

**Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs
DEPARTMENT OF ENERGY RESOURCES**

ALTERNATIVE ENERGY PORTFOLIO STANDARD

GUIDELINE

**ON BIOMASS, BIOGAS, AND BIOFUELS FOR
ELIGIBLE RENEWABLE THERMAL GENERATION UNITS**

[Effective Date]

Pursuant to the Alternative Energy Portfolio Standard Regulations at 225 CMR 16.00

This Guideline provides the detailed criteria by which Alternative Portfolio Standard (APS) Renewable Thermal Generation Units (RTGU) using solid biomass, biogas, and liquid biofuels shall be evaluated as to their eligibility, including qualifying types and sources, emission performance, fuel conversion efficiency, life-cycle greenhouse gas (GHG) emission reductions, and mitigation of performance deterioration due to boiler cycling, as well as sustainability in the case of forest-derived biomass.

The purpose of this Guideline is to provide clear criteria by which Generation Unit owners, operators, developers, output aggregators, and others can ascertain the likelihood of qualification of their projects that use such fuels.

This Guideline is effective immediately upon issuance. However, the Department of Energy Resources (Department) may consider variance from the Guideline in the case of systems that went into commercial operation prior to the issuance date.

1. Provisions in the APS Statute and Regulations

The ARPS statute at M.G.L. Chapter 25A, Section 11F^{1/2}(a) and(b)⁻¹, as amended by Chapter 251 of the Acts of 2014, mandates the following as an eligible Alternative Energy Generating Source, with certain conditions required for eligible biomass, biogas, and liquid biofuel technologies:

(a) . . . “alternative energy generating source” shall mean a source which generates energy using any of the following: . . . (iv) any facility that generates useful thermal energy using sunlight, biomass, biogas, liquid biofuel or naturally occurring temperature differences in ground, air or water, provided, however, that facilities using biomass fuel shall be low emission, use efficient energy conversion technologies and fuel that is produced by means of sustainable forestry practices; . . .

(b) The department, in consultation with the department of environmental protection, shall set: (i) 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; (ii) for eligible biomass, biogas and liquid biofuel technologies, a requirement of 50 per cent reduction in life-cycle greenhouse gas emissions compared to a high efficiency unit utilizing the fuel that is being displaced or, for a new load, a high-efficiency natural gas unit, if natural gas is available at reasonable cost to the site or otherwise the fuel that is most likely to be utilized; (iii) for eligible biomass, biogas and liquid biofuel technologies, requirements for thermal storage or other means to minimize any significant

¹ The ARPS statute is available at <https://malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter25A/Section11F1~2>. These were amended by sections 1, 2, 3, and 9 of [Chapter 251 of the Acts of 2014](#).

deterioration of efficiency or emissions due to boiler cycling, if feasible; (iv) for eligible biomass, biogas and liquid biofuel technologies, fuel conversion efficiency performance standards achievable by best-in-class commercially-feasible technologies; and (v) in consultation with the department of conservation and recreation, for forest-derived biomass, requirements that fuel shall be provided by means of sustainable forestry practices; provided, however, that the department shall adopt any existing or new biomass fuel sustainability standards if deemed appropriate by the department after a public comment process.

Additional restrictions on the use and eligibility of biomass, biogas, and biofuel can be found in 225 CMR 16.05(4)(g) through 225 CMR 16.05(4)(l). Pursuant to the verification provision in that language, the APS Regulations state the following at 225 CMR 16.05(4):²

~~(d) Restrictions and Standards on the Use of Eligible Biomass Fuel. An APS Renewable Thermal Generation Unit using Eligible Biomass Fuel is subject to the following restrictions:~~

- ~~1. Fuel Quality. Eligible Biomass Woody Fuel shall be produced using only Clean Wood, and meet fuel quality specifications with regards to moisture, ash, and chlorine content, as provided in the Department's *Guideline on Biomass, Biogas, and Biofuels for Eligible Renewable Thermal Generation Units*~~
- ~~2. Sustainable Forestry Management. Forest Derived Residues and Thinnings shall only be sourced from forests meeting Sustainable Forestry Management practices, as independently verified according to the specifications in the Department's *Guideline on Biomass, Biogas, and Biofuels for Eligible Renewable Thermal Generation Units*.~~
- ~~3. System Performance. 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 *Guideline on Biomass, Biogas, and Biofuels for Eligible Renewable Thermal Generation Units*.~~
- ~~4. Emission Performance Standards. 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 *Guideline on Biomass, Biogas, and Biofuels for Eligible Renewable Thermal Generation Units*.~~
- ~~5. Aggregation of Units using Eligible Liquid Biofuels. An APS Renewable Thermal Generation Unit using Eligible Liquid Biofuels or Eligible Liquid Biofuels blended with heating oil shall seek qualification as an APS Renewable Thermal Generation Unit only as part of an Aggregation, as provided for in 225 CMR 16.05(3).~~

~~The Department will review the Department's *Guideline on Biomass, Biogas, and Biofuels for Eligible Renewable Thermal Generation Units* not less than every two years in consultation with the MassDEP and DCR and update the Guideline where appropriate. The Department will assess the impact of biomass heating on the region's forests every five years, beginning in 2020 and in coordination with the Forest Impact Assessment under the Renewable Portfolio Standard Class I, as prescribed in 225 CMR 14.05(8)(b)2., and make program changes as necessary. The Department will report annually on the aggregate woody biomass fuel composition used in qualified APS Renewable Thermal Generation Units.~~

~~(e) Greenhouse Gas Emission Reduction. APS Renewable Thermal Generation Units utilizing biomass, biogas,~~

² The APS Regulations are available at <http://www.mass.gov/eea/docs/doer/renewables/thermal/225-cmr-16-draft-renewable-thermal-regulation-052416.pdf>

~~and biofuel shall reduce life cycle greenhouse gas emissions by at least 50% compared to a high efficiency unit utilizing the fuel that is being displaced or, for a new load, a high efficiency natural gas unit, if natural gas is available at reasonable cost to the site, or otherwise, the fuel that is most likely to be utilized. Additional information for determining whether or not systems meet this reduction can be found in the Department's *Guideline on Reduction of Greenhouse Gases for Eligible Renewable Thermal Generation Units Using Eligible Woody Biomass* and in the Department's *Guideline on Biomass, Biogas, and Biofuels for Eligible Renewable Thermal Generation Units*. Generation Units that report a percent under compliance in 225 CMR 16.05(4)(d)(iii), shall be placed in a probationary status and the Department shall notify the Owner that its Statement of Qualification shall be revoked at the end of five Compliance Years following the Compliance Year for which the percent under compliance was reported. The Unit's probationary status shall be rescinded and the Unit's Statement of Qualification shall no longer be subject to revocation if either:~~

- ~~1. — for any three Compliance Years of the probationary period the Generation Unit demonstrates that it is complying with the lifecycle greenhouse gas emissions requirements; or~~
- ~~2. — the Generation Unit's accumulated percent under compliance is offset by any net over compliance with the lifecycle greenhouse gas emissions requirement during the probationary period.~~

~~Pursuant to the statute and the regulations, this Guideline specifies the eligibility criteria for APS Renewable Thermal Generation Units that use biomass, biogas, and biofuels.~~

2. Applicability

This Guideline is applicable to all facilities utilizing biomass, biogas, and liquid biofuels that seek qualification as APS Renewable Thermal Generation Units under 225 CMR 16.00.

3. Biomass Sustainability

~~Per 225 CMR 16.05(4)(g)(2), f~~Facilities using woody biomass in the form of pellets, chips, cord wood, or biogas (through biomass gasification) will need to demonstrate that any ~~F~~forest ~~D~~erived Residues or Thinnings woody biomass they use to generate Useful Thermal Energy is sourced from forests managed according to Ssustainable Fforestry Management practices. The definition of Sustainable Forestry Management, which can be found in 225 CMR 16.02, is based off the definition of Sustainable Forestry from the Dictionary of Forestry provided by the Society of American Foresters. ~~Non-F~~forest ~~D~~erived woody biomass Residues (as defined in 225 CMR 16.020) ~~are is~~ considered to meet the sustainability requirements, so for these resources, no further sustainability demonstration is required.

~~Per 225 CMR 16.05(4)(k), t~~The Department will establish and maintain a Biomass Suppliers List with manufacturers and retail suppliers of eligible fuel that meets the biomass sustainability and fuel quality requirements. Facilities seeking qualification as APS Renewable Thermal Generation Units using woody biomass will be required to either only use fuel from a supplier on the Department's list ~~of suppliers for the duration of the APS qualification of the thermal energy generating unit,~~ and keep purchase records ~~to demonstrate compliance with this requirement or complete an annual report that documents the sustainability of the woody fuel used in the Generation Unit. The Department reserves the right to audit these records at any time during the Generation Unit's qualification period.~~

Fuel suppliers ~~wishing to be included on the list and~~ Generation Units will need to demonstrate to the Department's satisfaction the sustainable management of the forest from which woody biomass was sourced to the extent that forest derived biomass is used to manufacture the biomass fuel. Fuel suppliers

and Generation Units will need to document the chain of custody from the forest to the retail supplier and on to the end customer.

The ~~suppliers have the~~ following options are sufficient to demonstrate Sustainable Forest Management:

A) **Licensed Forester Attestation**

The licensed forester attests that all the plots from where Eligible Biomass Woody Fuel was sourced were covered by a long term forest management plan, adhered to best management practices, and implemented the Biomass Harvesting and Retention Guidelines for the Northeast (Forest Guild, 2010). For forests in the Commonwealth of Massachusetts the long term forest management plan should be a Commonwealth of Massachusetts Department of Conservation and Recreation (DCR) cutting plan under the long term management option. Suppliers utilizing forest outside of the Commonwealth of Massachusetts should have a cutting plan authorized under the host state forest agency or signature of a professional forester.

~~who is certified by the Society of American Foresters, licensed and/or certified by the host state of the harvest site.~~

Chain of custody is documented through bills of ~~lading~~laden. Eligible Biomass Woody Fuel must be reported on a consignment basis to ensure sufficient disaggregation of sustainability data. Each consignment should constitute the same characteristics in terms of feedstock types, biomass form, and geographical origin.

B) **Independent Certification ~~of Forest Resource~~**

The Department recognizes independent third-party certification schemes as meeting the sustainability requirements for Eligible Biomass Woody Fuel land. At time of writing, these are the Forest Stewardship Council (FSC) and Program for the Endorsement of Forest Certification (PEFC), which includes the Sustainable Forestry Initiative (SFI) and American Tree Farm System (ATFS). The Department will continue benchmarking other independent certification schemes and may update this Guideline as necessary.

The Department will work with the DCR and the Commonwealth of Massachusetts Department of Agricultural Resources (DAR) to include provisions for downed wood and soil conditions into the wood products specifications of the Commonwealth of Massachusetts Quality Program, so as to be able to add this program to the list of approved certification schemes.

To demonstrate that Eligible Biomass Woody Fuel is supplied under one of the approved schemes, the raw material needs to be supplied with a valid claim under that approved scheme (i.e. it must be certified against that scheme). Valid will mean that the claim covers the product delivered, the expiration date has not passed and it issued to the supplier making the claim. A supplier cannot supply raw material or fuel as certified by one of the approved schemes if it is not itself certified to that scheme. The raw material or fuel must be covered under the scope of the supplier's certification.

~~A Mass Balance Approach (MBA) is a means of accounting for the flows of material using a defined system during a defined period of time. In this system, sets of sustainability characteristics such as the origin from a certified source can be transferred between consignments or mix of consignments.~~

~~However, a node in the supply chain can only use or sell biomass with the same sustainability and legality characteristics and in the same volume as the biomass they took in originally, taking account of any conversion factors or losses in production, less any biomass they have recorded as being used or sold previously.~~

~~A MBA is recommended as a useful tool for ensuring that accurate information about the origin of the Eligible Biomass Woody Fuel passes through the supply chain whilst allowing material with differing content to be mixed.~~

If the Eligible Biomass Woody Fuel for an APS Renewable Thermal Generation Unit is sourced from ~~the same~~ property owned by as the Generation Unit owner, this Generation Unit will be considered a self-supplier. Self-suppliers must register with the ~~Biomass Suppliers List and~~ Department and demonstrate ~~to the Department that~~ they have the legal right to source the fuel, through ownership, rental, or other relevant arrangement. ~~A self-supplier that wants to supply Eligible Biomass Woody Fuels to other units or suppliers~~ will need to show compliance with all forestry related requirements laid out in this Guideline.

For the purpose of this program, a licensed forester is considered someone who is certified by the Society of American Foresters and has a valid forestry license and/or certification issued by the Commonwealth of Massachusetts, or other comparable state.

4. Verification

As established in 225 CMR 16.05(4)(g)(6), qQualified APS Generation Units using Eligible Biomass Woody Fuel are required to keep records that show only eligible fuel was used in the Generation Unit to generate Useful Thermal Energy. This record must clearly state the following elements and can consist of invoices, delivery notes, or any other documentation provided by the fuel supplier. The records must be kept for a period of at least five (5) years.

A) Supplier of the fuel

~~A) (must be featured on the Department's Biomass Supplier List)~~

B) Volume Amount of fuel delivered ~~(tons)~~

~~— Date of delivery~~

~~B)C) _____~~

C)D) _____ Fuel quality type and specifications prescribed 225 CMR 16.05(4)(g)1., including a certification that any emission control device was operated and maintained in accordance with the manufacturer's specifications in order to comply with the applicable particulate matter emission limit in 225 CMR 16.05(4)(g)5.

~~D)A) _____ Date of delivery~~

The independent verifier for ~~intermediate-small~~ Generation Units using eligible woody biomass will perform spot checks to verify the use of eligible fuel.

The independent verifier for Harge Generation Units using Eligible Biomass Woody Fuel will include in their meter reading audit a check of the eligibility of the biomass fuel used.

5. Greenhouse Gas Reduction

All qualified Generation Units using biomass, biogas, and biofuel must provide a 50% reduction in lifecycle GHG emissions, per M.G.L. Chapter 25A, Section 11F½ and 225 CMR 16.05(4)(i). The details per calculating this reduction are below.

A) Generation Units Using a Fuel Supplier from the Department’s Biomass Suppliers List

All Generation Units which purchase fuel from a fuel supplier on the Department’s Biomass Suppliers list are assumed to have met the requirement for a 50% reduction in lifecycle GHG emissions and are not required to provide any further analysis, unless requested by the Department.

B) Generation Units Not Using a Fuel Supplier from the Department’s Biomass Suppliers List

All Generation Units which purchase fuel from a fuel supplier not on the Department’s Biomass Suppliers list, or produce their own fuel, are required to submit to the Department a completed copy of the Department’s *Guideline on Reduction of Greenhouse Gases for Eligible Renewable Thermal Generation Units Using Eligible Woody Biomass*. If the analysis shows a GHG emissions reduction less than 50% in 30 years the Generation Unit will be subject to the provisions in 225 CMR 16.05(4)(i).

C) Generation Units Using Eligible Liquid Biofuel and Bio-oil

All Eligible Liquid Biofuel and bio-oil are required to meet the standards for advanced biofuels under the Federal Renewable Fuel Standard (RFS) program, which requires a 50% reduction in lifecycle GHG emissions, compared to number 2 fuel oil. Because of this provision all Eligible Liquid Biofuel and bio-oil is considered to have met the 50% reduction in GHG emissions and is not required to provide additional analysis, unless requested by the Department.

D) Generation Units Using Eligible Biogas Fuel

The analysis for the reduction of GHG for Generation Units using Eligible Biogas Fuel will be conducted on a case by case basis. The Department will use this information to report aggregate share of residues and thinnings from pellet & chip producers/suppliers used in the Commonwealth of Massachusetts and the associated greenhouse gas emission profile of the Eligible Biomass Woody Fuel. If the Department finds less than fifty percent (50%) greenhouse gas emission reductions in comparison to the default or displaced fossil fuel heating energy delivered unit, corrective measures will be taken. This may include removing suppliers with significantly lower shares of residues in the delivered Eligible Biomass Woody Fuel from the Commonwealth of Massachusetts Biomass Suppliers List.

5.6. Biomass Suppliers List

The Department shall provide a list of prescreened fuel suppliers, which qualified Generation Units, may use to source their fuel in order to ensure they meet the required biomass sustainability and GHG thresholds. Any supplier of wood pellets who wishes to be included in the Department’s Biomass Suppliers List must apply to the Department, using an application provided by the Department on its website. At this time, the Department will not prescreen suppliers of wood chips, as information

regarding biomass sustainability and greenhouse gas reduction will be collected from each individual Generation Unit.

Suppliers on the Biomass Suppliers List of Eligible Biomass Woody Fuel on the Department Biomass Suppliers List will annually report to the Department the source of the fuel, disaggregated into Forest Derived Residues, Non-Forest Derived Residues, Forest Derived Salvage, and Forest Derived Thinnings, and the demonstration of the biomass sustainability for applicable Forest Derived Woody Biomass. The Biomass Suppliers List shall contain three (3) Classes, which will be based on the percentage of residues and thinnings used in the fuel and fuel source which the biomass system will be replacing or supplementing. Fuel suppliers are able to qualify for one (1), two (2), or all Classes based on the makeup of their fuel. The maximum combined percentage of Forest Derived Residues, Non-Forest Derived Residues, and Forest Salvage per Class can be found in 225 CMR 16.05(4)(k) and seen in the table below. For example, a wood chip system replacing a natural gas unit would need to use fuel that has an annual average of fifty five percent (55%) Forest Derived Residues, Non-Forest Derived Residues, and Forest Salvage combined.

Table 1. Biomass Suppliers List, Class Characteristic

<u>Class</u>	<u>Fuel being displaced</u>	<u>Minimum combined percentage of Forest Derived Residues, Non-Forest Derived Residues, and Forest Salvage</u>
<u>Class I</u>	<u>Natural gas, electric resistance, propane, fuel oil #6, fuel oil #2</u>	<u>55%</u>
<u>Class II</u>	<u>Electric resistance, propane, fuel oil #6, fuel oil #2</u>	<u>50%</u>
<u>Class III</u>	<u>Fuel oil #6, fuel oil #2</u>	<u>35%</u>

following:

- ~~A) Total Volume of Eligible Biomass fuel supplied to Qualified APS Renewable Thermal Generation Units for the calendar year~~
- ~~B) Source of the fuel, disaggregated in residues and thinnings;~~
- ~~C) Demonstration of the sustainable forest management for applicable Forest Derived Woody Biomass; and~~

If the fuel supplier does not report to the Department annually, or does not meet the required breakdown of Forest Derived Residues and Forest Derived Thinnings, the fuel supplier will be taken off the list for the upcoming year. Fuel suppliers may reapply to be placed back on the list at the end of the year, if they can meet the Department’s standards.

6.7. System Performance

The APS Renewable Thermal Generation Units using eligible biomass fuels ~~must need to~~ meet the ~~following~~ system requirements in 225 CMR 16.05(4)(g), which can also be seen below.

Table 112. Air Emission Limits for Biomass Fuel Boilers and Furnaces at Nominal Output

<p>Systems less than 3 MMBtu/hr heat input. A boiler or furnace of less than 3,000,000 Btu per hour rated heat input must meet applicable emissions limits below: In a project that combines several heaters that on their own are below the threshold, these heaters have to meet the emission limits for units less than 3 MMBtu/h heat input.</p>		
	Pellets / Liquid Biofuels / Biogas	Chips
Particulate Matter emissions (PM)	<p>$\leq 0.08 \text{ lb PM}_{2.5} \text{ per MMBtu}_{\text{input}}$</p> <p>or</p> <p>$\leq 0.03 \text{ lb PM}_{2.5} \text{ per MMBtu}_{\text{input}}$ at sensitive populations³ at nominal output (equivalent to $< 0.10 \text{ lb PM}_{2.5} / \text{MMBtu}_{\text{output}}$ at 80% thermal efficiency)</p>	<p>$\leq 0.10 \text{ lb PM}_{2.5} \text{ per MMBtu}_{\text{input}}$</p> <p>or</p> <p>$\leq 0.05 \text{ lbs total PM per MMBtu}_{\text{input}}$ if EN303-5 is used to verify emissions</p> <p>or</p> <p>$\leq 0.03 \text{ lb PM}_{2.5} \text{ per MMBtu}_{\text{input}}$ at sensitive populations $< 0.10 \text{ lb PM}_{2.5} / \text{MMBtu}_{\text{input}}$⁴ at nominal output (equivalent to $< 0.10 \text{ lb PM}_{2.5} / \text{MMBtu}_{\text{output}}$ at 80% thermal efficiency)</p>
Carbon monoxide (CO) ⁵	270 ppm @ at 7% oxygen O ₂	270 ppm @ at 7% oxygen O ₂
<p>A boiler or furnace of greater than or equal to 3,000,000 Btu per hour rated heat input. Systems with $\geq 3 \text{ MMBtu/hr}$ heat input.</p>		
PM, CO, and other relevant criteria pollutants	Commonwealth of Massachusetts Department of Environmental Protection (MassDEP) permit-plan approval required, pursuant to 310 CMR 7.02(5).	

³ Sensitive populations include schools, hospitals, nursing homes, ~~and other facilities with similar populations or additional facilities determined by the Department.~~

⁴ ~~Sensitive populations include schools, hospitals, nursing homes, or additional facilities determined by the Department.~~

⁵ ~~May require a portable CO and O₂ analyzer for concentration determinations.~~

Table 322. Performance Requirements

<u>Performance Requirement</u>	<u>Pellets</u>	<u>Chips</u>
Thermal efficiency at nominal output (HHV)	<u>≥ 85% Higher Heating Value ≥ 85%</u>	<u>≥ 75% Higher Heating Value</u> <u>or</u> <u>≥ 80% Lower Heating Value if EN303-5 is used to verify particulate emissions ≥ 75%</u>
<u>Start up</u>	Automatic (i.e., electric ignition)	
Modulation/shut off	The system must automatically modulate to lower output and/or turn itself off when the heating load decreases or is satisfied	
Multi-pass heat exchanger	Required	
Pressurized portion of the system	ASME certification required	
Thermal storage	Required, unless the manufacturer has submitted independent third party test results documenting that the heating system meets the Massachusetts Clean Energy Center’s requirements (see below for more information)	
Fuel <u>S</u> torage	The system must have covered bulk storage	
Feedstock <u>C</u> onveyance	The system must be automatically fed from feedstock storage to the furnace or boiler	

A heat load calculation of the building must be provided to ensure proper sizing of the system. The heat load calculation must be based on Manual J of Air Conditioning Contractors of America or an equivalent method.

All cordwood systems will be reviewed on a case by case basis and qualified if the testing results for particulate emissions are equivalent or lower than the standards established for a wood pellet or wood chip system, efficiency is equivalent or greater than the established standards for wood pellet or a wood chip system, and the fuel quality standards are equivalent or more stringent than those standards for a wood pellet or wood chip system. Qualified cordwood systems will need to meet the sizing and installation requirements in New York State Energy Research and Development Authority’s (NYSERDA) Advance Cordwood Boiler program under Renewable Heat New York.

7.8. Qualifying a Central Wood Heating System

A) Units Boiler and furnaces \leq 1 MMBtu/hr⁶ rated heat input

In order to provide regional consistency for central wood heating system qualification, the Department, along with the Commonwealth of Massachusetts Clean Energy Center (MassCEC), will utilize ~~New York State Energy Research and Development Authority's (NYSERDA's)~~ list of qualifying technologies for its Small Pellet Boiler program under Renewable Heat New York.

The Department and MassCEC highly encourage and prefer manufacturers to seek qualification through NYSEDA for pellet wood fired hydronic heaters with two stage wood gasification combustion design tested in accordance with EN-303-5⁷, that are subject to the United States Environmental Protection Agency (EPA) Residential Heater NSPS 40 CFR Part 60 subpart QQQQ. As NYSEDA does not currently qualify wood chip fired hydronic heaters, the manufacturer of a wood chip fired hydronic heater subject to the Residential Heater NSPS, should test in accordance to the NSPS testing requirements, obtain EPA certification, and demonstrate that the hydronic heater meets the emission standards in this Guideline. If a wood chip fired hydronic heater or boiler is not subject to the Residential Heater NSPS, then the manufacturer may ~~can~~ submit results of independent tests ~~lab results~~ performed by an accredited lab based on EN303-5, EPA CTM-039, ASTM E2515-11, or and ASTM E2618-13 for continuously fed biomass hydronic heaters. If using EN303-5 the system's PM emissions must be tested at both nominal and 30% load capacity levels. Alternatively, an accredited lab ~~may~~ approved by the EPA to conduct EPA Test Method 28 WHH or EPA test method 28 WHH Partial Thermal Storage ("PTS"), ~~when a lab is approved by EPA for this specified test method, may conduct a test according to one of these methods, or the Canadian test method~~ CSA B415. Full test reports including calculations and raw data should be submitted to MassCEC (at biomassthermal@masscec.com) for review and evaluation by the Department, MassCEC, and MassDEP. If a wood chip fired boiler or furnace will be equipped with an emission control device (e.g., electrostatic precipitator), the owner or operator of the biomass heating system shall submit to the Department a statement from the biomass heating system installer that the system has been designed to meet the applicable emission limits.

B) Units Boilers and furnaces $>$ 1 MMBtu/hr heat input and $<$ 3MMBtu/hr rated heat input

For boilers ~~and furnaces units~~ with rated heat input capacity equal to or greater than 1 MMBtu/hr, the United States EPA reference test methods 5 or 201A (front half filterable) and 202 (back half condensable) shall be performed for PM 2.5. If using EPA reference test methods for PM 2.5, EPA reference test method 10 for carbon monoxide must also be performed. Alternatively, EN303-5 may be performed for total PM and carbon monoxide. If using EN303-5 the system must be tested at both nominal and 30% load capacities.

~~Other applicable test methods shall include reference test method 10 for Carbon Monoxide, 7e and reference test method 19 to convert from concentration to lb/ MMBtu for NOx. Sulfur~~

⁶ MMBtu = 1 million Btu, MBtu = 1 thousand Btu

⁷ Manufacturers that submit lab results based on the EN 303-5 method must include measurements for dust (i.e. total PM), as well as volatile organic compounds (VOCs), also known as organic gaseous carbon (OGC) in units of mg/MJ, so that MassCEC's or the Department's reviewers can calculate PM2.5 emissions. The lab results should also include the fuel's water content (in lb/lb or percent by weight), energy content (in kWh/kg or J/g or Btu/lb), and hydrogen content (in lb/lb or percent by weight).

~~content of fuel shall be measured in accordance with an applicable ASTM testing methodology and fuel flow with a certified fuel meter or factors in applicable Code of Federal Regulations (CFR) test methods for determination of SO₂ compliance.~~

Performance testing shall be conducted initially within ninety (90) days of achieving maximum capacity or within one hundred and eighty (180) days of start up, and then every three (3) years of operation ~~consistent with any permit term or condition~~. A manufacturer guarantee and/or evidence of testing for similar units of the same model are sufficient. If a wood chip fired boiler or furnace will be equipped with an emission control device (e.g., electrostatic precipitator), the owner or operator of the biomass heating system shall submit to the Department a statement from the biomass heating system installer that the system has been designed to meet the applicable emission limits. ~~when a Commonwealth of Massachusetts Department of Environmental Protection (DEP) air quality permit is not necessary.~~

PM 2.5 means particulate matter sized 2.5 microns or less collected using a filter and back half impinger set for condensables or a dilution tunnel method such as EPA reference test method 28 WHH that collects filterable and the condensable fraction.

C) Boilers and furnaces ≥ 3MMBtu/h rated heat input

Prior to installing a solid fuel automatic fed biomass heating boiler or furnace rated at 3 MMBtu/hr or greater heat input, the owner or operator must submit a Comprehensive Plan Application and receive approval from MassDEP pursuant to 310 CMR 7.02(5). MassDEP’s approval will require initial emissions testing within ninety (90) days of achieving maximum capacity or within one hundred and eighty (180) days of start up, and then every three (3) years of operation, or as otherwise required in the approval.

8.9. Thermal Storage Requirements

Per 225 CMR 16.05(4)(g)(4), thermal storage is required for all hydronic systems. All thermal storage tanks must have a minimum of R12 insulation and controls, integrating the central heater, and decrease the number of central heater starts and stops. The unit’s thermal storage capacity should be sized based on the thresholds in 225 CMR 16.05(4)(g)(4), and seen below.

Table 43. Thermal Storage Sizing Requirements

<u>Lead boiler system size (heat input)</u>	<u>Thermal storage required</u>
<u>< 80,000 Btu/hr</u>	<u>80 gallons</u>
<u>80,000 Btu/hr - 119,000 Btu/hr</u>	<u>1 gallon per 1 MBtu/hr</u>
<u>119,000 Btu/hr – 1 MMBtu/hr</u>	<u>119 gallons</u>
<u>> 1 MMBtu/hr</u>	<u>2 gallons per 1 MBtu/hr</u>

Units <1 MMBtu/h heat input

~~The thermal storage system must have a minimum (eighty) 80-gallon capacity and an additional one (1) gallon of capacity per 1,000 Btu/hr of nameplate heating capacity being installed over 80,000 Btu/hr up to one hundred and nineteen (119) gallons. For example, a 65,000 BTU/hr heater would require (eighty) 80 gallons of thermal storage. A 100,000 Btu/hr heater would require one hundred (100) gallons of thermal storage, and a 140,000 Btu/hr heater would require one hundred and nineteen (119) gallons of thermal storage.~~

Units >1 MMBtu/h heat input

~~The thermal storage system must have a minimum two (2) gallons of capacity per 1,000 Btu/hr of nameplate heating capacity being installed.~~

~~The thermal storage tank must have a minimum of R12 insulation and controls integrating the central heater and decrease the number of central heater starts and stops.~~

Any applicant who RTGU which wishes to omit thermal storage must submit to the MassCEC independent test lab results based on the EN 303-5⁸, EPA Test Method 28 WHH, or the CSA B415 test method documenting that each boiler is capable of all of the following:

- A) Modulating below 20% of maximum capacity
- B) Maintaining emissions rate per Table 2, of less than 0.08 lb PM_{2.5}/MMBtu_{input} for wood pellets or 0.01 lb PM_{2.5}/MMBtu_{input} at the system's minimum tested capacity⁹
Maintaining thermal efficiency per Table 3, (HHV) of ≥ 85% for wood pellets at the system's minimum tested capacity

C)

Alternatively, a Generation Unit Owner or an Authorized Representative for the Generation Unit may submit a request for a thermal storage waiver if they believe that the inclusion of thermal storage would be detrimental to system performance. The Department will review these requests on a case by case basis. All exception requests should be sent to thermal.doer@state.ma.us.

9.10. Biomass Fuel Quality and Unit Control Device Requirements

~~Eligible Biomass Woody Fuel~~Eligible Biomass Woody Fuel needs to meet the ~~following~~ fuel quality standards in 225 CMR 16.05(4)(g)(1) and seen below, so as to guarantee optimal, predictable, and uniform performance of the Qualified Unit. Biomass fuel includes wood pellets, wood chips, cord wood, and bio-oil, which is oil derived from woody biomass through pyrolysis.

A) A boiler or furnace of less than 3,000,000 Btu per hour rated heat input that utilizes an emission control device (e.g., electrostatic precipitator), subject to the approval of the Department in consultation with MassDEP, does not have to meet the fuel quality specifications in Table 5. The emission control device shall be designed and operated to ensure that the boiler or furnace does not exceed the applicable particulate matter emission limit in 225 CMR 16.05(4)(g)5.

B) A boiler or furnace of less than 3,000,000 Btu per hour rated heat input that does not utilize an emission control device (e.g., electrostatic precipitator) must meet the following fuel quality specifications:

⁸ Note that EPA's Residential Heater NSPS (40 CFR Part 60 subpart QQQQ) requires thermal storage for any unit that is subject to the NSPS that is certified using EN303-5 (i.e., thermal storage may not be omitted in this case).

⁹ The system's minimum tested capacity must be ≤ 30% of rated maximum capacity to demonstrate compliance with the emissions and efficiency requirements for conditions b and c.

Table 5. Fuel Quality Specifications

<u>Fuel quality specifications</u>	<u>Pellets</u>	<u>Chips</u>
<u>Calorific value</u>	<u>> 8,000 Btu/lb</u>	<u>> 5,950 Btu/lb</u>
<u>Moisture</u>	<u>< 8%</u>	<u>≤ 35%</u>
<u>Ash content by weight</u>	<u>< 1%</u>	<u>< 1.5%</u>
<u>Particulate size (percent retained by a half inch mesh screen)</u>	<u>Not applicable</u>	<u>75%</u>
<u>Chlorides</u>	<u>≤ 300 ppm</u>	<u>Not applicable</u>
<u>Source materials</u>	<u>Only Eligible Biomass Woody Fuel</u>	

Compliance with the pellet fuel quality standards can be demonstrated through certification against standards such as the Pellet Fuels Institute (PFI) Premium or ENPlus A1.

A)C) A boiler or furnace of equal to or greater than 3 MMBtu/hour rated heat input must receive a MassDEP plan approval pursuant to 310 CMR 7.02(5), which shall dictate fuel quality specifications.

~~**Table 43. Woody Biomass Fuel Quality Standards** Compliance with the pellet fuel quality standards can be demonstrated through certification against standards such as the Pellet Fuels Institute (PFI) Premium or ENPlus A1.~~

Cordwood fuel in advanced cordwood boilers must be properly dried and seasoned so that the moisture content of the wood is approximately 20%. To properly season the wood, it typically must be dried for at least 2 years. The wood should be stored under cover with sufficient ventilation to allow the wood to dry to approximately 20% moisture content. It is imperative that the wood fuel be at moisture content of 20% or below so that good combustion of the fuel is achieved. When wood above 20% moisture content or greenwood is used in advanced cord wood boilers seasonal efficiency decreases significantly while smoke emissions drastically increases.

All bio-oil that is made through pyrolysis must be made using Eligible Biomass Woody Fuel, meet ASTM D7544 - 12 Standard Specification for Pyrolysis Liquid Biofuel, and comply with all standards in the Federal Renewable Fuel program for biomass-based diesel.

~~10.~~

11. Biogas pipeline delivery Eligible Biogas Fuel

Biogas must be conveyed directly from its source to the Generation Unit in a dedicated pipeline. Units may co-fire with other fuels subject to the provisions in 225 CMR 16.05(2).

12. Eligible Liquid Biofuels

~~Biofuels need to be advanced biofuels, which require a fifty percent (50%) lifetime greenhouse gas emission savings per unit of delivered energy, in comparison to the petroleum distillate fuel displaced.~~¹⁰

~~In support of the DEP's commercial food waste disposal ban, only~~Only organic waste derived liquid biofuels ~~from entities subject to an organic waste disposal ban~~ will be ~~considered~~ Eligible Liquid Biofuel. ~~As stated in 225 CMR 16.05(1)(a)(6)(a)(vii), These organic waste derived biofuels have been determined to meet the greenhouse gas threshold for advanced biofuels.~~

Eligible Liquid Biofuels need to meet quality standard ASTM Standard D6751 (Standard Specification for Biodiesel Fuel Blend Stock (B100) for Middle Distillate Fuels or ASTM D396 - 15Cb (Standard Specification for Fuel Oils).

Per 225 CMR 16.05(4)(l), tThe Department will establish and maintain a Biofuel Suppliers List with retail suppliers of Eligible Liquid Biofuel that meets the resource and fuel quality requirements. Facilities seeking qualification as APS Renewable Thermal Generation Units using liquid biofuels will be required to only use fuel from a supplier on the Department list of suppliers for the duration of the APS qualification of the thermal energy generating unit, and keep records to demonstrate compliance with this requirement.

Fuel suppliers wishing to be included on the list will need to demonstrate to the Department's satisfaction the sourcing of the organic waste from which the liquid biofuel was made. Fuel ~~distributors~~suppliers will need to document the chain of custody from the ~~waste generator~~fuel supplier on to the ~~retail supplier and on to the~~ end customer. Fuel suppliers must have an approved Quality Assurance Plan (QAP) issued by the EPA for verifying the validity of Renewable Identification Numbers (RINs) under the Renewable Fuel Standard (RFS) program.

13. APS Eligible Liquid Biofuels Generation Unit Qualification

A qualified facility must demonstrate purchase of advanced biofuel from an approved vendor, on the Department's Biofuels Suppliers List, with a minimum component greater than ~~ten~~ twenty percent (> ~~2~~10%) advanced biofuels.

An APS Renewable Thermal Generation Unit using Eligible Liquid Biofuels blended with heating oil or neat shall seek qualification as an APS Renewable Thermal Generation Unit only as part of an Aggregation, as provided for in 225 CMR 16.05(~~4~~)(h)(~~3~~).

It is expected that heating fuel suppliers will act as Aggregators for these Generation Units.

14. Miscellaneous

The Department may permit an exception from any provision of this Guideline for good cause.

¹⁰~~An Act Relative to Clean Energy Biofuels, M.G.L. 94, § 295G1/2-2008~~