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VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Final Battery Energy Storage System Report

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC or Commission) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628-065). This letter transmits the final Battery Energy Storage System (BESS) Report (Attachment 1), responses to comments on the draft BESS Report (Attachment 2), which are included in the updated consultation record on the BESS study (Attachment 3). This letter also provides background information on the reason that Alabama Power conducted this study, and it reiterates Alabama Power's concerns regarding FERC's recommendation to conduct the study and how the study will be used in the NEPA process, as well as the challenges in providing additional quantitative information on resource effects.

On April 12, 2019, FERC issued its Study Plan Determination[1] (SPD) for the Harris Project, approving Alabama Power's ten relicensing studies with FERC modifications. On May 13, 2019, Alabama Power filed Final Study Plans to incorporate FERC's modifications and posted the Final Study Plans on the Harris relicensing website at www.harrisrelicensing.com.

Alabama Power filed its Initial Study Report (ISR)[2] with FERC on April 10, 2020 and held an ISR Meeting on April 27, 2020. On June 11, 2020, Alabama Rivers Alliance (ARA) filed comments on the ISR, requesting a new study titled "*Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts*". FERC stated in its August 10, 2020 Determination on Requests for Study Modifications for the Harris Project that the original objectives of the BESS study were *"to evaluate battery type and size configurations, costs, and ownership options, as well as technical barriers to implementing BESS. The study would also assess how much operational flexibility could be provided by BESS and allow for more control of discharges downstream of the dam."*

[1] Accession Number 20190412-3000.
[2] Accession Number 20200410-5084.

In its recommendation, FERC also noted that the BESS study "*would require evaluating not only the cost of installing the battery units, but also the potential benefits to both developmental and non-developmental resources*" as well as recommended that Alabama Power "*evaluate how each of these release alternatives would affect recreation and aquatic resources in the project reservoir and downstream"* and conduct such evaluations consistent with the Downstream Release Alternative Study Plan[3].

Alabama Power completed the BESS study, including the analysis of the two alternatives[4] that FERC recommended in their August 10, 2020 letter, as well as an explanation of why only a qualitative assessment of aquatic and recreation resource effects was performed. Alabama Power filed the Draft Report on April 12, 2021[5], concurrently with the Updated Study Report (USR)[6]. Stakeholder comments on the Draft Report were due to Alabama Power no later than May 26, 2021[7].

Alabama Power held a USR Meeting on April 27, 2021, and filed the USR Meeting Summary on May 12, 2021[8]. Comments on the USR Meeting Summary were due on June 11, 2021. The Alabama Department of Conservation and Natural Resources (ADCNR), FERC, and ARA submitted disagreements on the USR presentation and/or the USR Meeting Summary. In addition, ARA filed[9] a Dispute of Study concerning the Draft BESS Report, disputing whether Alabama Power conducted the study in accordance with FERC's August 10, 2020 Determination on Study Modifications. Alabama Power provided a response to disagreements on the USR and ARA's Study Dispute on July 12, 2021[10]. Alabama Power noted that it appeared that ARA was attempting to make the case that Alabama Power's study report failed to meet the criteria of the recommended study. Alabama Power recommended that FERC reject ARA's dispute with respect to Alabama Power's BESS Study Report and its attempt to expand the scope of that study.

In a letter dated August 10, 2021[11], FERC provided additional comments on the USR and requested that Alabama Power provide "*a quantitative assessment of the effects of integrating a BESS on aquatic and recreational resources in Lake Harris and the Tallapoosa River downstream of Harris Dam*". FERC also noted that Alabama Power's BESS report provided "*insufficient information to evaluate the potential environmental benefits of a BESS.*" Alabama Power asserts that FERC's August 10, 2021 letter both inaccurately defines the original intent of the BESS study and also raises serious concerns regarding the additional analysis that FERC is requesting from Alabama Power and how that information will be used in the Harris relicensing process.

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[3] Accession Number 20190513-5093
[4] FERC recommended two new release alternatives: 1) a 50 percent reduction in peak releases associated with installing one 60 MW battery unit and 2) a proportionately smaller reduction in peak releases with installing a smaller MW battery unit (i.e., 5, 10, or 20 MW battery).
[5] Accession Number 20210412-5747
[6] Accession Number 20210412-5737
[7] Due to the length and complexity of the draft Phase 2 operating reports, Alabama Power extended the review and comment period from May 11, 2021.
[8] Accession Number 20210512-5067
[9] Accession Number 20210611-5070
[10] Accession Number 20210712-5085
[11] Accession Number 20210810-3043

Alabama Power disputes FERC's statement that the "*August 10 {2020} determination required Alabama Power to conduct a study to determine whether a battery energy storage system (BESS) could be installed at the Harris Project to* ***"ameliorate the effects of peaking operation on aquatic and recreational resources downstream from Harris Dam"*** (bold emphasis added). Rather, FERC's August 10, 2020 Determination relied on ARA's study goal to "*evaluate whether a BESS could be economically integrated at the Harris Project in order to mitigate the impacts of peaking, while retaining full system capabilities*".

In all filings associated with the BESS study, Alabama Power has provided rationale on why integrating a BESS at the Harris Project is not a reasonable alternative, including Alabama Power's response to ARA's initial study request [12], declining to conduct the study at all. However, following FERC's August 10, 2020 letter, Alabama Power conducted a robust desktop economic analysis of the two BESS alternatives and provided a qualitative assessment of resource effects in the Draft Report. To meet the intent of providing an analysis of effects on aquatic and recreational resources, Alabama Power conducted the qualitative assessment using existing literature to provide information to FERC on the potential effects of the two BESS alternatives on downstream aquatic and recreational resources. This is consistent with a desktop level study, where using qualitative information in the absence of quantitative information is standard and accepted practice.

Despite this common practice used in many studies conducted by licensees and in FERC's own environmental analyses, FERC noted in their August 10, 2021 letter that Alabama Power's resource analysis *"is insufficient to assess the effects of integrating a BESS at the Harris Project on aquatic and recreational resources at the project and on the Tallapoosa River."* FERC requested that Alabama Power revise the Draft Report to include "*a detailed, quantitative assessment of the effects of integrating a BESS at the Harris Project on aquatic and recreational resources in Lake Harris and the Tallapoosa river downstream from Harris Dam*", and that Alabama Power conduct this analysis "*consistent with the Downstream Release Alternative Study".*

As Alabama Power explained in the Draft Report, the models used in the Downstream Release Alternatives Study include operational parameters such as peaking operations and continuous minimum flows. In order to model Project operations with peaking reduced or removed, the HEC-ResSim and HEC-RAS models would need to be redesigned to incorporate new operating rules. Defining new operating rules and redesigning the models is beyond the scope of the desktop, feasibility level study proposed by ARA and recommended by FERC. Further, it is an oversimplification to assume that the results of other relicensing studies, particularly the Downstream Release Alternatives study where potential effects on aquatic habitat and recreation were quantitatively analyzed, can be used to quantitively analyze the effects of integrating a BESS, because all of those operational alternatives included releases from the existing turbines as they are designed to operate, i.e., at a peaking, best gate flow. For these reasons, only a qualitative assessment was performed as part of this study.

In the Draft Report, Alabama Power provided sufficient analysis to support that a BESS cannot be economically integrated at the Harris Project and Alabama Power does not consider it a reasonable

[12] Accession Number 20200710-5122

alternative. In the handful of examples where a BESS has been integrated at a FERC-regulated hydropower project, it has been at the request of the licensee as it makes economic sense for those specific projects within those energy markets. If Alabama Power were to pursue the addition of a new generating asset such as a BESS to its energy portfolio, located at any of its hydropower projects or elsewhere, that decision would be made independent of the FERC relicensing process. It is important to note that as a storage project that was designed and licensed as such, the Harris Project is in effect, a large battery, providing not only energy during peak use times, but also ancillary services such as black start capability, system reliability, and voltage regulation. Removing or reducing the peaking capabilities at the Harris Project is essentially converting the project from storage to run-of-river, which would require a major redesign and redevelopment of the project, and which FERC has agreed on the record is not a reasonable alternative[13]. For these reasons, Alabama Power is not including the integration of a BESS at the Harris Project as part of its license proposal and FERC should eliminate it from further consideration in its environmental analysis.

Finally, FERC recommended that Alabama Power review the other Harris Relicensing studies as well as the Pacific Northwest National Laboratory's (PNNL) white paper *"Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower*". Alabama Power notes that the PNNL white paper was of little value in determining quantitative environmental analysis for the Harris Project resources other than to suggest the types of studies that would be needed to provide quantitative information; again, conducting these types of studies is outside the scope of the BESS analysis.

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg
Harris Relicensing Project Manager

Attachment 1 – Final Battery Energy Storage System Report
Attachment 2 – Comments and Reponses on the Draft Battery Energy Storage System Report
Attachment 3 – BESS Study Report Consultation Record (April 2019 – October 2021)

cc: Harris Action Team 1 Stakeholder List

[13] Accession Number 20200810-3007

Attachment 1

Final Battery Energy Storage System Report

Battery energy Storage System (BESS) Report

R.L. Harris Hydroelectric Project

FERC No. 2628

Prepared for:

Alabama Power

Prepared by:

Kleinschmidt Associates

November 2021

harrisrelicensing.com

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1.0 INTRODUCTION

Alabama Power Company (Alabama Power) owns and operates the R.L. Harris Project (FERC Project No. 2628) (Harris Project), licensed by the Federal Energy Regulatory Commission (FERC or Commission). Alabama Power is relicensing the 135-megawatt (MW) Harris Project, and the existing license expires in 2023. The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources.

Harris Reservoir is maintained at or below the elevations specified by the Harris operating curve, except when storing floodwater. From May 1 through October 1, Harris Reservoir is maintained at or below elevation 793 feet mean sea level (msl), depending on inflow conditions. Between October 1 and December 1, the operating curve elevation drops to elevation 785 feet msl. The pool level remains at or below elevation 785 feet msl until April 1. From April 1 to May 1, the operating curve elevation rises to full pool at elevation 793 feet msl. During high flow conditions, U.S. Army Corps of Engineers (USACE)-approved flood control procedures in the Harris Water Control Manual (WCM) are implemented. During low flow conditions, the drought contingency curve is intended to be used as one of several factors in evaluating reservoir operations consistent with approved drought plans.

Alabama Power began operating the Harris Project in 1983. Initially, the Harris Project operated in peaking mode with no intermittent flows between peaks. Agencies and nongovernmental organizations requested that Alabama Power modify operations to potentially enhance downstream aquatic habitat. In 2005, based on recommendations developed in cooperation with stakeholders, Alabama Power implemented a pulsing scheme for releases from Harris Dam known as the Green Plan (Alabama Power and Kleinschmidt 2018). The purpose of the Green Plan was to reduce the effects of peaking operations on the aquatic community downstream. Although Green Plan operations are not required by the existing license, Alabama Power has operated Harris Dam according to its guidelines since 2005.

1.1 Study Background

Alabama Power filed its Initial Study Report (ISR) with FERC on April 10, 2020 and held an ISR Meeting on April 27, 2020.

As part of the Integrated Licensing Process (ILP), stakeholders can request study modifications or propose new studies following the issuance of the ISR. On June 11, 2020, Alabama Rivers Alliance (ARA) filed comments[1] on the ISR, requesting a new study titled

[1] Accession No. 20200611-5114

"Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts". The goal of the requested study was to determine whether a Battery Energy Storage System (BESS) could be economically integrated at Harris to mitigate the impacts of peaking, while retaining full system peaking capabilities. ARA stated that a feasibility study is needed to assess how much operational flexibility a BESS could provide and how it might allow for more fine-tuned control of ramping rates and discharges while also benefitting the larger grid and Alabama Power.

On July 10, 2020, Alabama Power responded to the ISR comments and additional study requests, respectfully declining to conduct the proposed BESS study[2]. As outlined in Alabama Power's response, the Harris Project units are not capable of ramping and, thus, the cost of a BESS system with restricted hydraulic ramping must include not only the battery but also the cost of replacing turbine runners as well as determining the extent of the effect on the balance of plant.

On August 10, 2020, FERC issued a *Determination on Requests for Study Modifications for the R.L. Harris Hydroelectric Project* [3].Within its determination, FERC recommended that Alabama Power conduct a BESS Study along with the Downstream Release Alternative Study[4], stating that it currently had insufficient information to evaluate the potential environmental benefits of a BESS. FERC stated that the feasibility of a BESS would require evaluating not only the cost of installing the battery units, as requested by ARA, but also the potential benefits to both developmental and non-developmental resources. FERC recommended that two new release alternatives should be evaluated: (a) a 50 percent reduction in peak releases associated with installing one 60 MW battery unit and (b) a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e., 5, 10 or 20 MW battery). FERC stated further that Alabama Power should include in its cost estimates for installing a BESS any specific structural changes, any changes in turbine-generator units, and costs needed to implement each battery storage type, as well as evaluate how each of these release alternatives would affect recreation and aquatic resources in the project reservoir and downstream.

While Alabama Power does not consider installation of a BESS at the Harris Project as a reasonable alternative, this feasibility study was conducted to provide FERC with the information needed to support its analysis. Commonly used acronyms used in this report are included in Appendix A. The information in this report was developed using both internal Southern Company expertise as well as externally published information from the National Renewable Energy Laboratory (NREL) (Appendix B).

[2] Accession No. 20200710-5122
[3] Accession No. 20200810-3007
[4] For reasons stated in Section 5.0, Alabama Power did not conduct the BESS study as part of the Downstream Release Alternative study.

2.0 BESS STUDY SCOPE

Harris Dam has two hydroelectric units, each rated at 67.5 MW, and each unit produces approximately 60 megawatts (MW) at best gate (i.e., efficient gate). The average flow at best gate for each unit is approximately 6,500 cubic feet per second (cfs)[5].

Both units were designed as peaking units to quickly react to electrical grid needs, and as such, the turbines were not designed to operate over a wide operating range – or restricted ramping rate – over an extended period. In fact, restricted ramping is avoided to prevent damage to hydro turbine and generator equipment. When transitioning from spinning mode[6] to generating mode, the wicket gates are opened over a period of approximately 45 seconds. One reason for this method of operating is so the turbine spends a minimal amount of time in the rough zone. The rough zone is an area in the turbine operating range where flows that are less than efficient gate cause increased vibrations in the turbine as well as cavitation along the low-pressure surfaces of the turbine runner. Prolonged ramping of the units can cause severe damage to the hydro turbine and generator equipment machinery by exposing it to excessive vibrations from vortex cores, pressure oscillations, and cavitation. Because the existing turbines are not designed to operate in a gradually loaded state or at flows lower than best gate, this study also evaluates replacing one existing unit with an upgraded unit.

Hydropower operations (i.e., project peaking operations) within this report are defined as one unit operating for 4 hours during peak energy demand, which is consistent with hydropower operations included in the Hydrologic Engineering Center's Reservoir System Simulation (HEC-ResSim) Daily Model as described in Section 4.2.1.6 of the *Downstream Release Alternatives (DRA) Phase 1 Report*[7] (Alabama Power and Kleinschmidt 2020). As outlined in the DRA Phase 1 report, a power guide factor was used to simulate the existing generation at Harris. With full power storage available, the HEC-ResSim Daily Model is programmed to generate 3.84 hours per day. Note, however, that actual historic data illustrates that Harris operates, as needed, one or both units for *more than 4 hours* to meet higher peak demands (when water is available) or when inflows are high (i.e., flood conditions). For example, two-unit generation occurs for approximately 9 percent of the total historical period. Therefore, although this study evaluated a battery that is sized to meet the hydropower operations as defined in the HEC-ResSim Daily Model (i.e., a 60 MW battery with 240 MWh capacity that can provide the equivalent generation of

[5] In its August 10, 2020 Study Determination letter, FERC incorrectly states the best gate hydraulic capacity at 8,000 cfs. The best gate (i.e., efficient gate) hydraulic capacity of the units at Harris is approximately 6,500 cfs each, and the full gate (i.e., maximum gate; maximum turbine discharge) is approximately 8,000 cfs each.
[6] "Spinning mode is also known as motoring or synchronous condensing (condensing) mode, where, upon shutdown from a generating condition, the unit essentially becomes a motor with an exciter system that then allows the generating unit to receive or supply reactive power as necessary to maintain transmission system voltage.
[7] Accession No. 20200727-5088

one unit at best gate for 4 hours per day/every day), this size battery is not adequate to retain full system peaking capabilities.

Based on FERC's recommendations and ARA's study objectives, two BESS alternatives were evaluated in this study: Option A and Option B.

Option A is a 60 MW battery with 240 MWh capacity that can provide the equivalent generation of one unit at best gate for 4 hours per day/every day.

Option B is a 20 MW battery with 80 MWh capacity that can provide the equivalent generation of one-third of one unit at best gate for 4 hours per day/every day. The remaining 40 MW needed for 1-unit peaking generation would be produced by a new, upgraded unit.

As recommended by FERC, the scope for both Option A and Option B includes developing information and analyses to address the following questions.

1. What are the cost estimates for installing a BESS, any specific structural changes, any changes in turbine-generator units, and costs needed to implement each battery storage type? (Section 3.0)
2. What are the impacts to recreation and aquatic resources in the Tallapoosa River downstream of Harris Dam as a result of installing and operating a BESS at the Harris Project? (Section 4.0)

To provide a cost estimate for installing and maintaining a BESS, the scope for both Option A and Option B also includes developing information and analyses to address the following questions:

3. What are the costs associated with augmentation programs to maintain the nameplate capacity of a BESS? (Section 3.1.2)
4. How often does a BESS need to be replaced, and what is the replacement cost? (Section 3.1.3)
5. What are the efficiency considerations when sizing the BESS for each option? (Section 3.1.5)
6. How would the battery be charged? (Section 3.1.5)
7. Where would a battery of this size be located? How much space would be needed? (Section 3.1.6)
8. To what extent does installing and operating a BESS affect transmission? (Section 3.1.7)

2.1 Assumptions

Assumptions used in gathering and analyzing data for the BESS study are included below.

1. All BESS related cost projections were based on the National Renewable Energy Laboratory (NREL) "Cost Projections for Utility-Scale Battery Storage: 2020 Update". This paper was based on 19 publications that focus on lithium-ion, utility scale battery systems. The report developed an advanced, moderate, and conservative projection for capital cost as well as operating and maintenance cost. Moderate projections were used for all costs in this study. Due to only four publications including data for 2050, NREL assumed a 25 percent reduction in cost for the high and median cases and a 39 percent reduction for the low case between 2030 and 2050. Therefore, *all cost estimates are screening level only*. Additionally, because the evaluation is conducted at screening level, potential incentives to offset battery costs are not included.
2. This evaluation focused solely on the Lithium Ion (Li-ion) battery chemistry as it is the most established battery technology for this application. Power quality and stability were not considered in evaluating the batteries.
3. Preliminary transmission impacts are presented at a screening level effort.
4. For siting and environmental permitting, a high potential for variability exists, and site-specific details regarding battery installation were not vetted at this time.
5. All analyses assume an initial in-service date of 2025, which presumes that the new Harris license is issued in 2023 upon the expiration of the current license as well as a two-year installation period.
6. Power supplied to the grid is unchanged.
7. Turbine/unit modifications, including replacing one unit with an upgraded unit, would be required to meet the goal of the study.
8. NREL data used in this report also incorporates oversizing to accommodate energy losses.
9. For Option A, the same daily volume of flow is released, but the amount of flow that would have been released from one unit at best gate is now dispersed throughout the day.
10. For Option B, a peak release would still be required, because 40 MW is still required by the hydropower unit during peak (20 MW battery + 40 MW hydropower unit = 60 MW peaking capacity).

3.0 ECONOMICS

3.1 BESS

A BESS is an electrochemical device that charges (or collects and stores energy) from the grid or a power plant and then discharges that energy at a later time to provide electricity or other grid services when needed. Several battery chemistries are available or under investigation, but the current market is dominated by lithium-ion chemistries (NREL 2021). Historically, BESS integrates variable renewable energy sources such as solar and wind. Recently, a smaller scale BESS (i.e. approximately 4 MW) has been coupled with a *run-of-river* hydropower plant at the request of the licensee[8]. However, integration with storage hydroelectric projects is just now being developed on small scale projects, and at the licensee's request. This is likely because the value streams that can be realized by the integration of a BESS and a hydro facility (energy arbitrage, ancillary benefits) already exist at storage projects. In other words, hydro storage projects by nature are already similar to large batteries.

3.1.1 BESS Estimated Installation Costs

Option A

Using the NREL 2020 Annual Technology Book (ATB) (Appendix B), the Moderate In-Service Cost (2018$) is 1,004/kilowatt (kW). Incorporating an inflation assumption of 2.5 percent, the 2025 In-Service cost would be $1,194/kW and a total in-service cost of $71.64 Million (M), which does not include interconnection costs, internal overhead costs, contingency, and financing. These costs add an additional $25M to the total cost of the project as outlined below.

- BESS System - $71.64M[9]
- Interconnection - $9M [10]
- Internal Overheads - $3M [11]
- Contingency - $8.4M[12]
- Financing - $4.6M[13]
- ***Total Installed Cost (2025$) - $96.6M ($1,610 / kW)***

[8] See FERC Project No. P-1904

[9] BESS System estimates provided in this report are based on NREL moderate projection for 2025 In-Service.

[10] Interconnection estimates provided in this report are based on preliminary transmission planning review provided in Section 3.1.7.

[11] Internal Overhead estimates provided in this report are based on a 36-month development and implementation schedule.

[12] Contingency estimates provided in this report are estimated at 10% of total cost.

[13] Financing estimates provided in this report are estimated at 5 percent of total cost based on 36-month schedule.

Option B

Using the NREL 2020 ATB (Appendix B), the Moderate In-Service Cost (2018$) is 1,004/kilowatt (kW). Incorporating an inflation assumption of 2.5 percent, the 2025 In-Service cost would be $1,194/kW and a total in-service cost of $23.9M, which does not include interconnection costs, internal overhead costs, contingency, and financing. These costs add an additional $17.1M to the total cost of the project as outlined below.

- BESS System - $23.9M
- Interconnection - $9M
- Internal Overheads - $2.5M
- Contingency - $3.6M
- Financing - $2.0M
- ***Total Installed Cost (2025$) - $41.0M ($2,050 / kW)***

3.1.2 Fixed Operation & Maintenance with Augmentation

All Li-ion systems degrade over time, losing capacity, and these systems' Li-ion cells have both a calendar life (years) and cycle life (MWhs). The literature on calendar and cycle life continues to evolve as the technology advances. The rate of degradation is based on the rate of charging and discharging, use cycles, operating temperature, and chemistry of the battery. A cycle is defined as one full charge and discharge cycle.

Due to degradation, suppliers offer augmentation programs to maintain the nameplate capacity of a system. These augmentation programs can involve adjusting the system over time by replacing modules, adding additional modules, or simply over building the system and adjusting the operations. Due to the complex nature of augmentation, this process is not typically performed annually. Rather, it is typically performed every 2 to 3 years based on projected use, lead times on equipment, and market prices.

Utilizing NREL's guidance for a 2025 in-service date, the annual fixed Operation & Maintenance (O&M) cost (including the cost for augmentation) adjusted for inflation is $29.84/kW-yr. For Option A, this would result in an annual estimated cost of $1.79M for the first twenty years. For Option B, this would result in an annual estimated cost of $0.597M. Following battery replacement (see below), the annual estimated cost for Option A would be $1.94M, and Option B would be $0.647M. Approximately two-thirds of this cost is associated with the augmentation of the system to maintain the rated capacity.

3.1.3 Battery Replacement - Estimated Replacement Costs

Recognizing that a Li-ion battery storage asset life is typically no more than 20 years, it is assumed the asset would need be totally replaced in 2045. Utilizing the NREL 2020 ATB (Appendix B), the moderate replacement cost (2045$) is $1,293/kW.

Option A

Utilizing an inflation assumption of 2.5 percent, this results in the 2025$ replacement cost of $789/kW and a total 2025$ replacement cost of $47.4M, which does not include, internal overhead costs, contingency, and financing. These costs add an additional $9.1M (2025$) to the total cost of the project as outlined below.

- BESS System - $47.4M[14] (NREL)
- Internal Overhead costs - $1.5M[15]
- Contingency - $4.9M[16]
- Financing - $2.7M[17]
- ***Total 2045 Replacement Cost (2025$) - $56.5M ($941 / kW)***

Option B

Utilizing an inflation assumption of 2.5 percent, this results in the 2025$ replacement cost of $789/kW and a total 2025$ replacement cost of $15.8M, which does not include internal overhead costs, contingency, and financing. These costs add an additional $3.89M (2025$) to the total cost of the project as outlined below:

- BESS System - $15.8M
- Internal Overheads - $1.25M
- Contingency - $1.7M
- Financing - $0.94M
- ***Total Replacement Cost (2025$) - $19.7M ($984 / kW)***

[14] Based on NREL moderate projection for 2045 replacement (2025$)

[15] Based on an 18-month development and implementation schedule (2025$)

[16] Estimated at 10 percent of total cost (2025$)

[17] Estimated at 5 percent of total cost based on 18-month schedule (2025$)

3.1.4 Asset Value

When adding an asset to the Southern Company system, the potential value of the asset relative to the alternative must be considered, in addition to its costs.

When comparing the hydro peaking unit and the BESS peaking unit, Harris Dam hydro is given full deferred generation credit due to its ability to provide full-rated capacity for at least 8 hours. Whereas, based on current internal company guidance, a 4-hour energy storage asset would only receive approximately 76 percent annual deferred generation capacity credit. Deferred generation capacity credit is typically valued at the Cost of New Entry (CONE).

As discussed in Section 3.1.5, the hydro asset would create greater energy production cost savings due to its zero-cost fuel source. The BESS would only transfer energy from one time to another while overcoming its efficiency losses. While a BESS could be directly charged by a hydro facility if electrically configured correctly, it would only be attributed with the incremental energy production savings (Peak Discharge Cost vs. Off-Peak Charge Cost)[18].

The majority of the energy production cost savings would be attributed to the zero-cost fuel hydro facility. For this reason, it is not reasonable or necessary to locate a BESS near the Harris hydro asset. Any BESS would be located at the most cost-effective location in the Southern Company system.

While the combination of an upgraded unit and BESS could be considered equivalent to the peaking capabilities of the existing unit, it comes at a significant capital and long-term operations and maintenance cost. While the energy production savings could be deemed equivalent it would require a greater production of energy to overcome the efficiency losses through the BESS.

3.1.5 Battery Efficiency, Dispatch, and Charging

Efficiency

A BESS is a net energy consumer, as it requires more energy to charge than is discharged. For every 1 kW that enters the BESS, only 0.85 kW is exited, exhibiting a round-trip efficiency loss of 15 percent (Cole 2020; NREL 2020). Therefore, 15 percent of every kWh is lost due to charging and discharging processes. This efficiency is typically inclusive of the auxiliary loads to operate the battery's cooling systems. Current information puts the auxiliary load requirement at 1 to 2 percent of annual usage depending on the cooling technology and usage duty cycle.

[18] As discussed in Section 3.1.5, the inflow would not sufficiently charge the BESS at the Harris Project.

To accommodate these losses, a BESS is typically oversized (7 to 10 percent) so that the required useable energy can be delivered at the point of interconnection (POI). For a BESS to supply 60 MW for 4 hours or 240 MWh of useable energy the system would have an installed direct current capacity of approximately 260 MWh. Similarly, for a BESS to supply 20 MW for 4 hours or 80 MWh of useable energy, the system would have an installed direct current capacity of approximately 88MWh.

A BESS is made up of both a power conversion block and the energy block. The power conversion block is typically comprised of an inverter and transformer, and the energy block is comprised of the batteries and battery management system. The power block is typically oversized to accommodate the reactive power requirements to maintain power stability.

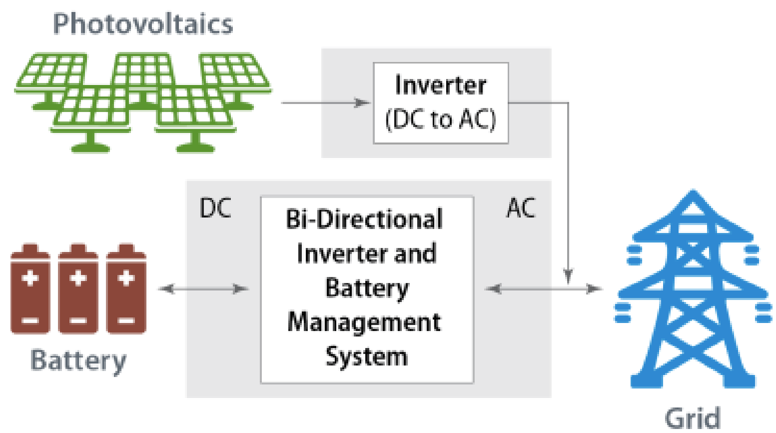
Dispatch and Charging

Southern Company dispatches generating assets to serve customers at the lowest cost while maintaining required reserve margins for reliability purposes. In the case of renewables such as solar, wind, or hydro, these assets can create significant energy production cost savings due to the zero-cost fuel. Solar and wind are variable energy resources where the output is dependent on the variable nature of the fuel resource. Solar and wind resources are typically allowed to dispatch as energy is generated to recognize those energy production cost savings for customers. Hydroelectric power is also dependent on nature and the amount of rain that has occurred throughout a time period. Peaking projects, like the Harris Project, operate to store energy in the reservoir and use it at the most valuable times of the day to create the greatest energy production costs-savings for customers.

A BESS can be charged using several different electrical configurations. An independently sited BESS would be directly connected and charged from the electrical grid. A BESS can also be charged by a co-located generator such as a solar or hydro facility, if electrically configured appropriately. In both configurations, the cost of charging the BESS would be at Southern Company's avoided energy cost while accounting for the efficiency losses of the BESS. Avoided energy cost is defined as the cost of the next increment of energy ($/MWh) to meet the next increment of load.

A BESS is a direct current (DC) system, so it requires a bi-directional inverter to connect to the alternating current (AC) power grid. Figure 3-1 below provides an example of a solar photovoltaic (PV) PV that is AC-coupled to a battery system through a common/shared switchgear. Whether the BESS is charged from the grid or the solar PV, its charging cost would be at the system's avoided energy cost if there is not a transmission related issue that limits the output of the solar PV. Due to efficiency losses, the amount of energy used to charge the BESS would be greater than is discharged.

Therefore, there would be an efficiency adjustment to the charging cost when determining the most economical times to dispatch power from the BESS.



Source: NREL 2017

Figure 3-1 AC-Coupled, Grid Connected BESS

In an example where the solar PV is directed to the BESS, the solar output that could have been directed to the grid to serve customers and create the associated energy production cost savings at those time periods is now directed to the BESS. Prior to directing the solar energy to the BESS, an economic optimization would be performed to recognize that the solar PV output by itself would have created a certain amount of energy production cost savings for customers and that there was an incremental amount of savings that could be realized for customers by using the BESS to shift solar production to more valuable (higher avoided energy cost) hours of the day while also recognizing the efficiency loss costs. While the BESS is creating an incremental amount of value for customers, it is really the hydro, solar, or wind assets that are creating the most energy production savings to customers. The BESS is merely trying to trans fer energy from one time to another to create an incremental amount of value, while requiring 15 percent more energy production.

When considering solar, the goal is to save the energy produced by the PV in the battery to use at a more optimal (peak) time. For hydro, the same concept would apply if the project is run-of-river, i.e., inflows are being instantaneously passed through the turbines and that energy is captured in a battery to use during the peak. The Harris Project, however, is not a run-of-river project; it is a storage project.

Charging a BESS with a hydropower unit is dependent on a reliable reservoir inflow. Otherwise, charging inconsistencies can affect the life of the battery and the guarantee that it can supply a certain amount of energy each day. The amount of inflow into Harris Reservoir is insufficient to fully charge both the Option A and the Option B BESS on a daily basis. The amount of flow into Harris Reservoir that can be consistently relied upon to charge the BESS is 247 cfs, which is the 95-percentile flow from the 1939-2011 unimpaired flow data in the HEC-ResSim model.

In order for the BESS to supply energy equally over a 4-hour peaking period, the battery would charge for 20 hours and discharge for 4 hours. Using the power equation and assuming a turbine efficiency of 90 percent[19], as well as considering the BESS efficiency losses described above, the energy produced by the hydropower unit with a flow of 247 cfs over 20 hours would be approximately 41 MWh. This means the BESS would have enough energy stored from the hydropower unit to produce approximately 10 MW per hour for 4 hours. The shortfall of the remaining 50 MW needed for peaking would be produced by the hydropower unit.

3.1.6 Battery Siting

A BESS has high energy density, meaning a substantial amount of energy can be placed in a small footprint; this correlates to a smaller acreage of land needed to site the BESS. A 60 MW / 240 MWh BESS would typically require approximately two acres of contiguous flat land to be cost effective. This land would house the battery containers, power conversion system, balance of plant equipment, and project level substation. Additional land would be required for the transmission system and construction staging operations.

Based on a cursory review of the proposed area around Harris Dam, adequate property for the BESS exists. Additional due diligence would be needed to determine siting availability and development feasibility and these studies would be performed in conjunction with any transmission interconnection studies. No environmental review was undertaken for this siting screening.

3.1.7 Interconnection

Alabama Power performed a screening level transmission study of the 60 MW (240 MWh)[20] BESS near Harris Dam. The BESS was evaluated as both a generator and a load to determine the impact on the transmission lines and associated system feeding the Crooked Creek Transformer Substation (TS) (Crooked Creek TS). This screening did not consider any stability or power quality analysis and represents a preliminary assessment of the BESS based on current assumptions within the transmission planning model.

The screening analysis determined that there is not currently adequate space and/or a spare terminal at the Harris Dam or Crooked Creek TS that could be used to interconnect the BESS. This screening analysis assumed that potential interconnection locations would be located at a new substation approximately one mile along the routes following the existing transmission lines from Crooked Creek TS. This would include either the East

[19] A turbine efficiency of 90 percent is high for a turbine being operated at the lower end of its operating range.
[20] Results are also applicable to Option B.

Roanoke – Crooked Creek 115 kV Transmission Line (TL) or the Martin Dam – Crooked Creek #1 115 kV TL. Site acquisition, design, and survey would be required to determine the optimal interconnection location and configuration. The estimated screening level capital cost for interconnections is approximately $9M, which includes costs associated with a new substation. The estimated screening level long-term, annual O&M costs for interconnections is an additional $173,000 per year[21].

3.2 Changes in Turbine-Generator Units

As described above, the existing turbines are not designed to operate at flows lower than best gate. Therefore, both alternatives evaluated within this study require replacing one of the existing turbines.

The existing turbines at Harris are Francis turbines with a maximum discharge of 8,000 cfs each. When evaluating an upgraded unit, it is imperative that the new unit retain the maximum discharge capacity of 8,000 cfs in order to operate during flood conditions. Additionally, an upgraded unit at Harris would need to operate at a much lower flow for both Options A and B. Option A would require a variable flow turbine capable of low flows to the current full gate flow, which is an unrealistic range given the mass of the rotating components. Option B would require a newly designed Francis turbine with a wider operating range capable of flows from ~4300 cfs up to the current full gate flow.

Replacing an existing Francis turbine with a new Francis turbine that has a wider operating range will require not only replacing the runner but replacing or refurbishing additional components that are normally addressed during a major turbine upgrade. Based on recent turbine upgrades at other Alabama Power projects, it is estimated that the cost to upgrade one of the Harris turbines with a new Francis turbine would exceed $20M. Francis turbines cannot operate at the lower flows required by Option A at Harris; therefore, a Francis turbine with a wider operating range would only be a possibility for Option B. A Kaplan variable flow turbine could provide lower flows in comparison to a Francis turbine; however, it is unlikely a Kaplan turbine could provide the full operating range required by Option A. If it could, replacing a Francis turbine with a Kaplan would require much more than the replacement of the runner and related components. It would require extensive structural modifications as well as complete replacement of major components such as wicket gates, discharge ring, hydraulic system, etc. In other words, installing a Kaplan variable flow unit would require a complete redesign of the Harris Project, because the powerhouse was constructed for a Francis style unit. A detailed engineering design would be required to determine if a Kaplan turbine is even possible in a powerhouse designed for a Francis unit. If it could be done, the range of flows would then be determined in addition to the costs of replacing a Francis unit with a Kaplan unit. This level of design detail is beyond the scope of this study. Therefore, Alabama Power is not providing a cost

[21] Based on current Open Access Transmission Tariff (OATT) rates and subject to periodic adjustments

estimate for replacing one of the existing turbines with a Kaplan variable flow turbine for Option A.

3.3 Summary of Estimated Costs

Option A is a 60 MW battery with 240 MWh capacity that can provide the equivalent generation of one unit at best gate for 4 hours per day/every day.

Option B is a 20 MW battery with 80 MWh capacity that can provide the equivalent generation of one-third of one unit at best gate for 4 hours per day/every day. The remaining 40 MW needed for 1-unit peaking generation would be produced by an upgraded hydro unit. Option "B" has a significantly higher cost per kW for total cost installed, because the fixed costs such as interconnection are not reduced significantly as the size of the project is reduced. Table 3-1 below summarizes the estimated costs of BESS over the license term.

Table 3-1 Summary of BESS Cost Estimates Over 40-Year License Term at the Harris Project

	Option A	Option B
Total Installed Cost (2025$)	$96.6M ($1,610 / kW)	$41.0M ($2,050 / kW)
Fixed O&M (including augmentation) (2025-2044)	$1.77M * 20 years	$0.597 * 20 years
Total Replacement Cost (2025$)	$56.5M ($941 / kW)	$19.7M ($984 / kW)
Fixed O&M (including augmentation) (2045-2064)	$1.94M * 20 years	$0.647M * 20 years
Turbine Replacement Cost	Undetermined	$20M
Interconnection O&M (based on current OATT rate and subject to periodic adjustments)	$173,000 * 40 years	$173,000 * 40 years

4.0 RESOURCE EFFECTS

Alabama Power is providing a scoping-level semi-quantitative assessment of the BESS effects on recreation and aquatic resources. The models utilized in the Final *Downstream Release Alternatives Phase 1 Study Report* (Alabama Power and Kleinschmidt 2020) include operational parameters such as peaking operations and continuous minimum flows. To model Project operations with peaking removed, the HEC-ResSim and Hydrological Engineering Center's River Analysis System (HEC-RAS) models would need to be redesigned to incorporate new operating rules. Defining new operating rules and redesigning the models is outside the scope of the study proposed by ARA and recommended by FERC.

In order to provide a semi-quantitative assessment, the 2001 operations hydrograph that was used to model the alternatives in the Downstream Release Alternatives Study was modified to create theoretical hydrographs for BESS Options A and B. For days with more than 4 unit hours of generation, the discharge was reduced by the equivalent of 4 unit hours of generation to represent replacement by BESS Option A. For Option B, the discharge was reduced by the equivalent of one-third of 4 unit hours of generation. The discharge replaced by BESS was then distributed evenly over each hour for that day for both Options A and B.

For days with 4 or less unit hours of generation for Option A and 1.33 or less unit hours of generation for Option B, the discharge for that day was averaged and distributed across each hour for that day. Figure 4-1 and Figure 4-2 provide 24-hour theoretical hydrographs for BESS Options A and B during winter, spring, summer, and fall.

Metrics for the theoretical BESS hydrographs were calculated to provide a comparison to Green Plan (baseline) operations. Results indicate BESS Option A and B would provide a daily average minimum flow of approximately 701 cfs and 316 cfs, respectively[22], though it would range substantially higher and lower on a daily basis, compared to a daily average minimum flow of 120 cfs under baseline (Green Plan) operations (Table 4-1). For BESS Option A, the daily minimum release ranged from 0 to 6,900 cfs, with 25th and 75th percentile values of 210 and 1,027 cfs. For BESS Option B, the daily minimum release ranged from 0 to 10,421 cfs, with 25th and 75th percentile values of 178 and 278 cfs.

Compared to baseline, the average magnitude of daily flow fluctuations would decrease by approximately 71% under BESS Option A and 27% under BESS Option B. Average hourly flow fluctuations would decrease by approximately 48% under BESS Option A and 39% under BESS Option B.

[22] Note that this is a daily average based on the 2001 calendar year flow conditions, not a continuous day-to-day minimum flow release; therefore, there would be no effects on lake levels compared to baseline.

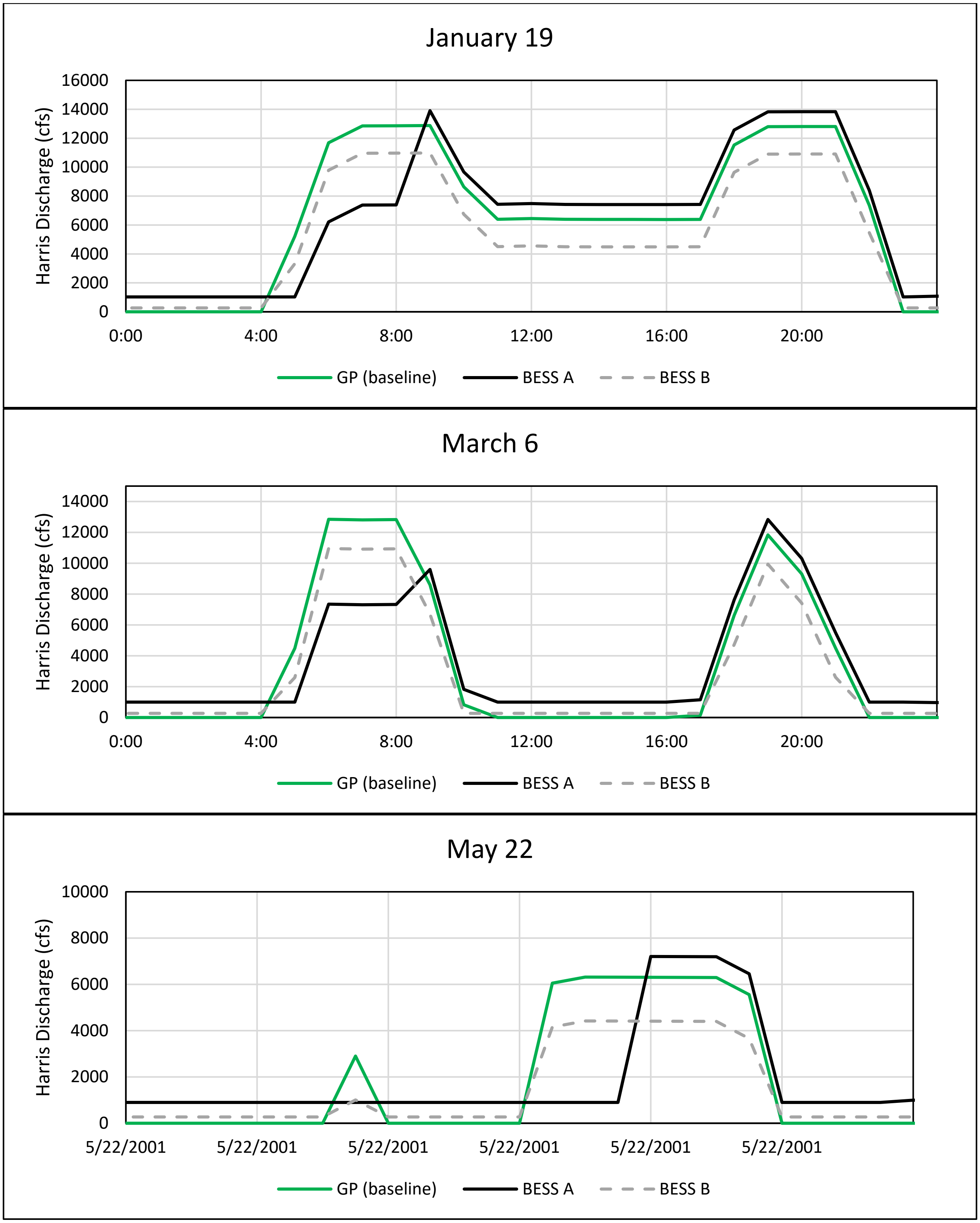


Figure 4-1 Theoretical 24-hour Hydrographs for BESS Options A & B for Example Dates in Winter and Spring

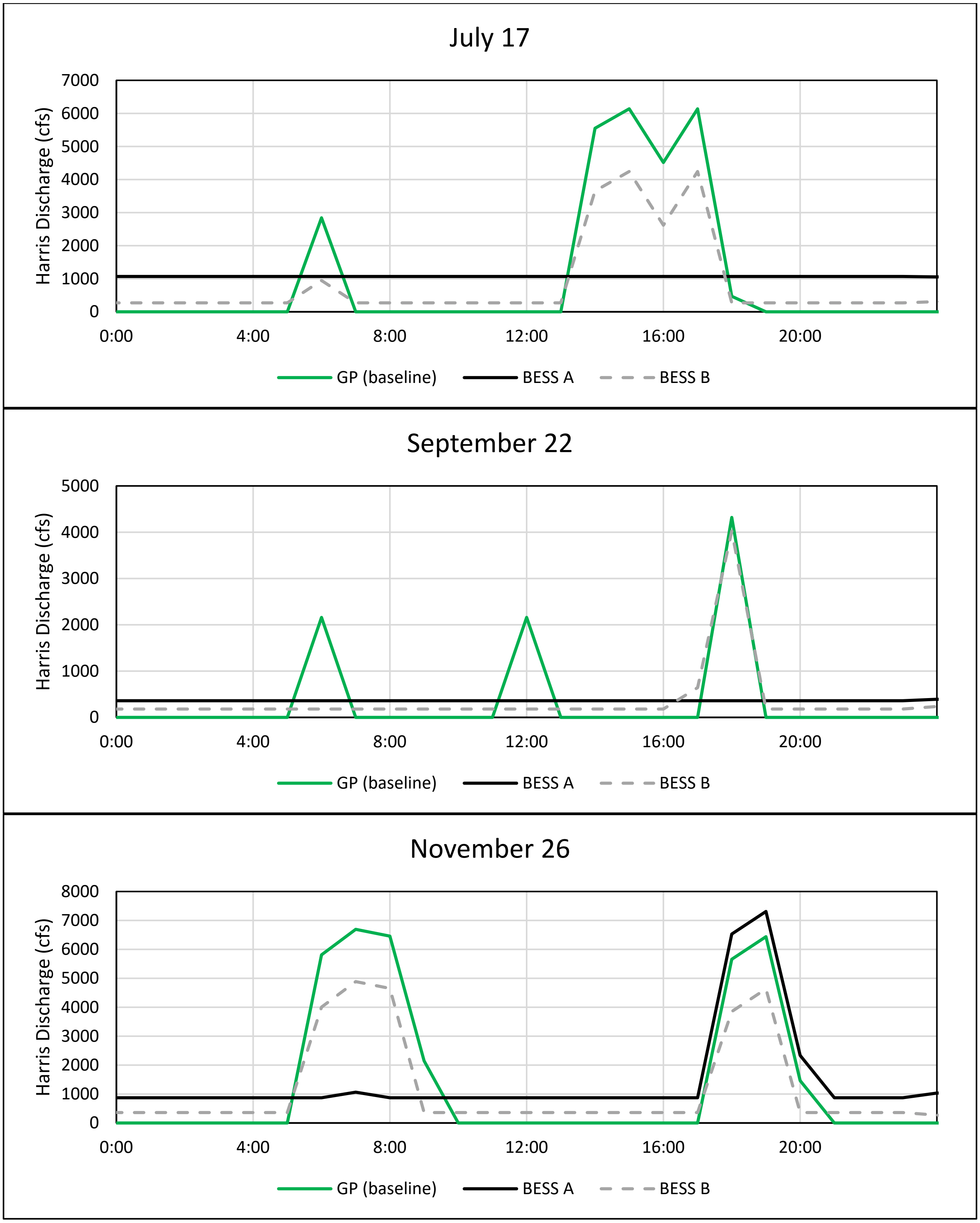


Figure 4-2 Theoretical 24-hour Hydrographs for BESS Options A & B for Example Dates in Summer and Fall

Table 4-1 Comparison of Metrics from Theoretical Hydrographs for BESS Options A and B

Operating Alternative	Average Daily Minimum Discharge (cfs)	Average Daily Flow Delta (cfs)	% Reduction in Average Daily Flow Delta	Average Hourly Flow Delta (cfs)	% Reduction in Average Hourly Flow Delta
Baseline (Green Plan)	120 (0 – 0)[1]	6,728	NA	875	NA
BESS Option A	701 (210 – 1027)	1,955	71%	452	48%
BESS Option B	316 (178 – 278)	4,880	27%	532	39%

[1] Numbers in parentheses depict 25th and 75th percentile values for the daily minimum discharge

Alabama Power would like to make one clarification to previous comments by FERC on the potential benefits of a BESS application on lake levels at the Harris Project. In the Determination on Study Modifications, FERC stated that during a 24-hour period the elevation level in Lake Harris can fluctuate 0.5 to 1.5 feet. Using the assumption that the volume of daily releases remains constant, but one unit is replaced by a 60 MW battery, FERC stated that the daily fluctuations could be cut in half. FERC's description of reservoir fluctuations is incorrect. As described in the Pre-Application Document and other relicensing documents, under normal conditions, Alabama Power operates the Harris Project during daily peak-load requirements to maintain reservoir levels according to the operating curve. Harris Reservoir is maintained at or below the elevations specified by the operating curve, except when storing floodwater. Table 4-2 below provides maximum, minimum, and average daily lake level fluctuations for the Harris Reservoir, as measured at Harris Dam. The average daily lake level fluctuation is well below 0.5 foot. Table 4-3 provides the number of days between 2015 and 2020 that the daily lake level fluctuation exceeded 1 foot. Special operations, such as flood control procedures, were in place each time the elevation fluctuation exceeded 1 foot within a day.

Table 4-2 Maximum, Average and Minimum Lake Harris Fluctuations (Daily)

Lake Harris Elevation Fluctuation in a Day (feet)							
	2015-2020	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Max	3.26	3.26	2.57	1.23	1.31	1.43	3.22
Average	0.23	0.23	0.20	0.19	0.23	0.19	0.32
Min	0.01	0.05	0.01	0.05	0.04	0.04	0.04

Table 4-3 Days Exceeding 1 Foot Fluctuation in Lake Harris from 2015-2020

	2015-2020	2015	2016	2017	2018	2019	2020
# of Days	34	6	5	2	3	1	17

4.1 Recreation Effects

4.1.1 Harris Reservoir

Assuming that utilizing a BESS would result in releasing the same daily volume of water as released under current operations, there would be no effect to reservoir levels, and, therefore, no effect on Lake Harris recreation.

However, if integrating a BESS (and concurrently, an upgraded unit) resulted in releasing a higher volume of water, the reservoir levels could be impacted. In the event that the daily volume of water released increased to the point that it affects Alabama Power's ability to maintain its operating curve, a negative impact on recreation would result[23].

4.1.2 Downstream of Harris Dam

Downstream recreation use can be affected by peaking flows. Flow effects on recreation-based activities can range widely in magnitude, frequency, and duration, depending on the project and its operational constraints (Reiser, Nightengale, Hendrix and Beck 2008). Although results from the Recreation Evaluation Report showed that the majority of recreation users below Harris Dam found all water levels acceptable (with river flows ranging from 499 to 6,110 cfs) and the recreation effort did not appear to be affected by flow (Kleinschmidt 2020), intermittent flows may decrease opportunities for recreation, particularly in the Project tailrace, where depth of water is very shallow when the turbines are not releasing water. Further downstream from the Project, the effect of a peaking flow is less as operating flows attenuate (Kleinschmidt 2020). For Option A, it is assumed the amount of flow that would normally be placed on peak would be released throughout the day resulting in more stable stage differences (i.e., less fluctuation), compared to one-unit peak releases. A more stable flow would benefit recreationists launching in the tailrace and for the first few miles below Harris Dam. Once a boater reaches the area around Malone, effects from changing the downstream peak release would be less apparent.

[23] See Section 3.7 of the Downstream Release Alternatives Phase 2 Report (Alabama Power and Kleinschmidt 2021) for further discussion regarding effects on Harris Reservoir recreation and the potential to reduce the usability of shoreline structures in the summer months in the event that the operating curve is not followed.

For Option B, the effects of peaking flows, and therefore intermittent flows, on recreation-based activities in the Project tailrace and first few miles downstream would still occur as they do under baseline operations, although the peak release would be smaller.

4.2 Aquatic Resource Effects

When flow varies, a number of stream variables may be affected, including velocity, depth, width, and wetted perimeter (the distance along the stream bottom from one shoreline to the other (Cushman 1985). Option A could potentially result in a reduced magnitude of water level fluctuations downstream because it is assumed that the one-unit release would be dispersed throughout the day. This would likely benefit the aquatic resources in the first seven miles downstream of Harris Dam, because a flow released over a longer time, compared to a one-unit peak release could benefit wetted perimeter by gradually increasing wetted area, allowing those species to move to other areas for refugia or other habitat, and increasing habitat stability. Based on analysis of the theoretical hydrograph for Option A, over the course of the 2001 calendar year, the daily average minimum flow would be approximately 701 cfs, though it would range substantially higher and lower on a daily basis. This would yield average increases in wetted perimeter within the range of results for the 600 and 800 cfs minimum flow scenarios modeled in the *Downstream Release Alternatives Draft Phase 2 Study Report* (Alabama Power and Kleinschmidt Associates 2021)(Table 4-6).

Option B would not have the same benefits as Option A because a peak release would still be required. With a 20 MW BESS, 40 MW is still required by the hydropower unit during peak. Therefore, the peak release would still occur, but would be proportionately smaller (i.e., approximately 4,300 cfs). In Option B, effects on the amount and stability of wetted habitat would be similar to the 300 cfs continuous minimum flow scenario described in the *Downstream Release Alternatives Draft Phase 2 Study Report* (Alabama Power and Kleinschmidt Associates 2021).

Note that for both Options A and B, a daily or periodic peak release would still occur, as shown in Figures 4-1 and 4-2 above.

Table 4-4 Percent Increase (compared to GP (baseline)) in Wetted Perimeter for 300, 600, and 800 cfs Continuous Minimum Flow Scenarios

Miles Below Harris	Mesohabitat Type	300 cfs	600 cfs	800 cfs
0.4	Riffle	6%	11%	14%
1	Riffle	2%	3%	4%
2	Riffle	7%	8%	9%
4	Pool	0%	1%	1%
7	Pool	6%	11%	12%
10	Riffle	1%	2%	2%
14	Run-Pool	1%	1%	1%
19	Riffle-Run	2%	7%	11%
23	Riffle	3%	7%	11%
38	Riffle	1%	2%	3%
43	Pool	1%	1%	2%

5.0 SUMMARY

The goal of this study is to evaluate whether a BESS could be economically integrated at the Harris Project in order to mitigate the impacts of peaking, while retaining full system peaking capabilities.

Based on FERC's recommendations and ARA's study objectives, Alabama Power evaluated two BESS release alternatives:

- 60 MW battery with 240 MWh capacity that can provide the equivalent generation of one unit at best gate for 4 hours per day/every day.
- 20 MW battery with 80 MWh capacity that can provide the equivalent generation of one-third of one unit at best gate for 4 hours per day/every day. The remaining 40 MW needed for 1-unit peaking generation would be produced by the new, upgraded unit.

Although FERC recommended that these analyses be conducted as part of the Downstream Release Alternatives Study, Alabama Power determined that a separate analysis is more appropriate. This evaluation differs from those included in the Downstream Release Alternatives Study in that it is a screening level effort, requires a more detailed economic analysis, and considers the replacement and addition of generation equipment such as the replacement cost of a turbine and installation/replacement cost of batteries. Additionally, in order to model Project operations with peaking removed, the HEC-ResSim and HEC-RAS models would need to be redesigned to incorporate new operating rules. Defining new operating rules and redesigning the models is outside the scope of the study proposed by ARA and recommended by FERC. Therefore, the impacts analysis is primarily qualitative only, whereas the Downstream Release Alternatives Study includes both quantitative and qualitative impacts analysis.

As discussed in this report, the cost of integrating a BESS at Harris is substantial, and, therefore, not economical in comparison to the potential limited environmental benefits. In addition to installation costs, costs associated with augmentation are required to maintain the nameplate capacity of a system. Furthermore, recognizing that a Li-ion battery storage asset life is typically no more than 20 years, it is assumed the asset would need be totally replaced in 2045. In terms of asset value, hydro generation provides more value when compared to BESS. Key considerations include the need to charge the BESS from the grid due to insufficient inflows as well the need for greater production of energy to overcome the efficiency losses through the BESS. Moreover, additional costs will be incurred for interconnection, as well as costs associated with replacing an existing unit.

Neither of the two alternatives retain full system peaking capabilities. Both alternatives evaluate hydropower operations (i.e. project peaking operations) defined as one unit operating for 4 hours during peak generation, which is consistent with the HEC-ResSim Daily Model in the DRA Phase 1 Report. As described in Section 2.0, actual historic data illustrates that Harris operates, as needed, one or both units for *more than 4 hours* to meet higher peak demands (when water is available) or when inflows are high (i.e., flood conditions). Therefore, for both Option A and Option B, there would be times throughout the year when higher, peaking flows would continue to be released, thereby reducing the potential environmental and recreational benefits of a BESS at the Harris Project.

Lastly, the extent to which the integration of a BESS at the Harris Project would mitigate the impact of peaking on recreation and aquatic resources was estimated by creating theoretical hydrographs using the same 2001 calendar year data employed in the Downstream Release Alternatives Study. Option A would potentially result in benefits to aquatic resources by increasing the amount and stability of wetted habitat to levels between the previously modeled 600 and 800 cfs minimum flow scenarios. Option B would result in benefits similar to the previously modeled 300 cfs minimum flow scenario. Under both options, benefits to aquatic resources would vary as the average daily minimum flow would vary higher and lower, depending on inflows.

BESS technology is very new, and methodology for integrating BESS at hydropower facilities is limited. In the handful of examples where a BESS has been integrated at a FERC-regulated hydropower project, it has been at the request of the licensee as it makes economic sense for those specific projects within those energy markets. For all of the reasons described above, integrating a BESS at the Harris Project is not a viable option for Alabama Power, and Alabama Power does not consider it a reasonable alternative.

6.0 REFERENCES

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APPENDIX A

ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

A

A&I	Agricultural and Industrial
ACFWRU	Alabama Cooperative Fish and Wildlife Research Unit
ACF	Apalachicola-Chattahoochee-Flint (River Basin)
ACT	Alabama-Coosa-Tallapoosa (River Basin)
ADCNR	Alabama Department of Conservation and Natural Resources
ADECA	Alabama Department of Economic and Community Affairs
ADEM	Alabama Department of Environmental Management
ADROP	Alabama-ACT Drought Response Operations Plan
AHC	Alabama Historical Commission
Alabama Power	Alabama Power Company
AMP	Adaptive Management Plan
ALNHP	Alabama Natural Heritage Program
APE	Area of Potential Effects
ARA	Alabama Rivers Alliance
ASSF	Alabama State Site File
ATV	All-Terrain Vehicle
AWIC	Alabama Water Improvement Commission
AWW	Alabama Water Watch

B

BA	Biological Assessment
B.A.S.S.	Bass Anglers Sportsmen Society
BCC	Birds of Conservation Concern
BLM	U.S. Bureau of Land Management
BOD	Biological Oxygen Demand

C

°C	Degrees Celsius or Centrigrade
CEII	Critical Energy Infrastructure Information
CFR	Code of Federal Regulation
cfs	Cubic Feet per Second
cfu	Colony Forming Unit
CLEAR	Community Livability for the East Alabama Region
CPUE	Catch-per-unit-effort
CWA	Clean Water Act

D

DEM	Digital Elevation Model
DIL	Drought Intensity Level
DO	Dissolved Oxygen
dsf	day-second-feet

E

EAP	Emergency Action Plan
ECOS	Environmental Conservation Online System
EFDC	Environmental Fluid Dynamics Code
EFH	Essential Fish Habitat
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act

F

°F	Degrees Fahrenheit
ft	Feet
F&W	Fish and Wildlife
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FNU	Formazin Nephelometric Unit
FOIA	Freedom of Information Act
FPA	Federal Power Act

G

GCN	Greatest Conservation Need
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS	Global Positioning Systems
GSA	Geological Survey of Alabama

H

Harris Project	R.L. Harris Hydroelectric Project
HAT	Harris Action Team
HEC	Hydrologic Engineering Center
HEC-DSSVue	HEC-Data Storage System and Viewer
HEC-FFA	HEC-Flood Frequency Analysis
HEC-RAS	HEC-River Analysis System
HEC-ResSim	HEC-Reservoir System Simulation Model
HEC-SSP	HEC-Statistical Software Package

HDSS	High Definition Stream Survey
hp	Horsepower
HPMP	Historic Properties Management Plan
HPUE	Harvest-per-unit-effort
HSB	Horseshoe Bend National Military Park

I

IBI	Index of Biological Integrity
IDP	Inadvertent Discovery Plan
IIC	Intercompany Interchange Contract
IVM	Integrated Vegetation Management
ILP	Integrated Licensing Process
IPaC	Information Planning and Conservation
ISR	Initial Study Report

J

JTU	Jackson Turbidity Units

K

kV	Kilovolt
kva	Kilovolt-amp
kHz	Kilohertz

L

LIDAR	Light Detection and Ranging
LWF	Limited Warm-water Fishery
LWPOA	Lake Wedowee Property Owners' Association

M

m	Meter
m^3	Cubic Meter
M&I	Municipal and Industrial
mg/L	Milligrams per liter
ml	Milliliter
mgd	Million Gallons per Day
µg/L	Microgram per liter
µs/cm	Microsiemens per centimeter
mi^2	Square Miles
MOU	Memorandum of Understanding

MPN	Most Probable Number
MRLC	Multi-Resolution Land Characteristics
msl	Mean Sea Level
MW	Megawatt
MWh	Megawatt Hour

N

n	Number of Samples
NEPA	National Environmental Policy Act
NGO	Non-governmental Organization
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
NWI	National Wetlands Inventory

O

OAR	Office of Archaeological Resources
OAW	Outstanding Alabama Water
ORV	Off-road Vehicle
OWR	Office of Water Resources

P

PA	Programmatic Agreement
PAD	Pre-Application Document
PDF	Portable Document Format
pH	Potential of Hydrogen
PID	Preliminary Information Document
PLP	Preliminary Licensing Proposal
Project	R.L. Harris Hydroelectric Project
PUB	Palustrine Unconsolidated Bottom
PURPA	Public Utility Regulatory Policies Act
PWC	Personal Watercraft
PWS	Public Water Supply

Q

QA/QC	Quality Assurance/Quality Control

R

RM	River Mile
RTE	Rare, Threatened and Endangered
RV	Recreational Vehicle

S

S	Swimming
SCORP	State Comprehensive Outdoor Recreation Plan
SCP	Shoreline Compliance Program
SD1	Scoping Document 1
SH	Shellfish Harvesting
SHPO	State Historic Preservation Office
Skyline WMA	James D. Martin-Skyline Wildlife Management Area
SMP	Shoreline Management Plan
SU	Standard Units

T

T&E	Threatened and Endangered
TCP	Traditional Cultural Properties
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TRB	Tallapoosa River Basin
TSI	Trophic State Index
TSS	Total Suspended Soils
TVA	Tennessee Valley Authority

U

USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

W

WCM	Water Control Manual
WMA	Wildlife Management Area
WMP	Wildlife Management Plan
WQC	Water Quality Certification

APPENDIX B

2020 ATB DATA FROM NREL

Cost Projections for Utility-Scale Battery Storage: 2020 Update

Wesley Cole and A. Will Frazier

National Renewable Energy Laboratory

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

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Contract No. DE-AC36-08GO28308

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June 2020

Cost Projections for Utility-Scale Battery Storage: 2020 Update

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National Renewable Energy Laboratory

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Executive Summary

In this work we describe the development of cost and performance projections for utility-scale lithium-ion battery systems, with a focus on 4-hour duration systems. The projections are developed from an analysis of 19 publications that consider utility-scale storage costs. The suite of publications demonstrates varied cost reductions for battery storage over time. Figure ES-1 shows the low, mid, and high cost projections developed in this work (on a normalized basis) relative to the published values. Figure ES-2 shows the overall capital cost for a 4-hour battery system based on those projections, with storage costs of $144/kWh, $208/kWh, and $293/kWh in 2030 and $88/kWh, $156/kWh, and $219/kWh in 2050. Battery variable operations and maintenance costs, lifetimes, and efficiencies are also discussed, with recommended values selected based on the publications surveyed.

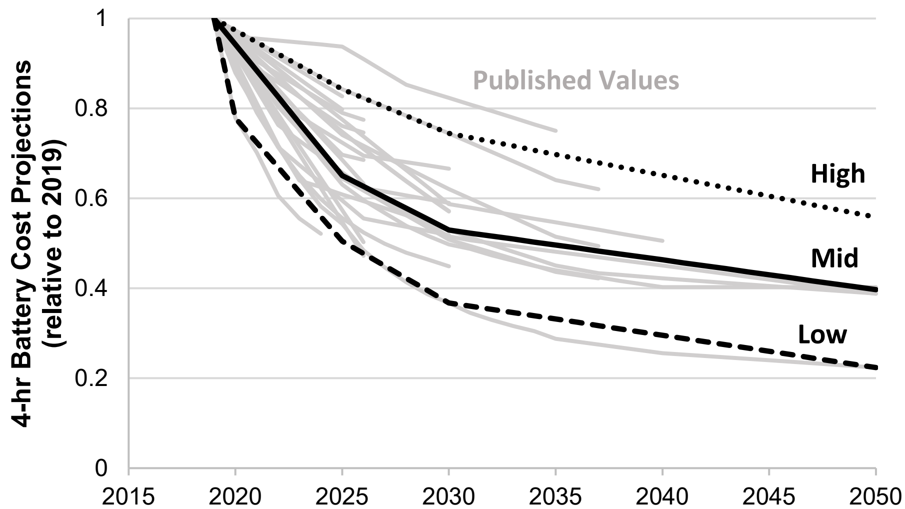

Figure ES-1. Battery cost projections for 4-hour lithium-ion systems, with values relative to 2019.
The high, mid, and low cost projections developed in this work are shown as the bolded lines.

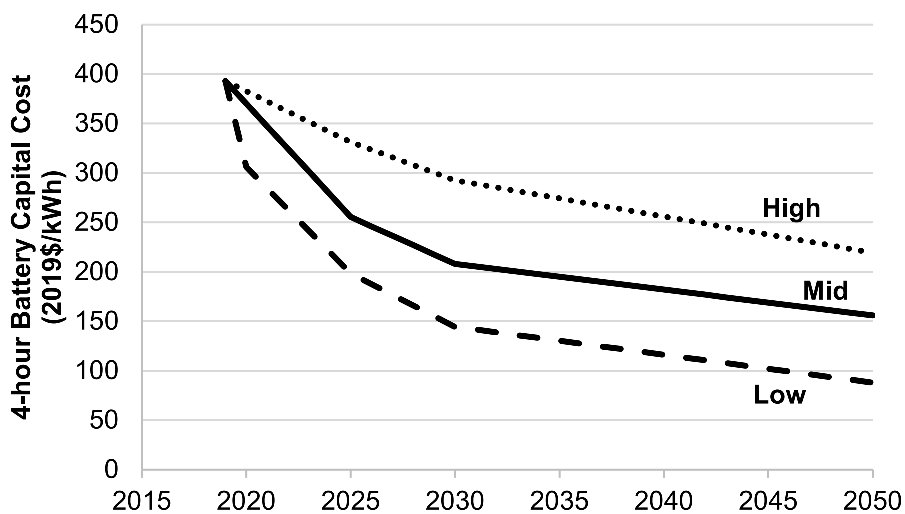

Figure ES-2. Battery cost projections for 4-hour lithium ion systems.

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1 Background

Battery storage costs have changed rapidly over the past decade. In 2016, the National Renewable Energy Laboratory (NREL) published a set of cost projections for utility-scale lithium-ion batteries (Cole et al. 2016). Those 2016 projections relied heavily on electric vehicle battery projections because utility-scale battery projections were largely unavailable for durations longer than 30 minutes. In 2019, battery cost projections were updated based on publications that focused on utility-scale battery systems (Cole and Frazier 2019). This report updates the cost projections published in 2019.

The projections in this work focus on utility-scale lithium-ion battery systems for use in capacity expansion models. NREL utilizes the Regional Energy Deployment System (ReEDS) (Cohen et al. 2019) and the Resource Planning Model (RPM) (Mai et al. 2013) for capacity expansion modeling, and the battery cost projections developed here are designed to be used in those models. Additionally, the projections are intended to inform the cost projections published in the Annual Technology Baseline (NREL 2019).

2 Methods

The cost and performance projections developed in this work use a literature-based approach in which projections are generally based on the low, median, and highest values from the literature. Table 1 lists 19 publications that are used in this work, though the projections rely primarily on those published in 2018 or 2019.

Table 1. List of publications used in this study to determine battery cost and performance projections.

Author or Organization	Citation
Avista	Avista (2017)
BNEF	BNEF (2019)
Brattle	Hledik et al. (2018)
CAISO	Energy and Environmental Economics, Inc. (2017)
DNV GL	DNV GL (2017)
EIA	EIA (2020)
EPRI	EPRI (2018)
IEA	IEA (2019)
IRENA	IRENA (2017)
Lazard	Lazard (2018) and Lazard (2019)
Navigant	Navigant (2017)
NIPSCO	NIPSCO (2018)
NYSERDA	NYSERDA (2018)
Platt River Power Authority	Aquino et al. (2017)
PNNL	Mongird et al. (2019)
PSE	PSE (2017)
Schmidt et al.	Schmidt et al. (2019)
Wood Mackenzie	Wood Mackenzie & Energy Storage Association (2019)

There are a number of challenges inherent in developing cost and performance projections based on published values. First among those is that the definition of the published values is not always clear. For example, dollar year, duration, depth-of-discharge, lifetime, and O&M are not always defined in the same way (or even defined at all) for a given set of values. As such, some of the values presented here required interpretation from the sources specified. Second, many of the published values compare their published projection against projections produced by others, and it is unclear how much the projections rely upon one-another. Thus, if one projection is used to inform another, that projection might artificially bias our results (toward that particular projection) more than others. Third, because of the relatively limited dataset for actual battery systems and the rapidly changing costs, it is not clear how different battery projections should be weighted. For example, should projections published in 2018 be given higher weight than those published in 2016? Or are some organizations better at making projections and therefore should be given higher weight?

In the interest of providing a neutral survey of the current literature, all cost projections included in this report are weighted equally. Only storage projections published in 2017 or later were considered. Many of the newest projections, however, are simply a compilation of older projections (just like this report). For example, Comello and Reichelstein (2019) relies on publications produced in 2017 or earlier, and Nian, Jindal, an Li (2019) use Cole et al. (2016) and IRENA (2017) for their cost projections. Thus, many of the latest papers with cost projections would create known redundancies (per the second challenge listed above) and were therefore excluded from this work. All cost values were converted to 2019$ using the consumer pricing index. In cases where the dollar year was not specified, the dollar year was assumed to be the same as the publication year.

We only used projections for 4-hour lithium-ion storage systems. We define the 4-hour duration as the output duration of the battery, such that a 4-hour device would be able to discharge at rated power capacity for 4-hours. In practice that would mean that the device would charge for more than 4 hours and would nominally hold more than its rated energy capacity in order to compensate for losses during charge and discharge.

We report our price projections as a total system overnight capital cost expressed in units of $/kWh. However, not all components of the battery system cost scale directly with the energy capacity (i.e., kWh) of the system (Feldman et al. Forthcoming). For example, the inverter costs scale according to the power capacity (i.e., kW) of the system, and some cost components such as the developer costs can scale with both power and energy. By expressing battery costs in $/kWh, we are deviating from other power generation technologies such as combustion turbines or solar photovoltaic plants where capital costs are usually expressed as $/kW. We use the units of $/kWh because that is the most common way that battery system costs have been expressed in published material to date. The $/kWh costs we report can be converted to $/kW costs simply by multiplying by the duration (e.g., a $300/kWh, 4-hour battery would have a power capacity cost of $1200/kW).

To develop cost projections, storage costs were normalized to their 2019 value such that each projection started with a value of 1 in 2019. We chose to use normalized costs rather than absolute costs because systems were not always clearly defined in the publications. For example, it is not clear if a system is more expensive because it is more efficient and has a longer lifetime, or if the authors simply anticipate higher system costs. With the normalized method, many of the difference matter to a lesser degree. Additionally, as will be shown in the results section, the 2019 benchmark cost that we have chosen for our current cost of storage is lower than nearly all the 2019 costs for projections published in 2017. By using normalized costs, we can more easily use these 2017 projections to inform cost reductions from our lower initial point.

If a publication began its projections after 2019, the 2019 value was estimated using linear extrapolation from the nearest value. For example, if the 2020 price was $500/kWh and the 2021 price was $480/kWh, then the 2019 price was assumed to be $520/kWh. Because projections tend to have more rapid declines in the early years, the linear approach will tend to underestimate the 2019 value, which in turn will overestimate the normalized values. If publications only provided values for specific years (e.g., 2018, 2020, and 2030), linear interpolation was used to fill in values for in-between years in order to create yearly projections.[1]

In order to define our low, mid, and high projections, we only considered cost projections published in 2018 and later. Projections published in 2017 are still shown in many figures in the results section, and we used the 2017-vintage data as a benchmark for the projections that we developed. We felt that the later vintage publications would provide a better assessment on anticipated storage cost reductions than those published in earlier years.

We defined our low, mid, and high projections as the minimum, median, and maximum point, respectively in 2020, 2025, and 2030. Defining the 2050 points was more challenging because only four datasets extended to 2050. Of the three datasets, they showed a 19%, 25%, 27%, and 39% cost reduction from 2030 to 2050. The 39% reduction was used from the low case, while 25% was used for the mid and high cases. In other words, the low case was assumed to decline by 39% from 2030 to 2050, while the mid and high cases were assumed to decline by 25% from 2030 to 2050.

Points in between 2018, 2020, 2025, 2030, and 2050 were set based on linear interpolation between years with values assigned. To convert these normalized low, mid, and high projections into cost values, the normalized values were multiplied by the 4-hour battery storage cost from Feldman et al. (Forthcoming) to produce 4-hour battery systems costs.

To estimate the costs for other storage durations (i.e., durations other than 4 hours), we assign separate energy costs and power costs such that

$$\text{Total Cost (\$/kWh)} = \text{Energy Cost (\$/kWh)} + \text{Power Cost (\$/kW)} / \text{Duration (hr)}$$

To break apart the total cost into energy and power components, we used the 4-hour and 2-hour cost estimates from Feldman et al. (Forthcoming). By using the total cost for two distinct durations, we could calculate the energy and power costs. We could also check these energy and power costs against the 1-hour and 0.5-hour cost estimates that were also included in Feldman et

[1] There was one exception to this linear interpolation. Because the projection from Schmidt et al. (2019) drove some of the low-cost projection in this work, we interpolated their values using a fourth-order polynomial in order to get a better estimates for their pre-2035 values.

al. (Forthcoming). We assume that the relative cost reductions developed for the total battery system cost apply equally to the energy and power components of the battery.

The method employed in this work relies solely on literature projections. It does not take into account other factors that might impact costs over time, such as materials availability, market size, and policy factors. Unless these and other factors are not captured in the work surveyed, then they will not be reflected in the projection produced here.

3 Results and Discussion

The normalized cost trajectories with the low, mid, and high projections are shown in Figure 1. The high projection follows the highest cost trajectory (of 2018 vintage or newer) through 2030. It then receives the 25% cost reduction from 2030 through 2050 as described in the methods section. The mid and low projections have initial slopes being steeper than later slopes, indicating that most publications see larger cost reductions in the near-term that then slow over time. By 2030, costs are reduced by 63%, 47%, and 26% in the low, mid, and high cases, respectively, and by 2050 are reduced by 78%, 60%, and 44%, respectively.

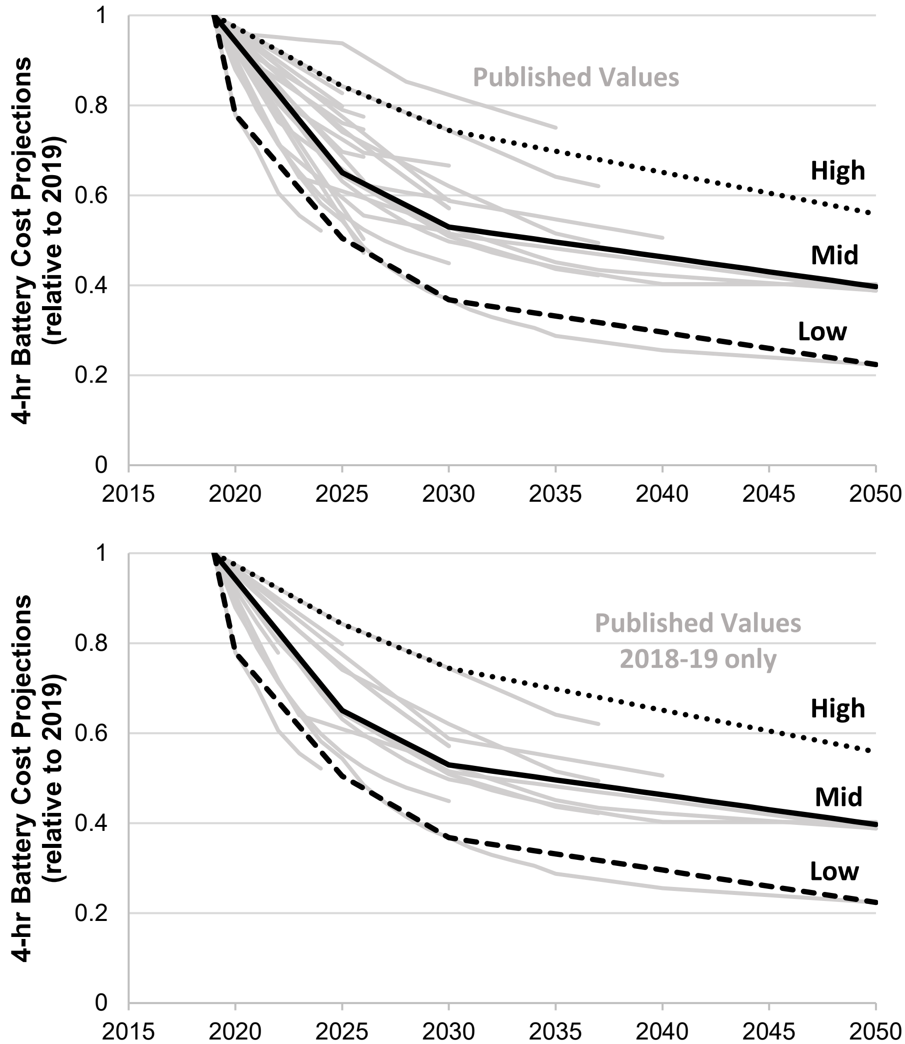

Figure 1. Battery cost projections for 4-hour lithium-ion systems, with values relative to 2019. The high, mid, and low cost projections developed in this work are shown as the bolded lines. The upper figure shows the full range of cost projections used in this work, while the lower figure shows only those cost projections published after 2017. Figure values are included in the Appendix.

The resulting total system cost for a 4-hour device is shown in Figure 2. The 2019 starting point of $380/kWh is taken from Feldman et al. (Forthcoming). Although there is uncertainty in the 2019 cost (which is discussed later), we use a single cost for 2019 for convenience as we apply these costs in our long-term planning models (applying the same costs in 2019 means that the 2019 solution will not change as we shift from a "high" to a "mid" to a "low" cost projection for storage). By definition, the projections follow the same trajectories as the normalized cost values. Storage costs are $124/kWh, $207/kWh, and $338/kWh in 2030 and $76/kWh, $156/kWh, and $258/kWh in 2050. Costs for each year and each trajectory are included in the Appendix.

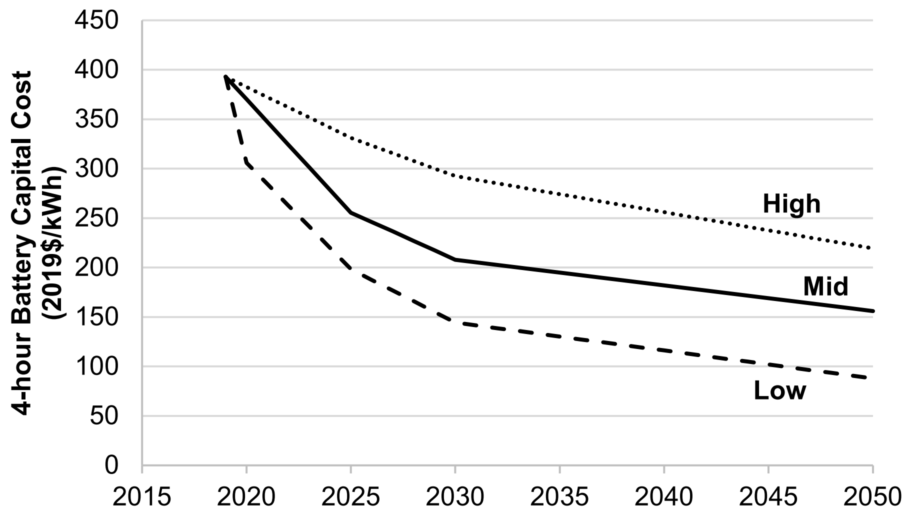

Figure 2. Battery cost projections for 4-hour lithium ion systems.

These values represent overnight capital costs for the complete battery system. Figure values are included in the Appendix.

Figure 3 shows how the absolute cost projections from Figure 2 compare to the published cost projection values. Because we chose to develop our projections based on the normalized cost values, they do not necessarily line up with the published cost projections. Many of the published cost projections never even reach the starting point that we have selected, while a few others are at some point lower than our low projection. Some of that discrepancy is due to the vintage of the projection. Cost projections published in 2017 tend to be higher than those published in 2018 or later. The lower plot in Figure 3 shows that the cost projections tend to be better aligned on an absolute basis when only the more recent cost projections are considered.

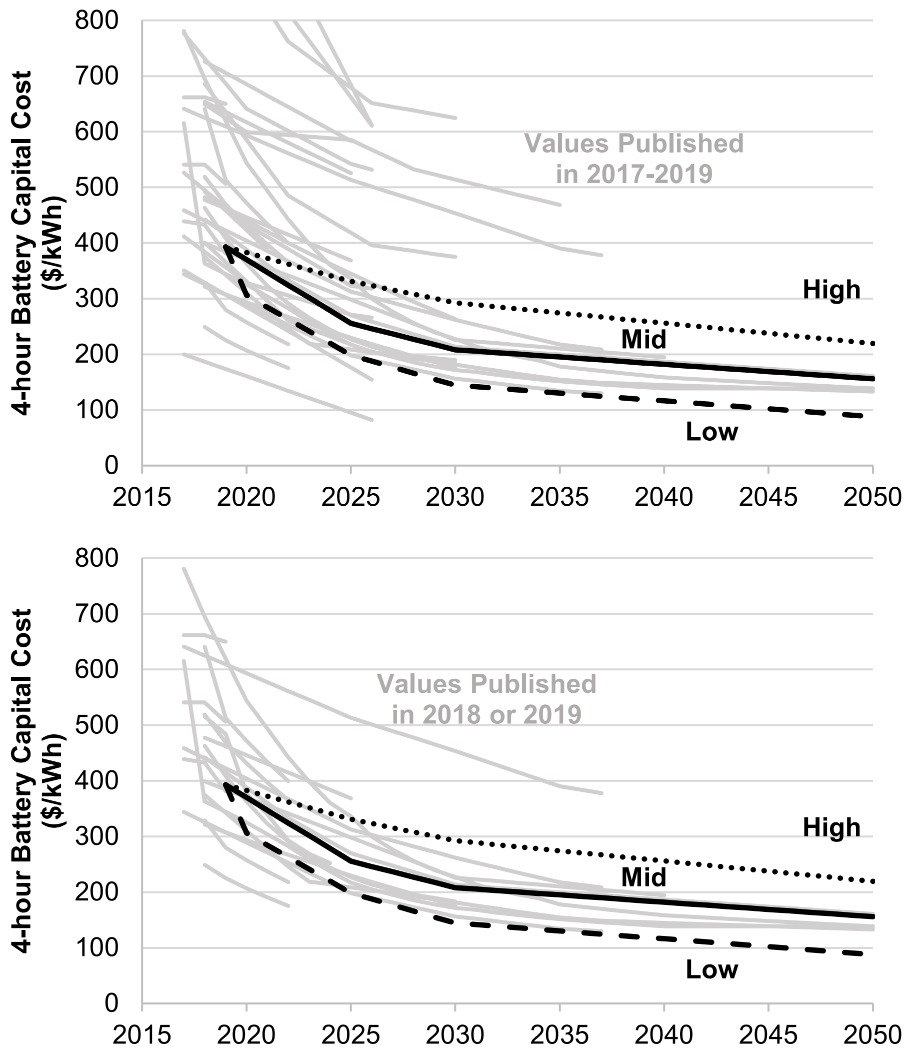

Figure 3. Battery cost projections developed in this work (bolded lines) relative to published cost projections. The upper figure shows the full range of cost projections used in this work, while the lower figure shows only those cost projections published after 2017. Cost values above $800/kWh are not shown.

One of the key assumptions in our projections is the choice of the starting point. A higher or lower starting point would shift the set of projections up or down relative to the change in magnitude of the starting point. To better assess the quality of our starting point, we compared the value from Feldman et al. (Forthcoming) with other values published in 2018 or later (shown in Figure 4). We did not consider older reported values because of the rapid changes in battery costs. This comparison increases our confidence that the starting value we have selected is reasonable, although it does demonstrate that there is considerable uncertainty (±$100/kWh) in the current price of battery storage systems.

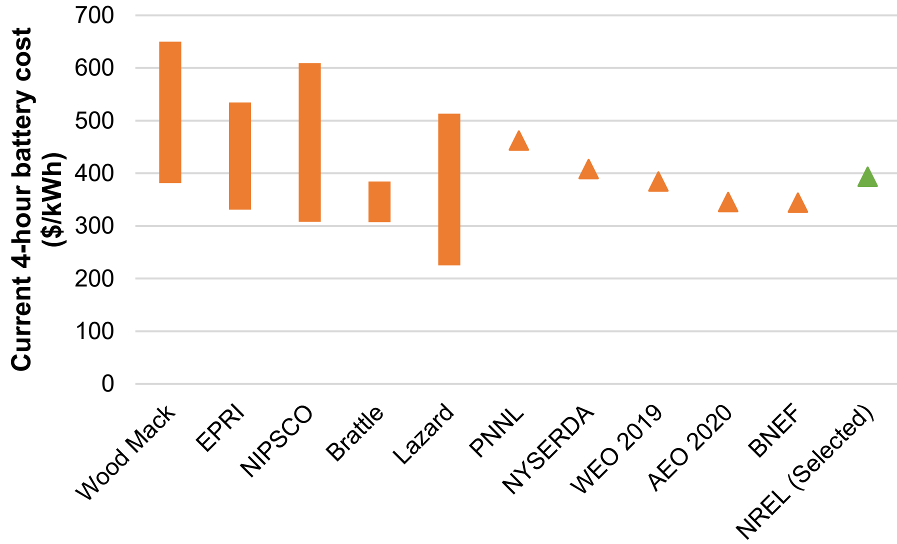

Figure 4. Current battery storage costs from studies published in 2018 or later. The NREL value (Feldman et al. Forthcoming) was selected as the 2019 starting cost for this work.

One of the other challenges with using the normalized cost reductions to develop our projections is that projections that start at a higher value than our starting point might see greater cost reduction potential, and thus have a high percent reduction but still never have a low $/kWh cost. Conversely, projections that start lower than our starting point might have smaller cost reduction potential on a percentage basis but achieve very low $/kWh costs. However, we still prefer to use the normalized cost reduction numbers because of the large discrepancy in starting costs across published projections, and because it helps to obviate the challenge of different cost and system definitions in the different publications.

Figure 5 shows the cost projections for the power and energy components of the battery. The breakdown of power and energy is derived from Feldman et al. (Forthcoming) as described in the methods section. These components are combined to give a total system cost, where the system cost (in $/kWh) is the power component divided by the duration plus the energy component.

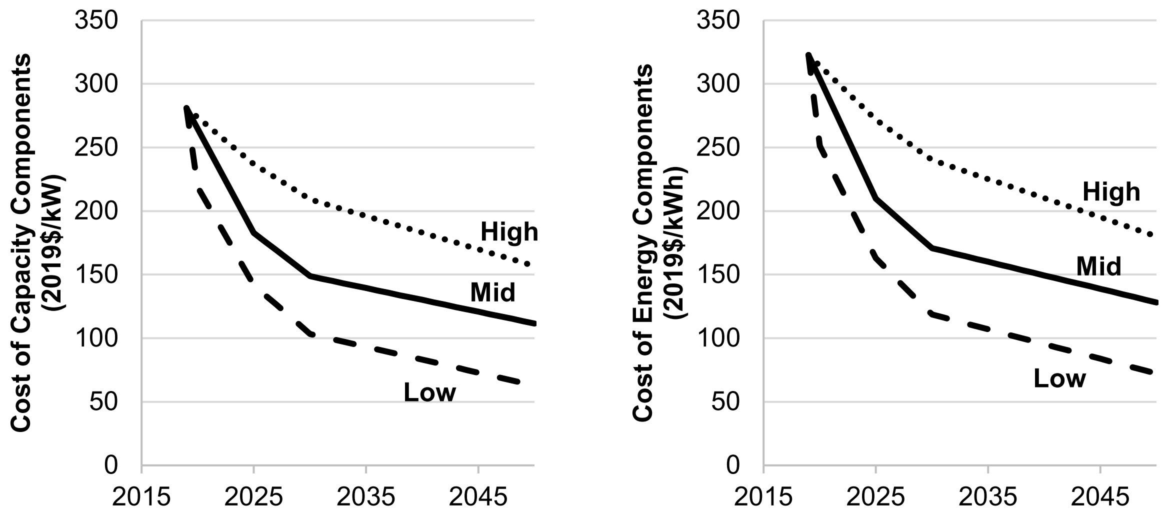

Figure 5. Cost projections for power (left) and energy (right) components of lithium-ion systems.
Note the different units in the two plots.

These power and energy costs can be used to specify the capital costs for other durations. Figure 6 shows the cost projections for 2-, 4-, and 6-hour duration batteries (using the mid projection only). On a $/kWh basis, longer duration batteries have a lower capital cost, and on a $/kW basis, shorter duration batteries have a lower capital cost. Figure 6 (left) also demonstrates why it is critical to cite the duration whenever providing a capital cost in $/kWh or $/kW.

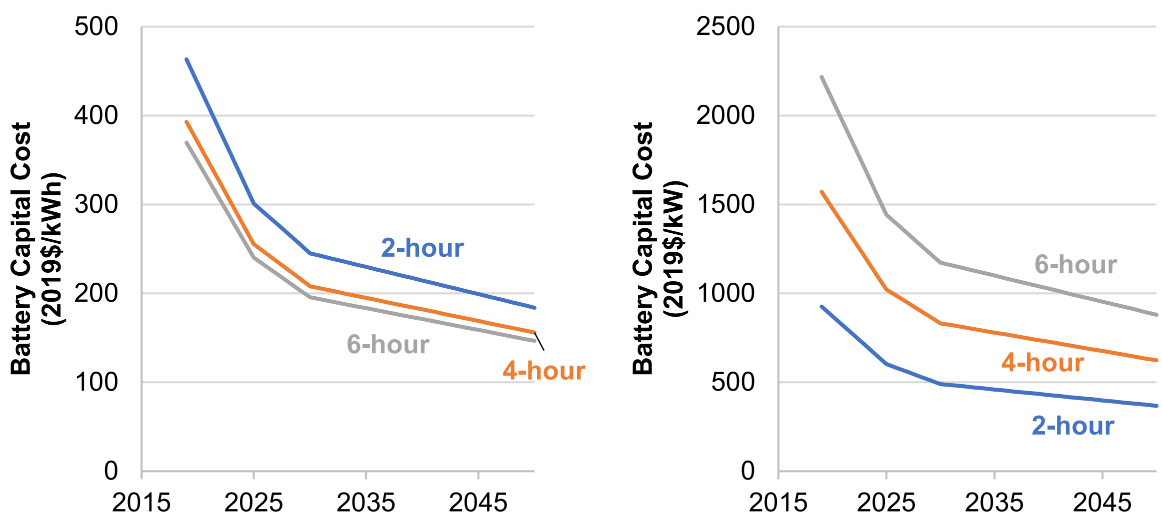

Figure 6. Cost projections for 2-, 4-, and 6-hour duration batteries using the mid cost projection.
Left shows the values in $/kWh, while right shows the costs in $/kW.

To fully specify the cost and performance of a battery storage system for capacity expansion modeling tools, additional parameters besides the capital costs are needed. Figure 6 shows the range of variable operations and maintenance (VOM), fixed operations and maintenance (FOM), lifetime, and round-trip efficiency[2] assumptions from the publications surveyed. The rightmost point in the figure shows the value that we have selected to represent our 4-hour battery system. The VOM is generally taken to be zero or near zero, and we have adopted zero for the VOM. This VOM is defined to coincide with an assumed one cycle per day and a given calendar lifetime. Cycling more than once per day might reduce that lifetime, so cycles beyond once per day should see a non-zero VOM.

We have allocated the all operating costs (at the one-cycle-per-day level) to the FOM. By putting the operations and maintenance costs in the FOM rather than the VOM we in essence assume that battery performance has been guaranteed over the lifetime, such that operating the battery does not incur any costs to the battery operator. The FOM has a much broader range of values. One of the primary differences in the level of FOM was whether augmentation or performance maintenance were included in the cost. For example, DNV GL (2017) reports a $6/kW-yr FOM and a $7.5/kWh-yr capacity maintenance cost to address degradation (values in 2017$). Lower FOM numbers typically include only simple maintenance while higher FOM numbers include some capacity additions or replacements to deal with degradation. We have adopted a FOM value from the high end and assume that the FOM cost will counteract degradation such that the system will be able to perform at rated capacity throughout its lifetime. The FOM value selected is 2.5% of the $/kW capacity cost for a 4-hour battery. We assume that this FOM is consistent with providing approximately one cycle per day. If the battery is operating at a much higher rate of cycling, then this FOM value might not be sufficient to counteract degradation.

[2] Round-trip efficiency is defined as the system efficiency through a charge/discharge cycle. For example, it would include losses associated with cooling systems or battery control equipment.

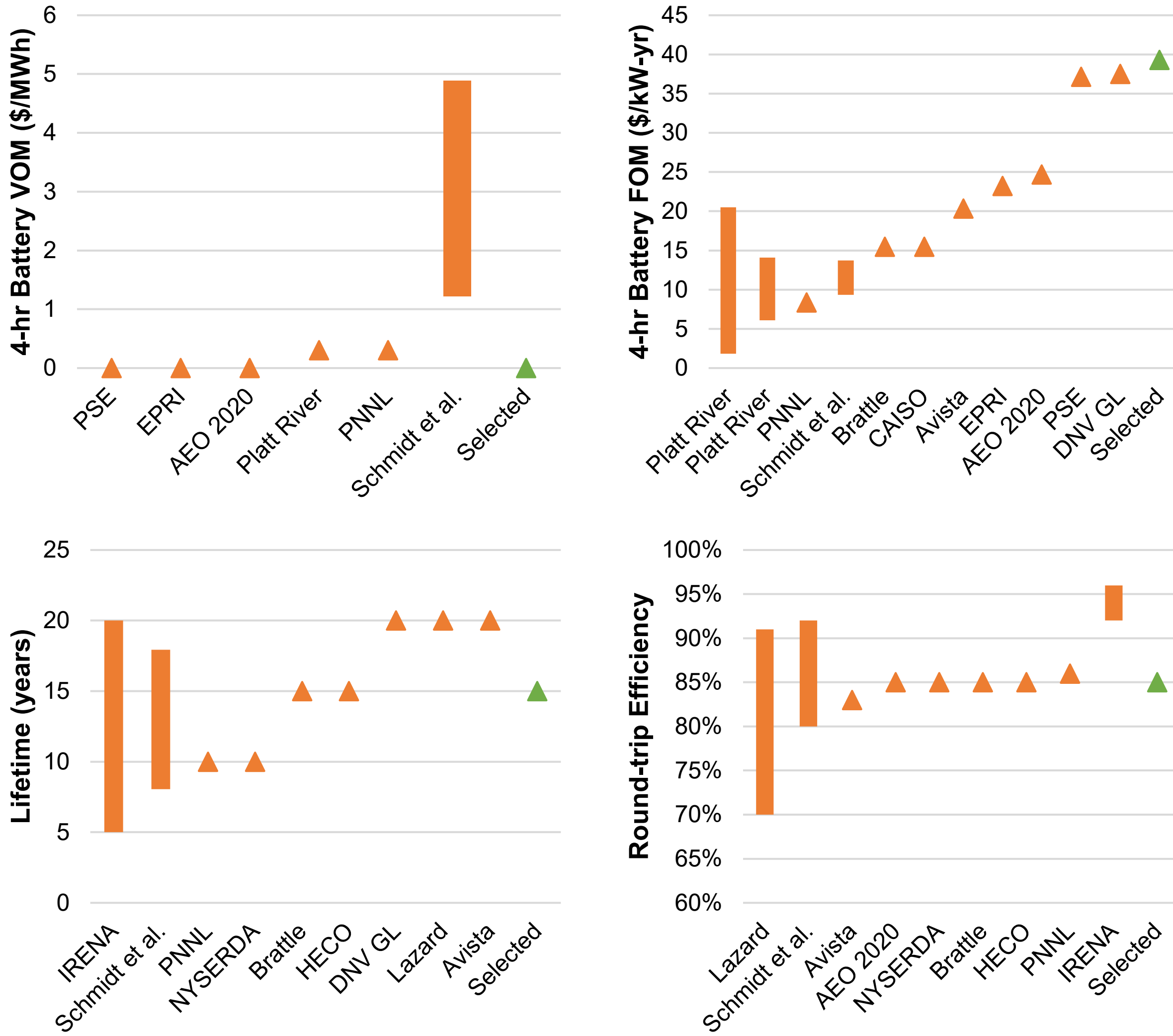

Figure 7. Variable O&M (top right), fixed O&M (top left), lifetime (bottom right), and round-trip efficiency (bottom left) from various published sources. The values selected for this study are the right-most values shown.

The lifetime we selected is 15 years, which is near the median of the published values. The round-trip efficiency is chosen to be 85%, which is well aligned with published values.

4 Summary

Battery storage costs have evolved rapidly over the past several years, necessitating an update to storage cost projections used in long-term planning models and other activities. This work documents the development of these projections, which are based on recent publications of storage costs. The projections show a wide range of storage costs, both in terms of current costs as well as future costs. Although the range in projections is considerable, all projections do show a decline in capital costs, with cost reductions by 2025 of 6-48%.

The cost projections developed in this work utilize the normalized cost reductions across the literature, and result in 26-63% capital cost reductions by 2030 and 44-78% cost reductions by

2050. The cost projections are also accompanied by assumed operations and maintenance costs, lifetimes, and round-trip efficiencies, and these performance metrics are benchmarked against other published values.

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Appendix

Table 2 includes the values that are plotted in Figure 1 and Figure 2. Figure 9 and Figure 10 show the comparison of the projections developed in this work relative to the projections that were produced in last year's report (Cole and Frazier 2019). Although 4-hour costs did not change much from last year's report, the relative distribution between the power and energy costs did change. Thus, 2-hour or 6-hour battery costs calculated using data from this year's report will show greater differences than the 4-hour batteries.

Table 2. Values from Figure 1 and Figure 2, which show the normalized and absolute storage costs over time. Storage costs are overnight capital costs for a complete 4-hour battery system.

	Normalized Cost Reduction			4-hour Storage Costs (2019$/kWh)		
Year	Low	Mid	High	Low	Mid	High
2019	1.00	1.00	1.00	393	393	393
2020	0.78	0.94	0.97	306	370	383
2021	0.73	0.89	0.95	286	351	372
2022	0.68	0.84	0.92	266	331	362
2023	0.62	0.79	0.90	245	312	352
2024	0.57	0.74	0.87	225	293	341
2025	0.52	0.70	0.84	205	273	331
2026	0.49	0.66	0.82	193	260	323
2027	0.46	0.63	0.80	181	247	316
2028	0.43	0.60	0.78	169	234	308
2029	0.40	0.56	0.76	156	221	300
2030	0.37	0.53	0.74	144	208	293
2031	0.36	0.52	0.74	142	205	289
2032	0.35	0.52	0.73	139	203	285
2033	0.35	0.51	0.72	136	200	282
2034	0.34	0.50	0.71	133	198	278
2035	0.33	0.50	0.70	130	195	274
2036	0.32	0.49	0.69	127	192	271
2037	0.32	0.48	0.68	125	190	267
2038	0.31	0.48	0.67	122	187	263
2039	0.30	0.47	0.66	119	185	260
2040	0.30	0.46	0.65	116	182	256
2041	0.29	0.46	0.64	113	179	252
2042	0.28	0.45	0.63	111	177	249
2043	0.27	0.44	0.62	108	174	245
2044	0.27	0.44	0.61	105	172	241
2045	0.26	0.43	0.60	102	169	238
2046	0.25	0.42	0.60	99	166	234
2047	0.25	0.42	0.59	96	164	230

	Normalized Cost Reduction			4-hour Storage Costs (2019$/kWh)		
2048	0.24	0.41	0.58	94	161	227
2049	0.23	0.40	0.57	91	159	223
2050	0.22	0.40	0.56	88	156	219

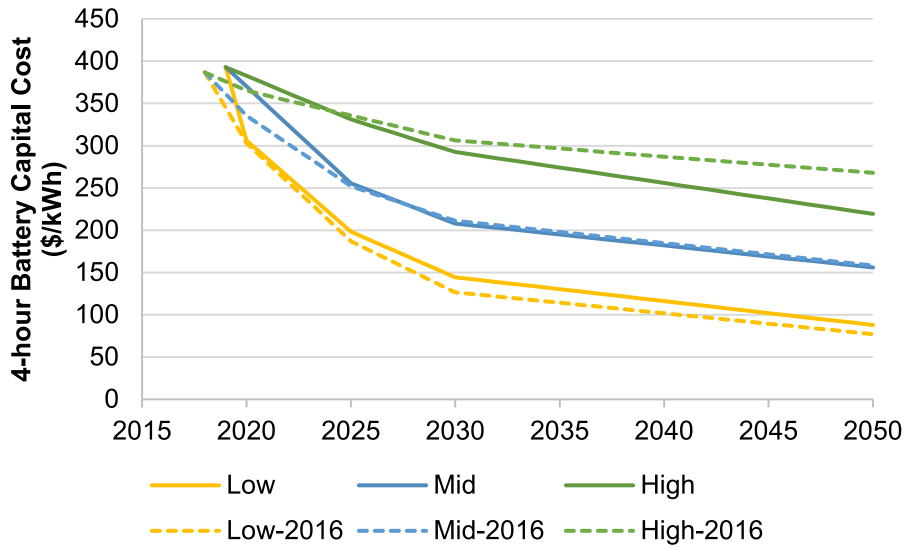

Figure 8. Comparison of cost projections developed in this report (solid lines) against the values from the 2019 cost projection report (Cole and Frazier 2019) (dashed lines).

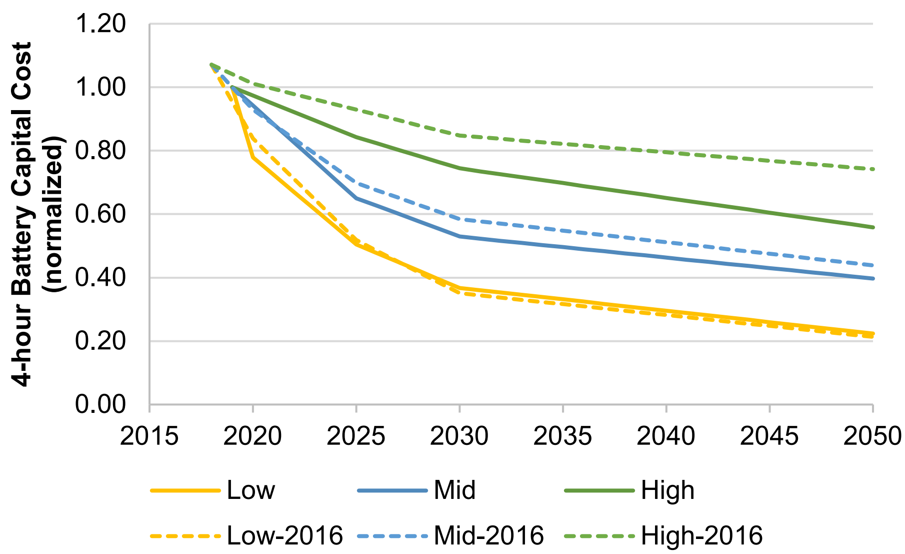

Figure 9. Comparison of cost projections developed in this report (solid lines) the values from the 2019 cost projection report (Cole and Frazier 2019) (dashed lines), with all values normalized to the "Mid" cost projection in the year 2019.

Attachment 2

Comments and Responses on the Draft Battery Energy Storage System Report

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Battery Energy Storage System (BESS)	Alabama Power Response
Alabama Department of Conservation and Natural Resources (ADCNR)	**5/27/2021** 20210527-5024	On page 17, Table 3-1 of the BESS Report, in addition to Option A and Option B, we recommend including a column which includes Cost Estimates Over 40-Year License Term at the Harris Project under current Green Plan operating procedures. It would be beneficial to include and discuss when the last turbine replacements were completed, the current life expectancy of the operating turbines, what routine turbine replacement would cost and what fixed O&M will be. Without this information it is difficult for stakeholders to identify and compare the full extent of cost estimates for BESS versus current operating conditions.	As required by 18 CFR § 5.18, Alabama Power will include within its Final License Application costs estimates under the No Action alternative (i.e. baseline, Green Plan). As previously stated, Alabama Power's Licensing Proposal does not include replacement of either unit at Harris.
Alabama Rivers Alliance (ARA)	**06/11/2021** 20210611-5070[1]	**A. Cost Analysis** … only explored one ownership option for procuring BESS, that being an outright purchase or company investment in the BESS. An evaluation of an independent power purchase agreement (PPA) for BESS services was not included as an alternative to financing the BESS internally, …Alabama Power's cost analysis does not factor in any potential incentives, including tax credits, that could be used to reduce the overall costs of a BESS…incorporating a survey of market PPA prices for BESS into the analysis will more accurately reflect these available incentives…Discussion of how incentives could reduce overall costs should be included in the final BESS Report. …the Draft BESS Report did not explore or mention the possibility of siting a BESS elsewhere on the transmission and distribution system…should consider the system benefits (and reduced interconnection costs) of siting the BESS elsewhere on the grid. … did not fully determine the costs of modifying or replacing one of the turbine-generators to enable installation of a BESS and accommodate a wider range of flows.	As stated in Alabama Power's Response to ARA's dispute on the BESS Study (Accession No. 20210712-5085), these topics go far beyond the limited scope of the study recommended by FERC and can more accurately be viewed as a request for additional studies. ARA failed to meet the requirements in 18 CFR § 5.15(e) for requesting new studies at this late stage of the Harris relicensing proceeding and failed to show good cause for why these additional studies are justified by one of the criteria in §5.15(e). As stated in the Final Report, the cost analysis was conducted at a screening level, and, therefore, potential incentives to offset battery costs were not included. Siting of a BESS elsewhere on the transmission and distribution system (i.e., on the grid) is outside of the scope of a hydroelectric relicensing process. As stated in the BESS Report, a detailed engineering design would be required to determine if a Kaplan turbine is even possible in a powerhouse designed for a Francis unit. If it could be done, the range of flows would then be determined in addition to the costs of replacing a Francis unit with a Kaplan unit. This level of design detail is beyond the scope of this study.

[1] In addition to comments filed with FERC as part of the Study Dispute concerning the Draft Battery Energy Storage System Report, ARA provided similar comments to Alabama Power via email dated 05/27/2021. The 05/27/2021 comments are included within the stakeholder consultation record for reference.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Battery Energy Storage System (BESS)	Alabama Power Response
Alabama Rivers Alliance (ARA)	**06/11/2021** 20210611-5070	**B. Benefits Analysis** The Draft BESS Report currently lacks sufficient benefits analysis, both regarding environmental benefits and system benefits that could make the installation more economic. *a. Grid and Economic Benefits* …did not analyze any potential benefits that adding a BESS could provide to its distribution system, its peak capacity, or any ancillary services such as voltage regulation and black start capabilities that would result…Acknowledgement and analysis of these overall system benefits that could make the installation of a BESS more economic should be included in the final report. *b. Environmental Benefits* Only a single paragraph of the Draft BESS Report is dedicated to assessing the beneficial effects on aquatic resources, and improved environmental outcomes generally are dismissed as "potential limited environmental benefits" without analysis. …new research by the Pacific Northwest National Laboratory (PNNL) explores just how many environmental benefits can accrue from optimizing BESS with hydropower operations, including releasing flows that are more similar to the historical hydrograph, improving water temperature regimes and dissolved oxygen levels, accommodating spawning windows, and fostering safer fish passage through hydropower structures…We encourage Licensee to incorporate the new research and instructive framework presented in the PNNL white paper.	If Alabama Power were to pursue the addition of a new generating asset such as a BESS to its energy portfolio, located at any of its hydropower projects or elsewhere, that decision would be made independent of the FERC relicensing process. It is important to note that as a storage project that was designed and licensed as such, the Harris Project is in effect, a large battery, providing not only energy during peak use times, but also ancillary services such as black start capability, system reliability, and voltage regulation. To meet the intent of providing an analysis of effects on aquatic and recreational resources, Alabama Power conducted the qualitative assessment using existing literature to provide information to FERC on the potential effects of the two BESS alternatives on downstream aquatic and recreational resources. This is consistent with a desktop level study, where using qualitative information in the absence of quantitative information is standard and accepted practice. It is an oversimplification to assume that the results of other relicensing studies, particularly the Downstream Release Alternatives study where potential effects on aquatic habitat and recreation were quantitatively analyzed, can be used to quantitively analyze the effects of integrating a BESS, because all of those operational alternatives included releases from the existing turbines as they are designed to operate, i.e., at a peaking, best gate flow. For these reasons, only a qualitative assessment was performed as part of this study. Alabama Power notes that the PNNL white paper was of little value in determining quantitative environmental analysis for the Harris Project resources other than to suggest the types of studies that would be needed to provide quantitative information; again, conducting these types of studies is outside the scope of the BESS analysis.

Commenting Entity	Date of Comment & FERC Accession Number	Comment – Battery Energy Storage System (BESS)	Alabama Power Response
Alabama Rivers Alliance (ARA)	**06/11/2021** 20210611-5070	**C. Lack of Modeling Data Available** Currently, the HEC-RAS and HEC-ResSim models and outputs are not available to stakeholders…ARA will continue its investigation of opportunities for increased operational flexibility and associated environmental benefits once those models and outputs are available.	As noted in Alabama Power's June 29, 2021 letter discussing the transmittal of modeling files (Accession No. 20210629-5073): Due to the file sizes associated with the HEC-RAS, HEC-ResSim, and EFDC models, Alabama Power is unable to file these models on FERC's elibrary. Stakeholders may request a copy of the three models by e-mailing harrisrelicensing@southernco.com and the models will be provided on a flash drive via U.S Postal Service.
Alabama Rivers Alliance (ARA)	**06/11/2021** 20210611-5070	**D. Potential Use of BESS with a Continuous Minimum Flow Turbine** …ARA suggests that Alabama Power consider matching a smaller-sized BESS with any minimum flow turbine to store energy to use on peak while passing a continuous minimum flow.	The evaluation of matching a smaller-sized BESS with any minimum flow turbine is beyond the limited scope of the FERC recommended study.
Synapse Energy Economics, Inc. via comments of Alabama Rivers Alliance (ARA)	**06/11/2021** 20210611-5070	**Recommendations** Based on our observations regarding the draft report, Synapse makes the following recommendations: • Alabama Power should provide cost and benefit information beyond the cost of the batteries. This would include economic and operational benefits in addition to more detailed environmental benefits. • Alabama Power should provide details on the operational assumptions used for hydro generation and BESS operations. • Alabama Power should provide information that evaluates possible BESS operations based on of hourly data for generation, water flow, energy prices, and modeled battery charging and discharging. • Alabama Power should analyze sizing the BESS to match the full capacity of an existing turbine. • Alabama Power should consider a power purchase agreement (PPA) for the battery system rather than a company investment. This would also include information on solar and BESS PPAs considered in Docket 32953 or other comparable PPAs. • Alabama Power should consider the benefits of locating the BESS elsewhere on the grid. • Alabama Power should consider the benefits of combining a BESS system with solar and obtaining investment tax credits. • Alabama Power should consider a minimum flow turbine and a smaller matching battery system. • Alabama Power should evaluate the impacts of reduced peaking operation without a BESS to the extent that has not been analyzed in the Green Plan. • Alabama Power should evaluate the benefits, including environmental ones, as well as the costs in all the analyses.	Comment noted

<u>**Commenting Entity**</u>	<u>**Date of Comment & FERC Accession Number**</u>	<u>**Comment – Battery Energy Storage System (BESS)**</u>	<u>**Alabama Power Response**</u>
<u>**Federal Energy Regulatory Commission**</u>	<u>**08/10/2021**</u> 20210810-3043	…consistent with the Downstream Release Alternative Study, the Draft BESS Report must be revised to include a detailed, quantitative assessment of the effects of integrating a BESS at the Harris Project on aquatic and recreational resources in Lake Harris and the Tallapoosa river downstream from Harris Dam.	Alabama Power has updated the report to include additional resources effects analyses.
<u>**Federal Energy Regulatory Commission**</u>	<u>**08/10/2021**</u> 20210810-3043	Information from other Harris relicensing studies, as well as the Pacific Northwest National Laboratory's white paper, "Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower," should be used, as appropriate, to inform the environmental benefits analysis in the Final BESS Report.	Alabama Power notes that the PNNL white paper was of little value in determining quantitative environmental analysis for the Harris Project resources other than to suggest the types of studies that would be needed to provide quantitative information; again, conducting these types of studies is outside the scope of the BESS analysis.

Attachment 3 – BESS Study Report Consultation Record (April 2019 – October 2021)

Alabama Rivers Alliance
Water Is Life

June 11, 2020

VIA ELECTRONIC FILING

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

RE: Comments on Initial Study Reports, Study Modification Requests, and New Study Proposal for R.L. Harris Hydroelectric Project (P-2628-065)

Dear Secretary Bose:

Enclosed for filing in the above-referenced docket are comments, study modification requests, and a new study proposal submitted by Alabama Rivers Alliance for the R.L. Harris Hydroelectric Project.

Thank you for your assistance in this matter. If you have any questions or need additional information, please call me at 205-322-6395.

Sincerely,

Jack K. West

Jack K. West, Esq.

Alabama Rivers Alliance
Policy and Advocacy Director
2014 6th Avenue North
Suite 200
Birmingham, AL 35203

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Alabama Power Company	)	R.L. Harris Hydroelectric Project
	)	
	)	Project No. 2628-065

ALABAMA RIVER ALLIANCE'S COMMENTS ON INITIAL STUDY REPORTS, STUDY MODIFICATION REQUESTS, AND NEW STUDY PROPOSAL

The Alabama Rivers Alliance (ARA) submits the following comments on the currently available draft study reports as part of the Federal Energy Regulatory Commission's Integrated Licensing Procedure (ILP) for the R.L. Harris Hydroelectric Project, FERC Project No. P 2628-065 ("Harris" or "Harris Project"). Study modification requests for the Water Quality Study and Downstream Release Alternatives Study are contained in Sections I and II, and a new study proposal for a Battery Storage Feasibility Study comprises Section IV. Drafts of the Downstream Aquatic Habitat Study Report, Aquatic Resources Study Report, and the Recreation Study Report will be filed by Licensee over the summer, and the results of the forthcoming fisheries studies will likely inform future comments on the study reports currently available and commented upon here.

I. DRAFT WATER QUALITY REPORT

A. <u>Request for Water Quality Study Modification</u>

The caliber and usefulness of the studies conducted pursuant to the ILP will only be as good as the quality and quantity of data collected. ARA recommends that each opportunity to gather relevant data be taken during the relicensing process. The Draft Water Quality Study Report gathers data from three sources: Alabama Power Company (Licensee), the Alabama Department of Environmental Management (ADEM), and Alabama Water Watch.[1]

Of primary concern for downstream ecological health are the two monitors collecting data closest to the dam, both of which are operated and monitored by Licensee. Continuous, 15-minute interval data for dissolved oxygen levels and water temperature has been collected from a monitor in the tailrace (approximately 800 feet from the dam) during the months of June - October in 2017, 2018, and 2019 ("Tailrace Monitor"). A second continuous, 15-minute interval monitor operated by Licensee was placed roughly 0.5 miles downstream of the dam ("Downstream Monitor") and collected dissolved oxygen and temperature data from March 12 through October 31 of 2019, excluding approximately a week's worth of data due to problems with the monitor.[2]

[1] Draft Water Quality Study Report (Mar. 2020), Accession No. 20200410-5095, at 5.
[2] *See* Appendix B (Excel spreadsheet) of the Draft Water Quality Report, "Downstream Monitor 2019" and "Notes" tabs.

Data collected by these two monitors, in particular, are essential to understanding the quality of water being discharged by Harris because they are closest to the dam and are the only continuous samplings included in the study. The ILP process allows for two seasons of study and data collection; however, Licensee is only collecting one season's worth of water quality data under the current study plan.[3] While the 2019 dissolved oxygen levels from the Downstream Monitor met or exceeded 5mg/L 99.9% of the time,[4] this is but one year's worth of data collected during a non-drought year. Data from the Tailrace Monitor for 2017 and 2018—closer in time to actual drought conditions in late 2016—shows "numerous events" where dissolved oxygen levels did not meet 5mg/L.[5] Due to flooding events, the Downstream Monitor could not be deployed until March 12, 2019, and was inoperable for approximately another week due to a dead battery and washing ashore.[6] Combined, roughly three weeks of data (or ~10% of the total) scheduled to be collected in the Water Quality Study Plan was not collected because of equipment failure and environmental conditions.

To bolster the studies being performed, and to provide the most useful reports to stakeholders and FERC, pursuant to 18 C.F.R. § 5.15(d), ARA proposes a second year of water quality monitoring at the Downstream Monitor to collect dissolved oxygen and water temperature data in 15-minute intervals from July1 – October 31, 2020, and from March 1 – June 30, 2021. While 2020 has been a wet year thus far, conditions later in the year and early next year may provide an opportunity to collect data during drier, potentially drought, periods.

Additionally, we request that discharge data be included along with the dissolved oxygen and temperature data collected by the Downstream Monitor in 2020-21 to enable stakeholders to better understand the relationship between releases and water quality. The Tailrace Monitor data included in Appendix B to the Water Quality Report for 2017-2019 includes 15-minute interval discharge data for "Turbine 1," "Turbine 2," and "Total Discharge," and such data should be included with the continued monitoring data.

Finally, an assessment of any aeration or aspiration devices used to boost dissolved oxygen levels should also be included in order to take into account such artificial enhancements (and to consider any declines in water quality were these devices not to function properly). Documents filed with FERC prior to Harris' operation describe "incorporating into the turbine discharge an aspiration system to provide up to a 2 ppm increase in dissolved oxygen."[7] The condition of any existing aspiration system and a comparison to current technologies used to enhance dissolved oxygen levels should be undertaken.

As FERC staff have recognized, it is difficult to draw conclusions and make decisions with only one season's worth of data from a critical monitoring location.[8] Without additional monitoring efforts, Licensee, FERC, and stakeholders will miss an opportunity to collect data more reflective

[3] *See* Final Water Quality Study Plan (May 2019), Accession No. 20190513-5093.
[4] Draft Water Quality Study Report (Mar. 2020), Accession No. 20200410-5095, at 46.
[5] *Id.*
[6] *See* Appendix B (Excel spreadsheet) of the Draft Water Quality Report, "Notes" tab.
[7] Application of Alabama Power Company for Approval of Revised Exhibit S to License (Apr. 30, 1982), Accession No. 19820504-0246, at 5.
[8] *See* Initial Study Report Meeting Summary (May 12, 2020). Accession No. 20200512-5083, at 24-27.

of periods where water quality is decreased and water quality criteria more difficult to meet. Gathering a second year of continuous, 15-minute interval data for dissolved oxygen and temperature (paired with discharge data) at the Downstream Monitor will provide a more robust dataset and strengthen the studies conducted during this ILP.

B. Water Temperature Concerns

There is significant stakeholder concern over the temperature of releases from Harris, and ARA understands that analysis of the effects of temperatures will be included in the forthcoming Aquatic Resources Study Report.[9] This concern stems from the scientific literature documenting the ecological consequences of cold-water pollution from hydroelectric dams[10] and decades of research on Harris indicating "thermal alteration and generation frequency negatively affect the occupancy of most fish species below the dam."[11] As additional study and analysis of the thermal regime progresses and is reported in the Aquatic Resources Study, ARA recommends that *temperature and flows be considered in tandem* during this analysis because "both discharge and temperature must be simultaneously considered for the successful implementation of environmental flow management below dams."[12]

The existing license for Harris required Licensee to work with state agencies and EPA prior to commencement of construction to come up with an "optimum design and placement of the project intake structures to permit withdrawal of water from selected levels of the reservoir to control the water quality of the discharges from the powerhouse."[13] Within four years of the issuance of the existing license, Licensee was required to file a revised (and then a re-revised) Exhibit S that included its plans to study the potential fishery resources of the reservoir and "a description of measures being taken to maintain or change the water quality of the Tallapoosa River downstream from the project."[14]

Licensee's re-revised Exhibit S filed in April of 1982 evidenced Licensee's understanding of the connection between temperatures and water quality and the need to design an intake structure to withdraw high-quality surface waters. Licensee's re-revised Exhibit S reads in part:

> "For enhancement of discharge water quality, it is desirable to withdraw water from as close to the surface as possible. At Harris Dam, which employs seasonal drawdown, the objective of surface withdrawal has been solved by incorporating into the design movable sills at the invert of each intake opening.…Location of

[9] Initial Study Report Meeting Summary (May 12, 2020). Accession No. 20200512-5083, at 26.
[10] Julian D. Olden & Robert J. Naiman, *Incorporating Thermal Regimes into Environmental Flows Assessments: Modifying Dam Operations to Restore Freshwater Ecosystem Integrity*, Freshwater Biology (2010) 55, at 88-90.
[11] Elise R. Irwin, *Adaptive Management of Flows from R.L. Harris Dam (Tallapoosa River, Alabama)—Stakeholder Process and Use of Biological Monitoring Data for Decision Making*, U.S. Geological Survey Open-File Report 2019-1026, at 22 [hereinafter "USGS Open-File Report 2019-1026"].
[12] Olden, *supra* note 10, at 87.
[13] Harris Dam License, FERC No. P-2628, Article 51, Appendix F to PAD, Accession No. 20180601-5125 [hereinafter "Harris License"].
[14] Harris License, Article 52.

> these sills at the highest levels possible for operation will ensure the highest quality water being drawn into the turbines."[15]

Despite early attempts to engineer an intake to accommodate epilimnetic withdrawals and "solve" the problem of cold releases with lower dissolved oxygen content, thermal pollution[16] has plagued the river downstream from Harris since it began operations.

Unfortunately, neither the Aquatic Resources Study Plan nor the Draft Water Quality Report contemplate the study of any potential remedial actions to adjust water temperatures in line with unregulated reaches of the Tallapoosa. Licensee has acknowledged that once an issue has been identified with water temperatures, it plans to study technologies that can address the thermal regime.[17] Due to the available evidence of low temperatures impacting both colonization and persistence of fishes and the downstream macroinvertebrate community[18] and the sizeable stakeholder concern, ARA urges thorough study of the infrastructure enhancements available for implementation at Harris to control release temperatures. A variety of temperature management strategies exist, including multi-level intake structures, floating intakes, and reservoir destratification approaches using pumps and submerged weirs, as well as operational adjustments in the timing and volume of releases.[19]

II. DRAFT DOWNSTREAM RELEASE ALTERNATIVES STUDY REPORT

The extent to which the Harris project has altered flows of the Tallapoosa River is reflected in comments submitted by the Alabama Department of Conservation and Natural Resources (ADCNR) in 1982, which lament the "loss of 49 percent of the last major free-flowing river habitat…in Alabama."[20] According to the ADCNR's reading of USGS data at the time, flows from the pre-dam period of 1923 to 1972 equaled or exceeded the minimum flow of 45cfs stipulated in Article 13 of the license *100% of the time*.[21] Flows of 8,000cfs due to single turbine generation at Harris were equaled or exceeded during that era only 4.4% of the time, and flows of 16,000cfs due to two-unit generation were equaled or exceeded only 1.2% of the time.[22] For decades the Tallapoosa downstream of Harris has weekly experienced flows it otherwise would have seen, on average, roughly eight days out of a given year.

This flow regime has not been without consequences. Researchers have documented as much as a 67% reduction in flows than during pre-dam periods, greater instability of day-to-day flow

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[15] Revised Exhibit S to Harris License Article 52 (Apr. 20, 1982), Accession No. 19820504-0246, at 5.
[16] Olden, *supra* note 10, at 91.
[17] Initial Study Report Meeting Summary (May 12, 2020). Accession No. 20200512-5083, at 26.
[18] *See generally*, USGS Open-File Report 2019-1026.
[19] Olden, *supra* note 10, at 97-101; *See also* Karin Krchnak et al., *Integrating Environmental Flows into Hydropower Dam Planning, Design, and Operations*, World Bank Technical Guidance Note (Nov. 22, 2009), at 24-27, *available at* http://documents.worldbank.org/curated/en/712981468346147059/Integrating-environmental-flows-into-hydropower-dam-planning-design-and-operations.
[20] Comments filed by ADCNR (Aug. 11, 1982) Accession No. 19820813-0012, at 3.
[21] *Id.* (emphasis added).
[22] *Id.*

variations, and an increase in very low-flow periods.[23] The flow instability and altered thermal patterns caused by hydropeaking operations have depressed species richness, "influenced fish persistence and colonization," reconfigured the downstream macroinvertebrate community, and created "adverse effects on hydraulic variables such as water velocity, depth, and temperature."[24]

As a result of Harris operations, the 14-mile stretch of the Tallapoosa from the dam to Alabama Highway 77 is currently listed by ADEM as a Category 4C waterbody impaired due to hydrologic alteration.[25] And the U.S. Geological Survey's (USGS) Open-File Report from last year indicates "that hydrologic alteration in the river has affected various biological processes."[26]

Despite the past decades of disruption, studies performed during the ILP and a reinvigorated adaptive management approach can shape a new framework for creating positive ecological responses below Harris. As the USGS Open-File Report on adaptive management of flows from Harris states, "[i]f flow and thermal alteration from the dam can be modified toward improving natural resource objectives, adaptive management processes and long-term monitoring could further reduce uncertainty related to biotic response to new Federal Energy Regulatory Commission licensing requirements."[27]

A. A Wider Variety of Release Patterns Needs to Be Modeled and Considered

We appreciate that Licensee was willing fifteen years ago to enter into a collaborative process with stakeholders and to voluntarily operate the Harris project according to an adaptive management plan known as the Green Plan,[28] the purpose of which "was to reduce effects of peaking operations on the aquatic community downstream."[29] The Green Plan was a starting point for adaptive management, but evidence suggests it has not improved conditions for aquatic life. The most recent published literature demonstrates that although "[h]abitat availability for fishes increased under the Green Plan management…improved conditions did not improve recruitment processes for species of interest."[30] Further, "results indicate that the Green plan did not meet the stakeholder objective to restore and maintain macroinvertebrate community composition similar to unregulated reaches within the regulated portions of the river."[31]

[23] Elise R. Irwin & M.C. Freeman, *Proposal for Adaptive Management to Conserve Biotic Integrity in a Regulated Segment of the Tallapoosa River, Alabama, U.S.A.*, Conservation Biology (2002), 16(5): 1212-1222.
[24] USGS Open-File Report 2019-1026, at 2-3.
[25] ADEM's *2020 Alabama Integrated Water Quality Monitoring and Assessment Report* required by Clean Water Act Section 305(b), Appx. B, at 33 *available at* http://www.adem.state.al.us/programs/water/waterforms/2020AL-IWQMAR.pdf.
[26] USGS Open-File Report 2019-1026, at 9.
[27] USGS Open-File Report 2019-1026, at 3.
[28] FERC Scoping Document 2 (Nov. 16, 2018), Accession No. 20181116-3065, FN11 at 16 ("The Green Plan is an adaptive management program that began in 2005, and that consists of providing pulsing flow releases (10 to 30 minutes in length) in the Tallapoosa River to enhance aquatic habitat, fish, and other aquatic organism downstream from Harris Dam.").
[29] Downstream Release Alternatives Study Plan (May 2019), Accession No. 20190513-5093, at 2.
[30] USGS Open-File Report 2019-1026, at 22.
[31] *Id.* at 3.

Since beginning adaptive management and the Green Plan roughly fifteen years ago, no actual adaptation or iteration has occurred. This relicensing and the studies now underway provide an opportunity to iterate, adapt, and improve flows and subsequent impacts on downstream aquatic life, recreation opportunities, erosion and sedimentation, and water quality. In order to make the refinements contemplated by a full adaptive management process, a wide variety of flow scenarios should be studied, and "[c]ontinuing adaptive management in tandem during the FERC relicensing process would be advantageous to include a specific assessment of long-term objectives of all stakeholders."[32]

B. Until Aquatic Resources and Aquatic Habitat Study Reports Are Available, It Is Premature to Ask Stakeholders to Specify All Flow Alternatives to Model

Commenters, stakeholders, and FERC staff have encouraged Licensee to examine a broad range of flows throughout the ILP.[33] Currently, licensee is studying two possibilities other than its current flow regime and its prior flow regime. The Draft Downstream Release Alternatives Phase 1 Report filed by Licensee assesses impacts to operational parameters (*e.g.*, generation, reservoir levels, flood control) under three flow scenarios: (i) the current Green Plan pulsing regime that has been in effect since 2005 through a voluntary adaptive management process; (ii) the pre-Green Plan regime with no intermittent flows between peaks, which occurred from 1983 to 2004; and (iii) a continuous minimum flow of 150cfs, which is the equivalent daily volume of the current Green Plan pulses and has never been physically implemented and studied.

A fourth release scenario, the alternative/modified Green Plan, will be evaluated in Phase 2 of the study, once results from the Aquatic Resources Study are available to shape the design of an altered Green Plan.[34] The two alternatives that have never been implemented—a continuous minimum flow of roughly an equivalent volume and altering the timing of the existing Green Plan releases—are effectively different flavors of the existing release scheme, though studying those modifications may yield important insights into improving flows.

The summary of the Initial Study Report meeting reflects that Licensee desires "to hear from stakeholders now" regarding alternative flow scenarios stakeholders would like to have modeled,[35] despite no draft Aquatic Resources Study or Aquatic Habitat Study reports being available. The downstream release alternatives, aquatic resources, water quality, and aquatic habitat reports are *all deeply interrelated*, and without at least draft reports of the fisheries studies, stakeholders should not be required to propose alternative flow scenarios until more information is available. Indeed, Licensee itself acknowledges that the results from the Aquatic Resources Study are needed

[32] *Id.* at 19.
[33] Initial Study Report Meeting Summary (May 12, 2020), Accession No. 20200512-5083, at 40; *see also* Comments submitted by the Environmental Protection Agency (Sept. 25, 2018), at 5 ("The EPA encourages APC to consider adding as many feasible modeling scenarios as possible to determine the optimal downstream flow conditions.").
[34] Draft Downstream Release Alternatives Phase 1 Report (Apr. 2020), Accession No. 20200410-5069, at 2, FN1.
[35] Initial Study Report Meeting Summary (May 12, 2020), Accession No. 20200512-5083, at 21.

to design the fourth flow scenario it plans to model.[36] Those same results will also inform what variety of inputs stakeholders suggest.

In fact, the logical time to propose additional flow scenarios is after Licensee has "analyze[d] the effects of each downstream release alternative on other resources, including water quality… downstream aquatic resource (temperature and habitat), wildlife and terrestrial resources, threatened and endangered species, recreation, and cultural resources," which will be accomplished by Phase 2 of the study.[37] At a minimum, stakeholders should be equipped with the draft fisheries studies showing the current status of aquatic resources before being required to list all alternative flows to be studied.

C. Preliminary Proposals for Additional Flow Modeling and Study Modification Request

However, ARA understands that the modeling of additional flows takes time and effort, and Licensee has made clear that it would like to have as much stakeholder input as to various flows to model as soon as possible. While reserving the right to request other release alternatives be considered once more information is made available to stakeholders, ARA proposes the following study modification request pursuant to 18 C.F.R. § 5.15(d) for additional flow scenarios be analyzed as part of the Downstream Release Alternatives Study:

(i) A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin streamgage, rather than the current 75%;

(ii) A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria;

(iii) A constant but variable release that matches the flow at the USGS Wadley streamgage to the UGSG Heflin streamgage to mimic natural flow variability;[38] and

(iv) 300cfs and 600cfs minimum flows.

Some of these flows, particularly items (iii) and (iv) may have been modeled internally by Licensee as part of the original adaptive management process; however, those models are not currently available as part of this relicensing.[39] Studying a wider range of potential flows during the ILP

[36] Draft Downstream Release Alternatives Phase 1 Report (Apr. 2020), Accession No. 20200410-5069, at 2, FN1 ("Results from the other three scenarios as well as from the Aquatic Resources Study are needed to design the alternative to be studied.").
[37] *Id.* at 2-3.
[38] We understand that there may limitations imposed by the existing turbines to implementing this type of flow, but modeling it would provide a frame of reference to other options relative to a more natural flow.
[39] USGS Open-File Report 2019-1026, at 10 ("The other three alternatives were based upon the concept of mimicking the flow regime recorded at the USGS streamgage in Heflin, at Wadley, 22 km below the dam. The Heflin streamgage measures flows in the unregulated upper portion of the Tallapoosa River (fig. A1); several stakeholders hypothesized that mimicking these flows at the dam would allow for some natural flow variability in the regulated portion of the river. The first of these alternatives was, in effect, modeled as a constant flow from the dam to maintain the Heflin

could result in improved diversity and abundance of aquatic life and habitat, more recreation opportunities, decreased erosion and sedimentation, and gains in water quality.

III. DRAFT EROSION AND SEDIMENTATION REPORT

FERC has identified erosion and sedimentation as an issue to assess for cumulative impacts, with the tentative geographic scope of inquiry to encompass the upper Tallapoosa and the 44 river miles downstream of Harris dam, including Horseshoe Bend Military Park.[40] The Erosion and Sedimentation Study Plan involves "collecting and summarizing information under baseline operations," meaning the project and project operations as they exist today.[41] While the Draft Erosion and Sedimentation Study Report primarily attributes erosion downstream of the dam to clear-cutting and agricultural use, it reports that "erosion at these sites may be exacerbated as a result of flow releases from Harris Dam."[42]

Article 20 of the existing license states that Licensee "is responsible for and must take reasonable measures to prevent erosion and sedimentation."[43] Such measures and responsibility must be comprehensive in light of hydropeaking's amplifying effects on other potential sources of erosion both upstream and downstream of Harris. The High Definition Stream Survey (HDSS) completed as part of the Erosion and Sedimentation Study Report describes opportunities to "support targeted restoration, habitat improvement," and identified at least one area that "would be an excellent area to focus streambank rehabilitation efforts."[44] The HDSS states that it documents baseline conditions and that future surveys could be directly compared to it in order to understand ongoing shifts in river conditions.[45] ARA supports the collection of future surveys for this purpose.

As part of its environmental analysis, ARA encourages FERC to consider all historical evidence available when assessing how geology and soils may be impacted over another 30- to 50-year license term, including any evidence submitted by stakeholders in the form of photographs, maps, and personal accounts. If the Green Plan, or a similar pulsing flow regime is to be continued as part of a renewed license, a suspended solids sampling conducted pre-pulse, during generation, and post-pulse would better identify how and when sediment transport is occurring in the river, enabling an identification of project operations' impact apart from natural river processes and other potential sources of erosion.

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target at Wadley (Heflin), which consisted of minimum flows plus any necessary generation flows. The second was similar, except the flow from the dam was to never reach levels below 8.5 m3/s (Heflin 300). The third was an option proposed by the power utility, in which at least 75 percent of the Heflin target was maintained by 2–3 daily pulses, 1 at 0600 and 1 at 1200.").

[40] FERC Scoping Document 2 (Nov. 16, 2018), Accession No. 20181116-3065, at 21-22.

[41] Erosion and Sedimentation Study Plan (May 2019), Accession No20190513-5093, at 2.

[42] Draft Erosion and Sedimentation Study Report (Mar. 2020), Accession No. 20200410-5091, at 31.

[43] Harris License, Article 20.

[44] *See* Appendix E to Draft Erosion and Sedimentation Study Report (Mar. 2020), Accession No. 20200410-5091, High Definition Stream Survey Final Report prepared by Trutta Environmental Solutions, LLC, at 43.

[45] *Id.*

IV. NEW STUDY PROPOSAL FOR BATTERY STORAGE FEASIBILITY STUDY TO RETAIN FULL PEAKING CAPABILITIES WHILE MITIGATING HYDROPEAKING IMPACTS

Project operations of hydropeaking dams come with environmental costs, and over the past decade dam operators have faced increasing pressure to shift from highly-altered hydrologic conditions (*i.e.*, peaking operations) to more natural flows to restore downstream ecosystems.[46] Yet the need to meet peak system demand remains, and researchers are increasingly studying the use of battery energy storage systems (BESS) to mitigate the effects of hydropeaking while retaining full peaking capabilities. Increasingly cost-effective BESS can substitute for the peaking ability (or a portion of the peaking ability) usually provided by conventional hydropower plants by storing hydropower produced during off-peak hours (*e.g.*, generated with a continuous minimum flow or variable flow) and discharging this power during peak periods.[47]

By implementing BESS, restrictions can be imposed on ramping rates, which requires operators to adjust flows more slowly and constrains peaking capabilities; however, supplemental energy can be discharged from the BESS to still meet peak demand. BESS also provide additional grid benefits of frequency regulation, voltage support, black start services, and can further accommodate intermittent renewables, which make up a growing portion of the generation mix. According to new research, BESS "should begin to enter into discussions related to hydropeaking mitigation, especially given the typically long duration of operating licenses."[48]

At Harris, Licensee has expressed concerns that a 150cfs minimum flow would begin to constrain the utility's ability to peak with its current level of flexibility.[49] By undertaking a study of pairing BESS with existing hydropower generation, FERC, Licensee, and stakeholders may uncover a cost-effective path to expand operational flexibility, create new grid benefits, and achieve multiple stakeholder objectives, including accommodating a wider range of releases and mitigated peaking that improve ecological health downstream. Some studies indicate that "BESS can help to restore the natural [flow] regime at lower costs than using environmental flows alone," and such may be the case with the Harris Project.[50]

Pursuant to 18 C.F.R. §§ 5.15(e) and 5.9(b), ARA submits this proposal for a new study to determine the feasibility of adding BESS to the Harris Project to both serve project purposes and address project effects.

A. Goals, Objectives, and Information to Be Obtained - § 5.9(b)(1)

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[46] Ryan A. McManamay et al., *Organizing Environmental Flow Frameworks to Meet Hydropower Mitigation Needs*, Environmental Management 58(3):365-85, doi: 10.1007/s00267-016-0726-y (Jun. 25, 2016), at 366.

[47] *See generally* Yoga Anindito et al., *A New Solution to Mitigate Hydropeaking? Batteries Versus Re-Regulation Reservoirs*, Journal of Cleaner Production 210 (2019) 477-489, *available at* https://kern.wordpress.ncsu.edu/files/2018/11/1-s2.0-S0959652618334401-main.pdf.

[48] Anindito, *supra* note 47, at 487.

[49] Initial Study Report Meeting Summary (May 12, 2020). Accession No. 20200512-5083, at 23.

[50] Anindito, *supra* note 47, at 487.

The goal of conducting the Battery Storage Feasibility Study is to determine whether a BESS system could be economically integrated at Harris to mitigate the impacts of hydropeaking while retaining full system peaking capabilities. The objectives of the study are to assess:

1. What type, size, and configuration of BESS is most practical?
2. How much would the BESS cost, and what are the ownership options?
3. What are the economic benefits of a BESS addition, including capacity and ancillary benefits and the ability to enable future additions of non-dispatchable renewables?
4. Could BESS integration allow Harris to generate more often while retaining week-day peaking capabilities?
5. What are the technical and economic barriers to integrating BESS?

B. <u>Resource Management Goals of the agencies or Indian Tribes with Jurisdiction over the Resource to Be Studies - § 5.9(b)(2)</u>

Not applicable.

C. <u>Relevant Public Interest Considerations in Regard to the Proposed Study - § 5.9(b)(3)</u>

Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values.

This study request relates to the public interest of restoring riverine ecosystems, including by providing more natural flow regimes that promote aquatic habitat and increase opportunities for fishing and other recreation. Riverine ecosystems are resources of particular public interest for a variety of reasons, including their ecological functions, sporting interest, and subsistence use. Describing the effects on these resources is necessary to fulfill the Commission's responsibilities under the National Environmental Policy Act (NEPA). Ensuring that environmental measures pertaining to these resources are considered in a reasoned way is relevant to the Commission's public interest determination.

D. <u>Existing Information and the Need for Additional Information - § 5.9(b)(4)</u>

While sources of information related to project generation and peak demand exist, there is a need for a more holistic understanding of Harris' role in the power system and what contributions it is required to make to meet system peak demand. The Pre-Application Document (PAD) filed by Licensee does not contain detailed information about the current operational flexibility of Harris, its limitations, and the causes of those limitations. A data gap exists around Project ramping rates, and understanding the extent to which imposing maximum ramping rates can smoothen the dam's discharge pattern and mitigate the impacts of hydropeaking would be useful to many stakeholders and to FERC. To ARA's knowledge, no battery feasibility study has been performed at other hydropower projects owned by Licensee that could provide sufficient comparable information, and a feasibility study is needed to assess how much operational flexibility BESS could provide and how it might allow for more fine-tuned control of ramping rates and discharges while also benefitting the larger grid and Licensee.

E. Nexus to Project - § 5.9(b)(5)

A clear project nexus exists between project operations, downstream releases, and aquatic habitat. The Harris Project regulates the timing, allocation, and distribution of water flows in the Tallapoosa below Harris Dam, and prior to the Green Plan, completely cut off flows of the river at times. This regulation influences the availability of water for a variety of uses, including power generation, fisheries, and recreation. This requested study could form the basis for license requirements stipulating minimum or variable releases, mitigation measures, and assist future adaptive management.

F. Study Methodology - § 5.9(b)(6)

Integrating BESS at hydropower projects is a relatively new field with no established methodology.[51] This study can be completed through desktop analysis only and is primarily a financial cost/benefit analysis. By lessening hydropeaking activities, energy and perhaps capacity revenues from Harris will be reduced, and the study must quantify the additional value of BESS to Harris. Adding BESS has the potential to produce energy, capacity, and ancillary revenues (as well as deferral of transmission and distribution investments) that could offset these implementation costs. Importantly, some of these values are not dependent upon water flow.

Study activities will include:

- Creating a survey of battery cost estimates based on public sources focusing on price projections for 2023 and beyond, as well as any incentives that may be available.
- Describing the operational flexibility gains for a range of BESS (*e.g.*, 5 MW, 2-hour; 5 MW, 4-hour; 10 MW, 2-hour; 10 MW, 4-hour) vs. costs.
- Comparing BESS options to "business-as-usual" Harris operations to quantify revenues to be replaced by a BESS alternative. This will provide a preliminary alternative framework to consider changes in operations and allow for comparisons against other possible project mitigation measures.

[51] Examples of battery-paired hydropower projects, such as the 4 MW battery storage project added to Byllesby project in Virginia and the hydro-battery microgrid project in Alaska, can be used to further develop this study. *See generally* James R. Thrasher, *How the Byllesby Hydro Plant Continues to Make History*, Hydro Review (Jul. 29, 2019), *available at* (https://www.hydroreview.com/2019/07/29/hydro-review-how-the-byllesby-hydro-plant-continues-to-make-history/#gref); Clay Koplin, *Cordova's Microgrid Integrates Battery Storage with Hydropower*, T&D World (Mar. 7, 2019), *available at* https://www.tdworld.com/distributed-energy-resources/energy-storage/article/20972311/cordovas-microgrid-integrates-battery-storage-with-hydropower; and Marek Kubik, *Adding Giant Batteries To This Hydro Project Creates A 'Virtual Dam' With Less Environmental Impact*, Forbes (May 23, 2019), *available at* https://www.forbes.com/sites/marekkubik/2019/05/23/adding-giant-batteries-to-this-hydro-project-cre

- Identifying any technical requirements and limitations to integrating BESS, including siting restrictions and any separate metering needed to allow the BESS to draw power from hydro generation, the grid, or a combination of the two.
- Preparing a report summarizing economic data and other analysis to be presented to stakeholders and commented upon.

G. Level of Cost and Effort - § 5.9(b)(7)

The total cost of this study is expected to be $20,000 - $30,000. This cost estimate is based on a recent battery storage feasibility study conducted for a series of four hydroelectric dams in the northeast. The study would include a review of dam operational constraints and power system requirements (2 days), gathering BESS economic data (1/2 day), analysis (4 days), project report development (3 days), and presentation of results to the stakeholders (1/2 day).

H. Changes in Law or Regulations - § 5.15(e)(1)

There have been no material changes in law or regulations applicable to the information in this study proposal.

I. Goals and Objectives of Other Studies - § 5.15(e)(2)

This study request puts forward new goals and objectives that are not addressed by the methodology of any of the current approved studies.

J. Timing of Request - § 5.15(e)(3)

Adding battery storage to existing hydropower projects is a relatively new topic with examples and studies just becoming available. The enabling factor has been decreases in battery prices in recent years, making the technology an increasingly economic option, along with the growing body of scientific literature documenting the need for better environmental performance at hydropeaking dams.

This study request was not made earlier because the subject of minimum flows constraining Licensee's ability to peak arose after the Draft Downstream Release Alternatives Study Report was filed. This study can be completed in a relatively short amount of time with desktop work only, and if taken into account with the ongoing flow modeling, could inform possible release alternatives and operational parameters that meet the objectives of Licensee and stakeholders, making it an appropriate request at this stage in the relicensing.

K. Changes in Project Proposal - § 5.15(e)(4)

There have been no significant changes in the project proposal.

Document Content(s)

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July 10, 2020

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Response to Initial Study Report (ISR) Disputes or Requests for Modifications of Study Plan

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street N.
Washington, DC 20426

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628). On April 10, 2020, Alabama Power filed the Initial Study Report (ISR) along with six Draft Study Reports and two cultural resources documents. Alabama Power held the ISR Meeting with stakeholders and FERC on April 28, 2020. On May 12, 2020, Alabama Power filed the ISR Meeting Summary. Comments on the ISR, draft reports, and ISR Meeting Summary were due on June 11, 2020.

On June 10, 2020, FERC staff provided comments on the ISR and the ISR Meeting Summary.[1] FERC requested that Alabama Power respond to specific comments by July 11, 2020. Attachment A of this filing includes Alabama Power's responses to those questions for which FERC requested a July 11 response.

Stakeholders and FERC provided three Additional Study Requests and two study modifications as part of comments on the ISR and ISR Meeting Summary. Two of the requested studies do not meet the criteria outlined in FERC's regulations at 18 C.F.R. § 5.9(b) and 5.15 and/or address pre-project conditions. Although, the other study request meets FERC's criteria, Alabama Power is not incorporating the study request into the relicensing process for the Harris Project. The complete response to these study requests is in Attachment B.

FERC staff, Alabama Rivers Alliance (ARA)[2], and the U.S. Environmental Protection Agency (EPA)[3] also requested the inclusion of additional downstream flow release alternatives as modifications to Alabama

[1] Accession No. 20200610-3059.

[2] Accession No. 20200611-5114.

[3] Accession Nos. 20200612-5025 and 20200612-5079.

Power's existing Downstream Release Alternatives Study. Alabama Power's response to the recommended modifications is also provided in Attachment B.

Within preliminary comments on the Draft Water Quality Study Report as well as during the ISR Meeting and within comments on the ISR and ISR Meeting Summary, multiple stakeholders requested that Alabama Power continue monitoring water quality downstream of Harris Dam in 2020 and 2021. To collect dissolved oxygen and water temperature data in 2020, Alabama Power installed the continuous monitor on May 4, following the ISR meeting. The generation monitor was installed on June 1 to align with the monitoring season start date in the Water Quality Study Plan. Alabama Power also agrees to collect water quality data at both locations in 2021 (from March 1 – June 30, 2021 at the continuous monitor and June 1 – June 30, 2021 at the generation monitor) to include in the final license application.

The EPA recommended inclusion of water quality monitoring data with the Water Quality report. Alabama Power notes that the Draft Water Quality Study Report contains an appendix with the 2017 – 2019 water quality monitoring data, and the Final Water Quality Study Report will contain a similar appendix with the complete set of water quality monitoring data (including 2020). Any data collected in 2021 and after the Final Water Quality Study Report is provided will be included within the Final Licensing Proposal.

Alabama Power reviewed FERC and stakeholder comments on the ISR and Draft Study Reports and will address all other comments in any Final Study Reports (filed in 2020 and 2021), the Updated Study Report (USR) (due April 10, 2021), or the Preliminary Licensing Proposal (PLP) (due on or before July 3, 2021).

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg

Angie Anderegg
Harris Relicensing Project Manager

Attachment A: Alabama Power's Response to FERC's June 10, 2020 Staff Comments on the Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project
Attachment B: Alabama Power's Response to Study Modifications and Additional Study Requests Following the May 12, 2020 Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

cc: Harris Stakeholder List

Attachment A

Alabama Power's Response to FERC's June 10, 2020 Staff Comments on the Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

FERC questions are presented in italic text and the specific information requested is highlighted in yellow; Alabama Power's response follows.

<u>Draft Downstream Release Alternatives (Phase 1) Study Report</u>

Question #2: During the ISR Meeting, Alabama Power requested that stakeholders provide downstream flow alternatives for evaluation in the models developed during Phase 1 of the Downstream Release Alternatives Study. Stakeholders expressed concerns about their ability to propose flow alternatives without having the draft reports for the Aquatic Resources and Downstream Aquatic Habitat Studies, which are scheduled to be available in July 2020 and June 2020, respectively. It is our understanding that during Phase 2 of this study, Alabama Power would run stakeholder-proposed flow alternatives that may be provided with ISR comments, as well as additional flow alternatives that stakeholders may propose after the results for the Aquatic Resources and Downstream Aquatic Habitat Studies are available. Please clarify your intent by July 11, 2020, as part of your response to stakeholder comments on the ISR.

<u>Alabama Power Response:</u>

Alabama Power's response to evaluating additional flow alternatives is discussed in Attachment B.

Regarding the Aquatic Resources and Downstream Aquatic Habitat Studies, it is Alabama Power's intent to provide stakeholders 30 days to review, provide comments, and recommend any additional flow analyses based on the information in the draft reports. It is also Alabama Power's intent to meet with the Harris Action Teams (HATs) between Fall 2020 and Spring 2021 to present preliminary results, including the bioenergetics modeling, and obtain stakeholder input on additional analyses.

Question #5: Page 14 of the Draft Downstream Release Alternatives (Phase 1) Study Report includes a description of the HEC-ResSim model that was developed for the project. Harris Dam was modeled in HEC-ResSim with both a minimum release requirement and maximum constraint at the downstream gage at Wadley. The draft report states that the minimum release requirement is based on the flow at the upstream Heflin gage, which is located on the Tallapoosa River arm of Harris Reservoir and has 68 years of discharge records. Page 5 of the draft report indicates that there is also a gage (Newell) on the Little Tallapoosa River Arm of the reservoir, which has 45 years of discharge records. It appears that only the Heflin gage was used in developing the minimum release requirement. As part of your response to stakeholder comments on the ISR, please explain the rationale for basing the minimum releases in the HEC-ResSim model only on the flows at the Heflin gage and not also on the flows at the Newell gage.

Alabama Power Response:

The HEC-ResSim model bases the releases on the Green Plan, which specifies the use of the Heflin gage. During development of the Green Plan, the Heflin gage was considered the gage that best mimicked the unregulated, natural flow of the Tallapoosa River. Based on available information from stakeholder meetings in early 2000, the Newell gage was not considered. Stakeholders involved in the Green Plan development process did acknowledge that the Heflin gage excluded the flow from Little Tallapoosa River.

Below is a brief summary of the recorded stakeholder discussions that reference the use of the Heflin gage.

- 5/21/2003 Stakeholder Meeting: Stan Cook (Alabama Department of Conservation and Natural Resources (ADCNR)) stated that the Heflin gage is being used to mimic natural events and that the "Big" Tallapoosa River better reflects a larger scale drainage.
- 8/4/2003 Stakeholder Meeting: Elise Irwin presents findings on the models indicate that the Heflin gage is a promising location.
- 11/3/2003 Stakeholder Meeting: Alabama Rivers Alliance (ARA) stated they wanted Alabama Power to evaluate use of a house turbine that would provide capabilities to duplicate the Heflin gage flows. During this meeting, it was mentioned that the Heflin gage does not include flows from the Little Tallapoosa River, and no one stated opposition to use of the Heflin gage.
- 1/1/2006 Stakeholder Meeting: Stakeholders commented that mimicking Heflin flows would allow for some natural variability of flow in the regulated part of the river.

Draft Erosion and Sedimentation Study Report

Question #7: The Erosion and Sedimentation Study in the approved study plan states that Alabama Power would analyze its existing lake photography and Light Detection and Ranging (LIDAR) data using a geographic information system (GIS) to identify elevation or contour changes around the reservoir from historic conditions and quantify changes in lake surface area to estimate sedimentation rates and volumes within the reservoir. In addition, the approved study plan states that Alabama Power will verify and survey sedimentation areas for nuisance aquatic vegetation. According to the study schedule, Alabama Power will prepare the GIS overlay and maps from June through July 2019 and conduct field verification from fall 2019 through winter 2020.

The Draft Erosion and Sedimentation Study Report does not include a comparison of reservoir contour changes from past conditions or the results of nuisance aquatic vegetation surveys. The report states that limited aerial imagery of the lake during winter draw down and historic LIDAR data for the reservoir did not allow for comparison to historic conditions and that Alabama Power will conduct nuisance aquatic vegetation surveys during the 2020 growing season. It is unclear why the existing aerial imagery and Alabama Power's LIDAR data did not allow for comparison with past conditions or why the nuisance aquatic vegetation surveys will be conducted during the 2020 growing season instead of during the approved field verifications from fall 2019 to winter 2020. As part of your response to stakeholder comments on the ISR, please clarify what existing aerial imagery and LIDAR data was used and why it was not suitable for comparison with past conditions.

Alabama Power Response:

Alabama Power has 2007 and 2015 Light Detection and Ranging (LiDAR) data for Lake Harris that it will use to develop a comparison for the Final Erosion and Sedimentation Study Report.

Ms. Donna Matthews proposed a new study of the Tallapoosa River downstream of Harris Dam to use historic images overlaid on current imagery to evaluate changes in the Tallapoosa River.[1] Alabama Power's response to this study request is addressed in Attachment B; however, Ms. Matthews noted in the ISR Meeting that she would share various images of the Tallapoosa River pre-Harris Dam and after construction. Alabama Power intends to facilitate obtaining copies of these images to provide to FERC for its use in addressing cumulative effects, as noted in FERC's November 16, 2018 Scoping Document 2.[2]

Regarding the nuisance aquatic vegetation component of the Erosion and Sedimentation study, the growing season is late spring into summer, which did not correspond with the fall 2019 to winter 2020 in the FERC-approved study plan schedule. Therefore, Alabama Power plans to conduct the nuisance aquatic vegetation survey in summer 2020. These results will be provided to HAT 2 participants as a technical memo to supplement the Draft Erosion and Sedimentation Study Report.

[1] Accession No. 20200612-5018.

[2] Accession No. 20181116-3065.

Question #9: (comment provided below includes only the information requested by FERC) As part of your response to stakeholder comments on the ISR, please provide:

1) *the maps and assessment of the availability of potentially suitable habitat within the project boundary for all of the T&E species on the official species list for the project;*
2) *documentation of consultation with FWS regarding the species-specific criteria for determining which T&E species on the official species list will be surveyed in the field;*
3) *a complete list of T&E species that will be surveyed during the 2nd study season as part of the T&E Species Study; and*
4) *confirmation that Alabama Power will complete the field verification scheduled by September 2020.*

Alabama Power Response:

1) The maps and assessment of the availability of potentially suitable habitat within the Harris Project Boundary were included in the draft Threatened and Endangered Species Desktop Assessment Report and were prepared based on available sources of information. Any maps and assessments of habitat suitability that could not be resolved in the desktop assessment will be included in the Final Threatened and Endangered Species Study Report. Alabama Power is actively consulting with U.S. Fish and Wildlife Service (USFWS) regarding Threatened and Endangered Species (T&E species) where existing information is insufficient to determine their presence/absence and habitat suitability. Alabama Power plans to continue to work with USFWS and the Alabama Natural Heritage Program (ANHP) to resolve questions about the species and perform field surveys as deemed appropriate.

2) Alabama Power met with HAT 3 participants on August 27, 2019 to discuss species included in the Threatened and Endangered Species Study Plan. As a result of that meeting and based on recommendations from USFWS, Alabama Power conducted surveys for Finelined Pocketbook in the Tallapoosa River and Palezone Shiner in Little Coon Creek. Additional surveys for Finelined Pocketbook in tributaries to Lake Harris are ongoing and should be completed in Summer 2020. Alabama Power is consulting with the USFWS and ANHP to determine the need for additional surveys. If requested, Alabama Power may perform surveys for additional species and/or assessments to determine suitability of habitat that could not be resolved in the Threatened and Endangered Species Desktop Assessment. All consultation regarding this process will be included as an appendix to the Final Threatened and Endangered Species Study Report.

3) Alabama Power plans to conduct additional surveys for Finelined Pocketbook in Summer 2020. Based on ongoing consultation with USFWS and with input from ANHP, Alabama Power may perform surveys for Price’s Potato Bean, White Fringeless Orchid, and Little Amphianthus (pool sprite) as well as assessments to determine if suitable habitat exists for Red-cockaded Woodpecker and Little Amphianthus.

4) Alabama Power plans to complete field verifications by September 2020.

Question #10: To facilitate review of the existing shoreline land use classifications, please file larger scale maps of all the shoreline areas as a supplement to the Draft Project Lands Evaluation Report, as part of your response to stakeholder comments on the ISR. Please include land use classifications on the maps. In addition, if available, please file the GIS data layers of the existing and proposed shoreline land use classifications.

Alabama Power Response:

Included with this filing are the larger scale maps, including land classifications, and the GIS files of the existing and proposed shoreline land use classifications.

Attachment B

Alabama Power's Response to Study Modifications and Additional Study Requests Following the May 12, 2020 Initial Study Report and Initial Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

Alabama Power received two recommendations to modify the existing FERC-approved studies and three Additional Study Requests. Alabama Power's response to the study modifications and Additional Study Requests is discussed below.

A. Modifications to Existing Studies

1) FERC Question #3:[1] "To facilitate modelling of downstream flow release alternatives, we recommend that Alabama Power run base flows of 150 cfs, 350 cfs, 600 cfs, and 800 cfs through its model for each of the three release scenarios (i.e., the Pre-Green Plan, the Green Plan, and the modified Green Plan flow release approach). The low-end flow of 150 cfs was proposed by Alabama Power as equivalent to the daily volume of three 10-minute Green Plan pulses. This flow also is about 15 percent of the average annual flow at the United States Geological Survey's flow gage (#02414500) on the Tallapoosa River at Wadley, Alabama, and represents "poor" to "fair" habitat conditions. We recommend 800 cfs as the upper end of the base flow modeling range because it represents "good" to "excellent" habitat and is nearly equivalent to the U.S. Fish and Wildlife Service's Aquatic Base Flow guideline for the Tallapoosa River at the Wadley gage. The proposed base flows of 350 cfs and 600 cfs cover the range between 150 cfs and 800 cfs."

2) ARA's June 11, 2020 comments:[2] "While reserving the right to request other release alternatives be considered once more information is made available to stakeholders, ARA proposes the following study modification request pursuant to 18 C.F.R. § 5.15(d) for additional flow scenarios be analyzed as part of the Downstream Release Alternatives Study:

    (i) A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gage, rather than the current 75%;

    (ii) A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria;

    (iii) A constant but variable release that matches the flow at the USGS Wadley stream gage to the UGSG Heflin stream gage to mimic natural flow variability, and

    (iv) 300 cfs and 600 cfs minimum flows.

    Some of these flows, particularly items (iii) and (iv) may have been modeled internally by Licensee as part of the original adaptive management process; however, those models are not currently available as part of this relicensing. Studying a wider range of potential flows during the ILP could result in improved diversity and abundance of aquatic life and habitat, more recreation opportunities, decreased erosion and sedimentation, and gains in water quality."

[1] Accession No. 20200610-3059.

[2] Accession No. 20200611-5114.

3) In its June 11, 2020 comments[3], EPA "requests that the flow scenarios include the evaluation of an option including both the pulses of the Green Plan with a minimum flow, and a higher minimum flow.

Alabama Power's Response:

Based on FERC, ARA, and EPA's recommendation to modify the Downstream Release Alternatives study, Alabama Power will model the following additional downstream flow scenarios:

- A variation of the existing Green Plan where the Daily Volume Release is 100% of the prior day's flow at the USGS Heflin stream gage, rather than the current 75%;
- A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing laid out in the existing Green Plan release criteria;
- 300 cfs continuous minimum flow;
- 600 cfs continuous minimum flow; and a
- 800 cfs continuous minimum flow.

These recommended flow release alternatives are in addition to Alabama Power's release alternatives in the FERC-approved Study Plan that include:

- Pre-Green Plan (peaking only; no pulsing or continuous minimum flow);
- Green Plan (existing condition);
- Modified Green Plan (changing the time of day in which the Green Plan pulses are released); and
- 150 cfs continuous minimum flow.

Alabama Power has not included ARA's recommended "constant but variable release that matches the flow at the USGS Wadley streamgage to the UGSG Heflin streamgage to mimic natural flow variability", as an alternative to model. This alternative would eliminate peaking operations, which would significantly reduce or eliminate use of the Harris Project for voltage support and system reliability, including black start operations. Alabama Power regards this alternative as a complete change in Project operations (from peaking to run-of-river) that is not consistent with Project purposes.[4]

Furthermore, the units are not capable of adjusting to the extent of simulating natural river flows. The flow through the Harris units varies only to the extent of changes in gross head (the difference between the forebay elevation and tailwater elevation) and the wicket gate opening. Small wicket gate openings lead to excessive pressure drops, which is the primary driver of cavitation[5] initiation. The best way to minimize cavitation and its associated detrimental vibrations is to quickly move the wickets gates from a closed position to the best gate setting. The best gate setting is a permanent setting on the governor system to ensure that the control system will force a fast movement of the wicket gates through the "rough zone" to the best gate position thereby minimizing the time spent in the rough zone. The rough zone is an area on the operating curve where flows that are less than efficient gate cause increased vibrations in the turbine

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[3] Accession Nos. 20200612-5025 and 20200612-5079.

[4] For additional explanation, see Alabama Power's March 13, 2019 letter to FERC (Accession No. 20190313-5060).

[5] Cavitation is a phenomenon in which rapid changes of pressure in a liquid lead to the formation of small vapor-filled cavities in places where the pressure is relatively low.

and cavitation along the low-pressure surfaces of the turbine runner. For these reasons, this is not a viable alternative.

Alabama Power also declines FERC's recommendation to study all of the continuous minimum flows combined with the Pre-Green Plan, Green Plan, and Modified Green Plan. Alabama Power asserts that modeling one combination of a continuous minimum flow AND pulsing (the hybrid Green Plan listed above) is adequate to determine the effect of this downstream release alternative on Project operations and other resources. The eight alternatives Alabama Power will model will provide sufficient information to evaluate the resources of interest, determine any downstream release proposal, and determine protection, mitigation, and enhancement (PM&E) measures to be incorporated into the new license for the Project.

B. Proposed Additional Studies

1) ARA proposed a new study for "Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts".

Alabama Power's Response:

While ARA's additional study request appears to conform to FERC's regulations and criteria for additional study requests, Alabama Power respectfully declines to complete this study for the Harris Project relicensing. Our reasons are provided below:

a. ARA notes that there is a data gap around Project ramping rates. The Harris Project units are not capable of ramping; rather they were designed as peaking units to quickly react to electrical grid needs, and as such, the turbines were not designed to operate in a gradually loaded state—or restricted ramping rate—over an extended period of time. In fact, restricted ramping is avoided to prevent damage to hydroturbine machinery. When transitioning from spinning mode to generating mode, the wicket gates are opened over a period of approximately 45 seconds. One reason for this method of operating is so the turbine spends a minimal amount of time in the rough zone.

b. The goal of this study, as outlined by ARA, is to determine whether a battery energy storage system (BESS) could be economically integrated at Harris. This technology is very new and there is no established methodology for integrating BESS at hydropower facilities. The cost of a BESS system with restricted hydraulic ramping is concerning because the cost must include not only the battery but also the cost of replacing both turbine runners and determining the extent of the effect on the balance of plant. Each unit at Harris makes approximately 60 megawatts (MW) at efficient gate. For an example, a 60 MW/60-megawatt hour (MWhr), 1-hour duration, standalone battery including construction and installation, is estimated to cost $36M dollars.[6] This battery would need to be sized to produce up to 60 MW for one hour so that the full capacity of the turbine could be supplemented from battery power. The battery would need this capacity because ramping would essentially begin at zero MWs with a very small wicket gate opening and then gradually open over the period of one hour. A smaller MW battery would not be large enough to make up the lost MWs in a full ramping scenario. For example, if a 5 MW battery

[6] Fu, Remo and Margolis, "2018 U.S. Utility-Scale Photovoltaics-Plus-Energy Storage System Costs Benchmark", National Renewable Energy Laboratory, NREL/TP-6A20-71714.

were used, the unit would have to ramp very quickly, within 30 to 45 seconds, to an output of 55 MW. The 5 MW battery would then make up for the remaining power to reach the original power output of 60 MW. To be clear, a battery smaller than the unit's power at efficient gate does not allow for full ramping because the unit must quickly be brought up to a point where the unit's power plus the battery's power equals 60 MW.

The cost of $36M would be doubled to $72M since there are two units at Harris Dam and peaking requires the availability of both units. Additionally, this is a one-hour battery, so the unit(s) must be at efficient gate at one hour past the start of generation. If a longer ramping rate was desired, the battery would likely need to be even larger. The cost to upgrade the turbine runners in order to have a much wider operating range would also need to be considered. It is also important to note that it is undetermined, due to the site-specific conditions and the geometry of the water passages in the powerhouse, if a suitable turbine runner with a wide operating range can even be produced.

c. While information and access to battery storage technology is increasing, as ARA notes, integrating BESS at hydropower projects is a relatively new field with no established methodology. This is especially true for the size of BESS needed to replace the full megawatt capacity at Harris. Furthermore, full-scale redesign of the existing turbines is not being considered by Alabama Power during this relicensing.

For these reasons, Alabama Power declines this study proposal and contends that the downstream release alternatives study will provide information for Alabama Power and the stakeholders to effectively evaluate effects of downstream releases on Project resources (both on Lake Harris and in the Tallapoosa River below Harris Dam) and for Alabama Power to propose an operating scenario for the next license term.

2) Pre-and Post-Dam Analysis of Downstream Impacts, including flooding, erosion, and habitat changes to flora and fauna.

Alabama Power's Response:

Mr. Chuck Denman[7] proposed that Alabama Power conduct an additional study that analyzes pre-dam and post-dam impacts on flooding, erosion, plants, and fisheries. This study request did not meet FERC's criteria for an additional study; however, Alabama Power notes that many of the analyses requested by Mr. Denman are in fact occurring as part of the Harris relicensing. FERC does not require a licensee to evaluate pre-project conditions in a relicensing. In FERC's "*Guide to Understanding and Applying the Integrated Licensing Process Study Criteria*" (2012), FERC notes that where information is being sought solely to look at historic effects, FERC staff will not require an applicant to reconstruct pre-project conditions, because that is not the baseline from which the FERC conducts its environmental analysis. The FERC's choice of current environmental conditions as the baseline for environmental analysis in relicense cases was affirmed in American Rivers v. FERC, 187 F.3d 1007, amended and rehearing denied, 201 F.3d 1186 (9th Cir., 1999); Conservation Law Foundation v. FERC, 216 F.3d 41 (D. C. Cir. 2000).

[7] Accession No 20200611-5174.

Alabama Power has consistently communicated and explained that it will use the 100-year flood event to model effects from a change in Harris Project operations on downstream resources. Alabama Power has also completed an erosion evaluation and is reviewing all stakeholder comments on lake and downstream erosion and sedimentation and will address those comments in the Final Erosion and Sedimentation Report. Alabama Power is also evaluating how changes to current Project operations may affect nuisance aquatic vegetation. Finally, Alabama Power has compiled a large amount of existing information on the Tallapoosa River fisheries community and is also conducting three studies investigating fish habitat, aquatic resources in the Tallapoosa River, and water quality and water temperature in both Lake Harris and in the Tallapoosa River. For these reasons, Alabama Power believes the issues raised by Mr. Denman are covered in the FERC-approved Study Plan and a new study is not warranted.

3) A New Study of the Downstream River Using Historic Images Overlaid onto Current Imagery

Alabama Power's Response:

Ms. Donna Matthews[8] proposed that Alabama Power conduct a new study using GIS to compare historic imagery to current imagery to evaluate effects of releases downstream of Harris Dam. Ms. Matthews notes that existing data can be used and that Alabama Power can gather historic images and overlay them on current images to determine the effects of the dam on the river downstream. The primary purpose of this study is to address "significant and persistent concerns about erosion" in the Tallapoosa River downstream of Harris Dam.

Alabama Power notes that while this study does not conform to FERC's criteria for additional studies, Alabama Power is committed to evaluating erosion and sedimentation effects on Lake Harris and in the Tallapoosa River downstream of Harris Dam. Alabama Power is reviewing stakeholder comments on the Draft Erosion and Sedimentation Report and will address these comments in the Final Erosion and Sedimentation Report. Further, the FERC-approved Erosion and Sedimentation Study Plan provides adequate methodology to address erosion and sedimentation issues resulting from Harris Project operations.

As noted above, FERC does not require licensees in the relicensing process to study pre-project conditions; however, Ms. Matthews volunteered in the April 28, 2020 ISR Meeting to provide images to Alabama Power that FERC may consider in conducting its cumulative effects analysis for soils and geologic resources, specifically erosion and sedimentation. Alabama Power intends to contact Ms. Matthews to obtain copies of these photos.

[8] Accession No. 20200611-5169.

Note: The large-scale maps referenced in the response to Question #10 are not included in this version of the filing due to file size recommendations for eFiling.

Harris relicensing - response to ISR comments

APC Harris Relicensing <g2apchr@southernco.com>

Fri 7/10/2020 6:58 PM

To: 'harrisrelicensing@southernco.com' <harrisrelicensing@southernco.com>
Bcc: 1942jthompson420@gmail.com <1942jthompson420@gmail.com>; 9sling@charter.net <9sling@charter.net>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; alpeeple@southernco.com <alpeeple@southernco.com>; amanda.fleming@kleinschmidtgroup.com <amanda.fleming@kleinschmidtgroup.com>; amanda.mcbride@ahc.alabama.gov <amanda.mcbride@ahc.alabama.gov>; amccartn@blm.gov <amccartn@blm.gov>; ammcvica@southernco.com <ammcvica@southernco.com>; amy.silvano@dcnr.alabama.gov <amy.silvano@dcnr.alabama.gov>; andrew.nix@dcnr.alabama.gov <andrew.nix@dcnr.alabama.gov>; arsegars@southernco.com <arsegars@southernco.com>; athall@fujifilm.com <athall@fujifilm.com>; aubie84@yahoo.com <aubie84@yahoo.com>; awhorton@corblu.com <awhorton@corblu.com>; bart_roby@msn.com <bart_roby@msn.com>; baxterchip@yahoo.com <baxterchip@yahoo.com>; bboozer6@gmail.com <bboozer6@gmail.com>; bdavis081942@gmail.com <bdavis081942@gmail.com>; beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; bill_pearson@fws.gov <bill_pearson@fws.gov>

1 attachments (143 KB)

2020-07-10 Response to ISR Comments.pdf;

Harris relicensing stakeholders,

On April 10, 2020, Alabama Power filed the Initial Study Report (ISR) along with six Draft Study Reports and two cultural resources documents. Alabama Power held the ISR Meeting with stakeholders and FERC on April 28, 2020. On May 12, 2020, Alabama Power filed the ISR Meeting Summary. Comments on the ISR, draft reports, and ISR Meeting Summary were due on June 11, 2020.

Alabama filed a response to ISR comments with FERC today. The response is attached and can also be found on the relicensing website: www.harrisrelicensing.com under "Relicensing Documents." Note that the larger scale maps requested by FERC can be found in the HAT 4 – Project Lands folder.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, DC 20426
August 10, 2020

OFFICE OF ENERGY PROJECTS

Project No. 2628-065 – Alabama
R.L. Harris Hydroelectric Project
Alabama Power Company

VIA FERC Service

Angie Anderegg
Harris Relicensing Project Manager
Alabama Power Company
600 North 18th Street
Birmingham, AL 35203

Reference: Determination on Requests for Study Modifications for the R.L. Harris Hydroelectric Project

Dear Ms. Anderegg:

Pursuant to 18 C.F.R. § 5.15 of the Commission's regulations, this letter contains the determination on requests for modifications to the approved study plan for Alabama Power Company's (Alabama Power) R.L. Harris Hydroelectric Project No. 2628 (Harris Project). The determination is based on the study criteria set forth in sections 5.9(b) and 5.15(d) and (e) of the Commission's regulations, applicable law, Commission policy and practice, and Commission staff's review of the record of information.

<u>Background</u>

Commission staff issued the study plan determination (SPD) for the Harris Project on April 12, 2019. Alabama Power filed an initial study report (ISR) and associated draft study reports on April 10, 2020, held an ISR meeting on April 28, 2020, and filed an ISR meeting summary on May 12, 2020. Comments on the ISR and meeting summary were filed by Commission staff on June 10, 2020, and by Alabama Department of Conservation and Natural Resources, Alabama Rivers Alliance, David Bishop, Dana Chandler, Wayne Cotney, Chuck Denman, Albert Eiland, Nelson Hay, Sharon Holland, Carol Knight, Joe Meigs, David Royster, Ronnie Siskey, Mike Smith, Michelle Waters, and John Carter Wilkins on June 11, 2020. The Alabama Department of Environmental Management, the U.S. Environmental Protection Agency (EPA), and Donna Matthews filed comments on June 12, 2020,[1] and the National Park Service filed comments June 29, 2020. Alabama Power filed reply comments on July 10, 2020.

Comments

Some of the comments received do not specifically request modifications to the approved study plan. This determination does not address these types of comments, which include: comments on the presentation of data and results; requests for additional information; disagreements on study results; recommendations for protection, mitigation, or enhancement measures; or issues that were previously addressed in either the November 16, 2018 Scoping Document 2 or the April 12, 2019 SPD.

Study Plan Determination

Pursuant to section 5.15(d) of the Commission's regulations, any proposal to modify a required study must be accompanied by a showing of good cause, and must demonstrate that: (1) the approved study was not conducted as provided for in the approved study plan, or (2) the study was conducted under anomalous environmental conditions or that environmental conditions have changed in a material way. As specified in section 5.15(e), requests for new information gathering or studies must include a statement explaining: (1) any material change in law or regulations applicable to the information request, (2) why the goals and objectives of the approved study could not be met with the approved study methodology, (3) why the request was not made earlier, (4) significant changes in the project proposal or that significant new information material to the study objectives has become available, and (5) why the new study request satisfies the study criteria in section 5.9(b).

Alabama Power agreed with requests to modify its Water Quality Study, as discussed immediately below. As indicated in Appendix A, two additional study modifications were requested, one of which Alabama Power partially agreed to and is required with staff modifications. In addition, three new studies were requested, one of which is approved herein, with staff modifications. The bases for modifying the study plan or approving new studies are explained in Appendix B (Requested Modifications to Approved Studies). Commission staff considered all study plan criteria in section 5.9 of

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[1] Alabama Department of Environmental Management (Alabama DEM) and Donna Matthews' comments were filed on June 11, 2020, just after close of Commission business at 5:00 p.m. EST. Section 385.2001(a)(2) of the Commission's regulations provide that any filing received on a regular business day after close of Commission business is considered filed on the next regular business day. Therefore, the comments by Alabama Department of Environmental Management and Donna Matthews are considered filed on the next regular business day, or June 12, 2020.

the Commission's regulations; however, only the specific study criteria particularly relevant to the study in question are referenced in Appendix B.

Water Quality Study

The draft Water Quality Study Report includes measurements of dissolved oxygen concentration and water temperature at a generation monitor located in the Harris Dam tailrace (3 years of data) and at a continuous monitor located about 0.5 mile downstream from Harris Dam (1 year of data). As requested by Alabama Rivers Alliance and other stakeholders, in its ISR reply comments,[2] Alabama Power agrees to collect additional water quality data in 2020 and 2021. Alabama Power provided a monitoring schedule for 2021 but did not do so for 2020 other than to say that monitoring began on May 4, 2020. Because the approved study plan requires Alabama Power to monitor dissolved oxygen and water temperature through October 31, the 2020 monitoring period should extend until October 31, 2020.

Threatened and Endangered Species Study

As noted in staff's comments on the ISR, the draft Threatened and Endangered (T&E) Species Study Report does not provide an assessment of T&E species populations and/or their habitats at the project, or a record of consultation with the U.S. Fish and Wildlife Service (FWS) regarding the need for field surveys for all of the species on the official T&E species list.[3] In its reply comments, Alabama Power states that existing information is insufficient to determine some of the T&E species' presence/absence and habitat suitability in the project area. Alabama Power also states that it may conduct additional field surveys[4] for T&E species and/or their potentially suitable habitat based on ongoing consultation with the FWS and Alabama Natural Heritage Program, and will provide documentation of this consultation in the Final T&E Species Report which will be filed in January 2021, per the approved study plan schedule filed on May 13, 2019.

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[2] *See* Alabama Power's July 10, 2020 Reply Comments at 2. Alabama Power indicates that the continuous monitor was installed on May 4, 2020, and the tailrace monitor was installed on June 1, 2020.

[3] *See* the official list of T&E species within the Harris Project boundaries (i.e., at Lake Harris and Skyline), accessed on July 27, 2018, by staff using the FWS's Information for Planning and Conservation website (https://ecos.fws.gov/ipac/) and filed on July 30, 2018.

[4] Alabama Power confirmed it would complete T&E species field verifications by September 2020, per the approved study plan schedule.

Requested Variances

In the ISR, Alabama Power requests variances to the approved schedules for the Draft Recreation Evaluation Study Report and the Cultural Resources Study.[5] Specifically, Alabama Power proposes to file its Draft Recreation Evaluation Study Report in August 2020, instead of June 2020, to allow time to complete two new recreation surveys, a Tallapoosa River Downstream Landowner Survey and a Tallapoosa River Recreation User Survey. Alabama Power also proposes to finalize the Area of Potential Effect (APE) for its Cultural Resources Study and file it with documentation of consultation in June 2020, which it did on June 29, 2020. No stakeholders objected to the requested variances and these changes to the approved study schedule will not affect the overall relicensing schedule. Therefore, the requested variances are approved.

Please note that nothing in this determination is intended, in any way, to limit any agency's proper exercise of its independent statutory authority to require additional studies.

If you have any questions, please contact Sarah Salazar at sarah.salazar@ferc.gov or (202) 502-6863.

Sincerely,

for
Terry L. Turpin
Director
Office of Energy Projects

Enclosures: Appendix A – Summary of determinations on requested modifications to approved studies and new study requests

[5] Alabama Power also requested a variance to the approved schedule for the Water Quality Study, proposing to submit its Clean Water Act section 401 water quality certification (certification) application to the Alabama DEM in April 2021, instead of as originally proposed in 2020. Section 5.23(b) of the Commission's regulations requires the application for certification to be submitted to the certifying agency within 60 days of issuance of the Ready for Environmental Analysis notice, which will occur post-filing. Accordingly, a variance for submitting the certification application prior to filing the license application is not needed.

Appendix B – Commission staff's recommendations on requested modifications to approved studies and new study requests

APPENDIX A

SUMMARY OF DETERMINATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES (see Appendix B for discussion)

Study	Recommending Entity	Approved	Approved with Modifications	Not Required
Requested Modifications to Approved Studies				
Downstream Release Alternatives Study	Commission staff, Alabama Rivers Alliance, EPA		X	
Operating Curve Change Feasibility Analysis Study and Downstream Release Alternatives Study – Climate Change Assessment	Donna Matthews			X
New Study Requests				
Battery Storage Feasibility Study	Alabama Rivers Alliance		X	
Pre-and Post-Dam Analysis of Downstream Impacts	Chuck Denman			X
Study of the Downstream River Using Historic, Pre-Dam Images Overlaid onto Current, Post-Dam Imagery	Donna Matthews			X

APPENDIX B

STAFF RECOMMENDATIONS ON REQUESTED MODIFICATIONS TO APPROVED STUDIES AND NEW STUDY REQUESTS

Downstream Release Alternatives Study

Background

Alabama Power designed and constructed the Harris Project, which began operation in 1983, as a peaking project. Prior to 2005, Alabama Power, while operating in a peaking mode, would alternately generate electricity for part of the day, and store flow in the reservoir for the rest of the day.[6] While storing flows, there would be no downstream flow releases into the Tallapoosa River other than a license required minimum release of 45 cubic feet per second (cfs), as measured at the United States Geological Survey (USGS) gage located 14 miles downstream at Wadley, Alabama.

In 2005, Alabama Power voluntarily modified project operation to provide downstream pulse flow releases ranging from 15 minutes to 4 hours in length during non-generation periods for the benefit of the aquatic community downstream (called “Green Plan”).

The goal of the approved Downstream Release Alternatives Study is to evaluate the effects of the current Green Plan and the historic peaking operation, along with alternative downstream releases, on environmental and developmental resources affected by the project. Throughout the study planning and implementation process, Alabama Power has requested that stakeholders provide alternative flow releases to model as part of the study.[7]

Requested Study Modification

The approved study plan requires Alabama Power to model four downstream release scenarios, including: (1) current operation (the Green Plan); (2) the project’s historic peaking operation; (3) a modified Green Plan (i.e., modifying the time of day during which the pulses are released); and (4) a downstream continuous minimum flow of 150 cfs under a historic peaking operation scenario. Based on the findings in the draft Downstream Release Alternatives Study Report, in comments on the ISR, Commission

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[6] *See* Final Downstream Release Alternatives Study Report at 1.

[7] *See* Study Plan Meeting Summary in the Revised Study Plan filed on March 13, 2019; the ISR Meeting Summary filed on May 12, 2020; and Alabama Power’s ISR reply comments filed on July 10, 2020.

staff, the Environmental Protection Agency (EPA), and Alabama Rivers Alliance, request that Alabama Power evaluate additional downstream release alternatives. Commission staff request that Alabama Power model continuous minimum flows of 150, 350, 600, and 800 cfs under the historic peaking, Green Plan, and modified Green Plan release scenarios. EPA requests that Alabama Power evaluate: (1) the Green Plan with minimum flows; and (2) continuous minimum flows higher than 150 cfs. Alabama River Alliance requests Alabama Power evaluate the following downstream flow alternatives:

1. a variation of the existing Green Plan where the Daily Volume Release is 100 percent of the prior day's flow at the upstream USGS Heflin stream gage (rather than the current 75 percent);
2. a hybrid Green Plan that incorporates a downstream continuous minimum flow of 150 cfs;
3. releases from the Harris Project that match flow at the downstream USGS Wadley stream gage to the USGS Heflin stream gage to mimic natural flow variability; and
4. downstream continuous minimum flows of 300 and 600 cfs.

Comments on Requested Study Modification

In Attachment B of its reply comments, Alabama Power proposes to model the following five downstream release alternative model runs, in addition to the required four initial alternative model runs, for a total of nine alternative model runs:

1. a variation to the existing Green Plan where the Daily Volume Release is 100 percent of the prior day's flow at the USGS Heflin stream gage;
2. a 150-cfs continuous minimum flow with Green Plan releases;
3. a 300-cfs continuous minimum flow with historic peaking operation;[8]
4. a 600-cfs continuous minimum flow with historic peaking; and
5. an 800-cfs continuous minimum flow with historic peaking.

Alabama Power does not propose to model Alabama Rivers Alliance's requested alternative for a release from the Harris Project that mimics the natural flow variability in the Tallapoosa River. Alabama Power states that such operation would significantly reduce or eliminate use of the project for peaking. Moreover, Alabama Power states that the project's units are not capable of adjusting, to the extent necessary, to simulate natural

[8] In the draft Downstream Release Alternatives Study Report, Alabama Power refers to the continuous minimum flow alternatives solely as minimum flows. To eliminate confusion, we recommend Alabama Power define the minimum flow alternatives, with regard to the associated operational scenario (e.g., 150-cfs continuous minimum flow with Green Plan operation).

river flows. Alabama Power also does not propose to model staff's requested range of minimum flows with the Green Plan (except 150 cfs) or modified Green Plan releases (with any flow). Alabama Power states that modeling one combination of a minimum flow (150 cfs) and Green Plan releases is adequate to determine the effect of this downstream release alternative on project resources.

Discussion and Staff Recommendation

The purpose of the Green Plan releases is to reduce the effects of peaking operation on the aquatic community, including habitat, in the Tallapoosa River downstream from Harris Dam. Monitoring conducted since initiation of the Green Plan in 2005 indicates that there has been an increase in shoal habitat availability, but the response by the fish community has been mixed (Irwin, 2019).

Alabama Rivers Alliance's request for a downstream release alternative, whereby releases from the Harris Project would mimic the Tallapoosa River's natural flow variability, which could benefit the habitat and aquatic community downstream from Harris Dam, would require a change in project operation from peaking to run-of-river. As detailed by Alabama Power in its July 10, 2020, comments,[9] the turbine-generator units at the Harris Project are designed to be operated at best gate and are not capable of adjusting to the extent necessary to simulate natural river flows (i.e., it is unable to operate in a run-of-river mode). Operating the units in this manner would lead to cavitation, which would damage the units. Therefore, operating the Harris Project to mimic the river's natural flow variability under a run-of-river mode would likely require significant redesign and redevelopment of the project (e.g., structural modifications, intake redesign, turbine retrofits, etc.). Because run-of-river operation is not feasible at the Harris Project without a major redesign and redevelopment of the project, we do not consider it to be a reasonable alternative for further consideration as part of our eventual environmental analysis. Therefore, we do not recommend modifying the study to include a release alternative that mimics natural flow variability in the Tallapoosa River.

With respect to the modified Green Plan releases requested by staff, we no longer recommend that Alabama Power model continuous minimum flows with this release strategy because, other than shifting the time of day of the releases, the release characteristics, model results, and environmental benefits would be the same as those for the continuous minimum flows and the Green Plan release strategy being modeled.

As noted above, the current license requires Alabama Power to release flows from the project such that a 45-cfs minimum flow is provided at the downstream USGS Wadley streamflow gage. Incrementally higher minimum flows (e.g., 150, 300, 600, and

[9] *See* Alabama Power's July 10, 2020 comments, Attachment B, page 2.

800 cfs) would provide additional wetted width, which could improve habitat availability between pulsing releases. Therefore, there is the potential for additional enhancement and protection that we will need to consider as part of our environmental analysis. Modeling a range of continuous minimum flows with the existing Green Plan releases would allow for an evaluation of flows that could improve downstream aquatic habitat. Therefore, in addition to the nine alternative model runs identified by Alabama Power,[10] we recommend Alabama Power model three additional continuous minimum flows with the Green Plan releases (i.e., 300, 600, and 800 cfs).[11]

Operating Curve Change Feasibility Analysis Study and Downstream Release Alternatives Study – Climate Change Assessment

Background

The approved study plan includes two operations-related modeling studies: an Operating Curve Change Feasibility Analysis Study and a Downstream Release Alternative Study. The respective objectives of these approved studies are to: (1) evaluate proposed incremental increases to the winter rule curve for Harris Lake; and (2) evaluate the effects of the historic peaking, existing Green Plan, and alternative downstream release alternatives, on environmental and developmental resources affected by the project.

Requested Study Modification

Donna Matthews requests that the Operating Curve Change Feasibility Analysis and Downstream Release Alternative Studies be modified to include additional modeling of the effect of climate change on flows and Harris Project operation. The additional modeling would use predictive data from climate change studies.

Comments on Requested Study Modification

No comments were filed on this requested study modification.

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[10] *See* Alabama Power's July 10, 2020 Reply Comments at Appendix B, page 2.

[11] These flows were selected because they are consistent with those minimum flows selected by Alabama Power for their historic peaking model runs.

Discussion and Staff Recommendation

We are not aware of any available climate change model or assessment, including the climate change assessment referenced by Ms. Matthews,[12] that would support, with any degree of accuracy and reliability, a prediction of water availability at the individual project level. However, there is historical streamflow data available for the Tallapoosa River upstream of, and downstream from, the Harris Project. This data can be used to evaluate whether climate change has resulted in any changes to hydrologic inputs over time at the project. Therefore, we do not recommend modifying either the Operating Curve Change Feasibility Analysis Study or Downstream Release Alternative Study to include additional modeling using predictive data from climate change studies.

[12] Ms. Matthews references U.S. Department of Energy (2017), which was cited in EPA's March 29, 2019 comments on Alabama Power's Revised Study Plan.

STAFF RECOMMENDATIONS ON REQUESTED NEW STUDIES

Battery Energy Storage Systems (BESS) Study

Background

Harris Lake is a storage reservoir in which flows are stored to supplement inflows from April through December. The daily discharge from the project is based on a percentage of flows measured at the upstream USGS Heflin gage (i.e., the Green Plan calls for daily discharge to be at least 75 percent of flows at Heflin). Hydropower is typically generated during hours when demand for electrical power is highest (i.e., peak energy), causing significant variations in downstream flows. Daily hydropower releases from the dam vary from 0 cfs during off-peak periods to as much as 16,000 cfs, which is approximately best gate,[13] or the maximum turbine discharge.

The project has two turbine-generating units, rated at 67.5 megawatts (MW) each, which produce about 60 MW and have a hydraulic capacity of 8,000 cfs each at best gate opening. Lake elevations can vary 0.5- to 1.5-feet during a 24-hour period as a result of daily peak releases. Daily tailwater levels can vary significantly (up to 5 feet) because of peaking hydropower operations at Harris Dam, characterized by a rapid rise in downstream water levels immediately after generation is initiated, and a rapid fall in elevations as generation is ceased. Except during high flow conditions when hydropower may be generated for more extended periods of time, this peaking power generation scenario with daily fluctuating downstream flows is repeated nearly every weekday. Under the voluntary Green Plan, environmental flows are released through the turbines daily for short periods of time (i.e., 15 minutes to 4 hours).

Recommended New Study

In its comments on the ISR, Alabama Rivers Alliance requests a new study titled "Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts." The goal of the study is to determine whether a battery energy storage system (BESS) could be economically integrated at Harris to mitigate the impacts of peaking, while retaining full system peaking capabilities. Under such a scenario, the BESS would be used to provide power during peak demand periods, which would

[13] In its reply comments, Alabama Power notes that the best gate setting is a permanent setting on the governor system to ensure that the control system will force a fast movement of the wicket gates to the best gate position thereby minimizing the time spent in the rough zone (i.e., an area on the operating curve in which flows that are less than efficient gate cause increased vibrations in the turbine and cavitation along the low-pressure surfaces of the turbine runner).

decrease the need for peak generation flow releases and reduce flow fluctuations downstream of the project. The objectives of the study are to evaluate battery type and size configurations, costs, and ownership options, as well as technical barriers to implementing BESS. The study would also assess how much operational flexibility could be provided by BESS and allow for more control of discharges downstream of the dam.

Alabama Rivers Alliance acknowledges that BESS at hydropower projects is a new field with no established methodologies. Alabama Rivers Alliance requests a desktop analysis to evaluate the feasibility of BESS at the Harris Project, including a preliminary cost/benefit analysis. Alabama Rivers Alliance estimates the cost of this study would be $20,0000 to $30,000.

Comments on the Study Request

Alabama Power did not adopt this study because it believes the system would have a high cost and the turbines at Harris Dam are not designed to operate in a gradually loaded rate over an extended period. Rather, the turbines are peaking units designed to quickly react to electrical grid needs. Restricted ramping may be possible; however, it would require replacement of both turbine runners at a cost in addition to the cost of the batteries. Alabama Power estimates the cost of one 60 MW-1-hour storage battery unit equivalent to the power of one turbine, would be $36,000,000. A battery equivalent to the power of both turbines would be $72,000,000. There would be additional cost for any necessary modification of the project turbine-generator units. (Alabama Power did not provide an estimate for the cost of modifying/replacing the turbine runners.) Alabama Power dismisses the feasibility of a smaller MW battery. Alabama Power states that a smaller MW battery, i.e., 5 MW, would not be large enough to make up the lost power in full ramping mode. A battery smaller than the turbine's efficient gate would not allow for full ramping of that turbine.

Discussion and Staff Recommendation

We reviewed Alabama Power's cost estimate for the installation of a BESS at the Harris Project. Alabama Power's cost of the battery is based on a 2018 National Renewable Energy Report which estimates the cost of a 60 MW, 1-hour reserve battery at $601/kWh, or about $36,0000,000 to be used in place of the MWs from one turbine at Harris (DOE, 2018). This cost does not include any modifications to the turbine-generator units, which would be necessary. In addition, a battery with 4 hours reserve storage may be necessary, because the Harris Project can generate up to 4 hours in peaking mode. The 2018 National Renewable Energy Report estimates the cost of a 60 MW, 4-hour reserve battery at $380/kWh, or about $91,0000,000 to mirror the MW from one unit at Harris. This option would also require modification of the turbine runners at additional costs.

The goal of Alabama Rivers Alliance's study is to evaluate the feasibility of a storage system which could be economically implemented at the Harris Project. Such a study would require evaluating not only the cost of installing the battery units, but also the potential benefits to both developmental and non-developmental resources. Installing a BESS at the Harris Project has the potential to mitigate project effects on water levels in Harris Lake, and fluctuations in flows released downstream during peaking operations. Potential hydrologic changes could be achieved by spreading out the releases throughout the day/night rather than releasing most of flows during peak hours. Assuming the same daily volume of flow is released, installing one 60-MW battery to provide an equivalent amount of the power provided by one turbine-generator unit could reduce daily fluctuations in Harris Lake by half. Harris Lake water levels, which currently fluctuate up to 1.5 feet daily, could be reduced to 0.75 feet daily. Downstream releases during peaking could be reduced from 16,000 cfs to 8,000 cfs, and the tailwater surface elevation could be reduced by 2.8 feet.[14] To consider the environmental benefits potentially associated with such changes in hydrologic conditions described above, the changes in releases from the project would have to be considered in the context of Alabama Power's approved Downstream Release Alternatives Study, which provides for identifying and evaluating Alternative Release scenarios.

Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located. When reviewing a proposed action, the Commission must consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project. We currently have insufficient information to evaluate the potential environmental benefits of a BESS. The cost of conducting the study, between $20,000 and $30,000, is relatively low and would provide information that does not already exist and is needed for our analysis.

Alabama Rivers Alliance's study methodology includes a description of operational flexibility associated with installing a range of battery sizes. Alabama Power did not consider a smaller battery because of the operational limits of the existing turbines. Alabama Power's analysis should not be limited to the existing turbines but should also consider the feasibility and cost of modifying or replacing a turbine necessary to support operation of a smaller battery, which may be more cost-effective and provide some environmental benefits. At minimum, the study should look at the costs and

[14] The tailwater elevation below Harris dam is 667.7 feet msl when two units are operating and 664.9 feet msl when one unit is operating, a difference of 2.8 feet.

environmental benefits of replacing one 60 MW unit, as discussed above, and at least one smaller battery and its associated changes in project releases.

Alabama Rivers Alliance's study methodology includes a survey of battery cost estimates based on public resources, future projections for battery costs, and potential incentives to offset battery cost. Alabama Power used a 2018 Department of Energy Report which provides a reasonable methodology for estimating the cost of a technology which has not been widely implemented in hydropower. The cost of batteries, however, is rapidly decreasing,[15] and future projections in the cost of a battery should be considered in the cost analysis.

In summary, we recommend that Alabama Power conduct a BESS Study, along with the Downstream Release Alternative Study. The Downstream Release Alternative Study should be amended to include at least two new release alternatives: (a) a 50 percent reduction in peak releases associated with installing one 60 MW battery unit, and (b) a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e. 5, 10 or 20 MW battery). Alabama Power should include in its cost estimates for installing a BESS any specific structural changes, any changes in turbine-generator units, and costs needed to implement each battery storage type. Finally, consistent with the Downstream Release Alternative Study Plan, Alabama Power should evaluate how each of these release alternatives (i.e., items (a) and (b) above) would affect recreation and aquatic resources in the project reservoir and downstream.

Change Analyses: Project Operation Effects on Environmental Resources in the Tallapoosa River Downstream from Harris Dam

Background

The purpose of the Erosion and Sedimentation Study relative to downstream resources is to identify problematic erosion sites and sedimentation areas on the Tallapoosa River downstream from Harris Dam as well as determine the likely causes. The plan calls for sites downstream of Harris Dam to be identified, including by stakeholders; documented by observation and video; and assessed for the location, extent, and potential causes of erosion or sedimentation. As outlined in the approved study plan, during Phase 1 of the Operating Curve Change Feasibility Analysis Study, Alabama Power modeled the effect of increasing the winter elevation of Harris Lake by 1-, 2-, 3-, and 4-feet on the ability to provide flood control and downstream releases, among other operational parameters. Information from the Erosion and Sedimentation Study will be used in Phase 2 of both the Downstream Release Alternatives Study and the Operating

[15] The National Energy Research Laboratory reports that since 2018, battery costs have been reduced by about 15 percent, with further decreases expected.

Curve Change Feasibility Analysis Study to assess the effects of potential changes in project operation on resources downstream from Harris Dam, including erosion and sedimentation in the Tallapoosa River.

Recommended New Studies

Pre-and Post-Dam Analysis of Downstream Impacts

Chuck Denman requests a new study with the goal of analyzing pre-dam and post-dam impacts on environmental resources downstream from Harris Dam, including flooding, erosion, and habitat changes to flora and fauna. Specifically, Mr. Denman requests the following information:

1. a storm runoff model comparing 25-, 50-, and 100-year 24-hour storm events.
2. use of available remote sensing materials to identify erosion by comparing the current river channel and islands' sizes and shapes with pre-dam conditions.
3. use of remote sensing to map flag grass[16] and invasive plant communities to compare changes from pre-dam conditions.
4. review available materials from local individuals in the community, as well as fish and game and other resources to determine what effect the dam has had on downstream fish species and population sizes.

Study of the Downstream River Using Historic, Pre-Dam Images Overlaid onto Current, Post-Dam Imagery

Donna Matthews states that erosion is a significant and persistent concern that is problematic for landowners, flora, and fauna in and around the Tallapoosa River downstream from Harris Dam. Ms. Matthews requests that Alabama Power use existing aerial imagery[17] and other available data to analyze changes in erosion, fisheries, and other environmental resources downstream from Harris Dam. As part of the study, Ms. Matthews requests that Alabama Power prepare a detailed geographic information system (GIS) map with existing information relating fish populations and other parameters in three dimensions (3D). The 3D GIS map would display presence/absence of species along the river length and during different decades, where data are available. Ms.

[16] Staff assumes that "flag grass" here refers to a non-native plant in the genus *Acorus*, such as *Acorus calamus*, given that the range of the native *Acorus americanus*, or "American sweetflag," is northern United States and Canada (USDA, 2020).

[17] Ms. Matthews filed an image of the Tallapoosa River in the Harris Project area from 1942 and provided a source for obtaining additional existing aerial imagery of the project area from 1950, 1954, 1964, and 1973.

Matthews states that the results could be used to evaluate the potential effects of future changes to downstream flow patterns.

Comments on the Study Requests

Alabama Power indicates that it is conducting many of the requested analyses as part of the approved study plan, including evaluations of how existing operation affects, and alternative operations may affect, erosion and sedimentation, nuisance aquatic vegetation, fisheries/aquatic resources, and water quality in the Tallapoosa River downstream from Harris Dam. Alabama Power also states that the approved Erosion and Sedimentation Study provides an adequate methodology to evaluate project-related effects on erosion and sedimentation downstream from Harris Dam. To support the Commission's cumulative effects analysis for soils and geologic resources (i.e., erosion and sedimentation), Alabama Power indicates that it intends to contact Ms. Matthews to obtain copies of the aerial images referenced in her study request and file them with the Commission.[18]

Discussion and Staff Recommendation

Mr. Denman and Ms. Matthews present their new study requests as collecting data on pre-dam conditions, which is not necessary with the context of the Commission's environmental baseline (i.e., current conditions) for evaluating project effects during a relicensing proceeding and does not relate to the eventual proposed action, which is relicensing an existing hydroelectric project.[19] The images of the project area that Ms. Matthews identifies were all taken prior to the construction and operation of the Harris Project. Analysis of these images would not be helpful in evaluating project-related erosion.

The flood analysis component of the Operating Curve Change Feasibility Analysis is intended to assess the effects of a large-scale flood, which could address some of the existing stormwater runoff and erosion issues that Mr. Denman identifies in his proposed study. The Downstream Release Alternatives Study calls for Alabama Power to model potential changes in operational flow releases. Modeling these potential operational scenarios will support an analysis of flow effects downstream of Harris Dam under a range of scenarios more effectively than additional modeling of smaller floods. The 100-year flood serves as a representative large flood for risk assessment and planning purposes. Therefore, modeling the 100-year flood scenario is sufficient.

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[18] *See* Alabama Power August 4, 2020 Memo.

[19] *Am. Rivers v. FERC*, 187 F.3d 1007, *amended by and denying reh'g*, 201 F.3d 1186 (9th Cir. 1999); *Conservation Law Found. v. FERC*, 216 F.3d 41 (D. C. Cir. 2000).

The data collected as part of the approved studies, including the Downstream Release Alternatives Study, Erosion and Sedimentation Study, Aquatic Resource Study, and Downstream Aquatic Habitat Study, include much of the information that Mr. Denman and Ms. Matthews request with regard to current conditions. The results of Phase 2 of the Downstream Release Alternatives Study that is being conducted currently (during the second study season, April 2020 through April 2021) will also provide information responsive to most of Mr. Denman and Ms. Mathews' requests. The information gained through the approved studies should be adequate to assess the effects of project operation on downstream resources, including erosion and sedimentation and related invasive species effects, fisheries, water quality and use, terrestrial resources, recreation, and cultural resources. Therefore, we do not recommend that Alabama Power conduct Mr. Denman's or Ms. Matthews' requested new studies.

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Determination on Study Modifications

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<mcoker@southernco.com>; mcw0061@aces.edu <mcw0061@aces.edu>; mdollar48@gmail.com
<mdollar48@gmail.com>; meredith.h.ladart@usace.army.mil <meredith.h.ladart@usace.army.mil>;
mhpwedowee@gmail.com <mhpwedowee@gmail.com>; mhunter@alabamarivers.org
<mhunter@alabamarivers.org>; michael.w.creswell@usace.army.mil <michael.w.creswell@usace.army.mil>;
midwaytreasures@bellsouth.net <midwaytreasures@bellsouth.net>; mike.holley@dcnr.alabama.gov
<mike.holley@dcnr.alabama.gov>; mitchell.reid@tnc.org <mitchell.reid@tnc.org>; mlen@adem.alabama.gov

<mlen@adem.alabama.gov>; mnedd@blm.gov <mnedd@blm.gov>; monte.terhaar@ferc.gov <monte.terhaar@ferc.gov>; mooretn@auburn.edu <mooretn@auburn.edu>; mprandolphwater@gmail.com <mprandolphwater@gmail.com>; nancyburnes@centurylink.net <nancyburnes@centurylink.net>; nanferebee@juno.com <nanferebee@juno.com>; nathan.aycock@dcnr.alabama.gov <nathan.aycock@dcnr.alabama.gov>; orr.chauncey@epa.gov <orr.chauncey@epa.gov>; pace.wilber@noaa.gov <pace.wilber@noaa.gov>; partnersinfo@wwfus.org <partnersinfo@wwfus.org>; patti.powell@dcnr.alabama.gov <patti.powell@dcnr.alabama.gov>; patty@ten-o.com <patty@ten-o.com>; paul.trudine@gmail.com <paul.trudine@gmail.com>; ptrammell@reddyice.com <ptrammell@reddyice.com>; publicaffairs@doc.gov <publicaffairs@doc.gov>; rachel.mcnamara@ferc.gov <rachel.mcnamara@ferc.gov>; raebutler@mcn-nsn.gov <raebutler@mcn-nsn.gov>; rancococ@teleclipse.net <rancococ@teleclipse.net>; randall.b.harvey@usace.army.mil <randall.b.harvey@usace.army.mil>; randy@randyrogerslaw.com <randy@randyrogerslaw.com>; randy@wedoweemarine.com <randy@wedoweemarine.com>; rbmorris222@gmail.com <rbmorris222@gmail.com>; rcodydeal@hotmail.com <rcodydeal@hotmail.com>; reuteem@auburn.edu <reuteem@auburn.edu>; richardburnes3@gmail.com <richardburnes3@gmail.com>; rick.oates@forestry.alabama.gov <rick.oates@forestry.alabama.gov>; rickmcwhorter723@icloud.com <rickmcwhorter723@icloud.com>; rifraft2@aol.com <rifraft2@aol.com>; rjdavis8346@gmail.com <rjdavis8346@gmail.com>; robert.a.allen@usace.army.mil <robert.a.allen@usace.army.mil>; robinwaldrep@yahoo.com <robinwaldrep@yahoo.com>; roger.mcneil@noaa.gov <roger.mcneil@noaa.gov>; ron@lakewedowee.org <ron@lakewedowee.org>; rosoweka@mcn-nsn.gov <rosoweka@mcn-nsn.gov>; russtown@nc-cherokee.com <russtown@nc-cherokee.com>; ryan.prince@forestry.alabama.gov <ryan.prince@forestry.alabama.gov>; sabrinawood@live.com <sabrinawood@live.com>; sandnfrench@gmail.com <sandnfrench@gmail.com>; sarah.salazar@ferc.gov <sarah.salazar@ferc.gov>; sbryan@pci-nsn.gov <sbryan@pci-nsn.gov>; scsmith@southernco.com <scsmith@southernco.com>; section106@mcn-nsn.gov <section106@mcn-nsn.gov>; sforehand@russelllands.com <sforehand@russelllands.com>; sgraham@southernco.com <sgraham@southernco.com>; sherry.bradley@adph.state.al.us <sherry.bradley@adph.state.al.us>; sidney.hare@gmail.com <sidney.hare@gmail.com>; simsthe@aces.edu <simsthe@aces.edu>; snelson@nelsonandco.com <snelson@nelsonandco.com>; sonjahollomon@gmail.com <sonjahollomon@gmail.com>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; stewartjack12@bellsouth.net <stewartjack12@bellsouth.net>; straylor426@bellsouth.net <straylor426@bellsouth.net>; sueagnew52@yahoo.com <sueagnew52@yahoo.com>; tdadunaway@gmail.com <tdadunaway@gmail.com>; thpo@pci-nsn.gov <thpo@pci-nsn.gov>; thpo@tttown.org <thpo@tttown.org>; timguffey@jcch.net <timguffey@jcch.net>; tlamberth@russelllands.com <tlamberth@russelllands.com>; tlmills@southernco.com <tlmills@southernco.com>; todd.fobian@dcnr.alabama.gov <todd.fobian@dcnr.alabama.gov>; tom.diggs@ung.edu <tom.diggs@ung.edu>; tom.lettieri47@gmail.com <tom.lettieri47@gmail.com>; tom.littlepage@adeca.alabama.gov <tom.littlepage@adeca.alabama.gov>; tpfreema@southernco.com <tpfreema@southernco.com>; trayjim@bellsouth.net <trayjim@bellsouth.net>; triciastearns@gmail.com <triciastearns@gmail.com>; twstjohn@southernco.com <twstjohn@southernco.com>; variscom506@gmail.com <variscom506@gmail.com>; walker.mary@epa.gov <walker.mary@epa.gov>; william.puckett@swcc.alabama.gov <william.puckett@swcc.alabama.gov>; wmcampbell218@gmail.com <wmcampbell218@gmail.com>; wrighr2@aces.edu <wrighr2@aces.edu>; wsgardne@southernco.com <wsgardne@southernco.com>; wtanders@southernco.com <wtanders@southernco.com>

Harris relicensing stakeholders,

Yesterday FERC issue a determination on study modifications for the Harris Project. It can be found on FERC elibrary and on the Harris relicensing website (www.harrisrelicensing.com) in the Relicensing Documents folder.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

FEDERAL ENERGY REGULATORY COMMISSION
MEMORANDUM

DATE: October 19, 2020

FROM: Sarah Salazar, Environmental Biologist
Division of Hydropower Licensing
Office of Energy Projects

TO: Public Files for the R.L. Harris Hydroelectric Project (Harris Project)
(FERC Project No. 2628-065)

SUBJECT: Email communication with the Alabama Rivers Alliance regarding battery storage feasibility studies conducted during FERC relicensings.

On October 14, 2020, Jack West (Alabama Rivers Alliance) emailed Commission staff to inquire about battery storage feasibility studies conducted during FERC relicensings other than the study being conducted in the Harris Project relicensing proceeding. Commission staff responded on October 15, 2020.

A copy of the email correspondence is attached.

From: Sarah Salazar
To: Jack West
Subject: RE: FERC Relicensing Battery Storage Feasibility Studies
Date: Thursday, October 15, 2020 3:58:03 PM

Hi Jack,

We are not aware of other FERC relicensings that have included battery storage feasibility studies, but there are projects such as the Ripogenus (FERC No. 2572) and Penobscot Mills (FERC No. 2458) where battery storage was proposed/installed by the licensees of those projects outside of relicensing.

Best,

Sarah Salazar

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863* ***Please consider the environment before printing this email.***

From: Jack West <jwest@alabamarivers.org>
Sent: Wednesday, October 14, 2020 5:54 PM
To: Sarah Salazar <Sarah.Salazar@ferc.gov>
Subject: Re: FERC Relicensing Battery Storage Feasibility Studies

Sarah,

Thank you for the reply and for looking into this. No rush at all. The eLibrary does seem to be greatly improved! Thanks for the link to the user guide.

Have a good evening,

On Wed, Oct 14, 2020 at 3:52 PM Sarah Salazar <Sarah.Salazar@ferc.gov> wrote:

> Hi Jack,
>
> Thanks for the well wishes. I hope you are able to stay healthy and safe as well. I'm checking with the licensing team members who reviewed this topic for us and will get back to you as soon as I can, hopefully by the end of the week.
>
> Note—FERC has a revamped version of e-library now and there are some new (hopefully improved) search methods. The following webpage has some tips on Keyword Searches in case it helps you: https://www.ferc.gov/ferc-online/elibrary/elibrary-search-tips. There is a link to an elibrary quick user guide on that page too. If you run into any apparent IT glitches I can ask our FERCOnline staff to look into it.
>
> Thanks in advance for your patience,
>
> Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863* ***Please consider the environment before printing this email.***

From: Jack West <jwest@alabamarivers.org>
Sent: Wednesday, October 14, 2020 3:46 PM
To: Sarah Salazar <Sarah.Salazar@ferc.gov>
Subject: FERC Relicensing Battery Storage Feasibility Studies

Hi Sarah,

I hope you are staying healthy and safe. I'm writing with a general question about studies conducted pursuant to FERC relicensings. Do you or your colleagues know of any FERC relicensings that have included battery storage feasibility studies?

I've spent some time searching FERC's eLibrary on this topic but have not been able to find any such studies occurring in other relicensings. If there is someone else at FERC I should direct this question to, please let me know.

Thank you,

--
Jack West, Esq.
Policy and Advocacy Director
Alabama Rivers Alliance
2014 6th Ave N, Suite 200
Birmingham, AL 35203
205-322-6395
www.alabamarivers.org

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

--
Jack West, Esq.
Policy and Advocacy Director
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2014 6th Ave N, Suite 200
Birmingham, AL 35203
205-322-6395
www.alabamarivers.org

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

Document Content(s)

From: Anderegg, Angela Segars
Sent: Friday, October 23, 2020 4:01 PM
To: Jack West
Cc: Chandler, Keith Edward
Subject: Re: Notice of Opportunity for Technical Assistance to Support Hydropower Decision Making

Thanks for passing this along.

Have a great weekend,

Angie

Get Outlook for iOS

From: Jack West <jwest@alabamarivers.org>
Sent: Thursday, October 22, 2020 3:14:01 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>; Chandler, Keith Edward <KECHANDL@SOUTHERNCO.COM>
Subject: Fwd: Notice of Opportunity for Technical Assistance to Support Hydropower Decision Making

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie and Keith,

You may have seen this already, but I wanted to forward you this notice I got from DOE the other week. There is an opportunity for technical assistance to support hydropower decision-making for utilities, and one of the topic areas listed is Optimization of Hybrid Hydropower and Storage Systems. I'm not sure what all the application entails, but it may be useful to you as the battery storage study progresses, so I thought I would share.

Best,

---------- Forwarded message ---------
From: **DOE Office of Energy Efficiency and Renewable Energy** <eere@service.govdelivery.com>
Date: Tue, Oct 13, 2020 at 2:11 PM
Subject: Notice of Opportunity for Technical Assistance to Support Hydropower Decision Making
To: <jwest@alabamarivers.org>

SHARE [lnks.gd]

Having trouble viewing this email? View it as a Web page [lnks.gd].

ENERGY.GOV
Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY [lnks.gd]

Water Power Technologies Office [lnks.gd]

October 13, 2020

U.S. Department of Energy Announces Notice of Opportunity for Technical Assistance to Support Hydropower Decision Making [lnks.gd]

Today, the U.S. Department of Energy's Water Power Technologies Office (WPTO) announced a Notice of Opportunity for Technical Assistance (NOTA) [lnks.gd] for Improving Hydropower's Value Through Informed Decision-Making. Part of WPTO's HydroWIRES (Water Innovation for a Resilient Electricity System) Initiative [lnks.gd], this opportunity will provide hydropower decision makers—such as utilities and system operators—with National Lab expertise and capabilities to address current challenges and capture new opportunities for their systems.

[lnks.gd]

Topic areas for technical assistance include:

- Participation in Energy Imbalance Markets
- Value of Inflow Forecasting Tools and Practices
- Hydropower in Integrated Resource Planning
- Optimization of Hybrid Hydropower and Storage Systems
- Open Topic.

Interested applicants must submit initial concept papers by **December 18, 2020**. Full applications will be due **January 29, 2021**. A live webinar [lnks.gd] is scheduled for November 4, 2020, at 2:00 p.m. ET to provide information on the FOA to potential applicants.

More information about the NOTA can be found in the EERE announcement [lnks.gd].

To learn more about WPTO and the HydroWIRES Initiative, visit the WPTO website [lnks.gd].

DOE Facebook [lnks.gd]

DOE Twitter [lnks.gd]

EERE Facebook [lnks.gd]

EERE Twitter [lnks.gd]

Energy Saver Facebook [lnks.gd]

Daniel R Simmons' Twitter [lnks.gd]

DOE YouTube [lnks.gd]

DOE LinkedIn [lnks.gd]

EERE LinkedIn [lnks.gd]

--

Jack West, Esq.
Policy and Advocacy Director
Alabama Rivers Alliance
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www.alabamarivers.org [alabamarivers.org]

600 North 18th Street
Hydro Services 16N-8180
Birmingham, AL 35203
205 257 2251 tel
arsegars@southernco.com

October 30, 2020

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Progress Update

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street N.
Washington, DC 20426

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628). On March 13, 2019[1], Alabama Power filed 10 study plans for FERC approval as part of the Integrated Licensing Process (ILP) for the Harris Project. On April 12, 2019[2], FERC approved Alabama Power's study plans with FERC modifications. Alabama Power filed the Final Study Plans with FERC on May 13, 2019[3] and posted the Final Study Plans to the Harris Project relicensing website at www.harrisrelicensing.com. Alabama Power filed the Initial Study Report along with six Draft Study Reports and two cultural resources documents on April 10, 2020[4].

As part of the May 13, 2019 filing, Alabama Power recognized the complexity of tracking the 10 relicensing studies and committed to filing a voluntary Progress Update with FERC in October 2019 and October 2020. Alabama Power filed the 2019 Progress Update on October 30, 2019[5]. The purpose of this Progress Update (Attachment A) is to ensure that stakeholders and FERC can review the study progress to date and plan for future reports, meetings, and overall relicensing activities. This is a voluntary action that is not required under the ILP. A summary of the Harris Project relicensing activities for the six established Harris Action Teams (HAT) and their associated studies from April 10, 2020 to date is outlined in the Progress Update. Alabama Power will post this 2020 Progress Update to the Harris Project relicensing website. The current HAT distribution lists are included as Attachment B.

---

[1] Accession No. 20190313-5060
[2] Accession No. 20190412-3000
[3] Accession No. 20190513-5093
[4] Accession No. 20200410-5084
[5] Accession No. 20191030-5053

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg
Harris Relicensing Project Manager

Attachments (2)

cc: Harris Stakeholder List

Attachment A
October 2020 Harris Project Progress Update

Harris Progress Update Report

R.L. Harris Hydroelectric Project

FERC No. 2628

Prepared for:

Alabama Power Company

Prepared by:

Kleinschmidt Associates

October 2020

TABLE OF CONTENTS

1.0 INTRODUCTION

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628). On June 1, 2018, Alabama Power filed a Pre-Application Document and began the Integrated Licensing Process (ILP) for the Harris Project[1].

On November 13, 2018, Alabama Power filed ten proposed study plans for the Harris Project. FERC issued a Study Plan Determination on April 12, 2019, which included FERC staff recommendations. Alabama Power incorporated FERC's recommendations and filed the Final Study Plans with FERC on May 13, 2019[2]. Based upon FERC's prior comments and as part of the Final Study Plans, Alabama Power incorporated within each study plan's schedule a milestone to file a voluntary Progress Update in October 2019 and October 2020. This Progress Update is designed to inform stakeholders and FERC of the study progress, future reports, Harris Action Team (HAT) meetings, and overall relicensing activities.

Three activities apply to all the HATs that are described here: the Initial Study Report (ISR), ISR Meeting, and the ISR Meeting Summary. On April 10, 2020, Alabama Power filed the ISR[3] along with six Draft Study Reports and two cultural resources documents. Alabama Power held an ISR Meeting with stakeholders and FERC on April 28, 2020 and filed the ISR Meeting Summary on May 12, 2020[4]. Comments on the ISR and ISR Meeting Summary were due June 11, 2020. On July 10, 2020, Alabama Power filed its response to questions/comments on the ISR and additional studies/study modifications for the Harris Project.[5]

On August 10, 2020, FERC sent a letter to Alabama Power discussing the Determination on Requests for Study Modifications for the R.L. Harris Hydroelectric Project[6]. In that letter, FERC recommended that Alabama Power conduct a new study titled Battery Energy Storage System (BESS). FERC recommended that the BESS study be conducted with the

[1] Accession No. 20180601-5125
[2] Accession No. 20190513-5093
[3] Accession No. 20200410-5084
[4] Accession No. 20200512-5083
[5] Accession No. 20200710-5122
[6] Accession No. 20200810-3007

Downstream Release Alternative Study and include at least two new release alternatives: (a) a 50 percent reduction in peak releases associated with installing one 60 MW battery unit, and (b) a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e., 5, 10 or 20 MW battery). FERC further recommended that Alabama Power include in its cost estimates for installing a BESS, any specific structural changes, any changes in turbine-generator units, and costs needed to implement each battery storage type. Finally, FERC recommended that, consistent with the Downstream Release Alternative Study Plan, Alabama Power evaluate how each of the release alternatives (i.e., items (a) and (b) above) would affect recreation and aquatic resources in the Harris Project reservoir and downstream. Alabama Power is conducting the BESS study as recommended by FERC and will prepare and file a BESS report in first quarter 2021.

Sections 2-7 of this Progress Report summarize the relicensing activities of the six established HATs from the ISR filing to date.

2.0 HAT 1 – PROJECT OPERATIONS

2.1 DOWNSTREAM RELEASE ALTERNATIVES STUDY PLAN

- Alabama Power downloaded the lever logger data and incorporated these data into the HEC-RAS (Hydrologic Engineering Center's River Analysis System) model.
- Alabama Power filed the Draft *Downstream Release Alternatives Phase 1 Report* on April 10, 2020[7] with comments due June 11, 2020. This report was also distributed to the HAT 1 (Project Operations) participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power filed the Final *Downstream Release Alternatives Phase 1 Report* on July 27, 2020[8]. This report was also distributed to the HAT 1 participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- As noted in the Alabama Power Response to ISR Disputes or Requests for Modifications of Study Plan filed on July 10, 2020 and recommended in FERC's August 10, 2020 Determination on Study Modifications, Alabama Power is analyzing additional downstream releases and using qualitative and quantitative data to identify potential resource impacts from changes in the downstream releases. Alabama Power will present this information in the Phase 2 Report. The Draft Phase 2 report will be filed on or before April 12, 2021.

2.2 OPERATING CURVE CHANGE FEASIBILITY ANALYSIS STUDY PLAN

- Alabama Power filed the Draft *Operating Curve Change Feasibility Analysis Phase 1 Report* on April 10, 2020[9] with comments due June 11, 2020. This report was also distributed to the HAT 1 (Project Operations) participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power hosted a HAT 1 meeting on June 4, 2020, to present the methodologies for analyzing how structures on Lake Harris and downstream

[7] Accession No. 20200410-5069
[8] Accession No. 20200727-5088
[9] Accession No. 20200410-5086

of Harris Dam might be affected by the proposed winter operating curve alternatives and posted the meeting summary on the Harris Relicensing website at www.harrisrelicensing.com.

- Alabama Power filed the Final *Operating Curve Change Feasibility Analysis Phase 1 Report* on August 31, 2020[10]. This report was also distributed to the HAT 1 participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power is analyzing qualitative and quantitative data in Phase 2 to identify potential resource impacts from a change in the operating curve. The Draft Phase 2 report will be filed on or before April 12, 2021.

[10] Accession No. 20200831-5339

3.0 HAT 2 – WATER QUALITY AND USE

3.1 EROSION AND SEDIMENTATION STUDY PLAN

- Alabama Power distributed the Draft *Erosion and Sedimentation Study Report* to HAT 2 (Water Quality and Use) participants for review on March 18, 2020. Alabama Power provided this report to HAT 2 participants prior to the official ISR comment period to allow additional time for review.
- Alabama Power filed the Draft *Erosion and Sedimentation Study Report* on April 10, 2020[11] with comments due June 11, 2020. This report was also distributed to the HAT 2 participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power posted the videos associated with the *Tallapoosa River High Definition Stream Survey Final Report* on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power facilitated obtaining from a stakeholder copies of various images of the Tallapoosa River pre-Harris Dam and post-construction. Alabama Power filed these images as Consultation Regarding Historic Photographs of the Tallapoosa River with FERC on August 4, 2020[12]. These photos were also posted to the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power performed additional reconnaissance at identified sedimentation sites on Lake Harris during full (summer) pool conditions to determine if any nuisance aquatic vegetation is present and will provide the results of that assessment to HAT 2 participants in the form of a technical memorandum on or before April 12, 2021.
- Alabama Power will file the Final *Erosion and Sedimentation Study Report* on or before April 12, 2021.

[11] Accession No. 20200410-5091
[12] Accession No. 20200804-5252

3.2 WATER QUALITY STUDY PLAN

- Alabama Power distributed the *Draft Water Quality Study Report* to HAT 2 participants for review on March 11, 2020. Alabama Power provided this report to HAT 2 participants prior to the official ISR comment period to allow additional time for review.
- Alabama Power filed the *Draft Water Quality Study Report* on April 10, 2020[13] with comments due June 11, 2020. This report was also distributed to the HAT 2 participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- As filed in the Response to ISR Disputes or Requests for Modifications of Study Plan on July 10, 2020, Alabama Power is collecting additional water quality data in 2020 and 2021 as requested by Alabama Rivers Alliance and other stakeholders.
- To collect dissolved oxygen and water temperature data in 2020, Alabama Power installed the continuous monitor on May 4, 2020, following the ISR meeting. The generation monitor was installed on June 1, 2020, to align with the monitoring season start date in the Water Quality Study Plan.
- Alabama Power will collect water quality data at both locations in 2021 (from March 1 – June 30, 2021 at the continuous monitor and June 1 – June 30, 2021 at the generation monitor) to include in the Final License Application (FLA).
- Alabama Power will file the Final *Water Quality Study Report* on or before April 12, 2021.

[13] Accession No. 20200410-5095

4.0 HAT 3 – FISH AND WILDLIFE

4.1 AQUATIC RESOURCES STUDY PLAN

- Alabama Power hosted a HAT 3 (Fish and Wildlife) meeting on June 2, 2020. Auburn University presented its research to date and informed meeting participants of remaining work on the Aquatic Resources Study. Alabama Power posted the June 2, 2020 HAT 3 meeting summary on the Harris Relicensing website at www.harrisrelicensing.com.
- Auburn has conducted fish sampling in May, July, and September 2020 and will also sample in November 2020.
- Auburn deployed eight acoustic receivers from Harris Dam to Malone to detect overall fish movement and responses and two acoustic receivers at Wadley. Auburn tagged 13 Alabama Bass and 3 Tallapoosa Bass and has also performed manual tracking of these fish. Results of this tagging will be compiled and presented in Auburn's report in 2021.
- Auburn continues to perform static and swimming respirometry testing of target fish species.
- Auburn continues to analyze temperature data and work on the bioenergetics modeling protocols.
- Alabama Power filed the Draft *Aquatic Resources Report* on July 28, 2020[14] with comments due August 28, 2020. This report was also distributed to the HAT 3 participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power will host a HAT 3 meeting on November 5, 2020; a meeting agenda was provided to HAT 3 participants on October 16, 2020.
- Alabama Power will file the Final *Aquatic Resources Report* on or before April 12, 2021.

[14] Accession No. 20200728-5120

4.2 Downstream Aquatic Habitat Study Plan

- Alabama Power filed the Draft *Downstream Aquatic Habitat Study Report* on June 30, 2020[15] with comments due August 1, 2020. This report was also distributed to the HAT 3 participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power will host a HAT 3 meeting on November 5, 2020; a meeting agenda was provided to HAT 3 participants on October 16, 2020.
- Alabama Power will file the Final *Downstream Aquatic Habitat Report*, including all Geographic Information System (GIS) Shapefiles and HEC-RAS model outputs on or before April 12, 2021.

4.3 Threatened And Endangered (T&E) Species Study Plan

- Alabama Power filed the Draft *Threatened and Endangered Species Desktop Assessment* on April 10, 2020[16] with comments due June 11, 2020. This report was also distributed to the HAT 3 participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- In accordance with FERC's Determination on Requests for Study Modifications for the R.L. Harris Hydroelectric Project, Alabama Power conducted additional field surveys for Threatened & Endangered species and/or their potentially suitable habitat based on ongoing consultation with the United States Fish and Wildlife Service (USFWS), Alabama Department of Conservation and Natural Resources (ADCNR), and Alabama Natural Heritage Program.
- Alabama Power will host a HAT 3 meeting on November 5, 2020; a meeting agenda was provided to HAT 3 participants on October 16, 2020.

  Alabama Power will provide documentation of consultation in the Final *Threatened and Endangered Species Report*, which will be filed in January 2021.

[15] Accession No. 20200630-5200
[16] Accession No. 20200410-5094

5.0 HAT 4 – PROJECT LANDS

5.1 PROJECT LANDS EVALUATION STUDY PLAN

- Alabama Power filed the Draft *Phase 1 Project Lands Evaluation Study Report* on April 10, 2020[17] with comments due June 11, 2020. This report was also distributed to the HAT 4 (Project Lands) participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power filed the Final *Phase 1 Project Lands Evaluation Study Report* on October 2, 2020[18]. This report was also distributed to the HAT 3 participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- Spring and summer fieldwork at the Flat Rock botanical area was completed, and researchers are planning one additional site visit to document any remaining plant species that bloom in late autumn. To date, 403 species have been documented from the Flat Rock botanical area. Researchers will submit a draft report in December 2020 on the additional research at the Flat Rock Botanical area, and a final report in Q1 2021; this report will be included in the Updated Study Report.
- On October 5, 2020, Alabama Power distributed the Final *Project Lands Evaluation Study Report* as well as a Draft Shoreline Management Plan (SMP) and Draft Wildlife Management Plan (WMP) Annotated Outline to HAT 4 for review and comment.
- Alabama Power held a HAT 4 meeting on October 19, 2020 to review and discuss the Draft SMP and WMP outline. A meeting summary was distributed to HAT 4 participants and posted on the Harris relicensing website at www.harrisrelicensing.com.
- Phase 2 of the Project Lands Evaluation Study will use the Phase 1 evaluation information, as well as results from other studies, to develop a WMP and a SMP, and draft versions of both plans will be filed with the FLA.

[17] Accession No. 20200410-5092
[18] Accession No. 20201002-5139

6.0 HAT 5 – RECREATION

6.1 RECREATION EVALUATION STUDY PLAN

- In the April 10, 2020 ISR, Alabama Power noted a variance in the Recreation Evaluation Study Plan due to the additional study elements and an extended deadline for landowners and the public to participate in the recreation surveys. Alabama Power noted a variance for filing the Draft *Recreation Evaluation Study Report* in August 2020 rather than in April 2020. FERC concurred with this variance on August 10, 2020.
- Alabama Power held a HAT 5 (Recreation) meeting on June 4, 2020 to present the methodologies for analyzing how structures on Lake Harris might be affected by the proposed winter operating curve alternatives and posted the HAT 5 meeting summary on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power filed the Draft *Recreation Evaluation Study Report* on August 24, 2020[19] with comments due September 30, 2020. This report was also distributed to the HAT 5 participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power hosted a HAT 5 meeting on October 19, 2020 to present the methodology for analyzing boatable flows in the Tallapoosa River and present initial recreation protection, mitigation and enhancement measures and posted the meeting summary on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power will file the Final *Recreation Evaluation Study Report* in November 2020.

[19] Accession No. 20200824-5241

7.0 HAT 6 – CULTURAL RESOURCES

7.1 CULTURAL RESOURCES PROGRAMMATIC AGREEMENT AND HISTORIC PROPERTIES MANAGEMENT PLAN STUDY PLAN

- Alabama Power filed the Inadvertent Discovery Plan (IDP) and Traditional Cultural Properties (TCP) Identification Plan on April 10, 2020[20] with comments due June 11, 2020. These documents were also distributed to the HAT 6 (Cultural Resources) participants and posted on the Harris Relicensing website at www.harrisrelicensing.com.
- In the April 10, 2020 ISR, Alabama Power noted a variance in the Cultural Resources Programmatic Agreement and Historic Properties Management Plan Study Plan to finalize and file the Area of Potential Effects (APE) and associated consultation by June 30, 2020 (revised from April 2020).
- Alabama Power distributed the Draft *Harris Project Area of Potential Effects Report* to HAT 6 on May 15, 2020 and posted the report on the Harris Relicensing website at www.harrisrelicensing.com.
- Alabama Power held a HAT 6 meeting on May 28, 2020, to discuss the Draft *Harris Project Area of Potential Effects Report* and review the status of the cultural resources surveys. Stakeholders comments were due June 15, 2020.
- Alabama Power posted a public version of the May 28, 2020 HAT 6 meeting summary on the Harris Relicensing website at www.harrisrelicensing.com; however, due to the privileged information discussed in the meeting, distribution of some of the meeting materials were limited.
- On June 18, 2020, the Alabama State Historic Preservation Office (SHPO) concurred with the Harris Project APE as defined by Alabama Power.
- Alabama Power filed the Final *Harris Project Area of Potential Effects Report* on June 29, 2020[21].
- On August 11, 2020, FERC found Alabama Power's proposed APE for the Harris Project appropriate[22].

[20] Accession Nos. 20200410-5067, 20200410-5068
[21] Accession No. 20200629-5328
[22] Accession No. 20200811-3007

- Alabama Power and the Office of Archeological Research (OAR) completed approximately 80 percent of all of the preliminary archeological assessments (96 sites) around Lake Harris. The remaining 20 percent will be completed as the water level of Lake Harris lowers in the winter months of 2020-2021 and the necessary shoreline is accessible.
- Alabama Power and OAR completed cultural resources assessments at Skyline (30 sites). In addition, OAR finished approximately 90 percent of the cave art survey sample in Skyline (14 caves were investigated, and OAR will reevaluate 3 cave sites).
- Alabama Power and OAR continue TCP consultation with the Muscogee (Creek) Nation. To date, there have been seven discussions.

  OAR identified known cultural resources sites in the Tallapoosa River downstream of Harris Dam. Alabama Power and OAR are evaluating effects on cultural resources due to any changes in Harris Project operations.

Attachment B
Harris Action Team Distribution Lists

HAT 1 – Project Operations

Full Name	Company
Damon Abernethy	Alabama Department of Conservation and Natural Resources
Bob Allen	U.S. Army Corps of Engineers
Brian Atkins	Alabama Department of Economic and Community Affairs
Nathan Aycock	Alabama Department of Conservation and Natural Resources
Richard Bronson	Stakeholder
Steve Bryant	Alabama Department of Conservation and Natural Resources
Nancy Burnes	Lake Wedowee Property Owners Association
Richard Burnes	Property Owner
Matt and Ann Campbell	Stakeholder
Kristie Coffman	Auburn University
Allan Creamer	Federal Energy Regulatory Commission
Doug & Jan Crisp	Stakeholder
Robin Crockett	Stakeholder
Gene Crouch	Keller Williams Realty Group; Lake Wedowee
Jesse Cunningham	Lake Martin HOBO
Dennis Devries	Auburn University
Mike Dollar	Lake Martin HOBO
Jeff Duncan	U.S. National Park Service
Albert Eiland	Property Owner
Todd Fobian	Alabama Department of Conservation and Natural Resources
Steve Forehand	Lake Martin Resource Association
Sylvia French	Lake Wedowee Property Owners Association
Tom Garland	Lake Wedowee Property Owners Association
Lisa Perras Gordon	U.S. Environmental Protection Agency
Chris Greene	Alabama Department of Conservation and Natural Resources
Jennifer Grunewald	U.S. Fish and Wildlife
Andrew Hall	Property Owner
Randall Harvey	U.S. Army Corps of Engineers
Jennifer Haslbauer	Alabama Department of Environmental Management
James Hathorn	U.S. Army Corps of Engineers
Dave Heinzen	Lake Martin HOBO
Keith Henderson	Alabama Department of Conservation and Natural Resources
Mike Holley	Alabama Department of Conservation and Natural Resources
Dan Holliman	U.S. Environmental Protection Agency
Sonja Hollomon	Stakeholder
Martha Hunter	Alabama Rivers Alliance
Elise Irwin	Auburn University
Butch Jackson	Stakeholder

Full Name	Company
Gerrit Jobsis	American Rivers
Chris Johnson	Alabama Department of Environmental Management
Evan Lawrence	Alabama Department of Conservation and Natural Resources
Michael Len	Alabama Department of Environmental Management
Fred Leslie	Alabama Department of Environmental Management
Tom Littlepage	Alabama Department of Economic and Community Affairs
Cindy Lowry	Alabama Rivers Alliance
Matthew Marshall	Alabama Department of Conservation and Natural Resources
Donna Matthews	Stakeholder
Lydia Mayo	U.S. Environmental Protection Agency
Rachel McNamara	Federal Energy Regulatory Commission
David Moore	Alabama Department of Environmental Management
Barry Morris	Lake Wedowee Property Owners Association
Ginny Oxford	Stakeholder
Erin Padgett	U.S. Fish and Wildlife
Mellie Parrish	Stakeholder
Ira Parsons	Lake Wedowee Property Owners Association
Jeff Powell	U.S. Fish and Wildlife
Becky Rainwater	ReMax Lakefront
Mitch Reid	Nature Conservancy
Sarah Salazar	Federal Energy Regulatory Commission
Jerrel Shell	Stakeholder
Barry Smith	Stakeholder
David Smith	Stakeholder
Paul Smith	Stakeholder
Linda Stone	Stakeholder
Chuck Sumner	U.S. Army Corps of Engineers
Monte Terhaar	Federal Energy Regulatory Commission
David Thomas	Stakeholder
David Thompson	Property Owner
John Thompson	Lake Martin Resource Association
George Traylor	Property Owner
Jimmy Traylor	Stakeholder
Steve Traylor	Stakeholder
Jack West	Alabama Rivers Alliance
Jonas White	U.S. Army Corps of Engineers
Russell Wright	Auburn University

HAT 2 – Water Quality and Use

Full Name	Company
Damon Abernethy	Alabama Department of Conservation and Natural Resources
Nathan Aycock	Alabama Department of Conservation and Natural Resources
Steve Bryant	Alabama Department of Conservation and Natural Resources
Nancy Burnes	Lake Wedowee Property Owners Association
Richard Burnes	Property Owner
Matt and Ann Campbell	Stakeholder
Maria Clark	U.S. Environmental Protection Agency
Kristie Coffman	Auburn University
Allan Creamer	Federal Energy Regulatory Commission
Jan and Doug Crisp	Stakeholder
Robin Crockett	Stakeholder
Jesse Cunningham	Lake Martin HOBO
Chris Decker	U.S. Environmental Protection Agency
Chuck Denman	Stakeholder
Jeff Duncan	U.S. National Park Service
Albert Eiland	Property Owner
Todd Fobian	Alabama Department of Conservation and Natural Resources
Steve Forehand	Lake Martin Resource Association
Tom Garland	Lake Wedowee Property Owners Association
Lisa Perras Gordon	U.S. Environmental Protection Agency
Chris Greene	Alabama Department of Conservation and Natural Resources
Evelyn Hammrick	Property Owner
Jennifer Haslbauer	Alabama Department of Environmental Management
Keith Henderson	Alabama Department of Conservation and Natural Resources
Mike Holley	Alabama Department of Conservation and Natural Resources
Dan Holliman	U.S. Environmental Protection Agency
Martha Hunter	Alabama Rivers Alliance
Elise Irwin	Auburn University
Gerrit Jobsis	American Rivers
Chris Johnson	Alabama Department of Environmental Management
Carol Knight	Stakeholder
Michael Len	Alabama Department of Environmental Management
Fred Leslie	Alabama Department of Environmental Management
Cindy Lowry	Alabama Rivers Alliance
Matthew Marshall	Alabama Department of Conservation and Natural Resources
Donna Matthews	Stakeholder
Lydia Mayo	U.S. Environmental Protection Agency
Rachel McNamara	Federal Energy Regulatory Commission

Full Name	Company
Harry Merrill	Stakeholder
David Moore	Alabama Department of Environmental Management
Barry Morris	Lake Wedowee Property Owners Association
Mellie Parrish	Stakeholder
Jerry & Mary Lee Poss	Stakeholder
Mitch Reid	Nature Conservancy
Eric Reutebuch	Auburn University
Sarah Salazar	Federal Energy Regulatory Commission
Amy Silvano	Alabama Department of Conservation and Natural Resources
David Smith	Stakeholder
Monte Terhaar	Federal Energy Regulatory Commission
John Thompson	Lake Martin Resource Association
Jack West	Alabama Rivers Alliance

HAT 3 – Fish and Wildlife

Full Name	Company
Damon Abernethy	Alabama Department of Conservation and Natural Resources
Nathan Aycock	Alabama Department of Conservation and Natural Resources
Steve Bryant	Alabama Department of Conservation and Natural Resources
Matt and Ann Campbell	Stakeholder
Kristie Coffman	Auburn University
Evan Collins	U.S. Fish and Wildlife
Allan Creamer	Federal Energy Regulatory Commission
Robin Crockett	Stakeholder
Chris Decker	U.S. Environmental Protection Agency
Dennis Devries	Auburn University
Jeff Duncan	U.S. National Park Service
Todd Fobian	Alabama Department of Conservation and Natural Resources
Steve Forehand	Lake Martin Resource Association
Tom Garland	Lake Wedowee Property Owners Association
Chris Greene	Alabama Department of Conservation and Natural Resources
Jennifer Grunewald	U.S. Fish and Wildlife
Keith Henderson	Alabama Department of Conservation and Natural Resources
Mike Holley	Alabama Department of Conservation and Natural Resources
Dan Holliman	U.S. Environmental Protection Agency
Martha Hunter	Alabama Rivers Alliance
Elise Irwin	Auburn University
Gerrit Jobsis	American Rivers
Evan Lawrence	Alabama Department of Conservation and Natural Resources
Cindy Lowry	Alabama Rivers Alliance
Matthew Marshall	Alabama Department of Conservation and Natural Resources
Donna Matthews	Stakeholder
Lydia Mayo	U.S. Environmental Protection Agency
Rachel McNamara	Federal Energy Regulatory Commission
Barry Morris	Lake Wedowee Property Owners Association
Chris Oberholster	Birmingham Audubon
Erin Padgett	U.S. Fish and Wildlife
Mellie Parrish	Stakeholder
Bill Pearsons	U.S. Fish and Wildlife
Jeff Powell	U.S. Fish and Wildlife
Mitch Reid	Nature Conservancy
Sarah Salazar	Federal Energy Regulatory Commission
Amy Silvano	Alabama Department of Conservation and Natural Resources
Tricia Stearns	Stakeholder

Full Name	Company
Monte Terhaar	Federal Energy Regulatory Commission
Jimmy Traylor	Stakeholder
Steve Traylor	Stakeholder
Jack West	Alabama Rivers Alliance
Pace Wilber	National Oceanic and Atmospheric Administration
Ken Wills	Alabama Glade Conservation Coalition
Russell Wright	Auburn University

HAT 4 – Project Lands

Full Name	Company
Damon Abernethy	Alabama Department of Conservation and Natural Resources
Nathan Aycock	Alabama Department of Conservation and Natural Resources
Matt Brooks	Alabama Law Enforcement Agency
Coty Brown	Alabama Law Enforcement Agency
Steve Bryant	Alabama Department of Conservation and Natural Resources
Matt and Ann Campbell	Stakeholder
Kristie Coffman	Auburn University
Evan Collins	U.S. Fish and Wildlife
Allan Creamer	Federal Energy Regulatory Commission
Robin Crockett	Stakeholder
Gene Crouch	Keller Williams Realty Group; Lake Wedowee
Todd Fobian	Alabama Department of Conservation and Natural Resources
Steve Forehand	Lake Martin Resource Association
Tom Garland	Lake Wedowee Property Owners Association
Keith Gauldin	Alabama Department of Conservation and Natural Resources
Chris Greene	Alabama Department of Conservation and Natural Resources
Jennifer Grunewald	U.S. Fish and Wildlife
Keith Henderson	Alabama Department of Conservation and Natural Resources
Mike Holley	Alabama Department of Conservation and Natural Resources
Martha Hunter	Alabama Rivers Alliance
Elise Irwin	Auburn University
Gerrit Jobsis	American Rivers
Bruce Knapp	Stakeholder
Evan Lawrence	Alabama Department of Conservation and Natural Resources
Cindy Lowry	Alabama Rivers Alliance
Diane Lunsford	Lake Wedowee Property Owners Association
Matthew Marshall	Alabama Department of Conservation and Natural Resources
Donna Matthews	Stakeholder
Lydia Mayo	U.S. Environmental Protection Agency
Allison McCartney	U.S. Bureau of Land Management
Rachel McNamara	Federal Energy Regulatory Commission
Harry Merrill	Stakeholder
Brad Mitchell	Lake Wedowee Property Owners Association
Barry Morris	Lake Wedowee Property Owners Association
Stan Nelson	Nelson and Company
Chris Oberholster	Birmingham Audubon
Erin Padgett	U.S. Fish and Wildlife
Mellie Parrish	Stakeholder

Full Name	**Company**
Jerry & Mary Lee Poss	Stakeholder
Jeff Powell	U.S. Fish and Wildlife
Mark Prestridge	Randolph County Water Authority
Mitch Reid	Nature Conservancy
Sarah Salazar	Federal Energy Regulatory Commission
Amy Silvano	Alabama Department of Conservation and Natural Resources
Chris Smith	Alabama Department of Conservation and Natural Resources
David Smith	Stakeholder
Glenell Smith	Stakeholder
Paul Smith	Stakeholder
John Sullivan	U.S. Bureau of Land Management
Monte Terhaar	Federal Energy Regulatory Commission
John Thompson	Stakeholder
Jack West	Alabama Rivers Alliance
Ken Wills	Alabama Glade Conservation Coalition

HAT 5 – Recreation

Full Name	Company
Damon Abernethy	Alabama Department of Conservation and Natural Resources
Nathan Aycock	Alabama Department of Conservation and Natural Resources
Matt Brooks	Alabama Law Enforcement Agency
Coty Brown	Alabama Law Enforcement Agency
Matt and Ann Campbell	Stakeholder
Kristie Coffman	Auburn University
Allan Creamer	Federal Energy Regulatory Commission
Robin Crockett	Stakeholder
Jesse Cunningham	Lake Martin HOBO
Mike Dollar	Lake Martin HOBO
Jeff Duncan	U.S. National Park Service
Todd Fobian	Alabama Department of Conservation and Natural Resources
Steve Forehand	Lake Martin Resource Association
Sylvia French	Stakeholder
Tom Garland	Stakeholder
Keith Gauldin	Alabama Department of Conservation and Natural Resources
Chris Greene	Alabama Department of Conservation and Natural Resources
Dave Heinzen	Lake Martin HOBO
Keith Henderson	Alabama Department of Conservation and Natural Resources
Mike Holley	Alabama Department of Conservation and Natural Resources
Sonja Hollomon	Stakeholder
Kevin Hunt	Consultant
Martha Hunter	Alabama Rivers Alliance
Elise Irwin	Auburn University
Butch Jackson	Property Owner
Gerrit Jobsis	American Rivers
Gerry Knight	Stakeholder
Evan Lawrence	Alabama Department of Conservation and Natural Resources
Cindy Lowry	Alabama Rivers Alliance
Matthew Marshall	Alabama Department of Conservation and Natural Resources
Donna Matthews	Stakeholder
Lydia Mayo	U.S. Environmental Protection Agency
Rachel McNamara	Federal Energy Regulatory Commission
Harry Merrill	Stakeholder
Brad Mitchell	Lake Wedowee Property Owners Association
Barry Morris	Lake Wedowee Property Owners Association
Chris Oberholster	Birmingham Audubon
Ginny Oxford	Stakeholder

Full Name	Company
Mellie Parrish	Stakeholder
Ira Parsons	Lake Wedowee Property Owners Association
Jerry and Mary Lee Poss	Stakeholder
Mitch Reid	Nature Conservancy
Sarah Salazar	Federal Energy Regulatory Commission
Chris Smith	Alabama Department of Conservation and Natural Resources
Paul Smith	Stakeholder
Jim Sparrow	Alabama Bass Federation
Tricia Stearns	Stakeholder
Monte Terhaar	Federal Energy Regulatory Commission
Jack West	Alabama Rivers Alliance
Bryant Whaley	Randolph County Economic / Industrial Development

HAT 6 – Cultural Resources

Full Name	Company
Nathan Aycock	Alabama Department of Conservation and Natural Resources
Steve Bryant	Alabama Department of Conservation and Natural Resources
Nancy Burnes	Lake Wedowee Property Owners Association
RaeLynn Butler	Muscogee (Creek) Nation of Oklahoma
Rae-Lynn Butler	Muscogee (Creek) Nation of Oklahoma
Bryant Celestine	Alabama-Coushatta Tribe of Texas
Kristie Coffman	Auburn University
Allan Creamer	Federal Energy Regulatory Commission
Robin Crockett	Stakeholder
Jeff Duncan	U.S. National Park Service
Todd Fobian	Alabama Department of Conservation and Natural Resources
Matthew Gage	Office of Archaeological Research
Chris Greene	Alabama Department of Conservation and Natural Resources
Larry Haikey	Poarch Band of Creek Indians
Evelyn Hamrick	Property Owner
Mike Holley	Alabama Department of Conservation and Natural Resources
Martha Hunter	Alabama Rivers Alliance
Gerrit Jobsis	American Rivers Alliance
Dr. Linda Langley	Coushatta Tribe of Louisiana
Janice Lowe	Alabama Quassarte Tribe
Matthew Marshall	Alabama Department of Conservation and Natural Resources
Donna Matthews	Stakeholder
Janet Maylen	Thlopthlocco Tribal Town
Lydia Mayo	U.S. Environmental Protection Agency
Amanda McBride	Alabama Historical Commission
Allison McCartney	U.S. Bureau of Land Management
Rachel McNamara	Federal Energy Regulatory Commission
Barry Morris	Lake Wedowee Property Owners Association
Karen Pritchett	United Keetoowah Band of Cherokee Indians
Mitch Reid	Nature Conservancy
Sarah Salazar	Federal Energy Regulatory Commission
Eric D. Sipes	Alabama Historical Commission
Barry Smith	Stakeholder
Robin Soweka	Muscogee (Creek) Nation of Oklahoma
John Sullivan	U.S. Bureau of Land Management
Monte Terhaar	Federal Energy Regulatory Commission
Elizabeth Toombs	Tribal Historic Preservation Office Cherokee Nation
Russ Townsend	Eastern Band of Cherokee Indians

Full Name	Company
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Lee Anne Wofford	Alabama Historical Commission

Document Content(s)

Harris Relicensing Progress Update

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goxford@centurylink.net <goxford@centurylink.net>; granddadth@windstream.net <granddadth@windstream.net>; harry.merrill47@gmail.com <harry.merrill47@gmail.com>; helen.greer@att.net <helen.greer@att.net>; holliman.daniel@epa.gov <holliman.daniel@epa.gov>; info@aeconline.com <info@aeconline.com>;

info@tunica.org <info@tunica.org>; inspector_003@yahoo.com <inspector_003@yahoo.com>; irapar@centurytel.net <irapar@centurytel.net>; irwiner@auburn.edu <irwiner@auburn.edu>; j35sullivan@blm.gov <j35sullivan@blm.gov>; james.e.hathorn.jr@sam.usace.army.mil <james.e.hathorn.jr@sam.usace.army.mil>; jason.moak@kleinschmidtgroup.com <jason.moak@kleinschmidtgroup.com>; jcandler7@yahoo.com <jcandler7@yahoo.com>; jcarlee@southernco.com <jcarlee@southernco.com>; jec22641@aol.com <jec22641@aol.com>; jeddins@achp.gov <jeddins@achp.gov>; jefbaker@southernco.com <jefbaker@southernco.com>; jeff_duncan@nps.gov <jeff_duncan@nps.gov>; jeff_powell@fws.gov <jeff_powell@fws.gov>; jennifer.l.jacobson@usace.army.mil <jennifer.l.jacobson@usace.army.mil>; jennifer_grunewald@fws.gov <jennifer_grunewald@fws.gov>; jerrelshell@gmail.com <jerrelshell@gmail.com>; jessecunningham@msn.com <jessecunningham@msn.com>; jfcrew@southernco.com <jfcrew@southernco.com>; jhancock@balch.com <jhancock@balch.com>; jharjo@alabama-quassarte.org <jharjo@alabama-quassarte.org>; jhaslbauer@adem.alabama.gov <jhaslbauer@adem.alabama.gov>; jhouser@osiny.org <jhouser@osiny.org>; jkwdurham@gmail.com <jkwdurham@gmail.com>; jlowe@alabama-quassarte.org <jlowe@alabama-quassarte.org>; jnyerby@southernco.com <jnyerby@southernco.com>; joan.e.zehrt@usace.army.mil <joan.e.zehrt@usace.army.mil>; john.free@psc.alabama.gov <john.free@psc.alabama.gov>; johndiane@sbcglobal.net <johndiane@sbcglobal.net>; jonas.white@usace.army.mil <jonas.white@usace.army.mil>; josh.benefield@forestry.alabama.gov <josh.benefield@forestry.alabama.gov>; jpsparrow@att.net <jpsparrow@att.net>; jsrasber@southernco.com <jsrasber@southernco.com>; jthacker@southernco.com <jthacker@southernco.com>; jthroneberry@tnc.org <jthroneberry@tnc.org>; judymcrealtor@gmail.com <judymcrealtor@gmail.com>; jwest@alabamarivers.org <jwest@alabamarivers.org>; kajumba.ntale@epa.gov <kajumba.ntale@epa.gov>; karen.brunso@chickasaw.net <karen.brunso@chickasaw.net>; kcarleton@choctaw.org <kcarleton@choctaw.org>; kechandl@southernco.com <kechandl@southernco.com>; keith.gauldin@dcnr.alabama.gov <keith.gauldin@dcnr.alabama.gov>; keith.henderson@dcnr.alabama.gov <keith.henderson@dcnr.alabama.gov>; kelly.schaeffer@kleinschmidtgroup.com <kelly.schaeffer@kleinschmidtgroup.com>; ken.wills@jcdh.org <ken.wills@jcdh.org>; kenbarnes01@yahoo.com <kenbarnes01@yahoo.com>; kenneth.boswell@adeca.alabama.gov <kenneth.boswell@adeca.alabama.gov>; kmhunt@maxxsouth.net <kmhunt@maxxsouth.net>; kmo0025@auburn.edu <kmo0025@auburn.edu>; kodom@southernco.com <kodom@southernco.com>; kpritchett@ukb-nsn.gov <kpritchett@ukb-nsn.gov>; kristina.mullins@usace.army.mil <kristina.mullins@usace.army.mil>; lakewedoweedocks@gmail.com <lakewedoweedocks@gmail.com>; leeanne.wofford@ahc.alabama.gov <leeanne.wofford@ahc.alabama.gov>; leon.m.cromartie@usace.army.mil <leon.m.cromartie@usace.army.mil>; leopoldo_miranda@fws.gov <leopoldo_miranda@fws.gov>; lewis.c.sumner@usace.army.mil <lewis.c.sumner@usace.army.mil>; lgallen@balch.com <lgallen@balch.com>; lgarland68@aol.com <lgarland68@aol.com>; lindastone2012@gmail.com <lindastone2012@gmail.com>; llangley@coushattatribela.org <llangley@coushattatribela.org>; lovvornt@randolphcountyalabama.gov <lovvornt@randolphcountyalabama.gov>; lth0002@auburn.edu <lth0002@auburn.edu>; mark@americanwhitewater.org <mark@americanwhitewater.org>; matt.brooks@alea.gov <matt.brooks@alea.gov>; matthew.marshall@dcnr.alabama.gov <matthew.marshall@dcnr.alabama.gov>; mayo.lydia@epa.gov <mayo.lydia@epa.gov>; mcoker@southernco.com <mcoker@southernco.com>; mcw0061@aces.edu <mcw0061@aces.edu>; mdollar48@gmail.com <mdollar48@gmail.com>; meredith.h.ladart@usace.army.mil <meredith.h.ladart@usace.army.mil>; mhpwedowee@gmail.com <mhpwedowee@gmail.com>; mhunter@alabamarivers.org <mhunter@alabamarivers.org>; michael.w.creswell@usace.army.mil <michael.w.creswell@usace.army.mil>; midwaytreasures@bellsouth.net <midwaytreasures@bellsouth.net>; mike.holley@dcnr.alabama.gov <mike.holley@dcnr.alabama.gov>; mitchell.reid@tnc.org <mitchell.reid@tnc.org>; mlen@adem.alabama.gov <mlen@adem.alabama.gov>; mnedd@blm.gov <mnedd@blm.gov>; monte.terhaar@ferc.gov <monte.terhaar@ferc.gov>; mooretn@auburn.edu <mooretn@auburn.edu>; mprandolphwater@gmail.com <mprandolphwater@gmail.com>; nancyburnes@centurylink.net <nancyburnes@centurylink.net>; nanferebee@juno.com <nanferebee@juno.com>; nathan.aycock@dcnr.alabama.gov <nathan.aycock@dcnr.alabama.gov>; orr.chauncey@epa.gov <orr.chauncey@epa.gov>; pace.wilber@noaa.gov <pace.wilber@noaa.gov>; partnersinfo@wwfus.org <partnersinfo@wwfus.org>; patti.powell@dcnr.alabama.gov <patti.powell@dcnr.alabama.gov>; patty@ten-o.com <patty@ten-o.com>; paul.trudine@gmail.com <paul.trudine@gmail.com>; ptrammell@reddyice.com <ptrammell@reddyice.com>; publicaffairs@doc.gov <publicaffairs@doc.gov>; rachel.mcnamara@ferc.gov <rachel.mcnamara@ferc.gov>; raebutler@mcn-nsn.gov <raebutler@mcn-nsn.gov>; rancococ@teleclipse.net <rancococ@teleclipse.net>; randall.b.harvey@usace.army.mil <randall.b.harvey@usace.army.mil>; randy@randyrogerslaw.com <randy@randyrogerslaw.com>; randy@wedoweemarine.com <randy@wedoweemarine.com>; rbmorris222@gmail.com <rbmorris222@gmail.com>; rcodydeal@hotmail.com <rcodydeal@hotmail.com>; reuteem@auburn.edu <reuteem@auburn.edu>; richardburnes3@gmail.com <richardburnes3@gmail.com>; rick.oates@forestry.alabama.gov <rick.oates@forestry.alabama.gov>; rickmcwhorter723@icloud.com <rickmcwhorter723@icloud.com>; rifraft2@aol.com <rifraft2@aol.com>; rjdavis8346@gmail.com <rjdavis8346@gmail.com>; robert.a.allen@usace.army.mil <robert.a.allen@usace.army.mil>; robinwaldrep@yahoo.com <robinwaldrep@yahoo.com>; roger.mcneil@noaa.gov <roger.mcneil@noaa.gov>; ron@lakewedowee.org <ron@lakewedowee.org>; rosoweka@mcn-nsn.gov <rosoweka@mcn-nsn.gov>; russtown@nc-cherokee.com <russtown@nc-cherokee.com>; ryan.prince@forestry.alabama.gov <ryan.prince@forestry.alabama.gov>; sabrinawood@live.com <sabrinawood@live.com>; sandnfrench@gmail.com <sandnfrench@gmail.com>; sandra.wash@kleinschmidtgroup.com <sandra.wash@kleinschmidtgroup.com>; sarah.salazar@ferc.gov <sarah.salazar@ferc.gov>; sbryan@pci-nsn.gov <sbryan@pci-nsn.gov>; scsmith@southernco.com

<scsmith@southernco.com>; section106@mcn-nsn.gov <section106@mcn-nsn.gov>; sforehand@russelllands.com <sforehand@russelllands.com>; sgraham@southernco.com <sgraham@southernco.com>; sherry.bradley@adph.state.al.us <sherry.bradley@adph.state.al.us>; sidney.hare@gmail.com <sidney.hare@gmail.com>; simsthe@aces.edu <simsthe@aces.edu>; snelson@nelsonandco.com <snelson@nelsonandco.com>; sonjahollomon@gmail.com <sonjahollomon@gmail.com>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; stewartjack12@bellsouth.net <stewartjack12@bellsouth.net>; straylor426@bellsouth.net <straylor426@bellsouth.net>; sueagnew52@yahoo.com <sueagnew52@yahoo.com>; tdadunaway@gmail.com <tdadunaway@gmail.com>; thpo@pci-nsn.gov <thpo@pci-nsn.gov>; thpo@tttown.org <thpo@tttown.org>; timguffey@jcch.net <timguffey@jcch.net>; tlamberth@russelllands.com <tlamberth@russelllands.com>; tlmills@southernco.com <tlmills@southernco.com>; todd.fobian@dcnr.alabama.gov <todd.fobian@dcnr.alabama.gov>; tom.diggs@ung.edu <tom.diggs@ung.edu>; tom.lettieri47@gmail.com <tom.lettieri47@gmail.com>; tom.littlepage@adeca.alabama.gov <tom.littlepage@adeca.alabama.gov>; trayjim@bellsouth.net <trayjim@bellsouth.net>; triciastearns@gmail.com <triciastearns@gmail.com>; twstjohn@southernco.com <twstjohn@southernco.com>; variscom506@gmail.com <variscom506@gmail.com>; walker.mary@epa.gov <walker.mary@epa.gov>; william.puckett@swcc.alabama.gov <william.puckett@swcc.alabama.gov>; wmcampbell218@gmail.com <wmcampbell218@gmail.com>; wrighr2@aces.edu <wrighr2@aces.edu>; wsgardne@southernco.com <wsgardne@southernco.com>; wtanders@southernco.com <wtanders@southernco.com>

Harris Relicensing stakeholders,

In the Harris Project Final Study Plans, filed with FERC on May 13, 2019, Alabama Power agreed to file voluntary Progress Updates with FERC in October 2019 and October 2020. The purpose of the Progress Update is to ensure that stakeholders and FERC can review the study progress to date and plan for future reports, meetings, and overall relicensing activities. This is a voluntary action that is not required under the ILP. Alabama Power has filed the October 2020 Progress Update with FERC and posted it to the Harris Project relicensing website: www.harrisrelicensing.com [harrisrelicensing.com] (in the Relicensing Documents folder).

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

APC Harris Relicensing

From: Chandler, Keith Edward
Sent: Tuesday, January 26, 2021 1:33 PM
To: Anderegg, Angela Segars
Subject: FW: Notice of Opportunity for Technical Assistance to Support Hydropower Decision Making

Keith Chandler, P.E.
Alabama Power
Environmental Affairs
Office: 205-257-1091
Cell: 205-438-4165
kechandl@southernco.com

From: Jack West <jwest@alabamarivers.org>
Sent: Thursday, October 22, 2020 3:14 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>; Chandler, Keith Edward <KECHANDL@SOUTHERNCO.COM>
Subject: Fwd: Notice of Opportunity for Technical Assistance to Support Hydropower Decision Making

---

Hi Angie and Keith,

You may have seen this already, but I wanted to forward you this notice I got from DOE the other week. There is an opportunity for technical assistance to support hydropower decision-making for utilities, and one of the topic areas listed is Optimization of Hybrid Hydropower and Storage Systems. I'm not sure what all the application entails, but it may be useful to you as the battery storage study progresses, so I thought I would share.

Best,

---------- Forwarded message ---------
From: **DOE Office of Energy Efficiency and Renewable Energy** <eere@service.govdelivery.com>
Date: Tue, Oct 13, 2020 at 2:11 PM
Subject: Notice of Opportunity for Technical Assistance to Support Hydropower Decision Making
To: <jwest@alabamarivers.org>

SHARE [lnks.gd]

Having trouble viewing this email? View it as a Web page [lnks.gd].

ENERGY.GOV
Office of
ENERGY EFFICIENCY &
RENEWABLE ENERGY [lnks.gd]

Water Power Technologies Office [lnks.gd]

October 13, 2020

U.S. Department of Energy Announces Notice of Opportunity for Technical Assistance to Support Hydropower Decision Making [lnks.gd]

Today, the U.S. Department of Energy's Water Power Technologies Office (WPTO) announced a Notice of Opportunity for Technical Assistance (NOTA) [lnks.gd] for Improving Hydropower's Value Through Informed Decision-Making. Part of WPTO's HydroWIRES (Water Innovation for a Resilient Electricity System) Initiative [lnks.gd], this opportunity will provide hydropower decision makers—such as utilities and system operators—with National Lab expertise and capabilities to address current challenges and capture new opportunities for their systems.

[lnks.gd]

Topic areas for technical assistance include:

- Participation in Energy Imbalance Markets
- Value of Inflow Forecasting Tools and Practices
- Hydropower in Integrated Resource Planning
- Optimization of Hybrid Hydropower and Storage Systems
- Open Topic.

Interested applicants must submit initial concept papers by **December 18, 2020**. Full applications will be due **January 29, 2021**. A live webinar [lnks.gd] is scheduled for November 4, 2020, at 2:00 p.m. ET to provide information on the FOA to potential applicants.

More information about the NOTA can be found in the EERE announcement [lnks.gd].

To learn more about WPTO and the HydroWIRES Initiative, visit the WPTO website [lnks.gd].

--

Jack West, Esq.
Policy and Advocacy Director
Alabama Rivers Alliance
2014 6th Ave N, Suite 200
Birmingham, AL 35203
205-322-6395

www.alabamarivers.org [alabamarivers.org]

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

From: Jack West <jwest@alabamarivers.org>
Sent: Wednesday, January 27, 2021 11:23 AM
To: Anderegg, Angela Segars
Cc: Chandler, Keith Edward; Cindy Lowry
Subject: Re: Harris Relicensing - BESS Study Resource

EXTERNAL MAIL: Caution Opening Links or Files

Angie,

Thanks for your response. We'll look forward to seeing the BESS draft study report when it becomes available.

Take care,

On Tue, Jan 26, 2021 at 3:36 PM Anderegg, Angela Segars <ARSEGARS@southernco.com> wrote:

> Hi Jack,
>
> We are in the process of completing the BESS analysis using internal expertise and will file the results this spring. I don't think this is something Alabama Power will pursue at this time given where we are in the relicensing process. Thank you for passing it along though.
>
> I hope your 2021 is off to a great start as well!
>
> **Angie Anderegg**
>
> Hydro Services
>
> (205)257-2251
>
> arsegars@southernco.com
>
> ---
>
> **From:** Jack West <jwest@alabamarivers.org>
> **Sent:** Tuesday, January 26, 2021 9:38 AM
> **To:** Anderegg, Angela Segars <ARSEGARS@southernco.com>; Chandler, Keith Edward <KECHANDL@SOUTHERNCO.COM>

Cc: Cindy Lowry <clowry@alabamarivers.org>
Subject: Harris Relicensing - BESS Study Resource

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie and Keith,

I hope your 2021 is off to a good start and that you're safe from the storms last night. The other week I saw an email from DOE (pasted below) about an extension on WPTO's notice of opportunity for technical assistance described below. I had forwarded you information about this towards the end of last year, but the new deadline is now February 17, 2021.

As I mentioned previously, since one of the categories in the NOTA is assistance on optimizing hydropower with energy storage systems, it seems like this could be an excellent and cost-effective resource for the BESS study. Do you think this is something APCo might pursue?

Best,

-Jack

Water Power Technologies Office [lnks.gd]

January 6, 2021

Deadline Extended for HydroWIRES NOTA [lnks.gd]

WPTO recently announced a Notice of Opportunity for Technical Assistance (NOTA) for Improving Hydropower's Value through Informed Decision-Making [lnks.gd]. Part of WPTO's HydroWIRES [lnks.gd] (Water Innovation for a Resilient Electricity System) Initiative, this opportunity will provide hydropower decision makers—such as utilities and system operators—with National Lab expertise and capabilities to address current challenges and capture new opportunities for their systems.

[lnks.gd]

Additionally, the work under this NOTA can help to validate National Lab-led modeling, analysis, and tools developed under the HydroWIRES Initiative for the benefit of the broader hydropower community, as well as further our collective understanding of possible roles for hydropower in an evolving grid.

WPTO has extended the application period for this NOTA. Interested applicants must submit initial concept papers by **February 17, 2021. Apply through EERE Exchange today [lnks.gd].**

--

Jack West, Esq.

Policy and Advocacy Director

Alabama Rivers Alliance

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205-322-6395

www.alabamarivers.org [alabamarivers.org]

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--

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Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

From: Anderegg, Angela Segars
Sent: Wednesday, March 3, 2021 8:09 AM
To: Jack West; Chandler, Keith Edward
Subject: RE: NHA VIRTUAL EVENT: Pairing Batteries & Hydropower: Clean Energy's Untapped Solution

Hi Jack,

Thanks for forwarding! I saw that come across from NHA a few days ago and I am going to try to attend.

I am beyond ready to meet in-person again. Hopefully we can do that safely sooner than later.

Thanks!

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Jack West <jwest@alabamarivers.org>
Sent: Tuesday, March 2, 2021 3:05 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>; Chandler, Keith Edward <KECHANDL@SOUTHERNCO.COM>
Subject: NHA VIRTUAL EVENT: Pairing Batteries & Hydropower: Clean Energy's Untapped Solution

---

Hi Angie and Keith,

I hope you're both doing well. This upcoming virtual event sponsored by the National Hydropower Association and the Energy Storage Association just popped up in my inbox, and I thought I would forward it since it could be helpful to your folks working on the battery storage study.

I know we've got lots of reports and HAT meetings and comment periods heading our way this spring with the Harris relicensing, and I hope we begin to safely meet in-person later in the year.

Take care,

Jack

March 11th at 2pm ET!

[r20.rs6.net]

NEW VIRTUAL EVENT

Path to Clean Energy

Pairing Batteries & Hydropower:

Clean Energy's Untapped Solution

Thursday, March 11 at 2:00-3:00pm ET

REGISTER TODAY! [r20.rs6.net]

Join us on March 11th at 2:00 pm EDT for the National Hydropower Association's Path to Clean Energy Virtual Event, **"Pairing Batteries & Hydropower: Clean Energy's Untapped Solution"**, hosted in partnership with the Energy Storage Association.

At this virtual event, panelists will explore the value streams of collocating batteries and hydropower. Pairing these technologies together has the potential to enhance grid reliability services, environment performance, and O&M costs.

Panelists will also discuss new market services that could be established, as well as examine the findings of a current project that has successfully paired hydropower and batteries together.

Energy storage technologies are poised to form the foundation of tomorrow's carbon-free electricity. Storage technologies like batteries and thermal are growing exponentially year-over-year, while pumped storage hydropower represents 93 percent of utility-scale storage in America. Separately, these technologies are helping to integrate variable renewables like wind and solar onto the gird, and accelerating the nation's efforts to decarbonize.

Panelists

Moderator: Malcolm Woolf, President & CEO, National Hydropower Association

Panel 1:

- Marc Chupka, Vice President, Research & Programs, Energy Storage Association

- Dr. Thomas Mosier, Energy Systems Group Lead, Idaho National Laboratory

Panel 2:

- Asa Hopkins, Vice President, Synapse Energy Economics

- Jens Paeutz, Marketing Director, Andritz Hydro Corp.

- Darron Scott, President &CEO, Kodiak Electric Association

REGISTER TODAY! [r20.rs6.net]

[r20.rs6.net]

Path to Clean Energy is a program of the National Hydropower Association.
For more information on waterpower, please visit www.hydro.org [hydro.org].

[r20.rs6.net]

--
Jack West, Esq.
Policy and Advocacy Director
Alabama Rivers Alliance
2014 6th Ave N, Suite 200
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205-322-6395
www.alabamarivers.org [alabamarivers.org]

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

APC Harris Relicensing

From: APC Harris Relicensing
Sent: Wednesday, March 17, 2021 1:23 PM
To: Barry Morris
Subject: RE: Meeting Postponed

Hi Barry,

You're right that the study report won't be ready prior to the April 1 meeting. We have quite a bit that we're working on wrapping up right now in order to meet the April 12 Updated Study Report filing. We will file the full report on that date.

We have been working with Southern Company in-house battery experts to answer the BESS questions, including capital and O&M costs and how the battery would be charged, and will file that info on April 12th as well.

Stay safe today!

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Barry Morris <rbmorris222@gmail.com>
Sent: Wednesday, March 17, 2021 11:45 AM
To: APC Harris Relicensing <g2apchr@southernco.com>
Subject: Re: Meeting Postponed

Angie: Barry Morris with the Lake Wedowee Property Owners Association. Too bad about the postponement. Is it safe to conclude that the HAT 1 Operations Phase 2 Study results will not be available until the April 1 meeting? I'd love to get a pre-read.

Also, it seems to me that installing a 60MW battery won't fix anything unless the company has a way to charge it from a source other than generating from the dam. Maybe charging it overnight with excess steam plant capacity? Dare I ask the cost and cycles/lifespan of a 60MW battery? These are rhetorical questions. Don't worry about having one of the experts give a detailed reply. I'm sure it will be covered in the meeting.

See you (sort of) on April Fools day. Barry

On Wed, Mar 17, 2021 at 9:44 AM APC Harris Relicensing <g2apchr@southernco.com> wrote:

> HAT 1,
>
> Given the severe weather forecast for most of the southeast today and throughout tonight and the uncertainty in what the impact may be and how many of us may be without power, we have decided to postpone tomorrow's HAT 1 meeting until **Thursday, April 1** from 9:00-3:00 (Central Time). The agenda will be the same.

I apologize for any inconvenience. Please be weather aware and stay safe!

Angie Anderegg

Hydro Services

(205)257-2251

arsegars@southernco.com

HAT 1,

We will have a HAT 1 meeting on **March 18th** from 9:00-3:00 (Central Time) in order to review the results of the Phase 2 analyses of both the Operating Curve Change Feasibility and Downstream Release Alternatives Studies. The agenda and Teams meeting information is below. Let me know if you have any questions.

Thanks,

Angie Anderegg

Hydro Services

(205)257-2251

arsegars@southernco.com

Agenda

9:00-11:00 Review results of Downstream Release Alternatives Phase 2 analysis

11:00-1:00 Break for lunch

1:00-3:00 Review results of Operating Curve Change Feasibility Phase 2 analysis

Microsoft Teams meeting

Join on your computer or mobile app

Click here to join the meeting

Join with a video conferencing device

southerncompany@m.webex.com

Video Conference ID: 112 415 227 9

Alternate VTC dialing instructions [webex.com]

Or call in (audio only)

+1 470-705-0860,,740663097#   United States, Atlanta

Phone Conference ID: 740 663 097#

Find a local number

Southern Company

RE: Harris Relicensing - Updated Study Report

Anderegg, Angela Segars <ARSEGARS@southernco.com>
Mon 4/12/2021 6:52 PM

To: APC Harris Relicensing <g2apchr@southernco.com>
Bcc: 1942jthompson420@gmail.com <1942jthompson420@gmail.com>; 9sling@charter.net <9sling@charter.net>; abnoel@southernco.com <abnoel@southernco.com>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; alpeeple@southernco.com <alpeeple@southernco.com>; amanda.mcbride@ahc.alabama.gov <amanda.mcbride@ahc.alabama.gov>; amccartn@blm.gov <amccartn@blm.gov>; ammcvica@southernco.com <ammcvica@southernco.com>; amy.silvano@dcnr.alabama.gov <amy.silvano@dcnr.alabama.gov>; andrew.nix@dcnr.alabama.gov <andrew.nix@dcnr.alabama.gov>; arsegars@southernco.com <arsegars@southernco.com>; athall@fujifilm.com <athall@fujifilm.com>; aubie84@yahoo.com <aubie84@yahoo.com>; awhorton@corblu.com <awhorton@corblu.com>; bart_roby@msn.com <bart_roby@msn.com>; baxterchip@yahoo.com <baxterchip@yahoo.com>; bboozer6@gmail.com <bboozer6@gmail.com>; bdavis081942@gmail.com <bdavis081942@gmail.com>; beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; bill_pearson@fws.gov <bill_pearson@fws.gov>; blacklake20@gmail.com <blacklake20@gmail.com>; 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Corrected Harris relicensing link

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: APC Harris Relicensing
Sent: Monday, April 12, 2021 1:47 PM
To: APC Harris Relicensing <harrisrelicensing@southernco.com>
Subject: Harris Relicensing - Updated Study Report

Harris relicensing stakeholders,

Pursuant to FERC's Integrated Licensing Process, Alabama Power filed its Harris Project Updated Study Report (USR) today. Concurrent with the USR filing, Alabama Power filed three draft study reports, four final study reports and the results of a Botanical Inventory at Flat Rock Park. Stakeholders may access the USR and the study reports on FERC's website (http://www.ferc.gov) by going to the "eLibrary" link and entering the docket number (P-2628). The USR and study reports are also available on the Project relicensing website at www.harrisrelicensing.com.

The Updated Study Report meeting will be held on **April 27, 2021**. Please hold this date from 9:00 am to 12:00 pm central time. Call in information for the meeting can be found below. The purpose of the meeting is to provide an opportunity to review the contents of the USR.

Alabama Power will file a summary of the USR meeting by **May 12, 2021**. Stakeholders will have until **June 11, 2021** to file written comments with FERC on the USR Meeting Summary.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

Microsoft Teams meeting

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April 12, 2021

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Updated Study Report

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC or Commission) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628-065). On April 12, 2019, FERC issued its Study Plan Determination[1] (SPD) for the Harris Project, approving Alabama Power's ten relicensing studies with FERC modifications. On May 13, 2019, Alabama Power filed Final Study Plans to incorporate FERC's modifications and posted the Final Study Plans on the Harris relicensing website at www.harrisrelicensing.com. In the Final Study Plans, Alabama Power proposed a schedule for each study that included filing a voluntary Progress Update in October 2019[2] and October 2020[3].

Pursuant to the Commission's Integrated Licensing Process (ILP) and 18 CFR § 5.15(f), Alabama Power is filing the Harris Project Updated Study Report (USR) (Attachment 1). The enclosed USR describes Alabama Power's overall progress in implementing the study plans, and summarizes the data collected and any variances from the study plan and schedule.

Concurrent with this USR filing, Alabama Power is filing:

- **Draft** *Downstream Release Alternatives Phase 2 Study Report*
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report*
- **Final** *Aquatic Resources Study Report*
- **Final** *Downstream Aquatic Habitat Study Report*
- **Final** *Erosion and Sedimentation Study Report*
- **Final** *Water Quality Study Report*
- A Botanical Inventory of a 35-Acre Parcel at Flat Rock Park, Blake's Ferry, Alabama

[1] Accession No 20190412-3000.
[2] Accession No 20191030-5053.
[3] Accession No 20201030-5215.

- **Draft** *Battery Energy Storage System at R.L. Harris Project Report*

Alabama Power is reporting the following variance to schedule/methods for the following studies:

- Operating Curve Change Feasibility Analysis Phase 2 Study - While use of historic photos from Lake Harris was mentioned in the Study Plan, photos could not be used to assess the effects of the winter pool alternatives due to the limited resolution of publicly available historical photos needed to assess individual erosion areas. In addition, Alabama Power provided qualitative information (rather than quantitative information noted in the Study Plan) regarding cultural resources on Lake Harris as the analysis of cultural resources is ongoing.

- Battery Energy Storage System (BESS) Study - FERC did not request a study plan for the BESS Study but provided recommendations for the type of analysis FERC expected Alabama Power to complete. Alabama Power evaluated the BESS separately from the other downstream release alternatives and results of the analysis are presented in a separate report, rather than included in the Downstream Release Alternatives Study.

- Erosion and Sedimentation Study - Alabama Power provided the results of the *Nuisance Aquatic Vegetation Survey Report* in Appendix F of the final report rather than providing to HAT 3 in the form of a technical memorandum.

- Aquatic Resources Study - Auburn University did not use the 30+2 sampling method as it was determined in the field to not be feasible/effective for sampling the sites and instead, shallow areas were sampled using boat and barge electrofishing equipment, which were found to be effective in sampling shallow areas within the study sites. The boat method used was a modification of the recently developed non-wadeable index of biological integrity (IBI). Sampling intensity was modified to accommodate available habitat, sampling frequency, and therefore IBI scores were not calculated.

- Cultural Resources Programmatic Agreement and Historic Properties Management Plan Study - A schedule variance occurred for completing the TCP identification process with the Muscogee (Creek) Nation in April 2021 (rather than February 2021 as noted in the Study Plan).

Pursuant to 18 CFR §5.15(f), Alabama Power will host the Updated Study Report Meeting (Meeting) with stakeholders and FERC on April 27, 2021 by conference call. The Meeting will begin at 9 AM central and conclude by 12 PM central. The purpose of the Meeting is to provide an opportunity to review the contents of the USR.

Alabama Power will file the Updated Study Report Meeting Summary by May 12, 2021. Stakeholders will have until June 11, 2021, to file written comments with FERC on the USR Meeting Summary. All comments must adhere to FERC regulations at 18 CFR Section 5.15 (c)(2)-(7). All Harris studies have been completed and a proposal for new information gathering or studies is subject to paragraph (e) of Section 5.15 except that the proponent must demonstrate extraordinary circumstances warranting approval. Stakeholders may access the USR and the individual study reports on FERC's website (http://www.ferc.gov) by going to the "eLibrary" link and entering the docket number (P-2628). The USR and study reports are also available on the Project relicensing website at https://harrisrelicensing.com.

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg

Angie Anderegg
Harris Relicensing Project Manager

Attachment – Updated Study Report

cc: Harris Stakeholder List

Attachment
Updated Study Report

UPDATED STUDY REPORT

R.L. HARRIS HYDROELECTRIC PROJECT

FERC NO. 2628

Prepared for:

Alabama Power Company

Prepared by:

Kleinschmidt Associates

April 2021

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1.0 INTRODUCTION

Alabama Power Company (Alabama Power) owns and operates the R.L. Harris Project (FERC Project No. 2628) (Harris Project), licensed by the Federal Energy Regulatory Commission (FERC). Alabama Power is relicensing the 135-megawatt (MW) Harris Project, and the existing license expires in 2023. The Harris Project consists of a dam, spillway, powerhouse, and those lands and waters necessary for the operation of the hydroelectric project and enhancement and protection of environmental resources. These structures, lands, and water are enclosed within the FERC Project Boundary. Under the existing Harris Project license, the FERC Project Boundary encloses two distinct geographic areas, described below.

Harris Reservoir is the 9,870-acre reservoir (Harris Reservoir) created by the R.L. Harris Dam (Harris Dam). Harris Reservoir is located on the Tallapoosa River, near Lineville, Alabama. The lands adjoining the reservoir total approximately 7,392 acres and are included in the FERC Project Boundary. This includes land to 795-feet mean sea level (msl)[1], as well as natural undeveloped areas, hunting lands, prohibited access areas, recreational areas, and all islands.

The Harris Project also contains 15,063 acres of land within the James D. Martin-Skyline Wildlife Management Area (Skyline WMA) located in Jackson County, Alabama. These lands are located approximately 110 miles north of Harris Reservoir and were acquired and incorporated into the FERC Project Boundary as part of the FERC-approved Harris Project Wildlife Mitigative Plan and Wildlife Management Plan. These lands are leased to, and managed by, the state of Alabama for wildlife management and public hunting and are part of the Skyline WMA.

The following Project terms will have these meanings throughout this Updated Study Report (USR):

[1] Also includes a scenic easement (to 800-feet msl or 50-horizontal-feet from 793-feet msl, whichever is less, but never less than 795-feet msl).

- Lake Harris refers to the 9,870-acre reservoir, the adjacent 7,392 acres of Project land, and the dam, spillway, and powerhouse.
- Skyline refers to the 15,063 acres of Project land within the Skyline WMA in Jackson County.
- Harris Project refers to all the lands, waters, and structures enclosed within the FERC Project Boundary, which includes both Lake Harris and Skyline.
- Harris Reservoir refers to the 9,870-acre reservoir only.
- Harris Dam refers to the dam, spillway, and powerhouse.
- The Project Area refers to the land and water in the Project Boundary and immediate geographic area adjacent to the Project Boundary.

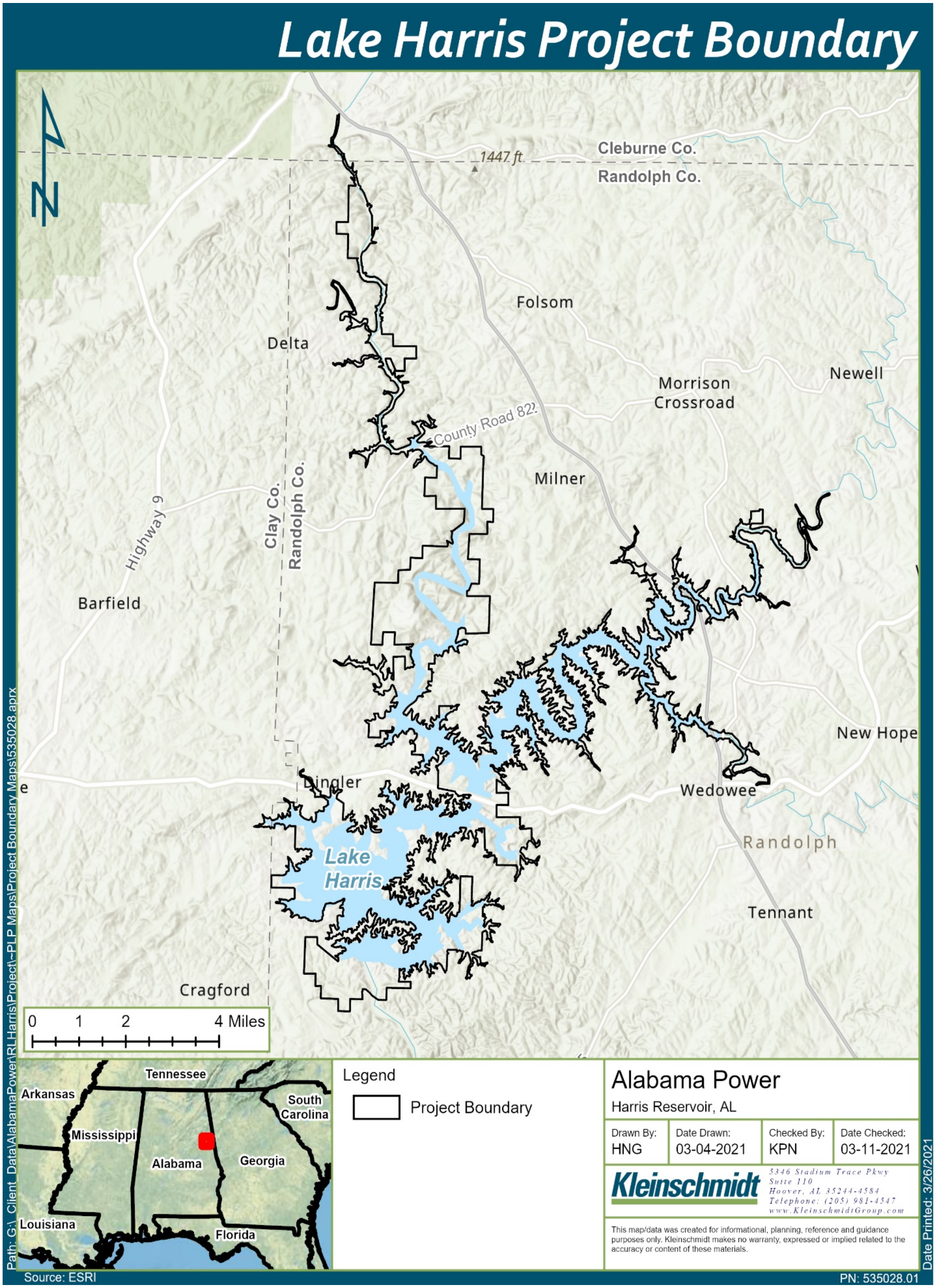

Figure 1 Lake Harris Project Boundary

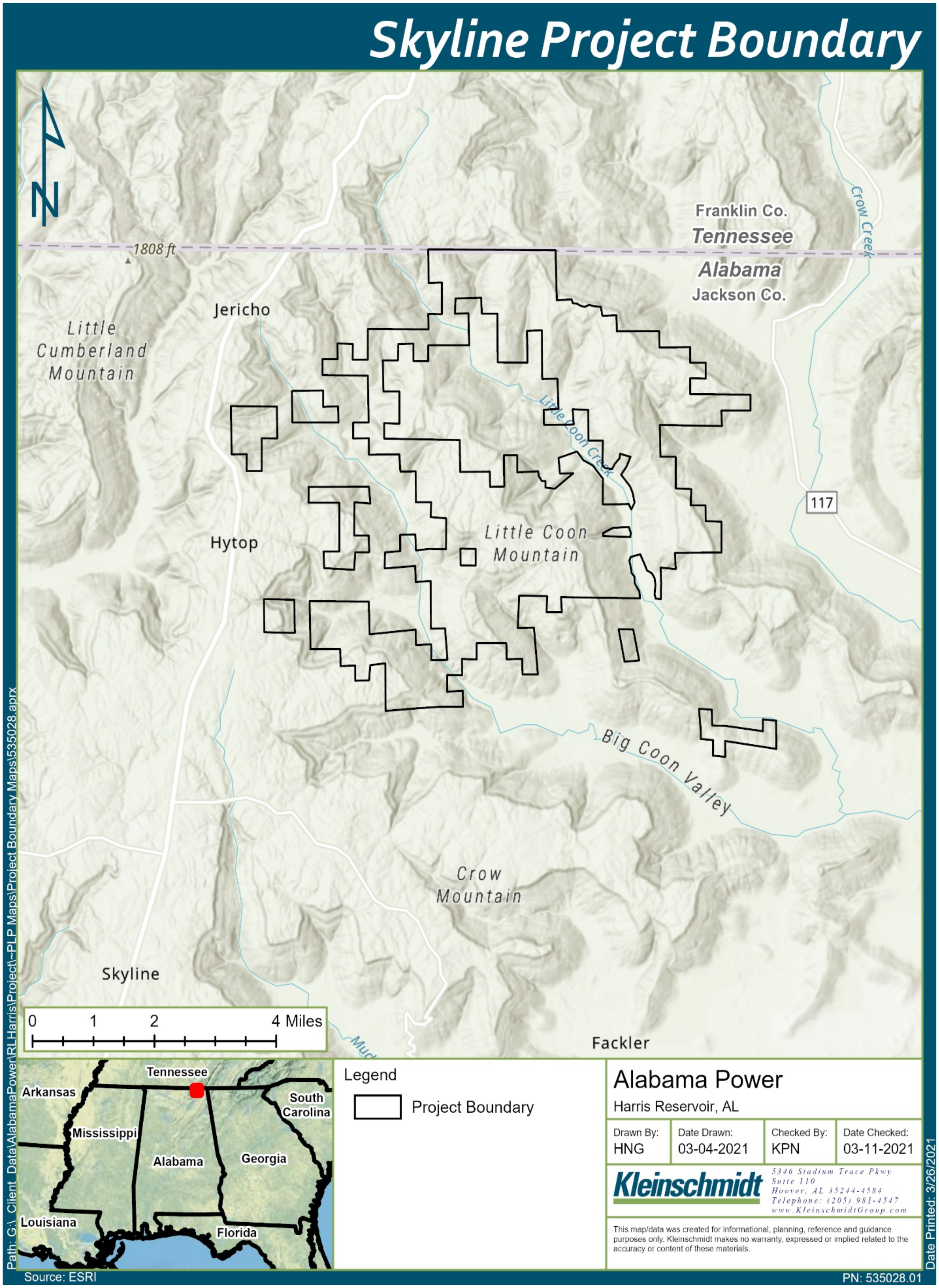

Figure 2   Skyline Project Boundary

2.0 HARRIS STUDY PLAN PROCESS OVERVIEW

During the October 19, 2017 Issue Identification Workshop, stakeholders provided information on resources that may be affected by the Harris Project. On August 28 and 29, 2018, FERC held Harris Project Scoping Meetings[2] to provide additional opportunities for stakeholders and the public to present and discuss any issues related to the Harris Project relicensing. On November 13, 2018, Alabama Power filed the following 10 proposed study plans for the Harris Project.

- Operating Curve Change Feasibility Analysis Study
- Downstream Release Alternatives Study
- Erosion and Sedimentation Study
- Water Quality Study
- Aquatic Resources Study
- Downstream Aquatic Habitat Study
- Threatened and Endangered Species Study
- Project Lands Evaluation Study
- Recreation Evaluation Study
- Cultural Resources Programmatic Agreement and Historic Properties Management Plan Study

Based on comments filed by stakeholders, Alabama Power filed revised study plans on March 13, 2019[3]. FERC issued a Study Plan Determination (SPD)[4] on April 12, 2019, which approved Alabama Power's study plans and included FERC staff recommendations. Alabama Power incorporated FERC's recommendations and filed the Final Study Plans with FERC on May 13, 2019[5].

Alabama Power formed the Harris Action Teams (HATs) to provide stakeholders an opportunity to work on the issues of most importance to them and, in the case of federal and state agencies, those issues where it has regulatory or statutory responsibility. The HATs include:

[2] Accession Nos. 20181010-4002 and 20181010-4003
[3] Accession No. 20190313-5060
[4] Accession No. 20190412-3000
[5] Accession No. 20190513-5093

- HAT 1 – Project Operations
- HAT 2 – Water Quality and Use
- HAT 3 – Fish and Wildlife
- HAT 4 – Project Lands
- HAT 5 – Recreation
- HAT 6 – Cultural Resources

The HATs met throughout 2018, 2019, 2020, and into 2021 to discuss the various studies. All HAT meetings from April 2020 to present were held virtually due to Coronavirus 2019 (COVID-19) and related travel and public gathering restrictions.

On April 10, 2020, Alabama Power filed six of the ten draft study reports and two cultural resources documents concurrently with the Initial Study Report (ISR), which included the consultation record for each of these six reports and cultural resource documents. On August 10, 2020, FERC sent a letter to Alabama Power discussing the Determination on Requests for Study Modifications for the R.L. Harris Hydroelectric Project [6], recommending an additional study on a Battery Energy Storage System (BESS).

The following provides a chronological account of all Draft and Final Study Reports as well as Progress Reports filed with FERC since the ISR filing on April 10, 2020.

- **Final** *Area of Potential Effects Report* on June 29, 2020[7]
- **Draft** *Downstream Aquatic Habitat Study Report* on June 30, 2020[8],
- **Final** *Downstream Release Alternatives Phase 1 Study Report* on July 27, 2020[9];
- **Draft** *Aquatic Resources Study Report* on July 28, 2020[10],
- **Draft** *Recreation Evaluation Study Report on* August 24, 2020[11].
- **Final** *Operating Curve Change Feasibility Analysis Phase 1 Study Report* on August 31, 2020[12];
- **Final** *Phase 1 Project Lands Evaluation Study Report* on October 2, 2020[13];

[6] Accession No. 20200810-3007
[7] Accession No. 20200629-5328
[8] Accession No. 20200630-5200
[9] Accession No. 20200727-5088
[10] Accession No. 20200728-5120
[11] Accession No. 20200824-5241
[12] Accession No. 20200831-5339
[13] Accession No. 20201002-5139

- Voluntary Progress Report on October 30, 2020[14];
- **Final** *Recreation Evaluation Study Report* on November 24, 2020[15]; and
- **Final** *Threatened and Endangered Species Study Report* on January 29, 2021[16].

Concurrent with this USR filing and pursuant to FERC's SPD and Determination on Requests for Study Modifications, Alabama Power is filing two draft Phase 2 study reports, four final study reports, a botanical inventory report, and the BESS Report, as follows.

- **Draft** *Downstream Release Alternatives Phase 2 Study Report*
- **Draft** *Operating Curve Change Feasibility Analysis Phase 2 Study Report*
- **Final** *Aquatic Resources Study Report*
- **Final** *Downstream Aquatic Habitat Study Report*
- **Final** *Erosion and Sedimentation Study Report*
- **Final** *Water Quality Study Report*
- A Botanical Inventory of a 35-Acre Parcel at Flat Rock Park, Blake's Ferry, Alabama
- **Draft** *Battery Energy Storage System at R.L. Harris Project Report*

The draft and final study reports include HAT meeting summaries and presentations, and documentation of consultation between April 2019 [17] through March 2021. Alabama Power will hold an USR meeting on April 27, 2021 and will file the meeting summary with FERC on May 12, 2021. Stakeholders may submit to Alabama Power and FERC by June 11, 2021, any disagreement concerning the USR meeting summary, and/or any modifications to any on-going studies or proposal to gather new information (18 Code of Federal Regulations (CFR), Section 5.15 (f)).

Sections 3.0 through 13.0 of this USR summarize the 11 FERC-approved studies in accordance with 18 CFR, Section 5.15, including 1) overall study progress, including data collected; 2) any variance from the FERC SPD and schedule; and 3) remaining activities and any modifications to the existing study or new studies proposed by Alabama Power.

[14] Accession No 20201030-5215
[15] Accession No. 20201124-5182
[16] Accession No. 20210129-5393
[17] Consultation records on some studies predate April 2019; the BESS consultation record begins April 2020 through March 2021.

3.0 OPERATING CURVE CHANGE FEASIBILITY ANALYSIS STUDY

3.1 Study Progress and Data Collection Summary

In accordance with the FERC-approved Study Plan, the evaluation of the winter pool alternatives were completed in two phases. Alabama Power filed the Draft *Operating Curve Change Feasibility Phase 1 Study Report* on April 10, 2020[18]. Alabama Power held a virtual HAT 1 meeting on June 4, 2020. Subsequently, FERC and the Alabama Department of Conservation and Natural Resources (ADCNR) submitted comments to Alabama Power on the Draft Phase 1 Study Report. As noted in Section 2.0, Alabama Power filed the Final *Operating Curve Change Feasibility Phase 1 Study Report* on August 31, 2020.

The Phase 1 Report described the hydrologic models (Hydrologic Engineering Center's River Analysis System [HEC-RAS] and Hydrologic Engineering Center's Reservoir System Simulation [HEC-ResSim]) developed for evaluating the winter pool alternatives (increasing the winter pool elevation in increments of 1 foot from 786 feet msl to 789 feet msl) and presented the results of the potential impacts of the alternatives on hydropower generation, flood control, navigation, drought operations, Green Plan (GP) flows, and downstream release alternatives. Due to timing of the development of the Phase 1 Report, Alabama Power included only the Pre-Green Plan (PGP), GP, and a 150 cubic feet per second (cfs) continuous minimum flow (CMF) in the Phase 1 Report. Shortly after Alabama Power finalized the Phase 1 Report, FERC required Alabama Power to evaluate additional downstream release alternatives. Alabama Power included the analysis of the impacts of raising the winter operating curve on the ability to pass the additional downstream release alternatives in the Draft *Operating Curve Change Feasibility Analysis Phase 2 Study Report*.

Alabama Power used the information in the Final Phase 1 Study Report along with FERC-approved relicensing study results and existing information to conduct the Phase 2 analysis to determine potential resource impacts on water quality, water use, erosion, sedimentation (including invasive species), aquatic resources, wildlife, threatened and endangered (T&E) species, terrestrial wetlands, recreation resources, downstream structures, and cultural resources. The Draft *Operating Curve Change Feasibility Analysis Phase 2 Study Report* provides the detailed methodology used to evaluate impacts on Project resources and accompanying results. Additional analyses were conducted using data from existing sources and the relicensing studies.

[18] Accession No. 20200410-5086

Alabama Power held a HAT 1 meeting on April 1, 2021, to review the results of the Phase 2 analysis with stakeholders and is filing the Draft *Operating Curve Change Feasibility Analysis Phase 2 Study Report* concurrently with the USR.

3.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Operating Curve Change Feasibility Analysis Phase 2 Study in accordance with the methods and schedule described in the FERC SPD with the following variances:

- While use of historic photos from Lake Harris was mentioned in the Study Plan, photos could not be used to assess the effects of the winter pool alternatives due to the limited resolution of publicly available historical photos needed to assess individual erosion areas.
- Alabama Power provided qualitative information (rather than quantitative information noted in the Study Plan) regarding cultural resources on Lake Harris as the analysis of cultural resources is ongoing.

3.3 Remaining Activities/Modifications or Other Proposed Studies

Phase 2 analyses are complete. Alabama Power does not propose any additional operating curve change studies beyond those in the FERC SPD.

Remaining activities include:

- Review comments on the Draft *Operating Curve Change Feasibility Analysis Phase 2 Study Report* and modify the Final Report, as appropriate. The Final Report will be filed with the Final License Application (FLA).
- Alabama Power will present its operating proposal and protection, mitigation, and enhancement (PME) measures in the Preliminary Licensing Proposal (PLP), which will be filed by July 3, 2021.

4.0 DOWNSTREAM RELEASE ALTERNATIVES STUDY

4.1 Study Progress and Data Collection Summary

In accordance with the FERC-approved Study Plan, the evaluation of the downstream release alternatives was completed in two phases. In Phase 1, study methods included using existing data (hydrologic record and baseline information) to develop the appropriate simulation models to conduct the analysis of the following downstream release alternatives:

- GP (baseline or existing condition)
- PGP
- 150CMF

The primary tool for this study was the HEC-River Analysis System (HEC-RAS); however, Alabama Power used other HEC models to address the effects of downstream release alternatives. For example, effects to Harris Reservoir in Phase 2 were evaluated by modeling the current operations combined with each downstream release alternative through the daily HEC-Reservoir Simulation Model (HEC Res-Sim) for the ACT basin.

Alabama Power filed the Draft *Downstream Release Alternatives Phase 1 Study Report* on April 10, 2020[19]. Subsequently, FERC, the Alabama Rivers Alliance (ARA), ADCNR, and the U.S. Environmental Protection Agency (USEPA) submitted comments to Alabama Power on the Draft Phase 1 Study Report. As noted in Section 2.0, Alabama Power filed the Final *Downstream Release Alternatives Phase 1 Study Report* on July 27, 2020.

During Phase 2 of this study, the outflow hydrographs from HEC-ResSim were routed downstream using HEC-RAS to assess effects of the following downstream release alternatives on Project resources (water quality, water use, erosion and sedimentation, downstream aquatic resources [temperature and habitat], wildlife and terrestrial resources, T&E species, recreation, and cultural resources):

- GP
- PGP
- Modified Green Plan
- 150CMF
- 300CMF
- 600CMF

[19] Accession No. 20200410-5069

- 800CMF
- 150CMF+GP
- 300CMF+GP
- 600CMF+GP
- 800CMF+GP

Additional analyses in Phase 2 were conducted using data from existing sources and the relicensing studies. Due to timing of the development of the Phase 1 Report and the request to evaluate additional downstream alternatives, Alabama Power included impacts from all downstream release alternatives on existing operational parameters (reservoir levels, hydropower generation, flood control, navigation and drought operations) in the Phase 2 analysis. While the SPD notes the effects analysis ongoing from June 2020-November 2021, Alabama Power and Kleinschmidt have completed the analyses.

Alabama Power held a HAT 1 meeting on April 1, 2021 to review the results of the Phase 2 analysis with stakeholders and is filing the Draft *Downstream Release Alternatives Phase 2 Study Report* concurrently with the USR.

4.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Downstream Release Alternatives Phase 2 Study in conformance with FERC's SPD. There are no variances from the study plan or schedule.

4.3 Remaining Activities/Modifications or Other Proposed Studies

Phase 2 analyses are complete. Alabama Power does not propose any downstream release alternative studies beyond those in the FERC SPD**.**

Remaining Activities include:

- Review comments on the Draft *Downstream Release Alternatives Study Phase 2 Report* and modify the Final Report, as appropriate. The Final Report will be filed with the FLA.
- Alabama Power will present its operating proposal and PME measures in the PLP, which will be filed by July 3, 2021.

5.0 BATTERY ENERGY STORAGE SYSTEM

5.1 Study Progress and Data Collection Summary

On August 10, 2020, FERC sent a letter to Alabama Power discussing the Determination on Requests for Study Modifications for the Project. In that letter, FERC recommended that Alabama Power conduct a BESS study. FERC recommended that the BESS study be conducted along with the Downstream Release Alternative Study and include at least two new release alternatives: (a) a 50 percent reduction in peak releases associated with installing one 60 MW battery unit, and (b) a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e., 5, 10 or 20 MW battery). FERC further recommended that Alabama Power include in its cost estimates for installing a BESS, any specific structural changes, any changes in turbine-generator units, and costs needed to implement each battery storage type. Finally, FERC recommended that, consistent with the Downstream Release Alternative Study Plan, Alabama Power evaluate how each of the release alternatives (i.e., items (a) and (b) above) would affect recreation and aquatic resources in the Harris Project reservoir and downstream of Harris Dam.

As discussed in the BESS report, Alabama Power does not consider installation of a BESS at the Harris Project as a reasonable alternative. The BESS study was conducted to provide FERC with the information needed to support its analysis. Although FERC recommended that these analyses be conducted as part of the Downstream Release Alternatives Study, Alabama Power determined that a separate analysis is more appropriate in that the BESS study is a screening level effort, requires a more detailed economic analysis, and considers the replacement and addition of generation equipment such as the replacement cost of a turbine and installation/replacement cost of batteries. Additionally, to model Project operations with peaking removed, the HEC-ResSim and HEC-RAS models would need to be redesigned to incorporate new operating rules. Defining new operating rules and redesigning the models is outside the scope of the study proposed by ARA and recommended by FERC. Alabama Power is filing the *Battery Energy Storage System Report* concurrently with the USR.

5.2 Variance from the Study Plan and Schedule

FERC did not request a study plan for the BESS Study but provided recommendations for the type of analysis FERC expected Alabama Power to complete. The BESS was evaluated separately from the other downstream release alternatives and results of the analysis are presented in a separate report.

5.3 Remaining Activities/Modifications or Other Proposed Studies

The BESS Study is complete. Alabama Power does not propose any additional BESS analysis beyond that recommended by FERC in its Determination on Requests for Study Modifications for the Project

Remaining Activities include:

- Review comments on the Draft *Battery Energy Storage System at R.L. Harris Project Report* and modify the Final Report, as appropriate. The Final Report will be filed with the FLA.

6.0 WATER QUALITY STUDY

6.1 Study Progress and Data Collection Summary

The Draft *Water Quality Study Report* was filed concurrently with the ISR on April 10, 2020[20]. Subsequently, the ADCNR, ARA, EPA, Alabama Department of Environmental Management (ADEM), and FERC submitted comments to Alabama Power on the Draft Study Report.

Alabama Power collected dissolved oxygen and temperature data at the generation monitor from June 1 to October 31, 2020 and at the continuous monitor from May 4 to October 31, 2020[21]. In addition, Alabama Power also collected monthly vertical profiles in the Harris Reservoir forebay from March to October 2020 and will continue collecting from March to October 2021. Alabama Power is continuing to collect water quality data at both downstream monitoring locations in 2021 (from March 1 – June 30, 2021 at the continuous monitor and June 1 – June 30, 2021 at the generation monitor) to include in the final license application.

Alabama Power is filing the *Final Water Quality Study Report* concurrently with the USR.

6.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Water Quality Study in conformance with FERC's SPD. There are no variances from the study plan or schedule.[22]

6.3 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional water quality studies.

[20] Accession No. 20200410-5095

[21] As noted in the ISR, Alabama Power also collected water quality data at 15-minute intervals at the generation monitor from June to October 2017-2019, and at the continuous monitor from March to October 2019.

[22] In the ISR, Alabama Power requested a variance to the approved Water Quality Study schedule to submit its Clean Water Act section 401 water quality certification to ADEM in April 2021, instead of as originally proposed in 2020. In the Determination on Study Modifications, FERC noted that Section 5.23(b) of the Commission's regulations requires the application for certification to be submitted to the certifying agency within 60 days of issuance of the Ready for Environmental Analysis notice, which will occur post-filing. Accordingly, a variance for submitting the certification application prior to filing the license application is not needed. As such, although a variance to the schedule does not need to be requested, Alabama Power notes that it plans to submit an application to ADEM for the 401 Water Qualification Certification (WQC) after the FLA is submitted in November 2021, not in April 2021 as noted in Alabama Power's ISR.

Remaining Activities include:

- Alabama Power will prepare the 401 WQC application and submit to ADEM after the FLA is filed with FERC.

7.0 EROSION AND SEDIMENTATION STUDY

7.1 Study Progress and Data Collection Summary

The Draft *Erosion and Sedimentation Study Report* was filed concurrently with the ISR on April 10, 2020[23]. Subsequently, the ADCNR, ARA, FERC and individual stakeholders submitted comments to Alabama Power on the Draft Study Report. Alabama Power is filing the Final *Erosion and Sedimentation Study Report* concurrently with the USR.

7.1.1 Lake Harris

Alabama Power performed additional reconnaissance at identified sedimentation sites on Lake Harris during full (summer) pool conditions to determine if any nuisance aquatic vegetation was present. Alabama Power provided the results of the nuisance aquatic vegetation assessment in Appendix F of the Final *Erosion and Sedimentation Study Report*.

7.1.2 Tallapoosa River Downstream of Harris Dam

No additional data were collected in the Tallapoosa River downstream of Harris Dam to complete the analyses presented in the Final *Erosion and Sedimentation Study Report*.

7.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Erosion and Sedimentation Study in accordance with the methods **and schedule described in the FERC SPD except for the following variance:**

- Alabama Power provided the results of the Nuisance Aquatic Vegetation Survey Report in Appendix F of the Final Erosion and Sedimentation Study Report rather than providing to HAT 3 in the form of a technical memorandum.

7.3 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional erosion and sedimentation studies, and there are no remaining activities.

[23] Accession No. 20200410-5091

8.0 AQUATIC RESOURCES STUDY

8.1 Study Progress and Data Collection Summary

As noted in Section 2.0, Alabama Power filed the Draft *Aquatic Resources Study Report*, which included the aquatic resources desktop assessment, on July 28, 2020. Subsequently, the ADCNR, ARA, EPA, individual stakeholders, and FERC submitted comments to Alabama Power on the Draft Study Report. Alabama Power held HAT 3 meetings on June 2, 2020, November 5, 2020, and March 31, 2021.

Auburn University (Auburn) conducted a literature review of temperature requirements of target species (Redbreast Sunfish [*Lepomis auratus*], Channel Catfish [*Ictalurus punctatus*], Tallapoosa Bass [*Micropterus tallapoosae*], and Alabama Bass [*Micropterus henshalli*]). Auburn University obtained temperature data from the U.S. Geological Survey (USGS), Alabama Power monitors, and the 20 temperature level loggers stationed downstream of Harris Dam and consolidated these data with historical data. Auburn continued fish sampling through January 2021 and tagged and tracked fish with acoustic/radio (CART tags) during the summer of 2020. Auburn also conducted static respirometry tests and measured active metabolic rates using a combination of increasing water velocity and decreasing water temperature. Auburn incorporated the necessary physiological parameters into bioenergetics models to conduct simulations needed to test potential influence of water temperature and flow on specific growth rates of target fishes below Harris Dam. Auburn conducted growth simulations of Redbreast Sunfish using respiration rate parameters largely gathered from Bluegill, a closely-related species. Growth simulations could not be conducted for other target species due to one or more factors, such as low sample sizes for laboratory experiments, a lack of published models developed for riverine populations, or because parameters for other target species did not fit models developed for closely-related species.

Alabama Power is filing the Final *Aquatic Resources Study Report*, including Auburn's final bioenergetics report, concurrently with the USR.

8.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Aquatic Resources Study in accordance with the methods and schedule described in the FERC SPD with the following variance:

- Auburn University did not use the 30+2 sampling method as it was determined in the field to not be feasible/effective for sampling the sites and instead, shallow areas were sampled using boat and barge electrofishing equipment, which were found to be effective in sampling shallow areas within the study sites. The boat method used was a modification of the recently developed non-wadeable index of biological integrity (IBI). Sampling intensity was modified to accommodate available habitat, sampling frequency, and therefore IBI scores were not calculated.

8.3 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional aquatic resources studies, and there are no remaining activities.

9.0 DOWNSTREAM AQUATIC HABITAT STUDY

9.1 Study Progress and Data Collection Summary

As noted in Section 2.0, Alabama Power filed the Draft *Downstream Aquatic Habitat Study Report* on June 30, 2020. Subsequently, the ADCNR and ARA submitted comments to Alabama Power on the Draft Study Report. Alabama Power held a virtual HAT 3 meeting on June 2, 2020, November 5, 2020, and March 31, 2021.

In reviewing the comments on the Draft *Downstream Aquatic Habitat Study Report*, Alabama Power determined that the primary purpose of this study was to examine effects on habitat only; therefore, in the final report, all previous data and references to temperature were removed and are now included in the Final *Aquatic Resources Study Report* and the Draft *Downstream Release Alternatives Phase 2 Study Report* consistent with that FERC-approved Study Plan.

Alabama Power continued collecting level logger data at 20 locations in the Tallapoosa River below Harris Dam through June 2020, which were incorporated into the analysis and subsequent final report.

Alabama Power is filing the Final *Downstream Aquatic Habitat Study Report* concurrently with the USR.

9.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Downstream Aquatic Habitat Study in conformance with FERC's SPD. There are no variances from the study plan or schedule.

9.3 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional downstream aquatic habitat studies, and there are no remaining activities.

10.0 THREATENED AND ENDANGERED SPECIES STUDY

10.1 Study Progress and Data Collection Summary

The Draft *Threatened and Endangered Species Desktop Assessment* was filed concurrently with the ISR on April 10, 2020[24]. Subsequently, the U.S. Fish and Wildlife Service (USFWS), ADCNR, FERC, ARA, the Alabama Glade Conservation Association, and an individual stakeholder submitted comments and questions regarding the Draft Desktop Assessment. Alabama Power held a virtual HAT 3 meeting on June 2, 2020, November 5, 2020, and March 31, 2021.

Alabama Power completed field surveys at Lake Harris and Skyline to determine if T&E species are located within the Project Boundary. As noted in Section 2.0, Alabama Power filed the Final *Threatened and Endangered Species Study Report*, including the Desktop Assessment and the results of all field investigations, on January 29, 2021.

10.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Threatened & Endangered Species Study in conformance with FERC's SPD. There are no variances from the study plan or schedule.

10.3 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional threatened and endangered species studies, and there are no remaining activities.

[24] Accession No. 20200410-5094

11.0 PROJECT LANDS EVALUATION STUDY

11.1 Study Progress and Data Collection Summary

The Draft *Phase 1 Project Lands Evaluation Study Report* was filed concurrently with the ISR on April 10, 2020[25]. Subsequently, the ADCNR and FERC submitted comments to Alabama Power on the Draft Study Report. As noted in Section 2.0, Alabama Power filed the Final *Phase 1 Project Lands Evaluation Study Report* on October 2, 2020. Alabama Power held a HAT 4 meeting on October 19, 2020, to present the Draft Shoreline Management Plan (SMP) and the Wildlife Management Plan (WMP) annotated outline.

Samford University conducted a botanical survey on an additional 35 acres of land adjacent to the previously surveyed area at Flat Rock Park. This additional botanical inventory report (*A Botanical Inventory of a 35-Acre Parcel at Flat Rock Park, Blake's Ferry, Alabama)* is being filed concurrently with the USR.

Phase 2 of this study is using the results of Phase 1 and other Harris relicensing studies to develop a WMP and a SMP. Specific activities for developing the SMP and WMP are included in the FERC-approved Study Plan.

11.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Project Lands Evaluation in conformance with FERC's SPD. There are no variances from the study plan or schedule.

11.3 Remaining Activities/Modifications or other Proposed Studies

Alabama Power does not propose any additional land evaluation studies.

Remaining activities include:

- Alabama Power will file a WMP and SMP with the FLA.

[25] Accession No. 20200410-5092

12.0 RECREATION EVALUATION STUDY

12.1 Study Progress and Data Collection Summary

As noted in Section 2.0, Alabama Power filed the Draft *Recreation Evaluation Study Report* on August 24, 2020[26]. Subsequently, the ADCNR, ARA, Tim Coe (Mayor of Wedowee), Donna McKay (Mayor of Town of Wadley), Bob Fincher (State Representative 37th House District), individual stakeholders, and FERC submitted comments to Alabama Power on the Draft Study Report. Alabama Power held HAT 5 meetings on June 4, 2020 and October 19, 2020. As noted in Section 2.0, Alabama Power filed the Final *Recreation Evaluation Study Report* on November 24, 2020.

12.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Recreation Evaluation Study in accordance with the methods and schedule described in the FERC SPD, including a variance that was approved by FERC on August 10, 2020.

12.3 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional recreation studies, and there are no remaining activities.

[26] This was noted as a schedule variance in the Initial Study Report due to the additional study elements and extended participation deadlines.

13.0 CULTURAL RESOURCES STUDY

13.1 Study Progress and Data Collection Summary

The Harris Project Cultural Resources *Programmatic Agreement and Historic Properties Management Plan* Study Plan involves collecting and summarizing existing cultural resources baseline information and developing a plan to assess cultural resources identified in the Harris Project Area of Potential Effect (APE). Alabama Power filed the *Inadvertent Discovery (IDP) Plan and Traditional Cultural Properties (TCP) Identification Plan* concurrent with the ISR on April 10, 2020[27]. Subsequently, stakeholders submitted comments to Alabama Power[28]. On May 15, 2020, Alabama Power provided the Draft *Area of Potential Effects Report* to HAT 6 for review. Alabama Power held a HAT 6 meeting on May 28, 2020 to discuss the APE report and the status of the TCP Identification study. Alabama Power filed the Final *Area of Potential Effects Report* on June 29, 2020[29]. On August 11, 2020, FERC issued its Determination of Area of Potential Effects for the Project[30]. Alabama Power held a virtual site visit of Skyline on March 4, 2021, for applicable tribes and the Alabama Historical Commission.

Alabama Power concluded cultural resources assessments for the sites identified during the Lake Harris preliminary archeological assessment in February 2021 and will complete the TCP identification process with the Muscogee (Creek) Nation in April 2021.

In addition to assessments on sites on Lake Harris, Alabama Power completed cultural resource assessments for Skyline. Further, as part of the Draft *Downstream Release Alternatives Phase 2 Study Report,* Alabama Power reviewed the effects of Project operations (including any proposed changes in downstream releases) to the known cultural resources downstream of Harris Dam[31].

[27] Accession No. 20200410-5068

[28] The Draft TCP Identification Plan and IDP Plan were distributed to HAT 6 for comments in February 2020.

[29] This was noted as a schedule variance in the Initial Study Report.

[30] Accession No. 20200811-3007

[31] This was a desktop review and did not include cultural resource assessments as most of the cultural resources downstream are outside of Alabama Power's administrative area of control.

13.2 Variance from the Study Plan and Schedule

Alabama Power conducted the Cultural Resources Programmatic Agreement and Historic Properties Management Plan Study in conformance with FERC's SPD with the following variances:

- a variance for filing the Final *Area of Potential Effects Report* which was approved by FERC following the ISR.
- will complete the TCP identification process with the Muscogee (Creek) Nation in April 2021 (rather than February 2021 as noted in the Study Plan).

13.3 Remaining Activities/Modifications or Other Proposed Studies

Alabama Power does not propose any additional cultural studies.

Remaining Activities include:

- Alabama Power will complete eligibility assessments for known cultural resources by July 2021.
- Alabama Power will issue determination of effect on historic properties by July 2021.
- Alabama Power will develop a Draft Historic Properties Management Plan (HPMP) for the Harris Project to be filed concurrently with the PLP. The HPMP will describe the Harris Project, APE, anticipated effects, and Alabama Power's proposed measures to protect historic properties.

Document Content(s)

HAT 1 - Draft Operations Reports

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Mon 4/12/2021 7:03 PM

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HAT 1,

The draft Operating Curve Feasibility Analysis Phase 2 Report, draft Downstream Release Alternatives Phase 2 Report and draft BESS Report are available for your review on the Harris relicensing website in the HAT 1 folder. These reports can also be found on FERC's website (http://www.ferc.gov) by going to the "elibrary" link and entering docket number P-2628.

Please submit your comments on these reports to Alabama Power at harrisrelicensing@southernco.com by **May 11, 2021**.

Thanks,

Angie Anderegg
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April 12, 2021

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Battery Energy Storage System Report

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC or Commission) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628-065). On April 12, 2019, FERC issued its Study Plan Determination[1] (SPD) for the Harris Project, approving Alabama Power's ten relicensing studies with FERC modifications. On May 13, 2019, Alabama Power filed Final Study Plans to incorporate FERC's modifications and posted the Final Study Plans on the Harris relicensing website at www.harrisrelicensing.com.

Alabama Power filed its Initial Study Report (ISR)[2] with FERC on April 10, 2020 and held an ISR Meeting on April 27, 2020. On June 11, 2020, Alabama Rivers Alliance (ARA) filed comments on the ISR, requesting a new study titled "Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts". On August 10, 2020, FERC issued a Determination on Requests for Study Modifications for the Harris Project. In its determination, FERC recommended that Alabama Power conduct a BESS Study along with the Downstream Release Alternative Study. Alabama Power determined that a separate analysis is more appropriate in that the BESS study is a screening level effort, requires a more detailed economic analysis, and considers the replacement and addition of generation equipment such as the replacement cost of a turbine and installation/replacement cost of batteries. The Draft Battery Energy Storage System Report (Draft Report) is contained in Attachment 1. Stakeholders have until May 11, 2021 to submit their comments to Alabama Power on the Draft Report. Comments should be sent directly to harrisrelicensing@southernco.com.

[1] Accession Number 20190412-3000.
[2] Accession Number 20200410-5084.

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg
Harris Relicensing Project Manager

Attachment 1 – Draft Battery Energy Storage System Report
Attachment 2 – BESS Study Report Consultation Record (April 2020-March 2021)

cc: Harris Action Team 1 Stakeholder List

HAT 1 - April 1 Meeting Summary

APC Harris Relicensing <g2apchr@southernco.com>

Fri 4/16/2021 4:22 PM

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HAT 1,

The meeting summary and presentation from our April 1 meeting can be found on the Harris relicensing website in the HAT 1 - Project Operations folder.

Thanks,

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Meeting Summary
Harris Relicensing Harris Action Team (HAT) 1 Meeting
April 1, 2021
9:00 am – 11:00 am
Microsoft Teams Meeting

Participants:
Angie Anderegg – Alabama Power Company (Alabama Power)
Dave Anderson – Alabama Power
Wesley Anderson – Alabama Power
Jeff Baker – Alabama Power
Jason Carlee – Alabama Power
Keith Chandler – Alabama Power
Evan Collins – U.S. Fish and Wildlife Service (USFWS)
Allan Creamer – Federal Energy Regulatory Commission (FERC)
Jim Crew – Alabama Power
Colin Dinken – Kleinschmidt Associates (Kleinschmidt)
Scott Fant – Alabama Power
Amanda Fleming – Alabama Power
Todd Fobian – Alabama Department of Conservation and Natural Resources (ADCNR)
Chris Goodman – Alabama Power
Stacey Graham – Alabama Power
Jim Hancock – Balch and Bingham
Jennifer Haslbauer - Alabama Department of Environmental Management (ADEM)
James Hathorn – U.S. Army Corps of Engineers (USACE)
Mike Holley – ADCNR
Martha Hunter – Alabama Rivers Alliance (ARA)
Elise Irwin – U.S. Geological Survey (USGS)
Kelly Kirven – Kleinschmidt
Michael Len – ADEM
Fred Leslie – ADEM
Ashley Lockwood – ADEM
Donna Matthews – Downstream Property Owner
Tina Mills – Alabama Power
Jason Moak – Kleinschmidt
David Moore –ADEM
Barry Morris – Lake Wedowee Property Owners Association (LWPOA)
Kevin Nebiolo – Kleinschmidt
Jessica Nissenbaum – Alabama Power
Kenneth Odom – Alabama Power
Erin Padgett – USFWS
Alan Peeples – Alabama Power
Sarah Salazar – FERC
Kelly Schaeffer – Kleinschmidt
Sheila Smith – Alabama Power
Thomas St. John – Alabama Power
Monte Terhaar – FERC

Jimmy Traylor – Downstream Property Owner
Sandra Wash – Kleinschmidt
Jack West – ARA

Meeting Summary:
Angie Anderegg (Alabama Power) opened the meeting with a safety moment and stated the meeting purpose: to present a summary of the quantitative and qualitative analysis of potential resource effects from the downstream release alternatives. Angie noted the Draft *Downstream Release Alternatives Phase 2 Study Report* would be filed April 12, 2021 with a stakeholder comment period until May 11, 2021. Dave Anderson (Alabama Power) reminded the participants of the downstream release alternatives that were analyzed in the Phase 1 report and provided a summary of the models and assumptions used in the study. Dave presented the effects of the downstream release alternatives on Harris Reservoir elevations, generation, revenue, flood control, navigation, drought operations, and the Martin Project Conditional Fall Extension.

Jimmy Traylor (Downstream Property Owner) asked what the generation would be in megawatts (MWs) with the continuous minimum flow (CMF) of 300 cubic feet per second (cfs). Angie replied the assumption used in the HydroBudget model was approximately 2.5 MWs for the theoretical 300 CMF unit. Angie explained the assumption for all the continuous minimum flow alternatives is that the flow is making power, but the power is provided off-peak with a separate unit. Jimmy inquired if Project resources, including generation for Alabama Power, would benefit if Lake Harris was raised year-round (with updated turbines at Harris Dam). Dave noted that the United States Army Corps of Engineers (USACE) Water Control Manual (WCM) dictates the operations at Lake Harris and the most efficient turbines were installed in the 1970s based on the size and head provided by the reservoir. Jimmy clarified his question, if Alabama Power would benefit financially with a raised operating curve and downstream flow regime that was approved by USACE. Dave explained that the Harris Relicensing Project studies analyze changing the winter rule curve at Lake Harris and providing releases in the Tallapoosa River downstream of the Dam. Specifically, the studies analyze the effects on resources, including generation and revenue to Alabama Power. Barry Morris (Lake Wedowee Property Owners Association, LWPOA) asked for clarification that a third unit would provide the minimum flow. Angie confirmed that the assumption for the model includes a new minimum flow unit that would release the flow and would make power.

Jason Moak (Kleinschmidt Associates (Kleinschmidt)) presented the effects of the downstream release alternatives on water quality and water use. Sarah Salazar (Federal Energy Regulatory Commission (FERC)) asked what stratification layer of the water column was being drawn from for generation. Jason M. confirmed water was being drawn from approximately 30-feet below the surface which, depending on the time of year, is either the metalimnion layer (a transition layer between the epilimnion and hypolimnion layer), or the hypolimnion. Jason M. added that the lake is a dynamic system that varies year-to-year. Jason M. referenced the *Water Quality Study Report* that notes a “u-shaped curve” has been experienced in some years, with a higher dissolved oxygen (DO) layer and warmer temperatures on top, a middle layer exhibiting lower DO, and a bottom layer with higher DO. Jason M. suggested this could be due to runoff and oxygen-demanding organic matter residing in the middle layer. Sarah asked if the models could show how the stratification layer might change under the different alternatives. Jason M. responded that it had not been modeled but major differences would not be expected based on existing information.

Jack West (Alabama Rivers Alliance (ARA)) inquired on the status of existing aeration devices. Jason M. responded that Alabama Power has draft tube aeration on the existing turbines that are operated in the low-DO season as well as a moveable sill that was incorporated into the design to allow the intake to draw from different layers in water column. Jason M. noted that the sill has been in the uppermost position for the last 15-20 years drawing from relatively high in the water column.

Allan Creamer (FERC) inquired if the hypothetical unit to capture the minimum flows would also be designed with aeration. Angie confirmed, as any flow that is passed from the Harris Dam would also need to meet the state water quality standard. Allan provided a hypothetical scenario where the weir is in its uppermost position (not varying) with the lake level elevation decreasing one foot. Allan stated that in theory more of the upper layer in the summer would be heated by the sun and would expect increased temperatures downstream. Jason M. noted that in this scenario the opposite effect also occurs. Jason M. explained that retention time would be reduced, so there would be less time for the water to be heated by the sun. Allan stated he would expect a little variation but that it may not be significant and that the two scenarios could potentially cancel each other. Jason. M. agreed that the two scenarios would likely cancel each other. Allan stated that temperature impacts could be modeled but may be beneficial to monitor the temperature post-implementation.

Jason M. presented the results on Erosion and Sedimentation and mentioned general trends downstream of Harris Dam. Regarding the table on slide 27 in the presentation, Sarah asked why the 300 CMF does not follow those general trends, specifically why the average daily fluctuations increased at 1 mile downstream under the 600 CMF+Green Plan (GP) compared to the 300 CMF+GP. Jason M. noted the data would be rechecked to confirm there was not an error in the presentation[1].

Jason M. presented the Aquatic Resources analysis regarding aquatic habitat, temperature, and fish entrainment. Keith Chandler (Alabama Power) asked for clarification on the Daily Average Wetted Perimeter Fluctuation table (slide 36). Jason M. explained that the percent changes in the table show the differences from existing conditions (GP) in daily average wetted perimeter fluctuation. For example, the 800 CMF alternative at two miles downstream shows wetted perimeter fluctuations would be reduced by 82% compared to baseline conditions.

Jason M. noted the HEC-RAS model revealed little difference in overall average water temperatures between each downstream release alternative at all locations analyzed; however, a noticeable difference in daily temperature fluctuations was present closer to Harris Dam. Barry asked for clarification on his interpretation that under any continuous minimum flow alternative, temperature variations would still exist downstream when generating. Jason M. noted that while the average temperature does not change between the alternatives, the daily fluctuation in temperature is smaller under some of the minimum flow alternatives. Angie confirmed that a delta or change in temperature does exist under any alternative. Jason M. added that daily 2–3-degree Celsius (°C) deltas can be present in unregulated streams on a summer day with natural conditions. Sarah requested that parameters (in graphs and boxplots) be defined in each graph to aid in data interpretation. Jack stated that daily short-term temperature variations decrease as minimum flow alternatives increase. With regard to the new minimum flow unit, Jack asked if

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[1] There was an error in the presentation and the results are accurately portrayed in the Draft *Downstream Release Alternatives Phase 2 Study Report*. The table has been corrected in the attached presentation.

the flows would be drawn from higher in the reservoir or at the same depths as the main units. Jason M. replied that the assumption is that the flows from the theoretical unit would be drawn from the same depth and existing penstock, and that is why the average temperatures are not changing.

Regarding a potential new unit and penstock location, Allan asked if a new unit could be designed to draw water from higher in the water column. Angie stated that an engineering design analysis would have to be completed, but a new intake may require boring into the dam. Allan stated that if a minimum flow is drawing from higher in the water column, it could potentially put warmer water downstream and decrease temperature fluctuations but noted design considerations and limitations. Keith added that deltas would likely increase under that scenario when the existing units were loaded. Jason M. also added that deltas decrease with a CMF due to having more water in the channel as it prevents the water from getting shallower and experiencing thermal heating.

Jason M. presented results on wildlife and terrestrial resources and threatened and endangered (T&E) species. Sarah asked if there were any results for state-listed species. Jason M. noted he was unsure if there were any state-listed species in the Project Area. Angie noted Alabama Power would confirm[2]. Sarah asked how littoral and wetland types may shift, in terms of acreage under the different alternatives. Jason M. stated that this information is in the report. Jack asked if the analysis considered the Finelined Pocketbook (*Hamiota altilis*) (mussel) critical habitat that is located upstream of the reservoir. Jason M. confirmed and noted that the critical habitat is upstream of the reservoir and outside of the area that fluctuates. In addition, none of the downstream release alternatives increase the elevation of the reservoir, thus, there is no effect upstream. Jack asked if greater releases downstream could potentially lower the elevation of the lake in a way that impacts the critical habitat. Jason M. responded that if the lake is lower, that transitional section from flowing water into lake habitat would shift further downstream; however, since the critical habitat is above the current reservoir fluctuations, lower lake levels shouldn't impact the area.

Colin Dinken (Kleinschmidt) and Dave presented recreation results. Martha Hunter (ARA) stated that effects on the lake and downstream resources are both important and there are a lot of issues to consider. Martha asked if Alabama Power budgeted for a new generator that would allow for a CMF. Angie responded no and explained that a theoretical unit was used in the modeling. Martha noted that although the unit is theoretical, the study results and the impacts to Project resources suggest there will be some sort of upgrade to the equipment at Harris. Under the assumption that a more efficient generator would be installed, Martha asked if an ideal lake level could first be determined to dictate the amount of flow released downstream. Kelly Schaeffer (Kleinschmidt) replied no and noted that Alabama Power evaluated the alternatives that were proposed by stakeholders and FERC. Kelly added that if a minimum flow is selected, Alabama Power will then evaluate how to provide the flow. Kelly stated that the Preliminary Licensing Proposal (PLP) will incorporate all the study results and contain Alabama Power's operating proposal. Martha asked if Alabama Power would be required to modify the proposal if FERC disagreed. Kelly replied that Alabama Power's goal is to ensure FERC has been provided enough information to make a decision, but FERC could request additional information or clarification. Sarah encouraged stakeholders to provide comments on the PLP. Sarah added that there is an

[2] The Lipstick Darter (*Etheostoma chuckwachatte*) is a state-protected fish species occurring downstream of Harris Dam. The Finelined Pocketbook (*Hamiota altilis*) is a federal and state-protected mussel species with critical habitat located in the Tallapoosa River upstream of Harris Reservoir.

additional comment period on the Final License Application (FLA), and FERC will consider stakeholder comments and recommendations. Sarah asked what criteria were used to determine which lake structures were removed from the recreation analysis, and Colin replied that a field inventory was performed to confirm the imagery, and structures that were severely damaged, appeared to be unmaintained or unused, or were under construction were omitted from the analysis.

Amanda Fleming (Alabama Power) presented results of the cultural analysis. Sarah inquired about the results of the table on slide 59, specifically that the third column represents the increase in percent of time that sites would be inundated versus the total. Amanda confirmed and added that Pre-GP is negative and represents less time of inundation compared to baseline (GP).

Barry mentioned when the GP was first being considered, one of the options was a re-regulation dam downstream that would provide a smaller lake to capture water and release flow slowly. Barry asked if that was still an option. Angie responded that it was eliminated when the GP was being evaluated as it essentially created an additional lake and potential adverse impacts to environmental resources. Jack noted that Alabama Power is in the process of completing the Battery Energy Storage System (BESS) study and inquired if it would be reevaluated with the other alternatives. Angie replied that the BESS analysis is being considered separately due to comparison constraints. Angie explained that models with operating rules exist in the Downstream Release Alternatives Study, with one rule being that the Project is to operate for power/peaking. Angie added that the power/peaking would be removed under the BESS alternative and would require new operating rules, which is beyond the scope of the analysis. Angie noted the analysis has been completed, including the impacts on aquatic resources and recreation, and the report will be filed on April 12, 2021 for review and comment.

The meeting concluded.

HAT 1 meeting - BESS study

APC Harris Relicensing <g2apchr@southernco.com>

Thu 4/22/2021 5:38 PM

To: APC Harris Relicensing <harrisrelicensing@southernco.com>
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<jeff_duncan@nps.gov>; Martindale, Lisa (LMARTIND@southernco.com) <LMARTIND@southernco.com>; Crew, James F. <JFCREW@southernco.com>

HAT 1,

We are going to have a HAT 1 meeting on May 3rd, 2:00-3:00, to walk through the BESS study results and answer any questions you may have. Teams meeting information is below.

Thanks

Angie Anderegg
Hydro Services
(205)257-2251
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From: Jack West <jwest@alabamarivers.org>
Sent: Friday, April 23, 2021 8:42 AM
To: Anderegg, Angela Segars
Cc: Sarah Salazar
Subject: Re: Next Week's Harris Updated Study Report Meeting

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie,

Thanks for sharing the draft agenda, and with all there is to get through next Tuesday, I agree that a separate meeting to discuss the BESS report makes sense. Thank you for setting that up. The Synapse guys will join for that one but will likely not be attending the meeting on Tuesday.

I look forward to the meeting Tuesday. Have a great weekend.

On Thu, Apr 22, 2021 at 5:30 PM Anderegg, Angela Segars <ARSEGARS@southernco.com> wrote:

> Hi Jack,
>
> Below is the agenda for the USR meeting. On Monday, I'm going to send this out to all stakeholders, along with the call in information and a link to the meeting presentation. You are welcome to forward the meeting invite to the Synapse folk and we'll make sure to capture them in the attendee list for the meeting. If they would like to be added to the overall stakeholder list, or any of the HATs, just ask them to forward me their contact info.
>
> Because we will be walking through where we are with all of the studies, we won't spending a ton of time on BESS on Tuesday. However, I do think it's a good idea to have a HAT 1 meeting specific to the BESS study, so stakeholders have more opportunity to ask questions. I'm going to send out a meeting notice for a HAT 1 meeting for Monday, May 3rd at 2:00.
>
> 9 AM – Introduction, Roll Call, Safety Moment
>
> 9:15 AM – USR Summary by Study
>
> - Operating Curve Change Feasibility Analysis
> - Downstream Release Alternatives
> - Battery Energy Storage System
> - Water Quality
> - Erosion and Sedimentation

- Aquatic Resources
- Downstream Aquatic Habitat
- Threatened and Endangered Species
- Project Lands Evaluation
- Recreation Evaluation
- Cultural Resources

Review any Action Items

Adjourn

Thanks!

Angie Anderegg

Hydro Services

(205)257-2251

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From: Jack West <jwest@alabamarivers.org>
Sent: Wednesday, April 21, 2021 3:50 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Cc: Sarah Salazar <sarah.salazar@ferc.gov>
Subject: Next Week's Harris Updated Study Report Meeting

Hi Angie,

I hope you're doing well. We are preparing for the Updated Study Report meeting on Tuesday, and I wanted to check with you to see if an agenda is available for that meeting. I know a lot will be compressed into three hours. We have engaged a consulting firm, Synapse Energy Economics, to advise on the battery storage study report, and they will be joining for part of the meeting. I can provide you names and email addresses of attendees if you need to update an invite list, or I can simply share the meeting link with them if that is easier.

If a draft agenda is available, it would be helpful to let them know the structure of the meeting and what parts are relevant to them.

Thanks, and we look forward to attending next week.

Best,

--

Jack West, Esq.

Policy and Advocacy Director

Alabama Rivers Alliance

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www.alabamarivers.org [alabamarivers.org]

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--

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Harris Relicensing - Updated Study Report Meeting

Anderegg, Angela Segars <ARSEGARS@southernco.com>

Mon 4/26/2021 2:53 PM

To: APC Harris Relicensing <g2apchr@southernco.com>

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Harris relicensing stakeholders,

The presentation for tomorrow's Updated Study Report meeting is available on the Harris relicensing website (Relicensing Documents). Microsoft Teams call-in information is below.

I look forward to talking with you tomorrow.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: APC Harris Relicensing
Sent: Monday, April 12, 2021 1:47 PM
To: APC Harris Relicensing <harrisrelicensing@southernco.com>
Subject: Harris Relicensing - Updated Study Report

Harris relicensing stakeholders,

Pursuant to FERC's Integrated Licensing Process, Alabama Power filed its Harris Project Updated Study Report (USR) today. Concurrent with the USR filing, Alabama Power filed three draft study reports, four final study reports and the results of a Botanical Inventory at Flat Rock Park. Stakeholders may access the USR and the study reports on FERC's website (http://www.ferc.gov) by going to the "eLibrary" link and entering the docket number (P-2628). The USR and study reports are also available on the Project relicensing website at http://harrisrelicensing.com.

The Updated Study Report meeting will be held on **April 27, 2021**. Please hold this date from 9:00 am to 12:00 pm central time. Call in information for the meeting can be found below. The purpose of the meeting is to provide an opportunity to review the contents of the USR.

Alabama Power will file a summary of the USR meeting by **May 12, 2021**. Stakeholders will have until **June 11, 2021** to file written comments with FERC on the USR Meeting Summary.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

Microsoft Teams meeting

Join on your computer or mobile app

Click here to join the meeting

Video Conference ID: 112 301 635 7
Alternate VTC dialing instructions
Or call in (audio only)
+1 470-705-0860,,168184661# United States, Atlanta
Phone Conference ID: 168 184 661#
Find a local number |

Updated Study Report (USR) Meeting

R.L. Harris Dam Relicensing
FERC No. 2628

April 27, 2021

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Meeting Etiquette

- ❑ Be patient with technology issues
- ❑ Follow the facilitator’s instructions
- ❑ Phones will be muted during presentations
- ❑ Turn off cameras to avoid bandwidth issues
- ❑ Meeting will be recorded to assist with preparing the meeting summary
- ❑ Follow along with PDF of presentations
- ❑ Facilitator will ask for participant questions at designated times during presentation; chat feature also available for questions
- ❑ Clearly state name and organization when asking questions

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Safety and Roll Call

Source: USCG Recreational Boating Report

Accidents happen!

Be prepared while on the water:

- PFDs
- Inspected fire extinguisher
- First aid kit
- Tool kit with flashlight
- Float plan
- Check the weather

Harris Relicensing Milestones

April 12, 2021 FERC Filing

❖Updated Study Report

❖Draft Reports

- Downstream Release Alternatives Phase 2
- Operating Curve Change Feasibility Analysis Phase 2
- Battery Energy Storage System (BESS)

❖Final Reports

- Aquatic Resources
- Erosion and Sedimentation
- Downstream Aquatic Habitat
- Water Quality
- A Botanical Inventory of a 35-Acre Parcel at Flat Rock Park, Blake's Ferry, Alabama

- Stakeholder comments on Draft Reports - May 11, 2021
- USR Meeting Summary - May 12, 2021
- USR Meeting Summary comments - June 11, 2021
- Preliminary Licensing Proposal (PLP) - by July 3, 2021
  - 90-day comment period
- Final License Application (FLA) and 3 Final Reports – by November 30, 2021

USR Meeting Purpose

Pursuant to 18 C.F.R. § 5.15(f)

- Overall study progress, including data collected
- Any variance from the study plan or schedule
- Remaining activities or study modifications, if any

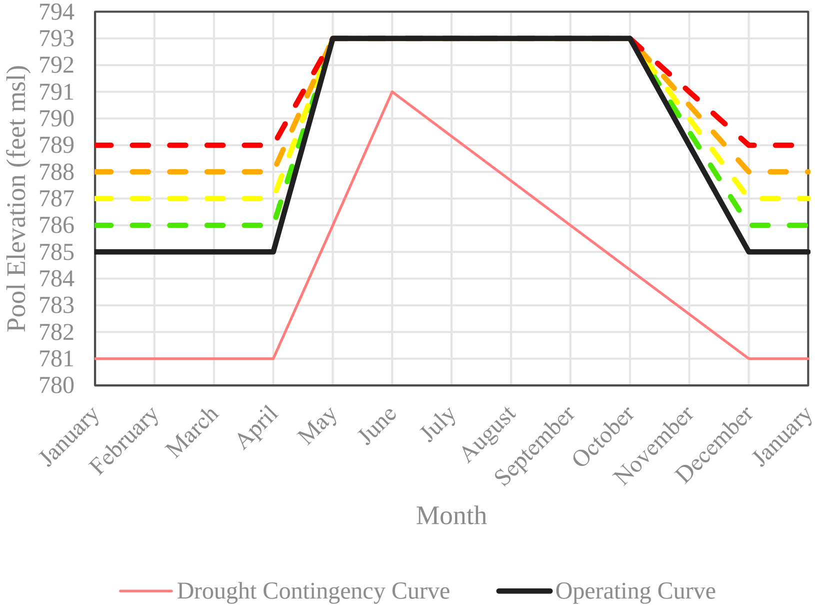
Summary of HAT Meetings – Post ISR

Meeting	Description	Date
Initial Study Report	Alabama Power presented information on the progress of each study including applicable study results, variances requested, and any additional studies or requested study modifications.	04/28/2020
HAT 3	Auburn University presented research to date and informed the HAT of remaining work on the Aquatic Resources Study.	06/02/2020
HAT 1 and 5	Alabama Power presented the methodology for: • analyzing the number of usable recreation structures on Lake Harris at the current winter operating curve and the alternatives • analyzing how structures located downstream of Harris Dam might be affected by a change in the winter operating curve during a 100-year flood event	06/04/2020
HAT 4	Alabama Power reviewed the goals and objectives of the Project Lands EvaluationStudy and discussed the Shoreline Management Plan and the Wildlife Management Plan outline.	10/19/2020
HAT 5	Alabama Power discussed the Phase 2 analyses for the recreation component of the Downstream Release Alternatives study including the definition for boatable flows, as well as potential recreation PME measures.	10/19/2020
HAT 3	Alabama Power presented modeling results on the Downstream Aquatic Habitat Study and discussed Auburn University's progress to date on the Aquatic Resources Study.	11/05/2020
Selected HAT 6	Alabama Power and OAR presented a virtual cultural resources overview of Skyline. Selected HAT 6 participants attended due to the privileged nature of material.	03/04/2021
HAT 3	Alabama Power and Auburn University presented results of the Downstream Fish Population Study for the Aquatic Resources Study.	03/31/2021
HAT 1	Alabama Power presented results of the Phase 2 Operating Curve Change Feasibility Analysis Study and the Phase 2 Downstream Release Alternatives Study.	04/01/2021

Agenda

Harris Relicensing Studies
• Operating Curve Change Feasibility Analysis
• Downstream Release Alternatives
• Battery Energy Storage System (BESS)
• Water Quality
• Erosion and Sedimentation
• Aquatic Resources
• Downstream Aquatic Habitat
• Threatened and Endangered (T&E) Species
• Project Land Evaluation
• Recreation Evaluation
• Cultural Resources

Harris Operating Curve and Operating Alternatives



- Evaluated in increments of 1 foot from 786 feet msl to 789 feet msl

Phase 1

- Modeling to evaluate potential impacts of winter operating curve change on:
  - generation
  - flood control
  - navigation
  - drought operations
  - Green Plan flows
  - downstream release alternatives

Phase 2

- quantitative and qualitative evaluations of potential resource impacts

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Operating Curve Change Feasibility Analysis Study

Study Progress:

- Used existing information, relicensing studies, and Phase 1 analysis
- Phase 2 Analysis analyzed operating curve effects on Project resource areas

- HAT 1 Meetings - June 4, 2020, and April 1, 2021

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Operating Curve Change Feasibility Analysis Study

Resource	+1 Foot	+2 Feet	+3 Feet	+ 4 Feet
Hydro Generation	$(19,400)	$(40,600)	$(52,100)	$(124,900)
Harris Reservoir Elevations	Over the period of record, increasing the winter pool elevation did not affect the amount of time the reservoir was at or above the full summer pool elevation of 793 feet msl.			
Downstream Effects of 100-Year Design Flood	298 acres (4.9%)	485 acres (7.9%)	686 acres (11.2%)	889 acres (14.6%)
Spillway Operation	12 (0.1%)	13 (0.1%)	20 (0.1%)	37 (0.2%)
Turbine Capacity Operation	15 (0.0%)	29 (0.1%)	54 (0.1%)	103 (0.3%)
Navigation	No Effect			
Drought Operations	No Effect			
Green Plan Flows	No Effect			
Downstream Release Alternatives	No Effect			
Structures Downstream of Harris Dam	0	4	4	9
Water Quality – Harris Reservoir	No Effect			
Water Quality – Harris Dam Discharge	No Effect			
Water Use – Harris Reservoir	Minor Beneficial Effect			
Water Use – Tallapoosa River	No Effect			

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Operating Curve Change Feasibility Analysis Study

Resource	+1 Foot	+2 Feet	+3 Feet	+ 4 Feet
Erosion – Harris Reservoir	No Effect			
Sedimentation – Harris Reservoir	Adverse Effect			
Erosion – Tallapoosa River	Minor Adverse Effect			
Sedimentation – Tallapoosa River	No Effect			
Aquatic Resources – Harris Reservoir	Beneficial Effect			
Aquatic Resources – Tallapoosa River	No Effect			
Wildlife – Harris Reservoir	Beneficial Effect			
Wildlife – Tallapoosa River	No Effect			
T&E Species – Harris Reservoir and Tallapoosa River	No Effect			
Terrestrial Wetlands – Harris Reservoir	Beneficial Effect			
Terrestrial Wetlands – Tallapoosa River	No Effect			
Recreation – Harris Reservoir	9.1%	17.8%	31.3%	41.4%
Recreation – Tallapoosa River	Minor Adverse Effect			
Cultural Resources – Harris Reservoir	Minor Beneficial Effect			
Cultural Resources – Tallapoosa River	Potential Adverse Effect			

Operating Curve Change Feasibility Analysis Study

Variances:

- ❖ Historic photos of Lake Harris could not be used to assess the effects of the winter pool alternatives due to the limited resolution to assess individual erosion areas.

- ❖ Provided qualitative information (rather than quantitative information noted in the Study Plan) regarding cultural resources on Lake Harris
    - analysis of cultural resources is ongoing.

Remaining Activities

- ❖ Stakeholder comments on the Draft Phase 2 Study Report

- ❖ Present the operating proposal and PME measures in PLP

Review of Downstream Release Alternatives Analyzed in Phase 2

Name/Description	Abbreviation
Green Plan (baseline or existing condition) – pulsing flows as described in the Green Plan release criteria	GP
Pre-Green Plan (peaking only; no pulsing or continuous minimum flow)	PreGP or PGP
Modified Green Plan	ModGP
150 cfs continuous minimum flow (CMF)	150CMF
300 cfs continuous minimum flow	300CMF
600 cfs continuous minimum flow	600CMF
800 cfs continuous minimum flow	800CMF
A hybrid Green Plan that incorporates both a base minimum flow of 150 cfs and the pulsing described in the existing Green Plan release criteria	150CMF+GP
A hybrid Green Plan that incorporates both a base minimum flow of 300 cfs and the pulsing described in the existing Green Plan release criteria	300CMF+GP
A hybrid Green Plan that incorporates both a base minimum flow of 600 cfs and the pulsing described in the existing Green Plan release criteria	600CMF+GP
A hybrid Green Plan that incorporates both a base minimum flow of 800 cfs and the pulsing described in the existing Green Plan release criteria	800CMF+GP

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Operations Model Assumptions

- A rule for peaking operations is included in all simulations.
- The minimum elevation for Harris Reservoir is 770.5 feet msl.
- Pre-Green Plan: The release criteria from the Green Plan contained in the model were removed.
- Continuous Minimum Flows: A new continuous release rule replaces the current Green Plan release rule. The releases were reduced to 85 cfs when the flows at the Heflin gage drop below 50 cfs. This is the drought cutback in the current Green Plan.
- Continuous Minimum Flows + Green Plan: A new continuous release rule is added with the current Green Plan release rule. Both rules reduce their releases to 85 cfs when the flows at the Heflin gage drop below 50 cfs. This is the drought cutback in the current Green Plan.
- A theoretical minimum flow unit that uses same intake as existing Harris unit to produce power.

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Downstream Release Alternatives Study

Study Progress

- Phase 2 Analysis:
  - Outflow hydrographs from HEC-ResSim were routed downstream using HEC-RAS to assess effects of the downstream release alternatives on Project resources

- HAT 1 Meeting - April 1

Downstream Release Alternatives Study

Resource	PreGP	ModGP	150CMF	300CMF	600CMF	800CMF	150CMF+GP	300CMF+GP	600CMF+GP	800CMF+GP
Harris Reservoir Elevations	=	=	=	=	-	-	=	-	-	-
Hydro Generation	+	-	-	-	-	-	-	-	-	-
Flood Control	=	=	=	=	=	=	=	=	=	=
Navigation	=	=	=	=	=	=	=	=	=	=
Drought Operations	=	=	=	=	=	=	=	=	=	=
Martin Conditional Fall Ext.	+	=	+	+	-	-	-	-	-	-
Water Quality - Reservoir	=	=	=	=	-	-	=	-	-	-
Water Quality – Tallapoosa	=	=	=	=	=	=	=	=	=	=
Water Use – Reservoir	=	=	=	=	=	-	=	=	-	-
Water Use – Tallapoosa	=	=	=	=	=	=	=	=	=	=
Erosion – Reservoir	=	=	=	=	=	=	=	=	=	=
Erosion – Tallapoosa	-	+	+	+	+	+	+	+	+	+
Aquatic Resources – Reservoir	=	=	=	=	-	-	=	-	-	-
Aquatic Resources – Fish Entrainment	=	=	=	=	=	=	=	=	=	=

Downstream Release Alternatives Study

Resource	PreGP	ModGP	150CMF	300CMF	600CMF	800CMF	150CMF+GP	300CMF+GP	600CMF+GP	800CMF+GP
Downstream Aquatic Habitat – Tallapoosa	-	+	+	+	+	+	+	+	+	+
Downstream Temperature Fluctuation – Tallapoosa	-	+	+	+	+	+	+	+	+	+
Wildlife – Reservoir	=	=	=	=	-	-	=	-	-	-
Wildlife – Tallapoosa	-	+	+	+	+	+	+	+	+	+
T&E Species – Reservoir	=	=	=	=	=	=	=	=	=	=
T&E Species – Tallapoosa	=	=	=	=	=	=	=	=	=	=
Recreation – Reservoir	=	=	=	=	-	-	=	-	-	-
Recreation – Tallapoosa	-	+	+	+	+	+	+	+	+	+
Cultural Resources – Reservoir	=	=	=	=	-	-	=	-	-	-
Cultural Resources – Tallapoosa	+	=	-	-	-	-	-	-	-	-

Downstream Release Alternatives Study

Variance

- ❖ No variances from the study plan or schedule

Remaining Activities

- ❖ Stakeholder comments on the Draft Phase 2 Study Report
- ❖ Present the operating proposal and PME measures in PLP

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Battery Energy Storage System (BESS) Study

Study Progress

- ❖ Evaluated 2 BESS release alternatives:
  - 50% reduction in peak releases associated with installing one 60 MW battery unit (Option A)
  - A proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (Option B)
- ❖ Developed costs for installing a BESS
- ❖ Structural changes including changes in turbine generator units and costs for implementing each battery storage type
- ❖ Effects on recreation and aquatic resources at Harris Project
- ❖ Upcoming HAT 1 Meeting on May 3

HARRIS DAM RELICENSING

Battery Energy Storage System (BESS) Study

Study Results

❖BESS Costs Over 40-Year License Term

	Option A	Option B
Total Installed Cost (2025$)	$96.6M ($1,610 / kW)	$39.0M ($1,950 / kW)
Fixed O&M (including augmentation) (2025-2044)	$1.77M * 20 years	$0.597 * 20 years
Total Replacement Cost (2025$)	$56.4M ($941 / kW)	$19.7M ($984 / kW)
Fixed O&M (including augmentation) (2045-2064)	$1.94M * 20 years	$0.647M * 20 years
Turbine Replacement Cost	Undetermined	$20M
Interconnection O&M (based on current OATT rate and subject to periodic adjustments)	$173,000 * 40 years	$173,000 * 40 years

❖Existing turbines are not designed to operate at flows lower than best gate

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Battery Energy Storage System (BESS) Study

Study Results

- ❖ Recreation – Lake Harris
  - No effect to recreation if BESS would result in releasing same daily volume of water as current operations
  - Adverse impact on recreation if BESS affected ability to maintain operating curve

- ❖ Recreation – Tallapoosa River downstream of Harris Dam
  - Option A – under certain assumptions, may benefit recreationists launching in tailrace and for the first few miles below Harris Dam
  - Option B – recreation based activities would still occur as they do under current operations, although peak release would be smaller

- ❖ Aquatic Resources – Tallapoosa River downstream of Harris Dam
  - Option A – could potentially benefit aquatic resources first 7 miles downstream
  - Option B – would not have same benefits as Option A as peak is still required; similar to Pre-Green Plan operations

Battery Energy Storage System (BESS) Study

Variance

- ❖ The BESS was evaluated separately from the other downstream release alternatives and results of the analysis are presented in a separate report.
  - Due to constraints of existing model rules
  - Not considered a reasonable alternative

Remaining Activities

- ❖ Stakeholders comment on the Draft BESS Report

HARRIS DAM
RELICENSING

Water Quality Study

Study Progress

Location	Source	Description	Period
Lake Harris	ADEM	Vertical profiles and discrete chemistry samples at six locations	April - October 2018; June, July, September, & October 2020
	Alabama Power	Vertical profiles in the forebay	March - October 2017 – 2020
	Alabama Water Watch	Surface samples at six locations	monthly to semi-monthly, 2011 – 2019
	ADEM	Monthly measurements and discrete samples at Tailrace, Malone, Wadley, and Horseshoe Bend	2018 – 2020 (no measurements collected at Tailrace in 2019)
Tallapoosa River, Harris Dam to Horseshoe Bend	ADEM	Continuous (15-minute interval) monitoring at Malone	May 2018 - November 2019; April – November 2020
	Alabama Power	Continuous (15-minute interval) monitoring during generation (approximately 800 ft downstream of dam)	June - October 2017 – 2020
	Alabama Power	Continuous (15-minute interval) monitoring (approximately 0.5 miles downstream of dam)	March - October 2019; May – October 2020
	Alabama Water Watch	Surface samples at Horseshoe Bend	1993, 2007, & 2014 – 2017

HARRIS DAM RELICENSING

Water Quality Study

Variance

- No variances from the study plan or schedule

Remaining Activities

- Alabama Power will prepare the 401 Water Quality Certification application and submit to ADEM after the FLA is filed with FERC.

Erosion and Sedimentation Study

Study Progress:

- ❖ No additional erosion data was collected downstream
- ❖ Conducted additional reconnaissance at identified sedimentation sites on Lake Harris during full (summer) pool conditions to determine if any nuisance aquatic vegetation was present.

Variance

- ❖ Alabama Power provided the results of the Nuisance Aquatic Vegetation Survey Report in Appendix F of the Final Erosion and Sedimentation Study Report rather than providing to HAT 3 in the form of a technical memorandum.

Remaining Activities

- ❖ No additional studies proposed and no remaining activities.

HARRIS DAM RELICENSING

Aquatic Resources Study

Study Progress:

❖Desktop Assessment characterizes aquatic resources and temperature in the Study Area

❖Auburn University:

- Conducted a literature review of temperature requirements of target species
- Temperature analysis
- Fish community sampling - continued sampling through January 2021
  - Tagged and tracked fish with acoustic/radio (CART tags) during the summer of 2020
- Conducted static respirometry tests and measured active metabolic rates
- Respirometry and bioenergetics modeling: effects of Harris operations (flow and temperature) on energy expenditures of target species

❖HAT 3 Meetings - June 2, 2020, November 5, 2020, and March 31, 2021

HARRIS DAM RELICENSING

Auburn University Study

Temperature Results:

- ❖No differences found between pre- and post-Green Plan Temperatures
- ❖99.71% of hourly temperature fluctuations were within 2 ℃
- ❖Extreme hourly fluctuations(≥10 ℃) were rare and could possibly be attributed to exposure of a logger to air or direct sunlight for a prolonged period followed by re-submersion
- ❖Lowest daily range in temperatures at Heflin
- ❖Temperature tended to increase with increasing distance from the dam but, in winter, temperature was typically warmer near the dam

Auburn University Study

Fish Community Results

- Diversity was lower than Travnichek and Maceina (1994), but overall trends in diversity upstream and downstream were similar
- Relative contribution of centrarchids lower than 1996 rotenone sample; combined contribution of cyprinids and castostomids similar to 1951 rotenone sample
- Channel Catfish and Alabama Bass had greater body condition in the tailrace. Several factors could cause this potentially including cooler temperatures (temp not reaching thermal maximum for growth) and/or diet
- Fewer older, larger fish captured in tailrace attributed to less available shelter from flows and/or sampling gear (barge instead of boat electrofisher)
- Lipstick Darter were abundant in tailrace, likely due to ideal habitat

HARRIS DAM RELICENSING

Auburn University Study

Bioenergetics and Growth Simulations:

❖Growth simulations could only be run for Redbreast Sunfish (using respiration rate parameters from published Bluegill data)

❖Other species had insufficient sample sizes or models that did not accurately estimate respiration rates

Bioenergetics Results:

❖Releases could slightly increase growth rate of age-1 Redbreast Sunfish

❖Release could slightly decrease growth rate of age-3 and age-5 Redbreast Sunfish due o the increased energy expenditure of swimming during releases; Model assumes that fish do not seek shelter during releases

❖Model used activity rates around Horseshoe Bend and assumes releases decrease temperature 5℃, but temperature fluctuations of that magnitude likely occur further upstream (tailrace to Malone)

Aquatic Resources Study

Variance

- Auburn University did not use the 30+2 sampling method as it was determined in the field to not be feasible/effective for sampling the sites

- Instead, shallow areas were sampled using boat and barge electrofishing equipment, which were found to be effective in sampling shallow areas within the study sites.

- The boat method used was a modification of the recently developed non-wadeable index of biological integrity (IBI). Sampling intensity was modified to accommodate available habitat, sampling frequency, and therefore IBI scores were not calculated.

Remaining Activities

- No additional studies proposed and no remaining activities.

HARRIS DAM RELICENSING

Downstream Aquatic Habitat Study

Study Progress

- Collected level logger data at 20 locations in the Tallapoosa River below Harris Dam through June 2020
- HAT 3 Meetings - June 2, 2020, November 5, 2020, and March 31, 2021

Variance

- No variances from the study plan or schedule

Remaining Activities

- No additional studies proposed and no remaining activities.

HARRIS DAM
RELICENSING

Threatened and Endangered Species Study

Study Progress

- ❖ Alabama Power completed field surveys at Lake Harris and Skyline to determine if T&E species are located within the Project Boundary.

- ❖ Filed the final report on January 29, 2021
  - Included the Desktop Analysis and results of all field investigations

- ❖ HAT 3 Meetings - June 2, 2020, November 5, 2020, and March 31, 2021

Variance

- ❖ No variances from the study plan or schedule

Remaining Activities

- ❖ No additional studies proposed and no remaining activities.

Project Land Evaluation

Study Progress

❖ Samford University conducted a botanical survey on an additional 35 acres of land adjacent to the previously surveyed area at Flat Rock Park.
  - This additional botanical inventory report was filed on April 12, 2021

❖ HAT 4 Meeting - October 19, 2020

Variance:

❖ No variances from the study plan or schedule

Remaining activities:

❖ Alabama Power will file a Wildlife Management Plan and Shoreline Management Plan with the FLA.

Recreation Evaluation

Study Progress

- ❖ Filed the Final Recreation Evaluation on November 24, 2020.
- ❖ HAT 5 Meetings - June 4, 2020 and October 19, 2020.

Variance

- ❖ No additional variances from the study plan or schedule

Remaining Activities

- ❖ No additional studies proposed and no remaining activities.

HARRIS DAM RELICENSING

Cultural Resources Study

Study Progress

- ❖ February 2021 - Concluded cultural resources assessments for the sites identified during the Lake Harris preliminary archeological and completed cultural resource assessments for Skyline

- ❖ March 4, 2021 - Held a virtual site visit of Skyline for applicable tribes and the Alabama Historical Commission

- ❖ April 2021 – Complete TCP identification process with the Muscogee (Creek) Nation

HARRIS DAM RELICENSING

Cultural Resources Study

Variance

❖ Alabama Power will complete the TCP identification process with the Muscogee (Creek) Nation in April 2021 (rather than February 2021 as noted in the Study Plan)

Remaining Activities

❖ Complete eligibility assessments for known cultural resources

❖ Issue determination of effect on historic properties

❖ Develop a Draft Historic Properties Management Plan (HPMP) for the Harris Project to be filed concurrently with the PLP

❖ Upcoming Selected HAT 6 Meeting- May 5, 2021. Selected due to sensitive nature of meeting material.

HARRIS DAM RELICENSING

HAT 1 - Draft Operations Reports

APC Harris Relicensing <g2apchr@southernco.com>

Wed 4/28/2021 3:17 PM

To: APC Harris Relicensing <harrisrelicensing@southernco.com>
Bcc: damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; nathan.aycock@dcnr.alabama.gov <nathan.aycock@dcnr.alabama.gov>; steve.bryant@dcnr.alabama.gov <steve.bryant@dcnr.alabama.gov>; todd.fobian@dcnr.alabama.gov <todd.fobian@dcnr.alabama.gov>; chris.greene@dcnr.alabama.gov <chris.greene@dcnr.alabama.gov>; keith.henderson@dcnr.alabama.gov <keith.henderson@dcnr.alabama.gov>; mike.holley@dcnr.alabama.gov <mike.holley@dcnr.alabama.gov>; evan.lawrence@dcnr.alabama.gov <evan.lawrence@dcnr.alabama.gov>; matthew.marshall@dcnr.alabama.gov <matthew.marshall@dcnr.alabama.gov>; brian.atkins@adeca.alabama.gov <brian.atkins@adeca.alabama.gov>; tom.littlepage@adeca.alabama.gov <tom.littlepage@adeca.alabama.gov>; jhaslbauer@adem.alabama.gov <jhaslbauer@adem.alabama.gov>; cljohnson@adem.alabama.gov <cljohnson@adem.alabama.gov>; mlen@adem.alabama.gov <mlen@adem.alabama.gov>; fal@adem.alabama.gov <fal@adem.alabama.gov>; alockwood@adem.alabama.gov <alockwood@adem.alabama.gov>; djmoore@adem.alabama.gov <djmoore@adem.alabama.gov>; arsegars@southernco.com <arsegars@southernco.com>; dkanders@southernco.com <dkanders@southernco.com>; wtanders@southernco.com <wtanders@southernco.com>; jefbaker@southernco.com <jefbaker@southernco.com>; jcarlee@southernco.com <jcarlee@southernco.com>; kechandl@southernco.com <kechandl@southernco.com>; mcoker@southernco.com <mcoker@southernco.com>; afleming@southernco.com <afleming@southernco.com>; cggoodma@southernco.com <cggoodma@southernco.com>; sgraham@southernco.com <sgraham@southernco.com>; ammcvica@southernco.com <ammcvica@southernco.com>; tlmills@southernco.com <tlmills@southernco.com>; cmnix@southernco.com <cmnix@southernco.com>; abnoel@southernco.com <abnoel@southernco.com>; kodom@southernco.com <kodom@southernco.com>; alpeeple@southernco.com <alpeeple@southernco.com>; scsmith@southernco.com <scsmith@southernco.com>; twstjohn@southernco.com <twstjohn@southernco.com>; Rasberry, Jennifer S. <JSRASBER@southernco.com>; mhunter@alabamarivers.org <mhunter@alabamarivers.org>; clowry@alabamarivers.org <clowry@alabamarivers.org>; jwest@alabamarivers.org <jwest@alabamarivers.org>; gjobsis@americanrivers.org <gjobsis@americanrivers.org>; kmo0025@auburn.edu <kmo0025@auburn.edu>; devridr@auburn.edu <devridr@auburn.edu>; irwiner@auburn.edu <irwiner@auburn.edu>; wrighr2@aces.edu <wrighr2@aces.edu>; lgallen@balch.com <lgallen@balch.com>; jhancock@balch.com <jhancock@balch.com>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; rachel.mcnamara@ferc.gov <rachel.mcnamara@ferc.gov>; sarah.salazar@ferc.gov <sarah.salazar@ferc.gov>; monte.terhaar@ferc.gov <monte.terhaar@ferc.gov>; gene@wedoweelakehomes.com <gene@wedoweelakehomes.com>; colin.dinken@kleinschmidtgroup.com <colin.dinken@kleinschmidtgroup.com>; chris.goodell@kleinschmidtgroup.com <chris.goodell@kleinschmidtgroup.com>; jason.moak@kleinschmidtgroup.com <jason.moak@kleinschmidtgroup.com>; kelly.schaeffer@kleinschmidtgroup.com <kelly.schaeffer@kleinschmidtgroup.com>; sandra.wash@kleinschmidtgroup.com <sandra.wash@kleinschmidtgroup.com>; jessecunningham@msn.com <jessecunningham@msn.com>; mdollar48@gmail.com <mdollar48@gmail.com>; drheinzen@charter.net <drheinzen@charter.net>; sforehand@russelllands.com <sforehand@russelllands.com>; 1942jthompson420@gmail.com <1942jthompson420@gmail.com>; nancyburnes@centurylink.net <nancyburnes@centurylink.net>; sandnfrench@gmail.com <sandnfrench@gmail.com>; lgarland68@aol.com <lgarland68@aol.com>; rbmorris222@gmail.com <rbmorris222@gmail.com>; irapar@centurytel.net <irapar@centurytel.net>; mitchell.reid@tnc.org <mitchell.reid@tnc.org>; richardburnes3@gmail.com <richardburnes3@gmail.com>; eilandfarm@aol.com <eilandfarm@aol.com>; athall@fujifilm.com <athall@fujifilm.com>; ebt.drt@numail.org <ebt.drt@numail.org>; georgettraylor@centurylink.net <georgettraylor@centurylink.net>; beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; dbronson@charter.net <dbronson@charter.net>; wmcampbell218@gmail.com <wmcampbell218@gmail.com>; jec22641@aol.com <jec22641@aol.com>; robinwaldrep@yahoo.com <robinwaldrep@yahoo.com>; sonjahollomon@gmail.com <sonjahollomon@gmail.com>; butchjackson60@gmail.com <butchjackson60@gmail.com>; donnamat@aol.com <donnamat@aol.com>; goxford@centurylink.net <goxford@centurylink.net>; mhpwedowee@gmail.com <mhpwedowee@gmail.com>; jerrelshell@gmail.com <jerrelshell@gmail.com>; bsmith0253@gmail.com <bsmith0253@gmail.com>; inspector_003@yahoo.com <inspector_003@yahoo.com>; paul.trudine@gmail.com <paul.trudine@gmail.com>; lindastone2012@gmail.com <lindastone2012@gmail.com>; granddadth@windstream.net <granddadth@windstream.net>; trayjim@bellsouth.net <trayjim@bellsouth.net>; straylor426@bellsouth.net <straylor426@bellsouth.net>; robert.a.allen@usace.army.mil <robert.a.allen@usace.army.mil>; randall.b.harvey@usace.army.mil <randall.b.harvey@usace.army.mil>; james.e.hathorn.jr@sam.usace.army.mil <james.e.hathorn.jr@sam.usace.army.mil>; lewis.c.sumner@usace.army.mil <lewis.c.sumner@usace.army.mil>; jonas.white@usace.army.mil <jonas.white@usace.army.mil>; gordon.lisa-perras@epa.gov <gordon.lisa-perras@epa.gov>; holliman.daniel@epa.gov <holliman.daniel@epa.gov>; mayo.lydia@epa.gov <mayo.lydia@epa.gov>; jennifer_grunewald@fws.gov <jennifer_grunewald@fws.gov>; erin_padgett@fws.gov <erin_padgett@fws.gov>; jeff_powell@fws.gov <jeff_powell@fws.gov>; jeff_duncan@nps.gov <jeff_duncan@nps.gov>; Martindale, Lisa (LMARTIND@southernco.com) <LMARTIND@southernco.com>

HAT 1,

Due to the length and complexity of these reports, Alabama Power would like to provide additional time for your review and comment. Please submit any comments you may have on the draft Operating Curve Feasibility Analysis Phase 2 Report, draft Downstream Release Alternatives Phase 2 Report and draft BESS Report by **May 26, 2021**.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

HAT 1,

The draft Operating Curve Feasibility Analysis Phase 2 Report, draft Downstream Release Alternatives Phase 2 Report and draft BESS Report are available for your review on the Harris relicensing website in the HAT 1 folder. These reports can also be found on FERC's website (http://www.ferc.gov) by going to the "elibrary" link and entering docket number P-2628.

Please submit your comments on these reports to Alabama Power at harrisrelicensing@southernco.com by **May 11, 2021**.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Jack West <jwest@alabamarivers.org>
Sent: Friday, April 30, 2021 3:30 PM
To: Anderegg, Angela Segars
Subject: Re: Comment Deadline Extension
Attachments: Questions on Initial Harris Dam BESS Report.docx

EXTERNAL MAIL: Caution Opening Links or Files

Angie,

In preparation for Monday's HAT 1 meeting to discuss the battery storage study, I've attached a list of questions our consultants put together. It may not be necessary to go through each one, but I thought I would share in case your internal battery folks want to look these over in advance. The guys from Synapse Energy Economics who will be joining the call are Max Chang, David White, and Andrew Takasugi.

Thanks for putting together the meeting. Have a great weekend.

On Wed, Apr 28, 2021 at 2:45 PM Anderegg, Angela Segars <ARSEGARS@southernco.com> wrote:

> Hi Jack,
>
> I was talking with someone about in-person meetings today. I haven't heard of any guidance from FERC, but I do know that I'll have to get approval internally before hosting a large meeting. My fingers are crossed that by this summer it won't be a problem.
>
> Talk to you Monday!
>
> **Angie Anderegg**
>
> Hydro Services
>
> (205)257-2251
>
> arsegars@southernco.com
>
> ---
>
> **From:** Jack West <jwest@alabamarivers.org>
> **Sent:** Wednesday, April 28, 2021 2:24 PM

To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: Comment Deadline Extension

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie,

Thank you for extending the stakeholder comment deadline to May 26th for the draft reports. There is certainly a lot of material to go through, and we appreciate the extra few weeks.

I'm just curious if there is any guidance internally or from FERC about when in-person meetings might resume? I know it's still months away, but I hope that there will be some in-person meetings after the PLP is filed in July.

See you on Monday for the HAT 1 meeting.

--

Jack West, Esq.

Policy and Advocacy Director

Alabama Rivers Alliance

2014 6th Ave N, Suite 200

Birmingham, AL 35203

205-322-6395

www.alabamarivers.org [alabamarivers.org]

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

--

Jack West, Esq.
Policy and Advocacy Director
Alabama Rivers Alliance
2014 6th Ave N, Suite 200
Birmingham, AL 35203
205-322-6395
www.alabamarivers.org [alabamarivers.org]

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

Synapse Questions for Alabama Power regarding RL Harris Project BESS Study – 4/29/21

1. How do the daily hydro operational rules change between the current Green Plan and BESS options A & B?
2. How does the operational mode of the Harris Project specifically change under these plans:
    a. Historical
    b. Green Plan
    c. Option A
    d. Option B
3. What does "no peak release" mean in the context of Option A? Does this mean that only one turbine operates in peak hours or something else? Are two turbines ever operating at the same time?
4. How long was the simulation period used for the BESS analysis and what were the sources of the data that was used?
5. What is the change in the hourly generation under various generation conditions ranging from daily capacity factors from 5 to 25 percent for BESS options A & B?
6. What is the charge/discharge cycle of the battery system under those range of conditions?
7. What values are used for the hourly energy prices in the analysis?
8. Could the BESS be charged using power from the grid during off-peak hours and subsequently dispatched during on-peak hours in order to bridge any gaps in charging potential due to changes in flow at the dam?
9. Was the battery system allowed to charge off the grid when there was insufficient hydro generation to take advantage of energy arbitrage?
10. Were other benefits of a battery system beyond energy storage considered such as, but not limited to: various ancillary services such as voltage regulation, frequency control?
11. How were the overhead costs associated with Option A and Option B estimated?
12. Why was 10% chosen as a contingency adder for Options A and B?
13. Why does the deferred generation credit fall with the installation of the BESS?
14. Would the battery storage at another location be more beneficial to utility operations?
15. We would like to receive a copy of the ResSim/RAS hourly and daily models along with the outputs.

From:	Clark, Maria
To:	Anderegg, Angela Segars
Subject:	RE: Harris Relicensing - Updated Study Report Meeting
Date:	Wednesday, May 12, 2021 11:24:05 AM
Importance:	High

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie,

Yes please, I need to know all dates and meetings for this project, my colleagues (from EPA) are collaborating in reviewing this project, but I'm the project's officer. You only will see EPA's official comments coming from me.
Thank you!
Maria

P.S. You might delete Dan Holliman from the list.

From: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Sent: Wednesday, May 12, 2021 10:26 AM
To: Clark, Maria <Clark.Maria@epa.gov>
Subject: RE: Harris Relicensing - Updated Study Report Meeting

You aren't receiving the HAT 1 emails because you aren't on the HAT 1 distribution list. I have Lisa Perras Gordon, Dan Holliman and Lydia Mayo signed up for EPA. I can include you on this email list also – just let me know what you prefer.

Thanks!

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Clark, Maria <Clark.Maria@epa.gov>
Sent: Wednesday, May 12, 2021 9:12 AM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: RE: Harris Relicensing - Updated Study Report Meeting

EXTERNAL MAIL: Caution Opening Links or Files

Thank you Angie. I checked and still not getting all the emails from AP.

From: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Sent: Wednesday, May 12, 2021 10:00 AM
To: Clark, Maria <Clark.Maria@epa.gov>
Subject: RE: Harris Relicensing - Updated Study Report Meeting

Hi Maria,

The attached email was sent out on 4/28, extending the comment period for the three draft operations study reports to May 26.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Clark, Maria <Clark.Maria@epa.gov>
Sent: Wednesday, May 12, 2021 8:47 AM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: RE: Harris Relicensing - Updated Study Report Meeting
Importance: High

EXTERNAL MAIL: Caution Opening Links or Files

Dear Angie,

Has there been an extension for this round of comments to AP?

Thank you!

Maria R. Clark
NEPA Section – Region 4
Strategic Programs Office
U.S. Environmental Protection Agency
61 Forsyth Street, SW
Atlanta, GA 30303
Phone# 404-562-9513

From: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Sent: Monday, April 26, 2021 10:55 AM
To: APC Harris Relicensing <g2apchr@southernco.com>
Subject: Harris Relicensing - Updated Study Report Meeting

Harris relicensing stakeholders,

The presentation for tomorrow's Updated Study Report meeting is available on the Harris relicensing website (Relicensing Documents [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com]). Microsoft Teams call-in information is below.

I look forward to talking with you tomorrow.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: APC Harris Relicensing
Sent: Monday, April 12, 2021 1:47 PM
To: APC Harris Relicensing <harrisrelicensing@southernco.com>
Subject: Harris Relicensing - Updated Study Report

Harris relicensing stakeholders,

Pursuant to FERC's Integrated Licensing Process, Alabama Power filed its Harris Project Updated Study Report (USR) today. Concurrent with the USR filing, Alabama Power filed three draft study reports, four final study reports and the results of a Botanical Inventory at Flat Rock Park. Stakeholders may access the USR and the study reports on FERC's website (http://www.ferc.gov [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com]) by going to the "eLibrary" link and entering the docket number (P-2628). The USR and study reports are also available on the Project relicensing website at http://harrisrelicensing.com [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com].

The Updated Study Report meeting will be held on **April 27, 2021**. Please hold this date from 9:00 am to 12:00 pm central time. Call in information for the meeting can be found below. The purpose of the meeting is to provide an opportunity to review the contents of the USR.

Alabama Power will file a summary of the USR meeting by **May 12, 2021**. Stakeholders will have until **June 11, 2021** to file written comments with FERC on the USR Meeting Summary.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

Microsoft Teams meeting

Join on your computer or mobile app
Click here to join the meeting [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com]

Video Conference ID: 112 301 635 7
Alternate VTC dialing instructions [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com]
Or call in (audio only)
+1 470-705-0860,,168184661# United States, Atlanta
Phone Conference ID: 168 184 661#
Find a local number [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com] [gcc02.safelinks.protection.outlook.com] |

Harris relicensing - USR meeting summary

APC Harris Relicensing <g2apchr@southernco.com>

Wed 5/12/2021 11:56 AM

To: APC Harris Relicensing <harrisrelicensing@southernco.com>
Bcc: 1942jthompson420@gmail.com <1942jthompson420@gmail.com>; 9sling@charter.net <9sling@charter.net>; abnoel@southernco.com <abnoel@southernco.com>; allan.creamer@ferc.gov <allan.creamer@ferc.gov>; alockwood@adem.alabama.gov <alockwood@adem.alabama.gov>; alpeeple@southernco.com <alpeeple@southernco.com>; amanda.mcbride@ahc.alabama.gov <amanda.mcbride@ahc.alabama.gov>; ammcvica@southernco.com <ammcvica@southernco.com>; amy.silvano@dcnr.alabama.gov <amy.silvano@dcnr.alabama.gov>; andrew.nix@dcnr.alabama.gov <andrew.nix@dcnr.alabama.gov>; arsegars@southernco.com <arsegars@southernco.com>; athall@fujifilm.com <athall@fujifilm.com>; aubie84@yahoo.com <aubie84@yahoo.com>; awhorton@corblu.com <awhorton@corblu.com>; bart_roby@msn.com <bart_roby@msn.com>; baxterchip@yahoo.com <baxterchip@yahoo.com>; bboozer6@gmail.com <bboozer6@gmail.com>; bdavis081942@gmail.com <bdavis081942@gmail.com>; beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; bill_pearson@fws.gov <bill_pearson@fws.gov>; blacklake20@gmail.com <blacklake20@gmail.com>; 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1 attachments (207 KB)

2021-05-12 USR Meeting Summary.pdf;

Harris relicensing stakeholders,

Pursuant to FERC's Integrated Licensing Process and 18 cfr § 5.15(f), Alabama Power filed the Harris Project Updated Study Report (USR) on April 12, 2021 and held the USR Meeting on April 27, 2021. Stakeholders have until **June 11, 2021** to file written comments with FERC on the attached USR Meeting Summary. All comments must adhere to FERC regulations at 18 CFR Section 5.15 (c)(2)-(7). Any proposal for new information gathering or studies is subject to paragraph (e) of Section 5.15 except that the proponent must demonstrate extraordinary circumstances warranting approval.

Stakeholders may access the USR Meeting Summary on FERC's website (http://www.ferc.gov) by going to the "eLibrary" link and entering the docket number (P-2628). The USR Meeting Summary is also available on the Project relicensing website at R.L. Harris Hydroelectric Project Relicensing Website - Welcome (harrisrelicensing.com).

Thanks,

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May 12, 2021

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Transmittal of the Updated Study Report Meeting Summary

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street NE
Washington, DC 20426

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC or Commission) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628-065). On April 12, 2019, FERC issued its Study Plan Determination[1] (SPD) for the Harris Project, approving Alabama Power's ten relicensing studies with FERC modifications. On May 13, 2019, Alabama Power filed Final Study Plans to incorporate FERC's modifications and posted the Final Study Plans on the Harris relicensing website at www.harrisrelicensing.com.

Pursuant to the Commission's Integrated Licensing Process (ILP) and 18 CFR § 5.15(f), Alabama Power filed the Harris Project Updated Study Report (USR) on April 12, 2021[2] and held the USR Meeting on April 27, 2021.

Stakeholders have until June 11, 2021 to file written comments with FERC on the attached USR Meeting Summary. All comments must adhere to FERC regulations at 18 CFR Section 5.15 (c)(2)-(7). Any proposal for new information gathering or studies is subject to paragraph (e) of Section 5.15 except that the proponent must demonstrate extraordinary circumstances warranting approval. Stakeholders may access the USR Meeting Summary on FERC's website (http://www.ferc.gov) by going to the "eLibrary" link and entering the docket number (P-2628). The USR Meeting Summary is also available on the Project relicensing website at https://harrisrelicensing.com.

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[1] Accession No 20190412-3000.

[2] Accession No 20210412-5737.

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg
Harris Relicensing Project Manager

Attachment – Updated Study Report Meeting Summary

cc: Harris Stakeholder List

Attachment
Updated Study Report Meeting Summary

Updated Study Report Meeting Summary
Harris Project
April 27, 2021
9:00 am – 12:00 pm
Microsoft Teams Meeting

Participants:
Angie Anderegg – Alabama Power Company (Alabama Power)
Wes Anderson – Alabama Power
Dave Anderson – Alabama Power
Jeff Baker – Alabama Power
Katie Bolton – Alabama Power
RaeLynn Butler – Muscogee (Creek) Nation
Jason Carlee – Alabama Power
Bryant Celestine – Alabama Coushatta Tribe of Texas
Keith Chandler – Alabama Power
Maria Clark – Environmental Protection Agency (EPA)
Evan Collins – United States Fish and Wildlife Service (USFWS)
Allan Creamer – Federal Energy Regulatory Commission (FERC)
Jim Crew – Alabama Power
Colin Dinken – Kleinschmidt Associates (Kleinschmidt)
Danielle Elefritz - FERC
Amanda Fleming – Alabama Power
Todd Fobian – Alabama Department of Conservation and Natural Resources (ADCNR)
Mike Godfrey – Alabama Power
Chris Goodman – Alabama Power
Stacey Graham – Alabama Power
Jim Hancock – Balch and Bingham
Jennifer Haslbauer – Alabama Department of Environmental Management (ADEM)
Martha Hunter – Alabama Rivers Alliance (ARA)
Kelly Kirven – Kleinschmidt
Carol Knight – Downstream Property Owners
Lisa Martindale – Alabama Power
Donna Matthews – Downstream Property Owner
Lydia Mayo – EPA
Amanda McBride – Alabama Historical Commission (AHC)
Rachel McNamara – FERC
Ashley McVicar – Alabama Power
Tina Mills – Alabama Power
Jason Moak - Kleinschmidt
David Moore – ADEM
Barry Morris – Lake Wedowee Property Owners' Association
Kenneth Odom – Alabama Power
Courtenay O'Mara – Georgia Power Company
Erin Padgett – USFWS
Alan Peeples – Alabama Power

Jennifer Rasberry – Alabama Power
Sarah Salazar - FERC
Kelly Schaeffer – Kleinschmidt
Robin Soweka – Muscogee (Creek) Nation
Sheila Smith – Alabama Power
Monte Terhaar - FERC
Jimmy Traylor – Downstream Property Owner
Sandra Wash – Kleinschmidt
Jack West – ARA
Ken Wills – Alabama Glade Conservation Coalition
Josh Yerby – Alabama Power

Updated Study Report (USR) Meeting Summary:

Angie Anderegg (Alabama Power Company (Alabama Power)) opened the meeting with a safety moment, reviewed Harris Relicensing milestones, and noted an upcoming (May 3, 2021) Harris Action Team (HAT) meeting on the Battery Energy Storage System (BESS) study. Angie stated the Updated Study Report (USR) meeting purpose: to present an overview of the study progress, including data collected, any variance to the study plan or schedule, and remaining activities for the Harris studies.

Dave Anderson (Alabama Power) presented the study progress, applicable variances, and remaining activities on the Operating Curve Change Feasibility Analysis study. Sarah Salazar (Federal Energy Regulatory Commission (FERC)) asked if Alabama Power would consolidate the effects on resources of the operating curve alternatives combined with proposed downstream alternatives in the Preliminary Licensing Proposal (PLP) so that stakeholders could comment on those proposed measures knowing the combined effects of both. Angie confirmed that only if Alabama Power's proposal includes both a downstream release and a change in the operating curve would those be analyzed together. Allan Creamer (FERC) noted that all existing erosion sites identified in the Erosion and Sedimentation Study appear to be located above the summer pool elevation and asked if an increase in the winter pool could cause additional wind and wave action on portions of the shoreline from a potential increase in recreation/boating. Dave agreed that the potential for that effect exists. Angie confirmed that, in general, there would be an increase in wave action with an increase in recreation. Allan recommended that this be identified as a potential effect on erosion in the *Operating Curve Change Feasibility Phase 2 Analysis Study Report*.

Sarah asked if the GIS data associated with the *Operating Curve Change Feasibility Phase 2 Analysis Study Report* had been filed. Dave replied no and noted that the GIS data will be filed with the Final License Application (FLA) in November. Sarah noted that the Project Boundary layer and the two other GIS layers filed with the *Phase 1 Project Lands Evaluation Study Report* contained differing projections and she requested that future GIS data layers use the same projection and coordinate system. Dave asked if the GIS data could be provided through the Harris Relicensing Website instead of FERC's e-Library. Sarah confirmed that the data would need to be filed on FERC's e-Library but could be added to the Harris Relicensing website as well. Donna Matthews asked for clarification on the variance related to the use of historic photos on Lake Harris[1]. Dave stated that historical aerial photos of the identified sedimentation sites on Harris Reservoir were to be compared to 2015 high-resolution photos; however, poor resolution of the historic photos did not provide the ability to compare the photos. Jason Moak (Kleinschmidt) added that Alabama Power's historic photos of the lake were also taken during different times of the year when the lake was at different levels. Donna asked if the photographs could be overlayed using landmarks. Dave mentioned that the photos could be georeferenced and overlayed, but the resolution of the photographs are not comparable. Jimmy Traylor (Downstream Property Owner) stated there were no advantages to downstream property owners if Alabama Power increased the lake level elevation, but instead could increase flooding and erosion downstream. Jimmy asked if Alabama Power could limit flooding by pre-evacuating the reservoir. Dave stated that pre-evacuation of the reservoir is not in the current Water Control Manual (WCM) procedures that are established by the U.S. Army Corps of Engineers (USACE). Jimmy asked if that could be changed. Dave noted it potentially could with extensive studies and noted that the USACE would require a lot more data to evaluate a change in the flood control procedures compared to the information Alabama Power has gathered thus far. Angie added that would be outside of the scope of the relicensing process.

Dave presented the study progress, applicable variances, and the remaining activities on the Downstream Release Alternatives Phase 2 study. Barry Morris (Lake Wedowee Property Owner's Association (LWPOA) stated that the 300 cubic feet per second (cfs) continuous minimum flow (CMF) is double the flow that Alabama Power currently passes through the dam and inquired on how 300 CMF would not affect the reservoir level. In addition, Barry asked if there would be a rule that would cutback the CMF depending on inflows to the lake. Angie responded that 300 CMF does not affect the reservoir level as there would be less water on peak and instead would pass continuously. Angie noted that the Green Plan (current operations) has provisions for cutbacks during drought. Angie added that if a minimum flow were proposed, Alabama Power would evaluate what drought cutback is needed for the minimum flow operations and how that would be provided. Barry asked for confirmation that the only time Alabama Power would cutback the CMF is during drought operations. Angie confirmed and noted that a drought cutback is built into the HEC-ResSim model that was used in the relicensing studies. Sarah asked if the terminology of the CMF alternatives could include "plus peaking" to clarify that the CMF is not the only water that is passing through the dam. Angie noted that Alabama Power will clearly describe its operations proposal in the PLP.

Allan asked for clarification on the trend in the average daily water surface fluctuation exceedance tables and on the average wetted perimeter tables in the *Downstream Release Alternatives Phase 2 Analysis Study Report*. Dave asked Allan to submit written comments on the draft report. Jack West (Alabama Rivers Alliance (ARA) noted that the 150 CMF and 300 CMF alternatives had no effect on Harris Reservoir elevations, with 600 CMF having an adverse effect. Jack asked if anything between 300 CMF and 600 CMF were modeled and at what point the CMF begins to impact lake levels. Dave responded that Alabama Power analyzed the alternatives that were approved by FERC and did not model anything between 300 CMF and 600 CMF. Jimmy asked why Alabama Power only considered the flow from the Tallapoosa River and had not analyzed the flow from the Little Tallapoosa River. Dave stated the Heflin gage was

[1] While use of historic photos from Lake Harris was mentioned in the Operating Curve Change Analysis Study Plan, photos could not be used to assess the effects of the winter pool alternatives due to the limited resolution of the historical photos. This was noted as a variance in the Updated Study Report and is separate from the downstream historical photos submitted by Donna Matthews that were filed with FERC.

found to be more representative of flows in the basin when the Green Plan (GP) was developed. Jimmy noted that if a CMF is proposed, the flow from the Tallapoosa River and the Little Tallapoosa River should be analyzed to understand the impacts to Harris Reservoir and the Tallapoosa River downstream. Dave stated that current operations in the model are based on the Heflin gage in the Tallapoosa River[2].

Carol Knight (Downstream Property Owner) stated concerns regarding erosion downstream of Harris Dam and recommended pre-evacuation of the reservoir be further considered. Alan Peeples (Alabama Power) explained that pre-evacuation could exacerbate flooding downstream due to error in rain forecasts. In addition, the current operations are dictated by the USACE WCM. Sarah asked why the 300 CMF+GP would impact reservoir elevations while the 300 CMF does not, even though the alternatives represent the same volume of water. Dave clarified that the two alternatives are not the same volume, as the 300 CMF+GP includes GP pulses in addition to the CMF and peaking operations (while 300 CMF includes 300 cfs CMF and peaking operations). Sarah asked for clarification, in that the GP pulses are subtracted from what would be used for peaking at any given time. Angie explained that in the model there is a rule that maintains the reservoir level and any water available above that needed for the CMF is allocated for peaking. Angie noted that the amount available for peaking varies depending on inflow (i.e. there are times when there is only enough water available for the CMF) and added that the higher CMF alternatives (and the 300 CMP+GP alternative) impact reservoir levels due to outflow being greater than inflow. Regarding impacts to generation, Monte Terhaar (FERC) requested megawatt hours (MWh) be presented in the summary table in the operating reports in addition to the monetary value. Kelly confirmed this change will be made in the Final Phase 2 reports.

Tina Mills (Alabama Power) presented the study progress, applicable variances, and remaining activities for the Battery Energy Storage System (BESS) study. There were no questions.

Jason M. presented study progress, applicable variances, and remaining activities for the Water Quality study. Allan noted that Table 4-9 of the *Water Quality Study Report* provides a monthly summary of dissolved oxygen (DO) and temperature data from the continuous monitor from 2019-2020 and asked how the generation and non-generation data would compare at that monitor. Jason M. noted that the analysis was not included in the report but anecdotally, there were minimal differences between data collected at the same time at the generation monitor versus the continuous monitor. Jason M. added that the monitors are approximately one-half mile apart so there is travel time to account for. Keith Chandler (Alabama Power) explained that the continuous monitor location was chosen in consultation with Alabama Department of Environmental Management (ADEM) as a site to monitor the fishery and the generation monitor location was agreed upon with ADEM as a site that was representative of turbine discharge. Keith added that travel time or other potential influences have not been evaluated at the continuous monitor. Allan stated that he would not expect travel time to impact data with the sites being approximately one-half mile apart. Keith clarified that the intent of the continuous monitor was to monitor the fishery, not plant discharge. Allan requested the data spreadsheet include generation information for the continuous monitor in order to compare DO and temperature. Jason M. added that zero generation listed for either data set does not mean zero

[2] Alabama Power notes that while the Green Plan is based on Heflin gage flows, the model used to analyze the downstream release alternatives uses average daily basin flows from 1939-2011.

flow since there is still flow while the river reaches equilibrium following generation in addition to intervening flows.

Jason M. presented the study progress, applicable variances, and remaining activities on the Erosion and Sedimentation study. Sarah noted that erosion is an area of concern for many stakeholders and wanted to ensure stakeholders had a chance to review the report and understand the results. Donna noted she had not had a chance to review the report and noted historical photos should be on the record to draw conclusions regarding erosion. Kelly confirmed that the historical photos provided by Donna had been filed with FERC and are on the record.

Jason M. presented the study progress, applicable variances, and remaining activities on the Aquatic Resources study. Jack asked if Alabama Power was studying ways to modify temperatures to ensure a warm-water fishery. Jack added that flows and temperature should not be decoupled and that a CMF of colder water could hinder the fishery. Jason M. noted that Alabama Power is reviewing information that was submitted regarding temperature modifications at other hydropower projects. Jason M. added that the temperature regime of the Tallapoosa River has been well studied during the relicensing process and noted temperatures below Harris Dam are well within the required temperature range of target species presented in Auburn's report. Jason M. stated that the data shows the temperature regime of the river below Harris Dam is not much different from a warm-water fishery, as it averages over 20 degrees Celsius (℃) and closer to 25 ℃ at several locations downstream during the summer. Jason M. added that only a 2-3℃ difference exists in portions of the year when compared to unregulated sites like Heflin or Newell; therefore, there does not appear to be a strong case for making a temperature modification. Jack stated that some of this information is in conflict with previous studies and ARA will file additional comments on temperature. Jimmy asked what the temperature difference is between the uppermost and lowest position of the skimmer weir. Jason M. noted that temperature at the lowest position had not been measured as the weir has been in the uppermost position since the early 2000s but speculated there would be a couple ℃ difference if the weir were lowered.

Jason M. presented the study progress, applicable variances, and remaining activities for the Downstream Aquatic Habitat (there were no stakeholder questions) and the Threatened and Endangered Species studies. Sarah noted that FERC requires licensees to specify timber management activities within the Project Boundary to perform their analysis on bat species. Sarah added that specific timber acreages of any tree removal activities as defined by the U.S. Fish and Wildlife Service (USFWS) are needed for the Streamlined Consultation regarding the Northern Long-eared Bat (*Myotis septentrionalis*) and asked if that information would be provided with the PLP. Angie responded that Alabama Power has been consulting with the USFWS on what is needed for consultation and is currently working on the Draft Wildlife Management Plan (WMP). Keith confirmed that timber management practices that are protective of bat species are currently being finalized with the USFWS. Angie added that the WMP will be filed in November 2021 with the FLA. Jason M. noted that the range of the Indiana Bat (*Myotis sodalist*) overlaps with the range of the Northern-Long eared Bat and the USFWS did not recommend Streamlined Consultation. Evan Collins (USFWS) suggested an additional meeting with FERC regarding Endangered Species Act (ESA) consultation. Evan noted there are three bat species likely to occur within the Project Boundary. Evan added that Streamlined Consultation is available to use for the Northern Long-eared Bat, but it would not address the effects to the Indiana Bat. Evan added that USFWS is working with Alabama Power on a more programmatic approach to managing timber for bats, reviewing areas of timber harvest as they are proposed over time. Sarah noted that FERC's federal action is issuing the license and T&E species issues need to be addressed in the license order. Regarding Alabama Power's proposed land classifications at Lake Harris, Sarah noted that there are not any distinguishing polygons in the GIS data within the natural areas that show areas of timber management. Sarah requested that Alabama Power's timber harvest estimates need to be on the record.

Tina presented the study progress, applicable variances, and remaining activities for the Project Lands Evaluation study. Ken Wills (Alabama Glade Conservation Coalition) asked if the original 20-acre botanical inventory report at Flat Rock Park was previously filed as a final report. Tina confirmed and noted that it was filed as an appendix to the *Phase 1 Project Lands Evaluation Study Report* in October 2020. Ken asked if the WMP would be available for additional review. Tina confirmed that Alabama Power is currently working with resource agencies on details of the WMP and it would be presented to the Harris Action Team 4 (HAT) prior to being filed with FERC in November 2021. Angie confirmed the WMP would be distributed for review and Alabama Power would hold a HAT 4 meeting prior to filing the WMP. Sarah requested the draft WMP be filed with the PLP by July 3, 2021 so that stakeholder comments could be incorporated prior to the FLA.

Amanda Fleming (Alabama Power) presented the study progress, applicable variances, and remaining activities on the Recreation study. Donna stated that there is only one public swimming area/day-use park on the reservoir and asked for additional information on Alabama Power's plan regarding new recreation sites. Amanda clarified that the Recreation Evaluation Study Report did not include this information and the Protection, Mitigation, and Enhancement (PME) measures (such as new recreation sites) will be presented in the PLP. Angie confirmed that Alabama Power has identified the need for an additional day-use park on the reservoir and it will be part of Alabama Power's proposal.

Amanda presented the study progress, applicable variances, and remaining activities on the Cultural Resources study. Regarding the downstream release alternatives and the operating curve alternatives, Rachel McNamara (FERC) asked if the location of the known cultural resources (19 sites downstream and 96 on Lake Harris) would be provided to HAT 6. Amanda requested that Rachel file written comments of her request. Rachel added it would be helpful to know which cultural resources were potentially being affected. Amanda clarified that the 19 sites downstream that were determined from the Alabama State Site File and not further analyzed, but the 96 sites around Lake Harris will be presented in the eligibility assessments.

Bryant Celestine (Alabama Coushatta Tribe of Texas) apologized for not previously participating in HAT 6 meetings thus far and asked if the Traditional Cultural Properties (TCP) invitation could be extended. Amanda stated that the TCP process is near completion with the Muscogee (Creek) Nation. Bryant stated the invitation to conduct TCP should not be concluded and noted a concern that the general area may contain archaeological sites that link the Alabama Coushatta Tribe of Texas to the Muscogee (Creek) Nation. Bryant added that the Coushatta Tribe of Louisiana and the Alabama-Quassarte Tribal Town of Oklahoma would likely have an interest in participating in the TCP process. Amanda requested Bryant to submit a written comment regarding his request. Maria Clark (Environmental Protection Agency (EPA)) encouraged Alabama Power to allow the Coushatta Tribe of Texas to participate in the TCP process.

Kelly asked participants for any additional questions. Regarding pre-evacuation of the reservoir in the case of a forecasted rain, Barry asked how long it would take, and at what flow, to lower the lake one to two feet. Alabama Power was not sure and requested Barry to file a written comment. Jack asked when the HEC-RAS and HEC-ResSim models and associated outputs would be available to stakeholders. Kelly noted these would be filed with the FLA to include any additional modeling that may be required based on comments from the draft operating reports. Jack stated that the models or at least some of the outputs would be helpful to have sooner to provide comments on the draft BESS report. Kelly requested this be further discussed in the upcoming HAT 1 meeting on May 6, 2021. Jack asked for an extension of the comment period of the draft operating reports. Kelly asked if Alabama Power could get back with stakeholders on this request[3]. Ken clarified that the comment period is only related to the draft operating reports and not the final study reports. Angie confirmed and added that stakeholders will have until June 11, 2021 to comment on the USR meeting summary.

<u>Microsoft Teams Chat Questions and Responses:</u>

- Jimmy Traylor: What is the inflow from The Little Tallapoosa River?
    - Jason Moak: Average annual flow in Little Tallapoosa River at USGS Newell gauge is 573 cfs based on 1976-2020 period of record.

- Donna Matthews: I, too, wonder what the interaction between Army Corp and dam operations is and why they are not participating.
    - Kelly Schaeffer: The USACE has been participating in this relicensing process. They attended the HAT 1 meetings on April 1, 2021.

- Donna Matthews: How many of the original 20 Level loggers remain in place. Do they continue to generate data? Where is that data available for viewing?
    - Colin Dinken (Kleinschmidt): All of those loggers were removed after May 2020 after they had gathered one year of continuous data. *15-minute data continuously for one year.

[3] Alabama Power provided stakeholders an additional 15-day comment period with comments due on May 26, 2021 on the Draft *Downstream Release Alternatives Phase 2 Study Report*, Draft *Operating Curve Change Feasibility Analysis Phase 2 Study Report*, and Draft *Battery Energy Storage System at R.L. Harris Project Report.*

HAT 1 - May 3 Meeting Summary

APC Harris Relicensing <g2apchr@southernco.com>

Tue 5/18/2021 9:32 AM

To: APC Harris Relicensing <harrisrelicensing@southernco.com>
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HAT 1,

The meeting summary and presentation from our May 3 meeting can be found on the Harris relicensing website in the HAT 1 - Project Operations folder.

Thanks,

Angie Anderegg
Hydro Services
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Meeting Summary
Harris Action Team (HAT) 1 Meeting
May 3, 2021
9:00 am – 10:00 am
Microsoft Teams Meeting

Participants:
Angie Anderegg – Alabama Power Company (Alabama Power)
Dave Anderson – Alabama Power
Jeff Baker – Alabama Power
Jason Carlee – Alabama Power
Keith Chandler – Alabama Power
Max Chang – Synapse Energy (Synapse)
Allan Creamer – Federal Energy Regulatory Commission (FERC)
Jim Crew – Alabama Power
Amanda Fleming – Alabama Power
Todd Fobian – Alabama Department of Conservation and Natural Resources (ADCNR)
Chris Goodman – Alabama Power
Stacey Graham – Alabama Power
Jim Hancock – Balch and Bingham
Jennifer Haslbauer – Alabama Department of Environmental Management (ADEM)
Martha Hunter – Alabama Rivers Alliance (ARA)
Kelly Kirven – Kleinschmidt Associates (Kleinschmidt)
Carol Knight – Downstream Property Owner
Matthew Marshall – ADCNR
Lisa Martindale – Alabama Power
Donna Matthews – Downstream Property Owner
Ashley McVicar – Alabama Power
Tina Mills – Alabama Power
Jason Moak – Kleinschmidt
David Moore – ADEM
Kenneth Odom – Alabama Power
Alan Peeples – Alabama Power
Jennifer Rasberry – Alabama Power
Grant Redding – Southern Company
Sarah Salazar – FERC
Kelly Schaeffer – Kleinschmidt
Sheila Smith – Alabama Power
Thomas St. John – Alabama Power
Andrew Takasugi – Synapse
Monte Terhaar - FERC
Sandra Wash – Kleinschmidt
Jack West – ARA
David White – Synapse

NOTE: A copy of the May 3, 2021 Battery Energy Storage System HAT 1 presentation is attached.

Meeting Summary:

Angie Anderegg (Alabama Power Company (Alabama Power)) opened the meeting with a safety moment and stated the meeting purpose: to present a summary of the Battery Energy Storage System (BESS) study. Grant Redding, Renewables and Battery Storage Planning and Development Manager for Southern Company, introduced himself to the meeting participants and noted his team supports the retail electric operating companies in their planning and development in renewables and battery storage. This support includes surveying the market annually as well as working with internal and external partners to develop performance and cost estimates. Grant noted that Mississippi Power Company recently received approval from the state commission to deploy a solar plus battery storage hybrid facility in Walnut Grove, Mississippi, and noted that his team is supporting the development of an 80-megawatt (MW) battery storage in the Georgia Power territory.

Tina Mills (Alabama Power) presented an overview of the current Harris operations followed by the summary of the BESS study. The presentation included information on study background and scope, assumptions, economics, estimated costs, fixed operation and maintenance (O&M) with augmentation, battery replacement, asset value, efficiency, dispatch, charging, battery siting and interconnection, changes in turbine-generator units, and effects on resources.

Angie noted that Jack West (Alabama Rivers Alliance (ARA)) had sent a list of questions prior to the meeting and asked if there were any follow-up questions on Harris operations following the presentation. Jack noted that only an outright battery purchase for the cost analysis was presented in the report and asked if Alabama Power reviewed any published Power Purchase Agreement (PPA) rates or considered any other approach besides an outright purchase. In addition, Jack asked how this approach compares to what Southern Company subsidiaries are doing in other markets, like in Georgia and Mississippi. Grant replied that Alabama Power did not review PPA pricing and noted that the National Renewable Energy Laboratory (NREL) pricing used to develop the cost estimate in the BESS study is in line with the market in terms of turnkey Engineering/Design, Procurement, and Construction (EPC) pricing for projects and exhibit similar size points.

Monte Terhaar (FERC) asked how the two-acre required land area estimate was determined for the battery storage. Grant replied that the acreage was based on current development efforts for a four-hour duration battery. Monte thought the required land would be more than two acres. Grant stated that as noted in the report, the two-acres would need to be on flat, contiguous land. Monte stated he is comfortable stating a minimum of two acres. Grant noted that siting in an urban area has additional National Fire Protection Association (NFPA) requirements and the acreage estimates account for buffers. Monte stated there are lot of considerations when it comes to siting, with some projects not having additional Project lands available and noted interconnection challenges for off-site battery storage. Sarah Salazar (FERC) asked if it was possible to estimate the battery replacement costs in 2045 dollars, since 2045 is when the battery is estimated to be replaced. Grant confirmed it could be and noted the estimates provided by NREL are in real dollars and use a 2.5 percent inflation rate to convert. Sarah asked if projected declines in battery costs were considered in the cost analysis. Angie confirmed that declining battery costs were considered. Monte asked if Alabama Power reduced the estimated costs of replacement batteries to account for projected battery price decreases in the future. Grant explained that based on NREL's projections and inflation curves, the 2045 nominal value is greater than the 2025 nominal value. Angie confirmed that the battery replacement cost estimate considers NREL's projected declining battery costs.

Max Chang (Synapse Energy (Synapse)) asked if multiple battery locations were evaluated within Alabama Power's distribution system or potentially tying to other renewable projects to capture Investment Tax Credits (ITC). Grant confirmed Alabama Power did not conduct this evaluation. Donna Matthews (Downstream Property Owner) asked if the solar project in Randolph County utilizes a BESS. Chris Goodman (Alabama Power) confirmed it was a PPA and does not have a BESS. Donna noted the project could be a potential way to tie-in energy. Donna added that Alabama Power's cost analysis appeared appropriate after comparing the costs of Walnut Grove in Mississippi and asked if these estimates were considered. Grant confirmed that the estimates presented for the Harris Project were dictated solely by NREL's projections. Donna noted her appreciation that Alabama Power is working towards their 2050 clean goal.

Max asked if HEC-ResSim model outputs could be provided. Angie noted that the HEC-ResSim model was developed by the U.S. Army Corps of Engineers (USACE) and was available to the public when USACE issued the new Water Control Manual (WCM) for the Alabama-Coosa-Tallapoosa (ACT) Basin. Stacey Graham (Alabama Power) confirmed that the model is not currently available for download. Angie noted that HEC-ResSim model includes the current operations for all Alabama Power and USACE projects in the ACT basin and could be shared, but Alabama Power would determine the best way to do so, potentially through the Harris Relicensing Website (www.harrisrelicensing.com).[1]

Max asked if the broader benefits of a BESS were analyzed, such as benefits to Alabama Power's distribution system, peak capacity, or voltage during periods of non-generation. Angie stated these were not analyzed. With regard to charging the BESS, Max asked if Alabama Power analyzed how the battery could be charged during off-peak hours from the grid and discharging during peak hours. Angie replied that Alabama Power did analyze if inflows were sufficient to charge the BESS. Angie added that Harris is a storage project with no water regulation above the project. Angie noted that since reliable inflow is not sufficient to charge the 60 MW battery or 20 MW battery, the battery would be charged from the grid regardless. Grant confirmed that system production cost modeling was not performed in this study. Max asked for confirmation that if a minimum flow option were proposed at Harris, it would not make a difference because the battery would be charged from the grid and not from a minimum flow. Angie confirmed.

Monte noted that only qualitative assessments on resources were provided in the report. Tina noted that the models used in the Downstream Release Alternatives Phase 2 study to provide quantitative analyses were not applicable to BESS, as the models included peaking operations. Max noted he had additional questions and asked if Alabama Power would prefer them to be submitted in writing. Tina replied that written comments on the draft report would be preferred and stakeholders have until May 26, 2021 to submit comments to harrisrelicensing@southernco.com.

Monte asked why the flows cannot be variable at Harris Dam. Kenneth Odom (Alabama Power) noted the spinning part of the plant is at least 361 tons, thus requiring a lot of force. Kenneth

[1] Following the BESS meeting, Angie consulted with the Alabama Power modeling group and it was determined that the HEC-ResSim and HEC-RAS models, along with outputs, would be shared with stakeholders in the Final License Application in November 2021.

added that the design of the runner (designed to avoid vortex cores, cavitation, and/or pressure oscillations) does not allow for variable flows. Monte noted that the report stated that 6,500 cubic feet per second (cfs) is best gate with a maximum gate flow of 8,000 cfs. Monte asked what minimum flow could be provided by the existing units. Kenneth replied the minimum is not known as the turbines move very quickly from the spinning/condensing mode (with no water flowing across) to the 6,500 cfs-flow zone to avoid cavitation. Kenneth added that he would not expect the flow to be much less than that to avoid vibrations. Sarah noted that she had read that it took approximately 45 seconds from turbine start to best gate. Kenneth confirmed that was accurate.

Monte noted that interest regarding battery storage at hydropower facilities is increasing and that as part of the relicensing process, FERC requested additional information for a BESS at the Harris Project. Monte stated that FERC has licensed a few BESS projects, but all were smaller projects and initiated by the licensee, as it was determined by the licensee to be cost-effective. Monte noted that the Harris Project is different as it is a large storage project, and the feasibility of a BESS at a large storage project is not yet determined. Monte noted that Alabama Power does not feel a BESS is a feasible alternative that should require a detailed analysis. Monte noted that FERC expected a fairly cursory study from Alabama Power at this point, and FERC will be analyzing the applicability of a BESS at the Harris Project.

Max asked if the Francis turbines were replaced with the Kaplan turbines, could the Kaplan turbines be operated under the same synchronous condenser mode or would operations have to change entirely. Kenneth noted that there would likely be operational changes, but the numerous structural changes would be an even greater consideration. Kenneth noted that the entire Harris plant was constructed for a Francis runner and that the Kaplan runner has a completely different structure. Jack noted that there was discussion of installing a theoretical continuous minimum flow turbine (and generating from that flow) at Harris during the recent Updated Study Report (USR) meeting. Jack stated that Alabama Power noted that generating some continuous minimum flows resulted in less water available for peak. Jack stated that pairing a small battery system with that theoretical minimum flow unit would preserve energy generated by the flow and could be used for peak.

Tina reminded participants to submit written comments on the draft BESS and Phase 2 reports (Operating Curve Change Feasibility Analysis and Downstream Release Alternatives) by May 26, 2021 and concluded the meeting.

HAT 1 Meeting
Battery Energy Storage System

R.L. Harris Dam Relicensing
FERC No. 2628

May 3, 2021

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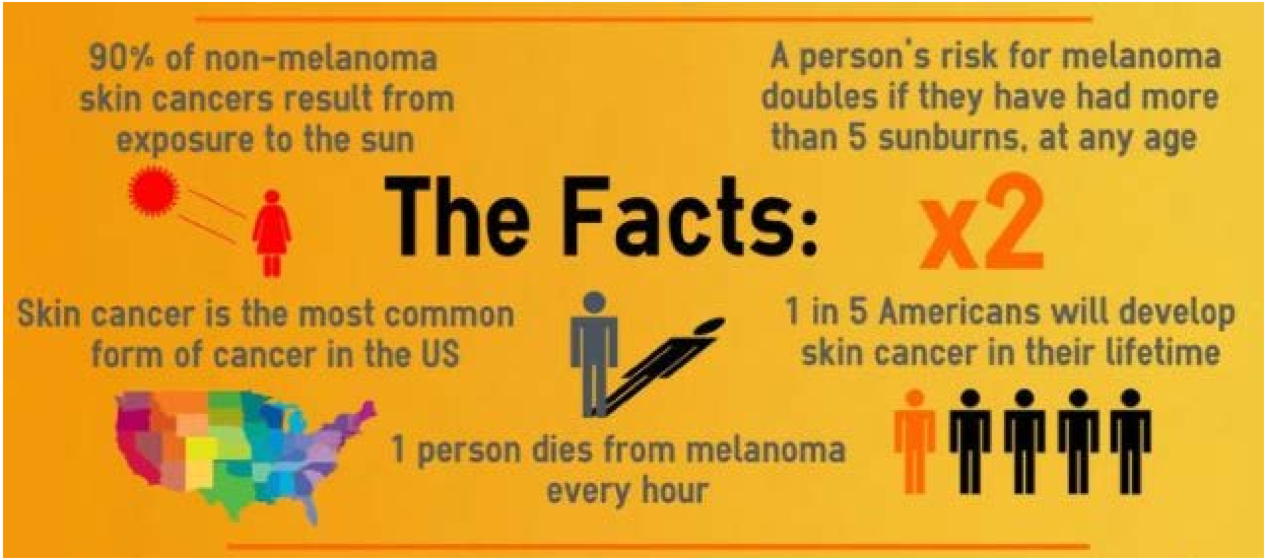
Meeting Etiquette

- ❑ Be patient with technology issues
- ❑ Follow the facilitator’s instructions
- ❑ Phones will be muted during presentations
- ❑ Follow along with PDF of presentations
- ❑ Use the "chat" feature in Microsoft Teams or write down any questions you have for the designated question section
- ❑ Facilitator will ask for participant questions following sections of the presentation
- ❑ Clearly state name and organization when asking questions
- ❑ Meeting will be recorded to assist with meeting notes

HARRIS DAM RELICENSING

Safety and Roll Call



- Effects
  - Skin Cancer
  - Wrinkles
  - Freckles
  - Cataracts
- Prevention
  - Sun Protective Clothing
  - Sunscreen
  - Wear Sunglasses
  - Seek Shade
  - Wear a HAT

Meeting Purpose and Agenda

❖ Present a summary of the BESS study

- Background
- Assumptions
- Economics of Batteries
- Change in Generator Units
- Estimated Costs
- Effects on resources
- Questions

Harris Operations

135 MW

- ❖ Two hydroelectric units at 67.5 MW each

Headwater Project

Storage Project

- ❖ Operated in accordance with USACE Harris Water Control Manual
- ❖ Maintained at or below the elevations specified by the Harris operating curve, except when storing floodwater

Peaking Plant

- ❖ Both units designed as peaking units
- ❖ Initially no intermittent flows between peaks
- ❖ 2005 – pulsing scheme known as Green Plan

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BESS Study Background

June 11, 2020 – ARA filed comments on Initial Study Report (ISR) and requested a BESS study

- **<u>Study Goal:</u>** determine whether BESS could be economically integrated at Harris to mitigate impacts of peaking, while retaining full system peaking capabilities

July 10, 2020 – Alabama Power responded to ISR comments, respectfully declining to conduct the proposed BESS study

August 10, 2020 – FERC issued *Determination on Requests for Study Modifications for the R. L. Harris Project* and **recommended** a BESS study

FERC's Recommended Study Scope

❖ Include costs and also potential benefits to both developmental and non-developmental resources

❖ Two release alternatives:
- Option A = a 50% reduction in peak releases associated with installing one 60 MW battery unit

- Option B = a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit

❖ Include cost estimates for
- installing a BESS
- structural changes
- changes in turbine-generator units
- costs needed to implement each battery storage type

❖ Evaluate effects on recreation and aquatic resources at Harris Project

❖ Incorporate the BESS Study into the Downstream Release Alternatives Study

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BESS Study Scope

- For this study, peaking operations = one unit operating for 4 hours during peak energy demand
  - Consistent with operations in HEC-ResSim Daily Model in DRA Phase 1 Report

- BESS Alternatives
  - 60 MW battery with 240 MWh capacity that can provide the equivalent generation of one unit at best gate for 4 hours per day/every day.
  - 20 MW battery with 80 MWh capacity that can provide the equivalent generation of one-third of one unit at best gate for 4 hours per day/every day.

Assumptions

- BESS related cost projections were based on the National Renewable Energy Laboratory (NREL) data
- Analysis focused solely on Lithium Ion battery chemistry
  - Power quality and stability not considered
- Preliminary transmission impacts - screening level effort
- High potential for variability exists for siting and environmental permitting; site-specific details were not vetted
- Analyses assume an initial in-service date of 2025
- Power supplied to the grid is unchanged
- Turbine/unit modifications required to meet goal of the study

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Assumptions, cont.

- NREL data used in report also incorporates oversizing to accommodate energy losses

- Option A - the same daily volume of flow is released, but the amount of flow that would have been released from one unit at best gate is now dispersed throughout the day

- Option B – a peak release would still be required because 40 MW is still required for hydropower unit during peak

Economics

- ❖ BESS
  - BESS estimated installation costs
  - Fixed operation & maintenance with augmentation
  - Battery replacement
  - Asset Value
  - Battery efficiency, dispatch, and charging
  - Battery siting
  - Interconnection

- ❖ Changes in Turbine-Generator Units

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Estimated BESS Installation Costs

- Installation Costs include:
  - BESS System
  - Interconnection
  - Internal Overheads
  - Contingency
  - Financing

- Option A Total Installed Cost (2025$) $96.6M

- Option B Total Installed Cost (2025$) $39.0M

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Fixed O&M with Augmentation

- All Li-ion systems degrade over time, losing capacity

- Due to degradation, suppliers offer augmentation programs to maintain the nameplate capacity of a system.
  - Typically performed every 2 to 3 years

- Option A
  - $1.79M annually for first twenty years
  - $1.94M annually following battery replacement

- Option B
  - $0.597M annually for first twenty years
  - $0.647M annually following battery replacement

Battery Replacement Costs

- Li-ion battery storage asset life is typically no more than 20 years
- Replacement Costs include:
  - BESS System
  - Internal Overheads
  - Contingency
  - Financing
- Option A Total 2045 Replacement Costs (2025$) $56.4M
- Option B Total 2045 Replacement Costs (2025$) $19.7M

Asset Value

- ❖ When adding an asset to the Southern Company system, the potential value of the asset relative to the alternative must be considered, in addition to its costs.
  - Compare hydro peaking unit and BESS peaking unit

- ❖ Deferred generation capacity credit
  - Existing hydro peaking unit – full deferred generation credit due to its ability to provide full-rated capacity for at least 8 hours
  - 4–hour energy storage asset – approximately 76% annual deferred generation capacity credit

- ❖ Energy production cost savings
  - Hydro asset is greater due to its zero-cost fuel source; not reasonable or necessary to locate a BESS near the hydro asset
  - BESS transfers energy from one time to another while overcoming its efficiency losses; only attributed with the incremental energy production savings; requires greater production of energy to overcome the efficiency losses

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Efficiency, Dispatch, and Charging

- ❖ A BESS is a net energy consumer, as it requires more energy to charge than is discharged; is typically oversized.
- ❖ Southern Company dispatches generating assets to serve customers at the lowest cost while maintaining required reserve margins for reliability purposes.
- ❖ BESS can be charged using several configurations; can be independently sited or charged by a co-located generator
- ❖ Charging a BESS with hydropower unit is dependent on a reliable reservoir inflow.
  - Inflow into Harris Reservoir is insufficient to fully charge both Option A and Option B on daily basis

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Battery Siting & Interconnection

Siting

- ❖ 60 MW / 240 MWh BESS would typically require approximately two acres of contiguous flat land to be cost effective.
  - Cursory review or proposed area around Harris Dam – adequate property exists
  - Additional due diligence to determine siting availability and development feasibility as well as environmental review

Interconnection

- ❖ Not currently adequate space and/or a spare terminal at Harris Dam or Crooked Creek Transmission System to connect to BESS
- ❖ New substation would be necessary
- ❖ Estimated screening level costs
  - Capital Costs - $9M
  - Long-term, O&M costs - $173k per year

Changes in Turbine-Generator Units

- Existing turbines are not designed to operate at flows lower than best gate.

- Upgraded unit must maintain ability to pass 8,000 cfs to operate during flood conditions

- Unit would need to operate at much lower flows for Options A and B
  - Option A requires a variable flow turbine capable of low flows to current full gate flow
  - Option B requires a newly designed Francis turbine capable of flows from approximately 4,300 cfs to current full gate flow

- Turbine Replacement Costs
  - Option A: unknown
  - Option B: $20M

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Estimated Costs

- Summary of costs over a 40-year license term
- Would require battery replacement during that term

	Option A	Option B
Total Installed Cost (2025$)	$96.6M ($1,610 / kW)	$39.0M ($1,950 / kW)
Fixed O&M (including augmentation) (2025-2044)	$1.77M * 20 years	$0.597 * 20 years
Total Replacement Cost (2025$)	$56.4M ($941 / kW)	$19.7M ($984 / kW)
Fixed O&M (including augmentation) (2045-2064)	$1.94M * 20 years	$0.647M * 20 years
Turbine Replacement Cost	Undetermined	$20M
Interconnection O&M (based on current OATT rate and subject to periodic adjustments)	$173,000 * 40 years	$173,000 * 40 years

Effects on Resources

- Scoping-level qualitative assessment

- Recreation – Lake Harris
  - No effect to recreation if BESS would result in releasing same daily volume of water as current operations
  - Adverse impact on recreation if BESS affected ability to maintain operating curve

- Recreation – Tallapoosa River downstream of Harris Dam
  - Option A – under certain assumptions, may benefit recreationists launching in tailrace and for the first few miles below Harris Dam
  - Option B – recreation based activities would still occur as they do under current operations, although peak release would be smaller

- Aquatic Resources – Tallapoosa River downstream of Harris Dam
  - Option A – could potentially benefit aquatic resources first 7 miles downstream
  - Option B – would not have same benefits as Option A as peak is still required; similar to Pre-Green Plan operations

HARRIS DAM RELICENSING

BESS Discussion

From: Jack West <jwest@alabamarivers.org>
Sent: Friday, May 21, 2021 9:29 AM
To: Anderegg, Angela Segars
Cc: Sarah Salazar
Subject: Re: Request for Harris Models and Temperature Data

EXTERNAL MAIL: Caution Opening Links or Files

Angie,

Thank you for the clarification. We'll look forward to reviewing the models and temp data once everything is ready.

Have a great weekend,

On Thu, May 20, 2021 at 12:29 PM Anderegg, Angela Segars <ARSEGARS@southernco.com> wrote:

> Hi Jack,
>
> They are not ready to share at this point. We are in the process of developing our license proposal and packaging everything, including the models, to share with all stakeholders when we file the Final License Application.
>
> Thanks,
>
> **Angie Anderegg**
>
> Hydro Services
>
> (205)257-2251
>
> arsegars@southernco.com
>
> ---
>
> **From:** Jack West <jwest@alabamarivers.org>
> **Sent:** Wednesday, May 19, 2021 10:48 AM
> **To:** Anderegg, Angela Segars <ARSEGARS@southernco.com>
> **Cc:** Sarah Salazar <sarah.salazar@ferc.gov>
> **Subject:** Re: Request for Harris Models and Temperature Data

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie,

Thank you for the response about when models, outputs, and temperature data will be available. Having the models and outputs available at this point would allow us to better analyze the economic and operational context in which a BESS would operate and to identify possible operating strategies that could improve the BESS economic and environmental benefits. Is your team continuing to refine the models between now and the filing of the final license application in November, or are they mostly finalized at this point?

Thank you,

On Thu, May 13, 2021 at 3:49 PM Anderegg, Angela Segars <ARSEGARS@southernco.com> wrote:

> Hi Jack,
>
> Following the BESS meeting, I consulted with our modeling group and our plan is to file all the models and outputs with the Final License Application in November 2021. As you will recall, we did not model the two options for the BESS study—it would have required developing new operating rules and assumptions, which was beyond the scope of the study. Therefore, any comments on the BESS study can likely be filed on the report itself, since no modeling occurred.
>
> The D/S Release alternatives study used both HEC-ResSim and HEC-RAS. As noted, these models and the outputs will be made available at the time we file the Final License Application. In addition to the models, Alabama Power will also file the temperature data you referenced with the Final License Application.
>
> Thanks,
>
> **Angie Anderegg**

Hydro Services

(205)257-2251

arsegars@southernco.com

From: Jack West <jwest@alabamarivers.org>
Sent: Friday, May 7, 2021 10:15 AM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Cc: Sarah Salazar <sarah.salazar@ferc.gov>
Subject: Request for Harris Models and Temperature Data

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie,

At the last few meetings there has been some discussion of when the HEC-RAS and HEC-ResSim models and outputs will be made available to stakeholders. If you could let me know when we might expect those to be made available, I would appreciate it. Again, our consultants reviewing the draft BESS study report would like to use those models and outputs for some of their analysis to be incorporated into comments for Alabama Power on May 26.

I would also like to request that Alabama Power's historical water temperature data from 2000-2018 be made available to stakeholders. This data is referenced and analyzed in the final Aquatic Resources Study Report and its appendices, and it would be helpful to be able to access the underlying data. When you can, please let me know if that is possible and a timeframe for when water temperature data might be available.

Enjoy your weekend,

--

Jack West, Esq.

Policy and Advocacy Director

Alabama Rivers Alliance

> > 2014 6th Ave N, Suite 200
> >
> > Birmingham, AL 35203
> >
> > 205-322-6395
> >
> > [www.alabamarivers.org [alabamarivers.org]]
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www.alabamarivers.org [alabamarivers.org]

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

From:	Sarah Salazar
To:	APC Harris Relicensing
Subject:	RE: HAT 1 - Draft Operations Reports
Date:	Wednesday, May 26, 2021 4:09:58 PM

Good afternoon Angie,

We have been working on comments on the draft operations reports, but will not be able to provide them by the requested deadline (today). We will provide them as soon as possible.

Thanks,

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863* ***Please consider the environment before printing this email.***

From: APC Harris Relicensing <g2apchr@southernco.com>
Sent: Wednesday, April 28, 2021 11:19 AM
To: APC Harris Relicensing <g2apchr@southernco.com>
Subject: HAT 1 - Draft Operations Reports

HAT 1,

Due to the length and complexity of these reports, Alabama Power would like to provide additional time for your review and comment. Please submit any comments you may have on the draft Operating Curve Feasibility Analysis Phase 2 Report, draft Downstream Release Alternatives Phase 2 Report and draft BESS Report by **May 26, 2021**.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

HAT 1,

The draft Operating Curve Feasibility Analysis Phase 2 Report, draft Downstream Release Alternatives Phase 2 Report and draft BESS Report are available for your review on the Harris relicensing website in the HAT 1 [harrisrelicensing.com] folder. These reports can also be found on FERC's website (http://www.ferc.gov [ferc.gov]) by going to the "elibrary" link and entering docket number P-2628.

Please submit your comments on these reports to Alabama Power at harrisrelicensing@southernco.com by **May 11, 2021**.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

APC Harris Relicensing

From: Anderegg, Angela Segars
Sent: Thursday, May 27, 2021 7:27 AM
To: Jack West; APC Harris Relicensing
Subject: Re: ARA Comments on Draft Study Reports

Together is just fine.

Thanks,

Angie

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From: Jack West <jwest@alabamarivers.org>
Sent: Wednesday, May 26, 2021 4:34:07 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>; APC Harris Relicensing <g2apchr@southernco.com>
Subject: ARA Comments on Draft Study Reports

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie,

I've attached ARA's comments on the draft Phase 2 Downstream Release Alternatives report, the draft Phase 2 Operating Curve Change Feasibility Analysis, and the draft BESS Report. Two attachments are included within the one .pdf file. I'm happy to send those as separate files if needed.

Thanks, and please let me know if you have any questions.

Best,

--
Jack West, Esq.
Policy and Advocacy Director
Alabama Rivers Alliance
2014 6th Ave N, Suite 200
Birmingham, AL 35203
205-322-6395
www.alabamarivers.org [alabamarivers.org]

Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

Alabama Rivers Alliance
Water Is Life

May 26, 2021

VIA EMAIL

Ms. Angie Anderegg
Harris Relicensing Project Manager
Alabama Power Company
600 North 18th Street
Birmingham, AL 35203

RE: Comments on Draft Phase 2 Downstream Release Alternatives Report, Draft Phase 2 Operating Curve Change Feasibility Analysis, and Draft Battery Energy Storage System (BESS) Report for R.L. Harris Hydroelectric Project (P-2628-065)

Dear Ms. Anderegg:

Please see below for the comments of Alabama Rivers Alliance (ARA) on the Draft Phase 2 Downstream Release Alternatives Report, the Draft Phase 2 Operating Curve Change Feasibility Analysis, and the Draft Battery Energy Storage System (BESS) Report submitted by Alabama Power Company for the relicensing of R.L. Harris Dam (P-2628-065). Thank you for the opportunity to comment and for including these comments in the Federal Energy Regulatory Commission (FERC) correspondence record. If you have any questions or concerns, please contact me at jwest@alabamarivers.org or by phone at (205)-322-6395.

I. Draft Phase 2 Downstream Release Alternatives Report

The Draft Phase 2 Downstream Release Alternatives Report ("DRA Phase 2 Report") evaluates 11 release alternatives, including the current Green Plan, along with multiple continuous minimum flow scenarios ranging from 150cfs to 800cfs both with and without the pulsing laid out in the existing Green Plan release criteria. As previously noted by FERC staff in comments on the Initial Study Reports, 150cfs represents "poor" to "fair" habitat conditions, while 800cfs represents "good" to "excellent" habitat.[1]

A. Evaluation of Providing a Continuous Minimum Flow

ARA encourages the release of a continuous minimum flow to restore a more natural flow regime and reduce both flow and water temperature fluctuations in the river downstream of Harris, which could lead to improved aquatic habitat, lessen erosion, and benefit recreationists. Following the

[1] FERC Staff Comments on ISR and ISR Meeting Summary (Jun. 10, 2020), Accession No. 20200610-3059, at A-2.

scientific literature, we continue to stress the importance of considering flows and temperature together and not assuming that any particular level of continuous minimum flow will yield a positive ecological response if water temperatures below the dam remain out of line with temperatures at unregulated sites.[2] In fact, a continuous minimum flow of excessively cold water could suppress spawning cues and inhibit the productivity of the aquatic environment.

Data from the DRA Phase 2 Report shows that releasing a continuous minimum flow may not significantly shift overall water temperatures, but it could reduce large swings in temperature close to the dam.[3] For instance, Table 3-12 shows that a 300CMF alternative could reduce maximum daily and hourly temperature changes by roughly half in the tailrace and one mile downstream compared to current operations. Figures 3-31, 3-32, and 3-33 of the report contain clear visual representations of how temperatures at the unregulated Heflin site compare to water temperatures below the dam. The departure of water temperatures downstream of the dam from unregulated Heflin water temperatures is most pronounced in spring and fall, which are critical spawning seasons.

According to Alabama Power's analysis, the HEC-ResSim model indicates that "PreGP, 150CMF, and 300CMF have negligible effects on average reservoir elevations" though 300CMF+GP, 600CMF, and 800CMF scenarios do begin to lower reservoir levels.[4]

The DRA Phase 2 Report does not specify, however, what level of continuous minimum flow (with or without Green Plan pulsing) begins to affect reservoir levels. ARA supports releasing the greatest continuous minimum flow possible that will not adversely affect reservoir levels, and we request that one further step of analysis be conducted to determine what amount of minimum flow can be released without impacting lake levels. For instance, if a 400cfs or 500cfs minimum flow could be released without impacting reservoir levels, that could represent substantial gains in habitat downstream and even further reduce fluctuations in river levels and water temperatures. As the report notes, "[g]enerally, results show that river fluctuations are lower with increasing continuous minimum flows."[5]

The point at which a minimum flow begins to impact lake levels is an important piece of information for stakeholders and FERC to have, and determining this point should not require extensive additional effort on Alabama Power's part. We request that it be included in the final report.

B. Possible Addition of a New Continuous Minimum Flow Turbine

The DRA Phase 2 Report describes generating off of the various minimum flow scenarios and employs a "theoretical unit that pulls water from the existing penstock" to use in Alabama Power's HydroBudget model.[6] As this analysis proceeds and potentially moves from the theoretical realm

[2] *See generally*, Julien D. Olden and Robert J. Naiman, *Incorporating Thermal Regimes into Environmental Flows Assessments: Modifying Dam Operations to Restore Freshwater Ecosystem Integrity*, Freshwater Biology (2010) 55.
[3] Downstream Release Alternatives Draft Phase 2 Report (April 2021), Accession No. 20210412-5748, at 54.
[4] *Id.* at 9.
[5] *Id.* at 29.
[6] *Id.* at 9.

into design and engineering, we encourage Alabama Power to investigate ways to supply any new generating unit used to pass a minimum flow with water from an elevation higher up in the water column than the existing intake and penstock.

Releasing and generating off of a continuous minimum flow of warmer water with higher levels of dissolved oxygen could benefit water quality and aquatic resources substantially. The current intake's skimmer weir is set at 756 feet msl, in the upmost position, yet at a full pool level of 793 feet msl, the water entering the penstock when the reservoir is at full pool comes from a depth of roughly 37 feet and ranges in temperature from approximately 12℃ to 22℃ from March to October, according to the forebay profiles provided as an appendix to the Water Quality Study Report data.[7] That compares to water temperatures in the range of 13℃ to 30℃ over the same months at a depth of 10 feet in the forebay profiles.

If a new continuous minimum flow turbine is proposed, it should be designed to draw from as high as possible in the reservoir in order to provide the greatest gains in water quality and benefits to aquatic resources downstream. The existing intake and penstock could potentially be modified to accommodate this, or a separate intake may be needed for a new generating unit.

II. Draft Phase 2 Operating Curve Change Feasibility Analysis

The Operating Curve Change Feasibility Analysis Draft Phase 2 Report ("Operative Curve Phase 2 Report") applies the hydrologic models and modeling results developed for the Phase 1 Report to quantitatively and qualitatively describe possible impacts to resources that would result from raises in the winter pool level.[8] Under the current operating curve, winter pool elevation is 785 feet msl, and the Phase 2 Report evaluates raising the winter pool level to either 786, 787, 788, or 789 feet msl.[9]

Elevating the winter pool level could benefit recreation on Lake Wedowee in the winter months by making some structures and boat ramps more accessible, however, increased recreation opportunities must be weighed against exacerbated downstream flooding that could result from a raise in the winter pool elevation. As the Operating Curve Phase 2 Report summarizes: "The primary adverse effect of raising the winter pool is on downstream resources in the form of an increase in flooding….The primary beneficial effect of raising the winter pool is in the number of reservoir recreational structures (boat slips, docks, etc.) that are available for private recreational use/access during the winter months."[10]

A. Exacerbated Flooding Downstream – Impacts to Downstream Residents and River Users

[7] Water Quality Report Study Data, Appendix B, Accession No. 20210412-5760.
[8] Operating Curve Change Feasibility Analysis Draft Phase 2 Report (April 2021), Accession No. 20210412-5750.
[9] *Id.* at 1.
[10] *Id.* at 55.

The modeling results summarized in Table 3-2 and Table 3-3 of the Phase 2 Report show that once the winter pool is raised by two feet and reaches 787 feet msl, more downstream structures become inundated during the 100-year design flood, including single family and mobile homes. With any amount of raise in the winter pool level, flooding becomes shorter in duration, but more intense in magnitude with a more rapid rise due to less storage being available in the reservoir and a quicker release of water.

Throughout the relicensing, many river users and downstream property owners have voiced concern about unpredictable flooding, property damage, and risks to personal safety caused by rapid and unannounced rises in river levels. ARA highly recommends that Alabama Power pay careful attention to these very real concerns of people living below Harris and those who recreate on the river. These flood events not only harm property but also present a threat to public safety.

Recreation downstream of Harris could also suffer with a higher winter pool level. Table 3-16 of the Phase 2 Report shows that the seven existing recreation sites below the dam would have a greater maximum depth of inundation, ranging from roughly 0.5 foot of depth increase with a 1-foot raise up to approximately 2.5 feet of depth increase with a four-foot raise in the winter pool. This additional inundation could make the recreation access points below the dam less accessible.

B. <u>Exacerbated Flooding Downstream – Impacts to Aquatic Life and Habitat</u>

Periodic flooding on the Tallapoosa River, particularly in the spring, is part of natural riverine processes. However, since beginning operations Harris Dam has highly altered hydrologic processes and flow regime characteristics and created frequent large flow fluctuations that can lead to more intense flooding than the ecosystem would experience in its natural state. The modeling in the Operating Curve Phase 2 Report shows that raising the winter pool level "results in greater outflow from Harris Dam and subsequent flooding" due to increases in spill frequency and the amount of time spent at turbine capacity.[11] While the percentage increases may appear small, more time spent at turbine capacity could have further repercussions on downstream aquatic resources and affect fish spawning sites and spawning behavior. Infrequent but intense flood events can have sizable negative effects on spawning success.

Erosion could also be worsened by raising the winter pool level. Due to steep streambanks and soil conditions, the Operating Curve Phase 2 Report notes that "[i]ncreased scour would occur as velocities increase with the higher channelized flows resulting from the decreased storage in Harris Reservoir associated with higher winter operating curve elevations."[12] Issues of erosion and sedimentation have been frequently cited by river users and property owners downstream of Harris, and any operational changes that could lead to increased erosion should be carefully considered and only adopted with robust mitigation and protection efforts.

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[11] *Id.* at 33.
[12] *Id.* at 31.

In deciding whether to change the operating curve to raise the winter pool, Alabama Power must weigh the potential benefits of increased recreation on the reservoir during winter months against possible exacerbated flooding below the dam, increased erosion, and further negative impacts to aquatic life and habitat. Without detailed and robust protection and mitigation plans, ARA would not support a change in the operating curve to raise the winter pool level. Whether or not the operating curve is changed to raise the winter pool level, protection and mitigation measures should be taken downstream of Harris to reduce flooding impacts, restore eroded and impaired streambank segments, and provide safer conditions for recreationists and residents.

III. Draft Battery Energy Storage System (BESS) Report

In order to make the Battery Energy Storage System (BESS) study as useful and productive as possible, ARA engaged experts from Synapse Energy Economics, Inc. to review the draft BESS Report produced by Alabama Power, and Synapse's comments and recommendations are included in Attachment A and incorporated into these comments by reference.

While no study plan was required to be created for the draft BESS Report, in its study determination issued in August 2020, FERC recommended that Alabama Power conduct the BESS study and amend the Downstream Release Alternatives Study to include at least two new release scenarios:

(a) A 50 percent reduction in peak releases associated with installing one 60 MW battery unit
(b) A proportionately smaller reduction in peak releases associated with installing a smaller battery unit (5, 10, or 20 MW battery).

Because pairing a BESS with the Harris project would require modifying or replacing one of the existing turbine-generators, FERC recommended Alabama Power include estimated costs for any specific structural changes, as well as the costs for the BESS itself. Finally, FERC advised that Alabama Power evaluate how each of the release alternatives specified in scenarios (a) and (b) above would impact recreation and aquatic resources on the reservoir and downstream of Harris.

A. Cost Analysis

The draft BESS report contains significant analysis of costs supported by estimates from NREL's 2020 Annual Technology Book. However, Alabama Power only explored one ownership option to procure a BESS, which is a company investment in the BESS. An evaluation of a power purchase agreement (PPA) was not evaluated as an alternative to financing the BESS internally. Both ARA's study request and FERC's study recommendation included comparing ownership options for BESS procurement, and we continue to suggest that Alabama Power provide a PPA financing alternative in its cost analysis since it is a common method by which utilities contract for BESS services. See Synapse's comments and recommendations in Attachment A for more detail on this point.

Unfortunately, Alabama Power's cost analysis does not factor in any potential incentives, including tax credits, that could be used to reduce the overall costs of a BESS. This is explicitly stated in Section 2.1 of the draft BESS Report, "…potential incentives to offset battery costs are not included."[13] Dramatic declines in BESS costs have been driven by technological advancements and through incentives—tax credits in particular—and these incentives continue to shape the market for BESS. Ignoring this reality skews the cost analysis towards the high end and paints an unreasonable picture of the actual costs of BESS. Again, incorporating a survey of market PPA prices for BESS into the analysis will more accurately reflect these available incentives. As Synapse notes in Attachment A, Alabama Power already has some useful PPA price comparisons available. Meaningful discussion of how incentives could reduce overall costs should be included in the BESS Report.

Additionally, Alabama Power's cost analysis shows high interconnection costs due to a lack of spare terminals at Harris or the Crooked Creek Transformer Substation, but the draft BESS Report did not explore siting a BESS elsewhere on the transmission and distribution system where it could produce greater benefits to the grid while still being optimized with the hydropower facility.

Finally, Alabama Power did not fully determine the costs of modifying or replacing one of the turbine-generators to accommodate installation of a BESS and enable a wider range of flows. ARA acknowledges the current physical and engineering constraints at Harris, but quantifying these upgrade costs is a crucial piece of the cost/benefit analysis, and this information is needed by stakeholders, FERC, and Alabama Power to analyze whether the benefits of justify the costs.

B. Benefits Analysis

Alabama Power initially declined to undertake the BESS study and does not consider it to be a reasonable alternative due to the costs of battery storage and associated improvements to the turbine-generators. However, a thorough analysis of the potential system and environmental benefits should still be conducted to provide stakeholders and FERC with the information necessary to evaluate the full spectrum of benefits a BESS may provide to measure against the costs of infrastructure improvements. The draft BESS Report currently lacks sufficient benefits analysis, both regarding environmental benefits and system benefits. Indeed, the current analysis is focused almost solely on costs to the exclusion of any benefits, producing an imbalanced report.

a. Environmental Benefits

Only a paragraph of the report is dedicated to assessing the effects on aquatic resources below the dam, and the possibility of improved environmental outcomes are largely dismissed as "potential limited environmental benefits" without analysis.[14] No attempt was made to quantify the environmental benefit of a 1/3 reduction in peaking flows resulting from Option B. Instead, a conclusory statement that "Option B would not likely benefit habitat stability, because the peak release would still occur"[15] takes the place of useful analysis.

As discussed further below, new research shows just how many environmental benefits can accrue from optimizing BESS with hydropower operations, including releasing flows that are more similar to the historical hydrograph, improving temperature regimes and dissolved oxygen levels,

[13] Draft Battery Energy Storage System (BESS) Report (April 201), Accession No. 20210412-5747, at 6.
[14] *Id.* at 21.
[15] *Id.* at 20.

accommodating spawning windows, and fostering safer fish passage through hydropower structures.

b. Grid and Economic Benefits

See Synapse's comments and recommendations in Attachment A for a list of potential grid and economic benefits that should be analyzed and added to the draft BESS Report.

c. Recommendations for Strengthening Benefits Analysis

Recent work by the Pacific Northwest National Laboratory (PNNL) can help inform the benefits analysis and can push the study forward with an improved methodology and framework for analyzing environmental benefits stemming from a BESS addition. PNNL's recent white paper, "Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower" is directly relevant to this study (in fact, it cites the Harris project as a case study), and a copy of this paper is included as Attachment B.[16]

PNNL's work explains how either co-located or offsite BESS can be co-optimized with hydropower facilities to gain "complementary performance profiles to hydropower projects, opening a broad spectrum of operational patterns" while improving environmental outcomes.[17] It provides both methodological guidance and a comprehensive framework for determining "the range and type of potential localized environmental benefits realized through integrating energy storage and hydropower."[18]

Environmental benefits mentioned in the PNNL paper range from reducing hydropeaking and releasing more natural flows to improving water temperature and dissolved gases—all of which are pertinent at Harris. Section 5.1 of the PNNL white paper contains a particularly applicable conceptual example that illustrates how a BESS could be used to enhance environmental benefits for a hydropeaking plant such as Harris. PNNL's discussion of deciding energy storage type, size, and location can inform and strengthen the initial analysis contained in the draft BESS report, particularly in the area of battery siting and interconnection.

PNNL's important and relevant work on this topic should be considered and used to update the draft BESS Report with more concrete benefits analysis, both environmental and economic. We encourage Alabama Power to incorporate the expanded methodology and framework presented in the PNNL white paper as it updates the draft BESS Report.

C. <u>Lack of Modeling Data Available</u>

Currently, the HEC-RAS and HEC-ResSim models and outputs are not available to stakeholders. Having the models and outputs available would allow stakeholders to better analyze the economic and operational context in which a BESS could operate and to identify possible operating strategies

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[16] Pacific Northwest National Laboratory, *Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower* (May 2021), PNNL-SA-157672, available at https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-SA-157672.pdf.
[17] *Id.* at iii.
[18] *Id.*

that could improve the BESS economic and environmental benefits. This information has been requested by ARA and other stakeholders and will be filed with the final license application in November 2020. ARA will continue analysis of the opportunities for increased operational flexibility and associated environmental benefits once those models and outputs are available. See Synapse's comments and recommendations in Attachment A for additional information that could help further assess economic and environmental benefits.

D. Potential Use of BESS with a Continuous Minimum Flow Turbine

As described in Section I above, the draft Phase 2 Downstream Release Alternatives Study incorporates a theoretical new turbine to release and generate off of a minimum flow. During the Updated Study Report meeting, Alabama Power noted that passing a continuous minimum flow leaves less water available to use on peak. Though not within the original scope of the current BESS study, ARA suggests that Alabama Power consider matching a smaller sized BESS with any minimum flow turbine to store energy to use on peak while passing a continuous minimum flow. Added flexibility will enhance project operations and create better environmental outcomes below Harris.

Thank you for your careful consideration of these comments.

Sincerely,

Jack K. West

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ATTACHMENT A

Comments of Synapse Energy Economics, Inc. on

Draft Battery Energy Storage System (BESS) Report

Memorandum

TO: JACK WEST, ALABAMA RIVERS ALLIANCE

FROM: MAX CHANG, ANDREW TAKASUGI, AND DAVID WHITE

DATE: MAY 25, 2021

RE: COMMENTS ON DRAFT ALABAMA POWER BATTERY ENERGY STORAGE SYSTEM FOR R.L. HARRIS DAM

Introduction

On April 12, 2021, Alabama Power released a draft feasibility study to quantify the associated costs assumed for the installation of a Battery Energy Storage System (BESS) for moderating the current water releases associated with peaking operations of the 135 megawatt[1] (MW) R.L. Harris Dam (Harris Project) located on the Tallapoosa River.[2] The draft report studied two alternatives:[3]

- Option A: A 60 MW battery with 240 MWh capacity that can provide the near equivalent generation of one unit at best gate for 4 hours per day/every day.
- Option B: A 20 MW battery with 80 MWh capacity that can provide the equivalent generation of about one-third of one unit at best gate for 4 hours per day/every day. The remaining 40 MW needed for 1-unit peaking generation would be produced by a new, upgraded unit.

The installation of a BESS could allow changes in the peak water discharges that would lessen the impacts on water quality and the riparian environment. The Alabama Power draft study considered changes in the dam operations that would generally operate only one turbine during peak periods. The generation at other times could be used to charge the BESS that could then discharge and provide power during the peak load periods. The BESS would thus essentially be used for a time shifting operation to maintain peak generation capability and revenues for Alabama Power.[4]

[1] The facility has two 67.5 MW turbines for a total capacity of 135 MW.

[2] Alabama Power. Battery Energy Storage System (BESS) Report R.L Harris Hydroelectric Project FERC No. 2628. April 2021. Available at http://www.harrisrelicensing.com/_layouts/15/start.aspx#/SitePages/Welcome.aspx

[3] Ibid. Page 5.

[4] The plant could change its operational mode even without a BESS, but a BESS provides a means for retaining some of its peak operating characteristics.

Alabama Power ultimately concluded that the installation of a BESS would not be a "reasonable alternative" based on its estimate of costs and benefits.[5]

Comments

Synapse has reviewed the draft report and has identified several issues with the report and as well as opportunities to reduce the dam's impact on the Tallapoosa river by altering the dam's operations and investing in specific infrastructure upgrades at the facility. Synapse's comments are detailed in the following bullets.

Synapse notes the following observations regarding Alabama Power's BESS installation costs/planning:

- In this draft report, Alabama Power did not evaluate an independent power purchase agreement (PPA) as an alternative to financing the battery internally. Synapse notes that in 2019, Alabama Power filed a petition for the issuance of a certificate of convenience and necessity that included five PPAs for solar and BESS systems.[6] Alabama Power did not reference specific costs or opportunities information from the Docket 32953 proceeding in its analysis of BESS for the Harris Project.
- The draft report did not look into siting a BESS elsewhere on the Alabama Power transmission and distribution system that could address local needs. Synapse believes that the location of a BESS could impact the cost of interconnection as well as the benefits.
- Given that the BESS would charge from the grid regardless of its proximity to the Harris Project, Synapse recommends that Alabama Power investigate whether there are any BESS systems already connected to the Alabama Power distribution system which might negate the need for a new battery installation.
- The draft report did not look into possible arbitrage opportunities related to the operations of a BESS (e.g. charging from the grid and/or from hydro generation during off-peak hours and selling during peak hours)
- The draft report did not look at the other possible benefits of the battery system including various ancillary services such as voltage regulation and black start capabilities.
- The study did not consider a BESS system of the same size as one of the existing turbines (67 MW vs. 60 MW), which would simplify many of the issues raised by Alabama Power regarding the need for incremental capacity.
- The draft study did not look at the minimum flow option that could match a smaller sized battery system with a smaller turbine that might have better economics.
- The draft study did not investigate whether the economics of the project could be improved by coupling a BESS with a solar PV installation to gain investment tax credits.
- Alabama Power has not provided modeling information to quantify hydro operations. This information would be helpful to pair with BESS operations.
- Synapse noted that Alabama Power appears to be against switching out any of the existing turbines for a variable load Kaplan turbine due to cost and constructability issues with the turbine housing.

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[5] Alabama Power. (2021). Page 22.

[6] See Alabama Public Service Commission Docket 32953. Available at http://psc.alabama.gov/

Recommendations

Based on our observations regarding the draft report, Synapse makes the following recommendations:

- Alabama Power should provide cost and benefit information beyond the cost of the batteries. This would include economic and operational benefits in addition to more detailed environmental benefits.
- Alabama Power should provide details on the operational assumptions used for hydro generation and BESS operations.
- Alabama Power should provide information that evaluates possible BESS operations based on of hourly data for generation, water flow, energy prices, and modeled battery charging and discharging.
- Alabama Power should analyze sizing the BESS to match the full capacity of an existing turbine.
- Alabama Power should consider a power purchase agreement (PPA) for the battery system rather than a company investment. This would also include information on solar and BESS PPAs considered in Docket 32953 or other comparable PPAs.
- Alabama Power should consider the benefits of locating the BESS elsewhere on the grid.
- Alabama Power should consider the benefits of combining a BESS system with solar and obtaining investment tax credits.
- Alabama Power should consider a minimum flow turbine and a smaller matching battery system.
- Alabama Power should evaluate the impacts of reduced peaking operation without a BESS to the extent that has not been analyzed in the Green Plan.
- Alabama Power should evaluate the benefits, including environmental ones, as well as the costs in all the analyses.

ATTACHMENT B

Pacific Northwest National Laboratory White Paper

Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower

Pacific Northwest
NATIONAL LABORATORY

PNNL-SA-157672

Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower

White Paper

May 2021

B Bellgraph, T Douville,
A Somani, K DeSomber,
R O'Neil, R Harnish,
J Lessick, D Bhatnagar,
J Alam

U.S. DEPARTMENT OF ENERGY

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PNNL-SA-157672

Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower

White Paper

May 2021

B Bellgraph, T Douville,
A Somani, K DeSomber,
R O'Neil, R Harnish,
J Lessick, D Bhatnagar,
J Alam

Prepared for
the U.S. Department of Energy
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Pacific Northwest National Laboratory
Richland, Washington 99354

Summary

Hydropower operators have many reasons to integrate energy storage, either co-located onsite or located elsewhere, but co-optimized with facility operations. Storage systems can be configured to have complementary performance profiles to hydropower projects, opening a broad spectrum of operational patterns.

Integrating energy storage can allow hydropower operators to accomplish the following:

- Capture additional revenue by using more agile operational characteristics for fast-response ancillary services or by generating greater amounts of peak energy with expanded operational limits.
- Adapt to changing regulatory and market conditions, such as evolution of the Energy Imbalance Market in the western United States, without pushing equipment beyond design parameters or optimal hydraulic performance.
- Improve asset management conditions by minimizing equipment wear and tear using energy storage to support fast-response ancillary services or support demands beyond optimally efficient setpoints.

An important but unexamined opportunity is to integrate energy storage systems with hydropower facilities to improve environmental outcomes. Integrated operations support increased flexibility in the management of the underlying water system and the associated ecosystem. The connections are particularly clear in modifying power generation relative to water storage, release, and flow regimes. Such integrated operations support regulatory requirements, including maintaining upstream reservoir levels, ensuring adequate downstream flows to meet an ecological target, or for human uses of a river such as fishing or boating.

This document provides an organized discussion of the relationship between hydropower-storage integration and improved localized environmental outcomes. Which includes:

- An overview and survey of current uses of energy storage in the hydropower industry.
- A comprehensive framework describing the range and type of potential localized environmental benefits realized through integrating energy storage and hydropower.
- Case study examples comparing real conditions with environmental requirements.
- Methodological guidance to analyze potential benefits, technology characteristics, and tradeoffs.
- A discussion of co-optimizing versus co-locating storage within the facility footprint.
- A concluding summary of the steps necessary for industry to fully develop and implement this concept.

This paper is a fundamental exploration of local environmental outcomes that can be realized through integration of energy storage systems with hydropower facilities. It provides a methodological foundation for future analysis rooted in expert knowledge of both hydropower–environmental interactions and attributes of energy storage technologies.

Acknowledgments

We thank several individuals and organizations who reviewed the contents of this white paper during its development and provided invaluable feedback that was integrated into the published version. Specifically (in no particular order), we thank Todd Olinsky-Paul of the Clean Energy States Alliance; Kevin Malone, independent consultant; Brent Nichols and Conor Giorgi of the Spokane Tribe of Indians; U.S. Department of Energy Southwestern Power Administration; Jack West at the Alabama Rivers Alliance; Jannik Haas at the University of Stuttgart; Kurt Miller with Northwest River Partners; the Low Impact Hydropower Institute; Jon Newman with Fluence Energy; The Hydropower Reform Coalition; and John Chandler of Puget Sound Energy.

Contents

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1.0 Problem Overview

Hydroelectric dams have been operating in the United States (U.S.) for more than 100 years, and throughout this time, the range of potential environmental effects from hydroelectric dams has become well-established. As part of the periodic authorization or review of these dams, environmental effects are studied, evaluated, and in some cases mitigated. Mitigation may require investing in habitat restoration, improving river connectivity for migratory species, monitoring water quality, engaging the public, developing and implementing new technologies (hardware or software), and directly adjusting dam operations.

As dam operators balance the management of environmental impacts with maintenance of their electricity resource, new storage technologies may help to meet both needs. Most federally operated hydropower projects, as well as those operating under licenses granted by the Federal Energy Regulatory Commission (FERC), have limits on their operations to reduce environmental impacts. These limitations include spilling water outside of generating turbines, or managing flow on daily, seasonal, or yearly time scales balanced around the needs of fish and other aquatic species, reservoir levels, or downstream ecological needs. These flow management practices affect the economic viability of a given hydroelectric project by limiting its full operational flexibility. Additionally, the increase in renewable energy production has challenged the contribution of hydropower to the grid, and maintaining environmental flows mandated by FERC license requirements will become increasingly challenging (Kern et al. 2014). As storage technologies advance and become commercially available at utility-grade, grid-scale, and cost-effective levels there is a new opportunity to imagine how they can integrate with hydroelectric operations to support the larger electrical grid, while maintaining financial stability and improving environmental outcomes.

This paper describes how the installation of energy storage systems, co-sited with hydroelectric projects, offer operational, economic, and environmental benefits by enabling a broader range of electricity performance, capitalizing on its flexibility and grid reliability, while mitigating critical environmental impacts or improving environmental outcomes across U.S. rivers and streams. The paper attempts to link environmental outcomes to energy storage utilization. It offers a comprehensive inventory of research-grade work, site-specific studies, policies, and pilot projects regarding energy storage and hydropower that show significant environmental implications. It provides an outline of methodologies given the known costs and attributes of storage technologies, with case study illustrations. It also outlines the key components of a methodology that could be applied within the context of specific projects to reveal the environmental benefits of energy storage paired with hydropower production to properly size the storage systems to capitalize on potential benefits.

This paper provides a framework for assessing the degree to which energy storage can support operational strategies to improve environmental objectives, including where flow releases or other operational changes are provided to match a water quality, fish, or other ecological objective. Factors driving the integration of hydropower and energy storage will be site-specific, and include combinations of operational, maintenance, economic, and environmental considerations. The focus of this paper will strongly support the validity of the environmental approach. A set of knowledge gaps to be addressed in future work is provided. To validate and support the information provided in this paper, further analysis will be required on a physical facility to serve as a test case.

2.0 Current Use of Energy Storage by the Hydropower Industry

Hydroelectric plants currently offer energy storage due to the presence of water reservoirs, but to increase storage, operators have at times considered batteries to be a competitive resource. Energy storage could be accomplished by expanding the impoundment and raising the height of a dam; however, raising dam height introduces a host of civil engineering requirements, costs, and timelines, as well as regulatory authorizations, and doing so would inundate new lands. Despite these challenges, dam-raising efforts are being considered.[1] In contrast, energy storage systems can be installed in as little as 6 months, when physical space, electrical infrastructure, and construction permits are readily available (Pyper 2017). Larger reservoirs offer similar characteristics of storage that are already available; energy storage systems can offer a complementary capability rather than an expansion of existing flexibility.

As batteries become more reliable and efficient, an emerging idea is to directly integrate batteries with hydroelectric plants and hybridize their operations for overall improved plant performance. To date this idea has been explored for power flexibility benefits or market participation eligibility, such as provision of ancillary services, market eligibility as a fast-responding resource, or improved operational integration across cascading plants. Many energy storage systems are sited at utility infrastructure based on reliability, or distribution or transmission requirements. The appropriateness of whether to co-site or to co-optimize storage systems with hydroelectric plants, given ownership model, revenue mechanism, and grid operation conditions, is discussed in a later section.

Examples of power flexibility achieved by incorporating different types of storage on-site at hydroelectric plants, either simulated or actual, are provided below.

- In Sweden, Fortum has connected a 5 MW battery system to a 44 MW hydropower plant to improve its quick response time and the precision of its regulation service, because wind power has created the need for increased flexibility. The site has also asserted that the battery helps to keep the market in balance and reduces wear on hydropower turbines, allowing for deferral of investment in maintenance or replacement (Hydro Review 2018).
- The Buck and Bullesby power plants owned by AEP in southwestern Virginia have installed a 4 MW battery system. The system is used to reduce peaking in the older hydropower plants and increase the value of frequency regulation in the PJM market. This allows AEP to leverage and enhance revenue by providing regulation services and offset the charges that customers incur.
- Idaho Falls Power has also implemented a black start field demonstration to show that run-of-river hydropower plants with energy storage can restore electric power without assistance from the transmission system. This capability is essential for small hydropower facilities to be able to operate a microgrid to power critical loads in the event of an outage.[2]

[1] San Vincente Dam in San Diego was raised more than 100 ft in 2012. See https://www.water-technology.net/projects/san-vicente-dam-raise-san-diego-california-us/. The Bureau of Reclamation intends to raise Shasta Dam in California by 18.5 ft. The project is currently in pre-construction. See https://www.usbr.gov/mp/ncao/shasta-enlargement.html.

[2] See the “Integrated” project, which explores the energy benefits to hydropower when paired with energy storage technology: https://factsheets.inl.gov/FactSheets/Integrating%20Hydropower.pdf.

- Other examples include the Cordova Electric Cooperative 1 MW battery and Kodiak Electric Association's 3 MW batteries. Both sites coordinate battery operations with small-scale hydropower to support small grids in Alaska. In Cordova, the battery system is designed to support a microgrid in the event of an outage due to harsh weather and avoid spill during dynamic seasonal loads. Kodiak aims to achieve reliability from an increase in the use of wind generation to support their microgrid, while reducing rates for customers with their two-battery system.
- Douglas County Public Utility District announced their intention to construct a 5 MW hydrogen electrolysis pilot project at its Wells Dam on the Columbia River (Shumkov 2020).
- In January 2020, Brookfield Renewable proposed an energy storage project at two of their hydro facilities along the Penobscot River—the Penobscot Mills and Ripogenus projects. Each project consists of a 10 MW, 20 MWh on-site system, which would be permitted under existing interconnection agreements. The batteries would allow the continued operation of the hydroelectric facilities during periods of high congestion and would have no impact on the operation or maintenance of the projects.[1]

It is clear from the examples above and the direction of the international industry that operational flexibility and asset management are the driving factors for hybridization of storage and hydroelectric plants. Even emerging "clean peak" policies such as Massachusetts' new Clean Peak Standard require hybridization of storage on clean energy projects to qualify for special treatment and remuneration, based on the premise that this additional flexibility is necessary to meet reliable system operations and clean energy goals.[2] [3] Additional power benefits for energy storage installations are yet to be analyzed, to the authors' knowledge. For example, storage systems could replace end-of-life small hydropower turbines to support station service at large plants.

3.0 A Novel Energy Storage Use Case: Environmental Benefits

This white paper posits that an additional class of benefits is derived from co-siting storage systems with hydroelectric plants—environmental benefits. As noted above, storage can improve the range of operational flexibility. Regardless of the primary investment driver, local environmental management is an essential part of the operational equation. Once hydropower plant operators install storage systems, the projects may operate differently to manage environmental constraints. Whether optimization occurs as an investment, regulatory, or planning tool, or after the fact as a new operational regime implemented from storage-integrated operations, improved environmental outcomes are possible with the installation of expanded on-site storage. New techniques such as advancements in multi-objective optimization of hydropower funded by the National Science Foundation (Roy et al. 2018) and

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[1] FERC Project No. 2458-214 – Penobscot Mills Project, Great Lakes Hydro, LLC; FERC Project No. 2572 – Ripogenus Project, Great Lakes Hydro, LLC.

[2] Arizona, California, North Carolina, and New York have explored clean peak standards without success in implementation. Michigan has explored a "low-cost peak program," which would require renewable energy generation to be paired with energy storage.

[3] See the Low Impact Hydropower Institute's webinar with experts discussing how this standard may affect operational and economic outcomes for hydropower plants: https://lowimpacthydro.org/massachusetts-clean-peak-standard/.

data-rich demonstrations are needed to fully evaluate the flexibility and environmental opportunities.

The nexus between environmental objectives and operational flexibility is well-established, and research continues to define these relationships.[1] A short list of operational changes to improve environmental outcomes, depending on site-specific operational and structural configurations, includes discharge ramping rates, minimum flows, reservoir levels, downstream and upstream temperature, dissolved gases (too much or too little), turbine loading patterns, as well as recreational management, boating flows, fish passage, flood control, irrigation, and other uses of the river. How could batteries or comparable energy storage technologies permit a win-win opportunity—operational flexibility and environmental improvements?

Examples of direct advocacy for energy storage installation for environmental outcomes, under discussion in two open FERC proceedings exist, as indicated in the case studies highlighted below.

3.1 Case Study: Connecticut River Conservancy and Great River Hydro's Vernon Dam (White et al. 2020)

The Connecticut River Conservancy contracted a study with Synapse Energy Economics in February 2020 to analyze the potential for the Vernon Dam hydroelectric plant (P-1904), owned by Great River Hydro, to be re-operated in a run-of-river mode and paired with a 10 MW, 2 hr battery storage system. The researchers aimed to determine the energy market revenue impacts of transitioning Vernon Dam to run-of-river operations while quantifying the value of installing an integrated battery storage system to capture a portion of peak energy prices.

The researchers found that a transition to run-of-river operations would moderately affect energy market revenues by 3 to 10 percent, while the other revenue streams (capacity, ancillary services, and renewable energy credits) would have little to no impact. It may be necessary, however, to relax true run-of-river operations during peak-load hours to maintain capacity values (and thus capacity revenues). Energy price arbitrage can be leveraged by charging batteries from turbines during periods of low energy prices and discharging power during periods of high energy prices. As New England increases its renewable energy levels, price volatility may increase, increasing the value of energy arbitrage. The cost range of the 10 MW proposed storage system was determined to be $4.9 to $9.8 million—a cost-effective investment at the lower end of the range, but a loss at the higher end.

With five hydropower plants along the Connecticut River in Massachusetts, New Hampshire, and Vermont applying for new licenses, this case study illustrates the potential for battery storage to offset revenues if peak operating plants convert to run-of-river operations. The results of this case study have been provided to the applicants for their consideration and submitted to the FERC docket as an alternative scenario opportunity.

[1] See U.S. DOE HydroWIRES grant to the Electric Power Research Institute to *Quantify Hydropower Capabilities for Operational Flexibility*: https://www.energy.gov/articles/doe-announces-249-million-funding-selections-advance-hydropower-and-water-technologies

3.2 Case Study: Alabama Rivers Alliance and Alabama Power's Harris Project[1]

One emerging case study with a goal of reducing hydropower peaking to reduce the impact of unnatural flows on the Tallapoosa River's ecosystem may begin to explain the potential environmental benefits of adding a battery and allowing greater flexibility to meet electrical demand. In June 2020, Alabama Rivers Alliance advocated for Alabama Power to conduct studies of downstream release alternatives and battery storage integration at the Harris Project (FERC #P-2628) on the Tallapoosa River. Current operations include discharge variations, occurring within a few hours' time, from zero to about 16,000 cubic feet per second (cfs) when both turbines are operating. FERC proceedings regarding downstream release alternatives included comments from FERC staff, Alabama Rivers Alliance, and the U.S. Environmental Protection Agency, each recommending specific study scenarios. Alabama Rivers Alliance requested a study to compare models simulating the release of the natural flow variability of the Tallapoosa River compared to several alternative operations scenarios. Simulation of "natural flows" will ultimately not occur, but the alternative scenarios to be studied will include (1) the current operation plan ("Green Plan," designed to reduce effects from peaking operations on the aquatic community), (2) the project's historical peaking operation, (3) a modified current operation plan, (4) a downstream continuous minimum flow of 150 cfs under the historical peaking operation scenario, and (5) six other operations scenarios including minimum flows of 300, 600, and 800 cfs; a derivation of the "Green Plan;" and two other scenarios resulting from an addition of a battery energy system.

Alabama Rivers Alliance requested that a new study be conducted by Alabama Power titled "Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts." This study would determine whether a battery storage system could be economically integrated at the Harris Project to provide power during peak demand periods—decreasing the need for peak generation flow released and reducing flow fluctuations downstream—by evaluating battery type, size, costs, ownership options, and barriers to implementation. In their response, FERC described the potential benefits of adding a battery energy system to include reducing the fluctuations in the reservoir by half, reducing peak flows from 16,000 to 8,000 cfs, and achieving the ability to release flows throughout the day and night versus only during peak demand hours. Alabama Power initially rejected the study, citing the high costs of battery storage systems and turbines that are not designed to operate gradually over an extended period. Using a 2018 National Renewable Energy Laboratory report (DOE 2018), Alabama Power estimated the cost of a 60 MW, 1 hr battery (the equivalent to power one turbine at the site) to be $36 million, with a combined cost for both turbines of $72 million. FERC further noted that a 4 hr 60 MW battery, costing $91 million may be needed because Harris Dam can generate for up to 4 hr. FERC recommended that the company conduct the battery storage feasibility study to include (1) a 50 percent reduction in peak releases associated with installing one 60 MW battery unit, and (2) a smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e., 5, 10, 20 MW), including cost estimates. The study will be conducted through April 2021 and will be used to assess the project impacts on downstream resources including aquatic species, erosion, water quality, terrestrial resources, and recreation.

[1] Project No. 2628-065 – Alabama R.L Harris Hydroelectric Project, Alabama Power Company.

4.0 Environmental Benefits Associated with Increased Operational Flexibility

An initial framework of relationships between storage and environmental outcomes is provided in Table 1. Although the issue categories in the table are not mutually exclusive, they begin to elucidate the potential environmental improvements that pairing energy storage with hydropower may provide. Future work would further characterize these examples and conduct a more thorough review of potential environmental gains derived from augmenting hydropower with energy storage technologies.

Adding a storage system to a facility would allow owners flexibility in generation, by breaking the tie between river flows and fluctuating power demands. Site-specific conditions, location, and regulations will dictate the magnitude and type of environmental outcome that may be realized. Table 1 discusses the potential improvements and is not intended to be all-inclusive, nor are all benefits applicable to every unique case.

Table 1. Taxonomy of potential environmental benefits from pairing hydropower with energy storage.

Issue Category	Desired Positive Environmental Outcome	Change in Operation with Energy Storage	Knowledge Gaps
Fisheries	Release flows that are more similar to the historic hydrograph (e.g., run-of-river) that includes cues used by fish for spawning, rearing, migration, etc.; reduce fish-stranding mortality.	Maintain operations and absorption of energy to permit a higher (or lower) release of flows.	Characterize the duration and intensity of flows and turbine operations/energy generation in relation to fish behavioral cues and survival relationships.
	Allow historical seasonal peak flows to enable fish spawning.	Reduce wear-and-tear on components through steady operation during fluctuating generation and release requirements.	Determine sizing and controls between energy storage and turbine units to integrate operations.
	Foster safe passage through hydropower infrastructure.	Allow spill for downstream passage to maintain the same electricity production; offset efficiency losses from fish screens.	Optimize storage capacity, state-of-charge, duration, degradation, and efficiency.
Water Quality	Reduce supersaturated total dissolved gas (TDG) levels.	Support more advantageous release schedules and reservoir management, absorption of energy if released through turbines under oversupply conditions.	Potentially improve TDG throughout a cascading hydropower system with new operations and energy storage flexibility?

Issue Category	Desired Positive Environmental Outcome	Change in Operation with Energy Storage	Knowledge Gaps
	Optimize dissolved oxygen.	Allow oxygen injection to be combined with turbine operation and releases through absorption of energy or support more advantageous release schedules.	Potentially improve dissolved oxygen with new operations and storage flexibility?
	Allow for improved temperature regimes.	Enable temperature control via locally powered reservoir control structure to manage downstream temperatures where seasonally stratified reservoirs are present.	Explore added flexibility of batteries and hydro operations to control temperature.
	Reduce unwanted nitrogen/phosphorous contributions to algal blooms.	Use energy storage system to allow spill variation in reservoir levels; local energy could be used for removing nutrients from water.	Understand the impacts of alternative operations on the ability to control nutrient levels.
Flows	Reduce intensity of peaking flows and up and/or down ramping rates.	Charge energy device in advance of peak flows to increase the responsiveness of the project to signal and shave flow releases to lower ramp rates.	Measurably improve environmental resources through changes in intensity and ramping that are possible with storage integration?
	Maintain minimum flows (varied by season or otherwise as specified).	Permit cost-effective decrement in flows and generation with releases not timed to match electricity demand.	Acquire new environmental benefits when minimum flows are more easily obtained as well as make valuation possible to allow new environmental markets?
	Enable bypass reach flows.	Allow maintenance of revenues during flow releases in the bypass.	Support releases for non-power flows?

4.1 Reducing Hydro Peaking

Hydropeaking and load following operation modes, whereby pulses of water are released in rapid response to meet changes in electrical demand, can alter the quantity, quality, and accessibility of downstream aquatic habitats (Clarke et al. 2008; Fisk et al. 2013). Depending on their timing, frequency, duration, and magnitude, discharge fluctuations can have adverse effects on stream fishes and other aquatic life (Young et al. 2011). Discharge fluctuations during the period of fish spawning may cause adult fish to abandon nests or alter spawning site selection (Chapman et al. 1986; Auer 1996; Zhong and Power 1996; Geist et al. 2008). Fluctuations in discharge that occur shortly after the spawning period can dewater nests, resulting in mortality of eggs and larval fish (Becker et al. 1982; McMichael et al. 2005; Fisk et al. 2013). Discharge fluctuations that occur during the early rearing stage can strand fish along changing channel margins or entrap them in isolated pockets of water (Cushman 1985; Halleraker et al. 2003; Connor and Pflug 2004; Nagrodski et al. 2012). Repeated, rapid fluctuations in discharge may also negatively affect downstream fishes indirectly by altering the density, biomass, and diversity of their food supply (Cushman 1985; Gislason 1985; Bunn and Arthington 2002), which can reduce fish growth as well as the biological productivity of the ecosystem. Reductions in spawning success, survival, and growth have the potential to reduce the productivity of populations that reside downstream of hydroelectric projects (Harnish et al. 2014).

Co-sited energy storage may enable a hydropower facility to meet system peaking needs, provided that state-of-charge control is aligned with the peaks, without releasing such significant water volumes downriver. Thus, energy storage systems would decrease peak generation flow releases, thereby reducing flow fluctuations downstream of the hydroelectric project—and ultimately, lowering the potential impacts on threatened fish and other organisms using the river habitat. Response times are also much faster when using batteries and power factors of 0.0 are supported, so more than just maintained but *improved* power system benefits (i.e., energy and ancillary services) may be achievable along with environmental improvements.

4.2 Securing Safe Fish Passage through Hydro Infrastructure

In addition to fish populations experiencing the effects of hydropower operations downstream of dams, fish migrating in a downstream direction may sustain injury or death while passing hydroelectric dams. At many hydroelectric dams, downstream migrants can pass via several different routes (e.g., spillways, turbines); however, passage through turbines is generally associated with the highest mortality rate (Muir et al. 2001). At some hydroelectric projects, operations have been altered to deliberately release water through spillways to direct downstream migrants from the turbines to the spillway to increase dam passage survival. Many species display differences in depth distribution and/or migratory activity throughout the daily cycle, which can alter their probability of turbine or spillway passage (Haro et al. 2000; Li et al. 2015). Therefore, energy storage systems, instead of the hydropower turbine, could be used to provide power when needed, allowing more water to be spilled during periods of peak fish passage or times when turbine passage rates are expected to be high. For example, salmon and steelhead smolts are more likely to pass through the powerhouses of Snake River dams at night than during the day due to a diel shift in depth distribution. Approximately 60 MW of stored power exported for 4 hr nightly could reduce powerhouse passage of Snake River Chinook salmon smolts by 12 to 23 percent over the entire summer passage season, thereby increasing survival significantly. Added flexibility of spill operations, and in turn, improved fish survival, may help hydropower operators further improve fish survival and reduce mitigation costs (e.g., mid-Columbia River No-Net-Impact funds).

Fish passage is not limited to spillways or downstream travel. Spill for upstream migration (i.e., fish ladders) can account for 10 percent of the flow rate, resulting in lost power generation potential. Noting that attraction flows to fish ladders need not spill constantly, the seasonality and perhaps even time of day of fish migration activity can allow for banking of energy benefits through energy storage, which can then be exported when spills do need to flow in correlation with fish activity.

A facility may also operate under specific flow rates for fish spawning benefits, which may require spilling water that cannot be used to generate electricity and may lower the annual energy production of a hydropower facility. However, just as spawning does not happen through all seasons and at all hours of the day, water can be released when needed for environmental benefit and the restriction may be relaxed at other times, thereby allowing a net energy production increase. When the timing of energy increases does not align with power system needs, there is an opportunity for energy storage systems to shift the available energy and make use of the surplus.

4.3 Operational Shifts and Requirements for Fish in the Eastern U.S.

In addition to operational shifts and flow management for western U.S. fish (in particular salmon) as indicated above, eastern U.S. hydropower plants also adjust operations for fisheries including resident, anadromous (e.g., American shad), and catadromous (e.g., American eel) fish. We discuss examples below related to fish specifically, because fish are often the driving factor of dam operational changes; however, we understand that many other aquatic species (e.g., mussels) as well as aquatic ecosystem health benefits are gained from these operational changes.

Operational shifts to ensure safe fish passage through hydropower plants is a precedented activity dating back to the early 1900s—particularly in the northeastern U.S., where migratory anadromous and catadromous fish use rivers highly developed with hydropower projects. For example:

- The Holtwood Hydroelectric Project on the Susquehanna River in Pennsylvania uses a tailrace lift with two entrances and a spillway lift for upstream fish passage and a pipe system for downstream fish passage.
- The York Haven Dam, also on the Susquehanna, uses a vertical slot fishway to support upstream passage of anadromous fish, primarily American Shad.
- In Maine, along the Penobscot River, the Milford Hydroelectric Project uses a 4 ft by 4 ft bottom entrance for American eels to pass through the dams slowed to 70 cfs into the plunge pool and an upstream fish lift capable of passing up to 300 cfs.
- The Orono Hydroelectric Project uses a similar system with an 8 ft wide downstream diadromous fish-passage floor screen chamber into the plunge pool and a lower-level 4 ft by 4 ft entrance designed to pass at 150 cfs.
- The Holyoke Dam, on the Connecticut River, uses two elevator fish lifts that carry migrating fish, including American Shad, Sea Lamprey, Atlantic Salmon, and American eel, up and over the dam.

In these cases, operational flows are altered to meet fish-passage needs. Storage augmentation at these facilities could allow increased flexibility to meet both the electrical demands of the grid as well as the site-specific fish-passage requirements.

4.4 Managing Spill for Habitat Benefit

Habitat benefits for the aquatic ecosystem as a whole may also extend to spill. Many river ecosystems rely on sediment that passes downstream in the absence of dams. Sandbars have been depleted by long-term dam presence, to the detriment of endangered species on the Colorado and Missouri Rivers. The Department of the Interior has shown success in rebuilding sandbars through controlled flood operations through the Glen Canyon Dam since 2012 (USGS 2015). Energy storage may enable a means for making up for some of the lost energy value associated with controlled flood events, or even increase their frequency to maximize the habitat benefit.

4.5 Preserving River Flows to Improve Water Temperature and Dissolved Gases

River water temperatures directly affect aquatic ecosystem health, and energy storage may allow more flexible operation to control downstream temperatures for environmental benefits. Extreme high temperatures, such as those that occurred in 2015 in the Columbia River, were associated with significant salmon and sturgeon fatalities;[1] in these situations, water temperatures may be able to be cooled by further operational flexibility at hydropower dams to release deeper and cooler hypolimnetic waters. Conversely, unnaturally cold water temperatures, such as in a dam tailrace when a thermally stratified reservoir releases the colder/deeper water through deep-draw turbines or spill, can also have detrimental effects such as creating unnatural temperatures that may allow, for example, an invasive species to increase predation on native warmwater fishes (Ward and Bonar 2003). To keep temperatures within acceptable ranges, the added operational flexibility that batteries paired with hydropower may provide could allow hydropower operators to be more selective about mixing upper warmer waters (using surface spillways) with deeper cooler waters (using deep-draw turbines or deep spill).

Similarly, oxygen and/or total dissolved gas (TDG) levels can be directly affected by hydropower operations to the detriment of fish and the larger ecosystem. For example, in the Coosa River in Alabama, low oxygen levels in tailrace waters are directly linked to operation of the turbines drawing low-oxygen water from deep water, which ultimately negatively affected ecosystem health and resulted in the operator's FERC licenses being vacated.[2] High dissolved gas levels above 100 percent also have detrimental effects on aquatic organisms. Dissolved gas levels above 110 percent can cause fish to lose their ability to sense (hear) encroaching predators (Weber and Schiewe 1976), and increasing gas concentrations up to 130 percent result in high mortality of some species (Mesa et al. 2000). An energy storage device may provide additional flexibility for hydropower generators to adjust operations as a function of oxygen/TDG level, or to allow some degree of spill from a considerable elevation to restore oxygen content. Operations to control dissolved oxygen and/or TDGs occur throughout the U.S., but, to our knowledge, the ability of batteries to improve the environmental outcomes has not yet been evaluated.

5.0 Considerations for Studying Storage Applications for Environmental Outcomes

Given the potential benefits, what is the best approach to determining whether a storage device could allow for operational changes that offer environmental benefits at hydropower projects?

[1] https://www.nwcouncil.org/news/warm-water-wreaks-havoc-columbia-river-fish

[2] https://www.gadsdentimes.com/news/20180827/alabama-power-loses-coosa-river-dam-licenses

This paper highlights key components of a *conceptual* methodology to evaluate potential environmental benefits of deploying storage systems in cooperation with hydropower facilities. The following example shows how the deployment of energy storage at a peaking hydropower facility can yield win-win outcomes, i.e., maintain the power generation requirement, while simultaneously allowing for less severe changes in water flows.

5.1 Conceptual Example to Illustrate How Storage May Be Used to Enhance Environmental Benefits for a Peaking Hydropower Plant

Figure 1 presents a stylized example of a utility that operates its hydropower plant to maximize generation during the morning and afternoon peaking periods. In this example, it is assumed that plant operations reach the upper limit of available water (ramp up in water flow – cubic feet per second per hour [cfs/hr]), which is required to ramp up power generation. With the addition of a storage system, plant operators can employ alternative operational strategies, in general charging the storage system when fuel (water) is available and operations are more flexible, and discharging electricity during peak hours or when operational and water (storage) limitations have been reached. Such a strategy could allow the hydropower plant to operate above normal operating levels during off-peak hours and operate at a lower level during peak periods. Water flow to support such an operational strategy would change as well (i.e., increase during off-peak periods and decrease during peak periods). The implied benefits of a less severe ramp up and ramp down of water would include less severe variations in tailwater elevations, and reduced time of running with water flows close to the maximum limit. Depending on the plant configuration and operating conditions, such an operational strategy might also enable coincident benefits, such as longer periods of operating the turbines near their peak efficiencies. It should be noted that the primary benefit associated with market-facing operations—either revenue capture or more efficient generation portfolio stack—is not adversely impacted, because the effective power supply is identical to the baseline.

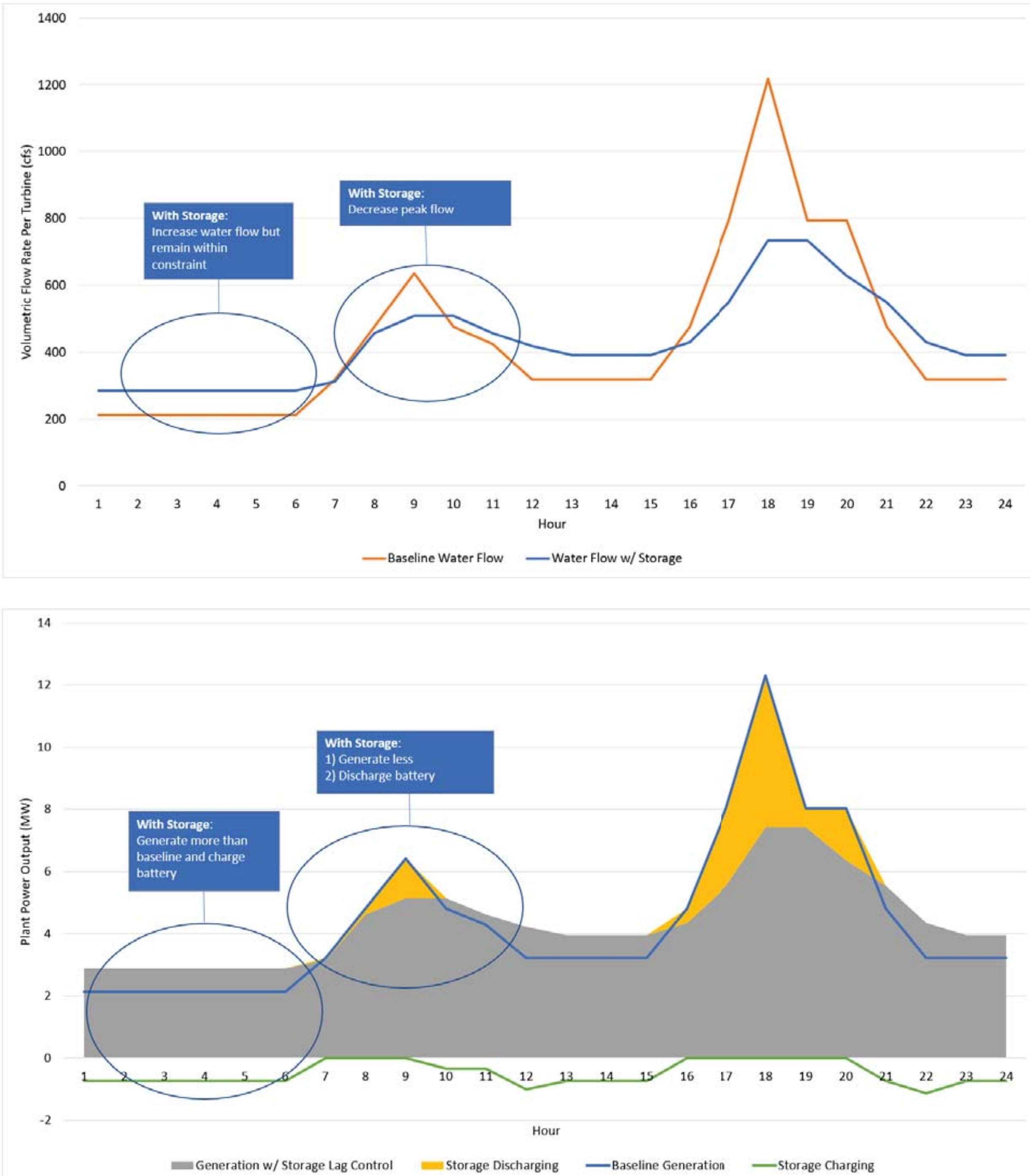

Figure 1. Conceptual example to illustrate alternative water flow regimes (top) and plant operations (bottom) based on deployment and use of energy storage technology.

5.2 General Process of Studying Storage Solutions for Environmental Outcomes

The hydropeaking example can be used to generalize the process one might use to study storage applications for environmental benefits. As highlighted in the example, the decision process requires an understanding of the relationship between environmental and power generation outcomes at a given location. Fundamentally, these outcomes are connected through water flow regimes at that location. Water flow regimes, characterized by min/max flow rates in units of cubic feet per second, daily fluctuations (cfs/24 hr), flow ramp rates (cfs/hr), and duration of sustained flows at increased or decreased levels, directly affect power generation possibilities at the location as well as the health of associated aquatic and riparian ecosystems. These regimes may need to be controlled in time, on hourly or seasonal bases, to balance positive environmental outcomes with power production. Any changes in water flow decisions, due to environmental or other objectives, will directly affect the power generation capabilities at that facility,[1] and hence, affect the choice of whether to install storage technology and if so what size. Figure 2 depicts the decision-making process that is encapsulated in the ensuing numbered steps.

Figure 2. Energy storage sizing methodology.

1. Baseline: Ascertain the existing operational baseline regime (i.e., generation and water flow patterns at a given location) by considering baseload, load following, and peaking.
2. Determine desired water flow regime(s):
    a. Flexibility: Identify the operational flexibility, in both power generation and flow patterns, relative to the baseline operational regime.
    b. Alternatives: Identify the alternative set of water flow regimes that help enhance environmental outcomes at the location based on the flexibility assessment.
3. Benefits and tradeoffs: Assess the environmental benefits, changes in power generation outcomes and other tradeoffs, if any, due to the alternative flow regime(s) (e.g., hydropeaking can limit the opportunities for whitewater recreation).
4. Determine the energy storage size and operation schedule: Perform analysis to optimize energy storage size, including identifying a suitable location, and identify an operational schedule for the hybrid system.

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[1] A current, ongoing research project stewarded by the U.S. Department of Energy's Water Power Technology Office, called "HydroWIRES Topic A," will provide a comprehensive mapping of environmental objectives and power operations at a facility, which could be used to supplement the proposed methodology.

5. Decision: Perform techno-economic analysis to ascertain economic outcomes of the optimization.
6. Adjust objectives, if needed, and repeat Steps 2 through 6.

While knowledge of the baseline operational regime—generation and water flow profiles and the inherent flexibility therein—may be known, the identification of alternative flow regimes requires thorough understanding of local environmental needs. These needs will inform how and when hydropower operations must be restricted, and when they can be relaxed, to achieve desirable environmental outcomes.

5.3 Alternative Water Flow Regimes to Enable Environmental Benefits

In the hydropeaking example, a threshold analytical understanding of the relationship between flow rates, power outcomes, and environmental outcomes must first be established. Data related to water elevations in locations of potential fish spawning habitat, flow rates at various river locations, and correlations of these data with flow rates through hydropower facilities must be collected to determine more precisely where and when maximum flow rates should be reduced. Additional measurements will be needed in various locations within a specific river to understand the efficacy of specific restrictions on ramp rate and successive ramping events in attaining meaningful environmental benefits of hydropeaking reduction. These requirements reach beyond hydropeaking reduction; the same can be said for any environmental gain associated with modifications of hydropower operations. The changes in operations, such as minimum and maximum flow limits, etc., will require precise determination of enhanced environmental benefits.

Table 2 presents a *hypothetical* set of values for maximum flow rates, ramp rates, and successive ramps per day that (1) are standard in baseline operations, before hydropeaking avoidance, and (2) will be required to achieve the environmental benefits associated with eliminating or reducing hydropeaking. The additional restrictions on power operations that come with changes in the values of these constraints directly correlate with either reduced or increased power generation potential. In the case of hydropeaking reduction, maximum flows must be reduced within time periods spanning several hours. In the consideration of whether energy storage can yield environmental benefits while maintaining power benefits, it is equally important to know where and when power operations can exceed the baseline. Minimum flow rates at off-peak times serve to limit the ramps associated with hydropeaking as well as provide a means for additional power generation to charge the energy storage asset. In this way, the information pertaining to the new flow regime, as well as the trade-off in power generation timing and scale, can be used to approximate the size, type, and location of a useful energy storage technology application.

Dispatch of the energy storage asset to shave hydropeaking is conceptually demonstrated in Figure 1, which demonstrates how flows can be reduced while energy is exported from the storage asset to maintain power system benefits. In this way, energy storage dispatch is directly linked to benefits to downstream fish populations during various life stages, as described in Table 2. To provide greater precision, an optimization problem can be formulated that treats the new flow regimes as constraints to ascertain the appropriate size, location, and type of storage technology. Hydropeaking avoidance is just one conceptual example. Appendix A presents two tables that repeat this methodology for the potential benefits associated with spill for safe fish passage downstream and upstream, and water quality benefits.

Table 2. Operational shift requirements to enable environmental benefits of hydropeaking reduction (hypothetical metrics).

Operational Constraint	Baseline	Flows to Meet Environmental Objectives (limit impacts from hydropeaking)	Potential Benefit	What data are needed?
Spawning flow range (cfs)	No limit	2,500–5,000	Conducive to spawning activity for spawning fish. Species and river dependent.	
Minimum flow release (cfs)	1,000	1,500–2,600	Protect larval fish incubating in gravel or developing during larval drift phase.	
Downramp amplitude limit (cfs)	None	4,000	Limit fish from getting trapped in pools that are disconnected from the main channel.	Habitat use – including water elevation of spawning habitats and larval fish behavior and habitat use. Life stage phenology.
Maximum downramp rate (cfs/hr)	No limit	3,000	Limit fish from getting trapped in pools that are disconnected from the main channel.	
Daytime downramping	Allowed	Not allowed	Limit fish being trapped; site- and species-specific differences	

5.3.1 Case Study: Glen Canyon Dam

Prior to 1991, Glen Canyon Dam (GCD) operated under fewer environmental restrictions. Table 3 shows that power plant water releases could range from 1,000 cfs to 30,500 cfs, with no limit regarding the daily fluctuations or ramp rates. Such flexibility caused significant environmental damage, such as the endangered species listing of native fishes and changes in the overall ecosystem due to changes in downstream water temperatures and decreased sediment load. From August 1991 to January 1997, temporary restrictions called “Interim Flow Restrictions” were put in place before the release of a final environmental impact statement. Since 1997, the water release range has been reduced to a range from 5,000 to 25,000 cfs, and daily fluctuations and ramp rates have been limited. More recently, in January 2017, a new Record of Decision (ROD, DOI 2016) mandating the preferred alternative prescribed by the Long-Term Experimental and Management Plan has been adopted and was first implemented in October 2017.

Table 3. Evolution of Glen Canyon Dam operating constraints.

Operational Constraint	Historical Flows (before 1991)	1996 ROD Flows (from 1997 to 2017)	2016 ROD Flows (after 2017)
Minimum flows (cfs)	3,000 (summer) 1,000 (rest of year)	8,000 (7 a.m. - 7 p.m.) 5,000 (at night)	8,000 (7 a.m. - 7 p.m.) 5,000 (at night)
Maximum non-experimental flows (cfs)[(a)]	31,500	25,000	25,000
Daily fluctuations (cfs/24 hr)	28,500 (summer) 30,500 (rest of year)	5,000, 6,000, or 8,000 depending on release volume	Equal to 10 X monthly water release (in thousands of acre-feet) during June-August, and equal to 9 X monthly water release the rest of the year, but never exceeding 8,000 cfs
Ramp rate (cfs/hr)	Unrestricted	4,000 up 1,500 down	4,000 up 2,500 down

(a) Except during experimental releases.

Because water flow rate and power are closely related, peaking capability at GCD has been also significantly reduced (Figure 3). Power generation is dependent on available head and flowrates. Before the environmental restrictions, during the week from July 19 to July 25, 1987, GCD was able to produce a peak power of 1,164 MW, that is, 89 percent of the potential peaking capacity of this period. After the 1996 ROD, during the same week of year 2015, this peak generation dropped to 746 MW, that is, only 68 percent of its potential available capacity. The limitation on the peak capacity is due to the maximum daily fluctuations imposed above.

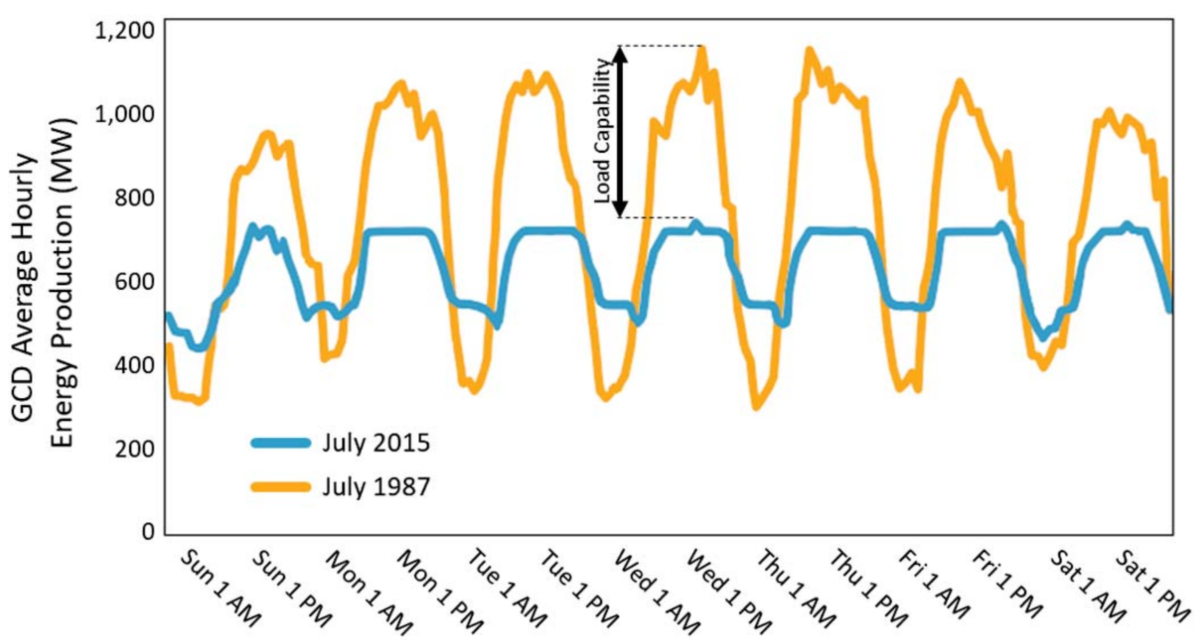

Figure 3. Hourly energy production at the GCD powerplant during a July week in 1987 and 2015.

5.3.2 Case Study: GCD Potential Improvements

The GCD case illustrates the potential benefits of implementing energy storage to improve environmental outcomes. Though the peaks vary significantly due to flow restrictions, the overall power generated relative to potential available power during the case periods is quite similar. Potential available power considers differences in head and assumes the maximum flowrate of 31,500 cfs can be achieved at the differing heads. If 31,500 cfs cannot be achieved during the lower head period of 2015, the convergence is increased. The July 1987 flow data generated at approximately 58 percent of the potential available power, whereas the July 2015 performance is approximately 54 percent of the potential available power. The convergence of these values is due to minimum flows being required during the night for 2015, increasing the generation over this period.

The imposed flow requirements resulting in night generation occur during a period of low demand. Increased power demands begin in the morning, taper through the day, then peak in the evening. Demand drops significantly at night. Implementing an energy storage system to capture the generation at night and discharge during the day would allow the average hourly energy productions from the environmentally restricted 2015 period to behave similarly to the less regulated 1987 period.

5.4 Process of Deciding the Storage Size, Type, and Location

Industry,[1] academia, and national labs have developed several tools and methodologies to assist with the sizing of energy storage for site-specific installations. Most of these tools and methodologies (Wu et al. 2017) focus primarily on maximizing revenues or cost-savings from power operations, either for the stand-alone storage technology or for a hybrid solution, such as a traditional solar or wind facility with the integrated addition of a storage system. To the best of our knowledge, currently there are no tools and methodologies that can assist with making decisions about the sizing of storage technologies for environmental benefits. However, existing methodologies can be adapted for this purpose. All that the methodologies require is a sufficiently precise characterization of the technical attributes of the resource being analyzed—whether a stand-alone storage system or a hybrid solution—and its intended functions. In the case of energy storage for environmental benefits, the technical characteristics of a hybrid hydropower resource with integrated storage will likely be based on the flow regimes, both baseline and alternative ones.

The changes in flow regimes may be required for a variety of reasons:

- FERC licensing or relicensing process, where the federal authorization for the facility requires a new flow regime or alternate water budget, such as maintaining upstream reservoir levels, or flow requirements to meet a downstream objective including human uses such as fishing or boating;
- operational strategies for asset management purposes, where the facility must adjust the hydraulic capacity of the system in order to maintain useful equipment life;
- new market opportunities, such as a change in the price of ancillary services, or changes in underlying regulatory and policy constructs, and market designs; and

[1] Det Norske Vitas (DNV)-GL's ES-Select tool compares energy storage technologies for different use cases; Pason Power Inc., and Energy Toolbase LLC., have designed a tool called Energy Toolbase to assist with sizing and controlling residential solar PV plus battery systems.

- mitigation of environmental issues, where water flows must be adjusted ~~provided~~ to match a water quality, fish, or other ecological objective.

In all but the last case, environmental benefits are not likely to be the primary drivers when making decisions about deploying an energy storage technology. Even so, the deployment of energy storage, whether for operational flexibility or asset management, will provide options for alternative operating practices and, by extension, alternative water flow regimes. The choice of storage technology in such cases will need to consider the appropriate combination of power generation and environmental outcomes, weighed against the cost of the storage technology itself. This process could be designed as a multi-objective optimization problem consisting of an appropriately weighted combination of objectives—(maximize) power generation responsiveness, operating limit, and flexibility, (minimize) asset management costs, (maximize) environmental compliance, and (minimize) technology costs. This process, essentially, uses a range of water flow regimes to construct the *pareto frontier* to analyze tradeoffs between different objectives.

Alternatively, one or more of the objectives may be treated as constraints in the design process. For instance, to avoid lost generation opportunity and attributes in the hydropeaking example, the baseline generation profile may be treated as a fixed requirement that the combination of storage and hydropower generation (with altered flow regime) must attain. Hence, the first step in the decision-making process is to determine the attributes of lost generation capacity—energy and power ranges, ramp rates, and so forth. The required set of attributes will help determine the choice of energy storage technologies. The next step in the process is to conduct techno-economic analyses based on understanding and knowledge of market conditions, water availability, and other critical considerations. The techno-economic analysis can be based on detailed time-series simulations and optimization of the hybrid resource, modeling its operations and dispatch in an actual market. Pacific Northwest National Laboratory's (PNNL's) energy storage evaluation tool (ESET), for instance, has been used extensively to create a sizing space for storage, based on known or assumed use cases (such as hydropeaking), deterministic or stochastic information on market conditions (prices, demand, and so forth), and storage technology specific considerations.

5.4.1 Storage Sizing Methodology for Maximizing Revenue of a Storage Hybrid System

The ESET tool formulates a linear programming problem to maximize the annual economic benefits of the energy storage or hybrid system. In this case, the benefits would include any identified hydropower use cases as well as any other market services that could be provided. The tool co-optimizes identified services to be provided subject to energy storage power and energy constraints, state-of-charge dynamics, and the coupling of different use cases. The ESET formulation dispatches the system on an hourly basis, first formulating a look-ahead optimization to determine a system operating point, and then dispatching the system on an hourly (or more granular) basis, to determine the number of hours the system would be actively engaged in the provision of each service. In addition, a storage system cost formulation can be added to the objective function to optimally size the storage system within the model. This cost formulation includes the equivalent system capital cost as a function of power and energy, which consists of investment, installation, and operations and maintenance costs for the storage device and associated inverter. The optimal sizing approach maximizes investment return for a given time frame. ESET then provides the maximized benefit, optimal size, and dispatch for the system under the given use cases and subject to the other variables (Wu et al. 2016). A *Monte Carlo type* analysis can then be conducted, varying one or more input variables of the formulation, including use case requirements, market prices, and storage technology types and costs, to generate a decision space. Within this space, present-value benefits and costs can be calculated to find optimal energy storage parameters that return the largest net-benefit.

The following sequence of steps presents a simplified version of the methodology:

1. Determine initial energy storage size.
2. Maximize revenue from hybrid plant operations subject to:
   - Plant electro-mechanical constraints,
   - Energy storage capacity limits.
3. Adjust energy storage size and re-initiate Step 2.

Figure 4 below, borrowed from Wu et al. (2016), presents an example decision space generated by the ESET tool across energy storage capacity and energy for different locations (i.e., San Francisco [SF], Chicago [CHI], Houston [HOU], and New York City [NYC]) and technology price points (i.e., high, medium, and low).

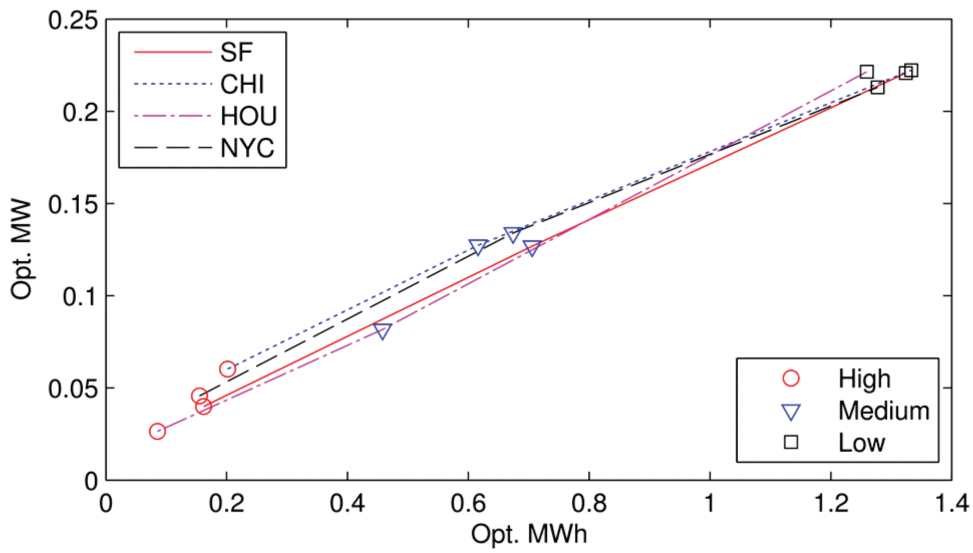

Figure 4. Optimal (Opt.) energy and power capacity in different battery cost scenarios and energy markets (San Francisco [SF], Chicago [CHI], Houston [HOU], New York City [NYC]).

Such tools and methodologies can be extended to study the suitability of different storage technologies for environmental benefits. The above methodology can be adapted to include desired environmental outcomes as additional constraints in the optimization problem. For instance,

1. Determine initial energy storage size.
2. Maximize revenue from hybrid plant operations subject to
   - Plant electro-mechanical constraints,
   - Energy storage capacity limits,
   - Environmental objectives:

- Flow >= Min flow limit
- Flow <= Max flow limit.

3. Adjust energy storage size and/or environmental objectives and rerun Step 2.

The min and max flow limits are derived from alternative flow regimes that correspond to desired environmental outcomes. In this way, the sensitivity of energy storage sizing relative to desired environmental outcomes can be determined by adjusting the water flow constraints.

6.0 Co-optimization vs. Co-location of Storage

There is a useful distinction here for when a storage system should be directly interconnected and integrated with a hydropower facility ("co-location") and when it should be operated in a coordinated fashion ("co-optimization"). Generating resources are already coordinated to operate as a portfolio, to serve load, to transmit energy, to balance control boundaries. Advanced control and communication can allow networked operation of electricity system assets across multiple systems. So, when does it make sense to site a storage system within a hydropower facility footprint? This section explores the contextual conditions that lean toward co-location or co-optimization of storage and hydropower assets.

6.1.1 Why Co-optimize?

Hydropower plants operate within a system context and their operation is coordinated with other resources to assure that load and generation are matched. In vertically integrated utilities or system-level coordination, the power tradeoffs for managing environmental objectives may be most cost-effectively dealt with by adjusting the merit order or dispatch of other plants, rather than co-siting storage at a specific project. For example, if a hydropower plant is limited in how fast it may ramp flows up and down, then the faster ramping requirement could be replaced by a gas unit or by other ramping resources already available elsewhere in the system.

For utility-owned plants, operating in organized markets, there may be locational considerations for siting energy storage systems based on geographical patterns of energy and ancillary service prices. One technique for identifying optimal siting of storage systems is to run a system-wide analysis using production cost models. These models enable co-optimization of the entire fleet of resources under a utility's ownership, with explicit consideration of certain locational aspects of its resources.

6.1.2 Why Co-locate?

Co-location of storage at the hydropower plant may allow additional local benefits. To achieve these locational benefits, utility-owned projects may be motivated to enhance the resource eligibility of a larger plant, or to maintain operational simplicity in response to a signal.

The case for co-location is notably broader for merchant (contracted resources) or market-facing plants. These plants are remunerated and environmentally governed independently from other resources, so there is greater motivation to demonstrate higher performance at the facility to be eligible for higher contractual rates, market products, or greater compensation.

Where avoiding harm to facility and unit components is a priority, integration of on-site storage solutions may help avoid detrimental use of existing equipment, such as low-loading units or frequent or sudden movement across hydraulic and efficiency ranges. Hydroelectric projects are uniquely capable of a suite of flexibility characteristics, including motoring units[1] and dispatchability using on-site water (energy) storage in reservoirs. Augmenting or preserving this flexibility with batteries could be very useful, because their characteristics are highly complementary to the flexibility of hydropower. Storage systems can increase the instantaneous responsiveness of units or avoid unit start-stop or rough zone utilization, thereby bolstering the case for on-site power value. They can also support local power needs, such as managing reactive power for voltage control, or assisting in the automatic generation control function for the management of area control error. Another factor is the speed of interconnecting a storage system to the grid, which is substantially more straightforward within the footprint of a large power plant (Kougias 2019).

In addition to the proximity benefits, it is typical for hydropower facilities to own a large parcel of land, or have overarching real-estate agreements for the surrounding land and its use, that may provide a suitable footprint for the location of the energy storage system. Locating energy storage on-site at the hydropower facility may eliminate the need for additional land acquisitions.

Aside from interconnection of the energy storage system, co-location is supported by existing transmission rights. The purpose of the energy storage being proposed provides operational flexibility rather than increased capacity beyond current peak demands. This allows the rights of the existing transmission system, sized for the existing generation, to be suitable for continued load transmission with the added energy storage system.

Many hydroelectric projects are located within a cascading operation, meaning that there are plants upstream or downstream between which there is a hydrologic link. Under these conditions, the project owner may operate the plants in a coordinated fashion, sequencing flows to an optimal outcome. Or if ownership is varied, there may be a coordination agreement regarding flow schedules or communication between plants to assure operational parameters are met at each plant. In these cases, energy storage, when integrated with a particular facility, such as a facility that acts as a hydrologic constraint, may permit additional flexibility to accrue to other plants in the same cascading system.

There also may be instances in which storage co-location is motivated by load tied directly to the water source, and the timing of the load does not align with hydropower production. Examples of this load include environmental restoration through active water treatment, oxygenation or cooling processes, hydrogen production, desalination, sensing, communications, and control and power backup. Loads of these types could be served by merchant resources as well as utilities under various arrangements. To the extent that these loads can be deferred in time and follow business-as-usual hydropower production patterns, the need for on-site storage to serve these loads and thus the requirement for co-location of energy storage assets may be reduced.

[1] Motoring of hydroelectric generators corresponds to an extreme idle state of running the turbines with insufficient pressure head to run the (interconnected) generator at synchronous speed. Under this condition, electrical generators act as synchronous motors and pull power from the grid to drive the turbines.

7.0 Next Steps

This paper outlines the potential for deriving improved environmental outcomes by integrating energy storage systems with hydropower plants. This idea is an exciting one, because it suggests that through technology investments, improvements in both river health and the financial future of hydropower plants can be achieved. Quantifying the mutual benefits is an important step in realizing storage adoption by privately and publicly owned hydropower projects.

Throughout this paper, existing knowledge and practical gaps in data, controls, and methodologies for evaluating this potential are indicated. The next steps, summarized below in order of action and scale, will help inform the industry and shape the discussion:

- Determine the full taxonomy and prioritization of the opportunity space for environmental benefits.
- Specify the practical considerations for retrofitting dams with energy storage, related to physical size, electrical interconnection, and charging mechanisms.
- Develop new techniques, based on multi-objective optimization, to support and evaluate the feasibility of hybridization for environmental benefits.
- Adapt or design a decision-support process to evaluate and inform the size, location, and type of energy storage technology.
- Simulate real hydropower plants and energy storage-informed operational models to design hybrid system controls and interactions of mutual benefit.
- Perform data-rich demonstrations of the relationships between environmental benefits and energy storage-augmented operations, in partnership with dam operators.

Several avenues are being explored to realize the data gaps listed above and to enable a demonstration project to serve as a foundation for integrating energy storage with hydropower projects for environmental benefits. Other use cases including the integration of energy storage with other electricity-dependent water infrastructure, such as water conveyance pumps, may offer similar potential for environmental benefits and will be additionally explored. Once a foundational use-case project is identified and implemented, the ultimate goal is to leverage this environmental use-case framework and apply it across the U.S. to other hydropower projects where energy storage could enable more cost-effective ecosystem improvements.

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Appendix A – Methodology Crosswalk

Table A.1. Operational shift requirements to enable environmental benefits of spill for safe fish passage (*hypothetical* metrics).

Operational Constraint	Baseline	Flows to Meet Environmental Objectives (limit impacts from not spilling)	Potential Benefit	What data are needed?
Minimum spill discharge (cfs)	7,000 (late summer) 30,000 (spring) Unrestricted (rest of year)	17,000 (summer smolt passage season) 100,000 for 16 hours daily (spring)	Route downstream-migrating fish from the powerhouse to the spillway to improve passage survival	Hourly passage routing of downstream-migrating fish
Passage flow rate (cfs)	Unrestricted	500 (upstream fish-passage season)	Provide adequate flow rate to attract for upstream fish passage	Seasonal and diel timing of upstream fish passage

Table A.2. Operational shift requirements to enable environmental benefits of Spill for Water Quality (*hypothetical* metrics).

Operational Constraint	Baseline	Flows to Meet Environmental Objectives (limit impacts on water quality)	Potential Benefit	What data are needed?
Minimum flows (cfs)	3,000 (summer) 1,000 (rest of year)	3,000 (summer) 1,000 (rest of year)	Reduce dissolved oxygen and total dissolved gas to at/near 100% for aquatic organism health	Water elevations near spawning habitat, correlation of elevations with flow rates as a function of river hydrology
Maximum non-experimental flows (cfs)[a]	31,500	31,500	Increase dissolved oxygen and/or total dissolved gas to increase under-saturated (<100%) water to avoid fish kills.	
Daily fluctuations (cfs/24 hr)	28,500 (summer) 30,500 (rest of year)	28,500 (summer) 30,500 (rest of year)	Manage spill to optimize oxygen and gas levels for aquatic system health.	
Spill flow rate (cfs)	No requirement	1000 (3-7am)	Spilling warmer surface water downstream may warm the river. Spill from higher elevations re-oxygenates the river but can be too much. Must be carefully planned.	

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Alabama Rivers Alliance
Water Is Life

June 11, 2021

VIA ELECTRONIC FILING

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

RE: Comments on Updated Study Reports, Updated Study Report Meeting Summary, and Study Dispute for R.L. Harris Hydroelectric Project (P-2628-065)

Dear Secretary Bose:

Enclosed for filing in the above-referenced docket are comments on various updated study reports, the Updated Study Report Meeting Summary, and a study dispute submitted by Alabama Rivers Alliance for the R.L. Harris Hydroelectric Project. If you have any questions or need additional information, please email me at jwest@alabamarivers.org or call 205-322-6395.

Sincerely,

Jack K. West

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Alabama Rivers Alliance
Policy and Advocacy Director
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UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Alabama Power Company	)	R.L. Harris Hydroelectric Pro ject
	)	
	)	Project No. 2628-065

ALABAMA RIVERS ALLIANCE'S COMMENTS ON UPDATED STUDY REPORTS, UPDATED STUDY REPORT MEETING SUMMARY, AND STUDY DISPUTE

As part of the Federal Energy Regulatory Commission's Integrated Licensing Process for the R.L. Harris Hydroelectric Project, FERC Project No. P-2628, Alabama Rivers Alliance (ARA) submits the following comments on the Final Water Quality Study Report, Final Aquatic Resources Study Report, Draft Phase 2 Downstream Release Alternatives Study Report, Draft Phase 2 Operating Curve Change Feasibility Analysis, and the Updated Study Report Meeting Summary filed by Alabama Power Company ("Licensee"). Additionally, ARA submits comments on Licensee's Draft Battery Energy Storage System (BESS) Study Report, together with a study dispute requesting completion of the BESS study.

I. FINAL WATER QUALITY STUDY REPORT

A. Dissolved Oxygen Levels

Monitoring data collected by Licensee, the Alabama Department of Environmental Management (ADEM), and Alabama Water Watch presented with the Final Water Quality Study Report show numerous events where dissolved oxygen (DO) levels failed to meet water quality standards. These recurring low DO levels pose a threat to aquatic resources below Harris. State water quality criteria specify that for waters classified as Fish and Wildlife, DO levels must meet the following:

> "For a diversified warm water biota, including game fish, daily dissolved oxygen concentrations shall not be less than 5 mg/1 at all times; except under extreme conditions due to natural causes, it may range between 5 mg/1 and 4 mg/1, provided that the water quality is favorable in all other parameters. The normal seasonal and daily fluctuations shall be maintained above these levels. In no event shall the dissolved oxygen level be less than 4 mg/1 due to discharges from existing hydroelectric generation impoundments. All new hydroelectric generation impoundments, including addition of new hydroelectric generation units to existing impoundments, shall be designed so that the discharge will contain at least 5 mg/1 dissolved oxygen where practicable and technologically possible. The Environmental Protection Agency, in cooperation with the State of Alabama and parties responsible for impoundments, shall develop a program to improve the design of existing facilities."[1]

[1] Ala. Admin. Code r. 335-6-10-.09, Specific Water Quality Criteria (2021) (emphasis added).

Data provided in the Appendix B spreadsheet to the Final Water Quality Report show DO levels did not meet 5 milligrams per liter (mg/L) downstream of Harris at the following times and locations:

1. *ADEM Malone Monitor* (approximately seven river miles downstream of dam; collected data at 15-minute intervals from May 2018 through September 2020)
    a. 111 instances during July 2018; 79 instances during August 2018; 171 instances during September 2018; 81 instances during October 2018; 25 instances during November 2018; 3 instances during November 2019; 10 instances during October 2020.

2. *APC Generation Monitor* (approximately 800 feet downstream of dam; collected data at 15-minute intervals from June to October 2017-2020)
    a. 552 instances during June 2017; 625 instances during July 2017; 586 instances during August 2017; 109 instances during September 2017; 49 instances during October 2017; 4 instances in July 2018; 223 instances during August of 2018; 74 instances during September 2018; 3 instances during June 2019; 4 instances during August 2019; 1 instance during October 2019; 36 instances during August 2020; 18 instances during September 2020; 85 instances during October 2020.

3. *APC Downstream Monitor* (approximately 0.5 miles downstream of dam; collected data at 15-minute intervals from March to October of 2019 and May to October 2020)
    a. 16 instances during June 2019; 11 instances during August 2019; 2 instances during October 2019; 14 instances during July 2020; 75 instances during August 2020; 64 instances during September 2020; and 134 instances during October 2020.

Interpreting ADEM's Malone monitor data, the Final Water Quality Report states: "Overall, dissolved oxygen levels were above 5mg/L for a majority of monitoring period, with less than one percent of all measurements falling below 5mg/L."[2] As other stakeholders have warned, interpretation of DO data in terms of percentage of time meeting the 5mg/L threshold obscures the harm to aquatic biota that can result from a single low-DO event. A more ecologically appropriate approach would be to focus on times when DO levels are *not* meeting water quality criteria with an assessment of possible corrective measures.

The Final Water Quality Report averages and summarizes other ADEM monitoring data from a site at Wadley (TA-1) and a site at Horseshoe Bend (TART-1); however, the full dataset is not included in the Appendix B spreadsheet. Again, averaging and summarizing data can be helpful to present results but risks misleading stakeholders about occasional or isolated low-DO events that harm and kill aquatic species. The data from ADEM's Wadley and Horseshoe Bend sites are presented as summaries and averages in Tables 4-4, 4-5, 4-6, and 4-7, but we ask that Licensee include the full monitoring data in the Appendix B spreadsheet for the Wadley (TA-1) and Horseshoe Bend (TART-1) ADEM sites.

[2] Final Water Quality Study Report (Apr. 2021), Accession No. 20210412-5760, at 25.

B. Aeration System

The Final Water Quality Report contains some discussion of the aeration system used to enhance DO levels, which can "provide up to a 2 mg/L increase in dissolved oxygen."[3] According to Licensee, the aeration devices were tested in 1983 and showed a 1.37 mg/L average increase in DO levels. Licensee tested the aeration system again in 2016, and results showed an average increase in DO levels of 1.1 mg/L. ARA requests that copies of both test results be made available to stakeholders.

ARA recommends Licensee conduct a full appraisal of the condition of the aeration devices and a comparison to currently available technologies used to support DO levels. As of 2016, the devices were only operating at 55 percent of their originally stated potential, and the effectiveness of the aeration system declined by approximately 20 percent since it was last tested in 1983. At some point, this system will have to be refurbished or upgraded, and addressing it as part of the relicensing process could help avoid repetition of the prolonged period of low DO levels from 2017. Were the aeration devices to have provided a full 2 mg/L boost, water quality criteria would have been met much more frequently during that time.

As a "party responsible for impoundments" under Ala. Admin. Code r. 335-6-10-.09, Licensee should seek to improve the design of existing facilities by evaluating whether the aeration devices should be updated or if other technologies should be integrated to ensure low-DO events do not occur. Modification of the existing intake structure could also allow for warmer water with higher levels of DO to be released and ensure that water quality criteria are met.

II. FINAL AQUATIC RESOURCES STUDY REPORT

A. Water Temperatures Downstream

ARA disagrees with the statements of Licensee's representatives contained in the Updated Study Report Meeting Summary that "the temperature regime of the river below Harris Dam is not much different from a warm-water fishery" and that "there does not appear to be a strong case for making a temperature modification."[4] These comments represent Licensee's evaluation of the temperature data collected as part of the study prepared for this relicensing and not an overall scientific consensus. The Tallapoosa River below Harris has been rigorously studied over the past 25 years, and the Final Aquatic Resources Study, including Auburn University's bioenergetics modeling and temperature analysis, is only one of a number of studies.

Based on prior extensive studies surveying a wide variety of fishes and macroinvertebrates below Harris, and based on the water temperature concerns put forth by resource agencies, enough evidence exists of the temperature impacts created by the hypolimnetic releases from Harris to justify discussion of the options available to remedy the current thermal regime. The following is

[3] *Id.* at 48.
[4] Updated Study Report Meeting Summary (May 12, 2021), Accession No. 20210512-5067, at 5.

a brief summarization of the considerable research pointing to ecological problems caused by low water temperatures below Harris:

- Nesting success for Redbreast Sunfish was negatively related to both peaking power generation and depressed water temperatures (Andress 2002).[5]
- Strongly fluctuating flows and decreased water temperatures negatively affect survival and early growth of age-0 Channel Catfish and Alabama Bass. Mortality was highest in treatments with decreased water temperatures, indicating that variation of the thermal regime could have significant impacts on survival of juvenile Channel Catfish and Alabama Bass. Daily growth rates were also lower in treatments with decreased water temperatures. Data also suggest that growth and survival may be impacted more by fluctuations in temperature versus flow variation (Goar 2013).[6]
- Improving flow and temperature criteria from Harris could enhance growth and hatch success of sport fishes (Irwin and Goar 2015).[7]
- Thermal spawning conditions for Channel Catfish occurred every year in unregulated reach but in only 7 out of 12 years in regulated river segment and occurred earlier in the year in regulated reaches (Lloyd et al. 2017)[8]
- Flow and temperature remain in a non-natural state in regulated reaches downstream of Harris, and the macroinvertebrate community in regulated reaches shows many dissimilarities to communities from unregulated river reaches (Irwin 2019).[9]

The detailed, long-term documented impacts on aquatic life due to excessively cold temperatures, temperature fluctuations, and flow fluctuations from the Harris project are at odds with the conclusions drawn by Licensee in the USR Meeting Summary and support the contention that temperature modifications are in fact needed.

Most recently, the US Geological Survey's Open File Report from 2019 ("USGS Report") recaps the history of the biological studies and monitoring below Harris and firmly links water temperature to detrimental effects on fishes and macroinvertebrates below the Harris project.[10] The USGS Report clearly points to an unnaturally cooler temperature regime as detrimental to aquatic species: "*Our long-term metapopulation data provide evidence that suggests broadscale negative influences of the dam on species persistence and colonization parameters. Specifically,*

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[5] Andress, R. O., *Nest Survival of* Lepomis *Species in Regulated and Unregulated Rivers*, Master's Thesis, Auburn University (2002).
[6] Goar, T.P., *Effects of Hydrologic Variation and Water Temperatures on Early Growth and Survival of Selected Age-0 Fishes in the Tallapoosa River, Alabama*, Doctoral Dissertation (2013).
[7] Irwin, E.R. and Goar, T.P., *Spatial and Temporal Variation in Recruitment and Growth of Channel Catfish, Alabama Bass and Tallapoosa Bass in the Tallapoosa River and Associated Tributaries* (2015), U.S. Department of Interior, Fish and Wildlife Service, Cooperator Science Series FWS/CSS -116, Washington, D.C.
[8] Lloyd, M.C., Q. Lai, S. Sammons, and E. Irwin, *Experimental Stocking of Sport Fish in the Regulated Tallapoosa River to Determine Critical Periods for Recruitment* (2017).
[9] Elise R. Irwin, *Adaptive Management of Flows from R.L. Harris Dam (Tallapoosa River, Alabama)—Stakeholder Process and Use of Biological Monitoring Data for Decision Making*, U.S. Geological Survey Open-File Report 2019-1026 (2019) [hereinafter "USGS 2019 OFR"].
[10] USGS 2019 OFR.

generation frequency and cool thermal regimes negatively affected fish persistence and colonization, respectively."[11]

Having broadly studied 38 fish species from 25 sites over a 12-year period below Harris, the authors of the USGS Report write: "*Although it has long been recognized that temperatures are altered below R.L. Harris Dam, specific inference regarding the influence on biotic processes has been lacking until this study, which clearly relates colonization rates (that is, recruitment of a species to a site) to increased thermal energy in the river. In addition, our data indicate that there is no downstream recovery for colonization processes such that colonization rates did not increase with distance from the dam.*"[12] Increasing thermal energy in the river, and thereby increasing colonization rates and recruitment, can only be achieved by adjusting the temperature of releases.

The Final Aquatic Resources Report sourced significant amounts of historic temperature data from regulated and unregulated river segments, but "unregulated and regulated river temperatures were not compared statistically due to limited data from the Heflin gage and a variety of other variables that could contribute to temperature differences between the regulated and unregulated river."[13] To enable a complete evaluation of thermal issues, all available water temperature data should be shared with stakeholders, including Licensee's historic temperature data provided to Auburn University. ARA has requested Licensee's 2000-2018 water temperature data referenced in Section 5.2.2 of the Final Aquatic Resources Report and used in Auburn's water temperature assessment. Licensee responded that its 2000-2018 temperature data will be filed with the Final License Application in November 2021. We request that all temperature data be made available to stakeholders as soon as possible since temperature has been a long-time area of concern.

B. Fish Population Study

The Aquatic Resources Study Plan states that the goal of many stakeholders in this relicensing is to "protect and enhance the health of populations of game and non-game species of fish and other aquatic fauna."[14] The FERC-approved study plan describes an "assessment of the entire fish population" while noting that a "subset of target species will be studied more intensively."[15] While Auburn researchers under contract with Licensee did some fish community sampling and reported those results in Appendix D, no portion of the Final Aquatic Resources Study Report has sufficiently assessed the impacts of flow regulation and temperature on non-game and non-target species. Population trends of non-target species are not discussed. No Index of Biology Integrity (IBI) scores were calculated to compare to prior studies. Variances in study methodology and control site selection were undertaken without adequate stakeholder input.

In August 2020, ARA recommended in comments on the Draft Aquatic Resources Study that Licensee review temperature data for at least some of the non-target species. Particularly because

[11] USGS 2019 OFR at 48.
[12] USGS 2019 OFR at 47.
[13] Final Aquatic Resources Study Report (Apr. 2021), Accession No. 20210412-5745, at 58.
[14] Final Aquatic Resources Study Plan (May 2019), Accession No. 20190513-5093, at 3.
[15] *Id.* at 5.

scant temperature data exists for two of the four target species (Tallapoosa Bass and Alabama Bass) and a wide range in thermal minima and preferred temperatures has been reported in the literature for another target species, Channel Catfish, we suggested a literature review of similar temperature data for at least some of the non-target species, including species the USGS Report indicates are most affected by Harris, such as Stippled Studfish, Blackspotted Topminnow, Black Redhorse, Blacktail Redhorse, Riffle Minnow, and Bullhead Minnow.[16] No information on thermal requirements for non-target species has been included in the final report.

C. Adaptive Management

A stakeholder process was begun in 2005 to evaluate and adjust flows, which culminated in the Green Plan, a process described as an adaptive management plan (AMP) by Licensee and other stakeholders. That painstaking and model-driven process consisted of years of stakeholder meetings, data collection, and evaluation. Yet the ultimate flow prescription that resulted was still a scientific "best guess" of what would benefit aquatic biota while meeting power generation requirements. After twelve years of research and monitoring, this flow hypothesis was disproved as to both fishes and macroinvertebrates: "Irwin and others reported an increase in shoal habitat persistence associated with the Green Plan; however, positive population responses have not ensued."[17] But the failure of the AMP was not that its flow prescription did not achieve the desired biological outcome; the failure was that there was no mechanism to reevaluate and adjust operations based on the knowledge gained after the Green Plan was instituted.

Adaptive management is by nature iterative, and no matter the flow scenario ultimately selected through this relicensing process, monitoring future ecological responses and preserving the flexibility to adjust operations based on system feedback is imperative. Especially because few of the alternative flow scenarios under consideration have been physically implemented and monitored, the flow regime arising from this relicensing process will be the next scientific "best guess."

In the face of changing climatic conditions that are forecasted to accelerate over the next license term, Licensee and FERC should not write a static flow prescription into the next license but instead fashion a mechanism for monitoring and responsive change. Biologists studying the river below Harris have for decades been calling for iterative adaptive management, a refrain heard most recently in the 2019 USGS Report: "Despite potential obstacles, an adaptive management approach still holds substantial promise for improving the management of regulated rivers by allowing managers and scientists to address the uncertainty in predicting and measuring how river fauna will respond to flow-regime alterations."[18] Licensee and stakeholders should not make the same mistake again and lock in a flow regime with no mechanism to adapt. One positive example of adaptive management involving minimum flows in another Southeastern river, which resulted from a recent relicensing, that Licensee, FERC, and stakeholders can can look to is the Parr Hydroelectric Project (FERC No. 1894).

[16] *See* USGS 2019 OFR, Table B1 (at 31), Figure B6 (at 37), and Figure B7 (at 38).
[17] USGS 2019 OFR at 48.
[18] USGS 2019 OFR, at 3.

III. DRAFT PHASE 2 DOWNSTREAM RELEASE ALTERNATIVES REPORT

The Draft Phase 2 Downstream Release Alternatives Report ("DRA Phase 2 Report") evaluates 11 release alternatives, including the current Green Plan, along with multiple continuous minimum flow scenarios ranging from 150cfs to 800cfs, both with and without the pulsing laid out in the existing Green Plan release criteria. As previously noted by FERC staff in comments on the Initial Study Reports, by some measures, 150cfs represents "poor" to "fair" habitat conditions, while 800cfs represents "good" to "excellent" habitat.[19]

A. Evaluation of Providing a Continuous Minimum Flow

ARA encourages the release of a continuous minimum flow to reduce both flow and water temperature fluctuations in the river downstream of Harris, which could lead to improved aquatic habitat, lessen erosion, and benefit recreationists. As part of an adaptive management program and along with other operational changes, a continuous minimum flow could be help restore a more natural flow and thermal regime.

Following the scientific literature, we continue to stress the importance of considering flows and temperature together and not assuming that any particular level of continuous minimum flow will yield a positive ecological response if water temperatures below the dam remain out of line with unregulated reaches.[20] In fact, a continuous minimum flow of excessively cold water could disrupt thermal cues for breeding and inhibit the productivity of the aquatic environment. Figures 3-31, 3-32, and 3-33 of the DRA Phase 2 Report contain clear visual representations of how temperatures at the unregulated Heflin site compare to water temperatures below Harris. The difference in water temperatures downstream from unregulated water temperatures is most pronounced in spring and fall, which are critical spawning seasons. Releases from Harris result in both substantial daily and hourly temperature fluctuations and also have a more general dampening effect on maximum and minimum temperatures, such that the river below Harris does not reach the high temperatures it would ordinarily reach in the summer nor the level of natural low temperatures in the winter.

Data from the DRA Phase 2 Report shows that releasing a continuous minimum flow may not significantly shift overall water temperatures, but it could reduce large swings in temperature close to the dam.[21] For instance, Table 3-12 shows that the 300CMF alternative could reduce maximum daily and hourly temperature changes by roughly half in the tailrace and one mile downstream compared to current operations.

B. Flow Impacts on Reservoir Levels

According to Licensee's analysis, the HEC-ResSim model indicates that "PreGP, 150CMF, and 300CMF have negligible effects on average reservoir elevations," but 300CMF+GP, 600CMF,

[19] FERC Staff Comments on Initial Study Reports and Initial Study Report Meeting Summary (Jun. 10, 2020), Accession No. 20200610-3059, at A-2.

[20] *See generally*, Julien D. Olden and Robert J. Naiman, *Incorporating Thermal Regimes into Environmental Flows Assessments: Modifying Dam Operations to Restore Freshwater Ecosystem Integrity*, Freshwater Biology (2010) 55.

[21] Downstream Release Alternatives Draft Phase 2 Report (Apr. 2021), Accession No. 20210412-5748, at 54.

and 800CMF scenarios do begin to lower reservoir levels.[22] The DRA Phase 2 Report does not specify, however, what level of continuous minimum flow (with or without Green Plan pulsing) begins to affect reservoir levels. ARA supports releasing the greatest continuous minimum flow possible that will not adversely affect reservoir levels, and we request that one further step of analysis be conducted to determine what amount of minimum flow can be released without impacting lake levels. For instance, if a 400cfs or 500cfs minimum flow could be released without impacting reservoir levels, that could represent substantial gains in habitat downstream and even further reduce fluctuations in river levels and water temperatures. As the report notes, "[g]enerally, results show that river fluctuations are lower with increasing continuous minimum flows."[23]

The point at which a minimum flow begins to impact lake levels is an important piece of information for stakeholders and FERC to have, and determining this point should not require extensive additional effort on Licensee's part. We request that it be included in the final report.

C. Possible Addition of a New Continuous Minimum Flow Turbine

The DRA Phase 2 Report describes generating off of the various minimum flow scenarios and employs a "theoretical unit that pulls water from the existing penstock" to use in Licensee's HydroBudget model.[24] We encourage Licensee to investigate ways to supply any new generating unit used to pass a minimum flow with well-oxygenated and warmer water from the epilimnion layer of the reservoir.

Releasing and generating off of a continuous minimum flow of warmer water with higher levels of dissolved oxygen could benefit water quality and aquatic resources substantially. If a new continuous minimum flow turbine is proposed, it should be designed to draw from as high as possible in the reservoir in order to provide the greatest gains in water quality and benefits to aquatic resources downstream. The existing intake and penstock could potentially be modified to accommodate this, or a separate intake may be needed for a new generating unit.

IV. DRAFT PHASE 2 OPERATING CURVE CHANGE FEASIBILITY ANALYSIS

The Operating Curve Change Feasibility Analysis Draft Phase 2 Report ("Operative Curve Phase 2 Report") applies the hydrologic models and modeling results developed for the Phase 1 Report to quantitatively and qualitatively describe possible impacts to resources that would result from raises in the winter pool level.[25] Under the current operating curve, winter pool elevation is 785 feet msl, and the Phase 2 Report evaluates raising the winter pool level to either 786, 787, 788, or 789 feet msl.[26]

Elevating the winter pool level could benefit recreation on Lake Wedowee in the winter months by making some structures and boat ramps more accessible, however, increased recreation

[22] *Id.* at 9.
[23] *Id.* at 29.
[24] *Id.* at 9.
[25] Operating Curve Change Feasibility Analysis Draft Phase 2 Report (Apr. 2021), Accession No. 20210412-5750.
[26] *Id.* at 1.

opportunities must be weighed against exacerbated downstream flooding that could result from a raise in the winter pool elevation. As the Operating Curve Phase 2 Report summarizes: "The primary adverse effect of raising the winter pool is on downstream resources in the form of an increase in flooding….The primary beneficial effect of raising the winter pool is in the number of reservoir recreational structures (boat slips, docks, etc.) that are available for private recreational use/access during the winter months."[27]

A. Impacts to Downstream Residents and River Users

The modeling results summarized in Table 3-2 and Table 3-3 of the Operating Curve Phase 2 Report show that once the winter pool is raised by two feet and reaches 787 feet msl, more downstream structures become inundated during the 100-year design flood, including single family and mobile homes. With any amount of raise in the winter pool level, flooding becomes shorter in duration, but more intense in magnitude with a more rapid rise due to less storage being available in the reservoir and a quicker release of water.

Throughout the relicensing, many river users and downstream property owners have voiced concern about unpredictable flooding, property damage, and risks to personal safety caused by rapid and unannounced rises in river levels. ARA highly recommends that Licensee pay careful attention to these very real concerns of people living below Harris and those who recreate on the river. These flood events not only harm property but also present a threat to public safety.

Recreation downstream of Harris could also suffer with a higher winter pool level. Table 3-16 of the Operating Curve Phase 2 Report shows that the seven existing recreation sites below the dam would have a greater maximum depth of inundation, ranging from roughly 0.5 foot of depth increase with a 1-foot raise up to approximately 2.5 feet of depth increase with a four-foot raise in the winter pool. This additional inundation could make the recreation access points below the dam less accessible.

B. Impacts to Aquatic Resources and Habitat

Periodic flooding on the Tallapoosa River, particularly in the spring, is part of natural riverine processes. However, since beginning operations, the Harris Project has highly altered hydrologic processes and flow regime characteristics and created frequent large flow fluctuations that can lead to more intense flooding than the ecosystem would experience in its natural state. The modeling in the Operating Curve Phase 2 Report shows that raising the winter pool level "results in greater outflow from Harris Dam and subsequent flooding" due to increases in spill frequency and the amount of time spent at turbine capacity.[28] While the percentage increases may appear small, more time spent at turbine capacity could have further repercussions on downstream aquatic resources and affect fish spawning sites and spawning behavior. Infrequent but intense flood events can have considerable negative effects on spawning success.

[27] *Id.* at 55.
[28] *Id.* at 33.

Erosion could also be worsened by raising the winter pool level. Due to steep streambanks and soil conditions, the Operating Curve Phase 2 Report notes that "[i]ncreased scour would occur as velocities increase with the higher channelized flows resulting from the decreased storage in Harris Reservoir associated with higher winter operating curve elevations."[29] Issues of erosion and sedimentation have been frequently cited by river users and property owners downstream of Harris, and any operational changes that could lead to increased erosion should be carefully considered and only adopted with robust mitigation and protection efforts.

In deciding whether to change the operating curve to raise the winter pool, Licensee, FERC, and stakeholders must weigh the potential benefits of increased recreation on the reservoir during winter months against possible exacerbated flooding below the dam, increased erosion, and further negative impacts to aquatic life and habitat. Without detailed and robust protection and mitigation plans, ARA would not support a change in the operating curve to raise the winter pool level. Either way, protection and mitigation measures should be taken downstream of Harris to reduce flooding impacts, restore eroded and impaired streambank segments, and provide safer conditions for recreationists and residents.

V. STUDY DISPUTE CONCERNING THE DRAFT BATTERY ENERGY STORAGE SYSTEM (BESS) REPORT

The Commission's study determination issued in August 2020 recommended that Licensee conduct the BESS study requested by ARA, along with amending the Downstream Release Alternatives Study to include at least two new release scenarios resulting from the addition of a BESS:

(a) A 50 percent reduction in peak releases associated with installing one 60 MW battery unit, and
(b) A proportionately smaller reduction in peak releases associated with installing a smaller battery unit (5, 10, or 20 MW battery).[30]

Because pairing a BESS with the Harris project could require modifying or replacing one of the existing turbine-generators, FERC specified that Licensee include estimated costs for any specific structural changes, as well as the costs for the BESS itself. Finally, FERC advised that Licensee evaluate how each of the release alternatives specified in Options A and B above would impact recreation and aquatic resources on the reservoir and downstream of Harris.

In making the study determination, Commission staff explained that FERC currently has "insufficient information to evaluate the potential environmental benefits of a BESS."[31] Despite Licensee's initial efforts in completing the study, this is still the case. The Draft Battery Energy

[29] *Id.* at 31.
[30] FERC Staff Recommendations on Requested Modifications to Approved Studies and New Study Requests (Aug. 10, 2020), Accession No. 20200810-3007, at B-10.
[31] *Id.* at B-9.

Storage System Report ("Draft BESS Report") filed by Licensee[32] offers progress towards quantifying the costs of a BESS installation, O&M and replacement costs, an assessment of interconnection issues, and siting overview. However, as it stands currently, the Draft BESS Report does not adequately analyze the possible environmental and grid benefits of adding BESS under Option A or B. Rather, it contains a lop-sided analysis long on costs and short on benefits.

ARA disagrees with the May 3, 2021 HAT 1 Meeting Summary statement that "FERC expected a fairly cursory study from Alabama Power at this point."[33] Instead, we recollect FERC staff's characterization of the benefits portion of the analysis as being merely cursory, not that the Commission expected a hasty and undetailed study.

Simply put, the draft report has not met the criteria laid out in the Commission's study determination, and further work is needed to supply FERC and stakeholders with the full picture of BESS cost/benefits analysis. Fortunately, as discussed below, a new publication by the Pacific Northwest National Laboratory directly on this topic can guide and better direct the environmental benefits analysis.

A. Cost Analysis

In order to make the BESS study as useful and productive as possible, ARA engaged experts from Synapse Energy Economics, Inc. ("Synapse") to review the Draft BESS Report and attend the HAT 1 meeting devoted to this topic held on May 3, 2021. Synapse's comments and recommendations produced for ARA are included in Attachment A and referenced here.

The Draft BESS Report contains significant analysis of costs for Options A and B supported by estimates from the National Renewable Energy Laboratory's (NREL) 2020 Annual Technology Book. However, Licensee only explored one ownership option for procuring BESS, that being an outright purchase or company investment in the BESS. An evaluation of an independent power purchase agreement (PPA) for BESS services was not included as an alternative to financing the BESS internally, though both ARA's study request and FERC's study determination mentioned comparing ownership options for the BESS. During the May 3, 2021 HAT 1 meeting, representatives of Licensee stated they did not review PPA pricing and only relied on NREL pricing estimates.[34] We continue to recommend that Licensee provide a PPA financing alternative in its cost analysis since this is a common method by which utilities contract for BESS services and could present a more economically viable path.[35]

Unfortunately, Licensee's cost analysis does not factor in any potential incentives, including tax credits, that could be used to reduce the overall costs of a BESS. This is explicitly stated in Section 2.1 of the Draft BESS Report, "…potential incentives to offset battery costs are not included."[36] Dramatic declines in BESS costs have been driven by both technological advancements and through incentives—tax credits in particular—and these incentives continue to shape the market

[32] Draft Battery Energy Storage System (BESS) Report (Apr. 2021), Accession No. 20210412-5747.
[33] HAT 1 Meeting Summary (May 3, 2021), at 4, *available at* http://www.harrisrelicensing.com.
[34] *Id.* at 2.
[35] *See* Attachment A, Memorandum of Synapse Energy Economics, Inc. (Jun. 9, 2021) at 3.
[36] Draft Battery Energy Storage System (BESS) Report (Apr. 2021), Accession No. 20210412-5747, at 6.

for BESS. Ignoring this reality skews the cost analysis towards the high end and paints an unreasonable picture of the actual costs of BESS. Again, incorporating a survey of market PPA prices for BESS into the analysis will more accurately reflect these available incentives. As Synapse notes in Attachment A, Licensee already has some useful PPA price comparisons available to it. Discussion of how incentives could reduce overall costs should be included in the final BESS Report.

Licensee's cost analysis shows high interconnection costs due to a lack of spare terminals at the Harris project or the Crooked Creek Transformer Substation,[37] but the Draft BESS Report did not explore or mention the possibility of siting a BESS elsewhere on the transmission and distribution system where it could be less expensive to interconnect, produce greater benefits to the grid, and still be co-optimized with the Harris project. Synapse notes in Attachment A that Licensee should consider the system benefits (and reduced interconnection costs) of siting the BESS elsewhere on the grid.[38]

Finally, Licensee did not fully determine the costs of modifying or replacing one of the turbine-generators to enable installation of a BESS and accommodate a wider range of flows. ARA acknowledges the current physical and engineering constraints at Harris and the undertaking required to assess turbine modification or replacement. Nonetheless, quantifying these costs is fundamental to a cost/benefit analysis, was spelled out in the Commission's study determination, and is needed by FERC, stakeholders, and Licensee to understand whether the benefits of adding a BESS outweigh the costs.

The closest the Draft BESS Report comes to assessing turbine upgrade costs is for Option B (no turbine upgrade cost estimate is given that could enable Option A): the cost of replacing one of the two Francis turbines with a new Francis turbine with a wider operating range would "exceed $20 million" based on "recent turbine upgrades at other Alabama Power Projects."[39] Estimating costs in excess of $20 million for the turbine upgrade is helpful, but far from precise. For some overall financial context, Licensee's original cost estimate to design and construct the Harris project was on the order of $210 million in today's dollars.[40]

B. Benefits Analysis

More than a cursory analysis of the potential grid and environmental benefits should be added to the Draft BESS Report to provide stakeholders and FERC with the information necessary to evaluate the full spectrum of benefits a BESS may provide to aquatic resources, aquatic habitat, recreation, erosion and sedimentation, water quality and to measure against the costs of infrastructure improvements. The Draft BESS Report currently lacks sufficient benefits analysis, both regarding environmental benefits and system benefits that could make the installation more

[37] *Id.* at 15.
[38] *See* Attachment A, Memorandum of Synapse Energy Economics, Inc. (Jun. 9, 2021) at 3.
[39] Draft Battery Energy Storage System (BESS) Report (Apr. 2021), Accession No. 20210412-5747, at 16.
[40] Federal Power Commission Press Release, "Alabama Power Co. Seeks FPC License for $27.4 Million Hydroelectric Project on Tallapoosa River" (Nov. 21, 1968), Accession No. 20010204-2552. The more precise figure stated in the press release of $27,438,455 adjusted for inflation is approximately $210,561,757 in today's dollars.

economic. In its current form, the report is focused almost solely on costs to the exclusion of any benefits, resulting in an imbalanced document.

a. Grid and Economic Benefits

Licensee did not analyze any potential benefits that adding a BESS could provide to its distribution system, its peak capacity, or any ancillary services such as voltage regulation and black start capabilities that would result.[41] The Draft BESS Report did not explore potential arbitrage opportunities stemming from operation of a BESS (*e.g.*, charging the BESS from the grid or hydro during off-peak hours and then selling the stored electricity during peak hours). Acknowledgement and analysis of these overall system benefits that could make the installation of a BESS more economic should be included in the final report.

b. Environmental Benefits

Only a single paragraph of the Draft BESS Report is dedicated to assessing the beneficial effects on aquatic resources,[42] and improved environmental outcomes generally are dismissed as "potential limited environmental benefits" without analysis.[43] No attempt was made to quantify the environmental benefit of a 1/3 reduction in peaking flows resulting from Option B. Instead, a conclusory statement that the reduced peaking flow provided by "Option B would not likely benefit habitat stability, because the peak release would still occur" takes the place of useful quantitative analysis.[44]

In contrast to the Draft BESS Report, new research by the Pacific Northwest National Laboratory (PNNL) explores just how many environmental benefits can accrue from optimizing BESS with hydropower operations, including releasing flows that are more similar to the historical hydrograph, improving water temperature regimes and dissolved oxygen levels, accommodating spawning windows, and fostering safer fish passage through hydropower structures. PNNL's recent white paper, *Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower*, is directly relevant to this study (in fact, it cites the Harris project as a case study), and a copy of this paper is included as Attachment B.[45] This important work can help inform the environmental benefits analysis in the Draft BESS Report and can bolster the study with an improved framework for analyzing the benefits stemming from a BESS addition.

PNNL's white paper explains how either co-located or offsite BESS can be co-optimized with hydropower facilities to gain "complementary performance profiles to hydropower projects, opening a broad spectrum of operational patterns" while improving environmental outcomes.[46] It provides both methodological guidance and a comprehensive framework for determining "the

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[41] HAT 1 Meeting Summary (May 3, 2021), at 3, *available at* http://www.harrisrelicensing.com.
[42] Draft Battery Energy Storage System (BESS) Report (Apr. 2021), Accession No. 20210412-5747, at 20.
[43] *Id.* at 21.
[44] *Id.* at 20.
[45] Pacific Northwest National Laboratory, *Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower* (May 2021), PNNL-SA-157672, *available at* https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-SA-157672.pdf [hereinafter "PNNL Paper"].
[46] PNNL Paper at iii.

range and type of potential localized environmental benefits realized through integrating energy storage and hydropower."[47] The array of benefits includes reducing hydropeaking to preserve more natural flows, improving water temperature and levels of dissolved gases, managing spill for habitat benefit, and securing safe fish passage through hydro infrastructure—all of which are pertinent at Harris.

Section 5.1 of the PNNL white paper contains a particularly applicable conceptual example that illustrates how a BESS can be used to enhance environmental benefits for a hydropeaking plant such as Harris. A BESS sizing methodology is also presented that can help balance power generation needs with a more flexible flow regime. PNNL's discussion of deciding energy storage type, size, and location can also inform and strengthen the initial analysis of siting and interconnection contained in the Draft BESS Report. This relevant and timely work on this topic should be considered and used to update the Draft BESS Report with more concrete benefits analysis, both environmental and economic. We encourage Licensee to incorporate the new research and instructive framework presented in the PNNL white paper.

C. Lack of Modeling Data Available

Currently, the HEC-RAS and HEC-ResSim models and outputs are not available to stakeholders. Without access to the models and outputs, the stakeholders cannot fully analyze the economic and operational context in which a BESS would operate and identify possible operating strategies that could improve the BESS economic and environmental benefits. The models and associated outputs have been requested by ARA and other stakeholders. They have been told that this information will be filed with the final license application in November 2020.[48] At that point, Licensee will have determined its preferred course of action, and input from stakeholders will not be as welcome. To fulfill the stakeholder input goals of the ILP, Licensee should make the models and outputs available as soon as possible. ARA will continue its investigation of opportunities for increased operational flexibility and associated environmental benefits once those models and outputs are available.

D. Potential Use of BESS with a Continuous Minimum Flow Turbine

As described in Section III above, the Draft Phase 2 Downstream Release Alternatives Study incorporates a theoretical new turbine to release and generate off of a minimum flow. During the Updated Study Report meeting, Licensee noted that passing a continuous minimum flow leaves less water available to use on peak. Though not within the original scope of the current BESS study, ARA suggests that Licensee consider matching a smaller-sized BESS with any minimum flow turbine to store energy to use on peak while passing a continuous minimum flow.

Synapse has completed some initial modeling of pairing a smaller BESS with a new CMF turbine at the various minimum flows being studied (150, 300, 600, and 800cfs). See the Minimum Flow Analysis section of the Synapse memorandum included as Attachment A for this analysis. It shows, for instance, an example of pairing an 11 MW/4-hour battery with a new CMF turbine to

[47] *Id.*
[48] HAT 1 Meeting Summary (May 3, 2021), at 3, FN1, *available at* http://www.harrisrelicensing.com.

generate off of ~300cfs minimum flow with approximately a one percent revenue loss.[49] The added flexibility provided by BESS could enhance project operations, facilitate future adaptive management, and create better environmental outcomes below Harris.

E. Dispute of Study

In the Updated Study Report, Licensee stated that "[t]he BESS Study is complete" and proposes to do no further analysis other than reviewing comments received.[50] For the reasons stated above, under 18 C.F.R. § 5.15(d) ARA disputes that the BESS study has been conducted as provided for in the Commission's study determination and requests that Licensee complete the environmental and economic benefits portion of the study. ARA is not asking for a significant modification to the study, just that it be conducted thoroughly and objectively to provide FERC the information staff initially requested so an assessment can be made of the potential environmental benefits of adding a BESS at Harris, along with the costs.

We offer up the latest technical research on this topic, along with Synapse's recommendations and analysis, to help guide the study to completion. As the PNNL paper evidences, this is an important emerging area that will continue to arise in hydropower relicensing. Integrating energy storage at hydropower projects can allow operators to improve asset management, adapt to changing regulatory and market conditions, and capture additional revenue—all while improving environmental outcomes.[51]

As the Commission considers a new license for the Harris project, now is the time to thoroughly analyze how a historically inflexible hydropeaking project will function in a rapidly evolving grid. What flexibilities and expanded operational parameters could be enabled to both mitigate environmental impacts and create a more flexible generation resource? At this juncture, ARA requests a full analysis of possible environmental benefits, which may ultimately lead to a more flexible and valuable project that can better accommodate recreation, aquatic resources, power generation, help meet water quality standards, and can support the transformation the larger grid will undergo during the Harris project's next license term.

[49] *See* Attachment A, Memorandum of Synapse Energy Economics, Inc. (Jun. 9, 2021), at 6.
[50] Updated Study Report (Apr. 2021), Accession No. 20210412-5737, at 13.
[51] PNNL Paper at iii.

ATTACHMENT A

Comments of Synapse Energy Economics, Inc. on

Draft Battery Energy Storage System (BESS) Report

Memorandum

TO: JACK WEST, ALABAMA RIVERS ALLIANCE

FROM: MAX CHANG, ANDREW TAKASUGI, AND DAVID WHITE

DATE: AMENDED JUNE 9, 2021

RE: COMMENTS ON DRAFT ALABAMA POWER BATTERY ENERGY STORAGE SYSTEM AND ILLUSTRATIVE MINIMUM FLOW ANALYSIS FOR R.L. HARRIS DAM

Introduction

On April 12, 2021, Alabama Power released a draft feasibility study to quantify the associated costs assumed for the installation of a Battery Energy Storage System (BESS) for moderating the current water releases associated with peaking operations of the 135 megawatt[1] (MW) R.L. Harris Dam (Harris Project) located on the Tallapoosa River.[2] The draft report studied two alternatives:[3]

- Option A: A 60 MW battery with 240 MWh capacity that can provide the near equivalent generation of one unit at best gate for 4 hours per day/every day.
- Option B: A 20 MW battery with 80 MWh capacity that can provide the equivalent generation of about one-third of one unit at best gate for 4 hours per day/every day. The remaining 40 MW needed for 1-unit peaking generation would be produced by a new, upgraded unit.

The installation of a BESS could allow changes in the water discharges that would lessen the impacts on water quality and the riparian environment. The Alabama Power draft study considered changes in the dam operations that would generally operate only one turbine during peak periods. The generation at other times could be used to charge the BESS that could then discharge and provide power during the peak load periods. The BESS would thus essentially be used for a time shifting operation to maintain peak generation capability and revenues for Alabama Power.[4]

[1] The facility has two 67.5 MW turbines for a total capacity of 135 MW.

[2] Alabama Power. Battery Energy Storage System (BESS) Report R.L Harris Hydroelectric Project FERC No. 2628. April 2021. Available at http://www.harrisrelicensing.com/_layouts/15/start.aspx#/SitePages/Welcome.aspx

[3] Ibid. Page 5.

[4] The plant could change its operational mode even without a BESS, but a BESS provides a means for retaining some of its peak operating characteristics and revenues.

Alabama Power ultimately concluded that the installation of a BESS would not be a "reasonable alternative" based on its estimate of costs and benefits.[5] Synapse has provided Alabama Rivers Alliance with comments and recommendations on the draft BESS report as well illustrative examples of how the dam operations could be altered to provide minimum flows of between 150 and 800 cubic feet per second (cfs).

Comments

Synapse has reviewed the draft report and has identified several issues with the report and as well as opportunities to reduce the dam's impact on the Tallapoosa river by altering the dam's operations and investing in specific infrastructure upgrades at the facility. Synapse's comments are detailed in the following bullets.

Synapse notes the following observations regarding Alabama Power's BESS installation costs/planning:

- In this draft report, Alabama Power did not evaluate an independent power purchase agreement (PPA) as an alternative to financing the battery internally. Synapse notes that in 2019, Alabama Power filed a petition for the issuance of a certificate of convenience and necessity that included five PPAs for solar and BESS systems.[6] Alabama Power did not reference specific costs or opportunities information from the Docket 32953 proceeding in its analysis of BESS for the Harris Project.
- The draft report did not look into siting a BESS elsewhere on the Alabama Power transmission and distribution system that could address local needs. Synapse believes that the location of a BESS could impact the cost of interconnection as well as the benefits.
- Given that the BESS would charge from the grid regardless of its proximity to the Harris Project, Synapse recommends that Alabama Power investigate whether there are any BESS systems already connected to the Alabama Power distribution system which might negate the need for a new battery installation.
- The draft report did not look into possible arbitrage opportunities related to the operations of a BESS (e.g. charging from the grid and/or from hydro generation during off-peak hours and selling during peak hours)
- The draft report did not look at the other possible benefits of the battery system including various ancillary services such as voltage regulation and black start capabilities.
- The study did not consider a BESS system of the same size as one of the existing turbines (67 MW vs. 60 MW), which would simplify many of the issues raised by Alabama Power regarding the need for incremental capacity.
- The draft study did not look at the minimum flow option that could match a smaller sized battery system with a smaller turbine that might have better economics.
- The draft study did not investigate whether the economics of the project could be improved by coupling a BESS with a solar PV installation to gain investment tax credits.
- Alabama Power has not provided modeling information to quantify hydro operations. This information would be helpful to pair with BESS operations.

[5] Alabama Power. (2021). Page 22.

[6] See Alabama Public Service Commission Docket 32953. Available at http://psc.alabama.gov/

- Synapse noted that Alabama Power appears to be against switching out any of the existing turbines for a variable load Kaplan turbine due to cost and constructability issues with the turbine housing.

Recommendations on Draft BESS Report

Based on our observations regarding the draft report, Synapse makes the following recommendations:

- Alabama Power should provide cost and benefit information beyond the cost of the batteries. This would include economic and operational benefits in addition to more detailed environmental benefits.
- Alabama Power should provide details on the operational assumptions used for hydro generation and BESS operations.
- Alabama Power should provide information that evaluates possible BESS operations based on of hourly data for generation, water flow, energy prices, and modeled battery charging and discharging.
- Alabama Power should analyze sizing the BESS to match the full capacity of an existing turbine.
- Alabama Power should consider a power purchase agreement (PPA) for the battery system rather than a company investment. This would also include information on solar and BESS PPAs considered in Docket 32953 or other comparable PPAs.
- Alabama Power should consider the benefits of locating the BESS elsewhere on the grid.
- Alabama Power should consider the benefits of combining a BESS system with solar and obtaining investment tax credits.
- Alabama Power should consider a minimum flow turbine and a smaller matching battery system.
- Alabama Power should evaluate the impacts of reduced peaking operation without a BESS to the extent that has not been analyzed in the Green Plan.
- Alabama Power should evaluate the benefits, including environmental ones, as well as the costs in all the analyses.

Minimum Flow Analysis

Synapse understands that Alabama Power operates the RL Harris hydroelectric facility in Alabama as a peaking resource, which means that downstream water flows can vary dramatically within any day. Synapse also understands that providing a continuous minimum flow could improve the downstream river environment.[7] This analysis looks at some operational aspects of such a change including a battery energy storage system. The scenarios described below should be treated as illustrative examples based on publicly available data undertaken in the absence of more specific generation and pricing data from Alabama Power.

[7] A true run-of-river operation could stabilize the upstream reservoir as well, but that is not explored in this memo.

Operational Background

The Harris facility contains two 67.5 MW vertical Francis turbines that typically operate together in a peaking mode producing 135 MW of power. Although these existing turbines can start and stop in a fairly short time frame, Alabama Power contends that the turbines cannot be operated at partial capacity. Each turbine has a maximum hydraulic capacity of 8,000 cubic feet per second (cfs) for a maximum turbine flow at peak operating conditions of 16,000 cfs. The average generation in a year is 151,878 MWh for an average hourly generation of 17.3 MWh, and an average daily generation of 416 MWh. This is equivalent to an average water flow of 2,055 cfs.[8]

The minimum continuous flows that have been recommended range from 150 to 800 cfs. These are quite small when compared to the maximum flows, but larger when compared to the annual average flow.

Analysis

Minimum flow scenarios ranging from 150 to 800 cfs have been proposed, with the higher levels having greater environmental value.[9]

We look at the impacts from several perspectives and configurations for the RL Harris facility. In all of these illustrative situations we assume that the existing turbines remain in place and operate in peaking mode using the available water consistent with the current reservoir operating curve. The minimum flow modes will reduce the amount of water available for those peaking operations, and thus the amount of peaking generation and revenue. In our minimum flow analysis, we have assumed that there is no need for the pulsing operation of the existing turbines associated with the current Green Plan which may allow some increased peak period generation.

1. **Minimum flow discharge with no generation.** The first scenario we analyzed was a minimum flow requirement, without any accompanying generation. These low minimum flow rates could not be captured by the two existing turbines that cannot operate at partial capacity. Table 1, below, shows the amount of generation (and revenue) which would be forfeit if this approach were adopted.[10]

   The assumption that no accompanying generation is produced during periods of minimum flow is based on the current turbine configuration. Alabama Power asserted in its draft Battery Energy Storage System Report that, “the existing turbines are not designed to operate in a gradually loaded state or at flows lower than best gate,” which is, “approximately 6,500 cfs,” per unit.[11]

[8] Information is from Chapter 4 of the Pre-Application document of June 2018.

[9] Synapse understands that flows above 600 cfs may impact water levels at the RL Harris reservoir.

[10] The daily generation equivalent is an estimate of the power that could be generated using the minimum flow if the existing turbine configuration allowed for the flow. The percent of average generation can be understood as the percent of current revenue that would be lost under this scenario.

[11] Alabama Power Battery Energy Storage System Report pages 4, 15.

Table 1. Illustrative Scenario: Minimum Flow with No Generation

	Flow Rate Scenarios				Units
Min Flow Rate[12]	**150**	**300**	**600**	**800**	cfs
Daily Generation Equivalent	22.8	45.6	91.1	121.5	MWh
% of Average Generation	5.5%	10.9%	21.9%	29.2%	

2. **Minimum flow with matching generation.** The second scenario we analyzed assumes that the minimum flow is captured with a new matching turbine and the energy is sold at market prices during the hours of operation. Given Alabama Power's comments regarding the current turbine configuration, it is likely that this scenario would require the installation of an additional turbine capable of operating at minimum flow.

   Table 2 shows the daily generation equivalent which could be produced by the matching turbine at minimum flow.[13] In addition, it shows projected lost-revenue from selling energy at an off-peak rate which is assumed to be 30% of the on-peak price associated with current operations.[14] These losses can be understood as opportunity costs relative to RL Harris's current operations which allow the power to be sold at the higher price.

   While the cost of installing the new matching turbine should be considered, Alabama Power has not provided any estimates of the costs associated with such a matching turbine modification. If Alabama Power chose this approach, it is possible that Alabama Power would seek to recover the incremental costs associated with new turbine installation from ratepayers.

Table 2.Illustrative Scenario: Minimum Flow with Generation

	Flow Rate Scenarios				Units
Min Flow Rate	**150**	**300**	**600**	**800**	cfs
Daily Generation Equivalent	22.8	45.6	91.1	121.5	MWh
% of Average Generation	5.5%	10.9%	21.9%	29.2%	
Off Peak Rate	30.0%	30.0%	30.0%	30.0%	% of peak rate
Lost Revenue	3.8%	7.7%	15.3%	20.4%	% of annual total

3. **Minimum flow with matching generation and storage.** In this example 16 hours per day of the minimum flow is captured with a matching turbine and the energy is stored in a battery system for discharge on peak. The introduction of battery storage in this scenario enables Alabama Power to reduce revenue impacts by selling off-peak generation at on-peak prices. The remaining revenue

[12] These minimum flow rates are illustrative and could vary, for example, by season.

[13] This new turbine is assumed to operate at the same efficiency as the existing turbines. Different configurations involving different elevations could also be considered.

[14] If hourly price data were available this estimate could be refined. Since Alabama Power is a vertically integrated utility the system lambda or marginal cost could be utilized in absence of an energy market.

impacts are due to efficiency losses associated with the battery system. Table 3 shows that revenue losses in this scenario are quite modest, though the cost of the battery system needs to be considered as well. In addition, the battery system could also generate revenue from other services it provides such as its added capacity for example.

Table 3. Illustrative Scenario: Minimum Flow with Generation and Battery

	Flow Rate Scenarios				Units
Min Flow Rate	**150**	**300**	**600**	**800**	cfs
Daily Generation Equivalent	22.8	45.6	91.1	121.5	MWh
% of Average Generation	5.5%	10.9%	21.9%	29.2%	
Battery efficiency[15]	85%	85%	85%	85%	%
Lost Revenue	0.6%	1.1%	2.3%	3.1%	% of annual total

4. Costs and Benefits

Table 4 shows the installation cost for a battery system based on information provided for Option A of the BESS report, although the actual costs might actually be lower as through a PPA for example. And there is also the unknown cost of the new minimum flow turbine.

Table 4. Battery Cost Estimate for Different Flow Rate Scenarios

	Flow Rate Scenarios				Units
Flow Rate	**150**	**300**	**600**	**800**	cfs
Battery Size	5.7	11.4	22.8	30.4	MW for 4 hours
Battery Cost	$8.7	$17.5	$34.9	$46.6	$M based on BESS Report

Beyond the cost of the battery and turbine, there remain some other factors which could influence decision makers. As already noted, changes in hydro operations to include minimum flow would provide environmental benefits downstream of the dam. Additionally, homeowners both upstream and downstream of the Harris Project will be interested in both recreational and flood prevention impacts of any operational changes.

This analysis provides a high level and illustrative estimate of some aspects of minimum flow operations with a matching turbine and batteries. Synapse recommends that Alabama Power further analyze the environment and economic aspects of such a modified operation for Harris.

[15] Battery efficiency value from the BESS draft report (page 12).

ATTACHMENT B

Pacific Northwest National Laboratory White Paper

Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower

Pacific Northwest
NATIONAL LABORATORY

PNNL-SA-157672

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White Paper

May 2021

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Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower

White Paper

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Prepared for
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Summary

Hydropower operators have many reasons to integrate energy storage, either co-located onsite or located elsewhere, but co-optimized with facility operations. Storage systems can be configured to have complementary performance profiles to hydropower projects, opening a broad spectrum of operational patterns.

Integrating energy storage can allow hydropower operators to accomplish the following:

- Capture additional revenue by using more agile operational characteristics for fast-response ancillary services or by generating greater amounts of peak energy with expanded operational limits.
- Adapt to changing regulatory and market conditions, such as evolution of the Energy Imbalance Market in the western United States, without pushing equipment beyond design parameters or optimal hydraulic performance.
- Improve asset management conditions by minimizing equipment wear and tear using energy storage to support fast-response ancillary services or support demands beyond optimally efficient setpoints.

An important but unexamined opportunity is to integrate energy storage systems with hydropower facilities to improve environmental outcomes. Integrated operations support increased flexibility in the management of the underlying water system and the associated ecosystem. The connections are particularly clear in modifying power generation relative to water storage, release, and flow regimes. Such integrated operations support regulatory requirements, including maintaining upstream reservoir levels, ensuring adequate downstream flows to meet an ecological target, or for human uses of a river such as fishing or boating.

This document provides an organized discussion of the relationship between hydropower-storage integration and improved localized environmental outcomes. Which includes:

- An overview and survey of current uses of energy storage in the hydropower industry.
- A comprehensive framework describing the range and type of potential localized environmental benefits realized through integrating energy storage and hydropower.
- Case study examples comparing real conditions with environmental requirements.
- Methodological guidance to analyze potential benefits, technology characteristics, and tradeoffs.
- A discussion of co-optimizing versus co-locating storage within the facility footprint.
- A concluding summary of the steps necessary for industry to fully develop and implement this concept.

This paper is a fundamental exploration of local environmental outcomes that can be realized through integration of energy storage systems with hydropower facilities. It provides a methodological foundation for future analysis rooted in expert knowledge of both hydropower–environmental interactions and attributes of energy storage technologies.

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1.0 Problem Overview

Hydroelectric dams have been operating in the United States (U.S.) for more than 100 years, and throughout this time, the range of potential environmental effects from hydroelectric dams has become well-established. As part of the periodic authorization or review of these dams, environmental effects are studied, evaluated, and in some cases mitigated. Mitigation may require investing in habitat restoration, improving river connectivity for migratory species, monitoring water quality, engaging the public, developing and implementing new technologies (hardware or software), and directly adjusting dam operations.

As dam operators balance the management of environmental impacts with maintenance of their electricity resource, new storage technologies may help to meet both needs. Most federally operated hydropower projects, as well as those operating under licenses granted by the Federal Energy Regulatory Commission (FERC), have limits on their operations to reduce environmental impacts. These limitations include spilling water outside of generating turbines, or managing flow on daily, seasonal, or yearly time scales balanced around the needs of fish and other aquatic species, reservoir levels, or downstream ecological needs. These flow management practices affect the economic viability of a given hydroelectric project by limiting its full operational flexibility. Additionally, the increase in renewable energy production has challenged the contribution of hydropower to the grid, and maintaining environmental flows mandated by FERC license requirements will become increasingly challenging (Kern et al. 2014). As storage technologies advance and become commercially available at utility-grade, grid-scale, and cost-effective levels there is a new opportunity to imagine how they can integrate with hydroelectric operations to support the larger electrical grid, while maintaining financial stability and improving environmental outcomes.

This paper describes how the installation of energy storage systems, co-sited with hydroelectric projects, offer operational, economic, and environmental benefits by enabling a broader range of electricity performance, capitalizing on its flexibility and grid reliability, while mitigating critical environmental impacts or improving environmental outcomes across U.S. rivers and streams. The paper attempts to link environmental outcomes to energy storage utilization. It offers a comprehensive inventory of research-grade work, site-specific studies, policies, and pilot projects regarding energy storage and hydropower that show significant environmental implications. It provides an outline of methodologies given the known costs and attributes of storage technologies, with case study illustrations. It also outlines the key components of a methodology that could be applied within the context of specific projects to reveal the environmental benefits of energy storage paired with hydropower production to properly size the storage systems to capitalize on potential benefits.

This paper provides a framework for assessing the degree to which energy storage can support operational strategies to improve environmental objectives, including where flow releases or other operational changes are provided to match a water quality, fish, or other ecological objective. Factors driving the integration of hydropower and energy storage will be site-specific, and include combinations of operational, maintenance, economic, and environmental considerations. The focus of this paper will strongly support the validity of the environmental approach. A set of knowledge gaps to be addressed in future work is provided. To validate and support the information provided in this paper, further analysis will be required on a physical facility to serve as a test case.

2.0 Current Use of Energy Storage by the Hydropower Industry

Hydroelectric plants currently offer energy storage due to the presence of water reservoirs, but to increase storage, operators have at times considered batteries to be a competitive resource. Energy storage could be accomplished by expanding the impoundment and raising the height of a dam; however, raising dam height introduces a host of civil engineering requirements, costs, and timelines, as well as regulatory authorizations, and doing so would inundate new lands. Despite these challenges, dam-raising efforts are being considered.[1] In contrast, energy storage systems can be installed in as little as 6 months, when physical space, electrical infrastructure, and construction permits are readily available (Pyper 2017). Larger reservoirs offer similar characteristics of storage that are already available; energy storage systems can offer a complementary capability rather than an expansion of existing flexibility.

As batteries become more reliable and efficient, an emerging idea is to directly integrate batteries with hydroelectric plants and hybridize their operations for overall improved plant performance. To date this idea has been explored for power flexibility benefits or market participation eligibility, such as provision of ancillary services, market eligibility as a fast-responding resource, or improved operational integration across cascading plants. Many energy storage systems are sited at utility infrastructure based on reliability, or distribution or transmission requirements. The appropriateness of whether to co-site or to co-optimize storage systems with hydroelectric plants, given ownership model, revenue mechanism, and grid operation conditions, is discussed in a later section.

Examples of power flexibility achieved by incorporating different types of storage on-site at hydroelectric plants, either simulated or actual, are provided below.

- In Sweden, Fortum has connected a 5 MW battery system to a 44 MW hydropower plant to improve its quick response time and the precision of its regulation service, because wind power has created the need for increased flexibility. The site has also asserted that the battery helps to keep the market in balance and reduces wear on hydropower turbines, allowing for deferral of investment in maintenance or replacement (Hydro Review 2018).
- The Buck and Bullesby power plants owned by AEP in southwestern Virginia have installed a 4 MW battery system. The system is used to reduce peaking in the older hydropower plants and increase the value of frequency regulation in the PJM market. This allows AEP to leverage and enhance revenue by providing regulation services and offset the charges that customers incur.
- Idaho Falls Power has also implemented a black start field demonstration to show that run-of-river hydropower plants with energy storage can restore electric power without assistance from the transmission system. This capability is essential for small hydropower facilities to be able to operate a microgrid to power critical loads in the event of an outage.[2]

[1] San Vincente Dam in San Diego was raised more than 100 ft in 2012. See https://www.water-technology.net/projects/san-vicente-dam-raise-san-diego-california-us/. The Bureau of Reclamation intends to raise Shasta Dam in California by 18.5 ft. The project is currently in pre-construction. See https://www.usbr.gov/mp/ncao/shasta-enlargement.html.

[2] See the "Integrated" project, which explores the energy benefits to hydropower when paired with energy storage technology: https://factsheets.inl.gov/FactSheets/Integrating%20Hydropower.pdf.

- Other examples include the Cordova Electric Cooperative 1 MW battery and Kodiak Electric Association's 3 MW batteries. Both sites coordinate battery operations with small-scale hydropower to support small grids in Alaska. In Cordova, the battery system is designed to support a microgrid in the event of an outage due to harsh weather and avoid spill during dynamic seasonal loads. Kodiak aims to achieve reliability from an increase in the use of wind generation to support their microgrid, while reducing rates for customers with their two-battery system.
- Douglas County Public Utility District announced their intention to construct a 5 MW hydrogen electrolysis pilot project at its Wells Dam on the Columbia River (Shumkov 2020).
- In January 2020, Brookfield Renewable proposed an energy storage project at two of their hydro facilities along the Penobscot River—the Penobscot Mills and Ripogenus projects. Each project consists of a 10 MW, 20 MWh on-site system, which would be permitted under existing interconnection agreements. The batteries would allow the continued operation of the hydroelectric facilities during periods of high congestion and would have no impact on the operation or maintenance of the projects.[1]

It is clear from the examples above and the direction of the international industry that operational flexibility and asset management are the driving factors for hybridization of storage and hydroelectric plants. Even emerging "clean peak" policies such as Massachusetts' new Clean Peak Standard require hybridization of storage on clean energy projects to qualify for special treatment and remuneration, based on the premise that this additional flexibility is necessary to meet reliable system operations and clean energy goals.[2] [3] Additional power benefits for energy storage installations are yet to be analyzed, to the authors' knowledge. For example, storage systems could replace end-of-life small hydropower turbines to support station service at large plants.

3.0 A Novel Energy Storage Use Case: Environmental Benefits

This white paper posits that an additional class of benefits is derived from co-siting storage systems with hydroelectric plants—environmental benefits. As noted above, storage can improve the range of operational flexibility. Regardless of the primary investment driver, local environmental management is an essential part of the operational equation. Once hydropower plant operators install storage systems, the projects may operate differently to manage environmental constraints. Whether optimization occurs as an investment, regulatory, or planning tool, or after the fact as a new operational regime implemented from storage-integrated operations, improved environmental outcomes are possible with the installation of expanded on-site storage. New techniques such as advancements in multi-objective optimization of hydropower funded by the National Science Foundation (Roy et al. 2018) and

[1] FERC Project No. 2458-214 – Penobscot Mills Project, Great Lakes Hydro, LLC; FERC Project No. 2572 – Ripogenus Project, Great Lakes Hydro, LLC.

[2] Arizona, California, North Carolina, and New York have explored clean peak standards without success in implementation. Michigan has explored a "low-cost peak program," which would require renewable energy generation to be paired with energy storage.

[3] See the Low Impact Hydropower Institute's webinar with experts discussing how this standard may affect operational and economic outcomes for hydropower plants: https://lowimpacthydro.org/massachusetts-clean-peak-standard/.

data-rich demonstrations are needed to fully evaluate the flexibility and environmental opportunities.

The nexus between environmental objectives and operational flexibility is well-established, and research continues to define these relationships.[1] A short list of operational changes to improve environmental outcomes, depending on site-specific operational and structural configurations, includes discharge ramping rates, minimum flows, reservoir levels, downstream and upstream temperature, dissolved gases (too much or too little), turbine loading patterns, as well as recreational management, boating flows, fish passage, flood control, irrigation, and other uses of the river. How could batteries or comparable energy storage technologies permit a win-win opportunity—operational flexibility and environmental improvements?

Examples of direct advocacy for energy storage installation for environmental outcomes, under discussion in two open FERC proceedings exist, as indicated in the case studies highlighted below.

3.1 Case Study: Connecticut River Conservancy and Great River Hydro's Vernon Dam (White et al. 2020)

The Connecticut River Conservancy contracted a study with Synapse Energy Economics in February 2020 to analyze the potential for the Vernon Dam hydroelectric plant (P-1904), owned by Great River Hydro, to be re-operated in a run-of-river mode and paired with a 10 MW, 2 hr battery storage system. The researchers aimed to determine the energy market revenue impacts of transitioning Vernon Dam to run-of-river operations while quantifying the value of installing an integrated battery storage system to capture a portion of peak energy prices.

The researchers found that a transition to run-of-river operations would moderately affect energy market revenues by 3 to 10 percent, while the other revenue streams (capacity, ancillary services, and renewable energy credits) would have little to no impact. It may be necessary, however, to relax true run-of-river operations during peak-load hours to maintain capacity values (and thus capacity revenues). Energy price arbitrage can be leveraged by charging batteries from turbines during periods of low energy prices and discharging power during periods of high energy prices. As New England increases its renewable energy levels, price volatility may increase, increasing the value of energy arbitrage. The cost range of the 10 MW proposed storage system was determined to be $4.9 to $9.8 million—a cost-effective investment at the lower end of the range, but a loss at the higher end.

With five hydropower plants along the Connecticut River in Massachusetts, New Hampshire, and Vermont applying for new licenses, this case study illustrates the potential for battery storage to offset revenues if peak operating plants convert to run-of-river operations. The results of this case study have been provided to the applicants for their consideration and submitted to the FERC docket as an alternative scenario opportunity.

[1] See U.S. DOE HydroWIRES grant to the Electric Power Research Institute to *Quantify Hydropower Capabilities for Operational Flexibility*: https://www.energy.gov/articles/doe-announces-249-million-funding-selections-advance-hydropower-and-water-technologies

3.2 Case Study: Alabama Rivers Alliance and Alabama Power's Harris Project[1]

One emerging case study with a goal of reducing hydropower peaking to reduce the impact of unnatural flows on the Tallapoosa River's ecosystem may begin to explain the potential environmental benefits of adding a battery and allowing greater flexibility to meet electrical demand. In June 2020, Alabama Rivers Alliance advocated for Alabama Power to conduct studies of downstream release alternatives and battery storage integration at the Harris Project (FERC #P-2628) on the Tallapoosa River. Current operations include discharge variations, occurring within a few hours' time, from zero to about 16,000 cubic feet per second (cfs) when both turbines are operating. FERC proceedings regarding downstream release alternatives included comments from FERC staff, Alabama Rivers Alliance, and the U.S. Environmental Protection Agency, each recommending specific study scenarios. Alabama Rivers Alliance requested a study to compare models simulating the release of the natural flow variability of the Tallapoosa River compared to several alternative operations scenarios. Simulation of "natural flows" will ultimately not occur, but the alternative scenarios to be studied will include (1) the current operation plan ("Green Plan," designed to reduce effects from peaking operations on the aquatic community), (2) the project's historical peaking operation, (3) a modified current operation plan, (4) a downstream continuous minimum flow of 150 cfs under the historical peaking operation scenario, and (5) six other operations scenarios including minimum flows of 300, 600, and 800 cfs; a derivation of the "Green Plan;" and two other scenarios resulting from an addition of a battery energy system.

Alabama Rivers Alliance requested that a new study be conducted by Alabama Power titled "Battery Storage Feasibility Study to Retain Full Peaking Capabilities While Mitigating Hydropeaking Impacts." This study would determine whether a battery storage system could be economically integrated at the Harris Project to provide power during peak demand periods—decreasing the need for peak generation flow released and reducing flow fluctuations downstream—by evaluating battery type, size, costs, ownership options, and barriers to implementation. In their response, FERC described the potential benefits of adding a battery energy system to include reducing the fluctuations in the reservoir by half, reducing peak flows from 16,000 to 8,000 cfs, and achieving the ability to release flows throughout the day and night versus only during peak demand hours. Alabama Power initially rejected the study, citing the high costs of battery storage systems and turbines that are not designed to operate gradually over an extended period. Using a 2018 National Renewable Energy Laboratory report (DOE 2018), Alabama Power estimated the cost of a 60 MW, 1 hr battery (the equivalent to power one turbine at the site) to be $36 million, with a combined cost for both turbines of $72 million. FERC further noted that a 4 hr 60 MW battery, costing $91 million may be needed because Harris Dam can generate for up to 4 hr. FERC recommended that the company conduct the battery storage feasibility study to include (1) a 50 percent reduction in peak releases associated with installing one 60 MW battery unit, and (2) a smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e., 5, 10, 20 MW), including cost estimates. The study will be conducted through April 2021 and will be used to assess the project impacts on downstream resources including aquatic species, erosion, water quality, terrestrial resources, and recreation.

[1] Project No. 2628-065 – Alabama R.L Harris Hydroelectric Project, Alabama Power Company.

4.0 Environmental Benefits Associated with Increased Operational Flexibility

An initial framework of relationships between storage and environmental outcomes is provided in Table 1. Although the issue categories in the table are not mutually exclusive, they begin to elucidate the potential environmental improvements that pairing energy storage with hydropower may provide. Future work would further characterize these examples and conduct a more thorough review of potential environmental gains derived from augmenting hydropower with energy storage technologies.

Adding a storage system to a facility would allow owners flexibility in generation, by breaking the tie between river flows and fluctuating power demands. Site-specific conditions, location, and regulations will dictate the magnitude and type of environmental outcome that may be realized. Table 1 discusses the potential improvements and is not intended to be all-inclusive, nor are all benefits applicable to every unique case.

Table 1. Taxonomy of potential environmental benefits from pairing hydropower with energy storage.

Issue Category	Desired Positive Environmental Outcome	Change in Operation with Energy Storage	Knowledge Gaps
Fisheries	Release flows that are more similar to the historic hydrograph (e.g., run-of-river) that includes cues used by fish for spawning, rearing, migration, etc.; reduce fish-stranding mortality.	Maintain operations and absorption of energy to permit a higher (or lower) release of flows.	Characterize the duration and intensity of flows and turbine operations/energy generation in relation to fish behavioral cues and survival relationships.
	Allow historical seasonal peak flows to enable fish spawning.	Reduce wear-and-tear on components through steady operation during fluctuating generation and release requirements.	Determine sizing and controls between energy storage and turbine units to integrate operations.
	Foster safe passage through hydropower infrastructure.	Allow spill for downstream passage to maintain the same electricity production; offset efficiency losses from fish screens.	Optimize storage capacity, state-of-charge, duration, degradation, and efficiency.
Water Quality	Reduce supersaturated total dissolved gas (TDG) levels.	Support more advantageous release schedules and reservoir management, absorption of energy if released through turbines under oversupply conditions.	Potentially improve TDG throughout a cascading hydropower system with new operations and energy storage flexibility?

Issue Category	Desired Positive Environmental Outcome	Change in Operation with Energy Storage	Knowledge Gaps
	Optimize dissolved oxygen.	Allow oxygen injection to be combined with turbine operation and releases through absorption of energy or support more advantageous release schedules.	Potentially improve dissolved oxygen with new operations and storage flexibility?
	Allow for improved temperature regimes.	Enable temperature control via locally powered reservoir control structure to manage downstream temperatures where seasonally stratified reservoirs are present.	Explore added flexibility of batteries and hydro operations to control temperature.
	Reduce unwanted nitrogen/phosphorous contributions to algal blooms.	Use energy storage system to allow spill variation in reservoir levels; local energy could be used for removing nutrients from water.	Understand the impacts of alternative operations on the ability to control nutrient levels.
Flows	Reduce intensity of peaking flows and up and/or down ramping rates.	Charge energy device in advance of peak flows to increase the responsiveness of the project to signal and shave flow releases to lower ramp rates.	Measurably improve environmental resources through changes in intensity and ramping that are possible with storage integration?
	Maintain minimum flows (varied by season or otherwise as specified).	Permit cost-effective decrement in flows and generation with releases not timed to match electricity demand.	Acquire new environmental benefits when minimum flows are more easily obtained as well as make valuation possible to allow new environmental markets?
	Enable bypass reach flows.	Allow maintenance of revenues during flow releases in the bypass.	Support releases for non-power flows?

4.1 Reducing Hydro Peaking

Hydropeaking and load following operation modes, whereby pulses of water are released in rapid response to meet changes in electrical demand, can alter the quantity, quality, and accessibility of downstream aquatic habitats (Clarke et al. 2008; Fisk et al. 2013). Depending on their timing, frequency, duration, and magnitude, discharge fluctuations can have adverse effects on stream fishes and other aquatic life (Young et al. 2011). Discharge fluctuations during the period of fish spawning may cause adult fish to abandon nests or alter spawning site selection (Chapman et al. 1986; Auer 1996; Zhong and Power 1996; Geist et al. 2008). Fluctuations in discharge that occur shortly after the spawning period can dewater nests, resulting in mortality of eggs and larval fish (Becker et al. 1982; McMichael et al. 2005; Fisk et al. 2013). Discharge fluctuations that occur during the early rearing stage can strand fish along changing channel margins or entrap them in isolated pockets of water (Cushman 1985; Halleraker et al. 2003; Connor and Pflug 2004; Nagrodski et al. 2012). Repeated, rapid fluctuations in discharge may also negatively affect downstream fishes indirectly by altering the density, biomass, and diversity of their food supply (Cushman 1985; Gislason 1985; Bunn and Arthington 2002), which can reduce fish growth as well as the biological productivity of the ecosystem. Reductions in spawning success, survival, and growth have the potential to reduce the productivity of populations that reside downstream of hydroelectric projects (Harnish et al. 2014).

Co-sited energy storage may enable a hydropower facility to meet system peaking needs, provided that state-of-charge control is aligned with the peaks, without releasing such significant water volumes downriver. Thus, energy storage systems would decrease peak generation flow releases, thereby reducing flow fluctuations downstream of the hydroelectric project—and ultimately, lowering the potential impacts on threatened fish and other organisms using the river habitat. Response times are also much faster when using batteries and power factors of 0.0 are supported, so more than just maintained but *improved* power system benefits (i.e., energy and ancillary services) may be achievable along with environmental improvements.

4.2 Securing Safe Fish Passage through Hydro Infrastructure

In addition to fish populations experiencing the effects of hydropower operations downstream of dams, fish migrating in a downstream direction may sustain injury or death while passing hydroelectric dams. At many hydroelectric dams, downstream migrants can pass via several different routes (e.g., spillways, turbines); however, passage through turbines is generally associated with the highest mortality rate (Muir et al. 2001). At some hydroelectric projects, operations have been altered to deliberately release water through spillways to direct downstream migrants from the turbines to the spillway to increase dam passage survival. Many species display differences in depth distribution and/or migratory activity throughout the daily cycle, which can alter their probability of turbine or spillway passage (Haro et al. 2000; Li et al. 2015). Therefore, energy storage systems, instead of the hydropower turbine, could be used to provide power when needed, allowing more water to be spilled during periods of peak fish passage or times when turbine passage rates are expected to be high. For example, salmon and steelhead smolts are more likely to pass through the powerhouses of Snake River dams at night than during the day due to a diel shift in depth distribution. Approximately 60 MW of stored power exported for 4 hr nightly could reduce powerhouse passage of Snake River Chinook salmon smolts by 12 to 23 percent over the entire summer passage season, thereby increasing survival significantly. Added flexibility of spill operations, and in turn, improved fish survival, may help hydropower operators further improve fish survival and reduce mitigation costs (e.g., mid-Columbia River No-Net-Impact funds).

Fish passage is not limited to spillways or downstream travel. Spill for upstream migration (i.e., fish ladders) can account for 10 percent of the flow rate, resulting in lost power generation potential. Noting that attraction flows to fish ladders need not spill constantly, the seasonality and perhaps even time of day of fish migration activity can allow for banking of energy benefits through energy storage, which can then be exported when spills do need to flow in correlation with fish activity.

A facility may also operate under specific flow rates for fish spawning benefits, which may require spilling water that cannot be used to generate electricity and may lower the annual energy production of a hydropower facility. However, just as spawning does not happen through all seasons and at all hours of the day, water can be released when needed for environmental benefit and the restriction may be relaxed at other times, thereby allowing a net energy production increase. When the timing of energy increases does not align with power system needs, there is an opportunity for energy storage systems to shift the available energy and make use of the surplus.

4.3 Operational Shifts and Requirements for Fish in the Eastern U.S.

In addition to operational shifts and flow management for western U.S. fish (in particular salmon) as indicated above, eastern U.S. hydropower plants also adjust operations for fisheries including resident, anadromous (e.g., American shad), and catadromous (e.g., American eel) fish. We discuss examples below related to fish specifically, because fish are often the driving factor of dam operational changes; however, we understand that many other aquatic species (e.g., mussels) as well as aquatic ecosystem health benefits are gained from these operational changes.

Operational shifts to ensure safe fish passage through hydropower plants is a precedented activity dating back to the early 1900s—particularly in the northeastern U.S., where migratory anadromous and catadromous fish use rivers highly developed with hydropower projects. For example:

- The Holtwood Hydroelectric Project on the Susquehanna River in Pennsylvania uses a tailrace lift with two entrances and a spillway lift for upstream fish passage and a pipe system for downstream fish passage.
- The York Haven Dam, also on the Susquehanna, uses a vertical slot fishway to support upstream passage of anadromous fish, primarily American Shad.
- In Maine, along the Penobscot River, the Milford Hydroelectric Project uses a 4 ft by 4 ft bottom entrance for American eels to pass through the dams slowed to 70 cfs into the plunge pool and an upstream fish lift capable of passing up to 300 cfs.
- The Orono Hydroelectric Project uses a similar system with an 8 ft wide downstream diadromous fish-passage floor screen chamber into the plunge pool and a lower-level 4 ft by 4 ft entrance designed to pass at 150 cfs.
- The Holyoke Dam, on the Connecticut River, uses two elevator fish lifts that carry migrating fish, including American Shad, Sea Lamprey, Atlantic Salmon, and American eel, up and over the dam.

In these cases, operational flows are altered to meet fish-passage needs. Storage augmentation at these facilities could allow increased flexibility to meet both the electrical demands of the grid as well as the site-specific fish-passage requirements.

4.4 Managing Spill for Habitat Benefit

Habitat benefits for the aquatic ecosystem as a whole may also extend to spill. Many river ecosystems rely on sediment that passes downstream in the absence of dams. Sandbars have been depleted by long-term dam presence, to the detriment of endangered species on the Colorado and Missouri Rivers. The Department of the Interior has shown success in rebuilding sandbars through controlled flood operations through the Glen Canyon Dam since 2012 (USGS 2015). Energy storage may enable a means for making up for some of the lost energy value associated with controlled flood events, or even increase their frequency to maximize the habitat benefit.

4.5 Preserving River Flows to Improve Water Temperature and Dissolved Gases

River water temperatures directly affect aquatic ecosystem health, and energy storage may allow more flexible operation to control downstream temperatures for environmental benefits. Extreme high temperatures, such as those that occurred in 2015 in the Columbia River, were associated with significant salmon and sturgeon fatalities;[1] in these situations, water temperatures may be able to be cooled by further operational flexibility at hydropower dams to release deeper and cooler hypolimnetic waters. Conversely, unnaturally cold water temperatures, such as in a dam tailrace when a thermally stratified reservoir releases the colder/deeper water through deep-draw turbines or spill, can also have detrimental effects such as creating unnatural temperatures that may allow, for example, an invasive species to increase predation on native warmwater fishes (Ward and Bonar 2003). To keep temperatures within acceptable ranges, the added operational flexibility that batteries paired with hydropower may provide could allow hydropower operators to be more selective about mixing upper warmer waters (using surface spillways) with deeper cooler waters (using deep-draw turbines or deep spill).

Similarly, oxygen and/or total dissolved gas (TDG) levels can be directly affected by hydropower operations to the detriment of fish and the larger ecosystem. For example, in the Coosa River in Alabama, low oxygen levels in tailrace waters are directly linked to operation of the turbines drawing low-oxygen water from deep water, which ultimately negatively affected ecosystem health and resulted in the operator's FERC licenses being vacated.[2] High dissolved gas levels above 100 percent also have detrimental effects on aquatic organisms. Dissolved gas levels above 110 percent can cause fish to lose their ability to sense (hear) encroaching predators (Weber and Schiewe 1976), and increasing gas concentrations up to 130 percent result in high mortality of some species (Mesa et al. 2000). An energy storage device may provide additional flexibility for hydropower generators to adjust operations as a function of oxygen/TDG level, or to allow some degree of spill from a considerable elevation to restore oxygen content. Operations to control dissolved oxygen and/or TDGs occur throughout the U.S., but, to our knowledge, the ability of batteries to improve the environmental outcomes has not yet been evaluated.

5.0 Considerations for Studying Storage Applications for Environmental Outcomes

Given the potential benefits, what is the best approach to determining whether a storage device could allow for operational changes that offer environmental benefits at hydropower projects?

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[1] https://www.nwcouncil.org/news/warm-water-wreaks-havoc-columbia-river-fish

[2] https://www.gadsdentimes.com/news/20180827/alabama-power-loses-coosa-river-dam-licenses

This paper highlights key components of a *conceptual* methodology to evaluate potential environmental benefits of deploying storage systems in cooperation with hydropower facilities. The following example shows how the deployment of energy storage at a peaking hydropower facility can yield win-win outcomes, i.e., maintain the power generation requirement, while simultaneously allowing for less severe changes in water flows.

5.1 Conceptual Example to Illustrate How Storage May Be Used to Enhance Environmental Benefits for a Peaking Hydropower Plant

Figure 1 presents a stylized example of a utility that operates its hydropower plant to maximize generation during the morning and afternoon peaking periods. In this example, it is assumed that plant operations reach the upper limit of available water (ramp up in water flow – cubic feet per second per hour [cfs/hr]), which is required to ramp up power generation. With the addition of a storage system, plant operators can employ alternative operational strategies, in general charging the storage system when fuel (water) is available and operations are more flexible, and discharging electricity during peak hours or when operational and water (storage) limitations have been reached. Such a strategy could allow the hydropower plant to operate above normal operating levels during off-peak hours and operate at a lower level during peak periods. Water flow to support such an operational strategy would change as well (i.e., increase during off-peak periods and decrease during peak periods). The implied benefits of a less severe ramp up and ramp down of water would include less severe variations in tailwater elevations, and reduced time of running with water flows close to the maximum limit. Depending on the plant configuration and operating conditions, such an operational strategy might also enable coincident benefits, such as longer periods of operating the turbines near their peak efficiencies. It should be noted that the primary benefit associated with market-facing operations—either revenue capture or more efficient generation portfolio stack—is not adversely impacted, because the effective power supply is identical to the baseline.

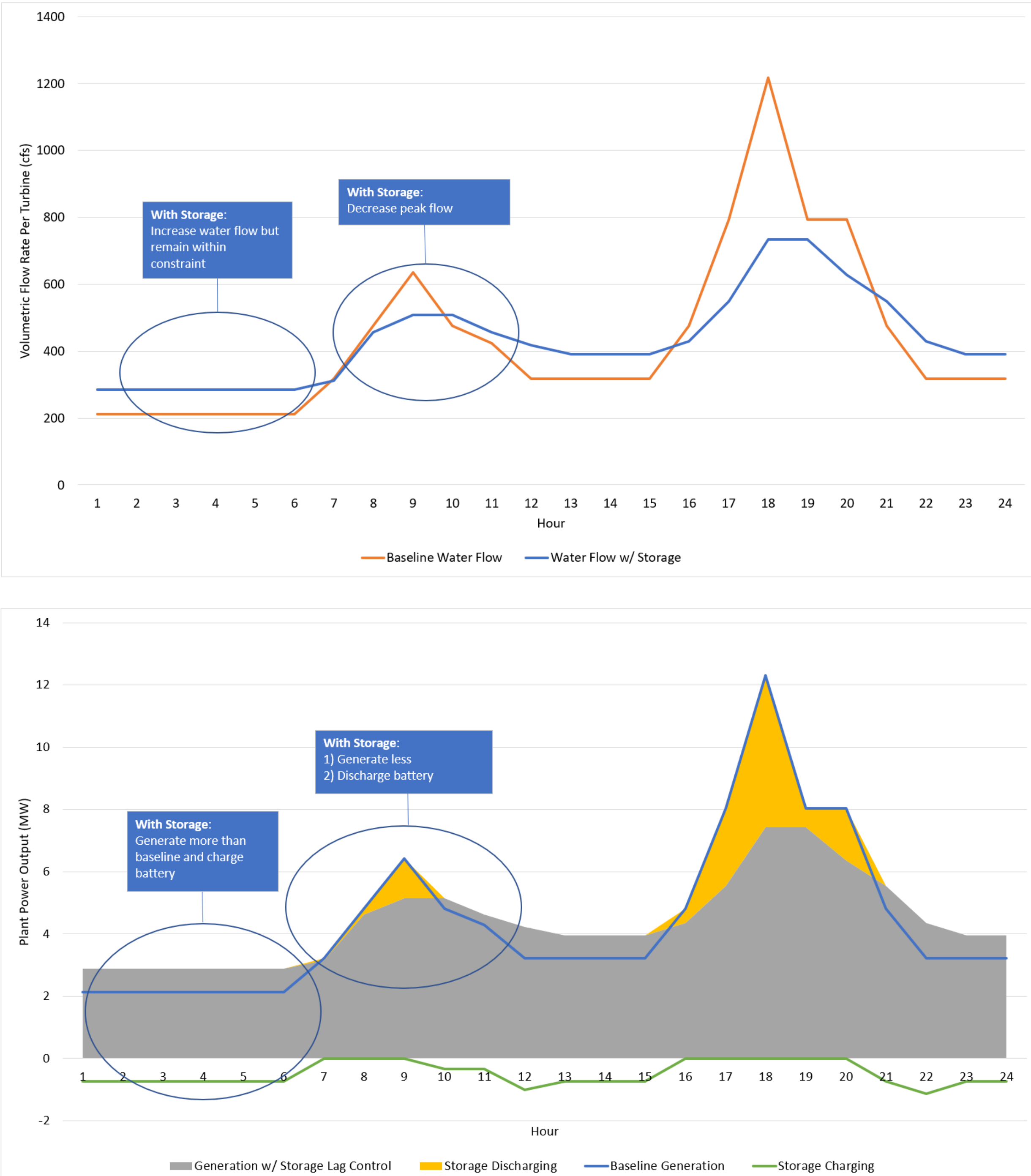

Figure 1. Conceptual example to illustrate alternative water flow regimes (top) and plant operations (bottom) based on deployment and use of energy storage technology.

5.2 General Process of Studying Storage Solutions for Environmental Outcomes

The hydropeaking example can be used to generalize the process one might use to study storage applications for environmental benefits. As highlighted in the example, the decision process requires an understanding of the relationship between environmental and power generation outcomes at a given location. Fundamentally, these outcomes are connected through water flow regimes at that location. Water flow regimes, characterized by min/max flow rates in units of cubic feet per second, daily fluctuations (cfs/24 hr), flow ramp rates (cfs/hr), and duration of sustained flows at increased or decreased levels, directly affect power generation possibilities at the location as well as the health of associated aquatic and riparian ecosystems. These regimes may need to be controlled in time, on hourly or seasonal bases, to balance positive environmental outcomes with power production. Any changes in water flow decisions, due to environmental or other objectives, will directly affect the power generation capabilities at that facility,[1] and hence, affect the choice of whether to install storage technology and if so what size. Figure 2 depicts the decision-making process that is encapsulated in the ensuing numbered steps.

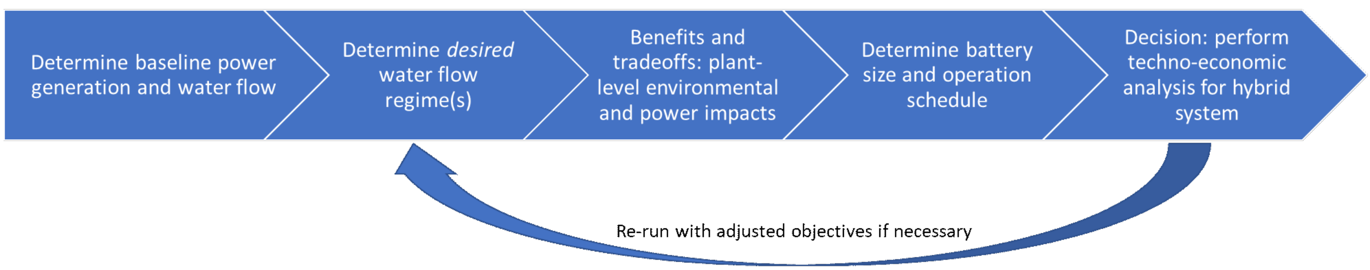

Figure 2. Energy storage sizing methodology.

1. Baseline: Ascertain the existing operational baseline regime (i.e., generation and water flow patterns at a given location) by considering baseload, load following, and peaking.
2. Determine desired water flow regime(s):
   a. Flexibility: Identify the operational flexibility, in both power generation and flow patterns, relative to the baseline operational regime.
   b. Alternatives: Identify the alternative set of water flow regimes that help enhance environmental outcomes at the location based on the flexibility assessment.
3. Benefits and tradeoffs: Assess the environmental benefits, changes in power generation outcomes and other tradeoffs, if any, due to the alternative flow regime(s) (e.g., hydropeaking can limit the opportunities for whitewater recreation).
4. Determine the energy storage size and operation schedule: Perform analysis to optimize energy storage size, including identifying a suitable location, and identify an operational schedule for the hybrid system.

[1] A current, ongoing research project stewarded by the U.S. Department of Energy's Water Power Technology Office, called "HydroWIRES Topic A," will provide a comprehensive mapping of environmental objectives and power operations at a facility, which could be used to supplement the proposed methodology.

5. Decision: Perform techno-economic analysis to ascertain economic outcomes of the optimization.
6. Adjust objectives, if needed, and repeat Steps 2 through 6.

While knowledge of the baseline operational regime—generation and water flow profiles and the inherent flexibility therein—may be known, the identification of alternative flow regimes requires thorough understanding of local environmental needs. These needs will inform how and when hydropower operations must be restricted, and when they can be relaxed, to achieve desirable environmental outcomes.

5.3 Alternative Water Flow Regimes to Enable Environmental Benefits

In the hydropeaking example, a threshold analytical understanding of the relationship between flow rates, power outcomes, and environmental outcomes must first be established. Data related to water elevations in locations of potential fish spawning habitat, flow rates at various river locations, and correlations of these data with flow rates through hydropower facilities must be collected to determine more precisely where and when maximum flow rates should be reduced. Additional measurements will be needed in various locations within a specific river to understand the efficacy of specific restrictions on ramp rate and successive ramping events in attaining meaningful environmental benefits of hydropeaking reduction. These requirements reach beyond hydropeaking reduction; the same can be said for any environmental gain associated with modifications of hydropower operations. The changes in operations, such as minimum and maximum flow limits, etc., will require precise determination of enhanced environmental benefits.

Table 2 presents a *hypothetical* set of values for maximum flow rates, ramp rates, and successive ramps per day that (1) are standard in baseline operations, before hydropeaking avoidance, and (2) will be required to achieve the environmental benefits associated with eliminating or reducing hydropeaking. The additional restrictions on power operations that come with changes in the values of these constraints directly correlate with either reduced or increased power generation potential. In the case of hydropeaking reduction, maximum flows must be reduced within time periods spanning several hours. In the consideration of whether energy storage can yield environmental benefits while maintaining power benefits, it is equally important to know where and when power operations can exceed the baseline. Minimum flow rates at off-peak times serve to limit the ramps associated with hydropeaking as well as provide a means for additional power generation to charge the energy storage asset. In this way, the information pertaining to the new flow regime, as well as the trade-off in power generation timing and scale, can be used to approximate the size, type, and location of a useful energy storage technology application.

Dispatch of the energy storage asset to shave hydropeaking is conceptually demonstrated in Figure 1, which demonstrates how flows can be reduced while energy is exported from the storage asset to maintain power system benefits. In this way, energy storage dispatch is directly linked to benefits to downstream fish populations during various life stages, as described in Table 2. To provide greater precision, an optimization problem can be formulated that treats the new flow regimes as constraints to ascertain the appropriate size, location, and type of storage technology. Hydropeaking avoidance is just one conceptual example. Appendix A presents two tables that repeat this methodology for the potential benefits associated with spill for safe fish passage downstream and upstream, and water quality benefits.

Table 2. Operational shift requirements to enable environmental benefits of hydropeaking reduction (hypothetical metrics).

Operational Constraint	Baseline	Flows to Meet Environmental Objectives (limit impacts from hydropeaking)	Potential Benefit	What data are needed?
Spawning flow range (cfs)	No limit	2,500–5,000	Conducive to spawning activity for spawning fish. Species and river dependent.	Habitat use – including water elevation of spawning habitats and larval fish behavior and habitat use. Life stage phenology.
Minimum flow release (cfs)	1,000	1,500–2,600	Protect larval fish incubating in gravel or developing during larval drift phase.	
Downramp amplitude limit (cfs)	None	4,000	Limit fish from getting trapped in pools that are disconnected from the main channel.	
Maximum downramp rate (cfs/hr)	No limit	3,000	Limit fish from getting trapped in pools that are disconnected from the main channel.	
Daytime downramping	Allowed	Not allowed	Limit fish being trapped; site- and species-specific differences	

5.3.1 Case Study: Glen Canyon Dam

Prior to 1991, Glen Canyon Dam (GCD) operated under fewer environmental restrictions. Table 3 shows that power plant water releases could range from 1,000 cfs to 30,500 cfs, with no limit regarding the daily fluctuations or ramp rates. Such flexibility caused significant environmental damage, such as the endangered species listing of native fishes and changes in the overall ecosystem due to changes in downstream water temperatures and decreased sediment load. From August 1991 to January 1997, temporary restrictions called "Interim Flow Restrictions" were put in place before the release of a final environmental impact statement. Since 1997, the water release range has been reduced to a range from 5,000 to 25,000 cfs, and daily fluctuations and ramp rates have been limited. More recently, in January 2017, a new Record of Decision (ROD, DOI 2016) mandating the preferred alternative prescribed by the Long-Term Experimental and Management Plan has been adopted and was first implemented in October 2017.

Table 3. Evolution of Glen Canyon Dam operating constraints.

Operational Constraint	Historical Flows (before 1991)	1996 ROD Flows (from 1997 to 2017)	2016 ROD Flows (after 2017)
Minimum flows (cfs)	3,000 (summer) 1,000 (rest of year)	8,000 (7 a.m. - 7 p.m.) 5,000 (at night)	8,000 (7 a.m. - 7 p.m.) 5,000 (at night)
Maximum non-experimental flows (cfs)[(a)]	31,500	25,000	25,000
Daily fluctuations (cfs/24 hr)	28,500 (summer) 30,500 (rest of year)	5,000, 6,000, or 8,000 depending on release volume	Equal to 10 X monthly water release (in thousands of acre-feet) during June-August, and equal to 9 X monthly water release the rest of the year, but never exceeding 8,000 cfs
Ramp rate (cfs/hr)	Unrestricted	4,000 up 1,500 down	4,000 up 2,500 down

(a) Except during experimental releases.

Because water flow rate and power are closely related, peaking capability at GCD has been also significantly reduced (Figure 3). Power generation is dependent on available head and flowrates. Before the environmental restrictions, during the week from July 19 to July 25, 1987, GCD was able to produce a peak power of 1,164 MW, that is, 89 percent of the potential peaking capacity of this period. After the 1996 ROD, during the same week of year 2015, this peak generation dropped to 746 MW, that is, only 68 percent of its potential available capacity. The limitation on the peak capacity is due to the maximum daily fluctuations imposed above.

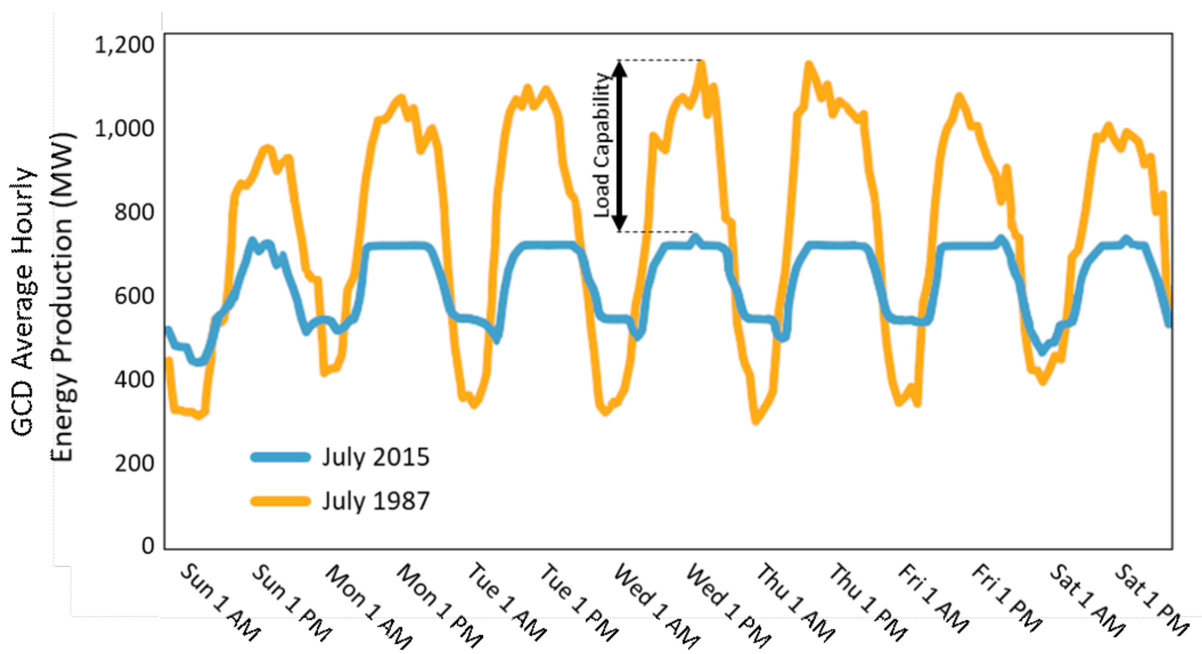

Figure 3. Hourly energy production at the GCD powerplant during a July week in 1987 and 2015.

5.3.2 Case Study: GCD Potential Improvements

The GCD case illustrates the potential benefits of implementing energy storage to improve environmental outcomes. Though the peaks vary significantly due to flow restrictions, the overall power generated relative to potential available power during the case periods is quite similar. Potential available power considers differences in head and assumes the maximum flowrate of 31,500 cfs can be achieved at the differing heads. If 31,500 cfs cannot be achieved during the lower head period of 2015, the convergence is increased. The July 1987 flow data generated at approximately 58 percent of the potential available power, whereas the July 2015 performance is approximately 54 percent of the potential available power. The convergence of these values is due to minimum flows being required during the night for 2015, increasing the generation over this period.

The imposed flow requirements resulting in night generation occur during a period of low demand. Increased power demands begin in the morning, taper through the day, then peak in the evening. Demand drops significantly at night. Implementing an energy storage system to capture the generation at night and discharge during the day would allow the average hourly energy productions from the environmentally restricted 2015 period to behave similarly to the less regulated 1987 period.

5.4 Process of Deciding the Storage Size, Type, and Location

Industry,[1] academia, and national labs have developed several tools and methodologies to assist with the sizing of energy storage for site-specific installations. Most of these tools and methodologies (Wu et al. 2017) focus primarily on maximizing revenues or cost-savings from power operations, either for the stand-alone storage technology or for a hybrid solution, such as a traditional solar or wind facility with the integrated addition of a storage system. To the best of our knowledge, currently there are no tools and methodologies that can assist with making decisions about the sizing of storage technologies for environmental benefits. However, existing methodologies can be adapted for this purpose. All that the methodologies require is a sufficiently precise characterization of the technical attributes of the resource being analyzed—whether a stand-alone storage system or a hybrid solution—and its intended functions. In the case of energy storage for environmental benefits, the technical characteristics of a hybrid hydropower resource with integrated storage will likely be based on the flow regimes, both baseline and alternative ones.

The changes in flow regimes may be required for a variety of reasons:

- FERC licensing or relicensing process, where the federal authorization for the facility requires a new flow regime or alternate water budget, such as maintaining upstream reservoir levels, or flow requirements to meet a downstream objective including human uses such as fishing or boating;
- operational strategies for asset management purposes, where the facility must adjust the hydraulic capacity of the system in order to maintain useful equipment life;
- new market opportunities, such as a change in the price of ancillary services, or changes in underlying regulatory and policy constructs, and market designs; and

[1] Det Norske Vitas (DNV)-GL's ES-Select tool compares energy storage technologies for different use cases; Pason Power Inc., and Energy Toolbase LLC., have designed a tool called Energy Toolbase to assist with sizing and controlling residential solar PV plus battery systems.

- mitigation of environmental issues, where water flows must be adjusted ~~provided~~ to match a water quality, fish, or other ecological objective.

In all but the last case, environmental benefits are not likely to be the primary drivers when making decisions about deploying an energy storage technology. Even so, the deployment of energy storage, whether for operational flexibility or asset management, will provide options for alternative operating practices and, by extension, alternative water flow regimes. The choice of storage technology in such cases will need to consider the appropriate combination of power generation and environmental outcomes, weighed against the cost of the storage technology itself. This process could be designed as a multi-objective optimization problem consisting of an appropriately weighted combination of objectives—(maximize) power generation responsiveness, operating limit, and flexibility, (minimize) asset management costs, (maximize) environmental compliance, and (minimize) technology costs. This process, essentially, uses a range of water flow regimes to construct the *pareto frontier* to analyze tradeoffs between different objectives.

Alternatively, one or more of the objectives may be treated as constraints in the design process. For instance, to avoid lost generation opportunity and attributes in the hydropeaking example, the baseline generation profile may be treated as a fixed requirement that the combination of storage and hydropower generation (with altered flow regime) must attain. Hence, the first step in the decision-making process is to determine the attributes of lost generation capacity—energy and power ranges, ramp rates, and so forth. The required set of attributes will help determine the choice of energy storage technologies. The next step in the process is to conduct techno-economic analyses based on understanding and knowledge of market conditions, water availability, and other critical considerations. The techno-economic analysis can be based on detailed time-series simulations and optimization of the hybrid resource, modeling its operations and dispatch in an actual market. Pacific Northwest National Laboratory's (PNNL's) energy storage evaluation tool (ESET), for instance, has been used extensively to create a sizing space for storage, based on known or assumed use cases (such as hydropeaking), deterministic or stochastic information on market conditions (prices, demand, and so forth), and storage technology specific considerations.

5.4.1 Storage Sizing Methodology for Maximizing Revenue of a Storage Hybrid System

The ESET tool formulates a linear programming problem to maximize the annual economic benefits of the energy storage or hybrid system. In this case, the benefits would include any identified hydropower use cases as well as any other market services that could be provided. The tool co-optimizes identified services to be provided subject to energy storage power and energy constraints, state-of-charge dynamics, and the coupling of different use cases. The ESET formulation dispatches the system on an hourly basis, first formulating a look-ahead optimization to determine a system operating point, and then dispatching the system on an hourly (or more granular) basis, to determine the number of hours the system would be actively engaged in the provision of each service. In addition, a storage system cost formulation can be added to the objective function to optimally size the storage system within the model. This cost formulation includes the equivalent system capital cost as a function of power and energy, which consists of investment, installation, and operations and maintenance costs for the storage device and associated inverter. The optimal sizing approach maximizes investment return for a given time frame. ESET then provides the maximized benefit, optimal size, and dispatch for the system under the given use cases and subject to the other variables (Wu et al. 2016). A *Monte Carlo type* analysis can then be conducted, varying one or more input variables of the formulation, including use case requirements, market prices, and storage technology types and costs, to generate a decision space. Within this space, present-value benefits and costs can be calculated to find optimal energy storage parameters that return the largest net-benefit.

The following sequence of steps presents a simplified version of the methodology:

1. Determine initial energy storage size.
2. Maximize revenue from hybrid plant operations subject to:
    - Plant electro-mechanical constraints,
    - Energy storage capacity limits.
3. Adjust energy storage size and re-initiate Step 2.

Figure 4 below, borrowed from Wu et al. (2016), presents an example decision space generated by the ESET tool across energy storage capacity and energy for different locations (i.e., San Francisco [SF], Chicago [CHI], Houston [HOU], and New York City [NYC]) and technology price points (i.e., high, medium, and low).

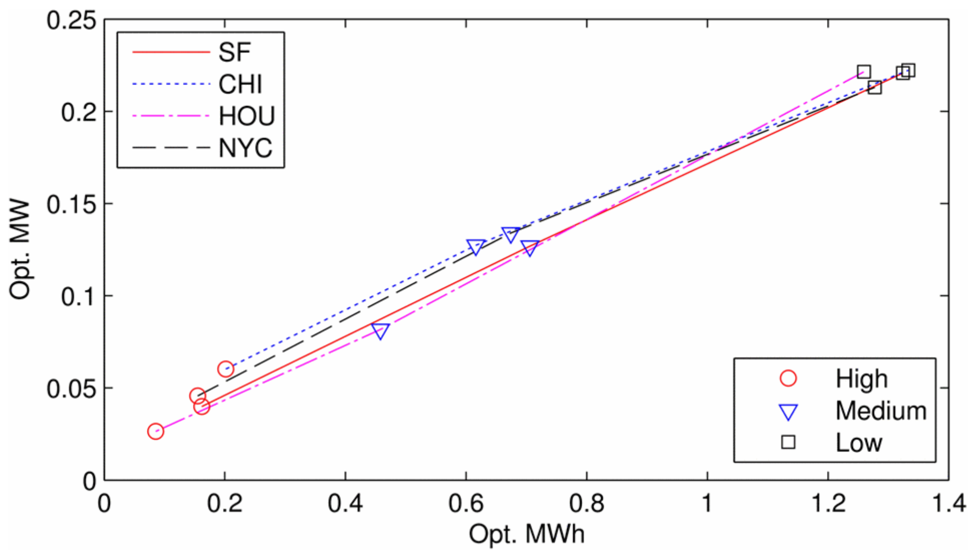

Figure 4. Optimal (Opt.) energy and power capacity in different battery cost scenarios and energy markets (San Francisco [SF], Chicago [CHI], Houston [HOU], New York City [NYC]).

Such tools and methodologies can be extended to study the suitability of different storage technologies for environmental benefits. The above methodology can be adapted to include desired environmental outcomes as additional constraints in the optimization problem. For instance,

1. Determine initial energy storage size.
2. Maximize revenue from hybrid plant operations subject to
    - Plant electro-mechanical constraints,
    - Energy storage capacity limits,
    - Environmental objectives:

- Flow >= Min flow limit
- Flow <= Max flow limit.

3. Adjust energy storage size and/or environmental objectives and rerun Step 2.

The min and max flow limits are derived from alternative flow regimes that correspond to desired environmental outcomes. In this way, the sensitivity of energy storage sizing relative to desired environmental outcomes can be determined by adjusting the water flow constraints.

6.0 Co-optimization vs. Co-location of Storage

There is a useful distinction here for when a storage system should be directly interconnected and integrated with a hydropower facility ("co-location") and when it should be operated in a coordinated fashion ("co-optimization"). Generating resources are already coordinated to operate as a portfolio, to serve load, to transmit energy, to balance control boundaries. Advanced control and communication can allow networked operation of electricity system assets across multiple systems. So, when does it make sense to site a storage system within a hydropower facility footprint? This section explores the contextual conditions that lean toward co-location or co-optimization of storage and hydropower assets.

6.1.1 Why Co-optimize?

Hydropower plants operate within a system context and their operation is coordinated with other resources to assure that load and generation are matched. In vertically integrated utilities or system-level coordination, the power tradeoffs for managing environmental objectives may be most cost-effectively dealt with by adjusting the merit order or dispatch of other plants, rather than co-siting storage at a specific project. For example, if a hydropower plant is limited in how fast it may ramp flows up and down, then the faster ramping requirement could be replaced by a gas unit or by other ramping resources already available elsewhere in the system.

For utility-owned plants, operating in organized markets, there may be locational considerations for siting energy storage systems based on geographical patterns of energy and ancillary service prices. One technique for identifying optimal siting of storage systems is to run a system-wide analysis using production cost models. These models enable co-optimization of the entire fleet of resources under a utility's ownership, with explicit consideration of certain locational aspects of its resources.

6.1.2 Why Co-locate?

Co-location of storage at the hydropower plant may allow additional local benefits. To achieve these locational benefits, utility-owned projects may be motivated to enhance the resource eligibility of a larger plant, or to maintain operational simplicity in response to a signal.

The case for co-location is notably broader for merchant (contracted resources) or market-facing plants. These plants are remunerated and environmentally governed independently from other resources, so there is greater motivation to demonstrate higher performance at the facility to be eligible for higher contractual rates, market products, or greater compensation.

Where avoiding harm to facility and unit components is a priority, integration of on-site storage solutions may help avoid detrimental use of existing equipment, such as low-loading units or frequent or sudden movement across hydraulic and efficiency ranges. Hydroelectric projects are uniquely capable of a suite of flexibility characteristics, including motoring units[1] and dispatchability using on-site water (energy) storage in reservoirs. Augmenting or preserving this flexibility with batteries could be very useful, because their characteristics are highly complementary to the flexibility of hydropower. Storage systems can increase the instantaneous responsiveness of units or avoid unit start-stop or rough zone utilization, thereby bolstering the case for on-site power value. They can also support local power needs, such as managing reactive power for voltage control, or assisting in the automatic generation control function for the management of area control error. Another factor is the speed of interconnecting a storage system to the grid, which is substantially more straightforward within the footprint of a large power plant (Kougias 2019).

In addition to the proximity benefits, it is typical for hydropower facilities to own a large parcel of land, or have overarching real-estate agreements for the surrounding land and its use, that may provide a suitable footprint for the location of the energy storage system. Locating energy storage on-site at the hydropower facility may eliminate the need for additional land acquisitions.

Aside from interconnection of the energy storage system, co-location is supported by existing transmission rights. The purpose of the energy storage being proposed provides operational flexibility rather than increased capacity beyond current peak demands. This allows the rights of the existing transmission system, sized for the existing generation, to be suitable for continued load transmission with the added energy storage system.

Many hydroelectric projects are located within a cascading operation, meaning that there are plants upstream or downstream between which there is a hydrologic link. Under these conditions, the project owner may operate the plants in a coordinated fashion, sequencing flows to an optimal outcome. Or if ownership is varied, there may be a coordination agreement regarding flow schedules or communication between plants to assure operational parameters are met at each plant. In these cases, energy storage, when integrated with a particular facility, such as a facility that acts as a hydrologic constraint, may permit additional flexibility to accrue to other plants in the same cascading system.

There also may be instances in which storage co-location is motivated by load tied directly to the water source, and the timing of the load does not align with hydropower production. Examples of this load include environmental restoration through active water treatment, oxygenation or cooling processes, hydrogen production, desalination, sensing, communications, and control and power backup. Loads of these types could be served by merchant resources as well as utilities under various arrangements. To the extent that these loads can be deferred in time and follow business-as-usual hydropower production patterns, the need for on-site storage to serve these loads and thus the requirement for co-location of energy storage assets may be reduced.

[1] Motoring of hydroelectric generators corresponds to an extreme idle state of running the turbines with insufficient pressure head to run the (interconnected) generator at synchronous speed. Under this condition, electrical generators act as synchronous motors and pull power from the grid to drive the turbines.

7.0 Next Steps

This paper outlines the potential for deriving improved environmental outcomes by integrating energy storage systems with hydropower plants. This idea is an exciting one, because it suggests that through technology investments, improvements in both river health and the financial future of hydropower plants can be achieved. Quantifying the mutual benefits is an important step in realizing storage adoption by privately and publicly owned hydropower projects.

Throughout this paper, existing knowledge and practical gaps in data, controls, and methodologies for evaluating this potential are indicated. The next steps, summarized below in order of action and scale, will help inform the industry and shape the discussion:

- Determine the full taxonomy and prioritization of the opportunity space for environmental benefits.
- Specify the practical considerations for retrofitting dams with energy storage, related to physical size, electrical interconnection, and charging mechanisms.
- Develop new techniques, based on multi-objective optimization, to support and evaluate the feasibility of hybridization for environmental benefits.
- Adapt or design a decision-support process to evaluate and inform the size, location, and type of energy storage technology.
- Simulate real hydropower plants and energy storage-informed operational models to design hybrid system controls and interactions of mutual benefit.
- Perform data-rich demonstrations of the relationships between environmental benefits and energy storage-augmented operations, in partnership with dam operators.

Several avenues are being explored to realize the data gaps listed above and to enable a demonstration project to serve as a foundation for integrating energy storage with hydropower projects for environmental benefits. Other use cases including the integration of energy storage with other electricity-dependent water infrastructure, such as water conveyance pumps, may offer similar potential for environmental benefits and will be additionally explored. Once a foundational use-case project is identified and implemented, the ultimate goal is to leverage this environmental use-case framework and apply it across the U.S. to other hydropower projects where energy storage could enable more cost-effective ecosystem improvements.

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Appendix A – Methodology Crosswalk

Table A.1. Operational shift requirements to enable environmental benefits of spill for safe fish passage (*hypothetical* metrics).

Operational Constraint	Baseline	Flows to Meet Environmental Objectives (limit impacts from not spilling)	Potential Benefit	What data are needed?
Minimum spill discharge (cfs)	7,000 (late summer) 30,000 (spring) Unrestricted (rest of year)	17,000 (summer smolt passage season) 100,000 for 16 hours daily (spring)	Route downstream-migrating fish from the powerhouse to the spillway to improve passage survival	Hourly passage routing of downstream-migrating fish
Passage flow rate (cfs)	Unrestricted	500 (upstream fish-passage season)	Provide adequate flow rate to attract for upstream fish passage	Seasonal and diel timing of upstream fish passage

Table A.2. Operational shift requirements to enable environmental benefits of Spill for Water Quality (*hypothetical* metrics).

Operational Constraint	Baseline	Flows to Meet Environmental Objectives (limit impacts on water quality)	Potential Benefit	What data are needed?
Minimum flows (cfs)	3,000 (summer) 1,000 (rest of year)	3,000 (summer) 1,000 (rest of year)	Reduce dissolved oxygen and total dissolved gas to at/near 100% for aquatic organism health	Water elevations near spawning habitat, correlation of elevations with flow rates as a function of river hydrology
Maximum non-experimental flows (cfs)[a]	31,500	31,500	Increase dissolved oxygen and/or total dissolved gas to increase under-saturated (<100%) water to avoid fish kills.	
Daily fluctuations (cfs/24 hr)	28,500 (summer) 30,500 (rest of year)	28,500 (summer) 30,500 (rest of year)	Manage spill to optimize oxygen and gas levels for aquatic system health.	
Spill flow rate (cfs)	No requirement	1000 (3-7am)	Spilling warmer surface water downstream may warm the river. Spill from higher elevations re-oxygenates the river but can be too much. Must be carefully planned.	

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Harris relicensing stakeholders,

Alabama Power has filed the response to Updated Study Report Meeting Summary Disagreements and Study Dispute with FERC. The filing can be found on eLibrary | File List (ferc.gov), as well as the Harris relicensing website (www.harrisrelicensing.com) in the Relicensing Documents folder.

Thanks,

Angie Anderegg
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Alabama Power

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July 12, 2021

VIA ELECTRONIC FILING

Project No. 2628-065
R.L. Harris Hydroelectric Project
Response to Updated Study Report (USR) Meeting Summary Disagreements and Study Dispute

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street N.
Washington, DC 20426

Dear Secretary Bose,

Alabama Power Company (Alabama Power) is the Federal Energy Regulatory Commission (FERC) licensee for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628). On April 12, 2021, Alabama Power filed the Updated Study Report (USR) along with three Draft Study Reports, four Final Study Reports, and a botanical inventory report. Comments on the three Draft Study Reports were due on May 26, 2021. Alabama Power held the USR Meeting with stakeholders and FERC on April 27, 2021. On May 12, 2021, Alabama Power filed the USR Meeting Summary. Comments on the USR Meeting Summary were due on June 11, 2021.

The Alabama Department of Conservation and Natural Resources (ADCNR), Federal Energy Regulatory Commission (FERC), and Alabama Rivers Alliance (ARA) submitted disagreements on the USR presentation and/or the USR meeting summary. Attachment A of this filing includes Alabama Power's responses to those disagreements and comments. In addition, ARA submitted a Dispute of Study for the Battery Energy Storage System (BESS) study. Alabama Power's response to the study dispute is provided in Attachment B.

Alabama Power is reviewing FERC and stakeholder comments on the USR and Draft Study Reports, as well as a small number of comments that were submitted on Final Study Reports. Alabama Power will address these comments, as applicable, and file all Final Study Reports with the Final License Application (FLA) in November 2021. The Final Study Reports will contain comment matrices listing the comment and how Alabama Power addressed the comments.

If there are any questions concerning this filing, please contact me at arsegars@southernco.com or 205-257-2251.

Sincerely,

Angie Anderegg
Harris Relicensing Project Manager

Attachment A: Alabama Power's Response to Disagreements on the Updated Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

Attachment B: Alabama Power's Response to Alabama Rivers Alliance Study Dispute for the R.L. Harris Hydroelectric Project

cc: Harris Stakeholder List

ATTACHMENT A

Alabama Power’s Response to Stakeholder Disagreements on the Updated Study Report Meeting Summary for the R.L. Harris Hydroelectric Project

Pursuant to the Federal Energy Regulatory Commission's (FERC) Integrated Licensing Process (ILP) and 18 CFR § 5.15(f), Alabama Power Company (Alabama Power) filed the R.L. Harris Project Updated Study Report (USR) on April 12, 2021[1]. The USR described Alabama Power's overall progress in implementing the study plans, and summarized the data collected and any variances from the study plan and schedule.

The Alabama Department of Conservation and Natural Resources (ADCNR), FERC, and Alabama Rivers Alliance (ARA) submitted comments disagreeing with certain aspects of the USR Meeting Summary for the R.L. Harris Project[2]. The comments provided below state the disagreement on the USR Meeting and Meeting Summary, followed by Alabama Power's response. The comments have been truncated to present only that portion that contains the disagreement specific to the USR Meeting Summary or USR Meeting presentation.

Comments are presented in italic text and Alabama Power's response follows.

ADCNR Comments submitted May 27, 2021

ADCNR Comment:

On page 30 of the PowerPoint presentation from the USR meeting on April 27, 2021, the licensee presented variances from the Final Aquatic Resources Study Plan. ADCNR noted that methodology modifications were made to the Final Aquatic Resources Study Plan without ADCNR and other stakeholder consultation or guidance…

It should be noted that the reason for not using the 30+2 method, Auburn and the licensee stated in the PowerPoint presentation during the USR meeting, that it was determined in the field to not be feasible/effective for sampling the sites. If this is true the licensee should explain the statement in PAD, Volume 1, Appendix E, page 7, which states, Alabama Power sampled fish communities in 2017 using standardize methods developed by the Geological Survey of Alabama (GSA) and ADCNR (O'Neil 2006). This sampling method is commonly referred to as the "30+2" method. Samples were collected at the Malone and Wadley sites along the Middle Tallapoosa in the spring and fall and the Upper Tallapoosa sites in July and October." In addition, ADEM was able to successfully complete a 30+2 sampling method at Wadley in 2018....

Alabama Power Response:

Previous comments provided by ADCNR regarding the use of the 30+2 method were addressed in the Final Aquatic Resources Report filed with FERC on April 12, 2021[3] and Alabama Power's response provided to ADCNR on June 4, 2021, and filed with FERC on June 15, 2021[4].

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[1] Accession No 20210412-5737

[2] Accession Nos. 20210527-5024, 20210609-3045, and 20210611-5070

[3] Accession No. 20210412-5745

[4] Accession No. 20210615-5110

ADCNR Comment:

ADCNR disagrees with the summary statement by the licensee on page 30 of the PowerPoint presentation from the USR meeting on April 27, 2021, that boat sampling methodologies are effective at sampling shallow areas within study sites. Both boat and barge electrofishing equipment may collect shallow water fish species specialists but do not provide an equivalent result of a targeted shallow fish population survey comparison that shallow water pre-positioned area electrofishing grids (PAE) or 30+2 sampling method would provide. Similarly, a shallow water electrofishing grid or 30+2 sampling method can collect deep-water fish species specialists but does not effectively sample deep water to provide reliable deep-water fish population results…"

Alabama Power Response:

Previous comments provided by ADCNR regarding the use of the 30+2 method were addressed in the Final Aquatic Resources Report filed with FERC on April 12, 2021, and Alabama Power's response provided to ADCNR on June 4, 2021, and filed with FERC on June 15, 2021.

ADCNR Comment:

On page 28 of the PowerPoint presentation from the USR meeting on April 27, 2021, it states, "Diversity was lower than Travnichek and Maceina (1994), but overall trends in diversity upstream and downstream were similar." This statement fails to specify that this result from Travnichek and Maceina (1994) and the Auburn Report was for the deep-water fish populations only. It should be included that Travnichek and Maceina (1994) results suggested that the effect of flow regulation on species richness and diversity of fishes in deep water habitats was negligible in the Tallapoosa River system downstream of hydroelectric facilities, but that flow regulation appeared to alter shallow water fish assemblages with species richness progressively increasing with distance from Harris Dam. … When discussing the Auburn Report's deep water fish population collections in the discussion and in overall USR meeting summaries include that reporting of the shallow water fish community monitoring between 2006 and 2016 indicates that fish densities in the regulated river downstream of Harris Dam were depressed when compared to unregulated sites (Irwin et al. 2019).

Alabama Power Response:

This comment was addressed in Alabama Power's response provided to ADCNR on June 4, 2021 and filed with FERC on June 15, 2021.

ADCNR Comment:

On page 48 of the Auburn report and on page 28 of the PowerPoint presentation from the USR meeting on April 27, 2021, it states, "Relative contribution of centrarchids lower than 1996 rotenone sample; combined contribution of cyprinids and catostomids similar to 1951 rotenone sample." Although proportionally this statement may be accurate, it is a deceiving conclusion to make regarding the overall density comparisons of cyprinids among studies…"

Alabama Power Response:

This comment was addressed in Alabama Power's response provided to ADCNR on June 4, 2021 and filed with FERC on June 15, 2021.

ADCNR Comment:

…Presenting only the Auburn Report deep water fish population results without including and discussing shallow water fish survey results presented in the PAD, Volume 1, Appendix E (plus additional supplementary material) in the Final Aquatic Resources Study Report and USR meeting conclusion statements is misleading to stakeholders in regard to the condition of overall fish population trends.

Alabama Power Response:

This comment was addressed in Alabama Power's response provided to ADCNR on June 4, 2021 and filed with FERC on June 15, 2021.

ADCNR Comment:

There have been two other notable variances from the Aquatic Resources Study Plan that should have been included in the USR summary presentation. The first variance involves the adequate selection of an upstream control site. In NOI, PAD, Scoping Document and Study Plans, ADCNR comments from October 1, 2018 (See ADCNR, P-2628-005 FERC ¶ 20181002-5006) "that selected sampling sites closely mirror those of samples collected historically and with the ADEM water quality and fish survey sites. This will allow for an ease of comparison over time and among various data sets." ADCNR had agreed with the Draft Aquatic Resources assessment that an alternative site was necessary for the current upstream control site due to its closely linked dam operation characteristics. ADCNR had requested input on site selection alternatives (See Attachment 2, page 18, ADCNR, P-2628-005 FERC ¶ 20210412-5745). Please include in the report why this was determined unnecessary and provide any comparison limitations the original upstream control site might contribute. The Auburn Report states on page 6, "There is little habitat heterogeneity at this site which is dominated by sluggish, turbid water" and page 47, "Higher catch rates of clupeids above the reservoir were likely due to the high connectivity between the reservoir and the Lee's Bridge site" indicating remaining researcher doubts about Lee's Bridge as an adequate control site. In addition, on page 22 of the Auburn Report, it states that Lee's Bridge was not accessible by boat during the winter due to reservoir drawdown. Using the Foster's Bridge access area, ADCNR frequently collects brood stock from the shoals above Lee's Bridge during early spring when Harris is still at winter pool and accessibility issues have not been problematic during low water. Overall, ADCNR remains concerned that the lack of an adequate control site could limit any strong conclusions when comparing data throughout the report.

Alabama Power Response:

This comment was addressed in Alabama Power's response provided to ADCNR on June 4, 2021 and filed with FERC on June 15, 2021.

ADCNR Comment:

The second variance involves the change from original electromyogram (EMG) telemetry tags to acoustic/radio (CART tags)… . The licensee should include in the discussion why the original electromyogram (EMG) telemetry data methodologies which included "tail-beat frequency" were modified and what key data gaps this change might have created. EMG tags could have provided data on how fish respond to increased flows and detected how tail-beat frequency corresponded to various flow conditions. The EMG tag variance was presented to stakeholders on page 23 of Initial Study Report (See P-2628-005 FERC ¶ 20200410-5084) but should still be included as an overall variance from the Study Plan in Aquatic Resources Final Report. It should be acknowledged that the change was a significant and critical loss to understanding in-situ target fish species movement in the tailrace. CART tag receivers were set to detect longitudinal stream distance movements and will not capture lateral movements or movements utilized between receivers to seek shelter due to flow changes.

Alabama Power Response:

Alabama Power noted the potential use of acoustic/radio (CART) tags and associated reasoning in the Initial Study Report[5] (ISR) filed April 10, 2020, and this variance was not repeated in the USR. The USR described overall progress in implementing the study plans, and summarized the data collected and any variances from the study plan and schedule with a focus on those variances that occurred after filing the ISR. Previous comments provided by ADCNR regarding CART tags were addressed in the Final Aquatic Resources Report filed with FERC on April 12, 2021, and Alabama Power's response provided to ADCNR on June 4, 2021, and filed with FERC on June 15, 2021.

[5] Accession No. 20200410-5084

ADCNR Comment:

On page 5 of the USR meeting summary, Jason Moak with Kleinschmidt noted that Alabama Power is reviewing information that was submitted regarding temperature modifications at other hydropower projects. Jason M. added that the temperature regime of the Tallapoosa River has been well studied during the relicensing process and noted temperatures below Harris Dam are well within the required temperature range of target species presented in Auburn's report. Jason M. stated that the data shows the temperature regime of the river below Harris Dam is not much different from a warm-water fishery, as it averages over 20 degrees Celsius (℃) and closer to 25 ℃ at several locations downstream during the summer. Jason M. added that only a 2-3℃ difference exists in portions of the year when compared to unregulated sites like Heflin or Newell; therefore, there does not appear to be a strong case for making a temperature modification. These statements summarize the licensee's interpretation only, with many points that are in sharp contrast to the temperature analyses presented in the Water Quality Report, Aquatic Resources Report and synopses presented in pages 26-45 of the Final Aquatic Resources Study, several of which indicate temperature effects on aquatic resources below Harris Dam…

Alabama Power Response:

Alabama Power's analysis of the long-term record of water temperatures below Harris, comparisons with recent water temperature records from unregulated sites upstream of Harris, and the results of Auburn's review of fish temperature requirements contained in the *Aquatic Resources Study Report* support the referenced statements by Jason Moak. Alabama Power agrees that previous studies indicated some effects on aquatic resources from water temperature and/or flow, though many of those studies show both negative and positive effects depending on the species and life stage. Alabama Power notes that the intent of the Aquatic Resources Study was to supplement the research conducted prior to relicensing, specifically those studies conducted by U.S. Geological Survey (USGS) and summarized in the 2019 USGS report[6], and to fill information gaps identified by Alabama Power, ADCNR, and other stakeholders during the 2018-2019 development of study plans. Results of the Downstream Aquatic Habitat Study and Phase 2 Downstream Release Alternatives Study indicate that flow modifications – specifically a continuous minimum flow – would have beneficial effects on aquatic resources by providing a reduction in daily and sub-daily water temperature fluctuations.

[6] Available at: https://pubs.usgs.gov/of/2019/1026/ofr20191026.pdf.

ADCNR Comment:

On April 2, 2021, ADCNR provided the licensee with comments regarding the Auburn Report. We are currently awaiting a response to these comments and are concerned with temperature and aquatic resource information details that may be input into the model from reports prior to our comments being fully addressed. Allan Creamer with FERC at HAT 3 meeting notes from March 31, "expressed concern about models that do not have good data going into them." ADCNR agrees that accurate and reliable data modeling requires inputs to be accurate and reliable. Below sub bulleted are comments regarding temperature overview statements provided by the licensee on page 27 of the PowerPoint presentation from the USR meeting on April 27, 2021. These comments concern the licensee's USR meeting summary statement that, "there does not appear to be a strong case for making a temperature modification," and issues to address when inputting temperature data into the Downstream Release alternative models…

Alabama Power Response:

Alabama Power sent a response to ADCNR's April 2, 2021 comments on June 4, 2021 and filed this response with FERC on June 15, 2021.

See response to ADCNR Comment on page 8. Alabama Power notes there are several sub-bulleted comments included with this comment that are related to study reports and not the USR. Alabama Power will address these comments, where applicable, in the *Final Downstream Release Alternatives Report* and the *Final Aquatic Resources Report* to be filed with the Final License Application in November 2021.

In the March 31, 2021, Harris Action Team (HAT) 3 meeting, Sarah Salazar (FERC) inquired if it was possible to compare the bioenergetics results obtained by Auburn University to those of similar rivers. After discussion on the limitations of comparing different river systems, Allan Creamer (FERC) noted that if data does not exist for a certain time, qualitative conclusions would need to be drawn and noted his concern regarding modeling with anecdotal data (versus qualitative conclusions). For context, the dialogue from the meeting is presented in quotes, below:

> "Sarah asked if it was possible to compare the bioenergetics results to those of similar rivers. Ehlana said different rivers could possibly be compared if there are a lot of similarities between the two systems. Dr. Devries said that studies used in the literature review of temperature requirements of the target species came from many different systems and regions (e.g., from ponds versus rivers or northern versus southern regions). Comparisons cannot be reliably made between systems or regions. A bioenergetics model from the northern United States could not be used in the southern United States. Only growth rates can be reliably compared using von Bertalannfy growth curves. Having growth records below Harris Dam would have been very helpful. Allan stated that the outcomes of the five inter-related studies being conducted for relicensing will need to be integrated to draw conclusions about different operating scenarios for Harris Dam. Allan noted the importance of understanding that only data and information from the record can be used for relicensing. If data does not exist for a certain time period, the best that can be done is to qualitatively describe what things may have been like at that time and try to draw some conclusions. Allan expressed concern about models that do not have good data going into them. He acknowledged that anecdotal

information could contain inherent biases, and it is not necessarily information that should be used in a model. Angie stated that the pieces are starting to come together and that the purpose of the meeting today was only to present results of the Auburn University study."

FERC Comments submitted June 9, 2021

FERC Comment:

The USR states that cultural resource assessments for Lake Harris and Skyline are complete; however, the USR does not include the results of those assessments. The cultural resource assessments should be fully documented and provided with the PLP. Alabama Power also intends to file a draft Historic Properties Management Plan (HPMP) with the PLP and proposes to allow stakeholders 60 days to comment. However, under section 5.16(e) of the Commission's regulations, stakeholders have a 90-day comment period for filing comments on the PLP, which would include the cultural resources assessment results and draft HPMP.

Alabama Power Response:

The cultural resource assessments are fully documented and the reports for the assessments were provided as Appendix C and Appendix D in the Draft HPMP filed on June 29, 2021[7]. Per FERC's request, quantitative analysis regarding the impact of different flows to the 19 cultural resource sites downstream of Harris Dam were also filed in Appendix J of the PLP, which was filed as "privileged". Although the draft HPMP was filed concurrent with the PLP, the draft HPMP is a separate filing and not specified under section 5.16(e). Due to the sensitive nature of the material and in accordance with Section 304 of the NHPA, Alabama Power filed the HPMP, associated appendices, and consultation record as "privileged". A copy of the draft HPMP and consultation record was distributed to limited stakeholders, who may submit comments directly to harrisrelicensing@southernco.com within **60 days** of the filing (or August 30, 2021) as specified in the HPMP cover letter. Stakeholders may provide comments on the cultural resources evaluation contained in the PLP in accordance with Section 5.16(e) which provides a 90 day comment period on the PLP (or Monday, September 27, 2021).

[7] Accession No. 20210629-5086

FERC Comment:

During the USR Meeting, Bryant Celestine of the Alabama-Coushatta Tribe of Texas requested that both the Alabama-Coushatta Tribe and the Coushatta Tribe of Louisiana be consulted about potential Traditional Cultural Properties (TCPs) within the project's area of potential effects. Please consult with these tribes regarding the need, timeline, and process for identifying TCPS and include any details about the TCP identification in the draft HPMP. In the draft HPMP include the full record of consultation with Tribes, including the Alabama-Coushatta Tribe of Texas and the Coushatta Tribe of Louisiana.

Alabama Response:

Following the USR meeting, Alabama Power contacted the Alabama-Coushatta Tribe of Texas, the Coushatta Tribe of Louisiana, and the Alabama-Quassarte Tribal Town regarding potential TCP consultation. The complete HAT 6 consultation record from April 2018 to June 2021 was filed with the draft HPMP[8].

[8] Accession No. 20210629-5086

ARA Comments submitted June 11, 2021

ARA Comment:

ARA disagrees with the statements of the Licensee's representatives contained in the Updated Study Report Meeting Summary that "the temperature regime of the river below Harris Dam is not much different from a warm-water fishery" and that "there does not appear to be a strong case for making a temperature modification". These comments represent Licensee's evaluation of the temperature data collected as part of the study prepared for this relicensing and not an overall scientific consensus. The Tallapoosa River below Harris has been rigorously studied over the past 25 years, and the Final Aquatic Resources Study, including Auburn University's bioenergetic modeling and temperature analysis, is only one of a number of studies.

Based on prior extensive studies surveying a wide variety of fishes and macroinvertebrates below Harris and based on the water temperature concerns put forth by resource agencies, enough evidence exists of the temperature impacts created by the hypolimnetic releases from Harris to justify discussion of the options available to remedy the current thermal regime. The following is a brief summarization of the considerable research pointing to ecological problems caused by low water temperatures below Harris:

- *Nesting success for Redbreast Sunfish was negatively related to both peaking power generation and depressed water temperatures (Andress 2002).*
- *Strongly fluctuating flows and decreased water temperatures negatively affect survival and early growth of age-0 Channel Catfish and Alabama Bass. Mortality was highest in treatments with decreased water temperatures, indicating that variation of the thermal regime could have significant impacts on survival of juvenile Channel Catfish and Alabama Bass. Daily growth rates were also lower in treatments with decreased water temperatures. Data also suggest that growth and survival may be impacted more by fluctuations in temperature versus flow variation (Goar 2013).*
- *Improving flow and temperature criteria from Harris could enhance growth and hatch success of sport fishes (Irwin and Goar 2015).*
- *Thermal spawning conditions for Channel Catfish occurred every year in unregulated reach but in only 7 out of 12 years in regulated river segment and occurred earlier in the year in regulated reaches (Lloyd et al. 2017)*
- *Flow and temperature remain in a non-natural state in regulated reaches downstream of Harris, and the macroinvertebrate community in regulated reaches shows many dissimilarities to communities from unregulated river reaches (Irwin 2019).*

The detailed, long-term documented impacts on aquatic life due to excessively cold temperatures, temperature fluctuations, and flow fluctuations from the Harris project are at odds with the conclusions drawn by Licensee in the USR Meeting Summary and support the contention that temperature modifications are in fact needed.

Most recently, the US Geological Survey's Open File Report from 2019 ("USGS Report") recaps the history of the biological studies and monitoring below Harris and firmly links water temperature to detrimental effects on fishes and macroinvertebrates below the Harris project. The USGS Report clearly points to an unnaturally cooler temperature regime as detrimental to aquatic species: "Our long-term *metapopulation data provide evidence that suggests broadscale negative influences of the dam on species persistence and colonization parameters. Specifically, generation frequency and cool thermal regimes negatively affected fish persistence and colonization, respectively."*

Having broadly studied 38 fish species from 25 sites over a 12-year period below Harris, the authors of the USGS Report write: "Although it has long been recognized that temperatures are altered below R.L. Harris Dam, specific inference regarding the influence on biotic processes has been lacking until this study, which clearly relates colonization rates (that is, recruitment of a species to a site) to increased thermal energy in the river. In addition, our data indicate that there is no downstream recovery for colonization processes such that colonization rates did not increase with distance from the dam." Increasing thermal energy in the river, and thereby increasing colonization rates and recruitment, can only be achieved by adjusting the temperature of releases.

The Final Aquatic Resources Report sourced significant amounts of historic temperature data from regulated and unregulated river segments, but "unregulated and regulated river temperatures were not compared statistically due to limited data from the Heflin gage and a variety of other variables that could contribute to temperature differences between the regulated and unregulated river." To enable a complete evaluation of thermal issues, all available water temperature data should be shared with stakeholders, including Licensee's historic temperature data provided to Auburn University. ARA has requested Licensee's 2000-2018 water temperature data referenced in Section 5.2.2 of the Final Aquatic Resources Report and used in Auburn's water temperature assessment. Licensee responded that its 2000-2018 temperature data will be filed with the Final License Application in November 2021. We request that all temperature data be made available to stakeholders as soon as possible since temperature has been a long-time area of concern.

Alabama Power Response:

Alabama Power disagrees with ARA's position that "enough evidence exists of the temperature impacts created by the hypolimnetic releases from Harris to justify discussion of the options available to remedy the current thermal regime". Alabama Power's review of the long-term record of water temperatures below Harris, comparisons with recent water temperature records from unregulated sites upstream of Harris, and the results of Auburn's review of fish temperature requirements contained in the *Aquatic Resources Study Report* support the referenced statements by Jason Moak of Kleinschmidt Associates. Temperature data from 2000-2018 is being filed concurrent with this response. Alabama Power agrees that previous studies indicated some effects on aquatic resources from water temperature and/or flow, though many of those studies show both negative and positive effects depending on the species and life stage. In addition, to our knowledge, none of the previous studies included an analysis and/or comparison of the temperature regime in the Tallapoosa River below Harris to reference sites. Alabama Power notes that the intent of the Aquatic Resources Study was to supplement the research conducted prior to relicensing, specifically those studies conducted by U.S. Geological Survey (USGS) and summarized in the 2019 USGS report[9], and to fill information gaps identified by Alabama Power, ADCNR, and other stakeholders during the 2018-2019 development of study plans.

[9] Available at: https://pubs.usgs.gov/of/2019/1026/ofr20191026.pdf.

The aquatic resources and water temperature data provided on the record will facilitate FERC’s ability to review and conduct their own independent analysis of the temperature effects in the Tallapoosa River below Harris Dam, given Alabama Power’s proposed operations and PME measures. Results of the Downstream Aquatic Habitat Study and Phase 2 Downstream Release Alternatives Study indicate that flow modifications – a continuous minimum flow – would have beneficial effects on aquatic resources by providing a reduction in daily and sub-daily water temperature fluctuations.

ATTACHMENT B

Alabama Power's Response to Alabama Rivers Alliance Dispute on the Battery Energy Storage Study for the R.L. Harris Hydroelectric Project

On April 12, 2021, Alabama Power Company (Alabama Power) filed its Updated Study Report for the R.L. Harris Hydroelectric Project (Harris Project) (FERC No. 2628-065) and draft and final study reports, including the *Battery Energy Storage System (BESS) Study Report*,[10] which FERC recommended in its August 10, 2020 Determination on Study Modifications. On June 11, 2021, Alabama Rivers Alliance (ARA) filed a letter commenting on Alabama Power's Updated Study Report Meeting Summary that included a study dispute with respect to the *BESS Study Report*[11].

In a June 11, 2020 letter filed with FERC, ARA proposed that Alabama Power conduct a BESS study for the Harris Project. In a July 10, 2020 response to that study request, Alabama Power declined to conduct the BESS study, explaining that the integration of a BESS at Harris Dam is not economically feasible and providing information demonstrating significant technical and other challenges associated with installing a BESS at Harris Dam. However, in its August 10, 2020 Determination on Study Modifications, FERC staff recommended that Alabama Power conduct a BESS study for Harris. Specifically, FERC staff recommended that Alabama Power:

1. Evaluate two release alternatives: (a) a 50 percent reduction in peak releases associated with installing one 60 MW battery unit, and (b) a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e., 5, 10 or 20 MW battery);
2. Include in its cost estimates for installing a BESS any specific structural changes, any changes in turbine-generator units, and costs needed to implement each battery storage type; and
3. Evaluate how each of the release alternatives would affect recreation and aquatic resources in the project reservoir and downstream.

Though Alabama Power's July 10, 2020 letter to FERC had provided sufficient information demonstrating that a BESS could not be economically integrated at Harris Dam, Alabama Power agreed to conduct the limited study as recommended by FERC in order to complete the Harris Project relicensing record with respect to a BESS and provide FERC "information that does not already exists and is needed for our analysis". To that end, Alabama Power's BESS study report submitted to FERC on April 12, 2021 evaluated each criterion recommended for study by FERC. The study report demonstrates that because integrating a BESS at the Harris Project in order to mitigate the effects of peaking would require significant redesign and redevelopment of the project, a BESS is not a reasonable alternative that necessitates further consideration[12]. Despite the fact that Alabama Power performed the BESS study consistent with the FERC-recommended criteria, ARA's June 11, 2021 comment letter disputes whether Alabama Power conducted the study in accordance with FERC's August 10, 2020 Determination on Study Modifications.

On June 9, 2021, FERC staff sent Alabama Power a detailed letter commenting on the Harris USR and the associated draft and final study reports. Alabama Power notes that FERC staff did not provide any

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[10] Accession No. 20210412-5747

[11] Alabama Power also notes that ARA provided comments on May 26, 2021 on the draft *BESS Report*. Alabama Power will address these comments in the final *BESS Report* to be filed with the FLA.

[12] In the context of downstream release alternatives, FERC stated in the August 10, 2020 Determination on Study Modifications that "… run-of-river mode would likely require significant redesign and redevelopment of the project (e.g. structural modifications, intake design, turbine retrofits, etc.) … run-of-river operation is not feasible at the Harris Project without a major redesign and redevelopment of the project, we do not consider it to be a reasonable alternative for further consideration …." (See p. B-4).

comments in their June 9, 2021 letter regarding insufficient information or inadequate analyses in the BESS Study Report. There is no suggestion in the comment letter that FERC staff believes the BESS study was not conducted as it was recommended to Alabama Power.

From a close reading of ARA's June 11, 2021 letter, it does not appear that ARA is attempting to make the case that Alabama Power's study report fails to meet the criteria of the recommended study. Instead, ARA identifies new or expanded topics for further study. For example, ARA's June 11, 2021 comment letter asks that FERC require Alabama Power to: 1) evaluate an independent purchase power agreement financing alternative; 2) to explore the possibility of siting a BESS somewhere on Alabama Power's transmission system other than at Harris Dam; 3) to evaluate potential incentives that could reduce costs of a BESS; 4) to engage in a full determination of the costs of modifying or replacing one of the turbines to enable installation of a BESS; and 5) to evaluate the potential benefits that adding a BESS could provide to Alabama Power's distribution system, etc. These topics go far beyond the limited scope of the study recommended by FERC and can more accurately be viewed as a request for additional studies. However, ARA fails to meet the requirements in 18 CFR § 5.15(e) for requesting new studies at this late stage of the Harris relicensing proceeding and fails to show good cause for why these additional studies are justified by one of the criteria in §5.15(e).

Because Alabama Power's *BESS Study Report* makes clear that a BESS is not economically feasible or a reasonable alternative at the Harris Project, and for the other reasons cited above, ARA's dispute with respect to Alabama Power's *BESS Study Report* and its attempt to expand the scope of that study should be rejected.

APC Harris Relicensing

From: Jesse Cunningham <jessecunningham@msn.com>
Sent: Thursday, July 22, 2021 12:40 PM
To: APC Harris Relicensing
Subject: Re: HAT 1 - Harris Relicensing

Got it Monday, thanks.

Jesse Cunningham

From: APC Harris Relicensing <g2apchr@southernco.com>
Sent: Thursday, July 22, 2021 12:11:21 PM
To: Jesse Cunningham <jessecunningham@msn.com>
Subject: RE: HAT 1 - Harris Relicensing

Hi Jesse,

So I forgot to let you know it was in the mail. It was sent last Friday. Let me know if you didn't receive it.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Jesse Cunningham <jessecunningham@msn.com>
Sent: Thursday, July 15, 2021 7:12 PM
To: APC Harris Relicensing <g2apchr@southernco.com>
Subject: Re: HAT 1 - Harris Relicensing

Ok. Thanks.

Jesse Cunningham

From: APC Harris Relicensing <g2apchr@southernco.com>
Sent: Thursday, July 15, 2021 10:59:54 AM
To: Jesse Cunningham <jessecunningham@msn.com>
Subject: RE: HAT 1 - Harris Relicensing

Good deal. I'll let you know when it's in the mail.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Jesse Cunningham <jessecunningham@msn.com>
Sent: Wednesday, July 14, 2021 2:55 PM
To: APC Harris Relicensing <g2apchr@southernco.com>
Subject: Re: HAT 1 - Harris Relicensing

Thanks Angie. We would like to have the three model files for future files and use (if necessary).

Jesse Cunningham

From: APC Harris Relicensing <g2apchr@southernco.com>
Sent: Wednesday, July 14, 2021 11:05:17 AM
To: Jesse Cunningham <jessecunningham@msn.com>
Subject: RE: HAT 1 - Harris Relicensing

Hi Jesse,

The flash drive would have the HEC-ResSim, HEC-RAS and EFDC models that we use to conduct the operations studies. We are happy to send one to you, but I wanted to make sure you knew that these are all the modeling files themselves. The study results reports can be found on our relicensing website in the HAT 1 - Project Operations [na01.safelinks.protection.outlook.com] [na01.safelinks.protection.outlook.com] [na01.safelinks.protection.outlook.com] folder. Below is a list of the three operations studies and the associated reports. If you would still like the models, just let me know.

Operating Curve Change Feasibility Analysis

- 2020-08-31 Final Op Curve Feasibility Analysis Report
- 2021-04-12 Draft Operating Curve Feasibility Analysis Phase 2 Report

Downstream Release Alternatives

- 2020-07-27 Final Downstream Release Alternatives Report
- 2021-04-12 Draft Downstream Release Alternatives Phase 2 Report

Battery Energy Storage System

- 2021-04-12 Draft BESS report

Thanks!

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Jesse Cunningham <jessecunningham@msn.com>
Sent: Tuesday, July 13, 2021 4:04 PM
To: APC Harris Relicensing <g2apchr@southernco.com>
Subject: HAT 1 - Harris Relicensing

Angie,

The Lake Martin HOBOs would like to review the three studies you offered for our review. Please send the Flash Drive to:

Lake Martin HOBOs

Jesse Cunningham
782 Ridge Road
Dadeville, Alabama 36853

Thanks,

Jesse Cunningham
H: 256-825-0919
C: 256-307-5755
HOBO: jesse@lakemartinhobos.com

From: Sarah Salazar <Sarah.Salazar@ferc.gov>
Sent: Thursday, August 5, 2021 1:37 PM
To: Anderegg, Angela Segars; Anderson, Dave
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

EXTERNAL MAIL: Caution Opening Links or Files

Good afternoon Angie and Dave,

I just want to confirm that I was able to download all the HEC-RAS and HEC-ResSim files from the external sharepoint site soon after you uploaded them. Also, last Monday our front office staff retrieved the flash drive and shared the remaining (EFDC) modeling files with us. I was able to copy them to another folder for our use by the end of the week.

Thank you,

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863*

Please consider the environment before printing this email.

From: Sarah Salazar
Sent: Tuesday, July 13, 2021 3:20 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Cc: Anderson, Dave <dkanders@southernco.com>
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

Thank you Angie. I notified our front office staff. I am not sure if they will be available to go to the office today, but I will let you know when they receive it.

Thanks again,

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863*

Please consider the environment before printing this email.

From: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Sent: Tuesday, July 13, 2021 11:48 AM
To: Sarah Salazar <Sarah.Salazar@ferc.gov>
Cc: Anderson, Dave <dkanders@southernco.com>
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

Hi Sarah,

We mailed the flash drive containing all three models via US Postal Service yesterday. It was 1-day delivery, so it should arrive today. Tracking number and details are below.

Tracking Number: EJ569533538US
Project Number: R.L. Harris Project (FERC No. 2628)
Description of Flash Drive: “zip” files of HEC-RAS, HEC ResSim, and EFDC models used for Harris relicensing studies, including instructions on “unzipping” and use

List of all security classes: All files are public
Access Number of Cover Letter: 20210629-5073

Thanks!

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Sarah Salazar <Sarah.Salazar@ferc.gov>
Sent: Monday, July 12, 2021 4:38 PM
To: Anderson, Dave <DKANDERS@SOUTHERNCO.COM>; Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

EXTERNAL MAIL: Caution Opening Links or Files

Thank you Dave, I see the files and will get back to you as soon as we finish downloading them (tomorrow at the earliest).

Thanks again,

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863*

Please consider the environment before printing this email.

From: Anderson, Dave <DKANDERS@SOUTHERNCO.COM>
Sent: Monday, July 12, 2021 5:20 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>; Sarah Salazar <Sarah.Salazar@ferc.gov>
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

Sarah,

The HEC-RAS and HEC-ResSim files have been uploaded to the FERC SharePoint site.

Dave

From: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Sent: Tuesday, June 29, 2021 2:33 PM
To: Sarah Salazar <Sarah.Salazar@ferc.gov>
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

Hi Sarah,

As you can see from the attached letter that we filed today, we were unable to e-File the HEC-RAS, HEC-ResSim, and EFDC models. As such, we are planning on submitting the HEC-RAS and HEC-ResSim models via FERC's external SharePoint site. The information requested in the guidance document is below:

- Project Number: R.L. Harris Project (FERC No. 2628)
- Description of Files: "zip" files of HEC-RAS and HEC-ResSim models used for Harris relicensing studies, including instruction on "unzipping" and use

- Name and e-mail address of staff: Dave Anderson, dkanders@southernco.com
- List of all security classes: All files are public
- Accession Number of Cover Letter: 20210629-5073

Also, because the files associated with the EFDC model cannot be broken down into <2GB files, we will be providing the EFDC model via the U.S. Postal Service and will send you the information for that submittal when we get a tracking number for the package.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Sarah Salazar <Sarah.Salazar@ferc.gov>
Sent: Thursday, June 17, 2021 2:35 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

Hi Angie,

I checked with our team and some of our staff have successfully downloaded and used similar models/associated files from our external Sharepoint site and applicants' sharepoint sites for other projects. Also, it might actually be more difficult for us to use the flash drive option. Could you try uploading all the files e-library can't accept to our external Sharepoint site (for us) and your relicensing website (for other stakeholders) and if we run into any glitches we could try the other methods next? If you need technical assistance with uploading the files to our external sharepoint site I can help connect you with someone in our FERC Online/IT Support next week.

Thanks,

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863*

From: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Sent: Thursday, June 17, 2021 12:47 PM
To: Sarah Salazar <Sarah.Salazar@ferc.gov>
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

Hi Sarah,

Thank you for following up. We've reviewed the files associated with the models and everything associated with the HEC-ResSim and HEC-RAS can be broken down into <2GB files. In our filing, we'll explain what is what and direct everyone to our website to download if they want them.

The EFDC model files include 5, 25 GB files that cannot be broken down or compressed any further. We may be able to put these on our website but they will require a strong network connection and quite a bit of time to download. Would you prefer us send the EFDC models to FERC via flash drive? We can make a note in our filing that we can provide this model via flash drive to stakeholders upon request.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Sarah Salazar <Sarah.Salazar@ferc.gov>
Sent: Wednesday, June 16, 2021 3:18 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

EXTERNAL MAIL: Caution Opening Links or Files

Good afternoon Angie,

Following up on the filing guidance for the models, it came to our attention that our external sharepoint site is not publicly accessible. Given that the Corps and Alabama Rivers Alliance also requested access to the models (including any inputs, outputs, and assumptions), would it be possible for you to share these files via the APC relicensing website as well? If so, when you file the models with the Commission, could you also indicate in the cover letter for the associated filings on e-library how stakeholders can access/request access to such files? Please let me know if you have any questions or concerns.

Thanks in advance,

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863*
Please consider the environment before printing this email.

From: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Sent: Thursday, June 10, 2021 4:44 PM
To: Sarah Salazar <Sarah.Salazar@ferc.gov>
Subject: RE: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

Thanks! This is very helpful. I'll let you know if I have any questions.

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Sarah Salazar <Sarah.Salazar@ferc.gov>
Sent: Thursday, June 10, 2021 1:26 PM
To: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Subject: Guidance for Filers: How to Transmit Files that cannot be eFiled to FERC

EXTERNAL MAIL: Caution Opening Links or Files

Hi Angie,

With help from a colleague, I found the attached guidance that was recently developed to provide options for filing documents that cannot be submitted to e-library. My colleague stated that our external sharepoint site works well and recommends it, but we can use the other filing options as well. Please review this guidance and let us know if you have follow-up questions.

Best,

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863*

Please consider the environment before printing this email.

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
August 10, 2021

OFFICE OF ENERGY PROJECTS

Project No. 2628-065 – Alabama
R.L. Harris Hydroelectric Project
Alabama Power Company

VIA Electronic Mail

Ms. Angie Anderegg
Harris Relicensing Project Manager
Alabama Power Company
ARSEGARS@southernco.com

Subject: Additional Staff Comments on Updated Study Report – R.L. Harris Hydroelectric Project No. 2628

Dear Ms. Anderegg:

Commission staff have reviewed stakeholders' comments on Alabama Power Company's (Alabama Power) Updated Study Report (USR) for the R.L. Harris Hydroelectric Project (Harris Project) and Alabama Power's responses to USR comments. Based on a review of the USR comments and responses, staff provide the following additional comments on the USR.

Background

Alabama Power's study plan was approved with modifications on April 12, 2019. Alabama Power filed an initial study report on April 10, 2020, and on August 10, 2020, Commission staff issued a determination on requested study modifications and new studies. The August 10 determination modified the Downstream Release Alternatives Study and required a new Battery Storage System Feasibility Study. Alabama Power filed the USR on April 12, 2021, held a USR meeting on April 27, 2021, and filed a USR meeting summary on May 12, 2021.

Comment Summary

Comments on the USR, associated study reports, and USR meeting summary were filed by the Alabama Department of Conservation and Natural Resources; Alabama

Department of Environmental Management; Environmental Protection Agency; Alabama Rivers Alliance; Lake Wedowee Property Owners Association; Randolph County, Alabama, Commissioners; Mayor (Town of Waverly) Taylor Melzer; Sheriff Cofield (Randolph County, Alabama); Michelle French; James Traylor; Donna Matthews; Corinne Cox; Chris Lunsford; and Carol Knight. Alabama Power filed reply comments on July 12, 2021. The comments address concerns with stakeholder-identified effects of project operation on environmental resources as well as the Draft Downstream Release Alternatives Phase 2 Study Report, the Draft Operating Curve Change Feasibility Analysis Phase 2 Study Report, the Final Aquatic Resources Study Report, the Final Downstream Aquatic Habitat Study Report, the Final Water Quality Study Report, and the Draft Battery Storage System Feasibility Study Report.

However, none of the comments specifically request modifications to the approved studies. For example, the comments provide recommendations for protection, mitigation, or enhancement measures; request additional information; clarify concerns raised at the USR meeting regarding the acquired data; recommend changes to the way data are presented in the USR; and continue to express general disagreement with the reliability of the study results based on disagreements on methods.[1] Therefore, no modification to the approved study plan is required.

Cultural Resources

In Commission staff's June 9, 2021 comments regarding Alabama Power's USR and associated study reports, staff stated that although Alabama Power intends to allow stakeholders 60 days to comment on its draft Historic Properties Management Plan (HPMP), stakeholders have a 90-day comment period for filing comments on the PLP, which would include the draft HPMP pursuant to section 5.16(e) of the Commission's regulations. In its July 12, 2021 letter responding to USR comments, Alabama Power stated that although the draft HPMP was filed concurrent with the PLP, the draft HPMP is a separate filing and not specified under section 5.16(e). Alabama Power also stated that the draft HPMP was filed as "privileged" due to the sensitive nature of the material (in accordance with Section 304 of the National Historic Properties Act), and a copy of

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[1] Specific examples of these comments include: (1) recommendations for additional public recreation sites and/or safety-related (search and rescue) access points at Lake Harris and along the Tallapoosa River downstream from Harris Dam; (2) requests for modeling combinations of different reservoir operating curve scenarios and downstream release alternatives together for further analyses; (3) concerns about the methods used to sample shallow water habitat in the Tallapoosa River (i.e., backpack electrofishing [30+2 protocol] versus barge electrofishing); and (4) concerns about the accuracy of the water quality data collected in the Tallapoosa River and/or how these data are reported and presented in the study reports.

the draft HPMP and consultation record was also distributed to limited stakeholders, who may submit comments directly to harrisrelicensing@southernco.com within 60 days of the filing (or August 30, 2021) as specified in the HPMP cover letter.[2] Staff concurs that filing the draft HPMP separately from the PLP and as "privileged" is appropriate. However, section 5.16(b)(2) of the Commission's regulations requires that the PLP "…[c]learly describe, as applicable, the existing and proposed project operation and maintenance plan, to include measures for protection, mitigation, and enhancement measures with respect to each resource affected by the project proposal...." The draft HPMP includes proposed protection, mitigation, and enhancement measures for cultural resources, and is therefore subject to comment as part of the PLP with the same public comment deadline as the PLP.

Alabama Power's July 12, 2021 response to USR comments also stated that stakeholders may provide comments on the cultural resources evaluation contained in the PLP in accordance with Section 5.16(e) which provides a 90-day comment period on the PLP (or Monday, September 27, 2021). However, as noted in Commission staff's email memo issued on July 29, 2021, our current practice is that any early filings or issuances will not result in changes to the deadlines in our published integrated licensing process project schedules. Therefore, the deadline for filing comments on the PLP is October 1, 2021.

Battery Storage System Feasibility Study

The August 10 determination required Alabama Power to conduct a study to determine whether a battery energy storage system (BESS) could be installed at the Harris Project to ameliorate the effects of peaking operation on aquatic and recreational resources downstream from Harris Dam. Among other things, Alabama Power was to evaluate how each of the required BESS alternatives[3] would affect aquatic and recreational resources in Lake Harris and downstream in the Tallapoosa River, consistent with the effects analysis in the Downstream Release Alternative Study.

The Draft BESS Report provides only brief, qualitative descriptions of potential effects on aquatic and recreational resources. This analysis is insufficient to assess the effects of integrating a BESS at the Harris Project on aquatic and recreational resources at the project and on the Tallapoosa River. Therefore, consistent with the Downstream

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[2] *See* Accession number 20210729-3033.

[3] The two BESS alternatives included: (1) a 50 percent reduction in peak releases associated with installing one 60 megawatt (MW) battery unit; and (2) a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e., 5, 10, or 20 MW battery unit).

Release Alternative Study, the Draft BESS Report must be revised to include a detailed, quantitative assessment of the effects of integrating a BESS at the Harris Project on aquatic and recreational resources in Lake Harris and the Tallapoosa river downstream from Harris Dam. For example, what are the quantitative effects of potentially changes lake levels on littoral-zone habitat, fish populations, and recreation access on Lake Harris? Similarly, what are the quantitative effects of reducing flow fluctuations in the Tallapoosa River on water quality (e.g., dissolved oxygen and water temperature), aquatic habitat, fish populations, and recreation use of the river? Information from other Harris relicensing studies, as well as the Pacific Northwest National Laboratory's white paper, "*Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower*,[4]" should be used, as appropriate, to inform the environmental benefits analysis in the Final BESS Report.

If you have questions please contact Sarah Salazar at (202) 502-6863, or at sarah.salazar@ferc.gov.

Sincerely,

Stephen Bowler

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

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[4] Pacific Northwest National Laboratory, *Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower* (May 2021), PNNL-SA-157672, *available at* https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-SA-157672.pdf.

Document Content(s)

APC Harris Relicensing

From: Sarah Salazar <Sarah.Salazar@ferc.gov>
Sent: Tuesday, August 10, 2021 12:36 PM
To: Anderegg, Angela Segars
Subject: FW: Compliance Directives issued in FERC P-2628-065
Attachments: 20210810-3043_P-2628-065.pdf

EXTERNAL MAIL: Caution Opening Links or Files

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Good afternoon Angie,

In case you haven't seen it on e-subscription yet, we just issued a letter with additional USR comments. Please see the attached copy and/or below for a link to the letter on e-library.

Thank you,

Sarah L. Salazar Environmental Biologist Federal Energy Regulatory Commission 888 First St, NE, Washington, DC 20426 (202) 502-6863 ? Please consider the environment before printing this email.

-----Original Message-----
From: 'FERC eSubscription' <eSubscription@ferc.gov>
Sent: Tuesday, August 10, 2021 12:45 PM
Subject: Compliance Directives issued in FERC P-2628-065

On 8/10/2021, the Federal Energy Regulatory Commission (FERC), Washington D.C., issued this document:

Docket(s): P-2628-065
Lead Applicant: Alabama Power Company
Filing Type: Compliance Directives
General Correspondence
Description: Letter to Alabama Power Company providing additional comments on the updated study report for the R.L. Harris Hydroelectric Project under P-2628.

To view the document for this Issuance, click here https://urldefense.proofpoint.com/v2/url?u=https-3A__elibrary.ferc.gov_eLibrary_filelist-3Faccession-5Fnum-3D20210810-2D3043&d=DwIGaQ&c=AgWC6Nl7Slwpc9jE7UoQH1_Cvyci3SsTNfdLP4V1RCg&r=3qWv32MayddUzrbqJnBFwNmttMUUbdCuXZrVDKTC5gg&m=q0-tnEOFYUWRnHVgQDQHQljwGSE-BW5pQ4ke059J6p8&s=5H_wnYMtwcIpj5hTJGm02X3p-mTX4qhx7uIZXCYU6Jo&e=

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or for phone support, call 866-208-3676.
Comments and Suggestions can be sent to this email address: mailto:FERCOnlineSupport@Ferc.gov

FEDERAL ENERGY REGULATORY COMMISSION
WASHINGTON, D.C. 20426
August 10, 2021

OFFICE OF ENERGY PROJECTS

Project No. 2628-065 – Alabama
R.L. Harris Hydroelectric Project
Alabama Power Company

VIA Electronic Mail

Ms. Angie Anderegg
Harris Relicensing Project Manager
Alabama Power Company
ARSEGARS@southernco.com

Subject: Additional Staff Comments on Updated Study Report – R.L. Harris Hydroelectric Project No. 2628

Dear Ms. Anderegg:

Commission staff have reviewed stakeholders' comments on Alabama Power Company's (Alabama Power) Updated Study Report (USR) for the R.L. Harris Hydroelectric Project (Harris Project) and Alabama Power's responses to USR comments. Based on a review of the USR comments and responses, staff provide the following additional comments on the USR.

Background

Alabama Power's study plan was approved with modifications on April 12, 2019. Alabama Power filed an initial study report on April 10, 2020, and on August 10, 2020, Commission staff issued a determination on requested study modifications and new studies. The August 10 determination modified the Downstream Release Alternatives Study and required a new Battery Storage System Feasibility Study. Alabama Power filed the USR on April 12, 2021, held a USR meeting on April 27, 2021, and filed a USR meeting summary on May 12, 2021.

Comment Summary

Comments on the USR, associated study reports, and USR meeting summary were filed by the Alabama Department of Conservation and Natural Resources; Alabama

Department of Environmental Management; Environmental Protection Agency; Alabama Rivers Alliance; Lake Wedowee Property Owners Association; Randolph County, Alabama, Commissioners; Mayor (Town of Waverly) Taylor Melzer; Sheriff Cofield (Randolph County, Alabama); Michelle French; James Traylor; Donna Matthews; Corinne Cox; Chris Lunsford; and Carol Knight. Alabama Power filed reply comments on July 12, 2021. The comments address concerns with stakeholder-identified effects of project operation on environmental resources as well as the Draft Downstream Release Alternatives Phase 2 Study Report, the Draft Operating Curve Change Feasibility Analysis Phase 2 Study Report, the Final Aquatic Resources Study Report, the Final Downstream Aquatic Habitat Study Report, the Final Water Quality Study Report, and the Draft Battery Storage System Feasibility Study Report.

However, none of the comments specifically request modifications to the approved studies. For example, the comments provide recommendations for protection, mitigation, or enhancement measures; request additional information; clarify concerns raised at the USR meeting regarding the acquired data; recommend changes to the way data are presented in the USR; and continue to express general disagreement with the reliability of the study results based on disagreements on methods.[1] Therefore, no modification to the approved study plan is required.

Cultural Resources

In Commission staff's June 9, 2021 comments regarding Alabama Power's USR and associated study reports, staff stated that although Alabama Power intends to allow stakeholders 60 days to comment on its draft Historic Properties Management Plan (HPMP), stakeholders have a 90-day comment period for filing comments on the PLP, which would include the draft HPMP pursuant to section 5.16(e) of the Commission's regulations. In its July 12, 2021 letter responding to USR comments, Alabama Power stated that although the draft HPMP was filed concurrent with the PLP, the draft HPMP is a separate filing and not specified under section 5.16(e). Alabama Power also stated that the draft HPMP was filed as "privileged" due to the sensitive nature of the material (in accordance with Section 304 of the National Historic Properties Act), and a copy of

[1] Specific examples of these comments include: (1) recommendations for additional public recreation sites and/or safety-related (search and rescue) access points at Lake Harris and along the Tallapoosa River downstream from Harris Dam; (2) requests for modeling combinations of different reservoir operating curve scenarios and downstream release alternatives together for further analyses; (3) concerns about the methods used to sample shallow water habitat in the Tallapoosa River (i.e., backpack electrofishing [30+2 protocol] versus barge electrofishing); and (4) concerns about the accuracy of the water quality data collected in the Tallapoosa River and/or how these data are reported and presented in the study reports.

the draft HPMP and consultation record was also distributed to limited stakeholders, who may submit comments directly to harrisrelicensing@southernco.com within 60 days of the filing (or August 30, 2021) as specified in the HPMP cover letter.[2] Staff concurs that filing the draft HPMP separately from the PLP and as "privileged" is appropriate. However, section 5.16(b)(2) of the Commission's regulations requires that the PLP "… [c]learly describe, as applicable, the existing and proposed project operation and maintenance plan, to include measures for protection, mitigation, and enhancement measures with respect to each resource affected by the project proposal...." The draft HPMP includes proposed protection, mitigation, and enhancement measures for cultural resources, and is therefore subject to comment as part of the PLP with the same public comment deadline as the PLP.

Alabama Power's July 12, 2021 response to USR comments also stated that stakeholders may provide comments on the cultural resources evaluation contained in the PLP in accordance with Section 5.16(e) which provides a 90-day comment period on the PLP (or Monday, September 27, 2021). However, as noted in Commission staff's email memo issued on July 29, 2021, our current practice is that any early filings or issuances will not result in changes to the deadlines in our published integrated licensing process project schedules. Therefore, the deadline for filing comments on the PLP is October 1, 2021.

Battery Storage System Feasibility Study

The August 10 determination required Alabama Power to conduct a study to determine whether a battery energy storage system (BESS) could be installed at the Harris Project to ameliorate the effects of peaking operation on aquatic and recreational resources downstream from Harris Dam. Among other things, Alabama Power was to evaluate how each of the required BESS alternatives[3] would affect aquatic and recreational resources in Lake Harris and downstream in the Tallapoosa River, consistent with the effects analysis in the Downstream Release Alternative Study.

The Draft BESS Report provides only brief, qualitative descriptions of potential effects on aquatic and recreational resources. This analysis is insufficient to assess the effects of integrating a BESS at the Harris Project on aquatic and recreational resources at the project and on the Tallapoosa River. Therefore, consistent with the Downstream

[2] *See* Accession number 20210729-3033.

[3] The two BESS alternatives included: (1) a 50 percent reduction in peak releases associated with installing one 60 megawatt (MW) battery unit; and (2) a proportionately smaller reduction in peak releases associated with installing a smaller MW battery unit (i.e., 5, 10, or 20 MW battery unit).

Release Alternative Study, the Draft BESS Report must be revised to include a detailed, quantitative assessment of the effects of integrating a BESS at the Harris Project on aquatic and recreational resources in Lake Harris and the Tallapoosa river downstream from Harris Dam. For example, what are the quantitative effects of potentially changes lake levels on littoral-zone habitat, fish populations, and recreation access on Lake Harris? Similarly, what are the quantitative effects of reducing flow fluctuations in the Tallapoosa River on water quality (e.g., dissolved oxygen and water temperature), aquatic habitat, fish populations, and recreation use of the river? Information from other Harris relicensing studies, as well as the Pacific Northwest National Laboratory's white paper, "*Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower*,[4]" should be used, as appropriate, to inform the environmental benefits analysis in the Final BESS Report.

If you have questions please contact Sarah Salazar at (202) 502-6863, or at sarah.salazar@ferc.gov.

Sincerely,

Stephen Bowler

Stephen Bowler, Chief
South Branch
Division of Hydropower Licensing

[4] Pacific Northwest National Laboratory, *Deployment of Energy Storage to Improve Environmental Outcomes of Hydropower* (May 2021), PNNL-SA-157672, *available at* https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-SA-157672.pdf.

Alabama Rivers Alliance
Water Is Life

October 1, 2021

VIA ELECTRONIC FILING

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

RE: Comments on Preliminary License Proposal for R.L. Harris Hydroelectric Project (P-2628-065)

Dear Secretary Bose:

Enclosed for filing in the above-referenced docket are comments submitted by Alabama Rivers Alliance on the Preliminary Licensing Proposal for the R.L. Harris Hydroelectric Project. If you have any questions or need additional information, please email me at jwest@alabamarivers.org or call 205-322-6395.

Sincerely,

Jack K. West, Esq.

Alabama Rivers Alliance
Policy and Advocacy Director
2014 6th Avenue North
Suite 200
Birmingham, AL 35203

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Alabama Power Company	)	R.L. Harris Hydroelectric Project
	)	
	)	Project No. 2628-065

COMMENTS OF ALABAMA RIVERS ALLIANCE ON THE PRELIMINARY LICENSING PROPOSAL

As part of the Federal Energy Regulatory Commission's Integrated Licensing Process for the R.L. Harris Hydroelectric Project (FERC Project No. P-2628), Alabama Rivers Alliance (ARA) submits the following comments on the Preliminary Licensing Proposal filed by Alabama Power Company ("Licensee"). ARA has been an active participant in the relicensing of the Harris Project, attending many of the HAT stakeholder meetings, and previously filing comments on scoping documents, the Initial Study Report (ISR), Updated Study Report (USR), and numerous draft and final study reports. We continue to advocate for improvements to water quality, substantial mitigation of the impacts of hydropeaking releases on aquatic resources, and increased public access for recreation at Lake Wedowee and in the Tallapoosa River.

I. RECREATION, ACCESS, AND PUBLIC SAFETY

A. Additional Recreation Sites on Lake Wedowee and Downstream of Harris Dam

As part of the proposed PME measures, Licensee proposes to provide an additional recreation site on Lake Wedowee in the vicinity of Wedowee Marine South that will include a day use park with a new boat ramp.[1] Licensee also proposes to install and maintain a new recreation access site for paddlers near the Harris tailrace within the Project Boundary. ARA supports these PME measures that will enhance recreation opportunities and public access on both Lake Wedowee and the Tallapoosa River downstream of the Harris Project.

During at least one of the HAT 5 meetings, there was discussion about possible off-license public access sites outside of the Project Boundary further downstream of Harris around Malone and Wadley to allow for canoe/kayak access, as well as fishing and swimming opportunities. As the downstream communities nearest to the dam, residents of these areas are some of the most negatively impacted by fluctuating river levels from generation, and ARA supports off-license arrangements to create true public access, not dependent on private landowner permission, so that these communities will have more than just dirt slides under bridges to use as recreation access points.

[1] Preliminary Licensing Proposal (Jun. 2021), Accession No. 20210629-5068, at 11-30 [hereinafter "PLP"].

B. Safety and Public Notification Plan

a. *Existing Safety and Information Resources Often Nonfunctional or Unavailable*

The PLP contains a short description of Licensee's safety and communications procedures, such as the Shorelines website, SmartLakes app, and toll-free phone number maintained by Licensee to provide the public with information about generation schedules, reservoir elevations, maps, and the dangerous conditions created by releases from the dam.[2] While these resources can be helpful to many members of the public, they are often simply not functioning properly or are inaccurate.

For example, the Shorelines website page for Harris Dam over the past few months, has regularly displayed a message that the "current operations schedule is temporarily unavailable." When trying to access information about the generation schedule for Harris through the toll-free phone number, callers often receive a message of "we are experiencing technical difficulties" instead of the tentative generation schedule. When searching for information on the SmartLakes app, under the "Generators" tab for Harris, a message reads "no data available." Previously, the SmartLakes app and Shorelines website have shown 3-day forecasts of the tentative operating schedule, but the releases often do not correspond to the schedule shown. This mismatch between the predicted schedule and actual timing of releases frustrates recreationists who sometimes travel an hour or more to reach the river only to find that the schedule was wrong and that the fishing or paddling they planned to do is no longer possible.

Moreover, an inaccurate release schedule can be more dangerous than no schedule at all, creating a false sense of security that the dam will not be generating until a later time. Releases can and do result in accidents and injury, including the tragic drowning of a fly-fisherman in the Harris tailrace earlier this year.[3]

b. *The Public Needs Accurate, Real-Time Information about Releases*

ARA understands that hydropeaking facilities like Harris must be dispatched quickly to meet an increase in electrical demand and that generation schedules are subject to change, sometimes on short notice. Given the notification options enabled by today's technology, and considering that Licensee has already developed a SmartLakes app, it is possible to improve public safety and recreation by giving river users and those who own property along the Tallapoosa River real-time notifications of generation releases and flood control procedures.

ARA recommends Licensee develop and include a Safety and Public Notification Plan as an additional protection, mitigation, and enhancement (PME) measure for the Harris Project. Releases from the dam create the primary threat to public safety, and real-time notification of generation

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[2] PLP at 11-9.
[3] Accident Report (Mar. 12, 2021), Accession No. 20210312-5045.

and flood control releases must be at the core of this plan. At a minimum, the Safety and Public Notification Plan should:

1. Correct the system errors in the current Shorelines website, toll-free call number, and SmartLakes app.
2. Evaluate the timing of the siren sounding at the dam and when water is actually released. Consider whether additional sires are needed further downstream in consultation with residents.
3. Create a system to allow any member of the public to sign up for mobile notifications via text, email, or through the existing SmartLakes app of **real-time generation events**.
4. Allow users to opt-in to receiving notifications through one or more mediums (text, email, app notification) when the Harris Project is being operated under flood control procedures and when normal operations are resumed.
5. Notifications should state, at a minimum, the time at which a generation event is occurring, the number of turbines operating, the expected length of generation, and whether the project is operating under flood control procedures.
6. Notifications should be sent out 5-10 minutes prior to the start of releases to give recreationists and property owners time to prepare. Some degree of lag will be present in delivering notifications, and the more advance notice, the better.
7. Consider placing a new programmable digital sign in the area of the proposed tailrace access point to give real-time notifications of releases to those accessing the river close to the dam.

Regarding Point #7 above, especially if there is to be a new canoe/kayak access site near the tailrace, accurate and reliable information about generation releases needs to be made available to the public at that location so that paddlers are not putting in just before a generation event. The dam, tailrace, and much of the surrounding area is without full wireless and cellular/data service, and having a programmable, updatable sign at this new recreation access point where the danger from releases is greatest would improve public safety for recreationists there.

C. Perception of Water Levels Downstream of Harris

Citing some of the public user survey data collected as part of the Recreation Evaluation Study Report, the PLP states that "[r]egarding water level and recreation on the Tallapoosa River downstream of Harris Dam, the water level does not appear to have any appreciable effect on recreation" and that "the majority of recreation users found all water levels acceptable."[4] As ARA pointed out in its comments on the Draft Recreation Evaluation Report containing similar conclusions, the lack of public access above Germany's Ferry skews the results of the survey, and these conclusions do not represent the full spectrum of river users, particularly those who recreate around Malone and Wadley.

[4] PLP at 11-18, 11-19.

As reported in the Downstream Tallapoosa River Public Access User Count and Survey Report, nearly 70 percent of all recreational trips on the Tallapoosa originated from the Horseshoe Bend boat ramp, followed by 12 percent starting at Germany's Ferry, and 10 percent at Jaybird Landing.[5] No individuals interviewed started a trip at Wadley. Less than 1 percent of river users surveyed started their trips at Malone. Additionally, the river outfitter referenced in the User Count and Survey Report believed that 80 percent of recreation activity he observed on the river occurred from Germany's Ferry to Jaybird Landing.[6]

The fact that the vast majority of individuals surveyed were recreating in an area over 30 river miles from Harris Dam skews the data and conclusions presented in the PLP because releases from the dam largely attenuate by the time the water reaches Horseshoe Bend. River recreationists that far from the dam do not deal with the severe fluctuations in water levels that recreationists upriver experience. Greater user satisfaction with water levels and instream flow in areas further from the dam with more stable flows is unsurprising and does not capture the full range of recreationist satisfaction.

The conclusions in the PLP about water level having no appreciable effect on recreationist satisfaction do not encompass the opinions of river users above Germany's Ferry because the interviews were so heavily skewed towards recreationists downriver of Germany's Ferry. Of course, most recreationists available to be interviewed would be found in that area because it is where public access is available. Despite ARA's previous comments, the PLP does not contextualize where recreationists were surveyed and extrapolates satisfaction levels from the Horseshoe Bend area to the river above Germany's Ferry. While the survey data may prove out high satisfaction with water levels around Horseshoe Bend where a large majority of the participants surveyed were recreating in an area with mostly attenuated and stable flows, it does not follow that water levels have no effect on recreation satisfaction upriver.

D. New Recreation Plan

In the PLP, Licensee describes developing and implementing a new Recreation Plan, but other than the few bullets listed in Table 11-7, we do not know what this plan will entail. We suggest that the Recreation Plan continue to be developed in conversation with the Alabama Department of Conservation and Natural Resources (ADCNR), the National Park Service (NPS), and other interested stakeholders and include the suggestions made in the section above about real-time notification of releases. Any off-license opportunities that arise for new recreation sites outside of the Project Boundary around Malone and Wadley should be included in the Recreation Plan.

II. CONTINUOUS MINIMUM FLOW, WATER TEMPERATURE, AND THE NEED FOR ADAPTIVE MANAGEMENT

A. New Continuous Minimum Flow Unit

[5] Final Recreation Evaluation Report (Nov. 2020), Appendix E, Public Access User Count and Survey Report, at 13.
[6] *Id.* at 3.

As one of the PME measures described in the PLP, Licensee proposes to "design, install, operate and maintain a minimum flow unit to provide a continuous minimum flow between 150 cfs and 300 cfs in the Tallapoosa River Below Harris Dam."[7] Licensee is now in the conceptual design phase of developing this continuous minimum flow (CMF) turbine and states that based on the early design, the new unit would be added to the east side of the powerhouse and connect to the Unit 1 penstock. Licensee states that the "the unit size would be limited by the space available" which would restrict the amount of flow the unit can pass.[8] A sufficient continuous minimum flow incorporated with an adaptive management framework that recognizes seasonal flow variability, could help restore a more natural flow and water temperature regime to the Tallapoosa River, as well as lessen the fluctuations in river levels and temperatures. This in turn could reduce the erosive effect of generation releases, stabilize and improve aquatic habitat, and benefit recreationists.

While ARA supports the design and development upgrades to increase the Harris Project's ability to pass a wider range of flows, including a CMF turbine, the amount of flow currently being proposed by Licensee in the PLP is insufficient to support a healthy aquatic ecosystem and instead will continue to cause harm to sensitive aquatic species. The low end of Licensee's proposed minimum flow range is no greater than the current Green Plan releases, which are equal to approximately 150 cfs.

Throughout the ILP process many stakeholders, including state and federal resource agencies and FERC staff, have encouraged Licensee to study a wider range of releases, which were incorporated into the Final Downstream Release Alternatives Study Report. In previous comments on the ISR, FERC staff noted that, according to some metrics, with a river of this size, 150 cfs represents "poor" to "fair" habitat conditions, while 800 cfs represents "good" to "excellent" habitat.[9] Yet Licensee proposes to continue passing flows at the "poor" end of the spectrum, which will continue to adversely impact aquatic life and habitat downstream of the dam.

As ADCNR has recently pointed out in comments on the PLP, if the Tallapoosa River were not regulated for hydropower production, ADCNR's Instream Flow Policy would recommend "conservation flows of 762 cfs from July through November, 1524 cfs from January through April, and 1016 cfs during May, June, and December."[10] These flow ranges that would be restorative to aquatic life are far higher than what is being proposed by Licensee.

According to Licensee's modeling results reported in the Final Downstream Release Alternatives Phase 2 Report, passing a flow of 300 cfs has negligible effects on average reservoir elevations but passing flows of 600 cfs or 800 cfs begins to lower reservoir levels in the HEC-ResSim model. However, the modeling results did not identify at what level a continuous minimum flow begins to affect reservoir levels, and ARA requested in its comments on the Downstream Release Alternatives Phase 2 Report that Licensee share with stakeholders the exact amount of flow that

[7] PLP at 5-7.
[8] PLP at 5-7.
[9] FERC Staff Comments on Initial Study Reports and Initial Study Report Meeting Summary (Jun. 10, 2020), Accession No. 20200610-3059, at A-2.
[10] Comments of Alabama Department of Conservation and Natural Resources on the Preliminary Licensing Proposal, (Sep. 27, 2021) Accession No. 20210928-5182, at 11.

does begin to impact reservoir levels. If a 400-600 cfs minimum flow could be released with negligible effects to lake levels, that could represent a substantial gain in river conditions downstream (relative to the proposed minimum flow) and further reduce water temperature and river level fluctuations. Despite requests, Licensee still has not presented stakeholders with the level of minimum flow that begins to impact reservoir levels or the seasonal variability of any effects on reservoir levels. We request that this information be included in the Final License Application.

We suggest that Licensee continue to explore design options for the CMF turbine so that the unit is not as space-constrained and can pass a greater range of flows, including a variable level of flows to accommodate seasonal flow fluctuations. We also encourage Licensee to continue to consider other options to augment flow outside of the CMF turbine. As one example, in the early 2000's when the Green Plan was being developed, Licensee studied the possibility of using a non-overflow structure siphon and found that it could deliver a flow of 150 cfs on the east side of the dam.[11] Siphoning or spilling water could help with flows, water temperature, and levels of dissolved gases since that water siphoned or spilled could be drawn from the upper layer of the stratified reservoir. If Licensee concludes that it can only pass 300 cfs through the CMF turbine, other flow augmentation measures must be considered.

B. Water Temperature Impacts

Despite numerous comments received from stakeholders and resource agencies voicing concern about low water temperatures throughout the relicensing process, Licensee has not included any PME measures in the PLP to mitigate the effects of the altered thermal regime created by the Harris Project. The segment of the Tallapoosa River below Harris has been studied rigorously over the past two decades, and researchers and resource agencies have documented the impacts to the aquatic community of artificially depressed temperatures from the hypolimnetic releases. To briefly summarize just some of the considerable published research identifying low water temperatures as a source of ecological problems:

- Nesting success for Redbreast Sunfish was negatively related to both peaking power generation and depressed water temperatures (Andress 2002).[12]
- Strongly fluctuating flows and decreased water temperatures negatively affect survival and early growth of age-0 Channel Catfish and Alabama Bass. Mortality was highest in treatments with decreased water temperatures, indicating that variation of the thermal regime could have significant impacts on survival of juvenile Channel Catfish and Alabama Bass. Daily growth rates were also lower in treatments with decreased water temperatures. Data also suggest that growth and survival may be impacted more by fluctuations in temperature versus flow variation (Goar 2013).[13]

[11] PLP, Appendix B, "Harris Downstream Flow AMP History and Research," at 416.
[12] Andress, R. O., *Nest Survival of* Lepomis *Species in Regulated and Unregulated Rivers*, Master's Thesis, Auburn University (2002).
[13] Goar, T.P., *Effects of Hydrologic Variation and Water Temperatures on Early Growth and Survival of Selected Age-0 Fishes in the Tallapoosa River, Alabama*, Doctoral Dissertation (2013).

- Improving flow and temperature criteria from Harris could enhance growth and hatch success of sport fishes (Irwin and Goar 2015).[14]
- Thermal spawning conditions for Channel Catfish occurred every year in unregulated reach but in only 7 out of 12 years in regulated river segment and occurred earlier in the year in regulated reaches (Lloyd et al. 2017)[15]
- Flow and temperature remain in a non-natural state in regulated reaches downstream of Harris, and the macroinvertebrate community in regulated reaches shows many dissimilarities to communities from unregulated river reaches (Irwin 2019).[16]

Ultimately, water temperature is as critical a variable as stream flow and must be incorporated into any discussion of sustainable and environmental flows. As we stated in our previous comments on the ISR, the USR, and the Draft Phase 2 Downstream Release Alternatives Report, the scientific literature stresses that flows and water temperature must be considered together, and Licensee should not assume that implementing a certain level of minimum flow will yield a positive ecological response if the temperatures of releases from the dam continue to be significantly colder than water temperatures at unregulated sites.[17] Ignoring water temperature and considering flows in isolation may actually cause further harm to aquatic species below Harris because establishing a continuous minimum flow of unnaturally cold water could further disrupt thermal cues for breeding, stunt growth rates, and inhibit the productivity of aquatic environment.

a. *Unsettled Water Temperature Data*

After years of discussions about water temperature concerns, Licensee made its 2000-2018 Tallapoosa water temperature data available to stakeholders in 2021. This data was previously used by Auburn University to complete its bioenergetics modeling and assess temperature fluctuations and flow impacts on four target fish species as part of the Aquatic Resources Study Report. However, when this data was finally made available to stakeholders, multiple errors and duplications in the data were observed by ADCNR, prompting Licensee to file a corrected water temperature dataset.

ARA analyzed the original vs. corrected datasets, and found that:

1. Temperature data for the years 2005, 2006, and 2008 were identical, except additional days were added to the end of those years.
2. For 2009 tailrace data, values for August 3-6 are missing in the corrected data and the corrected data presents warmer temperatures for August 7 to the end of the period.

[14] Irwin, E.R. and Goar, T.P., *Spatial and Temporal Variation in Recruitment and Growth of Channel Catfish, Alabama Bass and Tallapoosa Bass in the Tallapoosa River and Associated Tributaries* (2015), U.S. Department of Interior, Fish and Wildlife Service, Cooperator Science Series FWS/CSS -116, Washington, D.C.
[15] Lloyd, M.C., Q. Lai, S. Sammons, and E. Irwin, *Experimental Stocking of Sport Fish in the Regulated Tallapoosa River to Determine Critical Periods for Recruitment* (2017).
[16] Elise R. Irwin, *Adaptive Management of Flows from R.L. Harris Dam (Tallapoosa River, Alabama)—Stakeholder Process and Use of Biological Monitoring Data for Decision Making*, U.S. Geological Survey Open-File Report 2019-1026 (2019) [hereinafter "USGS 2019 OFR"].
[17] *See generally*, Julien D. Olden and Robert J. Naiman, *Incorporating Thermal Regimes into Environmental Flows Assessments: Modifying Dam Operations to Restore Freshwater Ecosystem Integrity*, Freshwater Biology (2010) 55.

3. For 2015 tailrace data, corrected values are identical to original values until October when a number of magnitude differences appear.
4. The Malone 2009 dataset is missing values for August 3-6.
5. The Malone 2011 corrected dataset ends April 20 while the original data continues to October 31.
6. The data for the Wadley site in years 2002, 2004, 2005, 2008, and 2011 are identical except for additional observations added to the end of the dataset.
7. The Wadley 2006 corrected data ends on September 27 while the original data continues to October 31 with some gaps.
8. The Wadley 2009 corrected data is missing valued for August 3-6 and August 7 to October 31 display warmer observations in the corrected dataset.
9. The Wadley 2015 corrected data is a completely different dataset when compared to the original.
10. The Wadley 2018 corrected data is completely different when compared to the original, and the corrected data is missing for August 29 to September 24.

Even though Licensee stated that it has now corrected its temperature data, anomalies such as the ones noted above remain, and Auburn University must re-analyze the "corrected" water temperature data for their portion of the Final Aquatic Resources Study Report. Many of the conclusions in the Final Aquatic Resources Study Report rested on analysis of the previous incorrect water temperature data, and it is possible that conclusions may change and an updated study report may need to be filed. We request that Licensee thoroughly explain to stakeholders all discrepancies and errors in the original vs. corrected temperature data and update the Final Aquatic Resources Study Report to reflect any changes in temperature data analysis.

What is clear is that water temperatures in the Harris tailrace are significantly cooler (multiple degrees centigrade differences) than water temperatures at the unregulated sites of Heflin and Newell. Table 8-5 of the PLP shows monthly average temperature data comparing temperature at regulated and unregulated sites. Even though temperature data for Heflin and Newell is only available for 2018-2020, the monthly average data reflects a consistent depression in temperatures below the dam compared to the unregulated river. The ecological impacts of these differences have been documented in the scientific literature cited above.

b. *Options for Warming Releases*

Two suggested options for warming releases to restore a thermal regime in line with unregulated reaches are: (1) to modify the existing intake structure and further raise the skimmer weir to draw from above the thermocline layer in the reservoir and (2) to take water temperature into consideration when designing the new CMF turbine so that it draws not from the existing penstock, as is being proposed currently, but from a separate intake above the thermocline when the reservoir is stratified in warmer months.

First, according to the PLP, the approximate depth of the Harris intake with the skimmer weir fully raised is 30 feet.[18] This is also roughly the depth where the reservoir begins to stratify during the

[18] PLP at 8-7.

summer and a colder, oxygen-depleted layer begins. As the PLP states in Section 7 on Water Resources: "Harris Reservoir is typically stratified from June through October, with hypoxic/anoxic conditions at depths greater than 30 feet."[19] Not only are the thermocline and hypolimnion layers of the reservoir less rich in dissolved oxygen, they are significantly colder than the upper layer. Modifying the intake structure to raise its invert elevation even 5-10 feet could allow warmer water with higher levels of dissolved oxygen to pass through the turbines. We encourage Licensee to investigate the feasibility of modifying the intake structure to allow for a greater range of intake depths.

Second, the new CMF turbine proposed by Licensee, in its current phase of conceptual development, will draw from the existing penstock to the Unit 1, meaning it will pass water drawn from the same depth in the reservoir as the existing turbines are passing. As design of this new CMF unit progresses, we suggest that Licensee consider how to supply this new unit with a separate or modified penstock and intake that could draw from higher in the reservoir. A minimum flow of warmer water from the upper layer of the reservoir could mitigate some of the cold-water effects currently impacting aquatic biota.

C. Adaptive Management Program vs. Proposed Aquatic Resources Monitoring Plan

In Section 8 of the PLP (Fish and Aquatic Resources), Licensee proposes a PME measure to develop and implement an Aquatic Resources Monitoring Plan after a continuous minimum flow has been established. Very little detail exists in the PLP about what this plan would entail, only that it would involve "periodic monitoring of aquatic resources…such as changes to habitat and the aquatic community from implementing the minimum flow."[20] Currently, the Aquatic Resources Monitoring Plan does not describe any sampling methods or species of concern. It also only contemplates going into effect after the CMF is implemented, but there would need to be pre-minimum flow and post-minimum flow comparisons for monitoring be of use.

While ARA agrees that biological monitoring should take place when changing the flow regime (both before and after), we continue to recommend a much more robust adaptive management program be included as a PME measure that would not only monitor observed changes in the aquatic community, but provide a framework for making flow and temperature modifications based on those observations. Particularly when there is uncertainty about how the aquatic environment will respond to flow and temperature changes, as there in the case of Harris, adaptive management is a useful tool for protecting aquatic resources from possible harm or supporting positive responses.

The Department of Interior's Adaptive Management Technical Guide defines adaptive management as "a systematic approach for improving resource management by learning from management outcomes" that focuses on "learning and adapting, through partnerships of managers, scientists, and other stakeholders who learn together how to create and maintain sustainable

[19] PLP at 7-5.
[20] PLP at 8-25.

resource systems."[21] As we have pointed out in comments on the ISR and USR, scientific researchers studying fishes and aquatic macroinvertebrates in the Tallapoosa River below Harris have been promoting the use of an adaptive management program: "*Despite potential obstacles, an adaptive management approach still holds substantial promise for improving the management of regulated rivers by allowing managers and scientists to address the uncertainty in predicting and measuring how river fauna will respond to flow-regime alterations.*"[22]

We recommend that Licensee's proposed Aquatic Resources Monitoring Plan be fleshed out to provide for ongoing adaptive management of the minimum flow and water temperature and include a management committee comprised of members of the resource agencies, Licensee, environmental NGOs, and other interested stakeholders. Having a mechanism and framework to adjust conditions based on observed changes is the heart of adaptive management, and we urge Licensee and FERC to incorporate adaptive management into the final license conditions. As we have stated in prior comments, the failure of the adaptive management program that led to the Green Plan was not that its flow prescription did not achieve the desired biological response, but that there was no mechanism to reevaluate and adjust operations based on the knowledge gained after the Green Plan flow regime was implemented.

We do not want to see the same mistake made twice and implore Licensee and FERC to not endorse one static flow prescription with no method for changes based on monitoring and feedback. Over the next 30-50 year license term, a changing climate with heightened droughts and floods will affect the river in unforeseeable ways, and preserving a method to adapt to those changes is key.

III. AQUATIC RESOURCES

Earlier this week, the U.S. Fish and Wildlife Service (USFWS) proposed to delist 23 species from the Endangered Species Act (ESA) because the species are now considered extinct and can no longer be protected.[23] Eight of the now-extinct species were freshwater mussels, six of which were previously found in Alabama's rivers. Those mussel species were the southern acornshell, stirrupshell, upland combshell, turgid-blossom pearly mussel, yellow-blossom pearly mussel, and the tubercled-blossom pearly mussel.[24] This announcement by USFWS serves as a sobering reminder of the irreversible effects of habitat fragmentation and poor water quality caused by damming rivers abundant with sensitive freshwater biodiversity.

On the Tallapoosa River, other imperiled freshwater mussel species are currently proposed for listing under the ESA, still waiting after roughly a decade for protections to be granted. These four freshwater mussels now under review for ESA listing are the Tallapoosa orb, Alabama hickorynut, delicate spike, and Alabama spike.[25] The finelined pocketbook, another freshwater mussel that is

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[21] U.S. Department of Interior, Adaptive Management Technical Guide (2009) at 1, https://www.doi.gov/sites/doi.gov/files/uploads/TechGuide-WebOptimized-2.pdf
[22] USGS 2019 OFR, at 3.
[23] U.S. Fish and Wildlife Service, Press Release, *U.S. Fish and Wildlife Service Proposes Delisting 23 Species from Endangered Species Act Due to Extinction* (Sep. 29, 2021) https://www.fws.gov/news/ShowNews.cfm?ref=u.s.-fish-and-wildlife-service-proposes-delisting-23-species-from-&_ID=37017
[24] *Id.*
[25] Comments of U.S. Fish and Wildlife Service on the PLP (Sep. 27, 2021), Accession No. 20210927-5092.

federally listed as endangered, previously lived in the Tallapoosa River below Harris and has critical habitat designated upstream of the dam, but field surveys conducted as part of the Aquatic Resources Study Report turned up no existing specimens. But it is not unprecedented for species thought to be extinct or extirpated from a system to reappear when conditions are improved for aquatic species. The tulotoma snail in the Coosa River basin is one example of an aquatic species that battled back from an ESA listing after habitat conditions and water quality were improved.[26]

Other sensitive aquatic species in the vicinity of the Harris Project and are listed in Appendix H of the PLP, including the state-protected Tallapoosa crayfish, lipstick darter, and crystal darter. As we have noted in past comments on the USR, much attention has been paid to the four target fish species during the studies conducted pursuant to the relicensing, but little time has been spent on the non-game, non-target species that the scientific literature shows are most affected by dam operations. The goal of the Aquatic Resources Study Plan was to "protect and enhance the health of populations of game and non-game species of fish and other aquatic fauna" and to include an "assessment of the entire fish population."[27] However, the studies, surveys, and reports have not sufficiently assessed the impacts of flow regulation and temperature on non-game and non-target species.

We recommended in August 2020 that Licensee review thermal tolerance data for at least some of the non-target species that the scientific literature indicates are most affected by Harris, including the stippled studfish, blackspotted topminnow, black redhorse, blacktail redhorse, riffle minnow, and bullhead minnow.[28] This was not done; no information on water temperature requirements for non-target species was gathered by Licensee as part of the aquatic resources studies.

After reviewing the Pre-Application Document, the Final Aquatic Resources Study Report, the PLP, and much of the published scientific literature cited in those documents, ARA continues to voice concern over the documented, ongoing impacts project operations have on aquatic species above and below the dam. Fish mortality due to turbine entrainment, disrupted spawning cues downstream, diminished macroinvertebrate communities, suppressed growth rates of fishes, blockage of fish passage, and decreased species persistence and colonization are all examples of the project's harmful impacts to aquatic life in the Tallapoosa River.

Significant PME measures are required now to mitigate the Harris Project's negative effects on aquatic life. As we have described in Section II above, both flows and temperatures must be addressed to begin to heal the Tallapoosa River from the effects of habitat fragmentation, fluctuating generation releases, and artificially low temperatures.

The Aquatic Resources Monitoring Plan proposed in the PLP must go beyond simply monitoring and actually lay out specific measures to protect sensitive species. It should proactively work to conserve the freshwater mussels that are under review for ESA listing now, before it is too late, so that these species can avoid extinction. As we further discussed in Section II, incorporating a true

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[26] U.S. Fish and Wildlife Service, Tulotoma Snail Downlisting Fact Sheet (Jul. 2011).
[27] Final Aquatic Resources Study Plan (May 2019), Accession No. 20190513-5093, at 3-5.
[28] *See* USGS 2019 OFR, Table B1 (at 31), Figure B6 (at 37), and Figure B7 (at 38).

adaptive management framework into the Aquatic Resources Monitoring Plan will assist in managing these concerns.

Additionally, the 14-day reservoir stabilization spawning window listed as a PME measure in Table 5-2 to benefit aquatic species on the reservoir should be mandatory each year and incorporated into the license conditions. Moreover, a similar period of tailrace level stabilization should be implemented to allow for increased spawning of fishes below the dam. Both spawning stabilization periods should be license requirements and mandate that Licensee consult with both ADCNR and USFWS on the appropriate seasonal timing of these stabilization periods.

Though the topic of migratory fish is briefly discussed in the PLP, it is silent as to any PME measures to actually provide or improve fish passage. Licensee owns and operates four hydropower projects on the Tallapoosa and "[n]one of the dams on the Tallapoosa River have locks that allow passage for fish."[29] Based on historical studies, a number of migratory aquatic species (anadromous, catadromous, and diadromous) have been found in the Tallapoosa River below Licensee's Thurlow Dam, including Alabama shad, Alabama sturgeon, American eel, paddlefish, and river redhorse.[30]

Licensee should be required to work with the resource agencies and the U.S. Army Corps of Engineers (USACE) to study and assess methods to enhance fish passage at all of Licensee's dams on the Tallapoosa River. The habitat fragmentation created by these hydropower projects can be mitigated to some extent if migratory fish are successfully able to pass both upstream and downstream of the projects. Reconnecting habitat benefits both fish species and mussels that rely on host fish to reproduce. Fish passage should be addressed in PME measures such as the Aquatic Resources Monitoring Plan and in the final license requirements. ARA recommends that a fishway prescription developed by the resource agencies be incorporated into the final license to require Licensee to study and improve fish passage at all four of its hydropower projects on the Tallapoosa.

IV. DISSOLVED OXYGEN LEVELS AND IMPROVING AERATION SYSTEMS

Our comments on the Updated Study Report contained a breakdown of recorded times and locations when dissolved oxygen (DO) levels below Harris did not meet the state water quality criteria of 5 mg/L, based on the monitoring data provided in Appendix B to the Final Water Quality Report. As ARA and other stakeholders have continually pointed out, Licensee is required to meet or exceed state water quality standards at all times, and even occasional low DO levels pose a threat to aquatic resources.

We also recommended that Licensee conduct a full appraisal of the condition of the aeration systems used to boost DO levels on both turbines, as well as provide copies of the test results for the aeration systems described in the Final Water Quality Report. We suggested that because the most recent test result from 2016 showed that the aeration system has degraded substantially and is only operating at roughly half capacity (boosting DO levels by approximately 1.0 mg/L instead

[29] PLP at 8-13.
[30] PLP at 8-16.

of 2.0 mg/L), Licensee should consider refurbishing the system or replacing it with a modern system that enables Licensee to meet water quality standards for DO concentrations at all times.

The PLP contains some additional description of the aeration system and states that it was historically only turned on when DO levels approached 5.5 mg/L,[31] but Licensee has not yet provided copies of aeration system test results or completed a full assessment of the systems or investigated upgrading the system to avoid future low DO events. Instead, Licensee proposes to continue operating the 40-year-old, underperforming aeration system.[32]

According to the PLP, the proposed new CMF turbine will include an aeration system, which under state water quality standards would be considered an "addition of [a] new hydroelectric generation unit to [an] existing impoundment," and must be designed so that its discharge will contain at least 5 mg/L of dissolved oxygen.[33] Having a CMF unit with a new aeration system could improve DO levels overall, but the volume of water Licensee is proposing to pass through the new CMF turbine (150-300 cfs) is small compared to the volume of hydropeaking releases. ARA recommends that additional PME measures be incorporated into the license conditions requiring: (1) ongoing continuous monitoring of DO levels; (2) that turbine aeration systems be turned on when DO levels approach 6.0 mg/L; and (3) that Licensee refurbish or upgrade the existing aeration systems to provide the full 2.0 mg/L DO boost that the system was originally supposed to deliver.

V. EROSION AND SEDIMENTATION

The Erosion and Sedimentation Study conducted by Licensee located 24 erosion sites on the reservoir and downstream of Harris Dam.[34] Nine sedimentation areas were identified around the reservoir.[35] A streambank assessment of the river downstream of the dam was performed via a High Definition Stream Survey (HDSS), revealing fifteen segments of river that scored either slightly impaired, impaired, or non-functional.[36] Throughout the relicensing, NPS has raised concerns of the erosive effects of generation releases approximately 40 river miles downstream of the dam at Horseshoe Bend National Military Park. During stakeholder meetings, property owners have reported trees falling into the river because riverbanks have been destabilized by erosion. As part of the Recreation Evaluation Report, the user experience summaries collected show that over 62 percent of river recreationists either "agree" or "strongly agree" that bank erosion is a concern along the Tallapoosa below Harris.[37]

Yet the PLP does not contain robust PME measures addressing the erosive effects of releases in the river below the dam. Licensee notes that installing and operating the new CMF turbine to provide a minimum flow may have a "potential minor benefit to areas of downstream erosion," but that measure alone is insufficient to mitigate project impacts.[38]

[31] PLP at 7-15.
[32] PLP at 7-23.
[33] Ala. Admin. Code r. 335-6-10-.09, Specific Water Quality Criteria (2021).
[34] PLP at 6-8.
[35] PLP at 6-11.
[36] PLP at 6-13.
[37] Final Recreation Evaluation Report (Nov. 2020), Accession No. 20200824-5241, at 40.
[38] PLP at 6-22.

ARA fully supports the development of a Shoreline Management Plan along Lake Wedowee to promote shorelines stabilized by native vegetation, but there is no analogous PME measure being offered downstream of the dam. We recommend that Licensee include an Erosion Monitoring and Repair Plan as an additional PME measure to: (1) repair the areas identified by the HDSS as slightly impaired, impaired, or non-functional; (2) monitor, report, and address ongoing erosion exacerbated by project operations; and (3) assist landowners along the river in better controlling erosion.

VI. NO OPERATING CURVE CHANGE

In the PLP, Licensee proposes not to change the operating curve or raise the winter pool elevation of Lake Wedowee. Table 5-1 shows a summary of alternatives considered but eliminated by Licensee and states that "any increase in the winter operating curve would result in an increase in downstream flooding, including both an increase in downstream acres inundated and an increase in downstream flood depth."[39] Licensee concluded that the increases in downstream flooding were not reasonable and therefore eliminated these scenarios from consideration.

The primary benefit of raising the winter pool elevation would be to make recreational structures such as boat launches and docks usable for a longer portion of the year, enabling greater access and an extended recreation season for some lake users. But this expanded recreation on the reservoir would come at a cost. As discussed in the Operating Curve Change Feasibility Analysis Phase 1 and Phase 2 Study Reports, the modeling results showed that raising the winter pool amplifies flooding below Harris, and more downstream structures—including mobile homes and single-family residences—become inundated during the 100-year design flood.

More intense and rapid flooding has the potential to harm people and property, as well as diminish recreation opportunities on the river. ARA supports Licensee's proposal to maintain the current operating curve and not raise the winter pool elevation. If dock use and boat ramp access could be increased without threatening downstream residents with more flooding, we would be in favor of a raise in the winter pool, but the ramifications of increased flooding are unreasonable and outweigh the limited recreation benefits.

VII. ONGOING BATTERY ENERGY STORAGE SYSTEM (BESS) STUDY

The PLP eliminates the alternative of adding a battery energy storage system (BESS) to the Harris Project to mitigate hydropeaking effects and increase project flexibility, stating that "[t]he cost of integrating a BESS at Harris is substantial, and, therefore, not economical in comparison to potential limited environmental benefits."[40] However, the BESS Study Report has yet to be finalized because Licensee did not include in the Draft BESS Report a thorough quantitative assessment of the possible environmental benefits that reducing peaking flows would have on

[39] PLP at 5-2.
[40] PLP at 5-4.

affected resources. In comments on the USR, FERC staff noted that the Draft BESS Report only includes a "brief, qualitative descriptions of potential effects on aquatic and recreational resources" and stated that the "Draft BESS Report must be revised to include a detailed, quantitative assessment of the effects of integrating a BESS at the Harris Project."[41] Until the requested analysis is completed and the BESS Study Report finalized, it is premature to eliminate BESS alternatives.

Regarding BESS costs, ARA would like to note that recent developments in BESS technologies continue to plummet the costs of utility-scale battery energy storage. A few months ago, a new iron-air battery technology was unveiled by Form Energy offering long-duration energy storage (100-hour) at a price of less than $20/kWh, which is on the order of a 10x reduction in price from current lithium-ion batteries.[42] While still a nascent energy storage technology, a pilot project will be completed by Form Energy in 2023,[43] and if successful, such drastic reductions in cost will make pairing energy storage technologies with existing hydropower projects to improve environmental outcomes even more feasible.

VIII. CUMULATIVE EFFECTS AND CHOICE OF NEPA REGULATIONS

In Section 5.6 of the PLP on "Cumulative Effects," Licensee discusses the Council on Environmental Quality's (CEQ) revisions to the regulations used by federal agencies to implement the National Environmental Policy Act (NEPA), which were finalized and became effective in September 2020 under the prior administration (referred to here as the "2020 Rule"). The 2020 Rule has been the subject of multiple legal challenges, and the current administration has indicated that it has numerous concerns with the rule and has initiated a comprehensive reconsideration of the 2020 Rule. In June 2021, CEQ extended the deadline for federal agencies to propose updates to their NEPA procedures, stating that "the deadline change will ensure that agencies avoid expending their limited resources developing procedures to conform with regulations that may soon be updated."[44]

As Licensee describes, FERC *may* apply the 2020 Rule to "ongoing activities and environmental documents that began before September 14, 2020, which includes the Harris Project."[45] But *should* FERC apply the 2020 Rule when that rule is currently being rewritten? The better procedural and project management decision would be to develop the Harris NEPA document consistent with the rules in effect prior to the 2020 Rule. Such an approach has been taken by the Department of Interior, which announced that DOI offices "will not apply the 2020 Rule in a manner that would change the application or level of NEPA that would have been applied to a proposed action before

[41] FERC Additional Staff Comments on Updated Study Report (Aug. 10, 2021), Accession No. 20210810-3043, at 3-4.
[42] Jason Plautz, *Form Energy's $20/kWh, 100-hour iron-air battery could be a 'substantial breakthrough'*, Utility Dive (Jul. 26, 2021), https://www.utilitydive.com/news/form-energys-20kwh-100-hour-iron-air-battery-could-be-a-substantial-br/603877/
[43] Great River Energy, *Long-duration battery project in the works*, (Jun. 17, 2020), https://greatriverenergy.com/long-duration-battery-project-in-the-works/
[44] White House Press Release, *CEQ Extends Deadline for Agencies to Propose Updates to National Environmental Policy Act Procedures* (Jun. 28, 2021).
[45] PLP at 5-9.

the 2020 Rule went into effect."[46] We recommend Commission staff take a similar approach with the Harris relicensing.

Importantly, the 2020 Rule no longer requires the separate consideration of cumulative effects of a proposed federal action. Licensee declined to include any cumulative effects analysis in the PLP on the basis that FERC might choose to apply the 2020 Rule. However, in its previous scoping activities, Commission staff "identified geology and soils (erosion and sedimentation), water quantity, water quality, and fishery resources as resources that could be cumulatively affected by the proposed continued operation and maintenance of the Harris Project, in combination with other hydroelectric projects and other activities in the Tallapoosa River Basin."[47] FERC staff have already recognized the need for cumulative effects analysis for multiple resources and delineated the geographical and temporal scopes of the analysis for different resources. We encourage FERC to continue down the path of assessing cumulative effects it began in the Harris scoping documents.

If FERC opts to conduct its NEPA analysis under the 2020 Rule, it is likely that supplemental analysis will later be required, whereas, if FERC decides to operate under the prior rules and requires cumulative effects analysis, it is far less likely that additional time and resources will be needed to later update the Harris NEPA document. In the event that FERC elects to conduct its NEPA review under the prior regulations, Licensee should be required to include cumulative effects analysis in its Final License Application.

[46] Secretary of the Interior, Order 3399 (Apr. 16, 2021), https://www.doi.gov/sites/doi.gov/files/elips/documents/so-3399-508_0.pdf

[47] FERC Scoping Document 2, Accession No. 20181116-3065, at 21.

Document Content(s)

APC Harris Relicensing

From: Sarah Salazar <Sarah.Salazar@ferc.gov>
Sent: Monday, October 4, 2021 11:54 AM
To: Anderegg, Angela Segars; Jack West
Cc: APC Harris Relicensing; Cindy Lowry
Subject: RE: Filing Difficulty with Harris PLP Comments - (P-2628)

Thank you Jack for letting me know and Angie for confirming you have received the comments.

Jack, I would recommend following up with FERC Online as you plan to do. Your receipt email is helpful. Hopefully the FERC Online can remedy the error. I just checked and I don't see the filing when I do a general docket search. I pasted the FERC Online staff contact info. below in case it is helpful for you.

For any issues regarding FERC Online, please contact ferconlinesupport@ferc.gov or call 866-208-3676.
Please include a current mail address, telephone number, and email address.

Sarah L. Salazar ✧ *Environmental Biologist* ✧ *Federal Energy Regulatory Commission* ✧ *888 First St, NE, Washington, DC 20426* ✧ *(202) 502-6863*
Please consider the environment before printing this email.

From: Anderegg, Angela Segars <ARSEGARS@southernco.com>
Sent: Monday, October 04, 2021 12:33 PM
To: Jack West <jwest@alabamarivers.org>; Sarah Salazar <Sarah.Salazar@ferc.gov>
Cc: APC Harris Relicensing <g2apchr@southernco.com>; Cindy Lowry <clowry@alabamarivers.org>
Subject: RE: Filing Difficulty with Harris PLP Comments - (P-2628)

Hi Jack,

We have received these comments and they will be included in the consultation record.

Thanks,

Angie Anderegg
Hydro Services
(205)257-2251
arsegars@southernco.com

From: Jack West <jwest@alabamarivers.org>
Sent: Monday, October 4, 2021 11:15 AM
To: Sarah Salazar <sarah.salazar@ferc.gov>; Anderegg, Angela Segars <ARSEGARS@southernco.com>
Cc: APC Harris Relicensing <g2apchr@southernco.com>; Cindy Lowry <clowry@alabamarivers.org>
Subject: Filing Difficulty with Harris PLP Comments - (P-2628)

EXTERNAL MAIL: Caution Opening Links or Files

Hi Sarah and Angie,

On Friday I filed Alabama Rivers Alliance's comments on the Preliminary Licensing Proposal for the Harris Project (P-2628), but I now realize the status of the filing is still showing as "pending" in FERC's system. Since there seems to be some kind of holdup with the filing, I wanted to transmit our comments to you via email, and I have also attached the filing receipt email I received from FERC's system on Friday (10/1/21). I will follow up with FERC tech support about this issue now and hope the comments come through on the docket soon.

If there is any other action I should take to ensure our comments are considered timely filed, please let me know.

Have a good day,

--

Jack West, Esq.
Policy and Advocacy Director
Alabama Rivers Alliance
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Celebrating more than 20 years of protecting Alabama's 132,000 miles of rivers and streams!

APC Harris Relicensing

From: eFiling@ferc.gov
Sent: Friday, October 1, 2021 1:50 PM
To: jwest@alabamarivers.org; efilingacceptance@ferc.gov
Subject: FERC Receipt of Filing in P-2628-065

Confirmation of Receipt

This is to confirm receipt by the FERC Office of the Secretary of the following electronic submission:

-Submission ID: 1245893
-Docket(s) No.: P-2628-065
-Filed By: Alabama Rivers Alliance
-Signed By: Jack West
-Filing Desc: Comments of Alabama Rivers Alliance on Preliminary Licensing Proposal under P-2628-065.
-Submission Date/Time: 10/1/2021 2:45:39 PM -Projected Filed Date/Time: 10/1/2021 2:45:39 PM (Subject to Change based on OPM/FERC Closure)

Additional detail about your filing is available via the following link:

https://urldefense.proofpoint.com/v2/url?u=https-3A__ferconline.ferc.gov_SubmissionStatus.aspx-3Fhashcode-3D0O5lwhj5rPMuWueXpc1VA&d=DwIFAg&c=AgWC6Nl7Slwpc9jE7UoQH1_Cvyci3SsTNfdLP4V1RCg&r=KIHEXxqCv-n6hwG7JCE9HbNBHXRXVRD7-u08-bjNu7Y&m=mdW9ayuRENxhU4V6byZs2LfX2qfzzLpSD_PmzFd2eBE&s=iN17sK-TVBRJE4vYuWlXkYQfFm4dJ0qJ8fu4l0wO6SM&e=

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