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Energy · Environment · Enterprise

M E M O R A N D U M

Date: August 7, 2017

To: Samantha Meserve, MA Department of Energy Resources

From: Peter Oven, WES

CC: Dan Wilson, WES

Re: MA APS thermal comments

The following are comments regarding the revised Regulations and Guidelines for the Massachusetts APS regarding the inclusion of renewable thermal energy generation units.

WES is grateful to DOER staff for the great amount of effort invested both behind the scenes and in public comment sessions, in bringing these rules and guidelines through the development process.

225-cmr-16-draft-aps-regulation-redline

1. On page 21, it states that "The MassCEC will act as the independent verifier for all small Generation Units and intermediate Generation Units using Eligible Biomass Woody Fuel" but it is not clear what the statutory duties are of this "independent verifier." Do all RTGU installations require an independent verifier, or only all small, and intermediate biomass RTGUs? Is the independent verifier the same as the Third Party Meter Reader?

guideline-on-metering-and-calculations-part-1-redline-060517

1. In section 2, on page 3, it states that "If a Generation Unit is classified as small, but wishes to be classified as intermediate, they may do so with the approval of the Department." WES proposes that DOER also allow small or intermediate RTGUs to be classified as large RTGUs with the approval of the Department, using the following proposed additional language: "*If a Generation Unit is classified as small or intermediate, but wishes to be classified as large, they may do so with the approval of the Department.*"

guideline-on-metering-and-calculations-part-2-clean-060917

1. Page 11, section 3 (Locating Btu Meters) states in b): "Whenever possible, Btu meters should be located before any point of connection with a non-useful heat load, such as a radiator of cooling tower that rejects excess heat, before delivery to the distribution system, or rejection of excess heating systems." This statement is confusing and WES proposes the following alternative languate which WES believes was the original intent of this statement: "*Whenever possible, Btu meters should be located after any point of connection with a non-useful heat load, such as a radiator or cooling tower that rejects excess heat, before delivery to the distribution system.*"

2. Page 12 includes a Figure 1 which shows a diagram of a generic central RTGU with distributed thermal loads. The purpose of this figure is not entirely clear, as the figure is not referenced in the text. On page 11, 3)c) states that when the RTGU is located more than 500 ft from the point of connection with a thermal load, the Btu meter(s) must be located within 30 ft from the point of connection to the thermal load. Could it be clarified as to exactly what scenario this is covering, and that the connection point for a district heating system is in fact in the central plant? It is important to note that either a fossil fuel district heating system or RTGU district heating system would see the same losses in the district heating lines, and that the connection point for the RTGU is therefore in the central plant. Regarding the discussion of this same case on page 10-11, the Exception states that pumping energy to transfer heat between the central RTGU and each remote building (more than 500 ft. from the "point of connection") should be counted as parasitic energy or grid energy. Could it be clarified as to what scenario this would be applied? Please remember that a fossil system serving this same district energy system has the same pumping requirements, and that the RTGU is simply supplying heat to this same system.
3. On page 13, it states that "The MWh of wood fuel consumed for the given quarter is to be determined per the method and protocol described in Section 3 of the *APS Guideline on Biomass, Biogas, and Biofuels for APS Renewable Thermal Generation Units*." WES is unable to locate this protocol in the referenced guideline.
4. Regarding page 14, Table 2, the thermal energy meter requirements for steam, WES has the following comments:
    a. "System Field Accuracy" is not well defined. Is this the accuracy at the design flow rate and rated output of the RTGU? Is this the accuracy of the flow meter only, or the accuracy of the overall Btu computation which takes into account pressure and/or temperature sensors?
    b. It should not be necessary to specify or exclude specific flow metering technologies, provided that the overall "System Field Accuracy" is maintained as specified. There are other flow metering technologies that provide similar accuracies to the technologies specified, and which may be more appropriate for certain facilities. If it is DOER's intention to maintain references to specific metering technologies, WES recommends that DOER include language stating that "*alternative metering technologies may be utilized under the guidance of a Professional Engineer registered in the Commonwealth of Massachusetts and in good standing, provided that the specified System Field Accuracy is maintained.*"
    c. For line sizes 8" and above, an orifice plate flowmeter is specified. Orifice plate flow elements are only one example out of a family of flowmeters which use the principle of pressure drop to measure flow. Other related pressure-drop flow elements include the HHR FlowPak manufactured by FTI Wika, and the V-Cone manufactured by McCrometer. These other flow elements have characteristics which may recommend their use in specific instances, such as improved accuracy, or reduced straight pipe requirements. Thus, DOER's specification of an orifice plate flow element for line sizes of 8" and above

could be burdensome and does not effectively advance DOER's specific goal in this case of requiring accurate metering of thermal energy.

d. For line sizes less than 8", a "vortex shedding tube" is specified. The term "vortex shedding tube" is inaccurate and WES believes that DOER intends to mean a vortex shedding flow meter. As previously mentioned, a vortex shedding flow meter is a reasonable flow measurement technology in many cases, but not necessarily in all cases. Orifice plate and other differential pressure flow elements can provide good accuracy and are more appropriate in certain circumstances. Thus, the specification of the vortex shedding meter in this case could be burdensome and has no effect on meter accuracy compared to alternate metering technologies which provide the same or better accuracy.

e. DOER makes no specific references to the sensing technologies nor the accuracies of the temperature and/or pressure sensors. As mentioned previously, the term "system field accuracy" is unclear and could refer to the overall Btu computation, or the accuracies of the individual sensors.

5. Regarding page 15, Table 3, the thermal energy meter requirements for hot water, WES has the following comment:
    a. There are certain situations where a mag meter has issues due to water quality, and there are sometimes issues with proper installation of acoustic meters. The accuracy of Btu metering is certainly impacted by the accuracy of the flow meter, but this is not the most beneficial place to spend additional dollars on Btu metering. The accuracy of the temperature sensors, recording equipment, and delta Ts of the system are much larger drivers of system accuracy.
6. Regarding page 15, Table 4, the thermal energy meter requirements for air, WES has the following comments:
    a. Where is air metering utilized elsewhere in this guideline?
    b. Without determination of the humidity ratios for the entering and leaving air, it is unlikely that any Btu metering system for air can achieve ±3% accuracy.
7. Regarding the requirements for electric (kWh) meters on page 16, WES believes that the requirement to be certified to ANSI C12.20 is unnecessarily stringent and will result in RTGU installations incurring significant cost for metering relatively little energy compared to the net thermal output of the RTGU. ANSI C12.20 specifies 2 accuracy classes, of 0.5% and 0.2%. It is not clear which accuracy class DOER intends for the meters on the RTGUs to meet. ANSI C12.1 is the standard for revenue grade electric meters with accuracy of 2%, and this should be sufficient based on comparison to the other meter accuracies specified by DOER in the metering guidelines. WES requests consideration of replacing 3.H)1) with the text: "*Be certified as meeting ANSI C12.20, be certified as meeting ANSI C12.1, or have a manufacturer's guaranteed accuracy of ±2% or better.*"
    a. Additionally, the requirement that the electric meter "Have a kW and kWh remote output signal with an output signal interval of not more than once per minute" seems to imply that the electric meter must have a pulse output. However, because the kW and kWh values will be logged by the DAS, a pulse output is not necessarily the most

convenient way to transmit this information. Additionally, it is unclear what DOER intends by the requirement that the signal interval not be more than once per minute, and how this has any bearing on the measurement of the electrical energy. WES recommends that DOER also allow for electric meters which transmit data via network protocols, e.g. Modbus. WES requests consideration of replacing 3.H)2) with the text: "*Have a network interface allowing access to kW and kWh registers, or have a kW and kWh remote output signal.*"

8. On page 48 and 49, in the sections on “Large, Fired RTGUs which Generate a Hot Heat Transfer Fluid,” the term “fluid” is imprecise. Air, water, and steam are all fluids, however, the metering diagram in Figure 15 on page 49 is clearly assuming that the fluid is a liquid. WES recommends that DOER use the word “*liquid*” rather than “fluid” in this case in order to differentiate it from air and steam.
9. Figure 15 on page 49, when interpreted as referring to hot water systems, shows an incorrect thermal storage tank configuration, because the thermal storage tank has no connection to the return water from the thermal load. Such a connection is necessary in order to allow for variance in flow rates between the boiler flow and the district system flow, and to allow for optimal thermal stratification in the tank. This error may result in confusion regarding the proper placement of the Btu flow meter and temperature sensors.
10. Figure 16 on page 53 makes assumptions regarding the layout of a steam system which do not apply in all cases, even cases which are explained in the notes which follow this figure. For example, no metering of the heat from the blowdown steam is shown, there is no allowance for an alternate location of the feedwater meter in the case of excessive makeup water, and not all systems have a deaerator tank. Rather than attempt to impose a one size fits all diagram, DOER should emphasize accuracy and proper design of the metering system for each specific and unique instance.
11. The equation “(SF* hS – FW*hFW) / 3.412E6 (Btu/MWh)” on page 55 is inaccurate because it subtracts the total energy in the feedwater which is used for blowdown, in addition to the energy in the feedwater used to determine the net energy added by the boiler to the steam, resulting in a Btu total which understates the actual useful heat delivered to the system. If the steam meter is before the deaerator, the parasitic steam load due to blowdown will be the mass flow of blowdown times the difference in enthalpy of the temperature setpoint of the DA tank and the enthalpy of the makeup water used to replace the water lost to blowdown. If DOER wishes to retain the feedwater meter and the location of the steam meter prior to the DA tank, WES proposes that DOER also specify a temperature sensor on the makeup water so as to determine hMW, the enthalpy of the makeup water, and to calculate useful heat delivered by the equation: SF * (hS – hFW) – (FW – SF)*(hFW – hMW). Alternatively, WES proposes that DOER eliminate the feedwater flow meter from the base metering system example, locate the steam meter downstream of the steam feed to the DA tank, and calculate useful heat delivered by the equation SF * (hS – hFW).

guideline-on-biomass-biogas-and-biofuels-redline-060517

1. Page 5 mentions the "independent verifier for large Generation Units." Is this independent verifier the same as the Third Party Meter Reader?
2. On page 12, table 3, there are requirements for biomass systems. One requirement is that start up is by an automatic (i.e. electric ignition) system. This requirement is applicable to smaller units, however, this does not make sense for larger units used in large district energy systems or for serving large process loads as industrial facilities. For large systems, the fireboxes are large, and the systems are designed to run constantly at high percentages of their rated capacity. These systems are designed to specifically keep owners from turning them on and off, and cycling these systems in this way would actually increase emissions. It is recommended that this requirement either have a size cutoff of approximately 500,000 Btu/hr or that owners be directed to follow manufacturer operational instructions that were used when the system was tested to show compliance with emission requirements. This requirement, as written now, also seems to be in conflict with the modulation/shut off item, which requires that the system "modulate to lower output **and/or** turn itself off…..". If the system is designed to modulate to lower output, but not turn itself off, then there would be no need for an automatic ignition system.
3. WES appreciates DOER's modifications to the fuel quality requirements which provides an exemption from compliance with DOER's fuel quality specifications, provided that applicable emissions limits are met.
4. The pellet standard for moisture is listed as <8%. It is assumed that this was meant to be consistent with PFI Premium. To be exact, PFI Premium's standard is ≤8%, rather than <8% as specified by DOER. Also, ENPlus A1 is also referenced as a way to comply with DOER's standard, and ENPlus A1 requires pellet moisture to be ≤10%. Therefore, neither PFI Premium nor ENPlus A1 certification would be sufficient to meet the DOER standard. WES recommends that DOER either allow certification to PFI Premium or ENPlus A1 to be used as qualification of pellet fuel in lieu of DOER's standards, increase DOER's standard to ≤10%, or change the standard to ≤8% and drop the reference to ENPlus A1.
5. Similarly, DOER's standard for pellet ash content is <1%, however PFI Premium's standard for ash content is ≤1%. WES recommends that DOER change its standard for ash content to ≤1% to be consistent with PFI Premium. As an aside, the ENPlus A1 standard for ash content is ≤0.7%.