

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

**ALTERNATIVE ENERGY PORTFOLIO STANDARD**

**GUIDELINE**

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

**June 8, 2016**

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

This Guideline provides the detailed criteria by which APS Renewable Thermal Generation Units 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 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 RPS statute at M.G.L. Chapter 25A, Section 11F<sup>1/2</sup>(a) and(b)<sup>1</sup>, 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

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<sup>1</sup> The RPS 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.

Pursuant to the verification provision in that language, the APS Regulations state the following at 225 CMR 16.05(4):<sup>2</sup>

(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:

- (i) Fuel Quality. Eligible Biomass Woody Fuel shall be produced using only clean wood, and meet fuel quality specifications with regards to moisture and ash as provided in the Department's *APS Guideline on Biomass, Liquid Biofuels and Biogas*.
- (ii) Sustainable Forestry. 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 *APS Guideline on Biomass, Liquid Biofuels and Biogas*.
- (iii) Greenhouse Gas Emission Reduction. APS Renewable Thermal Generation Units 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. To that end, an APS Renewable Thermal Generation Unit using Eligible-Biomass Woody Fuel shall contain at least 50% Residues or Forest Salvage and not more than 50% Thinnings.
- (iv) 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 *APS Guideline on Biomass, Liquid Biofuels and Biogas*.
- (v) 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 *APS Guideline on Biomass, Liquid Biofuels and Biogas*.

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

(vi) Aggregation of Units using Eligible Liquid Biofuels. An APS Renewable Thermal Generation Unit using Neat 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).

Pursuant to the statute and the regulations, this Guideline specifies the eligibility criteria for APS Renewable Thermal Generation Units that use solid biomass, biogas, and liquid 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**

Facilities using woody biomass in the form of pellets, chips, cord wood or biogas (through biomass gasification) will need to demonstrate that any forest derived woody biomass they use to generate useful thermal energy is sourced from forests managed according to sustainable forestry practices. Non-forest derived woody biomass (as defined in 225 CMR 16.00) is considered to meet the sustainability requirements, so for these resources no further sustainability demonstration is required.

The Department will establish and maintain a Biomass Suppliers List with 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 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 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 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 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 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. 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 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 as the Generation Unit, this Generation Unit will be considered a self-supplier. Self-suppliers must register with the Biomass Suppliers List and demonstrate to the Department 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.

#### **4. Verification**

Qualified 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 (must be featured on the Department's Biomass Supplier List)
- B) Volume of fuel delivered (tons)
- C) Fuel type and specifications
- D) Date of delivery

The independent verifier for small generation units using eligible woody biomass will perform spot checks to verify the use of eligible fuel.

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

Suppliers of Eligible Biomass Woody Fuel on the Department Biomass Suppliers List will annually report to the Department the 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 thinning
- C) Demonstration of the sustainable forest management for applicable Forest Derived Woody Biomass

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. System Performance**

The APS Renewable Thermal Generation Units using eligible biomass fuels need to meet the following system requirements.

**Table 1. Air emission limits for biomass fuel boilers and furnaces at nominal output**

<b>Systems less than 3 MMBtu/hr heat input.</b> 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.			
	<b>Pellets / Liquid Biofuels / Biogas</b>	<b>Chips</b>	<b>Cordwood</b>
Particulate emissions (PM)	<0.08 lb PM <sub>2.5</sub> /MMBtu <sub>input</sub> at nominal output (equivalent to <0.10 lb PM <sub>2.5</sub> /MMBtu <sub>output</sub> at 80% thermal efficiency)	<0.10 lb PM <sub>2.5</sub> /MMBtu <sub>input</sub> heat input at nominal output (equivalent to <0.125 lb PM <sub>2.5</sub> /MMBtu <sub>output</sub> at 80% thermal efficiency)	Reserved
Carbon monoxide (CO)	270 ppm @ 7% O <sub>2</sub>	270 ppm @ 7% O <sub>2</sub>	Reserved
<b>Systems with ≥ 3MMBtu/hr heat input.</b>			
PM, CO, and other relevant criteria pollutants	Commonwealth of Massachusetts Department of Environmental Protection permit required.		

**Table 2. Performance requirements**

	<b>Pellets</b>	<b>Chips</b>	<b>Cordwood</b>
Thermal efficiency at nominal output (HHV)	≥ 85%	≥ 75%	Reserved
StaRTGUp	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 MassCEC's requirements (see below for more information)		
Fuel Storage	The system must have covered bulk storage		
Feedstock Conveyance	The system must be automatically fed from feedstock storage to the furnace or boiler		None

## **6. Qualifying a Central Wood Heating System**

### **A) Units <1 MMBtu/h 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) 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 NYSERDA. If a manufacturer chooses not to pursue qualification through NYSERDA, the manufacturer can submit independent test lab results based on the EN 303-5,<sup>3</sup> EPA Test Method 28, or the CSA B415 test method to MassCEC (at [biomassthermal@masscec.com](mailto:biomassthermal@masscec.com)) for evaluation.

### **B) Units >1 MMBtu/h heat input**

For boilers with heat input capacity equal to or greater than 1 MMBtu/hr, United States Environmental Protection Agency (EPA) reference test methods 5 or 201A (front half filterable) and 202 (back half condensable) shall be performed for PM 2.5.

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 NO<sub>x</sub>. Sulfur 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 SO<sub>2</sub> 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 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 that collects filterable and the condensable fraction.

## **7. Thermal Storage Requirements**

### **A) 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.

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<sup>3</sup> Manufacturers that submit lab results based on the EN 303-5 method must include measurements for dust, as well as volatile organic compounds (VOCs), also known as organic gaseous carbon (OGC) in units of mg/MJ, so that MassCEC's reviewers can calculate PM<sub>2.5</sub> 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).

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.

Horizontal thermal storage tanks are not permitted.

**B) 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.

Horizontal thermal storage tanks are not permitted.

**8. Qualifying an APS Renewable Thermal Generation Unit (RTGU) using Eligible Biomass Woody Fuel for Installation Without Thermal Storage**

All RTGUs must incorporate thermal storage unless they have submitted and had approved by MassCEC independent test lab results based on the EN 303-5, EPA Test Method 28, 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 of less than 0.08 lb PM<sub>2.5</sub>/MMBtu<sub>input</sub> for wood pellets or 0.01 lb PM<sub>2.5</sub>/MMBtu<sub>input</sub> for wood chips at the system’s minimum tested capacity<sup>4</sup>
- C) Maintaining thermal efficiency (HHV) of ≥ 85% for wood pellets or ≥ 75% for wood chips at the system’s minimum tested capacity

**9. Biomass Fuel Quality**

Eligible Biomass Woody Fuel needs to meet the following fuel quality standards, so as to guarantee optimal, predictable, and uniform performance of the Qualified Unit.

**Table 3. Woody biomass fuel quality standards**

	<b>Pellets</b>	<b>Chips</b>
Calorific value	> 8,000 Btu/lb	> 5,950 Btu/lb
Moisture	< 6%	< 30%
Ash	< 1%	N/A
Source materials	Only Eligible Biomass Woody Fuel. Grass, construction & demolition waste are excluded.	

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

<sup>4</sup> The system’s minimum tested capacity must be ≤ 30% of maximum capacity to demonstrate compliance with the emissions and efficiency requirements for conditions b and c.

## **10. Biogas pipeline delivery**

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).

## **11. 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.<sup>5</sup>

In support of the DEP's commercial food waste disposal ban, only organic waste derived liquid biofuels from entities subject to an organic waste disposal ban will be eligible. 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 - 15b (Standard Specification for Fuel Oils).

The 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 suppliers will need to document the chain of custody from the waste generator 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.

## **12. 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 twenty percent (> 20%) 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(3).

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

## **13. Miscellaneous**

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

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<sup>5</sup> An Act Relative to Clean Energy Biofuels, M.G.L. 94, § 295G1/2 2008