Before the New Hampshire
Public Utilities Commission

DE 16-674

Motion to Correct Errors in PUC Determination of Avoided Costs

June 17, 2016 (rev. 6/21/16)

Now comes Clifton Below, a customer-generator with Granite State Electric Company, d.b.a. Liberty Utilities (LU), at the home address of 25 Perley Avenue, Lebanon, NH 03766-1816 and an email address of clifton.below@gmail.com and moves that the Commission correct errors in its determination of avoided costs pursuant to Puc 903.02(j) and revise its determination of rates for avoided energy costs and capacity factors as necessary. I state the following, all true to the best of my knowledge and belief, in support of this motion:

1. Puc 903.02(j) reads as follows: "To correct an error in its determination of avoided costs, the commission shall, on its own motion, the motion of a utility, or the motion of a third party revise its determination of rates for avoided costs and capacity factors as necessary. Any amounts paid or credited at the originally published rates and capacity factors shall be subject to reconciliation by the revised rates and factors."

2. The annual commission determinations of avoided costs in Puc 903.02(i) are for the purposes of "determining the rates for utility avoided costs for energy and capacity consistent with the requirements of the Public Utilities Regulatory Policy Act of 1978 (PURPA) (16 USC § 824a-3 and 18 CFR § 292.304)" and RSA 362-A:9 V(b).

3. Puc 903.02(i)(2) provides that (with emphasis added):

   The rates for avoided energy costs shall be based on the short-term avoided energy costs for the New Hampshire load zone in the wholesale electricity market administered by ISO New England, Inc., consisting of **the hourly real time locational marginal price (LMP) of electricity plus**

generation related ancillary service charges, all adjusted for the average line loss in New Hampshire between the wholesale metering point and the retail metering point;

4. Puc 903.02(i)(3) provides that the rate for avoided generation related FCM capacity costs is to include an adjustment "for average line loss in New Hampshire between the wholesale metering point and the retail metering point."

5. On or about May 20, 2016 I received a letter dated May 18, 2016 from Nicole Harris, Manager Billings & Collections for Liberty Utilities advising that through the March billing cycle I had generated a net surplus of 7,140 kWh (7.14 MWh) with an economic value of $247.56 for avoided energy and capacity costs. (Exhibit 1, p. 11.) I have no issue with LU's calculation of this value as it is consistent with the avoided cost values for PV systems published in an Excel spreadsheet on the PUC website at this address: https://www.puc.nh.gov/Electric/Avoided%20Cost%20Calculation%20for%20Puc%20900%204-15-2016_Final%20version.xlsx ("2016 source spreadsheet").

6. Upon examination of the source spreadsheet (and those for the prior 4 years that this calculation has been done) I identified 2 material errors that I believe should be corrected. Both errors result in an undervaluation of the avoided costs for net metered generation resulting in a benefit shift from customer-generators to others, possibly a mix of other customers, LU, and/or default service providers.

7. **<u>The first error</u>** arises from the use of $1.00/kWh as a proxy estimate for actual ancillary services charges. In the 2nd tab "AC calc" of the 2016 source spreadsheet starting at cell L20 is this note on data source: "** Generation Related Ancillary Services info not readily available. Used simplifying assumption of $1.00/MWh".

8. It is erroneous to state that such data or information is not readily available and the simplifying assumption of $1.00/MWh is only about 26% of the actual average (not load weighted) generation

related ancillary services charges for the NH load zone for the 12 months ending 3/31/16, as well as for the 12 months ending 3/31/15 and only 23% of such charges for the year ending 3/31/14.

9. Information on generation related ancillary service charges is, in fact, readily available from ISO-New England and on a timely basis, i.e. before April 15 of each year when such avoided costs calculations are required to be published by the PUC pursuant to Puc 903.2(i)(1). Within about 5 minutes of my search of the ISO-New England website I found 2 sources for such data.

10. The first source that I found is ISO-New England's "Monthly Wholesale Load Cost Report. March 2016," (April 11, 2016) found at http://www.iso-ne.com/static-assets/documents/2016/04/2016_03_wlc.pdf. Page 3 of this documents states as follows (with emphasis added):

> The purpose of this report is to provide a monthly presentation of the average costs associated with serving a real-time load obligation in the New England Wholesale Markets. While this analysis and report detail the *majority* of costs accruing to wholesale, real-time load according to current Wholesale Market Settlement rules, there are costs that occur from time to time that are not included.
>
> This analysis is intended to emphasize and underscore the locational aspects of the component costs of electricity in the New England Wholesale markets. The underlying information is derived at the zonal level, and in many cases, the component charges vary markedly by zone. Aggregating these costs to a New England level and dividing by the New England-level RTLO is potentially misleading. For this reason, a zonal load-weighted average of the hourly total zonal costs is computed. This load-weighted value is then averaged over the relevant time period and shown as the 'New England Total Cost' value.
>
> **In states where restructuring has occurred, the sum total of costs presented in this report most closely represents the 'energy supply' portion of the unbundled customer bill.** Transmission and distribution charges, including restructuring transition payments (if any), time-of-use or demand charges, and other retail tariffs are not included here.

11. A summary of such NH specific charges for the 13 months ending March 2016 is found on p. 15, Table 3.3.2 "New Hampshire Load Zone Wholesale Load Cost Components, Last 13 Months." (Exh. 2, p. 12) In addition to Energy LMP and Capacity (converted to $/MWh) average charges for all hours, on-peak, and off-peak for each month, this table includes the detailed charges that are ancillary to, or supplemental to and directly a function of, wholesale hourly energy charges, namely

"NCPC," "Ancillary Markets," "Misc Credit/Charge," and "Wholesale Mkt Service Charge." All of these charges are costs that are avoided when retail loads are reduced or displaced by production from customer-generators.

12. I copied Table 3.3.2 into an Excel spreadsheet to subtotal all of the ancillary charges exclusive of LMP and capacity and to generate a load weighted average for the 12 months ending 3/31/16, all hours, peak hours, and non-peak hours. The spreadsheet is attached electronically as "NH Wholesale Load Costs PY16.xlsx" and is shown as Exhibit 3, p. 13. The simple monthly average for these ancillary charges is $3.82/MWh and the load weighted average is $3.81/MWh.

13. The second source for generation related ancillary charges that I found, which is also referenced in the Monthly Wholesale Load Cost Report, is a page where ".csv" files can be downloaded with New Hampshire specific hourly values for LMP, Capacity and all charges for ancillary services found at: http://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/whlsecost-hourly-newhampshire. These monthly reports appear to be available shortly after the end of each month. I downloaded the 12 monthly NH files from 4/15 to 3/16 and compiled them into separate tabs in one Excel spreadsheet attached electronically hereto as "NH Hourly Wholesale Load Cost Reports 15-16.xlsx." I added column W to subtract out the RTLMP (energy) and Capacity values from total wholesale cost to load to yield a separate subtotal value for ancillary services charges. These reports also include hourly NH RTLMPs which appear to consistently match those in the source spreadsheets

14. Starting with the PUC 2016 source spreadsheet I added explanatory information and a number of supplemental calculations, including a conversion of the capacity value expressed in $/kW-month to $/MWh/year and combined it with the avoided energy cost calculation to yield a total avoided cost calculation for surplus generation expressed in $/MWh and $/kWh, for both PV and non-PV net

metered generation and ratios between the two. These additions are highlighted with a light grey background. I also inserted a Surplus Generation Valuation Example calculator, using my surplus generation as an example (cell F25 highlighted in yellow), that calculates avoided cost values for surplus PV generation using both the energy plus kW-month for capacity method, probably used by LU for producing the letter in Exhibit 1, and the composite $/MWh calculation that I have inserted. Both yield identical results that are only $0.01 different than LU's calculation, apparently a de minimis rounding difference. I also added tabs to generate results based on actual hourly and average generation related ancillary charges for comparison. This revised 2016 spreadsheet is electronically attached as "Avoided Cost Calculation for Puc 900 4-15-2016_Final-r.xlsx" and the revised first tab "Avoided Costs 4-15-16" is shown as Exhibit 4.1, p. 14.

15. I should also note that I slightly modified the structure of the 2nd tab "AC calc" so that the treatment of the skipped hour at the start of Daylight Savings Time (DST) in March and the extra hour at the end of DST in November are the same as the way ISO-NE treats those. Specifically the line for skipped hour in March was deleted (instead of zeroed out) and the extra 2am hour in November is shown as separate hour labeled 2X or 0:200x instead of adding the data for the two hours together as the source spreadsheets had done. This made the next step easier and still yields 8760 hours for the year. (Leap day is skipped.)

16. I copied the first two tabs in the revised 2016 spreadsheet to generate revised results using actual hourly NH specific charges for services ancillary to generation by inserting data from Column W for each month from "NH Hourly Wholesale Load Cost Reports 15-16.xlsx" in place of the PUC assumed $1/MWh. The results are shown in the 3rd tab of the revised 2016 spreadsheet, "Avoided Costs 4-15-16 (2)" and is shown as Exhibit 4.2 on p. 15. The result shows an increase in the energy avoided cost for non-PV generation of $2.89/MWh or 9.1% and for PV generation $3.09/MWh or 10.0%, and

an increase in overall value (including capacity) of 8.7% and 8.9% respectively. This is a material difference and should be corrected.

17. To see how close the use of on-peak and off-peak average annual generation related ancillary cost data from Exhibit 2 matched actual hourly data I created a 3rd set of tabs, entering the average on and off-peak generation related values of $4.47 and $3.35 respectively and using the ISO-NE on and off peak codes for each hour (Column W). The results slightly understate the energy value of non-PV generation compared to actual hourly data by 1.4% ($0.46/MWh) and overstates PV value by 0.5% ($0.16/MWh). (Exh. 4.3 on p. 16.) Since the same or greater amount of time was necessary to generate this result compared with using actual hourly data, due to the need to enter on and off peak codes that vary with weekends and certain holidays, there is no apparent advantage to using this less accurate method.

18. As another possible less time consuming way to calculate avoided costs I tried the use of a single load weighted average for generation related ancillary costs from Exhibit 2 to see how it matched actual hourly data by creating a 4th set of tabs just using $3.81 instead of $1 for that value. The results are shown in Exhibit 4.4, p. 17. This method overstated the energy value of non-PV generation by a mere $0.01/MWh but underestimated the energy value of PV by $0.19/MWh or 0.6%. This method maybe took a half an hour or so to do the work described in paragraph 12 compared with somewhat over an hour the first time I did the steps described in paragraph 13 and 15 and about an hour or a bit less the 2nd and 3rd times I did that for the years ending 3/31/15 and 3/31/14. Use of the annual average figure for NH would certainly be better than just assuming $1/MWh but use of the actual hourly data seems worth the small incremental additional effort, especially since most of the hourly data (for both LMP and ancillary services charges) could be inserted into the spreadsheet well in advance of the April 15 completion date set in the rules, with only March data needing to be inserted in April.

19. I repeated the steps described in paragraphs 14-16 for the PUC's Avoided Cost Calculations for the 12 months ending 3/31/15 and 3/31/14 using these two respective source files: https://www.puc.nh.gov/Electric/Avoided%20Cost%20Calculation%20for%20Puc%20900%204-15-2015_Final%20version.xlsx and https://www.puc.nh.gov/Electric/Avoided%20Cost%20Calculation%20for%20Puc%20900%204-15-2014_Final%20version.xlsx. I don't have clean working (not password protected) source spreadsheets for the prior two years and they don't seem to be available through the PUC website so I did not do those revisions, although the same assumed $1 value for generation related ancillary services charges were used in those avoided cost calculations and probably should be corrected.

20. The attached revised file for 2015 is named "Avoided Cost Calculation for Puc 900 4-15-2015_Final version-r.xlsx" and is attached electronically. The ISO-NE hourly source files for NH were compiled into the electronically attached file named "NH Hourly Wholesale Load Cost Report 14-15.xlsx." The summary avoided cost calculations are attached as Exhibits 5.1 and 5.2 on pp. 18-19. Using the actual hourly data instead of the assumed $1/MWh increased the non-PV energy value by $2.93/MWh from $49.85/MWh to $52.78/MWh or 5.9%. For PV energy value the increase was $3.45/MWh from $52.89/MWh to $56.34/MWh or 6.5%.

21. The attached revised file for 2014 is named "Avoided Cost Calculation for Puc 900 4-15-2014_Final version-r.xlsx" and is attached electronically. The ISO-NE hourly source files for NH were compiled into the electronically attached file named "NH Hourly Wholesale Load Cost Report 13-14.xlsx." The summary avoided cost calculations are attached as Exhibits 6.1 and 6.2 on pp. 20-21. Using the actual hourly data instead of the assumed $1/MWh increased the non-PV energy value by $3.53/MWh from $74.65/MWh to $78.18/MWh or 4.7%. For PV energy value the increase was $3.78/MWh from $79.68/MWh to $83.46/MWh, also 4.7%.

22. **The second material error** is with regard to the calculation of "average line loss in New Hampshire between the wholesale metering point and the retail metering point" (Puc 903.02(i)(2) and (3), or as FERC PURPA rule CFR §292.304 (e)(4), puts it "[t]he costs or savings resulting from variations in line losses from those that would have existed in the absence of purchases from a qualifying facility, if the purchasing electric utility generated an equivalent amount of energy itself or purchased an equivalent amount of electric energy or capacity." [That FERC rule was cited by the PUC before JLCAR in 2011 in support of the then proposed Puc 903.02 rule.]

23. The average line loss calculated by the PUC was 6.06% in 2014, 3.62% in 2015 and 3.11% in 2016. Individual utility "line losses" used in these calculations have ranged from 1.91% to 7.93%. These wide variations do not seem to comport with the line loss factors that Eversource and Unitil are using to gross up loads at retail meter points and equate them to power delivered at wholesale meter points. These values are shown on their website at these addresses: https://www.eversource.com/Content/nh/about/doing-business-with-us/energy-supplier-information/electric---new-hampshire and http://unitil.com/energy-for-businesses/electric-information/energy-supply-options/competitive-supplier-resources. Print outs of the relevant portions of these web pages are attached as Exhibits 7.1 and 7.2 respectively on pp. 22-23. Similar loss factors for Liberty Utilities do not seem to be available on their website. Eversource explains the use of these factors as follows: "The loss factors below are utilized to calculate losses, which will then be added to actual or estimated load to arrive at total supplier assigned load. The loss factors below do not include transmission losses." These factors range from a low of 4.42% for Rate LG customers to 7.75% for Rate R and G customers. In contrast, the PUC estimate of line losses for the 2016 avoided cost calculation using FERC Form 1 data is mere 2.94%. Clearly something is amiss here.

24. The problem likely arises from the use of the FERC Form 1, p. 402 data that shows net generation and power purchases for power acquired and a "Total Energy Losses" figure by accounting for certain dispositions of energy. The wide variability of this data from year to year and between utilities should make it suspect. Total Energy Losses may not equate well to line losses between wholesale and retail meter points. One possible explanation for some portion of the apparent decline in line losses may be net power generation that is being put onto the grid by customer-generators, like myself, that may not be included in the "Purchases" reported on FERC Form 1. This could be particularly true of group net metered generation where most of the power from a net metered system is being exported onto the distribution grid from the host location but is not being counted as utility purchases. In addition, even if generation exports onto the grid were counted as purchases there would be minimal line losses between producing and consuming retail meter points because this distributed generation is very proximate to load compared with the distance and subsequent line losses between retail meter points and wholesale meter points. In essence unaccounted for exported net metered generation could be reducing the apparent line losses on the distribution grid, but not the actual line losses between retail and wholesale meter points. The Puc 900 rule does not specify how this calculation is to be made, but it seems that the line loss factors that the utilities use to gross up retail loads form their meter points to wholesale meter points would be a much more accurate approximation of this component of avoided costs.

25. In the electronically attached file "Avoided Cost Calculation for Puc 900 4-15-2016_Final-r2.xlsx" I have provided two alternative calculations of line losses in the last tab "Losses" and shown as Exhibit 8, p. 24. The first alternative shown in dark shading simply corrects a minor error in the approach used by the PUC calculation where the "Total Energy Losses" are divided by "Total MWh Acquired" to yield a percentage of line losses. This factor could be used to net down from wholesale power acquired but isn't quite as accurate for grossing up from the retail load or generation. To do

that the line losses should be divided by retail load for the correct line loss factor. I have done that at lines 21-25. This results in only a 0.1% increase in the multiplier, arguably a de minimis error.

26. The second alternative calculation of line losses uses the available utility line loss factors cited in Exhibits 7.1 and 7.2 to gross up from retail load to wholesale load. I weighted those rates by rate class loads obtained from FERC Form 1, p. 304 (for CY 2014, the latest available at: https://www.puc.nh.gov/Electric/AnnualReports.html) to produce a more accurate estimate for line losses consistent with Puc 903.02(i)(2) and (3). This is shown in the box on lines 28-47 of the Exhibit 8 Losses tab (p.24). This results in an estimate of average NH line losses as a percent of retail load of 6.9%, more than double the PUC calculation. A 2nd revised "Avoided Costs 4-15-16 (2) r2" is shown as Exhibit 9, p. 25 and incorporates both the corrected actual generation related ancillary services charges for each hour and this revised line loss factor. Not surprisingly, the revised line loss factor increases the overall (energy and capacity) avoided costs for both non-PV and PV generation by 3.7% or $1.32/MWh and $1.39/MWh respectively. I should note that I had some uncertainty as to the proper matching up of loads by rate class from FERC Form 1, p. 304 but I did the best I could. PUC staff may have access to better quality and temporally matched data to better refine this revised calculation, with or without actual LU line loss factors.

27. By comparing Exhibit 9 with Exhibit 4.1, the overall effect of correcting both errors with the proposed revised calculations results in a 12.9% increase in the avoided cost value of PV generation (up $4.48/MWh from $34.67/MWh to $39.15/MWh) and a 12.7% increase in the avoided cost value of non-PV generation (up $4.21/MWh from $33.18/MWh to $37.39/MWh). These errors are material and I respectfully request that the PUC revise its determination of rates for avoided energy and capacity costs as is necessary pursuant to Puc 903.02(j).

/s/ Clifton C. Below