

BEFORE THE IDAHO PUBLIC UTILITIES COMMISSION

IN THE MATTER OF IDAHO POWER’S)	CASE NO. IPC-E-20-02
PETITION TO DETERMINE THE)	
PROJECT ELIGIBILITY CAP FOR)	INITIAL COMMENTS OF
PUBLISHED AVOIDED COST RATES AND)	RENEWABLE NORTHWEST
THE APPROPRIATE CONTRACT)	RE: ENERGY STORAGE
LENGTH FOR ENERGY STORAGE)	
QUALIFYING FACILITIES)	August 6, 2020

Initial Comments of Renewable Northwest in Case No. IPC-E-20-02
Re: Energy Storage

Renewable Northwest is grateful for the opportunity to submit comments to Idaho Public Utility Commission (“IPUC” or “Commission”) responding to Staff and Idaho Power Company (“Idaho Power” or “Company”) regarding energy storage resources and technology. As the region works to transition to a cleaner, more modern electricity system that relies on renewable resources for generation, storage resources will be increasingly important for integrating renewables, shifting generation in time to meet load, and providing essential grid services, among other benefits. Idaho Power is poised to be a key player in this transition, and as part of its commitment to achieving 100% clean energy the Company reports that it “plans to continue its path away from coal and invest in storage and additional clean generation sources like wind and solar.”¹ Given this growing role for storage in the region and in Idaho specifically, we appreciate the Commission’s order establishing an opportunity for public comment² and Staff’s thoughtful July 16, 2020 Request for Public Input and Initial Comments (“Request for Input”).

Renewable Northwest’s Initial Comments are framed as responses to the questions posed by Staff’s Request for Input. Broadly speaking, we discuss the state of storage technology and the benefits of storage resources, and we offer some initial thoughts on how to value, quantify, and offer compensation for those benefits. We would welcome the opportunity to provide additional comments or to answer any questions if helpful, and we look forward to reading Staff’s and the Company’s responses on August 27, 2020.

¹ *Idaho Power sets goal for 100-percent clean energy by 2045* (Mar. 26, 2019) (The Company also notes that “battery-storage technology should help maintain Idaho Power’s impressive reliability while moving the company closer to its goal.”).

<https://www.idahopower.com/news/idaho-power-sets-goal-for-100-percent-clean-energy-by-2045/>

² Idaho Public Utility Commission, Case No. IPC-E-20-02, Order No. 34699 (June 23, 2020).

Requests for Public Input

The time, costs, and resources required to develop a forecasted generation profile.

Since storage resources are not inherently “generation” resources, the forecasted generation profile for a storage resource depends on the purpose or application of its operation. Storage QFs can act as both generation and load. This operational profile makes them different from a solar or wind QF. Typically, standalone storage resources like battery energy storage systems (“BESS” or “battery storage resources”) are charged daily during off-peak or low-energy-price hours and discharged during the peak or high-energy-price hours to deliver maximum value to the grid. Pairing battery storage with variable generation technologies such as PV or wind can reduce curtailment and related costs providing potential benefits to the grid. Additionally, NREL reports that “[t]he potential for limited-duration storage to provide peak capacity is driven in part by its ability to reduce net demand, which is a function of the duration of energy storage and the shape of electricity demand patterns.”³ With the current level of battery management system (BMS) and output control, BESS are highly dispatchable, able to respond to signals on a millisecond level and to provide much needed ramping capabilities.

To develop a typical forecast generation profile of a battery storage resource, market-optimized dispatch models have to be run under multiple scenarios to optimize the hourly State of Charge (SoC), charge and discharge profile. Models available in the market include E3’s RESTORE, NREL’s SAM, Production Cost Models used by utilities such as PLEXOS and AURORA among many others. These models usually take into account market prices, battery size, capacity, and charge/discharge durations. The time and costs of the model depend on whether an in-house model is used or a consultant is appointed to run the model and can widely vary.

Whether there are additional benefits to the utility's system that are achieved by battery storage projects at specific thresholds.

Battery storage resources provide a myriad of grid benefits in today’s fast-changing electric system. Apart from providing peak load reduction and easier integration of variable renewable energy--a particularly important outcome given Idaho Power’s 100% clean energy goal⁴--battery storage resources can provide additional value to the grid owing to its fast ramping capabilities

³ Denholm et al 2019, *The Potential for Battery Energy Storage to Provide Peaking Capacity in the United States*. <https://www.nrel.gov/docs/fy19osti/74184.pdf>

⁴ *Idaho Power sets goal for 100-percent clean energy by 2045* (Mar. 26, 2019). <https://www.idahopower.com/news/idaho-power-sets-goal-for-100-percent-clean-energy-by-2045/>

(2-5 ms) and the ability to follow the load signals in a rapid manner. BESS can also provide ancillary services such as frequency regulation, flexibility reserves and voltage regulation.⁵ They can also provide added benefits to the transmission & distribution system of a utility as a resource to address T&D congestion issues and provide capital deferral benefits.⁶

While it is not clear that particular *capacity* thresholds offer additional benefits beyond those discussed above, benefits associated with particular *duration* thresholds may be worth considering as stakeholders study issues relating to storage QFs and BESS in general. As dispatchable but carbon-intensive thermal resources throughout the west retire, utilities have expressed concern regarding their ability to ensure system reliability during periods of time when variable renewable resources may be unavailable for multiple hours. As a result, longer-duration BESS may provide capacity or resource-adequacy benefits that are worth disaggregating from the analyses discussed above and understanding as standalone values.

Whether there are limitations on the ability of battery storage QFs to disaggregate.

Battery storage resources are modular and flexible in nature. This makes it comparatively easier for project operators to disaggregate, but it does not necessarily mean that the majority of battery storage resources would be disaggregated to provide maximum value to developers. Battery disaggregation is also limited by the inverter capacity of the battery. Disaggregation potentially leads to electrical losses, which can have detrimental effects on the project cash flow, Net Present Value, and Internal Rate of Return (IRR). These limitations may affect the viability of the project from a developer standpoint.

The characterization that developers disaggregate battery storage resources in order to game the PURPA eligibility requirements for standard rates, as suggested⁷ by Idaho Power Company, incorrectly assumes that the only reason to disaggregate battery storage is to gain unfair economic advantage. A more thorough understanding of the exact operational characteristics of the battery storage resources is required to make that determination.

⁵ *The Value of Energy Storage for Grid Applications*. NREL 2013. <https://www.nrel.gov/docs/fy13osti/58465.pdf>

⁶ *The Economics of Battery Storage*, Rocky Mountain Institute 2017
<https://rmi.org/wp-content/uploads/2017/03/RMI-TheEconomicsOfBatteryEnergyStorage-FullReport-FINAL.pdf>

⁷ Idaho Power Company Comments re: Case No. IPC-E-20-02. Filed July 16 2020

<https://puc.idaho.gov/Fileroom/PublicFiles/ELEC/IPC/IPCE2002/Company/20200716Comments.pdf>

Whether Staff’s understanding of the prevailing state of battery technology and inverter size is correct.

Staff’s understanding of the prevailing state of battery technology and inverter capacity broadly reflects current market conditions in the US. Lithium-ion batteries -- more specifically, Nickel-Manganese-Cobalt (NMC) Li-ion batteries -- are the prevalent technology for grid-scale application, although other Li-ion chemistries are improving efficiencies and durations rapidly at lower costs. Inverter sizing limits the battery’s capacity and thus places a lower limit on battery power capacity, expressed in kW or MW.

The all-in costs to develop and build a battery QF.

Renewable Northwest understands that Staff is currently looking into the overall costs and resource value of storage resources as part of a joint study with the Pacific Northwest National Laboratory (“PNNL”) to quantitatively analyze contract lengths for battery QF projects. This analysis will take the costs for a range of battery storage projects over 100kW and optimize the generation profile of the project to maximize revenue under the Company's Incremental Cost Integrated Resource Plan (“ICIRP”) Method. As additional resources for cost data, Staff can refer to Lazard’s Levelized Cost of Storage and NREL’s Annual Technology Baseline 2020 which provide comprehensive installed, fixed and variable operation & maintenance costs for grid-scale Li-ion batteries. RNW would like to note that the payback period for a storage project is essentially dependent on the contract lengths. Limiting the contract length to successive 2-year periods would result in high levels of financial uncertainty and risks for developers, thereby inhibiting future project development in Idaho.

The expected life of different battery technologies.

Battery lifetime depends on two operational characteristics of the battery chemistry. These are cycle life and calendar life. Cycle life provides information about how many times a battery can undergo a charge/discharge cycle such that its capacity remains above a 80% level. Calendar life of a battery is the time for which a battery can be stored, as inactive or with minimal use, such that its capacity remains above 80% of its initial capacity.

Typically, Lithium-ion batteries have a calendar life of 11 to 15⁸ years depending on how many times the batteries are cycled in a day. Other battery technologies such as Lead-Acid, sodium-sulfur, and vanadium redox flow have lesser calendar lifetimes ranging from 8 to 10 years. Cycle life data offers a significant advantage for Lithium-ion technology with number of

⁸ Battke et al 2013. *A review and probabilistic model of lifecycle costs of stationary batteries in multiple applications.*

cycles ranging from 5,000 to 15,000 with a median value of 10,250 cycles.⁹ Under deep discharge conditions when the battery cells are discharged up to 90% of their capacity on a daily basis, Li-ion can provide 3,000 cycles.¹⁰ Only Vanadium-redox flow batteries perform better with a median value of 13,000 cycles, although they fare much worse in roundtrip efficiency (70-75%) and energy density. Li-ion batteries, on the other hand, have high round-trip efficiency (more than 85%) and high energy density.

How ancillary services provided by battery QFs could be valued and what impact this would have on the payback period.

Battery QFs can provide essential reliability services, commonly referred to as “ancillary services” to the electric grid. As NREL sums it up, “There are various categories of operating reserves and ancillary services that function on different timescales, from subseconds to several hours, all of which are needed to ensure grid reliability.”¹¹ BESS can rapidly charge or discharge in a fraction of a second, faster than conventional thermal plants, making them a suitable resource for short-term reliability services, such as Primary Frequency Response (PFR) and Regulation. Appropriately sized BESS can also provide longer-duration services, such as load-following and ramping services, to ensure supply meets demand.

In ISO/RTO regions, ancillary services are usually valued through specific market products like Regulation Up, Regulation Down, Spinning and Non-Spinning reserves. In non-market regions, as is the case here, utilities tend to determine the difference between the expected load and resources and actual load and resources. The difference between load and resources is calculated every four seconds and is represented by the Area Control Error (“ACE”). ACE must be maintained within the pre-set limits, so Idaho Power must estimate the amount of regulation reserve that is necessary in order to maintain ACE within these limits in their Balancing Authority Area. Since battery storage resources have the ability to respond to the ACE signals rapidly by quickly charging or discharging, the ancillary services they provide should be valued and should take into consideration the marginal cost to provide these services.

⁹ *Id.*

¹⁰ Chen et al 2020. *Applications of Lithium-Ion Batteries in Grid-Scale Energy Storage Systems.*

¹¹ Denholm et al, *supra* n1.

The contract term necessary in order for a battery storage QF to have a reasonable opportunity to obtain financing.

According to NREL, “Utilities have begun adopting Li-ion storage because of the technology’s high round-trip efficiency, high power density, ample supply chain availability, falling cell and system costs, and favorable performance metrics. Most Li-ion applications to date have provided short-duration power and grid stabilization, capturing value from various services including frequency response, voltage regulation, spinning reserves, transmission deferral, peak shaving, and demand response.”¹² These applications often provided a positive rate of return through value stacking, although a project’s return is highly dependent on contractual terms and obligations between a utility and the developer.

Due to the limited energy market and lack of an ancillary service market in Idaho, battery QFs have significantly lesser revenue streams to recover capital costs and must obtain their revenue from avoided cost rates set by IPUC or determined according to IPUC-established methodology and implemented in either case by IPC. This regulatory construct makes it imperative that longer contract lengths are permitted to allow flexible grid resources such as batteries to generate a positive NPV over their lifetime. As per previous discussions on storage lifetime, contract lengths between 10 and 15 years would likely offer the opportunity for developers to generate positive returns at a reasonable payback time. RNW welcomes further discussion on the issue of contract lengths to support storage QFs and would be happy to provide additional information if requested.

Using multiple successive contracts with shorter length terms to maintain accuracy of avoided cost pricing over the life of a PURPA project and the QFs ability to obtain financing.

Using multiple successive contracts with shorter lengths would offer an opportunity for utilities to update the “avoided cost pricing” used for the ICIPR method over the life of the project but could create significant project financing-related uncertainties for developers. Developers usually conduct a financial analysis over the project lifetime to determine its profitability and payback time. Removing that certainty could cause projects to fail the initial screening, posing a barrier to obtaining equity financing and thus inhibiting the growth of storage QFs in Idaho. RNW welcomes Staff’s decision to engage with PNNL on a study to evaluate the effects of these factors and would welcome the opportunity to provide further comments on this issue once the report is out.

¹² Fu et al 2018, *2018 U.S. Utility-Scale Photovoltaics Plus-Energy Storage System Costs Benchmark*. <https://www.nrel.gov/docs/fy19osti/71714.pdf>

Best practices in surrounding states and analysis on the development of QFs in those states.

Staff’s summary on development of QFs in surrounding states of Oregon, Washington, Utah and Wyoming reflects the regional treatment of PURPA resources in a succinct manner. Staff’s observation that contract types and contract lengths are key factors in determining project financing capability and eventual deployment as a QF is also correct. Battery storage QFs offer a flexible and dispatchable resource for the electric grid. Contract lengths reflecting the actual lifetime of battery storage resources would provide greater financial certainty for project development and provide added value to the utility.

Conclusion

Addressing issues related to storage QFs and storage resources in general is critical for the growth of the clean, flexible, and modern grid in Idaho. Storage resources assist in integrating renewable energy and will play a key role in achieving Idaho Power’s goal of 100% clean power. Renewable Northwest thanks the Commission and Staff for consideration of these comments and would welcome the opportunity for continued participation in this docket.

Respectfully submitted,

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