

**Hydro Modernization**

2025 Integrated Resource Plan

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**Contents**

[1. Introduction 1](#_Toc188258967)

[2. Importance of Continued Hydro Modernization Investment 2](#_Toc188258968)

[3. 2025 IRP Hydro Modernization Requests 5](#_Toc188258969)

[3.1. History & Descriptions of Georgia Power Hydro Fleet in 2025 IRP Requests 5](#_Toc188258970)

[3.2. Scopes of Proposed Hydro Modernization Projects 8](#_Toc188258971)

[3.3. Estimated Schedules of Proposed Hydro Modernization Projects 10](#_Toc188258972)

[3.4. Estimated Costs of Proposed Hydro Modernization Projects 10](#_Toc188258973)

[4. Cost-Benefit Analysis & Economic Comparison of Alternatives 12](#_Toc188258974)

[4.1. Analysis Approach 12](#_Toc188258975)

[4.2. Key Analysis Assumptions 16](#_Toc188258976)

[5. Summary of Analysis Results 19](#_Toc188258977)

[5.1. Plant Burton approved in 2022 IRP 19](#_Toc188258978)

[5.2. Remaining Hydro Fleet requested in 2025 IRP 20](#_Toc188258979)

[6. Conclusion 22](#_Toc188258980)

[Attachment A – Photos before and after Modernization](#_Toc187250090)

[Attachment B – Unit Retrofit Feasibility Study – Burton](#_Toc187250091) PUBLIC DISCLOSURE

[Attachment C – Dam Removal Feasibility Study – Burton](#_Toc187250092)

[Attachment D – Dam Removal Feasibility Study – North Highlands](#_Toc187250093) PUBLIC DISCLOSURE

[Attachment E – Dam Removal Feasibility Study – Wallace](#_Toc187250094) PUBLIC DISCLOSURE

[Attachment F – Planning Level Cost Study for Twelve Dam Removals](#_Toc187250095)

[Attachment G – North Georgia Operations Modeling Summary](#_Toc187250096)

[Attachment H – Chattahoochee Operations Modeling Summary](#_Toc187250097)

[Attachment I – Central Georgia Operations Modeling Summary](#_Toc187250098)

[Attachment J – Cost-Benefit Analysis Detailed Results – MG0](#_Toc187250099) PUBLIC DISCLOSURE

[Attachment K – Cost-Benefit Analysis Detailed Results – 111-MG0](#_Toc187250100) PUBLIC DISCLOSURE

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# Introduction

Georgia Power Company (“Georgia Power” or the “Company”) is progressing on the seven hydroelectric (“hydro”) modernization projects approved by the Georgia Public Service Commission (the “Commission”) in the 2019 and 2022 Integrated Resource Plans (“IRPs”). Building on this experience, the Company is requesting approval to complete hydro modernization projects on the remaining hydro generating fleet operated by Georgia Power. Hydro modernization projects include critical replacements and/or refurbishments needed for turbines, generators, and balance of plant (“BOP”) equipment. Completing the remaining nine hydro modernization projects is crucial to maintaining the operation of these resources, being able to fully optimize the operation of the hydro fleet, as well as maximizing flexibility and economies of scale for the remaining projects. These hydro facilities include:

* Plant Tallulah and Plant Yonah in the North Georgia Hydro Group,
* Plant Bartletts Ferry Units 5 and 6, Plant Goat Rock, and Plant North Highlands in the Chattahoochee Hydro Group,
* Plant Lloyd Shoals and Plant Wallace (including Units 1, 2, 5 & 6 Pumped Storage and   
  Units 3-4) in the Central Georgia Hydro Group, and
* Plants Flint River and Morgan Falls.

The Stipulation approved in the 2022 IRP Final Order requires that all future hydro modernization requests include a cost-benefit analysis and economic comparison of the alternatives to modernization. Additionally, this type of analysis is required in the 2025 IRP for the previously approved Plant Burton.[[1]](#footnote-2) These analyses for Plant Burton and the remaining hydro fleet are detailed in Sections 4 & 5 of this document. Modernizing these plants preserves the energy and capacity benefits of these emissions-free resources during a period when additional capacity is needed as the Company experiences substantial load growth.

# Importance of Continued Hydro Modernization Investment

As discussed in Section 8.6 of the 2025 IRP Main Document (“Main Document”), Georgia Power’s hydro fleet includes some of the oldest generating resources owned by the Company with six plants over 100 years old and another five that are more than 97 years old. These resources include critical equipment at or nearing the end of its useful life. Investments in the modernization of these resources are required in order for customers to continue to benefit from the Company’s hydro resources for at least another forty years. Through the approvals in both the 2019 and 2022 IRPs, the Commission has recognized the importance of maintaining these valuable, dispatchable, and   
zero-emissions resources that provide unique benefits to the state of Georgia. Photos showing examples of pre- and post-modernization equipment at currently approved projects are provided in Attachment A.

**FERC License Compliance**

Georgia Power must keep these hydro units operational and capable of generating electricity in order to meet the compliance requirements of the current licenses issued by the Federal Energy Regulatory Commission (“FERC”) under the Federal Power Act (“FPA”). License holders are required to make all necessary replacements to maintain facilities in a condition adequate for the efficient operation for the development and transmission of power.[[2]](#footnote-3) FERC has stated, in an Order approving a license amendment associated with one of the hydro modernization projects previously approved by the Commission, that “given the age of the equipment, if Georgia Power does not conduct the proposed work, the [facility] would be at risk of non-operability and might not be able to be operated safely within the current license requirements…The proposed upgrades would allow Georgia Power to adequately maintain the project and meet the terms of its current license.”[[3]](#footnote-4)

At sites not yet approved for hydro modernization by the Commission, Georgia Power already has four hydro units (Plant Morgan Falls Units 3 & 4 and Plant Goat Rock Units 4 & 5) on forced outage that will remain inoperable until hydro modernization work is complete. Therefore, approval of the remaining hydro modernization projects in this IRP is needed to ensure a coordinated effort to maintain operability of the hydro fleet for ongoing compliance with the Company’s FERC licenses and mitigate the risk of additional units being placed on forced outage.

**Coordinated Effort for Remaining Hydro Fleet**

The hydro modernization effort seeks to strategically plan projects while optimizing resources, as well as design, planning, plant performance, river management, and execution of work in a more efficient manner than a longer-term piecemeal approach. Approval of the remaining fleet will allow the Company the flexibility to address the sites with the most pressing need of maintenance to mitigate extended unit outages in the near future, thereby benefiting the overall hydro modernization schedule. This approval will also maximize flexibility and efficiency for project implementation related to supply chain, permitting, labor force, and clean energy incentives, such as grant and loan opportunities.

Given the age of the hydro fleet, these projects have unique challenges related to engineering, procurement, and construction for this highly specialized equipment. Many of the original suppliers no longer exist and the equipment is obsolete, meaning there is no longer an industry support network for the existing parts. Therefore, the contacts, processes, and specialized work crews created as Georgia Power gains experience through the first seven approved hydro modernization projects are valuable resources that the Company must continue to leverage while assembled. These advantages are maximized through this comprehensive investment strategy to modernize the remaining hydro fleet to best serve customers for decades to come.

A key benefit of the Company’s strategic approach to modernization is that new replacement equipment will be consistently applied across all plants. This coordination will allow the Company to leverage economies of scale when procuring parts. A coordinated approach provides for common families of equipment across the hydro fleet, which can help the Company reduce specialized training and optimize its inventories. Specifically, approval of the remaining hydro fleet would allow the Company to make firm commitments for production slots for long-lead time equipment, reducing schedule risk. Replacing the equipment through an optimized modernization process also allows for a consistent design across units and minimizes outages and river/lake impact. Significantly, it can also reduce construction mobilization costs at the sites.

Additionally, as discussed in Section 8.6.2 in the Main Document, Georgia Power’s approved hydro modernization projects have been selected for approximately $15 million in Department of Energy (“DOE”) grants under Energy Policy Act Sections 243 and 247 of the Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law. The selected projects are Plant Tugalo Units 1-4 Turbine Upgrades ($5 million), Plant Tugalo Generator Upgrades ($5 million), and Plant Bartletts Ferry Units 1-4 Generator Upgrades ($5 million). These incentive programs are limited and will only be available until the allotted budgets are dispersed to the competitively awarded projects. For example, the Section 243 grant program was over-subscribed for the allotted budget, and DOE was not able to award grants to all eligible projects. However, the Section 247 grant program was under-subscribed, and DOE plans to open a new window to allow for additional projects to compete for this budgeted funding. If the hydro modernization projects at the remaining hydro facilities were approved by the Commission, the Company would have the certainty to complete the steps necessary to be able to compete for available benefits to be passed on to its customers for all projects.

Georgia Power is also pursuing DOE loan opportunities under the Title 17 program under Section 1706. Currently, these efforts include the 2019 and 2022 IRP approved projects, and the Company would extend these efforts to the additional projects approved in the 2025 IRP. The Company is currently working with DOE to ensure these projects meet the eligibility criteria for the Title 17 loan program. Approval of the remaining hydro modernization projects would allow Georgia Power to maximize benefits to customers from federal clean energy incentives, including grants, loans, and tax credits.

**Hydro Group Optimization**

Georgia Power is requesting approval of these modernization projects by river chain, or hydro group. This approach is consistent with FERC licenses, as well as DOE grant programs. Approval of the remaining facilities by river chain will create efficiencies for any license amendments that may be needed for the completion of these projects. The FERC license amendment process does not have any fixed timelines for approval, which leads to schedule uncertainty for modernization. For the currently approved projects, the Company has experienced that the FERC review and approval process for these license amendments has taken up to two years, and any efficiency to being able to pursue approval of multiple locations within one FERC license amendment would be beneficial to the overall hydro modernization schedule. Commission approval for all remaining hydro facilities would give the Company certainty to pursue amendments for all remaining plants on the same license.

Completing the modernization of the full hydro group on a river chain not only provides efficiencies during the project process but also enables improved operations following completion. The Company will be able to realize the full benefits of enhanced fleet dispatch and operational efficiency of each river chain. Specifically, the turbine and generator upgrades are expected to increase the efficiency of each unit, and upgraded control systems will allow for optimized water flow between interconnected facilities along each river chain. Modernized facilities will be updated with digital instrumentation and control systems that will allow for optimized dispatch of each facility.

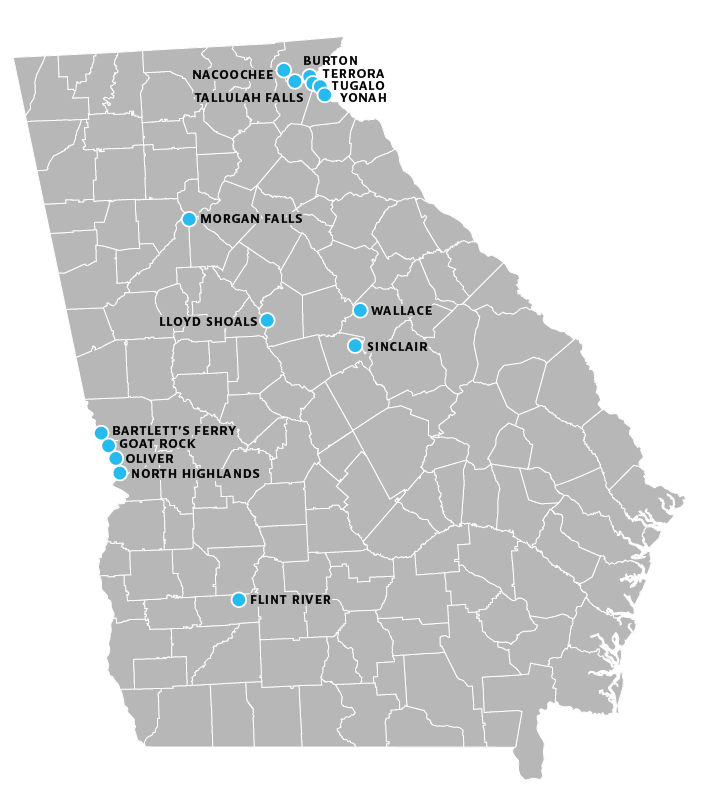
**Impact on Current IRP**

Modernization of the remaining hydro generating facilities is critical to maintaining the capacity from the Company’s hydro fleet. The remaining hydro fleet to be approved constitutes more than 650 MW of capacity resources, and the turbine redevelopment project at Plant Goat Rock is estimated to add an incremental 16 MW. With the continued and increasing capacity needs identified in this IRP, the Company and its customers will benefit from ensuring the ongoing reliable operation of these existing, dispatchable resources for at least another forty years.

# 2025 IRP Hydro Modernization Requests

## History & Descriptions of Georgia Power Hydro Fleet in 2025 IRP Requests

Georgia Power’s first hydro generating unit began operating more than 120 years ago at Plant Morgan Falls in 1904. Today, the hydro resources operated by Georgia Power, shown in Figure 1, plus the ownership interest in Plant Rocky Mountain, provide approximately 1,100 MW of emissions-free generating capacity on river chains across the state.

Figure 1. Map of Hydroelectric Generation Fleet Operated by Georgia Power

**North Georgia Hydro Group**

* **Plant Tallulah:** Placed in service in 1913 (Units 1-5) and 1920 (Unit 6), Plant Tallulah is the oldest and fourth downstream facility of the six developments comprising the North Georgia Hydro Group, which covers a 37-mile stretch of the Tallulah and Tugalo Rivers. Lake Burton serves as the main storage reservoir for the entire system, with additional storage available at the Tugalo development downstream of Tallulah. Flows from the upstream Mathis-Terrora development return to the Tallulah River and almost immediately enter Tallulah Falls Lake. Water from Tallulah Falls Lake enters the intake and power tunnel upstream of the Tallulah Falls dam to serve the Plant Tallulah powerhouse, located 1.8 miles downstream. The power tunnel is buried along the Tallulah Gorge rim.

The Tallulah development consists of an approximately 425-foot-long, 130-foot-high dam, a   
63-acre reservoir, a concrete intake structure, an approximately 6,700-foot-long power tunnel discharging into a surge tank, six penstocks, a powerhouse with six 12-MW generating units with a total installed capacity of 72 MW, and a 1,200-foot-long incline railway providing access to the powerhouse.[[4]](#footnote-5),[[5]](#footnote-6)

* **Plant Yonah:** Placed in service in 1925, Plant Yonah is the most downstream facility of the six developments comprising the North Georgia Hydro Group. Generation from the Tugalo development controls operation of the downstream Yonah development, since water from the tailrace of the Tugalo powerhouse flows into Yonah Lake, 3.1 miles downstream of the Tugalo Dam. The Yonah powerhouse is located at the base of the Yonah Dam.

The Yonah development consists of an approximately 950-foot-long and 95-foot-high dam, a 293-acre reservoir, three penstocks built into the dam, a powerhouse with three 7.5 MW generating units for a total installed capacity of 22.5 MW, and a tailrace.[[6]](#footnote-7)

**Chattahoochee Hydro Group**

* **Plant Bartletts Ferry Units 5 & 6:** Placed in service in 1985, Plant Bartletts Ferry Units 5 & 6 are located on the Chattahoochee River in Harris County, Georgia, and Lee and Chambers Counties, Alabama. Plant Bartletts Ferry is located upstream of the Middle Chattahoochee Hydro Group of Plants Goat Rock, Oliver, and North Highlands.

The Bartletts Ferry facility consists of an approximately 2,000-foot-long and 150-foot-high west dam and 915-foot-long and 125-foot-high east dam, two powerhouses, a 5,850-acre impoundment of Lake Harding, and a tailrace into the backwaters of the Goat Rock Reservoir. Units 5 & 6 are located in the east powerhouse, which contains two 54-MW generating units for a total installed capacity of 108 MW.[[7]](#footnote-8) Plant Bartletts Ferry Units 5 & 6 also serve as blackstart resources for Georgia Power, meaning they are capable of being used to restore electricity to the nearby system should a major generating facility go off-line.

* **Plant Goat Rock:** Placed in service between 1912 and 1956, Plant Goat Rock is one of the four developments comprising the Chattahoochee Hydro Group on the Chattahoochee River in Harris and Muscogee Counties, Georgia, and Lee and Russell Counties, Alabama. The Goat Rock facility is located between Plants Bartletts Ferry and Oliver.

The Goat Rock facility consists of a more than 1,400-foot-long and 75-foot-high dam, a   
965-acre impoundment, a powerhouse containing a total of six generating units for a total installed capacity of approximately 40 MW, and a tailrace. In 2005, Units 1 and 2 were replaced with new units that were renamed Units 7 and 8, thereby reducing the hydraulic turbine imbalance between the Bartletts Ferry and Goat Rock facilities.[[8]](#footnote-9) Goat Rock Units 4 and 5 are currently in forced outages due to equipment failures and will stay offline until modernization is completed.

* **Plant North Highlands:** Placed in service in 1902 and modified in 1963, Plant North Highlands is most downstream facility of the four developments comprising the Chattahoochee Hydro Group. The North Highlands facility is located approximately one mile downstream of Plant Oliver.

The North Highlands facility consists of an approximately 985-foot-long and 36-foot-high dam, a 131-acre impoundment, a powerhouse containing four generating units (three   
9.2-MW units and one 2-MW unit) for a total installed capacity of approximately 30 MW, and a tailrace.[[9]](#footnote-10)

**Central Georgia Hydro Group**

* **Plant Lloyd Shoals:** Placed in service in 1911, Plant Lloyd Shoals is located on the Ocmulgee River in the upper Ocmulgee River Basin in Butts, Henry, Jasper, and Newton Counties. The basin upstream of Lloyd Shoals Dam covers an area of 1,400 square miles.

The Lloyd Shoals facility consists of a 1,600-foot-long and 105-foot-high dam, the project impoundment of the 4,160-acre Lake Jackson, and a powerhouse containing six 3-MW generating units for a total installed capacity of 18 MW. The powerhouse is integrated with the Lloyd Shoals Dam and discharges directly into the Ocmulgee River.[[10]](#footnote-11)

* **Plant Wallace:** Placed in service in 1980, Plant Wallace is a pumped storage hydro facility located on the Oconee River, in Hancock, Putnam, Green, and Morgan Counties. The facility occupies approximately 495 acres of federal land within the Oconee National Forest. The approximately 19,000-acre Lake Oconee serves as the upper reservoir to Plant Wallace, which then flows into the more than 15,000-acre Lake Sinclair, which serves as the lower reservoir and storage for the downstream Plant Sinclair.

The Wallace facility consists of an approximately 2,400-foot-long and 120-foot-high dam, the Lake Oconee impoundment, six penstocks, an integral powerhouse containing four 52-MW reversible pump generating units and two 56-MW conventional generating units for a total installed capacity of 320 MW, and a tailrace into Lake Sinclair. Plant Wallace Units 3 & 4 also serve as blackstart resources for Georgia Power, meaning they are capable of being used to restore electricity to the nearby system should a major generating facility go off-line.[[11]](#footnote-12)

**Other Hydro Facilities**

* **Plant Flint River:** Placed in service in 1921 (Units 1 & 2) and 1925 (Unit 3), Plant Flint River is located on the Flint River and Muckafoonee Creek, near the City of Albany in Lee and Dougherty Counties. Construction of the project dams, impoundment, and associated powerhouse occurred between 1906 and 1921.

The Flint River facility consists of a Muckafoonee Creek diversion dam, a 500-foot-long spillway and 2,600-foot-long earthen dike, which joins the Flint River powerhouse and the diversion dam, the Flint River dam containing an integrated powerhouse, and a 1,400-acre impoundment. The powerhouse is equipped with three 1.8 MW generating units for a total installed capacity of 5.4 MW.[[12]](#footnote-13)

* **Plant Morgan Falls:** Placed in service in 1904 and modified in 1959 to increase the dam height, Plant Morgan Falls is located on the Chattahoochee River in Cobb and Fulton Counties, about 36 miles downstream of the U.S. Army Corps of Engineers Buford dam and 12.5 miles upstream of the city of Atlanta.

The Morgan Falls facility consists of an approximately 1,000-foot-long and 55-foot-high dam with a combined powerhouse and intake section integral to the dam, as well as a 200-foot-wide tailrace leading into a 684-acre reservoir of Bull Sluice Lake. The powerhouse is equipped with seven generating units for a total installed capacity of approximately 17 MW.[[13]](#footnote-14) Morgan Falls Units 3 & 4 are currently in forced outages due to equipment failures and will stay offline until modernization is completed.

## Scopes of Proposed Hydro Modernization Projects

The proposed hydro modernization projects for the remaining hydro generating units operated by Georgia Power will include critical replacements and/or refurbishments needed for turbines, generators, and BOP systems. Specific scope summaries expected for each site are described below.

**North Georgia Hydro Group**

* **Plant Tallulah:** The scope of work for Plant Tallulah Units 1-6 includes generator refurbishments or replacements, turbine replacements, and replacement of the BOP systems, such as lubricating oil, penstock isolation valves, service water systems, 480V switchgear, new hydraulic pressure units, and the plant control system.
* **Plant Yonah:** The scope of work for Plant Yonah Units 1-3 includes generator refurbishments or replacements, turbine replacements, and replacement of the BOP systems, such as lubricating oil, service water systems, 480V switchgear, new hydraulic pressure units, and the plant control system.

**Chattahoochee Hydro Group**

* **Plant Bartletts Ferry Units 5-6:** The scope of work for Plant Bartletts Ferry Units 5-6 includes generator replacements or refurbishments, turbine replacements, and replacement of the BOP systems, such as lubricating oil, service water systems, 480V switchgear, new hydraulic pressure units, and the plant control system.
* **Plant Goat Rock:** The scope of work for Plant Goat Rock Units 3-8 includes generator replacements or refurbishments, turbine replacements, and replacements of the BOP systems, such as lubricating oil, service water systems, 480V switchgear, new hydraulic pressure units, and the plant control system.

For Plant Goat Rock Units 3-6 turbine replacements, Georgia Power is requesting authority to develop, own, and operate the capacity increase associated with turbine redevelopment to correct a flow imbalance in the Chattahoochee Hydro Group. The redevelopment of the turbines is expected to increase the capacity of each unit by approximately 4 MW, bringing the capacity of the entire Goat Rock hydro facility from approximately 39 MW to approximately 55 MW. Actual capacity increases will be dependent on the project design. Following the approval of this request, the Company plans to complete further engineering and procurement processes to determine the optimal technology solution and design for these units. Georgia Power will provide a certification amendment application, including final engineering, procurement, and construction agreements and project cost estimates for Commission approval once finalized.

* **Plant North Highlands:** The scope of work for Plant North Highlands Units 1-4 includes generator replacements or refurbishments, turbine replacements, and replacements of the BOP systems, such as lubricating oil, service water systems, 480V switchgear, new hydraulic pressure units, and the plant control system.

**Central Georgia Hydro Group**

* **Plant Lloyd Shoals:** The scope of work for Plant Lloyd Shoals Units 1-6 includes generator replacements or refurbishments, turbine replacements, and replacement of the BOP systems, such as lubricating oil, service water systems, 480V switchgear, new hydraulic pressure units, and the plant control system.
* **Plant Wallace:** The scope of work for Plant Wallace Units 1-6 includes generator refurbishments or replacements, two turbine replacements, four pump turbine replacements, implementing a soft start system on the pump turbines, and replacement of the BOP systems, such as lubricating oil, service water systems, 480V switchgear, new hydraulic pressure units, servos, and the plant control system.

**Other Hydro Facilities**

* **Plant Flint River:** The scope of work for Plant Flint River Units 1-3 includes replacement of the BOP systems, such as lubricating oil, service water systems, 480V switchgear, new hydraulic pressure units, and the plant control system.
* **Plant Morgan Falls:** The scope of work for Plant Morgan Falls Units 1-7 includes generator replacements or refurbishments, turbine replacements, and replacement of the BOP systems, such as lubricating oil, service water systems, 480V switchgear, new hydraulic pressure units, and the plant control system.

## Estimated Schedules of Proposed Hydro Modernization Projects

Table 1 below includes the current estimated schedules for the requested hydro modernization projects for the remaining hydro generating units operated by Georgia Power. This table reflects the years in which activities are expected to begin. Please note that the Company will continue to evaluate the schedules of these hydro modernization projects to optimize resources and also address any changes at the sites with the most pressing need of maintenance to mitigate extended unit outages, thereby benefiting the overall hydro modernization schedule. The Company will continue to keep the Commission informed of any changes to the schedule through the bi-annual reporting process.

Table 1. Estimated Hydro Modernization Schedule of Requested Projects



Note: ENG = engineering.

## Estimated Costs of Proposed Hydro Modernization Projects

Table 2 below includes the capital budgets for the requested hydro modernization projects for the remaining hydro generating units operated by Georgia Power. The expected budgets are based on feasibility level project estimates and will be further refined as major equipment and construction contracts are procured. The Company will continue to keep the Commission informed of any changes to the budgets through the bi-annual reporting process.

Table 2. Estimated Hydro Modernization Budgets of Requested Projects (thousands of $)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Hydro Group** | **Plant** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** | **2033** | **TOTAL** |
| North GA | Tallulah | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 159,405** |
| North GA | Yonah | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 118,063** |
| Chattahoochee | Bartletts Ferry 5-6 | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 97,294** |
| Chattahoochee | Goat Rock | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 221,511** |
| Chattahoochee | North Highlands | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 144,440** |
| Central GA | Lloyd Shoals | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 167,048** |
| Central GA | Wallace | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 434,342** |
| Other | Flint River | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 41,180** |
| Other | Morgan Falls | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 167,570** |
|  | **Total** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **REDACTED** | **$ 1,550,852** |

# Cost-Benefit Analysis & Economic Comparison of Alternatives

The 2022 IRP Stipulation, which was approved in the 2022 IRP final order, requires the Company to complete a cost-benefit analysis and economic comparison of the alternatives to modernization for all future hydro modernization requests and the previously approved Plant Burton hydro modernization project. The alternatives to hydro modernization projects evaluated in this analysis include 1) unit retrofits for waterflow without generation and 2) dam removal. Through the Company’s evaluation of these alternatives for Plant Burton, it was determined that the unit retrofit option is an impractical alternative, as explained in Section 4.1 below. Therefore, the modernization base case was compared to the dam removal alternative for the hydro modernization requests in this 2025 IRP. This cost-benefit analysis demonstrates that modernization of Plant Burton, as well as the remaining hydro fleet, has cost-effective and/or qualitative drivers that substantially outweigh the alternatives to modernization, demonstrating that these investments are in the best interest of customers.

## Analysis Approach

**Evaluation by Hydro Group**

As discussed in Section 2, certain hydro resources are linked together by common river systems, and this linked system is referred to as a hydro group. For example, the North Georgia Hydro Group is interconnected by a common waterway, with the tailwater levels of each plant from Burton to Yonah serving as the headwater level for the next plant downstream, as shown in Figure 2. This operational relationship means that changes at one dam can significantly impact the others. Therefore, the removal of Yonah Dam would affect the upstream Tugalo plant, where modernization work is substantively complete, by decreasing its tailwater level, which could lead to adverse effects on turbine performance and operational range.

Figure 2. Illustrative Representation of River Chain for North Georgia Hydro Group



The economic analysis considers elements of these interactive plants by evaluating the linked plants together in a common study. For example, the North Georgia Hydro Group facilities are studied together with scenarios that evaluate the impact of modernizing all resources compared to alternative pathways to modernization of individual requested plants in the common river system. This concept is repeated for the Chattahoochee Hydro Group of Plants Bartletts Ferry, Goat Rock, Oliver, and North Highlands. Likewise, for the Central Georgia Hydro Group, Plant Wallace is grouped together with the previously approved Plant Sinclair due to their interactive nature. Some of the Company’s hydro resources do not have the same operational relationship to other GPC-owned hydro resources. These resources include Plants Lloyd Shoals, Flint River, and Morgan Falls. Therefore, these resources are studied individually rather than within a large operationally linked system.

**Alternatives to Modernization**

Modernization is essential to ensure the continued operation and compliance of the Company’s hydro units with FERC license criteria. As stated in Section 2, under Section 10(c) of the FPA,   
FERC licensees are required to maintain the physical structures of the project for efficient operation in the development and transmission of power.[[14]](#footnote-15) Specifically, FERC has acknowledged in a recent Georgia Power license amendment order that the facility equipment is nearing the end of its useful life and needs to be refurbished and replaced to carry out statutory and license obligations. Therefore, these modernization projects are crucial to extend the operational life of the remaining hydro facilities, mitigating the risks of inoperability and potential safety hazards.[[15]](#footnote-16) Therefore, hydro modernization is evaluated as the base case of this analysis.

**Unit Retrofit**

The Company’s FERC licenses also include specific requirements related to water flow management, including minimum and seasonal flows, which are achieved through the operation of the generating units. For an alternative that would keep the dams and powerhouses in place but would only retire the generating units, water flows would have to be maintained by a different method. Spillway gates at the Company’s hydro facilities are designed for passing flood flows, or large flows of water to keep lake levels from exceeding the elevation of the gates for dam stability purposes. Therefore, these high spillway gate flow releases are too large to precisely manage lake levels and minimum and seasonal flows releases required by the FERC licenses. Most importantly, spillway gates physically cannot pass flows below the elevation of the spillway gates.

If the Company were unable to generate power by moving water through the turbine, which is the most precise and effective way to regulate lake levels under normal flow conditions, then it would be out of compliance with its FERC license. To retrofit the hydro facilities to pass water to meet FERC license requirements without turbines would require additional investment and civil retrofits.

For Plant Burton, the Company commissioned a third-party feasibility level study to determine the initial scope and cost estimates associated with this type of retrofit to allow water flows to meet FERC license requirements without turbines. This unit retrofit alternative would entail structural modifications to retrofit the turbine with energy dissipating water valves to permanently pass water flow through the turbine spiral case without generation. These valves would pass water through a device with a large number of holes in order to maximize the dissipation of the water pressure and energy from the spiraling water, that would have otherwise been converted into electricity. The study identified a multitude of negative effects associated with this option, including cavitation, pressure pulsation, noise, and erosion of the associated structures. The economic evaluation of this alternative includes similar BOP costs, ongoing operations and maintenance (“O&M”) costs, and maintenance capital costs to the modernization baseline, as well as the significant capital investment associated with the engineering and installation of this type of energy dissipation device while providing zero energy or capacity benefit. This unit retrofit feasibility study is provided in Attachment B.

The Company is not aware of hydroelectric facilities where this unit retrofit alternative is being implemented or proven to allow water flow without generation. Furthermore, even if this alternative could maintain the water flows required by the FERC license, the units would still not be meeting the obligations of the FERC license to generate power. The Company would likely have to submit a   
FERC license surrender to pursue this alternative. There would be extensive uncertainty associated with a license surrender, including implications on who would own and who would regulate the facility since it would no longer be a generating facility under the jurisdiction of FERC. This uncertainty would also extend to the FERC requirements associated with the license surrender, which could include forced dam removal. Therefore, Georgia Power included the unit retrofit alternative for Plant Burton only and eliminated this option as an inferior alternative for the remaining hydro requests in the 2025 IRP.

**Dam Removal**

If the units were not maintained through hydro modernization to meet FERC license criteria, the main alternative evaluated by the Company is dam removal, which involves significant financial and logistical challenges. To the Company’s knowledge, removing large hydroelectric dams is rare in the United States, and the costs can be substantial, such as those provided in Section 5. Dam removals would directly impact major lakes in Georgia, including Lake Oconee and Lake Burton, to revert these lakes to rivers. The loss of these lakes and the associated recreation opportunities would have severe ramifications on the communities and economies surrounding these locations. For this reason alone, Georgia Power does not find it in the best interest of customers or the state of Georgia to pursue dam removal at any of the Company’s hydro facilities. However, because the Company is required to complete an economic analysis of alternatives to modernization, the dam removal alternative was evaluated in order to quantify these extreme impacts for the Commission.

Georgia Power commissioned third-party, feasibility-level studies for dam removal at three sites in order to gain indicative results and cost estimates at each of the river chains: Plant Burton for the North Georgia Hydro Group, Plant North Highlands for the Chattahoochee Hydro Group, and Plant Wallace for Central Georgia Hydro Group. These three feasibility-level studies evaluate the qualitative and quantitative impacts of dam removal, including estimates for removal construction costs. Compared to the modernization capital estimates for the same sites, the cost estimates for removal construction were found to be roughly the same for Plant North Highlands but more than double for both Plants Wallace and Burton. Therefore, for the same or increased investment, Georgia Power customers would lose the associated capacity and energy benefits from these resources over the next 40 years or more.

A cost study was also completed for the remaining twelve dams owned and operated by Georgia Power in order to provide planning level cost estimates through data analysis of the 2023 United States Geological Survey (“USGS”) Dam Removal Cost Database and supplemental information from dams on the Klamath River. With a range from 50% to 300% for the low and high range respectively, the base cost estimates consider factors such as dam height, crest length, watershed area, and mean annual discharge. The report highlights that the estimates do not include indirect impacts and mitigations, such as impacts to properties or third parties.

The dam removal studies for Plants Burton, North Highlands, and Wallace are provided in Attachments C, D, and E, respectively. The data analysis study for the remaining sites is provided in Attachment F. See Table 3 for a summary of dam removal cost estimates from these studies.

Table 3. Summary of Dam Removal Construction Cost Estimates

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name1 | Dam Height  (ft) | Dam Crest Length (ft) | Base Cost  ($M)2 | Lower Range (50%) Cost ($M) | Upper Range (300%) Cost ($M) |
| Burton | 128 | 983 | 170 | NA | NA |
| Nacoochee | 73 | 505 | 70 | 40 | 210 |
| Terrora | 115 | 665 | 170 | 90 | 510 |
| Tallulah | 130 | 400 | 130 | 70 | 330 |
| Tugalo | 160 | 865 | 430 | 220 | 1,290 |
| Yonah | 95 | 925 | 180 | 90 | 540 |
| Bartletts Ferry | 150 | 752 | 320 | 160 | 960 |
| Goat Rock | 75 | 1,202 | 170 | 90 | 510 |
| Oliver | 70 | 1,893 | 250 | 130 | 750 |
| North Highlands | 36 | 985 | 140 | NA | NA |
| Lloyd Shoals | 105 | 1,109 | 240 | 120 | 720 |
| Wallace | 118 | 2,395 | 990 | NA | NA |
| Sinclair | 105 | 1,378 | 300 | 150 | 900 |
| Flint River | 60 | 1,752 | 200 | 100 | 600 |
| Morgan Falls | 56 | 898 | 100 | 50 | 300 |

Notes:

1. Data for Burton, North Highlands, and Wallace from studies in Attachments C-E.   
   Data for remaining sites from study in Attachment F.
2. Costs rounded to the nearest $10 million.

As identified in these studies, the dam removal process would carry a high level of uncertainty and risk. The FERC license surrender process would have uncertain outcomes related to approval, timeframes which would be expected to span many years, and ongoing requirements related to restoration and remediation if needed.[[16]](#footnote-17) For example, additional sedimentation removal beyond that included in the feasibility-level study would substantially increase the cost estimates associated with site restoration. Also, the feasibility-level studies did not include all logistical costs or time impacts, such as those associated with public outreach and potential legal services. Further, hydro facilities provide operational benefits to the transmission system that have not been quantified in these studies, and two facilities serve as blackstart resources for the Georgia Power system as a reliability benefit for all customers.

When evaluating the dam removal alternative, the Company also considered how the river chain would be impacted. In order to avoid tailrace impacts that would leave upstream facilities inoperable when a dam is removed, the installation of a weir to manage tailwater for interconnected facilities on the river chain would likely be needed and has been assumed in the case of any individual dam removal scenarios in the cost-benefit analysis. The cost of a weir installation has therefore been added to the dam removal costs. Dam removal within a river chain also impacts the expected water flows and therefore the capacity and energy benefits associated with the remaining generation resources. Studies were also conducted with an operations model to simulate the changes to generation under various dam removal scenarios for each river chain. These scenarios include the extreme scenario of no weir additions for dam removals downstream, such as Plants Yonah and North Highlands, which would have a cascading impact leading to the dam removal of the entire river chain. This extreme scenario is also included in the cost-benefit analysis in   
Section 5. The river flow studies for North Georgia Hydro Group, Chattahoochee Hydro Group, and Central Georgia Hydro Group are provided in Attachments G, H, and I.

The uncertainty and potential complications associated with the dam removal pathway further emphasize the need for investment in maintaining these critical hydroelectric resources. Investment in modernization efforts will safeguard these resources against extreme outcomes.

## Key Analysis Assumptions

The Company’s economic analysis compares the incremental costs and benefits of each alternative pathway. The incremental costs, which are further described below, include incremental modernization capital, O&M, maintenance capital, and retirement costs. Retirement costs include replacement capacity costs and dam removal capital costs, including any associated weir costs. Benefits include investment tax credits and production costs savings as an energy benefit. The results of the economic analysis reflect the total costs of each pathway allowing for comparisons to pathways with modernization and with alternatives to modernization.

**Modernization Capital**

The analysis incorporates the costs described in Section 3.4 which only include the project budgets incremental to the projects previously approved in the 2019 and 2022 IRPs.

**Maintenance Costs**

The analysis incorporates the incremental costs associated with continued operation of each hydro facility. O&M includes all labor, materials, engineering and support services, and overhead costs necessary to operate the plant. O&M costs for hydro resources are fixed costs. Maintenance capital costs include dam safety costs, non-generation related capital costs, and generation capital costs required to support routine maintenance needs.

**Retirement Cost**

The economic analysis considers dam removal as the primary alternative to modernization as described in Section 4.1 above. Dam removal costs were modeled in the year modernization was assumed to be completed. Dam removals for the facilities that operate as part of a river chain also require the installation of a weir to manage tailwater. Because the Company does not have a site-specific understanding of the feasibility or cost implications of this pathway, the Company is conservatively assuming the costs of a weir based on a historical project completed downstream of Plant North Highlands around 2013, where a smaller dam (not owned by Georgia Power) was removed, and a weir was necessary to maintain proper operation of the North Highlands facility.

**Replacement Capacity Costs**

The Company also considered the costs of replacement generation capacity for the dam removal scenarios. When evaluating the economics of situations that contemplate the consequence of not modernizing, the Company must replace the lost generation capacity that was otherwise provided by each hydro unit. This analysis assumes that each hydro unit would be replaced with natural gas combustion turbine (“CT”) resources. Replacement with another carbon-free capacity resource, such as solar plus battery energy storage systems (“BESS”) was not evaluated in this analysis since this scenario would have higher costs than the CT replacement and would only further support results where modernization is the economic alternative.

**Production Costs Savings or Energy Benefit**

This item represents the energy benefit, or avoided energy costs (“AEC”), for each alternative considered. When each hydro unit operates, the marginal energy-related costs during that operation are avoided on the system, including components associated with marginal replacement fuel costs, variable O&M, fuel handling, compliance-related environmental costs, intra-day commitment costs, and transmission losses. To determine the production cost savings, or energy benefit, of each alternative, the Company begins by generating hourly marginal energy costs in AURORA with final Budget 2025 (“B2025”) assumptions. The resulting marginal energy-related costs represent the hourly AEC. The Company then uses these hourly AEC to determine the relative energy benefit of each hydro unit. The AURORA model is utilized to economically dispatch each hydro group to derive the energy benefit for each group. The energy benefit for each group is then allocated on a capacity basis to each hydro resource for the alternatives considered. Further, the energy benefit impacts to the river chain were determined from the river flow studies described in Section 4.1.

**Tax Credits and Government Programs**

The Inflation Reduction Act provides an Investment Tax Credit (“ITC”) for which the modernization capital portion of these projects will qualify. The Company assumes a 30% ITC, which includes bonuses for meeting the prevailing wages and apprenticeship. Additionally, Plant Lloyd Shoals is in an Energy Community as identified by the DOE. It will qualify for an additional 10% bonus. Overall, the ITC will be worth 30-40% of the capital investments for the units and will be earned the year following commercial operation. For purposes of economic analysis, the Company applied a 10% risk adjustment to the value of these credits, reflecting market conditions and the potential need to transfer the credits. Georgia offers a state ITC for investments in new or existing facilities. Hydro facilities will qualify for a 3-8% tax credit, determined by the county in which the dam is located. Each year, the state updates the tier of each county based on economic activity. The state tax credit is earned during construction and is the equivalent of the sum of a calendar year capital spending multiplied by the applicable rate. The Company also assumes these projects will qualify for the DOE Title 17 Section 1706 Loan Guarantee Program.

**Scenarios**

The Company’s IRP process considered multiple views of the future price of natural gas, future pressure on the Company’s carbon dioxide (“CO2”) emissions, future cost and performance of generating technologies, and future electricity consumption. The scenarios are described in   
Chapter 3 in the 2025 IRP Main Document. For the Hydro Modernization economic analysis presented in this report, the Company’s results reflect the moderate-gas, zero-dollar carbon (“MG0”) and MG0 with the 111 Greenhouse Gas (“GHG”) Rules (“111-MG0”) scenarios only. The level of detail and sophistication required to complete these analyses limit the ability to complete more economic scenarios. However, given hydro resources are carbon-free and not reliant on gas prices, these resources are expected to present improved economics in the majority of the alternative future scenarios that contain a cost of carbon, carbon constraints, or higher costs of natural gas. Likewise, some moderate declines in economic benefit can be expected in lower gas price environments. Overall, the MG0 and 111-MG0 scenarios are expected to provide sufficient information to recognize the benefits of hydro modernization, given most alternative scenarios would likely improve economics.

# Summary of Analysis Results

Tables 4 through 10 are matrix summaries of the cost-benefit analysis for hydro modernization for each river chain or hydro facility, as applicable. These net present value (“NPV”) results are calculated by comparing the hydro modernization costs and benefits to the costs and benefits of the highest net-cost alternative – either the dam removal of the facility or associated river chain. When a positive value is shown, it indicates that hydro modernization and continued operation create a greater net benefit on behalf of Georgia Power customers than the dam removal alternative. These deltas are rounded to the nearest $10 million. Cost-benefit analysis details for the MG0 and   
111-MG0 scenarios are provided in Attachments J and K, respectively.

## Plant Burton approved in 2022 IRP

Table 4. Plant Burton Cost-Benefit Analysis Summary,   
compared to Plant Burton dam removal

|  |  |  |
| --- | --- | --- |
| 2024 NPV (M$)  2025 - 2071 | North GA:  System Modernization\* | North GA:  Burton Retrofit |
| MG0 | $120 | $50 |
| 111-MG0 | $120 | $50 |

\*Includes modernization capital for Plant Burton and the North Georgia Hydro Group facilities with hydro modernization requests in the 2025 IRP (Plants Tallulah and Yonah)

## Remaining Hydro Fleet requested in 2025 IRP

Table 5. North Georgia Hydro Group Cost-Benefit Analysis Summary,   
compared to North Georgia full system dam removals

|  |  |  |  |
| --- | --- | --- | --- |
| 2024 NPV (M$)  2025 - 2073 | North GA: System Modernization\* | North GA: Tallulah  Dam Removal | North GA:  Yonah  Dam Removal |
| MG0 | $880 | $770 | $790 |
| 111-MG0 | $870 | $770 | $780 |

\*Includes modernization capital for the North Georgia Hydro Group facilities with hydro modernization requests in the 2025 IRP   
(Plants Tallulah and Yonah)

Table 6. Chattahoochee Hydro Group Cost-Benefit Analysis Summary,   
compared to Chattahoochee full system dam removals

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 2024 NPV (M$)  2025 - 2073 | Chattahoochee: System Modernization\* | Chattahoochee: Bartletts Ferry Units 5-6  Dam Removal | Chattahoochee: Goat Rock  Dam Removal | Chattahoochee: North Highlands Dam Removal |
| MG0 | $590 | $520 | $530 | $470 |
| 111-MG0 | $570 | $520 | $520 | $460 |

\*Includes modernization capital for the Chattahoochee Hydro Group facilities with hydro modernization requests in the 2025 IRP (Plant Bartletts Ferry Units 5-6, Plant Goat Rock, and Plant North Highlands)

Table 7. Plant Lloyd Shoals Cost-Benefit Analysis Summary,   
compared to Plant Lloyd Shoals dam removal

|  |  |
| --- | --- |
| 2024 NPV (M$)  2025 - 2073 | Central GA:  Lloyd Shoals Modernization |
| MG0 | $110 |
| 111-MG0 | $100 |

Table 8. Plant Wallace Cost-Benefit Analysis Summary,   
compared to Plant Wallace dam removal

|  |  |
| --- | --- |
| 2024 NPV (M$)  2025 - 2073 | Central GA:  Wallace Modernization\* |
| MG0 | $900 |
| 111-MG0 | $880 |

\* For the Central Georgia Hydro Group, Plant Wallace is grouped together with the previously approved Plant Sinclair due to their interactive nature. Analysis includes only modernization capital requested in 2025 IRP (Plant Wallace).

Table 9. Plant Flint River Cost-Benefit Analysis Summary,   
compared to Plant Flint River dam removal

|  |  |
| --- | --- |
| 2024 NPV (M$)  2025 - 2073 | Other:  Flint River Modernization |
| MG0 | $80 |
| 111-MG0 | $80 |

Table 10. Plant Morgan Falls Cost-Benefit Analysis Summary,   
compared to Plant Morgan Falls dam removal

|  |  |
| --- | --- |
| 2024 NPV (M$)  2025 - 2073 | Other: Morgan Falls Modernization |
| MG0 | ($30) |
| 111-MG0 | ($40) |

# Conclusion

In this 2025 IRP, the Company is requesting approval to complete hydro modernization projects by river chain on the remaining hydro generating fleet operated by Georgia Power. As required by the 2022 IRP Final Order for any future hydro modernization requests, the Company completed cost-benefit analyses and economic comparisons of the alternatives to modernization for these nine projects and the previously approved Plant Burton. Third-party feasibility-level studies were completed for unit retrofit and dam removal alternatives to gain cost estimates and identify ranges of associated risks in order to inform the economic analyses. The unit retrofit alternative was determined to be an impractical alternative as part of the Burton analysis and was, therefore, eliminated as an option for the other locations. Dam removal was the primary alternative considered for the remaining projects.

As with Plant Burton, modernization was determined to be the economic option compared to dam removal for all newly requested projects, except Plant Morgan Falls. Georgia Power requests approval of all nine remaining modernization projects, including Plant Morgan Falls to keep the facility operational for ongoing benefits in the best interest of customers. As the Company’s oldest hydro plant from 1904, two of the seven units at the 11 MW Plant Morgan Falls are already out of service due to equipment failures until modernization is completed. Importantly, water releases from the Morgan Falls reservoir and nearby Buford reservoir serve as the main water supply sources for metro Atlanta with agreements in place with the Atlanta Regional Commission to ensure that water levels in these reservoirs are sufficiently maintained to meet the water needs of Atlanta. Plant Morgan Falls provides recreational and community benefits through its location on 14 acres of federal lands within the Chattahoochee River National Recreation Area.[[17]](#footnote-18) Though these benefits were not quantifiable for inclusion in the economic analysis, these qualitative factors show that Plant Morgan Falls is crucial to Atlanta’s water supply, in addition to providing recreational support to the community.

Finally, the economic analyses also support Georgia Power’s request for approval of the modernization projects at the other eight remaining hydro facilities, in order to 1) maintain compliance with FERC license requirements related to water flow and generation, 2) leverage efficiencies in the engineering, procurement, construction, and project management processes, and 3) optimize the operations of each river chain. Accordingly, approval in the 2025 IRP of all nine remaining hydro modernization projects is in the best interest of customers to maintain the full 1,100 MW of carbon-free, hydro resources in Georgia Power’s capacity resource mix.

1. Item 34 in the 2022 IRP Final Order Adopting Stipulation, pg. 29, in Docket 44160. [↑](#footnote-ref-2)
2. FPA Section 10(c) of the Federal Power Act, 16 U.S.C. §803(c) [↑](#footnote-ref-3)
3. FERC Final Order for Plant Tugalo Amendment, February 16, 2023 [↑](#footnote-ref-4)
4. North Georgia, FERC Project No. 2354-018, Order Issuing New License, October 3, 1996 [↑](#footnote-ref-5)
5. Unit capacities provided in Section 3.1 are nameplate capacities from the FERC licenses and will not directly match the IRP planning capacities listed in the Main Document Attachment C, Table C.2, which are modeled for the Intercompany Interchange Contract (“IIC”) based on the average simulated generation during eight (8) consecutive hours occurring on five (5) consecutive weekdays using the average water inflows from historic data. The IRP planning capacities are used in the economic analyses in Sections 4 & 5. [↑](#footnote-ref-6)
6. North Georgia, FERC Project No. 2354-018, Order Issuing New License, October 3, 1996 [↑](#footnote-ref-7)
7. Bartletts Ferry, FERC Project No. 485-065, Order Issuing New License, December 22, 2014 [↑](#footnote-ref-8)
8. Middle Chattahoochee, FERC Project No. 2177-053, Order Issuing New License, December 27, 2004 [↑](#footnote-ref-9)
9. Ibid. [↑](#footnote-ref-10)
10. Lloyd Shoals, FERC Project No. 2336-101, Order Issuing New License, September 10, 2024 [↑](#footnote-ref-11)
11. Wallace, FERC Project No. 2413-124, Order Issuing New License, June 18, 2020 [↑](#footnote-ref-12)
12. Flint River, FERC Project No. 1218-014, Order Issuing New License, September 30, 1999 [↑](#footnote-ref-13)
13. Morgan Falls, FERC Project No. 2237-017, Order Issuing New License, May 22, 2008 [↑](#footnote-ref-14)
14. Federal Power Act, 16 U.S.C. 802, Section 10(c) [↑](#footnote-ref-15)
15. FERC Final Order for Plant Tugalo amendment, February 16, 2023, paragraphs 26 and 39. [↑](#footnote-ref-16)
16. For reference, Georgia Power is currently pursuing FERC license surrender and dam removal for Plants Langdale and Riverview, as approved in the 2019 IRP. While the three associated dams range from only 12-15 feet high, the initial cost estimates for dam removal total approximately **REDACTED**. To highlight timeline uncertainty, Georgia Power is still waiting for the final FERC surrender order for this process that began in 2018. [↑](#footnote-ref-17)
17. Morgan Falls, FERC Project No. 2237-017, Order Issuing New License, May 22, 2008 [↑](#footnote-ref-18)