Alabama Power

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

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

Attachment 1

Battery Energy Storage System Report

Battery energy Storage System (BESS) Report

R.L. Harris Hydroelectric Project

FERC No. 2628

Prepared by:

Alabama Power Company

April 2021

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

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 "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

[1] Accession No. 20200611-5114
[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.

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).

2.0 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 on the operating curve where flows that are less than efficient gate cause increased vibrations in the turbine and 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

[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

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 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 3.03.0)
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 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]

---

[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.

- Financing - $4.6M[13]
- ***Total Installed Cost (2025$) - $96.6M ($1,610 / kW)***

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 $17.6M to the total cost of the project as outlined below.

- BESS System - $23.9M
- Interconnection - $9M
- Internal Overheads - $2.5M
- Contingency - $3.6M
- Financing - $2.0M
- ***Total Installed Cost (2025$) - $39.0M ($1,950 / 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

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

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 interconnection costs, internal overhead costs, contingency, and financing. These costs add an additional $10.8M (2025$) 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 - $2.7M[17]
- ***Total 2045 Replacement Cost (2025$) - $56.4M ($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 interconnection costs, internal overhead costs, contingency, and financing. These costs add an additional $10.8M (2025$) to the total cost of the project as outlined below:

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

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

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. If a BESS is needed, then it should be located at the most cost-effective location on 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.

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

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.

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.

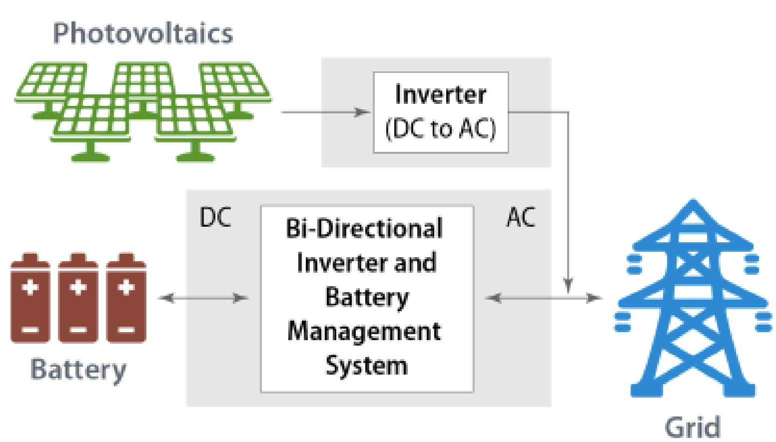
Dispatch and Charging

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. Source: NREL 2017

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 transfer 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

[19] A turbine efficiency of 90 percent is high for a turbine being operated at the lower end of its operating range.

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 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.

[20] Results are also applicable to Option B.

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

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 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)	$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

4.0 RESOURCE EFFECTS

Alabama Power is providing a scoping-level qualitative 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.

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 4-1 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 4-2 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 4-1 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 4-2 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[22].

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

[22] 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.

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.

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. 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 aquatic resources would be similar to Pre-Green Plan operations described in the *Downstream Release Alternatives Draft Phase 2 Study Report* (Alabama Power and Kleinschmidt Associates 2021). Wetted habitat would not differ substantially from Option A to Option B; further, Option B would not likely benefit habitat stability, because the peak release would still occur.

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 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.

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 remains unknown. However, it is known that a smaller battery would not achieve the desired benefits, because a peaking flow would still be required.

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

Alabama Power Company and Kleinschmidt Associates (Alabama Power and Kleinschmidt). 2018. Pre-Application Document for the R.L. Harris Hydroelectric Project (FERC No. 2628). Alabama Power Company, Birmingham, AL. prepared by Kleinschmidt. June 2018.

Alabama Power Company and Kleinschmidt Associates (Alabama Power and Kleinschmidt). 2020. Downstream Release Alternatives Final Phase 1 Study Report (FERC No. 2628). Alabama Power Company, Birmingham, AL. prepared by Kleinschmidt. April 2020.

Alabama Power Company and Kleinschmidt Associates (Alabama Power and Kleinschmidt). 2021. Downstream Release Alternatives Draft Phase 2 Study Report (FERC No. 2628). Alabama Power Company, Birmingham, AL. prepared by Kleinschmidt. April 2021.

Cole, Wesley, and A. Will Frazier. 2020. *Cost Projections for Utility-Scale Battery Storage: 2020 Update*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-75385. https://www.nrel.gov/docs/fy20osti/75385.pdf

Cushman, Robert M. 1985. "Review of Ecological Effects of Rapidly Varying Flows Downstream from Hydroelectric Facilities" in North American Journal of Fisheries Management. Volume 5, Issue 3A. July 1985.

Kleinschmidt Associates. 2020. Recreation Evaluation Report. R.L. Harris Hydroelectric Project (FERC No. 2628).

Nightengale, Tim & Reiser, Dudley & Hendrix, Albert & Beck, Stuart. (2008). Effects of Pulse-Type Flows on Aquatic Biota. Hydro Review. 27. 54-63.

NREL (National Renewable Energy Laboratory). 2020. *2020 Annual Technology Baseline*. Golden, CO: National Renewable Energy Laboratory.

NREL. 2021. Understanding Battery Energy Storage Systems and Their Role in Grid Integration | USAID-NREL Partnership | NREL

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

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at www.nrel.gov/publications.

Contract No. DE-AC36-08GO28308

Technical Report
NREL/TP-6A20-75385
June 2020

Cost Projections for Utility-Scale Battery Storage: 2020 Update

Wesley Cole and A. Will Frazier

National Renewable Energy Laboratory

Suggested Citation
Cole, Wesley, and A. Will Frazier. 2020. *Cost Projections for Utility-Scale Battery Storage: 2020 Update*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A20-75385. https://www.nrel.gov/docs/fy20osti/75385.pdf

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

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at www.nrel.gov/publications.

Contract No. DE-AC36-08GO28308

Technical Report
NREL/TP-6A20-75385
June 2020

National Renewable Energy Laboratory
15013 Denver West Parkway
Golden, CO 80401
303-275-3000 • www.nrel.gov

NOTICE

This work was authored by the National Renewable Energy Laboratory, operated by Alliance for Sustainable Energy, LLC, for the U.S. Department of Energy (DOE) under Contract No. DE-AC36-08GO28308. Funding provided by the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy Solar Energy Technologies Office. The views expressed herein do not necessarily represent the views of the DOE or the U.S. Government.

This report is available at no cost from the National Renewable Energy Laboratory (NREL) at www.nrel.gov/publications.

U.S. Department of Energy (DOE) reports produced after 1991 and a growing number of pre-1991 documents are available free via www.OSTI.gov.

Cover Photos by Dennis Schroeder: (clockwise, left to right) NREL 51934, NREL 45897, NREL 42160, NREL 45891, NREL 48097, NREL 46526.

NREL prints on paper that contains recycled content.

Acknowledgments

We are grateful to ReEDS modeling team for their input on this work. We also thank David Feldman (NREL), Ryan Hledik (Brattle), Cara Marcy (EPA), Vignesh Ramasamy (NREL), and Daniel Steinberg (NREL) for providing input and feedback on this report. This report was jointly funded by the EERE Office of Strategic Programs, Solar Energy Technologies Office, Water Power Technology Office, and Wind Energy Technology Office, under contract number DE-AC36-08GO28308. All errors and omissions are the sole responsibility of the authors.

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.

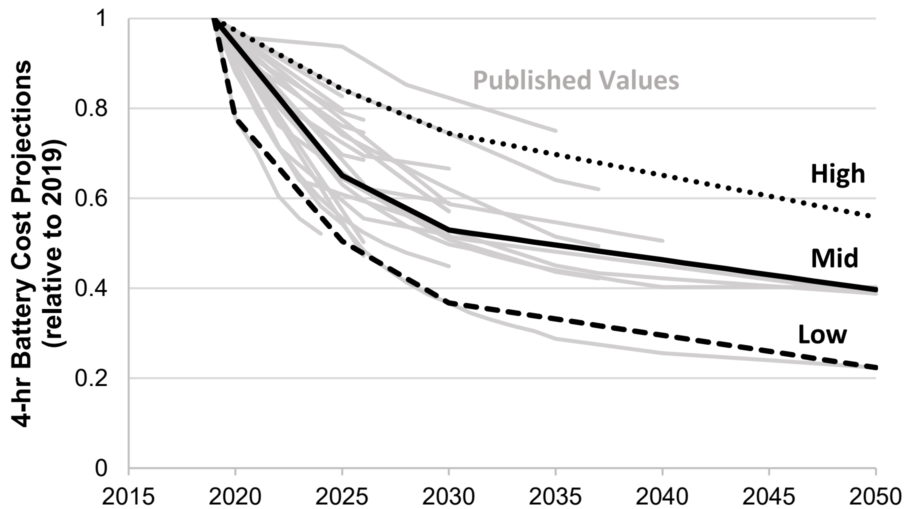


Figure ES-1. Battery cost projections for 4-hour lithium-ion systems, with values relative to 2019. The high, mid, and low cost projections developed in this work are shown as the bolded lines.

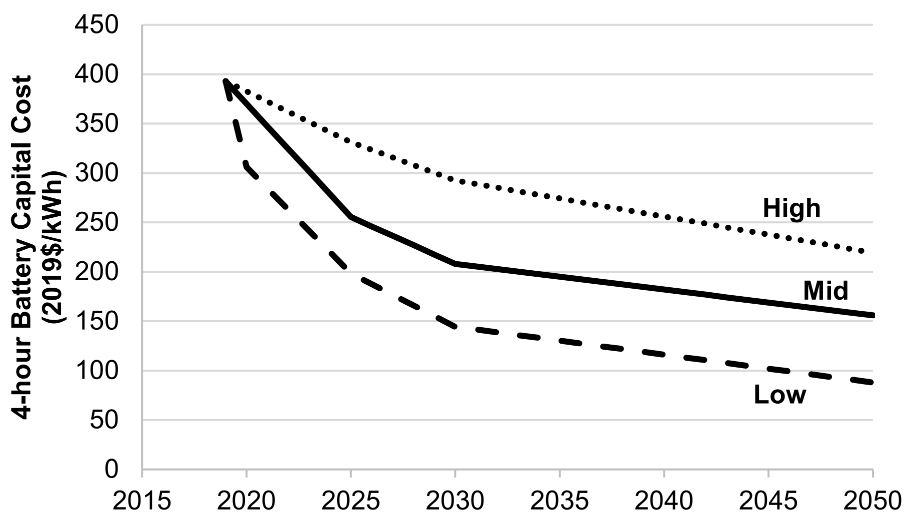


Figure ES-2. Battery cost projections for 4-hour lithium ion systems.

Table of Contents

List of Figures

List of Tables

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.

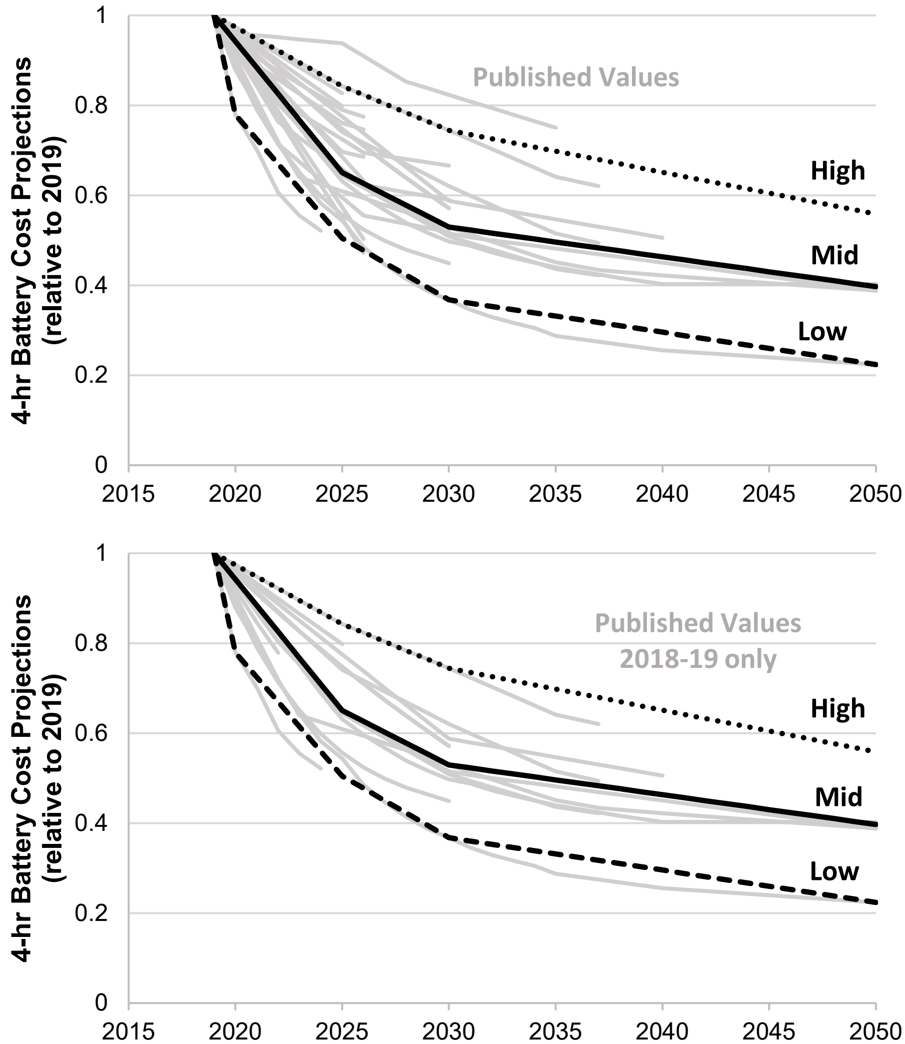


Figure 1. Battery cost projections for 4-hour lithium-ion systems, with values relative to 2019. The high, mid, and low cost projections developed in this work are shown as the bolded lines. The upper figure shows the full range of cost projections used in this work, while the lower figure shows only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

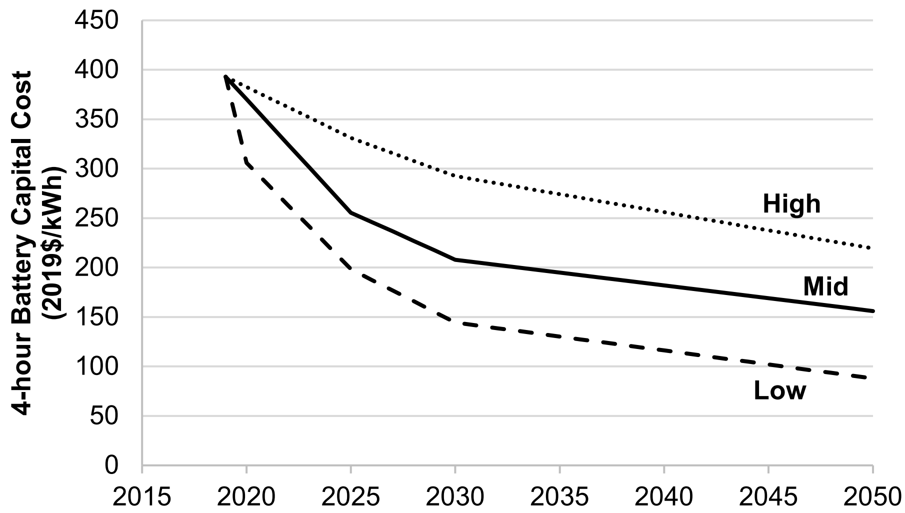
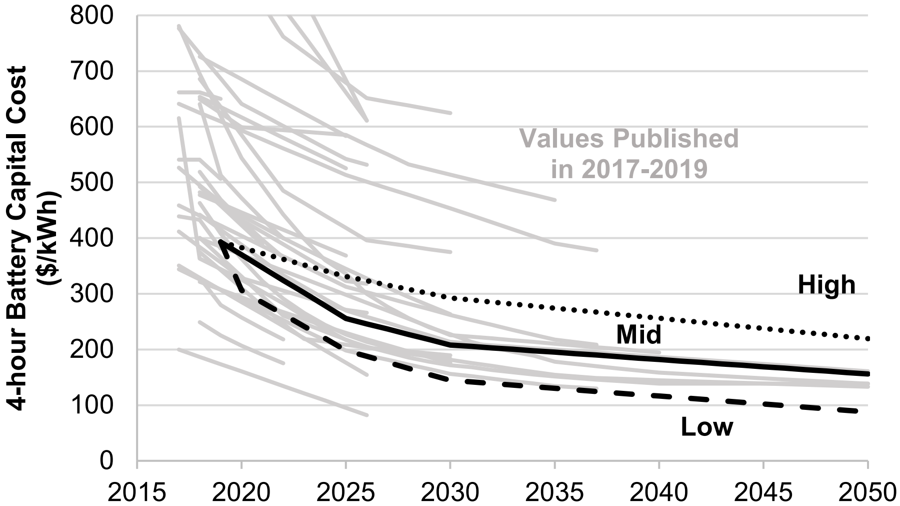


Figure 2. Battery cost projections for 4-hour lithium ion systems.

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.



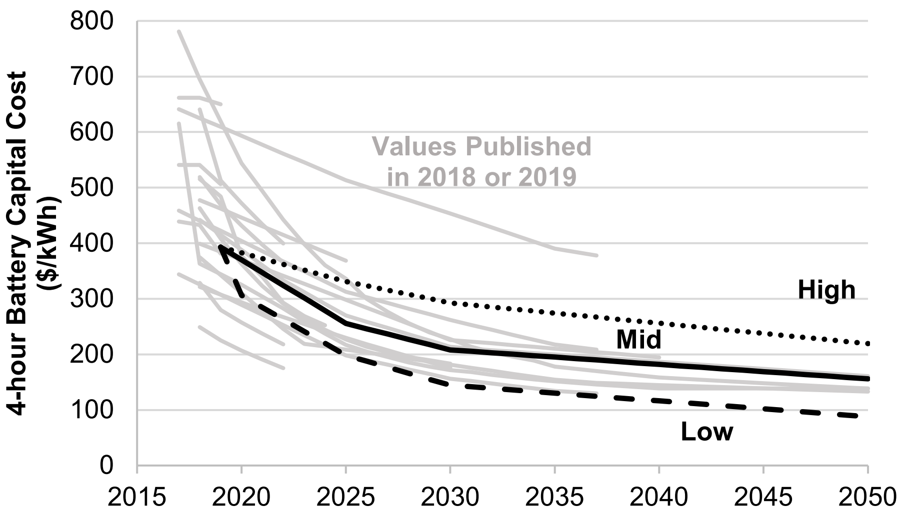


Figure 3. Battery cost projections developed in this work (bolded lines) relative to published cost projections. The upper figure shows the full range of cost projections used in this work, while the lower figure shows only those cost projections published after 2017. Cost values above $800/kWh are not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

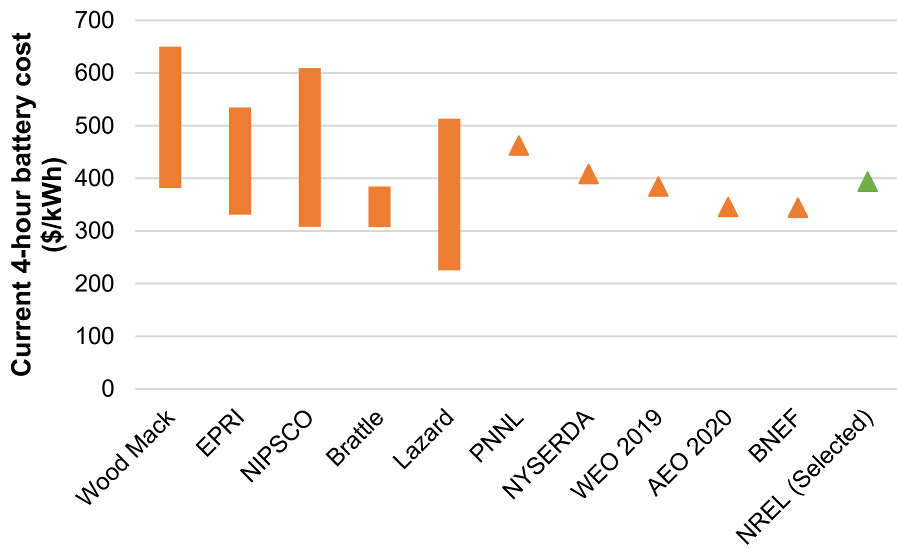


Figure 4. Current battery storage costs from studies published in 2018 or later. The NREL value (Feldman et al. Forthcoming) was selected as the 2019 starting cost for this work.

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.

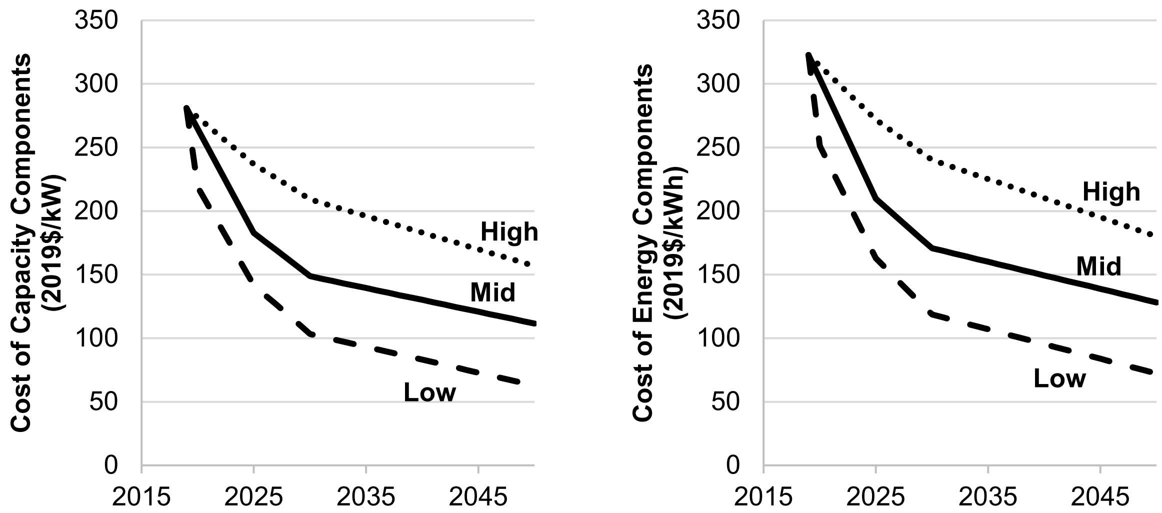


Figure 5. Cost projections for power (left) and energy (right) components of lithium-ion systems.
Note the different units in the two plots.

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.

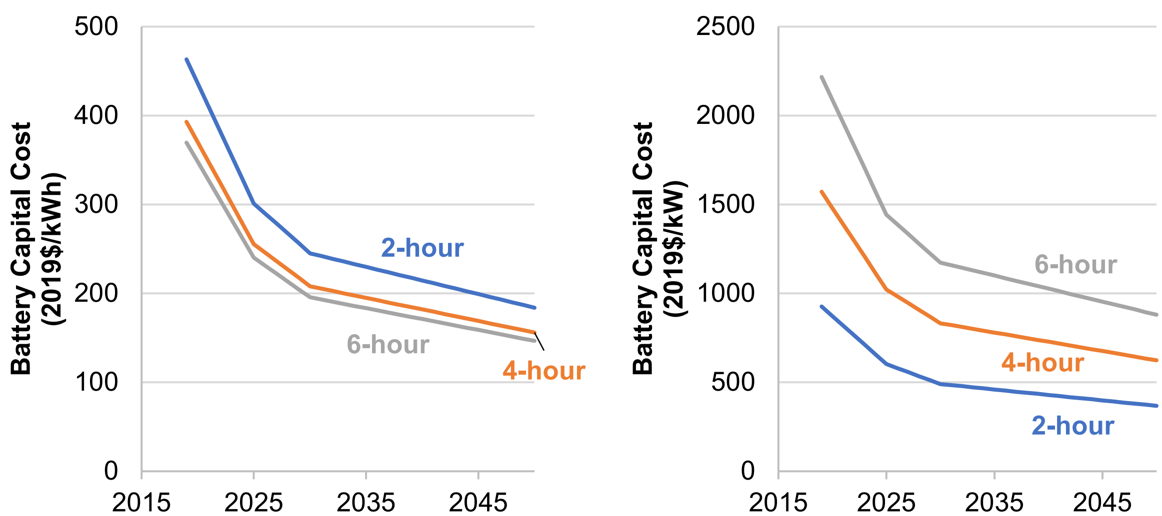


Figure 6. Cost projections for 2-, 4-, and 6-hour duration batteries using the mid cost projection.
Left shows the values in $/kWh, while right shows the costs in $/kW.

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.

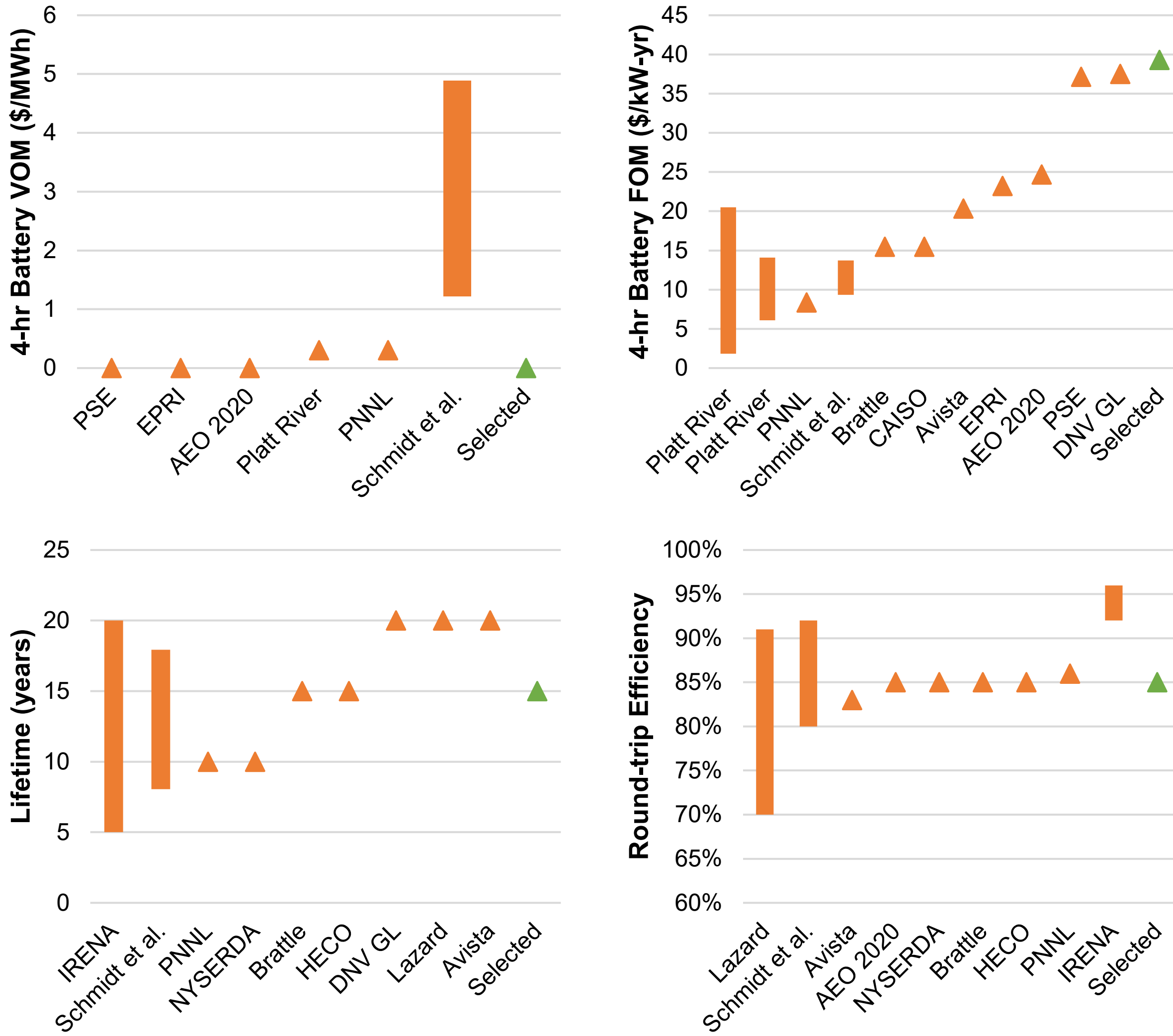


Figure 7. Variable O&M (top right), fixed O&M (top left), lifetime (bottom right), and round-trip efficiency (bottom left) from various published sources. The values selected for this study are the right-most values shown.

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.

References

Aquino, Todd, Mathew Roling, Chris Baker, and Lukas Rowland. 2017. "Battery Energy Storage Technology Assessment." https://www.prpa.org/wp-content/uploads/2017/10/HDR-Battery-Energy-Storage-Assessment.pdf.

Avista. 2017. "2017 Electric Integrated Resource Plan." AVISTA. https://www.myavista.com/-/media/myavista/content-documents/about-us/our-company/irp-documents/2017-electric-irp-final.pdf?la=en.

BNEF. 2019. "Long-Term Energy Storage Outlook."

Cohen, Stuart, Jonathon Becker, David A. Bielen, Maxwell Brown, Wesley J. Cole, Kelly P. Eurek, Allister Frazier, et al. 2019. "Regional Energy Deployment System (ReEDS) Model Documentation: Version 2018." NREL/TP-6A20-72023. Golden, CO: National Renewable Energy Laboratory. https://doi.org/10.2172/1505935.

Cole, Wesley, and Will A. Frazier. 2019. "Cost Projections for Utility-Scale Battery Storage." Technical Report NREL/TP-6A20-73222. Golden, CO: National Renewable Energy Laboratory. https://doi.org/10.2172/1529218.

Cole, Wesley, Cara Marcy, Venkat Krishnan, and Robert Margolis. 2016. "Utility-Scale Lithium-Ion Storage Cost Projections for Use in Capacity Expansion Models." In *2016 North American Power Symposium (NAPS)*, 1–6. Denver, CO, United States: IEEE. https://doi.org/10.1109/NAPS.2016.7747866.

Comello, Stephen, and Stefan Reichelstein. 2019. "The Emergence of Cost Effective Battery Storage." *Nature Communications* 10 (1): 1–9. https://doi.org/10.1038/s41467-019-09988-z.

DNV GL. 2017. "Energy Storage Potential Evaluation." 10046409–R–01–E. https://www.pacificpower.net/content/dam/pacific_power/doc/About_Us/Rates_Regulation/Oregon/Regulatory_Filings/Docket_UM_1857/7-14-17_Filing/report/exhibits/Appendix_A_REDACTED.pdf.

EIA. 2020. "Annual Energy Outlook 2020 with Projections to 2050." AEO2020. Annual Energy Outlook. Washington, D.C.: U.S. Energy Information Administration. https://www.eia.gov/outlooks/aeo/pdf/AEO2019.pdf.

Energy and Environmental Economics. 2017. "RESOLVE Documentation: CPUC 2017 IRP: Inputs & Assumptions." Energy and Environmental Economics, Inc. http://cpuc.ca.gov/uploadedFiles/CPUCWebsite/Content/UtilitiesIndustries/Energy/EnergyPrograms/ElectPowerProcurementGeneration/irp/AttachmentB.RESOLVE_Inputs_Assumptions_2017-09-15.pdf.

EPRI. 2018. "Energy Storage Technology and Cost Assessment: Executive Summary." 3002013958. https://www.epri.com/#/pages/product/000000003002013958/&src=mail?lang=en-US.

Feldman, David, Ran Fu, Ashwin Ramdas, Jal Desai, and Robert Margolis. Forthcoming. "U.S. Solar Photovoltaic System and Energy Storage Cost Benchmark: Q1 2019." NREL/TP-6A20-75161. Golden, CO: National Renewable Energy Laboratory.

Hledik, Ryan, Judy Chang, Roger Lueken, Johannes Pfeifenberger, John Imon Pedtke, and Jeremy Vollen. 2018. "The Economic Potential for Energy Storage in Nevada," October, 92.

IEA. 2019. "World Energy Outlook 2019." International Energy Agency.

IRENA. 2017. "Electricity Storage and Renewables: Costs and Markets to 2030." https://www.irena.org/publications/2017/Oct/Electricity-storage-and-renewables-costs-and-markets.

Lazard. 2018. "Lazard's Levelized Cost of Storage Analysis—Version 4.0." https://www.lazard.com/media/450774/lazards-levelized-cost-of-storage-version-40-vfinal.pdf.

———. 2019. "Lazard's Levelized Cost of Storage Analysis—Version 5.0." https://www.lazard.com/media/451087/lazards-levelized-cost-of-storage-version-50-vf.pdf.

Mai, Trieu, Easan Drury, Kelly Eurek, Natalie Bodington, Anthony Lopez, and Andrew Perry. 2013. "Resource Planning Model: An Integrated Resource Planning and Dispatch Tool for Regional Electric Systems." TP-6A20-56723. National Renewable Energy Laboratory. http://www.nrel.gov/docs/fy13osti/56723.pdf.

Mongird, K, V Viswanathan, P Balducci, J Alam, V Fotedar, V Koritarov, and B Hadjerioua. 2019. "Energy Storage Technology and Cost Characterization Report." PNNL-28866. Richland, WA: Pacific Northwest National Laboratory. https://www.energy.gov/sites/prod/files/2019/07/f65/Storage%20Cost%20and%20Performance%20Characterization%20Report_Final.pdf.

Navigant. 2017. "Storage in the Northwest." Presented at the Northwest Demand Response and Energy Storage Summit, Portland, OR, September 28.

Nian, Victor, Gautam Jindal, and Hailong Li. 2019. "A Feasibility Study on Integrating Large-Scale Battery Energy Storage Systems with Combined Cycle Power Generation – Setting the Bottom Line." *Energy* 185 (October): 396–408. https://doi.org/10.1016/j.energy.2019.07.028.

NIPSCO. 2018. "NIPSCO Integrated Resource Plan 2018: Appendix A." Northern Indiana Public Service Company LLC. https://www.nipsco.com/docs/librariesprovider11/rates-and-tariffs/irp/2018-nipsco-irp-appendix-a.pdf?sfvrsn=2.

NREL. 2019. "2019 Annual Technology Baseline." Golden, CO: National Renewable Energy Laboratory. https://atb.nrel.gov/.

NYSERDA. 2018. "New York State Energy Storage Roadmap." New York State Energy Research and Development Authority. http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={2A1BFBC9-85B4-4DAE-BCAE-164B21B0DC3D}.

Puget Sound Energy. 2017. "2017 PSE Integrated Resource Plan." https://www.pse.com/pages/energy-supply/resource-planning.

Schmidt, Oliver, Sylvain Melchior, Adam Hawkes, and Iain Staffell. 2019. "Projecting the Future Levelized Cost of Electricity Storage Technologies." *Joule*, January. https://doi.org/10.1016/j.joule.2018.12.008.

Wood Mackenzie & ESA. 2019. "U.S. Energy Storage Monitor: Q4 2018."

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

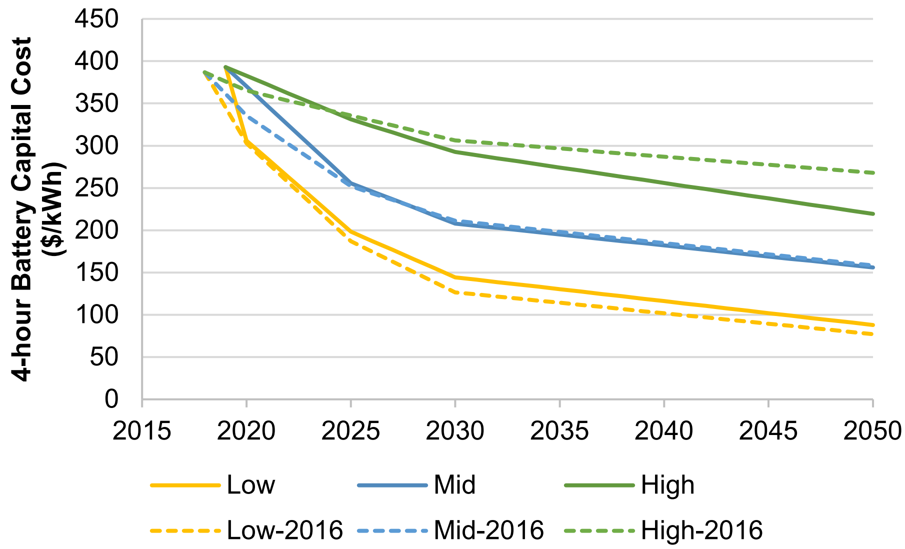


Figure 8. Comparison of cost projections developed in this report (solid lines) against the values from the 2019 cost projection report (Cole and Frazier 2019) (dashed lines).

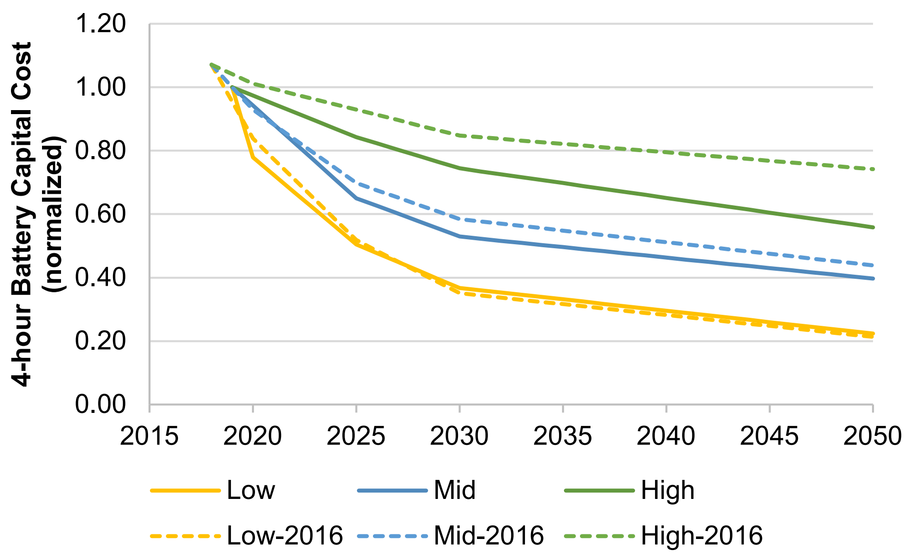


Figure 9. Comparison of cost projections developed in this report (solid lines) the values from the 2019 cost projection report (Cole and Frazier 2019) (dashed lines), with all values normalized to the “Mid” cost projection in the year 2019.

Attachment 2
BESS Study Report Consultation Record (April 2020-
March 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. Request for Water Quality Study Modification

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

---

[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. <u>A Wider Variety of Release Patterns Needs to Be Modeled and Considered</u>

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.

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)

[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)

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

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,

Angela 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.

Draft Downstream Release Alternatives (Phase 1) Study Report

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.

Alabama Power Response:

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. <u>Modifications to Existing Studies</u>

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

[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.

Background

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

---

[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.

---

[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

---

[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.

---

[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.

[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.

LITERATURE CITED

Irwin, E.R., ed. 2019. 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. 93 p. access at https://doi.org/10.3133/ofr20191026.

(USDA) U.S. Department of Agriculture. 2020. Plant Database, Plants Profiles: *Acorus americanus* (Raf.) Raf. and *Acorus calamus* L. Available at: https://plants.sc.egov.usda.gov/core/profile?symbol=ACAM and https://plants.sc.egov.usda.gov/core/profile?symbol=ACCA4, respectively. Accessed on July 31, 2020.

(DOE) U.S. Department of Energy. 2018. U.S. Utility-Scale Photovoltaics-Plus-Energy Storage System Costs Benchmark, DOE's National Renewable Energy Laboratory, Technical Report NREL/TP-6A20-71714, November 2018.

Determination on Study Modifications

APC Harris Relicensing <g2apchr@southernco.com>

Wed 8/12/2020 8:45 PM

To: APC Harris Relicensing <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>; blacklake20@gmail.com <blacklake20@gmail.com>; blm_es_inquiries@blm.gov <blm_es_inquiries@blm.gov>; bob.stone@smimail.net <bob.stone@smimail.net>; bradandsue795@gmail.com <bradandsue795@gmail.com>; bradfordt71@gmail.com <bradfordt71@gmail.com>; brian.atkins@adeca.alabama.gov <brian.atkins@adeca.alabama.gov>; bruce.bradford@forestry.alabama.gov <bruce.bradford@forestry.alabama.gov>; bsmith0253@gmail.com <bsmith0253@gmail.com>; butchjackson60@gmail.com <butchjackson60@gmail.com>; bwhaley@randolphcountyeda.com <bwhaley@randolphcountyeda.com>; carolbuggknight@hotmail.com <carolbuggknight@hotmail.com>; celestine.bryant@actribe.org <celestine.bryant@actribe.org>; cengstrom@centurytel.net <cengstrom@centurytel.net>; ceo@jcchamber.com <ceo@jcchamber.com>; cggoodma@southernco.com <cggoodma@southernco.com>; cgnav@uscg.mil <cgnav@uscg.mil>; chad@cleburnecountychamber.com <chad@cleburnecountychamber.com>; chandlermary937@gmail.com <chandlermary937@gmail.com>; chiefknight2002@yahoo.com <chiefknight2002@yahoo.com>; chimneycove@gmail.com <chimneycove@gmail.com>; chris.goodell@kleinschmidtgroup.com <chris.goodell@kleinschmidtgroup.com>; chris.greene@dcnr.alabama.gov <chris.greene@dcnr.alabama.gov>; chris.smith@dcnr.alabama.gov <chris.smith@dcnr.alabama.gov>; chris@alaudubon.org <chris@alaudubon.org>; chuckdenman@hotmail.com <chuckdenman@hotmail.com>; clark.maria@epa.gov <clark.maria@epa.gov>; claychamber@gmail.com <claychamber@gmail.com>; clint.lloyd@auburn.edu <clint.lloyd@auburn.edu>; cljohnson@adem.alabama.gov <cljohnson@adem.alabama.gov>; clowry@alabamarivers.org <clowry@alabamarivers.org>; cmnix@southernco.com <cmnix@southernco.com>; coetim@aol.com <coetim@aol.com>; colin.dinken@kleinschmidtgroup.com <colin.dinken@kleinschmidtgroup.com>; cooper.jamal@epa.gov <cooper.jamal@epa.gov>; coty.brown@alea.gov <coty.brown@alea.gov>; craig.litteken@usace.army.mil <craig.litteken@usace.army.mil>; crystal.davis@adeca.alabama.gov <crystal.davis@adeca.alabama.gov>; crystal.lakewedoweedocks@gmail.com <crystal.lakewedoweedocks@gmail.com>; crystal@hunterbend.com <crystal@hunterbend.com>; dalerose120@yahoo.com <dalerose120@yahoo.com>; damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; dbronson@charter.net <dbronson@charter.net>; dcnr.wffdirector@dcnr.alabama.gov <dcnr.wffdirector@dcnr.alabama.gov>; decker.chris@epa.gov <decker.chris@epa.gov>; devridr@auburn.edu <devridr@auburn.edu>; dfarr@randolphcountyalabama.gov <dfarr@randolphcountyalabama.gov>; dhayba@usgs.gov <dhayba@usgs.gov>; djmoore@adem.alabama.gov <djmoore@adem.alabama.gov>; dkanders@southernco.com <dkanders@southernco.com>; dolmoore@southernco.com <dolmoore@southernco.com>; donnamat@aol.com <donnamat@aol.com>; doug.deaton@dcnr.alabama.gov <doug.deaton@dcnr.alabama.gov>; dpreston@southernco.com <dpreston@southernco.com>; drheinzen@charter.net <drheinzen@charter.net>; ebt.drt@numail.org <ebt.drt@numail.org>; Eddie Plemons <eddieplemons@charter.net>; eilandfarm@aol.com <eilandfarm@aol.com>; el.brannon@yahoo.com <el.brannon@yahoo.com>; elizabeth-toombs@cherokee.org <elizabeth-toombs@cherokee.org>; emathews@aces.edu <emathews@aces.edu>; eric.sipes@ahc.alabama.gov <eric.sipes@ahc.alabama.gov>; evan.lawrence@dcnr.alabama.gov <evan.lawrence@dcnr.alabama.gov>; evan_collins@fws.gov <evan_collins@fws.gov>; eveham75@gmail.com <eveham75@gmail.com>;

fal@adem.alabama.gov <fal@adem.alabama.gov>; fredcanoes@aol.com <fredcanoes@aol.com>; gardenergirl04@yahoo.com <gardenergirl04@yahoo.com>; garyprice@centurytel.net <garyprice@centurytel.net>; gene@wedoweelakehomes.com <gene@wedoweelakehomes.com>; georgettraylor@centurylink.net <georgettraylor@centurylink.net>; gerryknight77@gmail.com <gerryknight77@gmail.com>; gfhorn@southernco.com <gfhorn@southernco.com>; gjobsis@americanrivers.org <gjobsis@americanrivers.org>; gld@adem.alabama.gov <gld@adem.alabama.gov>; glea@wgsarrell.com <glea@wgsarrell.com>; gordon.lisa-perras@epa.gov <gordon.lisa-perras@epa.gov>; 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>; henry.mealing@kleinschmidtgroup.com <henry.mealing@kleinschmidtgroup.com>; 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>; kate.cosnahan@kleinschmidtgroup.com <kate.cosnahan@kleinschmidtgroup.com>; 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>; lswinsto@southernco.com <lswinsto@southernco.com>; 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>; 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
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!

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].

--

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 Power

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
Jack West	Alabama Rivers Alliance
Lee Anne Wofford	Alabama Historical Commission

Document Content(s)

Harris Relicensing Progress Update

APC Harris Relicensing <g2apchr@southernco.com>

Fri 10/30/2020 5:37 PM

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>; 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>; Beason, Jeffrey A. <JABEASON@southernco.com>; beckyrainwater1@yahoo.com <beckyrainwater1@yahoo.com>; bill_pearson@fws.gov <bill_pearson@fws.gov>; blacklake20@gmail.com <blacklake20@gmail.com>; blm_es_inquiries@blm.gov <blm_es_inquiries@blm.gov>; bob.stone@smimail.net <bob.stone@smimail.net>; bradandsue795@gmail.com <bradandsue795@gmail.com>; bradfordt71@gmail.com <bradfordt71@gmail.com>; brian.atkins@adeca.alabama.gov <brian.atkins@adeca.alabama.gov>; bruce.bradford@forestry.alabama.gov <bruce.bradford@forestry.alabama.gov>; bruce@bruceknapp.com <bruce@bruceknapp.com>; bsmith0253@gmail.com <bsmith0253@gmail.com>; btseale@southernco.com <btseale@southernco.com>; butchjackson60@gmail.com <butchjackson60@gmail.com>; bwhaley@randolphcountyeda.com <bwhaley@randolphcountyeda.com>; carolbuggknight@hotmail.com <carolbuggknight@hotmail.com>; celestine.bryant@actribe.org <celestine.bryant@actribe.org>; cengstrom@centurytel.net <cengstrom@centurytel.net>; ceo@jcchamber.com <ceo@jcchamber.com>; cggoodma@southernco.com <cggoodma@southernco.com>; cgnav@uscg.mil <cgnav@uscg.mil>; chad@cleburnecountychamber.com <chad@cleburnecountychamber.com>; chandlermary937@gmail.com <chandlermary937@gmail.com>; chiefknight2002@yahoo.com <chiefknight2002@yahoo.com>; chimneycove@gmail.com <chimneycove@gmail.com>; chris.goodell@kleinschmidtgroup.com <chris.goodell@kleinschmidtgroup.com>; chris.greene@dcnr.alabama.gov <chris.greene@dcnr.alabama.gov>; chris.smith@dcnr.alabama.gov <chris.smith@dcnr.alabama.gov>; chris@alaudubon.org <chris@alaudubon.org>; chuckdenman@hotmail.com <chuckdenman@hotmail.com>; clark.maria@epa.gov <clark.maria@epa.gov>; claychamber@gmail.com <claychamber@gmail.com>; clint.lloyd@auburn.edu <clint.lloyd@auburn.edu>; cljohnson@adem.alabama.gov <cljohnson@adem.alabama.gov>; clowry@alabamarivers.org <clowry@alabamarivers.org>; cmnix@southernco.com <cmnix@southernco.com>; coetim@aol.com <coetim@aol.com>; colin.dinken@kleinschmidtgroup.com <colin.dinken@kleinschmidtgroup.com>; cooper.jamal@epa.gov <cooper.jamal@epa.gov>; coty.brown@alea.gov <coty.brown@alea.gov>; craig.litteken@usace.army.mil <craig.litteken@usace.army.mil>; crystal.davis@adeca.alabama.gov <crystal.davis@adeca.alabama.gov>; crystal.lakewedoweedocks@gmail.com <crystal.lakewedoweedocks@gmail.com>; crystal@hunterbend.com <crystal@hunterbend.com>; dalerose120@yahoo.com <dalerose120@yahoo.com>; damon.abernethy@dcnr.alabama.gov <damon.abernethy@dcnr.alabama.gov>; dbronson@charter.net <dbronson@charter.net>; dcnr.wffdirector@dcnr.alabama.gov <dcnr.wffdirector@dcnr.alabama.gov>; decker.chris@epa.gov <decker.chris@epa.gov>; devridr@auburn.edu <devridr@auburn.edu>; dfarr@randolphcountyalabama.gov <dfarr@randolphcountyalabama.gov>; dhayba@usgs.gov <dhayba@usgs.gov>; djmoore@adem.alabama.gov <djmoore@adem.alabama.gov>; dkanders@southernco.com <dkanders@southernco.com>; donnamat@aol.com <donnamat@aol.com>; doug.deaton@dcnr.alabama.gov <doug.deaton@dcnr.alabama.gov>; dpreston@southernco.com <dpreston@southernco.com>; drheinzen@charter.net <drheinzen@charter.net>; ebt.drt@numail.org <ebt.drt@numail.org>; eddieplemons@charter.net <eddieplemons@charter.net>; eilandfarm@aol.com <eilandfarm@aol.com>; el.brannon@yahoo.com <el.brannon@yahoo.com>; elizabeth-toombs@cherokee.org <elizabeth-toombs@cherokee.org>; emathews@aces.edu <emathews@aces.edu>; eric.sipes@ahc.alabama.gov <eric.sipes@ahc.alabama.gov>; erin_padgett@fws.gov <erin_padgett@fws.gov>; evan.lawrence@dcnr.alabama.gov <evan.lawrence@dcnr.alabama.gov>; evan_collins@fws.gov <evan_collins@fws.gov>; eveham75@gmail.com <eveham75@gmail.com>; fal@adem.alabama.gov <fal@adem.alabama.gov>; fredcanoes@aol.com <fredcanoes@aol.com>; gardenergirl04@yahoo.com <gardenergirl04@yahoo.com>; garyprice@centurytel.net <garyprice@centurytel.net>; gene@wedoweelakehomes.com <gene@wedoweelakehomes.com>; georgettraylor@centurylink.net <georgettraylor@centurylink.net>; gerryknight77@gmail.com <gerryknight77@gmail.com>; gfhorn@southernco.com <gfhorn@southernco.com>; gjobsis@americanrivers.org <gjobsis@americanrivers.org>; gld@adem.alabama.gov <gld@adem.alabama.gov>; glea@wgsarrell.com <glea@wgsarrell.com>; gordon.lisa-perras@epa.gov <gordon.lisa-perras@epa.gov>; 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

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>

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
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!

APC Harris Relicensing

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

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!

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

[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
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!

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