



64 Peg Shop Road
Keene, NH 03431

June 15, 2016

Dear Ms. Meserve,

Following please find DCM Logic's comments on portions of the APS Regulation Filed as part of the Renewable Heating and Cooling in the Alternative Portfolio Standard. We think it important to bring to your immediate attention that prominent portions of the draft regulations and guidelines as published are not in conformity with the legislation on which they are based.

Our comments derive from comprehensive monitoring, done on several different manufacturers' boilers over the last three heating seasons, and on computations that aggregate data from over seventy boilers in over forty installations during this time period. We believe that our database may quite likely be the largest multi-season biomass boiler operation database in existence. The conclusions from it can be of substantial help to your Department in drafting regulations and guidelines that comply with the requirements set forth in relevant Commonwealth legislation, and form the basis for our comments that follow.

We would welcome the opportunity to discuss our comments with you and your colleagues at your earliest convenience.

Respectfully submitted,

A handwritten signature in blue ink that reads 'David N. Spindler'.

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DCM Logic Comments on *225 CMR 16.00 Alternative Energy Portfolio Standard (APS) and APS Guideline on Biomass, Biogas, and Biofuels for APS Renewable Thermal Generation Units*

DCM Logic finds that key portions of the MA Department of Energy Resources regulations regarding its biomass thermal programs, when viewed from the perspective of extensive real-world biomass boiler data, do not comport with relevant Massachusetts legislation.

It may be that DOER has accessed substantial amounts of data that support its rulemaking decisions and that this data credibly calls into question the data to which DCM Logic has access. If not, we believe that basing rulemaking decisions on particular rules used in other wood heat incentive programs, “accepted industry practice,” or other theories unconfirmed by real-world data is unhelpful both to the Commonwealth’s users of commercial-scale biomass heat as well as for the advancement of the biomass thermal industry in general. Seen in this light, portions of the regulations also have the more serious defect of failing to comply with relevant Massachusetts legislation.

Listed below are comments on specific sections of 225 CMR 16.00: Alternative Energy Portfolio Standard (APS) [Draft] (hereafter, “the Regulations”) and *APS Guideline on Biomass, Biogas and Biofuels for APS Renewable Thermal Generation Units* (hereafter, “the Guidelines”). We examine these proposed regulations against real-world data in order to point out where the Regulations and Guidelines stand in opposition to certain portions of the Acts of 2014, Chapter 251 (hereafter, “the Act”).

Section I: Comments on the Regulations

1. Regulations, 225 CMR 16.05(4)(d)iv:

Section 2(b)iii of the Act directs the Department to set “for eligible biomass, biogas and liquid biofuel technologies, requirements for thermal storage or other means to minimize any significant deterioration of efficiency or emissions due to boiler cycling, if feasible.” [emphasis added]

225 CMR 16.05(4)(d)iv states: “APS Renewable Thermal Generation Units shall meet fuel conversion efficiency performance standards achievable by best-in-class commercially-feasible technologies, and shall minimize any significant deterioration of efficiency or air emissions due to cycling by applying correctly sized and insulated thermal storage unless the system can

maintain performance and low air emission levels at low capacity, as detailed in the Department's *APS Guideline on Biomass, Liquid Biofuels and Biogas*.”¹

Unless the Department has evidence to support its decision that certain thermal storage requirements do in fact minimize cycling, this portion of the Regulations does not comply with the Act.

DCM Logic's data from monitoring dozens of boiler plants over three heating seasons shows that cycling is in fact not correlated with the sizing of thermal storage. It is also not possible from this data set to say that there is support for any level of thermal storage sizing as being “correct.” (Data available upon request.) In addition, we know of no data that supports a correlation between the quantity of thermal storage and cycling. Lastly, to address the important “if feasible” standard of the Act, using a certain quantity of thermal storage alone is not a feasible (commercially or otherwise) means of reducing cycling since it does not produce the desired effect.

If “requirements for thermal storage” are insufficient to “minimize any significant deterioration of efficiency or emissions due to boiler cycling, if feasible” (Section 2(b)iii of the Act), the Act then requires the Department to set “other means” to achieve this same goal.

On its face, the language in 225 CMR 16.05(4)(d)iv appears to be the “other means” required by the Act: “unless the system can maintain performance [referring, presumably, to efficiency] and low air emission levels at low capacity, as detailed in the Department's *APS Guideline on Biomass, Liquid Biofuels and Biogas*.” The Guidelines also require modulation to levels lower than 20% of full output (p. 8, #8).

We support high efficiency and low emissions at low output modulation as well as the ability of boilers to modulate to low levels of output. However, here the Department's Regulations and Guidelines depart from the requirements of the Act. The Act is rightly concerned with cycling, and its harmful effects on efficiency and emissions. In current industry tests, efficiency and emissions are measured at steady-state levels, whereas the Act refers to cycling, which by definition is not steady-state operation. In addition, the Regulations confuse the ability to modulate to a certain low output level with responsiveness in modulation controls that compel a boiler to quickly modulate to low output levels when needed. It is this responsiveness that actively increases cycle length, not the mere ability to modulate to a certain level.

¹ The Department's website includes a document titled, “APS Guideline on Biomass, Biogas and Biofuels for APS Renewable Thermal Generation Units.” Despite the slight difference in title, we assume that this is the document to which this draft provision refers.

Taken together, the portions of the Regulations and Guidelines so far quoted fail to comply with the Act's requirements of 1) setting thermal storage requirements to reduce cycling, or 2) setting other means of reducing cycling. However, another portion of the Guidelines, if modestly revised, successfully complies with the "other means" requirement contemplated in the Act. In the original, the Guidelines read:

"The system must automatically modulate to lower output and/or turn itself off when the heating load decreases or is satisfied."
(Guidelines, p. 6, Table 2)

Allowing a boiler to turn off when the heating load decreases stands in direct opposition to the intent of the Act to reduce cycling. Boilers should modulate to lower output when the heating load decreases, otherwise average cycle length will decrease. DCM Logic's data set shows a very strong connection between the responsiveness of modulation controls and cycle length. We recommend changing the language in 225 CMR 16.05(4)(d)iv and Guidelines, Table 2 to:

"The system must automatically modulate to lower output when the heating load decreases and turn itself off when the heat load is satisfied."

In our opinion, this qualifies as an "other means" method of reducing cycling referred to by the Legislature.

If the Department believes that it is also necessary to respond to the Legislature's suggestion in Section 2(b)iii to formulate requirements about thermal storage, adding the following language to the above sentence may be sufficient:

"The use of thermal storage may be part of an overall solution to reduce boiler cycling, provided system boilers use responsive modulation controls."

Finally, requiring responsive modulation controls is clearly within the "if feasible" standard of the Act. We recommend using the above language in order to comply with the requirements of the Act.

2. Regulations, 225 CMR 16.05(4)(d)v:

Section 2(a)iv of the Act requires “that facilities using biomass fuel shall be low emission [and] use efficient energy conversion technologies.”

Section 2(b)i of the Act requires that the Department shall set

“Emission performance standards that are protective of public health, including standards for eligible biomass, biogas and liquid biofuel technologies that limit eligibility only to best-in-class commercially-feasible technologies, inclusive of energy conversion and emissions controls, with regard to reducing emissions of particulate matter sized 2.5 microns or less and carbon monoxide and other air pollutants.”

Regulations, 225 CMR 16.05(4)(d)v repeats part of the Act, and makes reference to the Guidelines:

“APS Renewable Thermal Generation Units shall meet air emission performance standards that are protective of public health, including standards for particulate matter sized 2.5 microns or less and carbon monoxide, as detailed in the Department’s *APS Guideline on Biomass, Liquid Biofuels and Biogas*. “

Inexplicably, the Guidelines do not require systems with thermal storage to meet any emissions and efficiency requirements at low output modulation (Guidelines, p. 6-7). We do not see how this exemption for systems with thermal storage (which may spend 40% of their seasonal operating time at firing rates lower than 50% of full output modulation) can be considered in compliance with the Act’s Section 2 requirements that biomass fuel facilities shall be “low emission [and] use efficient energy conversion technologies” and that the Department’s standards be “protective of public health.” (Data on modulation levels available upon request.)

Section II: Comments on the Guidelines

1. Page 6. The draft as it stands reads as follows:

“Modulation/shut off: The system must automatically modulate to lower output and/or turn itself off when the heating load decreases or is satisfied.”

Allowing a boiler to turn off when the heating load merely decreases runs counter to the Legislature’s desire in Section 2(b)iii of the Act to reduce cycling. Responsive modulation to lower outputs decreases cycling, and

responsive modulation to higher outputs increases the comfort delivered by the boiler. We recommend revising to the following:

“The system must quickly and automatically modulate to higher or lower output when the heating load increases or decreases respectively, and turn itself off when the heat load is satisfied.”

2. Page 7-8, #7. DCM Logic’s data show no support for a particular amount of thermal storage per unit of nameplate capacity output successfully acting to decrease boiler cycling. (See Section I, Comment 1 of this document). We recommend deleting specific thermal storage amount recommendations. If this is not ultimately deleted, we strongly urge that the requirement not exceed NYSERDA’s requirement of 2 gallons storage per kbtu of capacity of the smallest boiler installed (not of the plant’s total installed capacity).² Also, we see no conceivable justification in theory or fact for abruptly increasing the minimum size of thermal storage by a factor of nearly 20 from 119 gallons for a boiler plant generating .999 MMBtu/hr to 2,000 gallons for a boiler plant generating 1.001 MMBtu/hr.
3. Page 8, #7. We assume that DOER is prohibiting horizontal thermal storage tanks because of the difficulty in achieving stratification, and because of the belief that stratification of thermal storage is necessary to minimize cycling. DCM Logic’s data set shows no correlation between the level of thermal storage tank stratification and cycling. (Data available upon request.) We recommend deleting this sentence, as it does not help fulfill the requirement of Section 2(b)iii of the Act to minimize cycling.
4. Page 8. #8. Very few, if any, biomass boilers can modulate to output levels lower than 20% of full output modulation. The effect of this provision will be to require thermal storage in all installations, which we presume is the intention of neither the Legislature nor the Department. We recommend changing this modulation requirement to 30% of nameplate capacity, and requiring this capability whether or not thermal storage is used. (As mentioned previously, systems with thermal storage can spend a large proportion of their operating time at low output modulation). We are also unclear why systems with thermal storage are not subject to emissions and efficiency requirements except at full output modulation and recommend a level playing field for all systems, whether or not thermal storage is used. (See Section I, Comment 2 of this document)

² NYSERDA, *Renewable Heat NY Technical Guidance Document for Large Commercial Pellet Boilers*, p. 8.