GWA Research, LLC
7 Masa Morey Lane
Lyme, NH 03768
603-795-4920
www.gwaresearch.com

April 3, 2024

Deandra Perruccio
NH Department of Energy
21 South Fruit Street
Suite 10
Concord, NH 03301

Dear Ms. Perruccio:

I am writing on the behalf of Keene State College, Keene, NH. The Keene State College central heating plant boilers use of renewable vegetable oil fuel (Tradename LR100) was approved for eligibility to produce NH Class I Thermal RECs on 27 July 2017. It is a 5.886 MW equivalent facility, its NEPOOL GIS code is NON105740. I serve as the Independent Monitor for this facility effective 22 September 2023.

To compute the net Thermal REC's generated by this facility data from temperature and pressure sensors, as well as boiler makeup water flow meters, are used to make the calculation via an approved alternative metering method in compliance with NH PUC 2506.04(f)3. These sensors and meters upload their data to a Honeywell energy management system where they are logged and stored.

During the 4th Quarter of CY 2023 the Honeywell system failed to log/store data during several extended periods. The timeframe was limited to a couple periods where data was lost for different, but related reasons. These reasons are quoted below directly from the Honeywell technician for the site:

- "11/17/23 4:00 PM – 11/20/23 8:02 AM. Server was down for the weekend and started again on Monday. After discussing with the IT department I was informed the larger server which houses our virtual machines was experiencing problems on the 17th. This larger machine was either shutdown or rebooted and our Honeywell servers were not turned back on. Since server was completely down for this period of time I have no trending data for this period."

- "11/16/23 10:14 AM – 11/16/23 12:02 PM. The five Honeywell virtual machines were upgraded and switched over to five new virtual machines. This was about a two hour

changeout process. Because new servers were being turned and configured the data from this period of time I am also unable to get."

- "I am having a problem with the trending sampling causing the 6 minute average to not work properly. I had to send you 1 minute snapshot reporting for the period of time trending has been on new servers (16th). From the 16th to the 1st it is data from old servers at 6 minute intervals. I am currently working on sample time problem with Honeywell."

There were other small outages leading up to, and after, these major outages. These problems did not result from any actions of the local staff, or impacts from the monitoring equipment used by the Alternate Metering Method to gather the data needed to calculate the TREC's.

The system was back up and operating after these brief periods noted above. I have not reduced the 1st quarter's data from CY24 yet but will be doing so soon and at that point will do a thorough review of the data. The Honeywell technician assigned to the site does a review of the data as he retrieves it for my use; he discovered the other issues before forwarding the data to me, as I expect he will do going forward. He has not informed me of any issues in the 1st quarter data from CY24 and all of that data has been transmitted to me at this point.

My understanding is that there have not been major issues with data due to failures of the Honeywell BMS system in the past. Certainly, one would not expect this to be any more than an isolated incident for a firm with the resources of Honeywell, and whose business focus is centered on and around monitoring and control activities.

As to the future, I'm encouraging the site, through the LR100 fuel supplier, to have the fuel consumption meters for all three boilers calibrated by an independent agent either in place or via removal and delivery to their laboratory. I would monitor the activities associated with the recalibration. I'm also making other recommendations on when the meters are read that will facilitate reconstruction as I've done here should that be necessary. Those efforts, combined with the additional data and experience I have gained through this effort and will gain with my continuation as IM for this site, will assure a much more accurate and reliable backup method should an unlikely failure of the Honeywell system occur in the future.

For these incidents, I have reconstructed the missing logged data using fuel use records. The method I used relies on the specific rate of fuel consumption, measured in gallons of LR100 used per MWh of Thermal REC's generated. This calculation of specific fuel usage rate is made for each boiler (Boilers 2, 3, and 4; Boiler 1 is no longer is service) using all data from periods during the 4th Quarter of CY 2023 for which data was logged by the Honeywell system. The specific fuel usage rate is combined with the fuel use as measured by fuel meters that are read and recorded manually on a daily basis.

A theoretical minimum specific fuel usage rate per MWh can be calculated using the Higher Heating Value of the fuel which has been measured at 128,000 Btu/gallon, this minimum specific fuel usage rate represents 100% conversion of fuel to Thermal REC's. As a check on

the specific fuel usage rate calculated from the manual fuel meter records this minimum theoretical fuel consumption can be used to find the fuel conversion efficiency based on the fuel use records. This value is calculated as 76.5% and 80.2% for Boilers #2 and #3, respectively. These values are creditable based on my engineering judgement. The lower efficiency of Boiler #2 when compared to Boiler #3 is attributed to the fact that it was in service for much less for the 4th Quarter of CY 2023, generating approximately 1/3 of the Thermal REC's produced by Boiler #3.

For Boiler #4 this check on the specific fuel usage rate per MWh produces a boiler conversion efficiency greater than 100%, thus the reconstruction of its Thermal REC's from the fuel use is not valid. The fuel flow meter for Boiler #4 is obviously underpredicting flow. To deal with that issue, for Boiler #4 I used the average specific fuel consumption per MWh of Boilers #2 and #3, which would represent a fuel conversion efficiency of 78.4%. This results in a conservative estimate as the fuel use measured by the underreporting #4 fuel meter is paired with the specific fuel consumption per MWh of the #2 and #3 boilers. The underreporting of the fuel meter for Boiler #4 is approximately 30%, thus the Thermal REC's would be similarly underreported assuming the average conversion efficiency of the #2 and #3 Boilers for Boiler #4. In my engineering judgement this method is fully supportable as resulting in an overall underreported Thermal REC's generation for the 4th Quarter of CY 2023.

To put these reconstructions in perspective, the net increase in TREC's is 266.9 MWh from this adjustment, which represents only 3.4% of the total Thermal REC's to be reported for the 4th Quarter of CY 2023 for the facility.

Thus, I am requesting one time approval for this instance to report the Thermal REC's as adjusted by this method for the fourth quarter of CY2023.

I'll be glad to answer any questions on this request.

Respectfully,

Gary Phetteplace, PhD, PE

CF: Rory Gaunt, Lifecycle Renewables