

EXHIBIT D

REQUIREMENTS FOR BIOMASS-FUELED BID FACILITIES

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Fuel Type	Applicable Sections			
	Section I	Section II	Section III	Section IV
Unadulterated Wood and Agricultural Biomass	X			
Landfill Gas and Anaerobic Digestion	X			
Multi-Fuel Including Eligible and Ineligible Feedstocks	X	X		
Clean MRF (note 1)	X		X	
Mixed Waste Biomass	X			X
Mixed Waste Biomass Using CEACP (note 2)	X		X	X

*Notes: (1) Clean MRF is defined as clean wood separated from the mixed waste stream of C&D debris at a permitted MRF or C&D processing facility. (2) Adulterated feedstocks using the Comparative Emissions Alternative Compliance Protocol (CEACP) have additional requirements.*

**I. BIOMASS PROJECTS – ALL FUEL TYPES**

This section prescribes basic requirements that apply to all biomass power generation facilities. Additional requirements apply to facilities that use a combination of eligible and ineligible fuels, fuels derived from mixed waste streams such as Construction and Demolition (C&D) debris, and Landfill Gas or Renewable Pipeline Gas. Provisions related to procurement or delivery of biomass fuels do not apply to projects where the fuel is produced at the same facility that generates the power such as a landfill gas project that generates power on site.

**A. BASIC REQUIREMENTS**

Basic requirements for all Sellers include:

- Seller is required to have fuel procurement contracts to ensure that the biomass fuels specification is consistent with the definition of eligible resources.

## I. Biomass Projects – All Fuel Types

- For Sellers using harvested or silvicultural waste wood, a Forest Management Plan is required. Harvested/silvicultural wood suppliers are required to be in compliance with the Forest Management Plan and to prepare harvest plans for each parcel.
- For each fuel delivery, the Seller must implement a plan to sample/inspect fuel for compliance with eligibility specifications that includes procedures for fuel inspection and delivery acceptance or rejection. For gaseous or liquid fuels derived from eligible solid biomass resources the Seller must certify the eligible content of the feedstocks used to produce the fuel for each fuel producer.
- Prior to Operational Certification/Statement of Qualification (SOQ)<sup>1</sup>, the Seller must obtain all environmental approvals and permit modifications required by NYSDEC.
- For Operational Certification/SOQ the contractor must submit a Fuel Management, Measurement, and Calibration Plan described below.

## B. SUBMISSION OF A FUEL MANAGEMENT, MEASUREMENT, AND CALIBRATION PLAN

Prior to Operational Certification/SOQ, the Seller must submit a Fuel Management, Measurement, and Calibration Plan (The Plan). The Plan is intended to demonstrate to NYSERDA that the facility has in place the procedures to track fuel deliveries and inspect the quality of fuel deliveries. The Plan must cover all aspects of fuel procurement and onsite operations important to ensuring the terms of the contract are met. In general, fuel procurement, inspection of deliveries, onsite fuel management, fuel flow measurement and sampling for testing should be addressed.

Facilities that fire exclusively eligible fuels will need to prepare a relatively brief Fuel Management, Measurement, and Calibration Plan, aimed primarily at fuel delivery inspection and quality assurance. A sample plan outline is included in the [RES Biomass Power Guide](#) for the Renewable Energy Standard (RES) Program which can be downloaded from the NYSERDA RES Program web site. The Plan must include the following information:

### 1. FUEL PROCUREMENT

Identify fuel procurement QA/QC provisions that ensure fuel suppliers have an effective QA/QC program in place to provide biomass fuels from secondary sources meeting the criteria for RES eligibility. Describe the process for certifying suppliers to meet RES requirements. If harvested fuels are used then the facility's Forest Management Plan can be referred to in this section.

### 2. FUEL MANAGEMENT AND INSPECTION

How fuel is to be managed and inspected must be documented. The plan should address delivery, inspection, and storage and management of the fuel up to point of firing. Facilities may receive deliveries of biomass fuels through a variety of modes: for example, truckloads of wood chips, a tanker of renewable diesel, or landfill gas flowing through piping. The Plan's details should include how the fuel is to be sampled and inspected for ineligible fuels

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<sup>1</sup> For additional information regarding RES Statement of Qualification (SoQ), please visit NYSERDA's Eligibility and Certification page: <https://www.nyserra.ny.gov/All-Programs/Programs/Clean-Energy-Standard/Renewable-Generators-and-Developers/RES-Tier-One-Eligibility/Certification>

**I. Biomass Projects – All Fuel Types**

or contaminants prior to delivery acceptance and/or use. For example, a solid fuel facility must describe how trailers of wood chips will be inspected prior to or during unloading and how material will be handled if inspection reveals ineligible fuel contamination that has entered the eligible fuel handling system. Additional requirements are set forth in Sections II, III and IV of this exhibit for facilities that fire a combination of eligible and ineligible fuels, Clean MRF Fuels, or biomass recovered from mixed waste streams.

**3. OPERATING PROCEDURES**

Facilities must also provide operating procedures that facility staff will use to inspect, monitor and measure fuels, and document the execution of these procedures. Such procedures should be prepared in a way that facilitates their distribution to plant personnel, including how and when to take fuel samples, and inspect fuel unloading for ineligible contaminants in the eligible fuel stream. Such procedures should be posted at all necessary locations, including sampling points and fuel delivery stations.

**4. FUEL FLOW MEASUREMENT AND SAMPLING**

A key aspect of the plan is a description of how, where, and with what frequency fuel flow measurement and fuel sampling of eligible fuels will be performed. Special requirements are placed on facilities that fire Clean MRF Fuels or a mix of eligible and ineligible fuels. These requirements are addressed in subsequent Sections of this exhibit. For all facilities, the method of measuring fuel flow will depend on the methods of delivery. Generally, for solid and liquid biofuels truck scales will be the standard method for measuring fuel intake. The Plan should describe how deliveries are weighed in and out and how the scales are maintained and calibrated for accuracy. Additional requirements are set forth in subsequent Sections of this exhibit for facilities that fire a combination of eligible and ineligible fuels, Clean MRF Fuels, or biomass recovered from mixed waste streams.

**5. FUEL TESTING AND ANALYSIS**

For eligible fuels derived from secondary sources (all fuels that do not come directly from wood harvested on forested land as chips or roundwood in accordance with an approved Forest Management Plan and Harvest Plan), RCRA metals<sup>2</sup> and copper analyses should be performed to establish a baseline fuel composition. The plan must describe how these analyses are conducted for each combination of fuel supplier (fuel broker) and fuel source, at least once every six months. Additional requirements are set forth in Sections II, III and IV of this exhibit for facilities that fire a combination of eligible and ineligible fuels, Clean MRF Fuels, or biomass recovered from mixed waste streams.

**C. FOREST MANAGEMENT AND HARVEST PLANS**

For any facility planning to use biomass harvested from forest land (chipped or roundwood) the facility must prepare a Forest Management Plan which sets forth the requirements and environmental safeguards for every harvest. The form and content of the plan is described in the [RES Biomass Power Guide](#). For each harvest of forest biomass, a harvest plan must be prepared

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<sup>2</sup> “RCRA Metals” refers to EPA analytical method EPA SW-846, for the measurement of lead, arsenic, chromium, selenium, mercury, silver, cadmium, and barium.

in accordance with the Forest Management Plan and kept on file for the duration of the RES contract at the Power Generating Facility.

#### **D. REPORTING REQUIREMENTS**

##### **Initial Reports**

Facilities must provide the Fuel Management Measurement and Calibration Plan including the results of the RCRA metals and copper analyses for secondary sources of biomass.

For Facilities procuring biomass from wood harvested on forested land as chips or roundwood, a Forest Management Plan must be submitted and approved for Operational Certification/SOQ.

##### **Monthly Reports**

Facilities must prepare a monthly fuel delivery and inspection log that will be available for review by NYSERDA on request. For each fuel delivery, the record must include the supplier name and address, the fuel source, the fuel weight, description of the composition and physical characteristics, and a statement of inspection (pass/fail) to determine the integrity of the fuel. Reports related to procurement or delivery of biomass fuels do not apply to projects where the fuel is produced at the same facility that generates the power such as a landfill gas project that generates power at the same site. However, these on-site fuel and power production facilities must track and report the amounts for fuel produced for power production. This documentation may be requested for the purposes of verifying the electricity output by fuel source as indicated in NYGATS by the facility.

##### **Semiannual and Annual Reports**

Facilities must provide the results of the RCRA metals and copper analyses for secondary sources of biomass for each supply source and fuel type.

## **II. BIOMASS PROJECTS USING ELIGIBLE AND INELIGIBLE FUELS**

Projects that use a combination of eligible and ineligible fuels must track the use of eligible fuels and ineligible fuels and the energy produced by each fuel category. This category of projects also includes Renewable Pipeline Gas which is transported by a common carrier and therefore comingled with ineligible fuels. This Section contains the requirements and methods for the measurement and accounting of Actual Eligible Production. Actual Eligible Production reporting requirements vary between projects using solid biomass fuels and those using liquid biofuels or bio-gas fuels such as Renewable Pipeline Gas (RPG), Landfill Gas (LFG), biogas from anaerobic digestion, and syngas from biomass gasification.

### **A. GENERATION FROM A MIX OF ELIGIBLE BIOMASS AND INELIGIBLE FUELS**

Additional record keeping and reporting is required for plants using a mix of eligible and ineligible fuels. The amount of eligible generation from the plant (or generation unit) is proportional to the amount of input energy provided by the eligible fuel. The data collected shall be used to determine the daily heat input provided by the eligible solid biomass and the total daily heat input of all fuels to determine the Actual Eligible Production of the net electricity generated and sold in a monthly reporting period. This documentation may be requested for the purposes of verifying the electricity output by fuel source as indicated in NYGATS by the facility.

#### **Solid Biomass Fuels**

- The Seller is required to take samples from eligible and ineligible fuel streams for purposes of both fuel quality control and energy measurement. The Seller is required to maintain sample integrity and to have written fuel sampling procedures for handling, storage and shipping to the analysis lab.
- Continuous mass flow measurements are required for all fuels as fed to the boiler. A Fuel Management, Measurement, and Calibration Plan pursuant to guidelines herein must be submitted to and approved by NYSERDA before Operational Certification/SOQ will be granted. Such plan must include procedures to ensure compliance with the requirements of this Contract when the equipment for fuel flow measurement is out of service.
- Approved test and measurement protocols for composition, moisture content and heat content are listed in the Test Methods Section below. If an alternative method is to be used it must to be submitted to NYSERDA in advance for approval by NYSERDA.
- **If Clean MRF is one of the Fuels, requirements of Section III also apply**

#### **Non-Pipeline Quality Bio-Gas Fuels (Such As Landfill Gas, Anaerobic Digester Gas) In Combination with Ineligible Fuels (Such As Natural Gas)**

- Sufficient metering must be in place at the landfill collection/processing facility to allow accurate accounting of gas produced, collected, and used in energy conversion on a daily basis. If the landfill gas generator and the electric generator are not owned and operated by the same organization and collocated, contracts must be in place to allow this

## II. Projects Using Eligible and Ineligible Fuels

information to be shared in compliance with the other requirements listed in this section.

- The volume of metered gas collected and used from either the landfill gas collection system or the anaerobic digester system should be reported in units of standard cubic feet (scf).
- The total (gross) amount of electricity generated using the eligible/ineligible fuel gas mixture must be reported on a daily basis.
- Approved test and measurement protocols for composition, moisture content and heat content are listed in the “Testing and Analysis Methods” Section below. If an alternative method is to be used it must be submitted to NYSERDA in advance for approval by NYSERDA.

**Pipeline Quality Bio-Gas Fuels (RPG)**

- Common carrier RPG resources shall be considered eligible only if sourced and used in the same state to generate power delivered to New York.
- Contracts for RPG transported over common carrier must be new contracts with respect to the date established in the RFP for project eligibility. The Seller must notify the gas producer as part of the new RPG contract, or modification, that the gas contract is being purchased for conversion to RES eligible power and is subject to the accounting rules of the RES program, that could include some of the provisions listed above for the use of non-pipeline quality gas.
- The RPG producer/supplier must certify that the gas delivered under contract is produced from new resources (i.e., new or expanded RPG production systems).
- The Seller must keep and provide sufficient records on physical delivery from common carrier, gas consumption, and gas quality to pro rate the Seller’s monthly electrical generation based on the ratio of the total RPG contract gas energy and the total gas energy used. A report detailing the use of eligible and ineligible fuels shall be required.
- The Seller shall provide reporting of the total net electricity (net electricity in this context refers to the electric generation sold to the grid) generated as a direct result of the above measured eligible bio-gas fuel delivered to the conversion system. Total electricity shall be measured in MWh or kWh.

**B. SUBMISSION OF A FUEL MANAGEMENT, MEASUREMENT, AND CALIBRATION PLAN**

For Operational Certification/SOQ the Seller must submit to NYSERDA a Fuel Management, Measurement and Calibration Plan as described in Section I. For facilities firing a mix of eligible and ineligible fuels additional requirements include:

## II. Projects Using Eligible and Ineligible Fuels

### 1. FUEL PROCUREMENT

Describe all fuel sources and estimate delivered proportions for each eligible and ineligible fuel type (e.g. harvested wood, Clean MRF Fuel). Identify fuel procurement QA/QC provisions that ensure fuel suppliers have an effective QA/QC program in place to provide biomass fuels from secondary sources meeting the criteria for RES eligibility. Describe the process for certifying suppliers to meet RES requirements. If harvested fuels are used, then the facility's Forest Management Plan can be referred to in this section.

### 2. FUEL MANAGEMENT AND INSPECTION

In order to use the accepted method for accurate measurement of heat input, facilities must maintain eligible biomass fuel deliveries as a separate fuel stream up to the main fuel feed line or surge bin. Specifically, mixing on the storage pile of other long term storage device is not acceptable unless there are extenuating physical conditions at the facility site that can be shown to make this requirement an undue burden.<sup>3</sup>

The Fuel Management and Inspection Plan should address delivery, inspection, and storage and management of the fuel up to the fuel feed lines for firing the boiler or combustion chamber or loading the surge bin in preparation for immediate firing. Any deviation from these principals will require NYSERDA review and consent.

### 3. OPERATING PROCEDURES

No additional requirements

### 4. FUEL FLOW MEASUREMENT AND SAMPLING

Multi-fuel power generation systems are subject to power production measurement and accounting rules that are designed to ensure that only the renewable portion of power generation is purchased under the RES program procurements. This requires accurate accounting of the eligible renewable portion of the power production at the plant based on the following:

- a. An accurate and separate measurement and accounting of the RES program eligible and ineligible fuels heat input to the conversion device; and
- b. An apportionment of total electricity generation based on the fraction of the total conversion device heat input provided by the RES program eligible fuel source.

The Seller will maintain and calibrate all equipment used for mass (solid fuels) and volumetric (liquid or gaseous) flow measurement and associated control devices in accordance with the procedures and calibration schedule set herein. A calibration schedule for each of the key equipment components must be provided. These schedules should be based on vendor recommendations or industry best practices. In any case, the following minimum standards apply:

- a. Gravimetric scales for ineligible fuels shall be calibrated no less than twice per year;
- b. Belt scales for eligible fuels shall be calibrated no less than once per month.
- c. Gas analysis and metering equipment are to be calibrated no less than once a year. If

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<sup>3</sup> If NYSERDA grants an exception to the separate fuel storage and metering rule, a plan for tracking and accounting for the eligible fuel firing must also be approved.

## II. Projects Using Eligible and Ineligible Fuels

any meter required is not under the contractor's direct control, the contractor must provide other evidence of demonstrating that such meters are in proper working order.

The seller will maintain a calibration log that includes:

- a. A description of the calibration protocol
- b. Certifications for weighing and measurement systems used in calibration
- c. Record of measured variance and adjustments made to the equipment as a result of calibration
- d. Signature and date for the calibration technician
- e. If the calibration protocol deviates from the manufacturer's recommendations, such deviations should be noted and explained separately
- f. As a separate attachment, the Seller should include copies of the manufacturer cut sheets, if available, specifying the system's accuracy, general operating characteristics and a written description or copy of the manufacturer's calibration requirements.

All scales and meters shall be calibrated by a third Party annually, and the results of such calibration must be provided to NYSERDA with the first invoice for each contract year.

**Measurement and Sampling Requirements for Sellers Using Solid Biomass Fuels**

The plan must describe the sampling equipment and procedures for maintaining sample integrity until delivery to the lab. The Seller is required to take grab samples from the as-fired eligible biomass fuel stream once every three-hour period. The Seller shall create a daily "super sample" from these grab samples. This "super sample" shall be sealed or stored in an environment that prevents decomposition of biomass and prevents moisture evaporation from the biomass. This "super sample" must be tagged with the date on which it was collected and logged in a Seller supplied sampling log. The Seller shall send the daily "super sample" to a lab within 24 hours of collection for a proximate analysis. Laboratory proximate analysis of moisture content in the biomass fuel must include an accounting for evaporative losses by adding condensed moisture in the sealed container to the moisture measured in the biomass sample. The proximate analysis result of the "super sample" shall be used to calculate daily as-fired heat input values. The Seller shall maintain documentation of sample timeliness, analysis and actions taken if analysis is delayed. The lab shall analyze the "super samples" within five business days of receipt. If a sample is delayed being shipped to the laboratory, the Seller shall notate any samples analyzed greater than six days from collection on the monthly invoice.

**Measurement and Sampling Requirements for Sellers Using Liquid Biofuels**

Eligible liquid fuels should be sampled and analyzed similarly to solid fuels. The seller is required to take grab samples once every three hours, which shall be combined into a daily super-sample which is sent to a lab for analysis. Care should be taken that the liquid is stored in such a way that no evaporation, leaching, or container degradation compromises the sample integrity.

**Measurement and Sampling Requirements for Sellers Using Non-Pipeline Quality Bio-Gas Fuels (Such As Landfill Gas, Anaerobic Digester Gas)**

Continuous metering of eligible and ineligible fuel flows is required. The average methane



## II. Projects Using Eligible and Ineligible Fuels

content (% volume) of the bio-gas metered during the reporting period must be measured continuously using analyzers to generate a monthly weighted average or sampled and analyzed using an approved sampling protocol. This value shall be used for calculating heating input of the eligible fuel gas stream in the reporting periods after the sample's collection and prior to the next sample by incorporating data found in the baseline gas composition data. A statement of the composition of any natural-gas fired at the site from the supplier, including heating value must be kept on record. Monthly supplier bills may be used to validate the composition of the delivered natural gas in lieu of gas testing if such bills contain information on the heating value of the delivered gas.

If gas is being extracted from multiple landfill cells or multiple digester systems, individual metering and testing may be required if the composition of the resulting gas streams is materially different. The end use of the bio-gas or bio-gas mixture (electricity, thermal, flared, losses, export to end-user via common carrier, etc.) should be reported as a percentage by volume.

An ultimate bio-gas fuel composition analysis (annual baseline) is required. This test must be performed annually and must include trace hydrocarbons and other combustible gases in the fuel. The heating value for the fuel should be reported on a basis consistent with other reporting heating values required. The estimated heating value of the bio-gas (Btu/scf) used for electricity production and the basis for the estimate (higher or lower heating value) should be documented monthly through laboratory testing or may be calculated using an annual baseline test and measurement of methane content.

If bio-gas is to be fired with solid or liquid ineligible fuels, then the measurement of the non-gaseous fuels shall be subject to rules governing the use of each fuel.

**Measurement and Sampling Requirements for Sellers Using Pipeline Quality Bio-Gas Fuels (RPG)**

Metering at the point of conversion to RPG and at the end use must be sufficient to verify contract volumes associated with RPG contracts.

Critical metering points at the point of RPG injection to the common carrier and the point of withdrawal shall be subject to a calibration protocol. Operational Certification/SOQ shall be conditioned on a plan for such calibration being submitted to and approved by NYSERDA.

Sufficient metering must be in place at the landfill collection/processing facility to allow accurate accounting of gas produced, collected, and the resulting volumes and energy content of the gas converted to RPG on a daily basis. Additional measurement or monitoring systems required to allocate the RPG produced to RPG delivery contracts may be required.

**5. FUEL TESTING AND ANALYSIS**

The Plan will provide procedures and schedules for testing the samples in accordance with the accounting requirements for eligible energy production. The Plan will identify the third-party labs that will conduct the testing of the chemical composition of the fuel. The labs used must not be affiliated with the Seller, and must be experienced with the analytical testing.

## II. Projects Using Eligible and Ineligible Fuels

**C. TESTING AND ANALYSIS METHODS*****Test Methods for Cofiring Eligible and Ineligible Fuels*****Eligible Solid Fuels**

The test methods in Table 1 are required to determine the values used to calculate the RES eligible generation from cofired solid biomass fuels. The use of alternatives may be approved, but approval must be sought in advance of using alternative methods in any report.

**Table 1 Test Methods for Eligible Solid Fuels**

<b>Fuel Type</b>	<b>Measurement</b>	<b>Testing Method</b>	<b>Testing Frequency</b>
Directly Harvested ( <i>associated with an FMP</i> )	Proximate Analysis	ASTM Standard Method of Proximate Analysis (D5142)	Grab or in-line samples taken every 3-hour period. Such grab samples are to be measured in a single “Super Sample” at the end of each 24-hour operating period.
Not Directly Harvested ( <i>not associated with an FMP</i> )	Proximate Analysis	ASTM Standard Method of Proximate Analysis (D5142)	Grab or in-line samples taken every 3-hour period. Such grab samples are to be measured in a single “Super Sample” at the end of each 24-hour operating period.
	RCRA Metals Analysis	EPA SW-846, for lead, arsenic, chromium, selenium, mercury, silver, cadmium, and barium	Once for each combination of supplier and source on a semiannual basis

**Ineligible Solid Fuels**

The test methods in Table 2 are required to determine the values used to calculate the amount of ineligible generation from ineligible fuels. The use of alternatives may be approved, but approval must be sought in advance of using alternative methods in any report.

**Table 2 Test Methods for Ineligible Solid Fuels**

<b>Measurement</b>	<b>Test or Measurement Method</b>	<b>Frequency</b>
Fuel Composition	ASTM Standard Test Method of Ultimate Analysis (D5373)	Once for each combination of supplier and source on a semiannual basis
Proximate Analysis	ASTM Standard Method of Proximate Analysis (D5142)	If needed, from one “Super Sample” assembled each day from grab samples taken every 3-hour period

## II. Projects Using Eligible and Ineligible Fuels

***Test Methods for Gaseous Fuel Cofiring*****Eligible Gaseous Fuels**

The following test methods in Table 3 are required to determine the heating values for bio-gas fuels. The use of alternatives may be approved, but approval must be sought in advance of using alternative methods in any report.

**Table 3 Test Methods for Eligible Gaseous Fuels**

Measurement	Test or Measurement Method	Frequency
Fuel Composition	ASTM D2650 - 10 Standard Test Method for Chemical Composition of Gases by Mass Spectrometry	Semiannually for each source (individual testing may be required by cell or digester)
Methane Content – Continuous	Continuous Methane Analyzer	Continuous
Methane Content – Sample Average	If a Continuous Methane Analyzer is not used then periodic analysis of landfill gas composition using statistically valid samples using calibrated portable gas meters and delivering a confidence level of 95% may be used.	Monthly

**Ineligible Gaseous Fuels**

The following test methods in Table 4 are required to determine the values for ineligible gaseous fuels in the calculations below. The use of alternatives may be approved, but approval must be sought in advance of using alternative methods in any report.

**Table 4 Test Methods for Ineligible Gaseous Fuels**

Measurement	Test or Measurement Method	Frequency
Fuel Composition	Heating value data from pipeline or utility supplier (may be derived from supplier invoice)	Monthly

***Test Methods for Liquid Fuel Cofiring*****Eligible Liquid Fuels**

The following test methods in Table 5 are required to determine the heating values for liquid fuels. The use of alternatives may be approved, but approval must be sought in advance of using alternative methods in any report.

**Table 5 Test Methods for Eligible Liquid Fuels**

Measurement	Test or Measurement Method	Frequency
Proximate Analysis	Testing methods will be determined based on the type of liquid fuel used	Grab samples taken every 3-hour period. Such grab samples are to be measured in a single “Super Sample” at the end of each 24-hour operating period.

**Ineligible Gaseous Fuels**

## II. Projects Using Eligible and Ineligible Fuels

The following test methods in Table 6 are required to determine the values for ineligible liquid fuels in the calculations below. The use of alternatives may be approved, but approval must be sought in advance of using alternative methods in any report.

**Table 6 Test Methods for Ineligible Liquid Fuels**

Measurement	Test or Measurement Method	Frequency
Fuel Composition	Testing methods will be determined based on the type of liquid fuel used	Once for each combination of supplier and source on a semiannual basis

#### D. CALCULATING ELIGIBLE RENEWABLE GENERATION

The following equations shall be used to calculate the amount of eligible renewable generation produced at a facility cofiring eligible and ineligible fuels. Equations 1 and 2 are the basic equations for calculating the Renewable Energy Generations (MWh/month) measured during the monthly reporting period. Recognizing that the total heat input to the generating unit will be derived from multiple fuels, the cofiring percentage is generically calculated as expressed in the following equations:

##### Equation 1: Biomass Cofiring Percentage

$$\text{Cofiring Percentage} = \frac{\text{Heat Input}_{\text{biomass}}}{\text{Heat Input}_{\text{total}}}; \text{ where}$$

$$\text{Heat Input}_{\text{total}} = \text{Heat Input}_{\text{biomass}} + \text{Heat Input}_{\text{ineligible fuel}}$$

$$\text{Heat Input}_{\text{Biomass}} = \text{HHV}_{\text{biomass}} \times \text{Biomass Mass Flow Rate}$$

$$\text{Heat Input}_{\text{Ineligible}} = \text{HHV}_{\text{ineligible fuel}} \times \text{Ineligible Fuel Mass Flow Rate}$$

$$\text{HHV} = \text{High Heating Value (Btu/lb) measured on the same moisture basis as the Mass Flow Rate}$$

For this purpose, the biomass heat input must be based on RES eligible biomass fuels. The cofiring percentage can then be used to apportion the total generation as follows:

##### Equation 2: Renewable Energy Generation

$$\text{Generation}_{\text{Renewable}} = \text{Generation}_{\text{Total}} \times \text{Cofiring Percentage};$$

The principles for calculating the biomass generation from direct cofiring in a gas- or liquid fueled plant mirror those outlined for a solid fuel plant. The key variables for calculating the renewable generation component remain the heating value of the fuel, fuel flow rate, and total boiler heat input. However, gas and liquid fuels can be used in a wider array of conversion devices, which introduces some additional complexity. The [RES Biomass Power Guide](#) Appendix B provides a guide of acceptable methods for calculating the cofiring percentage and consequently apportioning the total generation as *Renewable* and *Non-Renewable*.

## II. Projects Using Eligible and Ineligible Fuels

**E. ADDITIONAL REPORTING REQUIREMENTS**

In addition to the reports specified in Section I the seller must provide the following:

**Monthly Reports**

Facilities that use Eligible and Ineligible fuels must report the results of fuel sample testing each month. NYSERDA will provide the invoice templates, in Excel file spreadsheets that include tables for reporting the fuel composition and amount of fuel fired for each distinct type of eligible and ineligible fuel used at the facility. Each test result must be backed up by the laboratory analysis report that must be kept on file at the facility for the length of the RES contract. This documentation may be requested by for the purposes of verifying the electricity output by fuel source as indicated in NYGATS by the facility.

**Semiannual and Annual Reports**

Fuel Composition test results for each combination of supplier and source on a semiannual basis.

### **III. CLEAN MRF FUELS**

The term “Clean MRF Fuel” referred to in the Contract shall mean clean biomass separated from the mixed waste stream of Construction & Demolition (C&D) debris at a permitted Material Reclamation Facility (MRF) or C&D processing facility. Use of Clean MRF Fuel is subject to the fuel quality assurance and control procedures described below. Note, these provisions are not applicable to clean wood separated at the source (the construction or demolition site).

#### **A. REQUIREMENTS**

Requirements for the use of Clean MRF Fuels include:

- Separation of the clean biomass from C&D Debris at a MRF or C&D Processing Facility
- Approval of a Beneficial Use Determination by NYSDEC (BUD) for the use of the fuel (or equivalent for Clean MRF fuels produced in other states).
- Initial and monthly sampling and testing of the fuel product to the fuel quality standard adopted by the PSC in PSC Order CASE 09-E-0843<sup>4</sup>
- Fuel flow measurement, reported using templates provided by NYSERDA, for the separate accounting of generation produced from clean MRF fuels each month.

Since portions of the MRF fuel deliveries may not meet the RES fuel quality standard the facility must abide by the general provisions of Section I and the special provisions for cofiring eligible and ineligible fuel found in Section II.

#### **B. SUBMISSION OF A FUEL MANAGEMENT, MEASUREMENT, AND CALIBRATION PLAN**

For Operational Certification/SOQ the Seller must submit to NYSERDA a Fuel Management, Measurement and Calibration Plan as described in Sections I and II. For facilities firing Clean MRF Fuels, additional requirements beyond those prescribed in Sections I and II are described below, which must be addressed in the Plan.

##### **1. FUEL PROCUREMENT**

Describe all fuel sources and estimate delivered proportions of each fuel type (e.g. harvested wood, Clean MRF Fuel). Identify fuel procurement QA/QC provisions that ensure all Clean MRF Fuel suppliers have an effective QA/QC program in place to provide biomass fuels from the C&D waste stream meeting the criteria for RES eligibility. Describe the process for certifying suppliers to meet RES requirements. The Plan shall provide for NYSERDA’s review and approval of each Clean MRF supplier. If harvested fuels are used then the facility’s Forest Management Plan can be referred to in this section.

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<sup>4</sup>Rulemaking Allowing Clean Wood Separated from Construction and Demolition Waste at Material Reclamation Facilities to be Eligible for Use as Biomass Fuel in the Renewable Portfolio Standard Program. Niagara Generation, LLC, Retail Renewable Portfolio Standard, Order Approving Petition with Modifications, State of New York Public Service Commission, Case 09-E-0843, November 22, 2010, p 16-17.

## 2. FUEL MANAGEMENT AND INSPECTION

To ensure that the Clean MRF meets fuel quality standards referenced in the PSC Order CASE 09-E-0843, the Plan from the Seller must provide the fuel inspection procedures for the Clean MRF. The fuel quality specification should reference the fuel quality test limits listed in Section C below. As stated in the New York Public Service Commission (PSC) Order the Seller shall maintain supply contracts only with facilities permitted to receive and process C&D debris by the state in which they are located. The Seller should only accept Clean MRF Fuels from MRFs that have been approved by NYSERDA.

## 3. OPERATING PROCEDURES

No additional requirements

## 4. FUEL FLOW MEASUREMENT AND SAMPLING

Laboratory analytical testing of fuel samples is required initially for Operational Certification/SOQ and then monthly for reporting RES eligible energy production and invoicing. The facility may choose to use either of the following options for monthly fuel sampling:

### **Option 1: Regular sampling of as-fired Clean MRF Fuel prior to fuel blending for firing (*Preferred Method*)**

Grab samples from the unblended as-fired eligible Clean MRF Fuel stream will be taken once every 3-hour period at a collection station prior to blending and/or transport to the boiler. Fuel Quality Testing will be conducted using a monthly aggregated “super sample.” *This method requires the facility to have a separate storage and fuel feed system for the Clean MRF Fuels, similar to the requirements of cofiring facilities.*

### **Option 2: Random sampling each delivery of Clean MRF Fuel at the power generating facility**

For this option, grab samples are withdrawn from the interior of the load at predetermined intervals that span the load. This method allows for random sampling of the load since the operator cannot visually select the sample from the top of the load. The facility may propose an alternative random method for NYSERDA consideration if it prevents operators from preferentially selecting the cleanest sample material. Samples can then be bagged and labeled for testing. “Super samples” are aggregated from individual samples collected over a month’s time. The facility will take a minimum of three samples for each load using a procedure that ensures random sampling from the delivery vehicle. Delivery samples will be identified with the supplier and the portion unused in the super sample will be preserved until the monthly test results are received by the facility and reported to NYSERDA.

### **Preparation and Testing of Monthly Samples**

Individual fuel samples taken each month must be ground and combined and thoroughly mixed to make up the month’s test sample (“super sample”) shipped to the lab. The monthly super sample should be shipped on the next business day following the close of the month. Up to three weeks will be allowed from the day that samples are shipped to the lab for the completion of all tests. In practice this means that invoices to NYSERDA for one month of renewable power production will likely be submitted at the earliest in the fourth week of the

month following production to allow for the inclusion of test results. If the fuel test results exceed the limits for contamination then the Clean MRF Fuel portion of the total fuel fired that month and the associated generation will be ineligible under the RES.

To ensure the proper measurement and accounting for monthly RES eligible generation for each month the following additional requirements for both Options 1 and 2 must be met. Monthly Samples will be subject to a proximate analysis to determine moisture content and higher heating value. If the monthly Clean MRF Fuel deliveries fail to pass the RES fuel quality test criteria the entire and full amount of monthly generation from Clean MRF Fuels must be deducted from the invoice as ineligible fuel using the same methods for reporting of cofired eligible biomass and ineligible fuels. Specifically, data regarding the heating value and mass flow of the rejected load and the energy conversion efficiency of the unit will be used to determine the amount of energy generation disqualified from the RES invoice.

#### **Use of Subsamples**

The Facility may wish to collect subsamples that collectively represent the entire amount of Clean MRF Fuel fired in the month. Subsamples may represent fuel fired over a smaller time interval (weeks or days), fuel delivered by each supplier in the month, or equal increments of fuel mass flow fired (every 10 tons). As long as the subsample increments collectively represent the entire amount of fuel fired in the month they may be treated as subsamples for fuel quality analysis. In the event that the monthly super sample fails to meet the Clean MRF Fuel Quality standard, the facility may order additional tests performed for all the subsamples to determine what portion of the fuel fired is ineligible. The portion of the monthly fuel fired that is determined to be ineligible on a heat input basis by subsample testing will be deducted from the eligible fuel portion and reported separately as ineligible fuel fired in the month.

### **5. FUEL TESTING AND ANALYSIS**

The testing requirements for use of Clean MRF Fuels are specified in Section C. The Plan will identify the third-party labs that will conduct the testing of the chemical composition of the fuel. The labs used must not be affiliated with the Seller and experienced with the analytical testing.

### **C. ANALYSIS AND TEST METHODS FOR USING CLEAN MRF FUELS**

Test protocols for contaminants typically found in C&D wastes were adopted by the PSC in the 2010 Order.<sup>5</sup> To assure accurate test results, it is critical that the samples be thoroughly ground and mixed to homogenize the sample material prior to testing. The list of contaminants and test methods for measuring contaminant concentrations are provided in Table 7. Different versions of the same test method, designated by the test method suffix letter, are acceptable. Where the performing lab has a choice, the latest version should be used. If the facility's chosen lab prefers an alternative test method to the PSC accepted method it must conduct a comparative analysis. The comparative analysis must statistically prove that the alternative method is equally precise

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<sup>5</sup> Contaminant Limits established in the 2010 Order are maximum concentration limits for any MRF Clean Fuel.



and repeatable as the PSC approved method. The alternative method cannot be used until approved by NYSERDA.

In Table 8 A and B and Table 9 the test reporting forms are provided. The reporting form in Table 8 A includes the limits for concentrations of contaminants in eligible Clean MRF Fuels. Contaminant Limits listed in the second column of the reporting form above were adopted by the PSC. Different versions of the same test method as designated by the test method suffix letter are all acceptable.

**Table 7 Test Methods for Clean MRF Fuels- Analysis Basis: Dry Matter (Moisture Free)**

<b>Contaminant</b>	<b>Primary Test or Measurement Method</b>	<b>Approved Alternate Method</b>	<b>Frequency</b>
Arsenic, Cadmium, Chromium, Lead, Selenium, Silver, Titanium, Zinc	EPA SW 846-6010C – Inductively Coupled Plasma-Atomic Emission Spectrometry	EPA 200.7 Rev 4.4 – Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission	monthly
Mercury	EPA SW 846-7471 – Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique)	None	monthly
Total Pesticides	EPA SW 846-8081B – Organochlorine Pesticides by Gas Chromatography	None	monthly
Total Herbicides <sup>6</sup>	EPA SW 846-8151A – Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzoylation Derivatization	EPA SW846-SV 8270 for Pentachlorophenol ONLY	monthly
Polychlorinated Biphenyls (PCBs)	EPA SW 846-8082A – Polychlorinated Biphenyls (PCBs) by Gas Chromatography	None	monthly
O, M, & P Cresols	EPA SW 846-8270D – Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	None	monthly
Chlorine	ASTM D6721 - Standard Test Method for Determination of Chlorine in Coal by Oxidative Hydrolysis Microcoulometry	None	monthly
Plastics	Visual Inspection	None	each delivery
Total Non-wood <sup>7</sup>	Visual Inspection	None	each delivery

<sup>6</sup> EPA SW846-SV 8270 can be used as an alternate test method to EPA SW 846-8151A for pentachlorophenol

<sup>7</sup> Non-wood does not include soil and metal fasteners which are noncombustible

**Table 8A MRF Fuel Quality Testing Form - Limits in PPM Analysis Basis: Dry Matter (Moisture Free)**

<b>MRF Fuel Quality Testing</b>				<b>Monthly Super Sample Results (ppm)</b>
<b>MRF Fuel Quality Analysis</b>	<b>Limit (total)</b>	<b>Primary Method</b>	<b>Alternate Method</b>	
Arsenic (ppm)	50.00	EPA SW 846-6010C	EPA 200.7 Rev 4.4	
Cadmium (ppm)	20.00	EPA SW 846-6010C	EPA 200.7 Rev 4.4	
Chromium (ppm)	200.00	EPA SW 846-6010C	EPA 200.7 Rev 4.4	
Lead (ppm)	250.00	EPA SW 846-6010C	EPA 200.7 Rev 4.4	
Selenium (ppm)	20.00	EPA SW 846-6010C	EPA 200.7 Rev 4.4	
Silver (ppm)	100.00	EPA SW 846-6010C	EPA 200.7 Rev 4.4	
Titanium (ppm)	300.00	EPA SW 846-6010C	EPA 200.7 Rev 4.4	
Zinc (ppm)	200.00	EPA SW 846-6010C	EPA 200.7 Rev 4.4	
Mercury (ppm)	0.20	EPA SW 846-7471	None	-
Total Pesticides <sup>(1)</sup> (ppm)	0.16	Listed Below	Listed Below	-
Total Herbicides <sup>(2)</sup> (ppm)	0.50			
PCBs (ppm)	20.00	EPA SW 846-8082A	None	
O, M, and P Cresols (ppm)	1,200.00	EPA SW 846-8270D	None	
Chlorine (ppm)	1,500.00	ASTM D6721	None	
<b>Meets Standard?</b>				Yes / No

Notes 1 and 2: Totals for all Pesticides and Herbicides are calculated in Table 9 (Specific Pesticides and Herbicides to be Analyzed) and reported on this form.

**Table 8 B Contaminants Evaluated by Visual Inspection on each Delivery**

Contaminant	PSC Acceptance Limits	Inspection Results
Plastics	1% dry weight	
Total Non-wood	1% dry weight	

Table 9 below lists the full set of Herbicides and Pesticides required to be analyzed. The Totals on this supporting form should be entered into the total Herbicides and Pesticides rows of the reporting form in Table 8A.

**Table 9 Specific Pesticides and Herbicides to be Analyzed**

<b>(1) Pesticides tested for include:</b>			<b>Monthly Super Sample</b>
<b>Analyte</b>	<b>Cas Number</b>	<b>EPA Test Method</b>	
4,4'-DDD	72-54-8	SW 846-8081B	
4,4'-DDE	72-55-9	SW 846-8081B	
4,4'-DDT	50-29-3	SW 846-8081B	
Aldrin	309-00-2	SW 846-8081B	
alpha-BHC	319-84-6	SW 846-8081B	
beta-BHC	319-85-7	SW 846-8081B	
Chlordane, Total	57-74-9	SW 846-8081B	
delta-BHC	319-86-8	SW 846-8081B	
Dieldrin	60-57-1	SW 846-8081B	
Endosulfan I	959-98-8	SW 846-8081B	
Endosulfan II	33213-65-9	SW 846-8081B	
Endosulfan sulfate	1031-07-8	SW 846-8081B	
Endrin	72-20-8	SW 846-8081B	
Endrin aldehyde	7421-93-4	SW 846-8081B	
Endrin ketone	53494-70-5	SW 846-8081B	
Heptachlor	76-44-8	SW 846-8081B	
Heptachlor epoxide	1024-57-3	SW 846-8081B	
Lindane	58-89-9	SW 846-8081B	
Methoxychlor	72-43-5	SW 846-8081B	
<b>Total:</b>			-
<b>(2) Herbicides tested for include:</b>			<b>Monthly Super Sample</b>
<b>Analyte</b>	<b>Cas Number</b>	<b>EPA Test Method</b>	
2,4,5-T	93-76-5	SW 846-8151A	
2,4,5-TP	93-72-1	SW 846-8151A	
2,4-D	94-75-7	SW 846-8151A	
4-Nitrophenol	100-02-7	SW 846-8151A	
Dalapon	75-99-0	SW 846-8151A	
Dicamba	1918-00-9	SW 846-8151A	
Dichlorprop	120-36-5	SW 846-8151A	
Dinoseb	88-85-7	SW 846-8151A	
Pentachlorophenol	87-86-5	SW 846-8151A or EPA SW 846-SV 8270	
<b>Requirements:</b>	1. Analysis Basis: HHV - As Received; All Other Analytes - Dry Basis (Moisture Free)		
	2. Testing was performed using the EPA/ASTM test method listed for each analyte		
<b>Clarifications:</b>	1. EPA SW864-SV 8270 can be used as an alternate test method to EPA SW 864-8151A for pentachlorophenol		
	2. Different versions of the same test method are acceptable designated by the test method suffix letter.		

**D. ADDITIONAL REPORTING REQUIREMENTS**

In addition to the reports specified in Sections I and II the seller must provide the following:

**Monthly Reports**

Facilities that use Clean MRF fuels must create a monthly super sample representing all the MRF fuel used in the month and provide the results of fuel quality testing in the form of Table 8 A and Table 9 along with the invoice to NYSERDA each month. Each test result report must be backed up by the laboratory analysis report that must be kept on file at the facility for the length of the RES contract. The Facility must also report results of a proximate analysis to determine moisture content and higher heating value for monthly super samples of the Clean MRF Fuel. The contaminants listed in Table 8 B are visually inspected and reported in the fuel delivery logs.

In the event that the test results show that one or more contaminants in the fuel exceed the limits specified in Table 8, the entire Clean MRF fuel supply for that month must be reported as ineligible fuel and subtracted from the total biomass generation reported for the period.

The Facility may wish to collect subsamples that collectively represent the entire amount of Clean MRF Fuel fired in the month. Subsamples may represent fuel fired over a smaller time interval (weeks or days), fuel delivered by each supplier in the month, or equal increments of fuel mass flow fired (every 10 tons). As long as the subsample increments collectively represent the entire amount of fuel fired in the month they may be treated as subsamples for fuel quality analysis. In the event that the monthly super sample fails to meet the Clean MRF Fuel Quality standard, the facility may order additional tests performed for all the subsamples to determine what portion of the fuel fired is ineligible. The portion of the monthly fuel fired that is determined to be ineligible on a heat input basis by subsample testing will be deducted from the eligible fuel portion and reported separately as ineligible fuel fired in the month.

Additional documentation may be requested by NYSERDA for the purposes of verifying the electricity output by fuel source as indicated in the [NYGATS Operating Rules](#).

**Initial Reports**

Accompanying the Fuel Management Measurement and Calibration Plan report should be the initial fuel quality test summary in the form of Table 8A and Table 8B.

## IV. Biomass Recovered from Mixed Waste Streams

**IV. BIOMASS RECOVERED FROM MIXED WASTE STREAMS**

These contract provisions apply to facilities using biomass recovered from municipal mixed-waste streams or other waste biomass specifically listed in the PSC Orders<sup>8</sup>. These provisions do not apply to clean MRF Fuels.

For biomass recovered from municipal mixed-waste streams or other waste biomass listed in the PSC Orders, the RES program requires a primary conversion step to liquid or gaseous fuels. ***For this reason, this section refers to the raw biomass used at the facility as a biomass feedstock, which is distinct from the final fuel product used to generate electricity. The feedstock conversion step produces a clean biomass fuel used for power generation.*** Power generation facilities that choose to use these types of biomass must demonstrate that emissions from electric energy production from the use of the adulterated feedstocks are equal to or less than the emissions for the process using unadulterated biomass feedstocks.

The biomass feedstock must be produced at a permitted solid waste facility in compliance with all NYSDEC standards for operation (or an equivalent set of state standards for solid waste management outside of New York) and is subject to the NYSDEC BUD review process. The feedstock production facility must have a regular routine independent monitoring program that pays NYSDEC (or approved third-party<sup>9</sup>) monitors to ensure that its biomass processing is consistent within facility permits and conditions. In addition, these feedstock production facilities are required to employ sorting techniques that recover the biomass fraction of mixed waste. As Part of the Operational Certification/SOQ process the power generating facility will be required to provide copies of the solid waste BUD and air permits.

**A. REQUIREMENTS**

To operationally certify a power generation facility using adulterated biomass feedstocks for the RES program, the following steps must be taken: (1) analyze the feedstock for components that under the combustion conditions could produce air pollutants of concerns; and (2) demonstrate that using the adulterated biomass feedstock, the plant meet or exceed the emission performance of the plant using only unadulterated biomass.

The primary process to demonstrate that the facility meets requirements set forth in the standard is called comparative emissions testing. With this process, the facility owner must demonstrate that the emissions resulting from the use of the proposed adulterated feedstock is equivalent to or

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<sup>8</sup> From the PSC Order 8/1/2016 Appendix A: Agricultural by-products such as leather and offal and food processing residues that are converted into a biogas or liquid biofuel. Adulterated forms of wood, such as plywood and Particle board, may be used as a feedstock for biogas or liquid biofuel conversion technologies if it can be demonstrated that the technology employed would produce power with emissions comparable to that of biogas or liquid biofuel using only unadulterated sources as feedstock.

<sup>9</sup> All out of state projects will be required to utilize a third-party monitor to ensure that its biomass processing is consistent with facility permits and conditions. Projects located out of state will be required to meet the same standard, but these projects will necessarily rely on monitoring services provided by an approved third party monitor.

## IV. Biomass Recovered from Mixed Waste Streams

better than the emissions generated with an unadulterated feedstock using the same conversion process.

There is also an alternative compliance pathway to the comparative emissions testing process, which may be used for biomass gasification facilities to demonstrate compliance with the standard. The alternative compliance protocol consists of (1) demonstrating through environmental performance data that the proposed gasification/generation system design will limit the formation and emission of one or more relevant contaminant of concern to levels below those that would be generated from either the direct combustion of clean wood or gasification and subsequent syngas combustion using clean wood, and (2) implementation of ongoing feedstock testing to ensure that any contaminants for which the avoidance/elimination by the proposed system has not been sufficiently demonstrated are within threshold levels. This approach is referred to as the Comparative Emissions Alternative Compliance Protocol, or CEACP.

The requirements for each of these processes are summarized below. Additional guidance is provided in the [RES Biomass Power Guide](#) on the NYSERDA RES Website.

**Step 1 – Pollutant Precursor Screening Analysis**

The feedstock testing and screening analysis is the first step in the process to qualify for use of adulterated biomass feedstocks, regardless of whether the facility is following the comparative emissions testing procedure or CEACP. The facility must submit an ultimate and proximate feedstock analysis as well as compound- and element- specific analyses of the adulterated feedstock(s). These chemical analyses for feedstock screening must include the components of the feedstock that, under the combustion conditions present in the proposed biomass facility, could produce air pollutants of concern. In this methodology, they will be called “precursor” compounds and elements. Test results from these analyses enable NYSERDA and the facility to determine the air emissions testing regime or environmental performance data that will be required to demonstrate RES compliance. The sampling protocol for sample collection and analysis must provide assurance that the feedstock analyses are representative of the feedstocks that will be used at the facility. At a minimum, the air pollutants that NYSERDA is concerned with are those for which the facility was required to test in permitting, plus the air pollutants listed in the pollutants of concern column of Table 10 below. The limits are based on typical feedstock analyses for forest-harvested wood, in the expectation that most adulterated feedstock will be significantly wood-derived.

Any precursor elements or compounds that are found in the proposed feedstock in greater concentration than in the unadulterated biomass sample will be listed for testing along with its associated air pollutant(s) generated in combustion in the test report submitted to NYSERDA. A comparative air emissions test will be required for the air pollutant associated with that precursor, or if the alternative compliance protocol is used then that precursor must be addressed in the associated environmental performance data or ongoing feedstock testing and monitoring plan.

The screening analysis report to NYSERDA should also include a copy of the air permit and solid waste permit, listing the feedstocks that the facility is permitted to receive and convert. NYSERDA will review and then either recommend approval of the report and pollutant list

## IV. Biomass Recovered from Mixed Waste Streams

to DPS or return the report to the facility with a list of deficiencies noted. The facility may choose to resubmit a revised analysis and list or withdraw the adulterated feedstock from consideration.

If the facility intends to use the CEACP for compliance, the facility developer must also submit a request to NYSERDA for approval to use this alternative approach which can be included in the screening analysis report. That request should explain in detail why the facility faces barriers that would effectively prevent the performance of comparative emissions testing as prescribed in the comparative emissions testing process.

**Table 10 Precursors to Pollutants of Concern for Adulterated Biomass**

	Precursor	Air Pollutants of Concern	Precursor Limit (ppm, dry basis)
	Mercury (Hg)	mercury	0.17
	Organic Matter	benzo-a-pyrene	n/a <sup>10</sup>
	Chlorine (Cl)	hexachlorobenzene; 2,3,7,8-tetrachlorodibenzo-p-dioxin; 2,3,7,8-tetrachlorodibenzofuran; polychlorinated biphenyls	370
<b>RCRA Metals</b>	Arsenic	elemental and organic compound emissions	5
	Cadmium		0.9
	Chromium		17
	Lead		4.4
	Zinc		200
	Polychlorinated Biphenyls (PCBs)	PCBs, PCDDs	<i>detectable</i>
	Plastics, Total Non-wood	hexachlorobenzene; 2,3,7,8-tetrachlorodibenzo-p-dioxin; 2,3,7,8-tetrachlorodibenzofuran (via HCl); polyaromatic hydrocarbons	1% by dry weight

### Step 2 – Comparative Emissions Test Protocol Development

This step only applies if the facility can perform comparative emissions testing. If the CEACP is being used, refer to Step 2A.

Comparative emissions testing requires that air emissions generated by firing the fuel produced from the unadulterated feedstock(s) and from the corresponding adulterated

<sup>10</sup>Benzo-a-pyrene emissions tend to be a function of combustion conditions, rather than of the type or chemical composition of the fuel used. For this reason, there will be no precursor screening for this pollutant of concern; all facilities will be required to include it in their comparative emissions testing protocol or alternative compliance protocol to comparative emissions testing.

## IV. Biomass Recovered from Mixed Waste Streams

feedstock(s) be measured separately and the results compared. Based on the prescribed list of pollutants to be tested, the facility will develop a test plan for comparative air emissions measurement. Wherever possible, the protocol will use ASTM, EPA or DEC approved test methods. A protocol for measuring each air pollutant must be provided. The facility owner's comparative test plan is required to specifically address the issue of feedstock variability so that the full range of permitted feedstock compositions is evaluated. The Plan will include the approved list of pollutants to be measured and NYSERDA will review the plan and then either recommend approval to OCE or return it to the facility with a list of deficiencies noted. The facility must resubmit a revised plan. It is possible that a facility may have a technology or adulterated feedstock that precludes effective comparative emissions testing because the technology is not compatible with typical unadulterated feedstocks. If this is the case and alternative testing plan may be submitted for NYSERDA consideration. The [RES Biomass Power Guide](#) provides additional guidance on acceptable alternative plans.

**Step 2A – Alternative Compliance Plan Development**

This step only applies if the facility is using the CEACP. The project must use environmental performance data to demonstrate that the subject plant will have emission levels equal to or less than those likely to be generated from the direct combustion of clean wood, or gasification and subsequent syngas combustion using clean wood for one or more pollutant of concern. The environmental performance data used to meet this requirement may include a combination of scientific analysis (relevant studies or data), pilot scale testing, or testing at an analogous system constructed elsewhere. The developer must submit a testing and analysis plan to NYSERDA.

Note that for any pilot scale or proxy facility used for the analysis, the test gasifier must be similar to the technology proposed for the project in the following respects:

- Gasifier type (e.g. direct/indirect, etc.),
- Reactor operating pressures and temperatures,
- Reactants, and
- Bed technology (e.g., moving grate, circulating fluidized bed, bubbling fluidized bed, etc.).

The adulterated feedstock(s) evaluated in the analysis should be representative of the full range of feedstocks permitted for use. The choice of both adulterated and unadulterated feedstocks used for comparison must be clearly indicated in the analysis plan submitted to NYSERDA, and the unadulterated baseline feedstock is subject to NYSERDA approval.

**Step 3 – Emissions Testing and Reporting**

This step only applies if the facility can perform comparative emissions testing. If the CEACP is being used, refer to Step 3A.

The facility must make all arrangements to conduct the comparative emissions test. NYSERDA may send a test monitor (either contractor or other state agency) to observe the tests and report any deviations from the test plan. The report from the emissions testing contractor including the statistical analysis of the results must be submitted to NYSERDA.



## IV. Biomass Recovered from Mixed Waste Streams

The executive summary of the test report should clearly state which pollutants were found to be within the prescribed limits and which pollutants exceeded the limits.

**Step 3A – Alternative Analysis and Reporting**

This step only applies if the facility is using the alternative compliance protocol.

The facility must make all arrangements to analyze and prepare the environmental performance data and report to be submitted to NYSERDA. The executive summary of the test report should clearly state the results of the analysis including which pollutants the system is demonstrated to avoid above threshold levels. The report should also include the plan for ongoing feedstock testing as needed (fuel management plan, sampling, and testing protocols).

**B. SUBMISSION OF A FUEL MANAGEMENT, MEASUREMENT, AND CALIBRATION PLAN**

For Operational Certification/SOQ the Seller must submit to NYSERDA a Fuel Management, Measurement and Calibration Plan as described in Section I. Topics to be addressed in the Plan beyond what is required in Section I are described below.

**1. FUEL PROCUREMENT**

Identify all mixed waste sources. The biomass feedstocks must be provided by permitted solid waste facilities in compliance with all NYSDEC standards for operation (or an equivalent set of state standards for solid waste management outside of New York). Identify fuel procurement QA/QC provisions that ensure that fuel suppliers have an effective QA/QC program in place to provide consistent biomass mixed waste fuels conforming to the fuel specification approved for comparative testing, or to meet the CEACP requirements. Describe the process for certifying suppliers to meet RES requirements.

**2. FUEL MANAGEMENT AND INSPECTION**

The feedstock production facility must describe or provide documentation for the independent monitoring program that pays for NYSDEC (or approved third-party) monitors to ensure that its biomass processing is consistent within facility permits and conditions. Independent monitors must be identified in the plan and evidence of their qualifications provided.

**3. OPERATING PROCEDURES**

No additional requirements.

**4. FUEL FLOW MEASUREMENT AND SAMPLING**

No additional requirements for facilities using the comparative emissions testing protocol.

Feedstock monitoring protocols for adulterated feedstocks that use the CEACP must be equivalent to those set forth for the Clean MRF Fuels, as described in Section II.B. This includes laboratory analytical testing and then monthly for reporting RES eligible energy production and invoicing for any contaminant of concern that is not demonstrated to be treated by the proposed gasification process.

**IV. Biomass Recovered from Mixed Waste Streams****5. FUEL TESTING AND ANALYSIS**

No additional requirements for facilities using the comparative emissions testing protocol.

Adulterated fuels that are following the CEACP must use equivalent procedures and reporting as for Clean MRF fuels for any contaminant of concern that is not demonstrated to be treated by the proposed gasification process. Testing requirements for use of Clean MRF Fuels are specified above Section III.C.

**C. ANALYSIS AND TEST METHODS FOR USING BIOMASS RECOVERED FROM MIXED WASTE STREAMS**

Methods for the Pollutant Precursor Screening Analysis(Step 1 of the process described in “IV.A. Requirements” Section) approved by NYSERDA are listed in Table 11. Alternative methods may be proposed and submitted to NYSERDA for approval. The facility will submit to NYSERDA the results of the chemical analyses shown in Table 11 plus any analyses required to measure concentrations of precursors to air pollutants listed in the facilities air permits (e.g. sulfur).

## IV. Biomass Recovered from Mixed Waste Streams

**Table 11 Adulterated Biomass Screening Analysis Methods**

		Precursor	Test Method for Solid Materials
		Mercury (Hg)	EPA SW 846-7471 – Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique)
		Organic Matter	<i>not screened for; a function of combustion conditions</i>
		Chlorine (Cl)	ASTM D6721 - Standard Test Method for Determination of Chlorine in Coal by Oxidative Hydrolysis Microcoulometry
<b>RCRA Metals</b>	Arsenic	EPA SW 846-6010C – Inductively Coupled Plasma-Atomic Emission Spectrometry	
	Cadmium		
	Chromium		
	Lead		
	Zinc		
		Polychlorinated Biphenyls (PCBs)	EPA SW 846-8082A – Polychlorinated Biphenyls (PCBs) by Gas Chromatography
		Plastics, Total Non-wood	Flotation or air separation <sup>11</sup>

For the Comparative Emissions Test (Steps 2 and 3 of the process described in “IV.A. Requirements” Section) the unadulterated feedstock should be selected by the facility for compatibility with its conversion technology, which may be designed for feedstocks of a specific size, moisture, and chemical composition. The adulterated feedstock(s) used for testing should be representative of the full range of feedstocks permitted for use. **The choice of both adulterated and unadulterated feedstocks must be clearly indicated in the Plan submitted to NYSERDA, and the unadulterated baseline feedstock is subject to NYSERDA approval.** A Partial list of approved test methods is provided in Table 12.

<sup>11</sup> The specific methodology for performing this separation and measurement must be submitted to and approved by NYSERDA before the screening tests are performed.

## IV. Biomass Recovered from Mixed Waste Streams

**Table 12 Comparative Air Emissions Tests (Gaseous Materials)**

<b>Pollutant of Concern</b>	<b>Test For</b>	<b>Analytical Test Method</b>
benzo-a-pyrene	polycyclic aromatic hydrocarbons (PAH)	EPA SW 846 Method 0010 ( <i>Modified Method 5 Sampling Train</i> ) with EPA SW 846 Method 8270D ( <i>Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry</i> )
hexachlorobenzene (HCB)	hexachlorobenzene (HCB)	EPA SW 846 Method 0010 ( <i>Modified Method 5 Sampling Train</i> ) with EPA SW 846 Method 8270D ( <i>Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry</i> )
2,3,7,8-tetrachlorodibenzo-p-dioxin	polychlorinated dibenzo-p-dioxins/ dibenzofurans (PCDD/F)	EPA Method 23 ( <i>Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans from Municipal Waste Combustors</i> )
2,3,7,8 – tetrachlorodibenzo-furan		
arsenic	inorganic and organic metals emissions	40 CFR Part 60, Appendix A, Method 29 ( <i>Metals Emissions from Stationary Sources</i> )
cadmium		
chromium		
alkylated lead compounds		
mercury		
zinc		
polychlorinated biphenyls (PCB)	polychlorinated biphenyls (PCB)	EPA SW 846 Method 0010 ( <i>Modified Method 5 Sampling Train</i> ) with EPA SW 846 Method 8270D ( <i>Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry</i> )

For the CEACP (Steps 2A and 3A of the process described in “IV.A. Requirements” Section), if any pilot scale or proxy facility is used for the analysis, the test gasifier must be similar to the technology proposed for the project in the following respects:

- Gasifier type (e.g. direct/indirect, etc.),
- Reactor operating pressures and temperatures,
- Reactants, and
- Bed technology (e.g., moving grate, circulating fluidized bed, bubbling fluidized bed, etc.).

The adulterated feedstock(s) evaluated in the analysis should be representative of the full range of feedstocks permitted for use. **The choice of both adulterated and unadulterated feedstocks**

## IV. Biomass Recovered from Mixed Waste Streams

**used for comparison must be clearly indicated in the analysis plan submitted to NYSERDA, and the unadulterated baseline feedstock is subject to NYSERDA approval.**

For any contaminant of concern from the adulterated feedstock that is not demonstrated to be treated by the proposed gasification process in a way that would meet the emissions level requirements, an ongoing feedstock testing program is required for the feedstocks used for the system to ensure any contaminants of concern or their precursors are not present at levels above the threshold limits. The feedstock monitoring protocols for adulterated feedstocks under the Comparative Emissions Alternative Compliance Protocol are equivalent to those set forth for the Clean MRF Fuels, as described in Section III. The same test methods and frequency of testing and reporting should be applied for any applicable contaminants.

**D. ADDITIONAL REPORTING REQUIREMENTS**

In addition to the reports specified in Section I the seller must provide the following:

**Initial Reports**

The Fuel Screening Analysis Report and the Comparative Emissions Test Report or Alternative Compliance Analysis Report prior to Operational Certification/SOQ.

**Monthly Reports**

Adulterated fuels that are following the CEACP must use equivalent procedures and reporting as for Clean MRF fuels for any contaminant of concern that is not demonstrated to be treated by the proposed gasification process. The requirements for monthly reporting are described in Section III.D above.