Public Service of New Hampshire d/b/a Eversource Energy
Docket No. DE 19-057

Date Request Received: 07/19/2021 **Date of Response: 07/27/2021**
Request No. RR 1-002 **Page 1 of 6**
Request from: Department of Energy

Witness: Lee G. Lajoie

Request:
Please provide an explanation or analysis of the actions that would have been required to provide service via diesel generation to the customers served by the submarine cable installed pursuant to project A16NO2 on Bates page 26, Line 7 of Exhibit 62, and the expected costs of providing such service.

Response:
As testified to during the July 19, 2021 hearing in this matter, based upon the characteristics of the service to be provided, the conditions of service and Eversource's experience, Eversource did not previously undertake a specific analysis to determine the viability of providing service to Lockes and Welch Islands by way of distributed generation as opposed to construction of a new submarine cable at a total cost of approximately $1.8 million. Below, Eversource provides such an analysis as requested. Of note, given the time available, this analysis contains numerous estimates and assumptions that may or may not provide a complete view of the costs, or the construction or operational issues. Regardless, Eversource has attempted to provide an analysis based upon estimates that it believes are reasonable.

Base assumptions:

1. Eversource has an obligation to serve, in accordance with state law and Commission rules. Accordingly, abandoning the customers when the cables fail is not deemed to be a viable option.
2. The existing customers on Welch and Lockes islands have been served by Eversource for decades and should continue to have the same characteristics of electric service under any proposed alternatives as they currently have being served by underwater cables, notably without limits on demand (kW) or energy (kWh) usage within the applicable rate schedule, or limits on the time of day or time of year when electric service is available.
3. Calculations within this document are based on typical residential customer usage of approximately 600 kWh per month with a peak demand of 5 kW or less. Some properties on the islands appear to be larger but some are assumed to be camps. Therefore, these values were used as an average.

Option 1: Diesel Generators

As stated in the 2015 LCIRP filing (DE 15-248), Eversource piloted the use of a seasonal mobile diesel generator to defer the construction of a substation and associated distribution line construction in the summer of 2010 and 2011 in New Boston. While this option may be considered in specific applications, the classification by the NH Department of Environmental Services ("DES") of the use of a mobile generator in New Hampshire as a "stationary" generator requires above ground storage tank permits, as

well as emissions testing, reporting, and payment of fees. In addition, the local planning board required noise studies to understand the potential impact to nearby residents. Operational stability and fueling challenges also need to be considered when determining the viability of this option as a short-term solution. Further, the 2010/2011 pilot was placed in a roadside commercial location and was accessible with traditional tanker trucks for refueling , as well as for service personnel.

Since homes on the island may be occupied at any time during the year, island generation would need to be maintained year-round, and therefore fuel provided year-round. Other issues include the tracking of emissions and the associated fees and noise issues with the continuous operation of generators on two islands in the largest lake in the State of NH. There is no commercial dock on either island and it is questionable whether any residents would give permission to use their private dock for the transfer of fuel from a boat to an island storage facility on a regular basis. Environmental considerations for the transportation of fuel to the islands and the transfer of fuel to the island storage must be taken into account, although they are difficult to quantify.

Past experience: In the 1990's a motel in Gorham, NH installed a diesel generator to provide electric service and use waste heat from the unit to heat its pool water. The motel completely disconnected from Eversource's electric distribution system. Within a few years (less than 10), the diesel generator set caught fire and the motel was without power until Eversource could reconnect it to the electric system. The motel subsequently abandoned its equipment and remains an Eversource customer. Given the difficulties in reaching the islands, should a similar generator failure occur on Welch and/or Lockes islands, addressing the damaged equipment and assuring continued service would be substantially more difficult than in this example.

A second experience involves a pair of generators on the top of Mount Washington which had provided electric service to the observatory for many years. In 2008, a project was completed to run electric cables to the summit alongside the Cog Railway tracks. This project was initiated in part to limit the amount of fuel which needed to be brought to the summit and stored, and to reduce the cost of the electricity produced by the generators which was re-sold to various entities with electrical equipment at the summit. In order to maintain the critical power supply at the summit in the event of an interruption of service on the cables, the generators remain and a 2009 news article stated that 45,000 gallons of kerosene are still stored at the summit to fuel the units in the event they are called upon. http://www.newhampshirelakesandmountains.com/articles-c-2009-05-19-148547.113119_high_electric_rates_roil_mt_washington_summit_users.html

Cost: A 600 kW stationary diesel generator was recently quoted at $129,000. It requires major maintenance at an estimated 12,000 to 30,000 hours. Fuel consumption is estimated at between 22 and 42 gallons per hour (depending on electric load). Over the course of a year this amounts to an estimated 193,000 gallons of fuel for each island at the fuel consumption rate for an average of half-load over the year. It is assumed that two units would be needed on each island to provide backup power if a unit is out of service for maintenance or repair. Sites to locate the units would need to be procured on each island, along with sufficient storage for the required amount of fuel and associated facilities such as concrete slabs and oil retention facilities for above ground storage tanks. Step-up transformers would also be required to increase the voltage to 7.2 kV to energize the existing distribution line on each island. Assuming the purchase of four generators (two for each island to provide reliability) and fuel for one generator at each location to run at an average of half load for 8760 hours per year at an average price per gallon of $3.52 (a current price for kerosene) this totals $1,872,749. This cost does not include site preparation costs, two step-up transformers, modifications or additions to existing distribution equipment, permits, fees, or any logistical issues of transporting fuel. It also does not account for

expected resistance from island residents to the noise and emissions from a diesel generator, nor does it account for any process that may be required with DES.

Option 2: Individual roof-top solar with battery storage

This option would require the placement of solar panels on the roofs of the existing customers on the island and the placement of a battery storage unit somewhere on each customer's property. It is assumed that the Company would need to retain ownership of and assume maintenance and repair obligations for both facilities in order to meet its obligation to serve. While individual customers could elect to install their own solar and storage equipment, unless all customers elected to do so, Eversource would be responsible for assuring service to those customers. Installing and maintaining Company equipment in this manner leads to liability concerns with the equipment as well as with Company employees working on the roofs of privately owned residences, especially in winter conditions.

Many of the homes on the island have significant tree coverage which would limit the effectiveness of roof top solar unless significant tree cutting were to be done and subsequently maintained (see figures 2 through 4). In addition to the likelihood of complaints by the residents, tree cutting within 150 feet of shoreline is generally restricted by RSA 227-J.

Additional concerns with roof top solar with storage include ensuring enough generation and storage such that residents do not run out of power, the need to clear snow off the solar panels in the winter, and the need for physical space for battery storage units inside customer residences which, in many cases, do not have basements/foundations.

A 2016 report by the National Renewable Energy Laboratory of the U. S. Department of Energy showed PV with storage for two different cases – a small installation (5.6 kW PV coupled with 3 kW/6kWh battery) and a larger installation (5.6 kW PV coupled with a 5 kW/20 kWh battery) (see figure 1). The report is available at https://www.nrel.gov/docs/fy17osti/67474.pdf. Note that both installations would be "DC Coupled", since there will be no utility interconnection in this case.

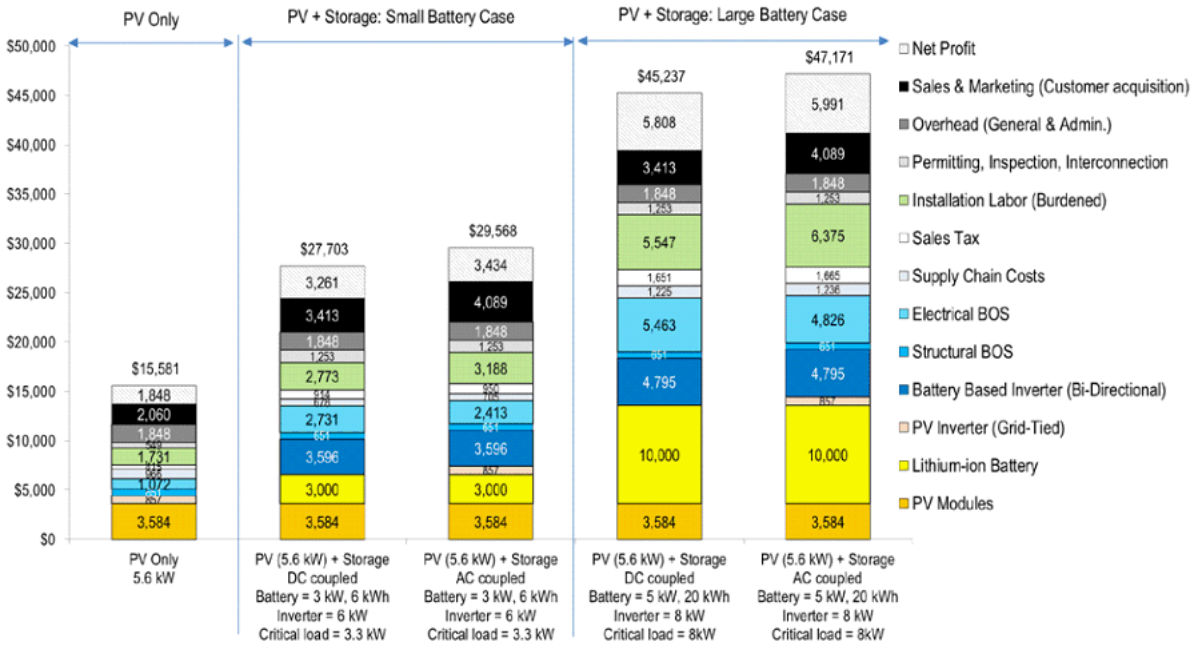

Figure 3. Modeled total installed cost and price components for residential PV-plus-storage systems, small-battery case vs. large-battery case (2016 U.S. dollars)

Figure 1

Cost: Using costs from the NREL study and assuming half the residents would need the small size and half would need the large size from this study, the cost for only the solar and battery installations is $3,647,000. Significant additional costs for tree cutting would be required for the installations, plus ongoing operational costs to ensure the systems remain viable for year-round power supply.

Option 3: Large scale solar with storage:

Both islands are heavily forested. Accordingly, a large-scale solar installation would require significant clearing. Assuming suitable land could be found farther than 150 feet from the shoreline clearing that land would not appear to violate statutes. It would, however, require either purchasing the property or obtaining landowner permission or easements for this installation. There are large lots on the interior of each island, but it is unknown if the owners would be interested in selling or leasing land for the installation of a solar array and battery storage unit, nor is it clear what the costs of such a sale or lease would be assuming it was possible.

Experience: Although Eversource has not constructed any large-scale solar installations in NH, a nearby utility installed a 40 kW array which is expected to produce 4,800 kWh annually. This array covers approximately 4,650 square feet. Scaling this up to an array which would produce the estimated requirement of 20 kWh per day per customer (total of 365,000 kWh annually) this would require approximately one acre on each island, plus clearing outside that acre to prevent tree shadows from interfering with the solar array.

Based on the need to provide 24 hour service for potentially several days when the solar panels might be at significantly reduced capacity or completely out of service due to weather conditions, it is estimated that each island would need at least a 7 MWh battery (50 customers at 20 kWh/day for 7 days).

Cost: The neighboring utility's 4,800 kWh array cost approximately $400,000. Scaling this up for purposes of this analysis to the 365,000 kWh array required gives an estimated cost of $3,000,000 for the solar installation. In the testimony of Charlotte B. Ancel and Jennifer A. Schilling in this docket, which has been entered into the record as Exhibit 8, Eversource estimated that a 7.1MWh battery installation in Westmoreland, NH would require a total capital cost of approximately $7,000,000. It is reasonable to anticipate that the costs would be higher for an island-based installation. However, for this analysis, Eversource will rely upon the $7,000,000 estimate. This brings the total for a ground-mounted array with battery storage to $10,000,000 for each island, or $20,000,000 for the two installations required. This cost does not include acquisition of an acre of land on each island, clearing the land, or other associated costs.

Figure 2 shows an example of tree coverage for some residences on Welch Island.

Figure 2

Figure 3 shows a similar situation for Lockes Island

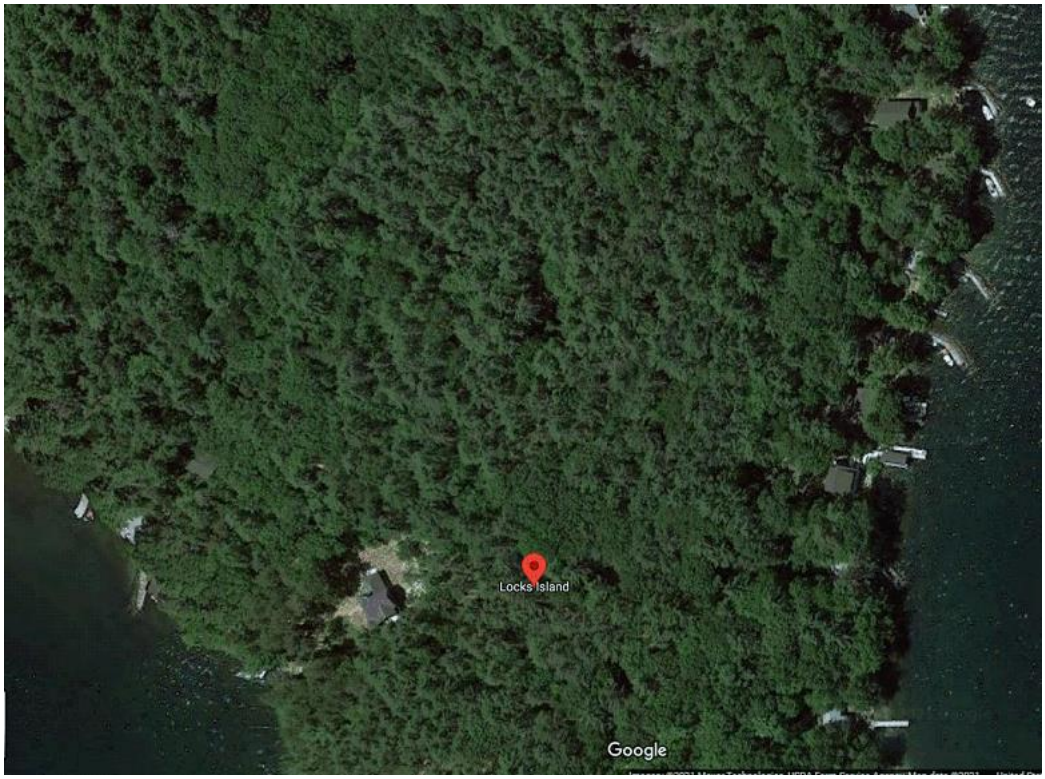

Figure 3

Figure 4 shows an overview of the two islands with the mainland in the lower left

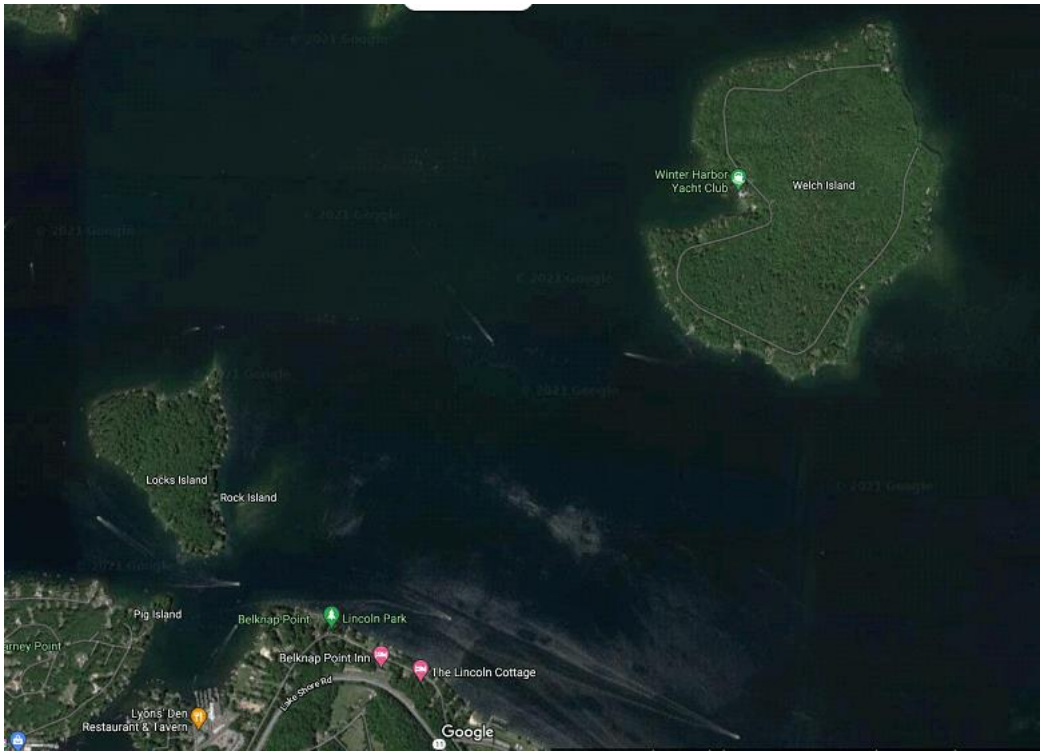

Figure 4