

THE STATE OF NEW HAMPSHIRE
before the
PUBLIC UTILITIES COMMISSION
DE 12-023

Granite State Electric Company d/b/a Liberty Utilities

Default Service Loss Factor Investigation

August 31, 2012

1. Background

In Order 25,376 in DE 12-023, Granite State Electric Company's ("Granite State" or "Company")¹ default service docket, the Commission instructed Granite State to investigate the causes of power losses experienced by the Company's small and large default service customers in New Hampshire. The Commission requested that the Company examine its losses compared to those of National Grid's Massachusetts distribution company ("MECo") and to Unitil Energy Systems, Inc.'s losses in New Hampshire. This report, which analyzes those losses, is submitted in compliance with Order 25,376.

2. The Issue/Investigation

Losses are inherent on any electric system. Losses occur regularly on both the electric transmission and distribution systems because of line loss, transformer losses, system configuration, faults, unmetered loads, theft, and metering inaccuracies. The level of losses on any given electric system can also be affected by the type of load served and time of year; systems serving more rural residential customers require more transformation and longer lines and will result in increased losses, while systems serving a larger urban population of commercial and industrial customers who are delivered voltage at a higher voltage level will experience lower system losses. Losses for this study are determined by comparing the ratio between the distribution loads without losses to the distribution loads with losses. Because of the varied sources of losses, the amount of losses can change from month to month or year to year. The purpose of this report is to analyze the causes of losses in the Company's system and to compare the loss factors to those of MECo's and Unitil's New Hampshire customers.

In 2009, National Grid submitted a report to the Staff on losses experienced on the Granite State system and in 2010 in DE 10-020 submitted another report examining the losses. Those reports identified a steady decline in the losses beginning in 2008. Two causes were identified: (1) a wholesale settlement modeling error, and (2) metering equipment located in Tewksbury, MA, operating outside of their design specification, which created what looked like a steady decline in the losses on the Granite State system. Subsequently, National Grid corrected the wholesale settlement model for New Hampshire, and in November 2011, completed the replacement of the meters and metering equipment on the N214 and O215 lines in Tewksbury MA.

¹ On July 3, 2012, Liberty Energy Utilities (New Hampshire) Corp. acquired the stock of Granite State Electric Company from National Grid USA, and thus is the new owner of the business.

The loss value of an electric distribution system can be calculated by dividing the total wholesale energy delivered into the system by the total energy measured at the retail meters for all of the system's associated customers.

Loss Factor

$$\frac{\textit{Wholesale Loads}}{\textit{Retail Loads}}$$

For Energy Service (Default Service), this value is broken into large and small customer groups. Granite State's Large Customer Group ("LCG") is comprised of the G1 and G2 rate classes. Granite State's Small Customer Group ("SCG") includes rate classes D, D-10, G-3, M, T, and V.

Exhibit 1 contains a table of monthly wholesale and retail loads for the Granite State LCG and SCG customer groups and includes a calculation of the monthly average loss factor.

Exhibit 2 contains a graph of the loss factor for both the SCG and LCG. As shown, the loss factor is highly variable and at least 12 months of data will be required to determine how the recent meter replacements will affect the loss value in either customer group.

Exhibit #3 identifies the loss factor for both the SCG and LCG back to 2006 and shows the improvements in calculated losses as a result of New England Power's wholesale modeling changes implemented in 2008.

3. Explanation of Current Granite State Losses

a. **Transmission Losses**

The energy required to serve Granite State's customers is delivered by NEP at specific delivery points as conceptually illustrated in figures 4 and 5. Currently NEP delivers load into the New Hampshire and Vermont Load Zones (see Exhibit 5). This area is defined as the NEP Meter Domain², which is the interconnected transmission grid that provides service to New Hampshire and Vermont utilities including Granite State, New Hampshire Electric Cooperative, Central Vermont Public Service Company and Green Mountain Power, as defined by the independent system operator in New England (ISO New England). NEP monitors all generators and all ties, including all ties with adjacent transmission grids that feed into the New Hampshire and Vermont Load Zones in the NEP Meter Domain in compliance with ISO-NE's operating procedures and tariffs. See Exhibit 5. By metering all these points, NEP can determine the energy delivered to all connected utilities, including Granite State. The connected utilities are metered at the transmission and distribution interconnection points of their systems and the sum of all the interconnection points for a given utility will be the delivered load for that utility.

² A Meter Domain is the collection of generators, tie-lines and load that are assigned to an ISO New England participant who has the responsibility for reading and submitting wholesale meter data to ISO New England for use in the wholesale settlement process.

The load feeding into NEP’s meter domain is the sum of all NEP’s generators and ties (ties can either bring energy in or send energy out of the NEP Meter Domain) and includes the ties to other New Hampshire and Vermont utilities. Granite State is metered as part of the NEP meter domain. At this time, the total load feeding into NEP’s meter domain minus the load going out to adjacent utilities is Granite State’s load. This method of metering is approved by the ISO and was acceptable when Granite State was a subsidiary of National Grid. In the next two years, NEP, Granite State and the ISO will implement a plan to develop a new Granite State meter domain. This new meter domain will change the wholesale metering points to locations where NEP delivers load into the new Granite State meter domain, as identified in Exhibit 4. These changes may present an opportunity to reduce the losses to all customers and customer groups served by Granite State. To implement these changes Granite State must develop a new electric settlement system that will measure power flows in and out of its meter domain and operate that system for at least 12 months to gather the appropriate data to determine the value and variability of the new loss factors. The new system is schedule to be in service by the fall of 2013.

b. Comparing Default Service Losses

i. Granite State Default Service Losses Compared to National Grid-MECO

Default service losses for National Grid in Massachusetts (MECo) as compared to Granite State’s losses are provided in Exhibit 6. As shown, the Granite State monthly loss factor was significantly more variable prior to the replacement of meters in Tewksbury MA in November 2011. Exhibit 6 reflects an average default service loss factor of approximately 6.5% for National Grid in Massachusetts as compared to 8.75% for Granite State. In addition, Granite State’s loss factor is significantly more variable. The distribution systems of Granite State and MECO are significantly different in size and density of customers. MECO serves many more customers in a much more densely populated area than Granite State, which by definition will result in lower losses. The differing density among the customers of each system explains in part why Granite State’s losses are higher and more variable than those seen by MECO. As a result of the replacement of the meters at Tewksbury and resulting modeling changes on the NEP System, Granite State’s loss factor has been less variable, though it is premature to determine whether a sustained reduction in Granite State’s loss factors will be achieved.

ii. Unitil Default Service Losses

The Unitil Default Service Losses for its large and small customer groups are presented in the table below:

| Distribution Loss Factors by Customer Group: 2009 - 2011 | | | | | |
|---|-------------|----------------------|--------------|----------------------|--------------|
| | | Large Customer Group | | Small Customer Group | |
| | Year | UES | GSECo | UES | GSECo |
| | 2009 | 5.53% | 6.64% | 6.70% | 8.20% |
| | 2010 | 4.46% | 5.68% | 8.32% | 7.24% |
| | 2011 | 1.00% | 8.13% | 8.62% | 9.67% |
| | Average | 3.66% | 6.82% | 7.88% | 8.37% |

As shown, Granite State's average loss factor for the LCG is significantly different from Unitil's only in 2011. The SCG losses are very similar to Unitil's. Unitil's service area is also more similar in density to Granite State's than MECo's. These two factors indicate that Granite State losses are reasonable when compared to a similarly sized distribution company in New Hampshire.

c. Meter Investigation

Granite State currently is studying all metering points at the interconnection of NEP and Granite State's facilities, including both Potential Transformers (PT's) and Current Transformers (CT's) and the meter itself to determine if any known problem exists with this equipment. This study includes an examination of NEP's testing schedule for the equipment. Meters operating outside of their design criteria may misrepresent energy delivered in either direction. Meters measuring large loads can have normal metering inaccuracies that can affect the results in the NEP meter domain. Based on our study NEP is in compliance with the testing requirements identified by the ISO. NEP has also agreed to upgrade meters and metering equipment at several locations within meter domain. This information is important to an understanding of Granite State's loss factor because meters operating outside their design tolerance can increase or decrease losses.

d. Distribution Losses

In addition to the investigation of the relevant meters, Granite State has examined every tie to its distribution system, adjacent transmission and distribution companies and all the generators within the Granite State meter domain. This was required to determine whether these ties play any factor in Granite State's current loss factor. Several ties exist at several different voltage levels. Virtually all of ties are monitored by metering equipment but 3 ties were identified that need additional meters and metering equipment:

1. Liberty Street in Salem, NH: This is a tie point with MECo at the New Hampshire-Massachusetts state line.
2. Ayers Village Rd in Salem, NH: This is a tie point with MECo at the New Hampshire-Massachusetts state line.
3. Charlestown #8 Substation, Charlestown, New Hampshire: The 8L2 circuit has a distribution tie with New Hampshire Electric Cooperative; in addition, there is a second unmetered tie with Granite State's 8L1 circuit.

NEP has agreed to install meters and appropriate metering equipment within the next twenty four months to measure current flow at these interconnection points. These new meters may help to improve the representative measure of the meter domain. At this time, Granite State is unable to estimate the impact these new meters will have on default service losses but will keep the Commission apprised of the results once the meters are installed.

e. Borderline Customers

Granite State has identified over 200 customers currently served from Granite State's load zone that are being billed by adjacent utilities. These so-called "borderline customers" are customers served under a FERC tariff which requires an adjacent utility to serve its neighbors' customers when it is not practical to build facilities to serve those borderline customers from their own facilities. The borderline customers

served from the Granite State system being billed by MECo results in approximately 1.2 million kWh per year of energy that is not reported by Granite State. This under-reporting reduces the total retail load and results in a small increase in the total distribution loss factor. Granite State and MECo are in the process of putting in place borderline service agreements.

f. Residual Losses

Residual Losses are inherent on an electric system and include unmetered load, transformer losses, faults, system configuration changes, meter read timing, where meter reads and billing cycles do not match up with loss data, energy theft, and street lighting. Exhibit 7 illustrates the residual loss factors of MECo in the Northeastern Massachusetts (NEMA) and West Central Massachusetts (WCMA) load zones compared to the Granite State load zone. These values range from approximately +4% to a negative 3% and appear to cycle up and down depending on the load cycle. This does not appear to be a major contributing factor to default service losses in New Hampshire because the Granite State Residuals are very similar to MECo's NEMA and WCMA Load Zones.

g. Supplier Load Estimation process

The supplier load estimation process aggregates all hourly customer load to a supplier level and reports the supplier's load obligation to the supplier and the ISO for hourly market settlement. This process is currently performed for Granite State by National Grid under the Amended and Restated Transition Services Agreement. National Grid uses a software application called PULSE to perform this calculation and reporting function. Granite State is in the process of selecting a software package that it will use to perform this function. The data (hourly loads for each customer) will be similar to but not identical for each software application. Granite State will compare PULSE data to the selected system by having the two run in parallel to examine the data for any significant differences. At this time, it is too early to tell how much this will affect default service losses.

h. New Granite State Meter Domain

As a result of the sale of Granite State, the wholesale meter reading responsibility for the Granite State system will stay with NEP. Liberty Utilities, NEP and the ISO New England have identified the new metering points require for market settlement with the ISO New England. The new metering points will establish the new GSE meter domain by monitoring all substations where energy flows from NEP to GSE, all generators inside the GSE meter domain and all ties to adjacent meter domains. This change will move the meter locations to more accurately measure the total wholesale load delivered to Granite State customers. The details required to establish the new meter domain have been identified by Granite State, NEP and ISO-NE. The systems required for data collection and settlement implementation are not expected to be completed until the fall of 2013.

4. Conclusion

This detailed investigation of the losses on the Granite State system focused on both the transmission system and the distribution system and identified what causes losses and why losses on one system can vary from another. The investigation confirmed loss values are not out of line when compared to another New Hampshire utility but confirmed loss values were moderately higher when compared to adjacent load zones in Massachusetts.

The investigation into transmission system losses focused on the NEP New Hampshire load zone and changes that will result from the sale of Granite State to Liberty Utilities. Granite State working with NEP and the ISO New England has developed a new meter domain. The new meter domain will change the delivery points to locations where energy flows from NEP's system into Granite State's system. This metering change has the potential to decrease the overall wholesale load delivered into the Granite State load zone and possibly decreasing the total losses to Granite State's customers. Granite State will apprise the Commission of its progress regarding these changes. Three additional meters and the associated metering equipment will be installed to improve the accuracy of the total wholesale load reported to serve Granite State's customers.

The investigation into distribution losses focused on residual losses, borderline customers and a comparison of total distribution system losses with surrounding utilities. Residual losses appeared to be in line with neighboring Massachusetts customers. It is expected that changes to the way borderline customers are reported will increase the total Granite State retail load and may reduce the overall distribution losses to Granite State's customers. By accounting for these borderline sales, it is expected that there will be an increase in electric sales of approximately 1.2 million kilowatt hours per year for Granite State may reduce the distribution losses to all customer groups.