New York State
Renewable Portfolio Standard

Biomass Power Guide

Revised July 22, 2014

Prepared for
New York State Energy Research and Development Authority

Prepared by
Antares Group, Incorporated

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The New York State Public Service Commission (PSC) Orders issued for Case 03-E-0188 are the controlling authority for all determinations of eligibility of projects participating in the NYS RPS. NYSERDA Guidance documents provide Offerors additional information about the application of the Orders to specific projects and methodologies for determining the amounts of power eligible for contract payments as well as guidance on RPS certification procedures for facilities contracting with NYSERDA for the sale of renewable attributes. If there is any question about the application of the guidance to a project the PSC Orders will take precedence.

The RPS program was designed to evolve as the implementing authorities gain experience with the program. Guidance provided at this time and any time during the program implementation will apply to the current procurement and may change with successive procurements and PSC Orders. Offerors are advised to review applicable guidance provided with the announcement of each successive RPS procurement or auction.

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Acronyms

480A	New York State Real Property Tax Law 480A Program
AEM	Agricultural Environmental Management
ATFS	American Tree Farm System
BUD	Beneficial Use Determination
BMP	Best Management Practice
CAFO	Concentrated Animal Feeding Operations
C&D	Construction and Demolition
CEMS	Continuous Emission Monitoring System
CNMP	Comprehensive Nutrient Management Plan
CPA	Certified Public Accountant
DAR	Division of Air Resources
DAR-1	NYSDEC Guidelines for the Control of Toxic Ambient Air Contaminants
DAR-3	NYSDEC Guide for Permitting Alternative Fuels
FGD	Flue Gas Desulfurization
FMP	Forest Management Plan
FSC	Forest Stewardship Council
HHV	Higher Heating Value
LFG	Landfill Gas
MCW	Moisture Content, Wet Basis
MRF	Material Reclamation Facility
NYS	New York State
NYS DEC	New York State Department of Environmental Conservation
NYS DPS	New York State Department of Public Service
EPA	Environmental Protection Agency
NYSERDA	New York State Energy Research and Development Authority
OEEE	Office of Energy Efficiency and the Environment
OEM	Original Equipment Manufacturer
PSC	Public Service Commission
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RFP	Request for Proposals
RPG	Renewable Pipeline Gas
RPS	Renewable Portfolio Standard
SFI	Sustainable Forestry Initiative
SPDES	State Pollutant Discharge Elimination System
TF	Tree Farm

Additional Information Available on the Web

Active links as of the publication date.

American Tree Farm System, American Tree Farm System
http://www.treefarmsystem.org/

Chapter IV Subchapter B Part 360 Solid Waste Management Facilities Regulations (6 NYCRR Part 360-1.8, which describes permit application requirements and procedures for solid waste management facilities in more detail for RPS facilities planning on using biomass from a mixed waste stream), New York State Department of Environmental Conservation

http://www.dec.ny.gov/regs/2491.html

Forest Law Tax Program, New York State Department of Environmental Conservation
http://www.dec.ny.gov/lands/5236.html

Forest Stewardship Council United States. Forest Stewardship Council United States.
http://www.fscus.org/

Policy DAR-1: Guidelines for the Control of Toxic Ambient Air Contaminants. New York State Department of Environmental Conservation
http://www.dec.ny.gov/chemical/30681.html

Policy DAR-3: Alternative Fuels, New York State Department of Environmental Conservation.
http://www.dec.ny.gov/chemical/31238.html

Renewable Portfolio Standard documents, New York State Public Service Commission Website.

http://www3.dps.ny.gov/W/PSCWeb.nsf/All/1008ED2F934294AE85257687006F38BD?OpenDocument

Sustainable Forestry Initiative, Sustainable Forestry Initiative Inc.
http://www.sfiprogram.org/

Units of Measurement

Btu	British thermal unit
CO_2	carbon dioxide
kW	one kilowatt; 1000 watts
kWh	one kilowatt hour; 1000 watt hours
lb	pound
MMBtu	one million British thermal units
MW	one megawatt; 1 million watts
MWh	one megawatt hour; 1000 kilowatt hours
NO_x	nitrogen oxides
S	sulfur
scf	standard cubic feet
SO_2	sulfur dioxide
ton	2,000 pounds

Definitions

Adulterated Biomass – Biomass that has been treated or contaminated in some way; also includes animal byproducts and wastes.

Averaging Period – The averaging period for calculating the baseline will require facilities to provide the monthly production figures for the five most recent years prior to the vintage date established by the applicable RFP.

Baseline Biomass Fuel Use – The amount (in tons) of eligible biomass fuels used to generate power during the averaging period.

Baseline Biomass Generation – The baseline will be calculated by averaging the renewable generation (kWh) from eligible biomass fuels for the plant during the two highest years during the averaging period.

Baseline Renewable Generation Capacity – Baseline Capacity will be determined and documented by either the nameplate capacity of the biomass generation equipment or operational tests conducted at full load measuring the biomass generation capacity. This value is expressed in MW.

Clean MRF Fuel – Clean biomass separated from C&D wastes at a Materials Reclamation Facility (MRF) or C&D processing facility (any facility permitted to handle C&D debris).

Eligible Fuel – Unadulterated biomass that can be used towards production of renewable energy generation in the RPS program Certain categories of adulterated biomass can be used to produce eligible biomass fuels by converting them to a clean biofuel or biogas before using them as fuel. The RPS program imposes a number of constraints on the eligibility of biomass fuels which are described in this guide.

Feedstock – Raw material that is processed for other purposes.

Fuel Sample Collection – Retrieval of fuel samples from the sampling points within the plant. Details on sample collection requirements are available in Section 7 Fuel Management, Measurement, and Calibration Plan

Independent Analysis Report – Facilities will provide an audit report endorsed by an independent CPA or professional engineer of its baseline and incremental capacity analysis. The analysis to establish the baseline and incremental capacity must be supported by documentation of either the nameplate capacity or operational tests at full load capacity of the biomass power generated before and after plant modification or upgrade to increase biomass generation capacity. The report must also document the investment in renewable plant equipment for the modification or upgrade.

Ineligible Fuel – Fuels that may be used by the generating facility for startup or power generation but cannot be counted towards renewable energy generation in the RPS program; contains all fossil fuels as well as adulterated biomass. Facilities that use these fuels must have strict accounting and measurement systems in place to ensure that generation from ineligible fuels is not included in reported renewable generation under an RPS contract.

Mixed-stream Biomass – Adulterated and unadulterated biomass materials that have been in contact with each another in the same waste stream.

New York State Real Property Tax Law 480A Program – Established in 1974 to encourage the long-term ownership of woodlands to produce forest crops and thereby increase the likelihood of a more stable forest economy through the form of tax relief to qualifying owners.

RPS Capacity Investment – The incremental investment must be properly documented and may only include costs directly associated with the engineering and installation of the new equipment.

RPS Capacity Ratio – The ratio of the incremental renewable generation capacity to the total renewable generation capacity at the plant; where the total renewable generation capacity is defined as the sum of the average baseline capacity plus the incremental renewable capacity.

RPS-eligible Attributes – All environmental characteristics, claims, credits, benefits, emissions reductions, offsets, allowances, allocations attributable to the generation of RPS eligible electricity by the power generation facility and billed as Actual Eligible Production.

RPS Program Incremental Generation – The plant's RPS eligible incremental renewable generation above the historical baseline established through the Provisional and Operational Certification Process.

RPS Program Incremental Generation Capacity – The plant's RPS eligible incremental generation capacity (in MW) based on the nameplate renewable generation capacity of new assets or respectively the calculated value of the new biomass capacity addition (in MW) based on operational testing at full load.

Source – Where biomass resources are generated.

Source-separated Biomass – Clean, unadulterated biomass that has been separated at the source or point of generation before it could be mixed with adulterated waste.

Supplier – Individuals or businesses who provide commodities for consumption; sometimes the source of the commodity may also act as the supplier, and sometimes it may take several suppliers to move a commodity from the source to the consumer.

Total Renewable Generation Capacity – Defined as the Baseline Renewable Generation Capacity plus the Incremental (New) Capacity added through investment. This value will be expressed in MW.

Unadulterated Biomass – Untreated and uncontaminated biomass.

Vintage Date of Eligible Facilities – The earliest date for first commercial operation allowable for the facility (or facility modification for incremental generation) to participate in the RPS as specified in the NYSERDA Request for Proposal to which the facility responded and was awarded a contract.

1 PURPOSE AND SCOPE

The New York State Renewable Portfolio Standard (RPS) program is seeking a portfolio of renewable generation technologies to meet the goal of increasing renewable generation in New York. The rules for eligibility broadly include biomass resources and conversion technologies with some exceptions. This document has been prepared to offer guidance to prospective biomass power project developers on requirements for the eligibility of biomass-based projects to participate in the RPS Program. Biomass Power is used in this document as a general term that includes projects based on solid, liquid and gaseous fuels derived from organic matter from the biosphere. Special emphasis has been placed on the areas where the RPS program has placed unique constraints on aspects of biomass generation: accounting for RPS program generation in biomass cofiring, constraints on the use of adulterated biomass in power plants, and requirements for the use of forest resources. The PSC Orders which prescribe eligibility requirements for biomass projects are as follows:

- ORDER REGARDING RETAIL RENEWABLE PORTFOLIO STANDARD effective September 24, 2004, CASE 03-E-0188, State of New York Public Service Commission.
- ORDER APPROVING IMPLEMENTATION PLAN, ADOPTING CLARIFICATIONS, AND MODIFYING ENVIRONMENTAL DISCLOSURE PROGRAM, effective April 14, 2005 – Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard, CASE 03-E-0188, State of New York Public Service Commission.
- ORDER APPROVING PETITION WITH MODIFICATIONS effective November 22, 2010 – In the Matter of the Petition of Niagara Generation, LLC for 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, CASE 09-E-0843, State of New York Public Service Commission.

All projects participating in the RPS must be permitted and in compliance with environmental and operating permits. The facility must first be permitted by DEC (or comparable agency in other states) which requires the facility to meet all current regulations on air emissions including specific applicable limits on criteria pollutants and air toxics for all the fuels they intend to use. The RPS imposes additional fuel and environmental requirements beyond state and federal regulations. In general there are restrictions on the types of feedstocks that qualify as biomass. In particular there are special rules that apply to the use of fuels derived from mixed waste streams covering both eligible conversion technologies and air emissions.

The reader should keep in mind several precepts in using this Guide:

1. The application of any guidance contained in this document in no way precludes, supersedes, or relieves project developers from fulfilling the legal obligations otherwise incumbent on developers or plant operators. This includes, but is not limited to, any operating or environmental permits. Although many of the procedures and protocols presented in this document are intended to leverage

existing regulatory infrastructure or standard plant operating practice, the specifics of each project permit and operating requirements are still subject to all Federal and State laws and oversight bodies such as the New York State Department of Environmental Conservation. Guidance presented in this document is solely for the purpose of establishing and maintaining eligibility for the RPS program.

2. In the April 14, 2005 "Order Approving Implementation Plan, Adopting Clarifications, and Modifying Environmental Disclosure Program," the New York State Public Service Commission (PSC) authorized the Office of Energy Efficiency and the Environment (OEEE) of the Department of Public Service to issue advisory opinions, provisional certification, and operational certification for projects. However, the Order also gives the New York State Energy Research and Development Authority (NYSERDA) a substantial role in collecting/analyzing data and making recommendations to the OEEE Director. Final authority for determining eligibility of projects seeking to participate in the RPS program rests with the Office of Energy Efficiency and the Environment (OEEE) of the Department of Public Service. The exact requirements for the biomass project developer to comply with RPS program are contained in the Order and the details of calculations and reporting will be provided within each facility's contractual agreement with NYSERDA.
3. The information and protocols provided in this document are presented as guidelines to developers regarding their existing or planned power plant's treatment under the New York RPS program and associated contracting processes.
4. Although the authors of this Guide have provided as general a perspective as possible while covering the key issues regarding the participation of biomass projects in the RPS program, special circumstances may arise that fall outside of this document's scope.

This Guide describes the combination of biomass conversion technologies and eligible biomass resources or feedstocks that are included in the New York RPS program. In particular, it provides guidance on the very different requirements imposed on biomass facilities using adulterated or unadulterated biomass feedstocks. In addition to specifying which types of biomass and feedstocks qualify under each category, the report also describes the steps that must be taken to ensure that facilities using either type of fuel meet program requirements. For example, biomass obtained from forest resources must meet state guidelines for sustainable harvesting and have a Forest Management Plan (FMP) in place to guide all harvesting activities performed by suppliers.

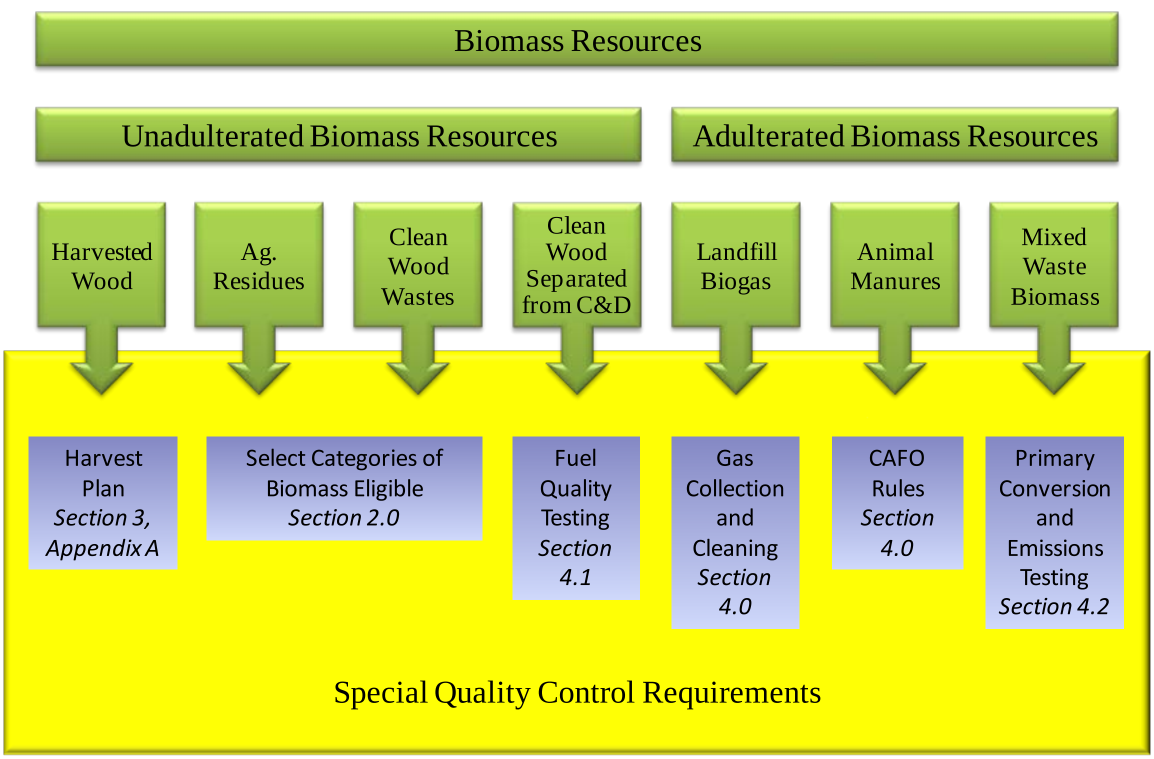
While some developers may choose to establish energy facilities that are fueled by biomass alone, some may choose to establish cofiring operations or modify existing facilities to incorporate biomass usage through retrofit equipment. This report gives guidelines for determining what portion of the energy generated would be considered as "renewable" by the RPS program and consequently how much would be eligible for program participation. It details the steps that should be taken to develop a fuel management plan and establish a checklist of calculations and measurements that will be done to measure and validate the renewable generation of the system.

2 ELIGIBLE FEEDSTOCK AND TECHNOLOGY COMBINATIONS

The PSC RPS Orders prescribe eligibility requirements for biomass projects in terms of feedstock and technology combinations. The Orders permit a wide variety of resources and conversion technologies to be eligible for the RPS program. However many of the feedstock/fuel and technology choices have specific conditions that must be met for eligibility. To assist the project developer to find the specific requirements for their project the following diagrams provide a map of the applicable sections first by resource categories and then by technology configurations.

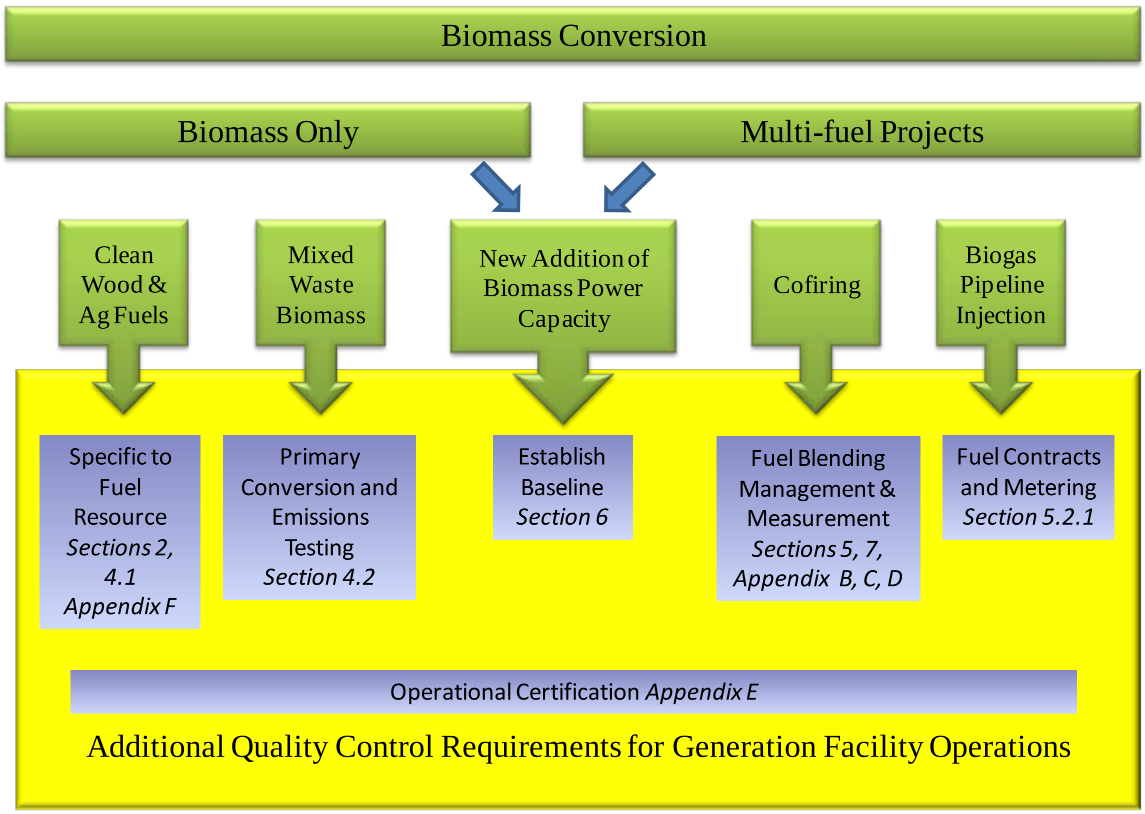
The RPS eligible resources (Exhibit 1) include both clean unadulterated and adulterated sources. Special requirements apply to many of the resources with the most stringent conditions applied to mixed waste biomass.

Exhibit 1: Map of Section References by Resource



Eligible biomass conversion systems include a wide range of technologies and configurations (Exhibit 2). Specific rules apply to multi-fuel facilities where RPS eligible and ineligible fuels are used for power generation. The RPS also allows for the addition of new RPS capacity at existing renewable energy facilities whose vintage precludes participation of the existing capacity in the program.

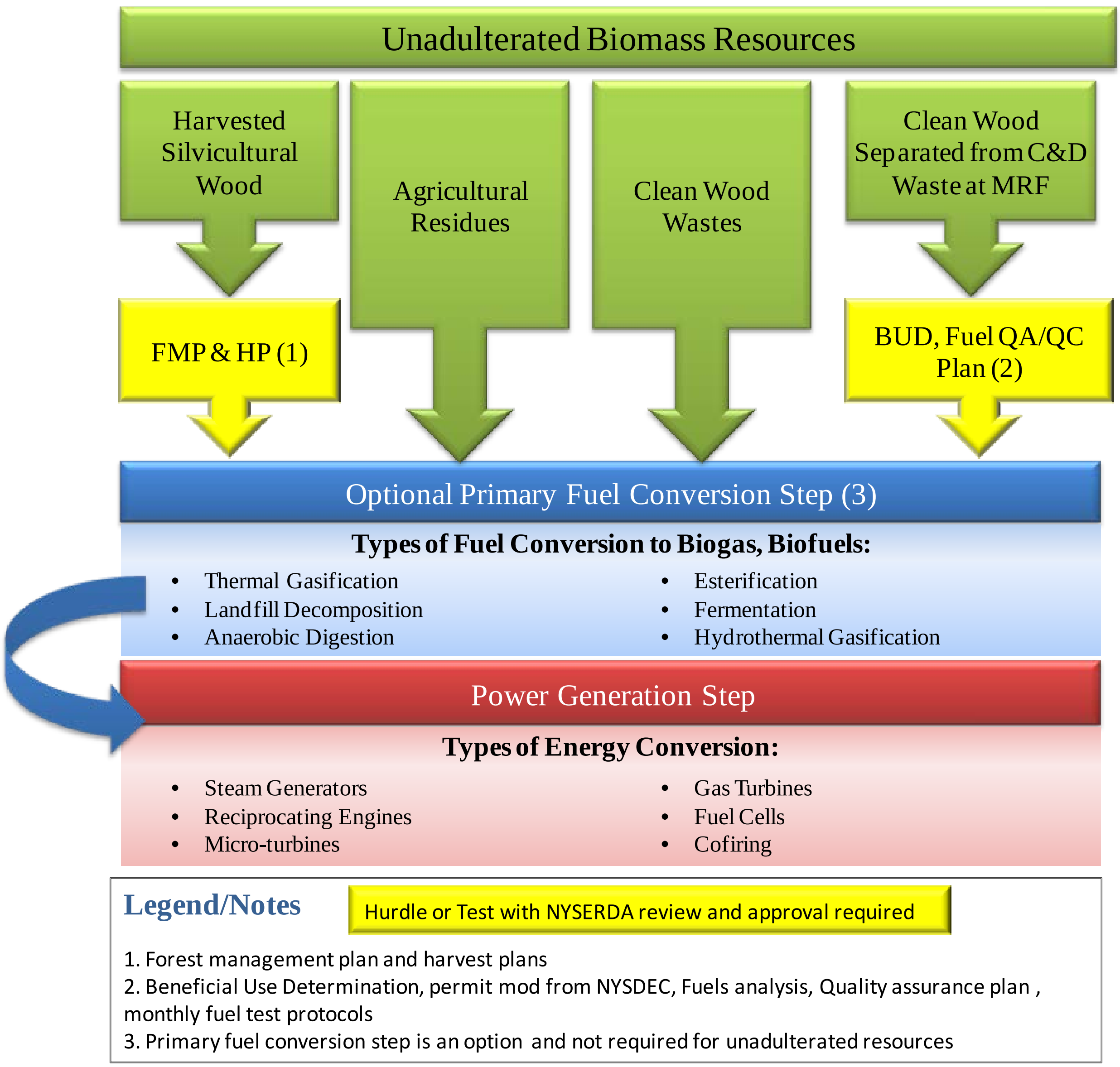
Exhibit 2: Map of Section References for Generation Technology and Configuration



The following section provides an overview of how the RPS rules apply to combinations of feedstocks and conversion technologies. These combinations are presented schematically in Exhibit 3 and Exhibit 4 below. For unadulterated biomass a feedstock conversion step to produce a clean liquid or gaseous fuel prior to the energy conversion step is always an option but not a requirement (Exhibit 3). For the adulterated biomass feedstocks the primary conversion step is mandatory (Exhibit 4). The diagrams indicate which feedstock and technology combinations are eligible and which ones must meet special hurdles or tests of eligibility.

2.1 UNADULTERATED BIOMASS

Exhibit 3: RPS Eligibility for Unadulterated Biomass



Unadulterated biomass may be used with **any** of the accepted feedstock conversion and power generation technologies to generate eligible renewable generation under the RPS program. Unadulterated biomass as defined in the PSC Orders includes:

- **Agricultural residue –** woody or herbaceous matter remaining after the harvesting of crops or the thinning or pruning or orchard trees on agricultural lands.
- **Harvested wood –** wood that is produced during commercial harvesting. Subject to the requirements for developing, maintaining, and abiding by a forest management plan
- **Mill residue wood –** hogged bark, trim slabs, planer shavings, sawdust, sander dust and pulverized scraps from sawmills, millworks, and other secondary wood products industries.
- **Pallet waste –** unadulterated wood collected from portable platforms used for storing or moving cargo or freight.
- **Refuse derived fuel –** Two types of refuse derived fuels qualify as eligible fuels:
  - The **source-separated**, combustible, untreated and uncontaminated wood portion of municipal solid waste or construction and demolition debris.
  - **Clean wood recovered from a Construction and Demolition (C&D) debris** at a permitted Material Reclamation Facility (MRF) or C&D processing facility. This type of eligible fuel is subject to additional quality control safeguards and testing described in Section 4.
- **Site conversion waste wood –** wood harvested when forestland is cleared for the development of buildings, road, or other improvements.
- **Silvicultural waste wood –** wood harvested during timber stand improvement and other forest management activities conducted to improve the health and productivity of the forest. Subject to the requirements for developing, maintaining, and abiding by a forest management plans.
- **Sustainable yield wood (woody or herbaceous) –** woody or herbaceous crops grown specifically for the purpose of being consumed as an energy feedstock (energy crop). Some examples include willow, poplar, sycamore, and ash species (woody), and Miscanthus, hemp, and grasses (herbaceous).

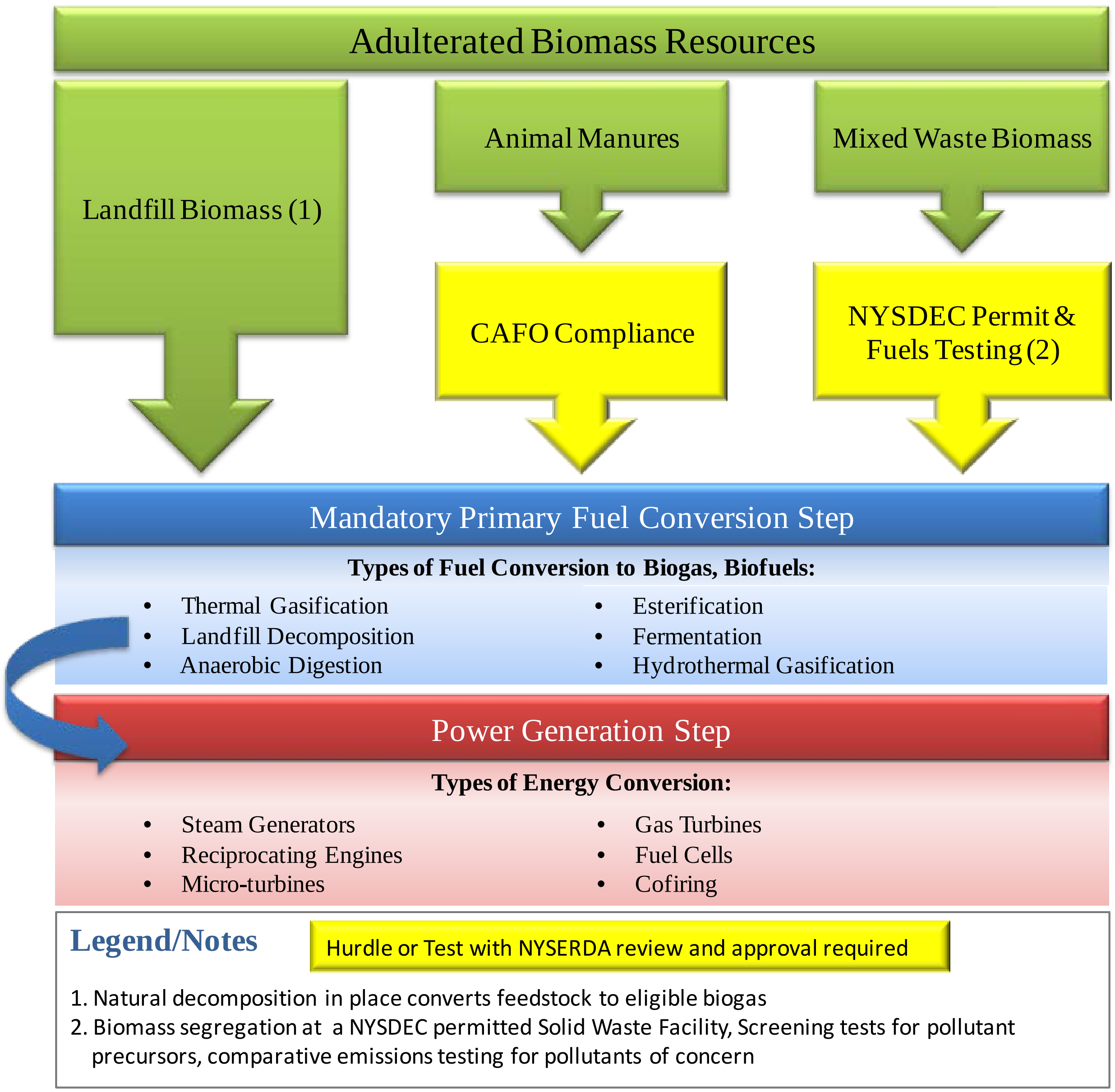
Cofiring eligible and ineligible resources

Projects that plan to cofire unadulterated biomass with fossil fuels or other ineligible fuels have additional measurement and reporting requirements to ensure that only the electricity generated from eligible biomass is counted in the RPS program. Those requirements are discussed in Section 5. This requires separate feed and measurement systems for each fuel stream plus regular sampling and analysis of fuels to ensure that the reported eligible generation is based on an accurate measurement of heat input for each fuel stream to the boiler or other conversion system.

2.2 ADULTERATED BIOMASS

Exhibit 4 shows that greater feedstock flexibility has been offered to projects that employ technologies that convert biomass to a clean gaseous or liquid fuel prior to combustion: natural biological processes, biomass gasification, pyrolysis, or hydrolysis. Adulterated biomass sources may be used as feedstocks for these primary conversion technologies under certain conditions described in this section. This is a key provision of the NYS RPS program that allows NY to tap a broader set of biomass resources with important environmental benefits.

Exhibit 4: RPS Eligible Projects - Adulterated Biomass Sources



Adulterated biomass as defined in the PSC Orders includes:

- all types of biomass that do not fall within the categories of eligible unadulterated biomass in Section 2.1 above, such as paper, paperboard boxes, textiles, yard waste and leaves, non-recyclable wood (e.g. plywood and particle board);
- agricultural by-products such as leather and offal and food processing residues;
- other adulterated wood wastes and mixed adulterated and clean wood wastes

The simplest example of two step conversion is the landfill gas (LFG) system which provides a means to capture the biogas generated by the natural decomposition of the biomass portion of municipal solid waste. The benefits of capturing the methane generated from landfill decomposition before it enters the atmosphere and using it to produce energy are well documented. Because the benefits of LFG energy projects have been well demonstrated, there are no special technical requirements for these projects to participate. All other projects electing to use some forms of adulterated biomass must meet additional specified requirements before the energy generated can be considered for eligibility under the RPS program. These requirements are discussed in Section 4.2 of the Handbook

3 BIOMASS HARVESTED FROM FOREST RESOURCES

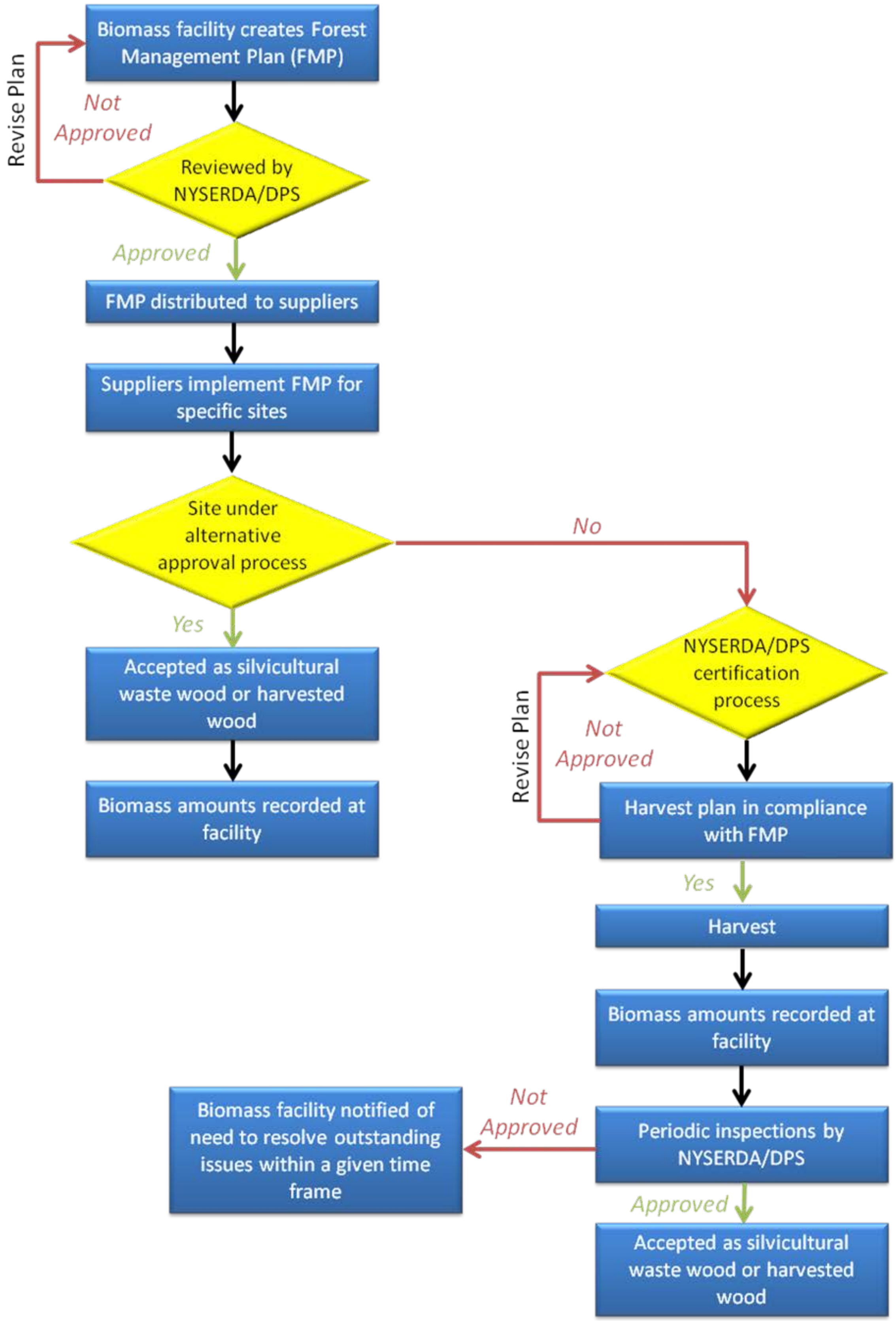
New York State has an abundant supply of wood that can be used to help achieve the RPS program targets. There are over 15.94 million acres of timberland in the state and the annual growth rate on this land is over two times greater than what is currently being harvested. Biomass harvested from timberland that is used to meet the targets of the RPS program is defined in the PSC Order as either "Harvested Wood" or "Silvicultural Waste Wood." Mechanisms have been set up as part of the RPS program to ensure that the biomass in these categories is managed so that it provides a sustainable feedstock. This portion of the Guide outlines the procedures required to use this biomass as part of the plant's RPS program eligible fuel supply. This includes providing a framework for developing a facility forest management plan and harvest plans.

The PSC Orders state that biomass facility owners must have and be in compliance with an approved forest management plan (FMP) to make use of biomass that fits under the definitions of "Harvested Wood" and/or "Silvicultural Waste Wood." The FMP should address the overall management goals and performance standards that need to be used during the procurement of the biomass resource for the facility. The FMP is required to include: standards and guidelines for sustainable forest management and requires the adherence to management practices that conserve biological diversity, productive forest capacity, and promote forest ecosystem health. The FMP must be completed by a qualified forester and approved by the Department of Public Service. The pathways for approval are shown in the flow chart in Exhibit 3. For purposes of the RPS program, an individual is considered to be a qualified forester if he/she meets one or more of the following qualifications:

- An individual who has a Bachelors or higher degree in Forest Management or an associated forestry discipline from a Society of American Foresters accredited or candidate institution, *and* at least three years of substantial forestry experience of a grade and character satisfactory to the Department of Public Service or its designee.[1]
- An individual who is a Society of American Foresters Certified Forester
- An individual who is a member of the Association of Consulting Foresters

[1] Such experience can include professional level work in silviculture, wood products procurement, forest land management planning, urban forestry, forest land taxation planning, forest engineering, forest pest control or other duties deemed suitable by the Department of Public Service.

Exhibit 5: Pathways for Approval of Harvested Wood



A copy of the approved FMP needs to be provided to each of the biomass suppliers for the biomass facility. Suppliers need to be in compliance with the FMP for the facility. Landowners supplying feedstocks to the suppliers are not required to have their own forest management plan. However, suppliers are required to prepare harvest plans for each parcel where harvested biomass is supplied to an RPS program eligible generator. This requirement should be clearly stated in the FMP. It should be further stated that harvest plan content and adherence to the harvest plan remains the responsibility of the participating biomass facility.

Once a FMP has been approved, there are two processes that can be used to ensure that harvest operations conform to the FMP:

1. The state approval process, or;
2. The alternative approval process.

3.1 STATE APPROVAL PROCESS

Under this process the harvest plan needs to include:

- Landowner objectives
- A map of the area to be harvested
- Skid road layout
- Locations of all streams, wetlands and water bodies
- Forest type designation, anticipated volume of wood to be harvested
- Silvicultural techniques and best management practices to be implemented (see Appendix A: Harvest Plan Template)

As part of this process, provisions need to made by the biomass facility owners so that the biomass facility forester can meet with DPS staff, DEC personnel, or a qualified private consultant hired by the state at least once a year. These staff will conduct on-site inspections of active or recently completed harvesting operations to ensure that they are in compliance with the FMP and harvest plans.

3.2 ALTERNATIVE APPROVAL PROCESS

Facilities utilizing biomass that is harvested from land parcels enrolled in one of the following programs do not have to adhere to the requirements of the State Approval Process:

- Forest Stewardship Council (FSC)
- Sustainable Forestry Initiative (SFI)
- American Tree Farm System (ATFS)[2]
- New York State Real Property Tax Law 480A Program

NYSERDA will accept harvest compliance from any of these programs. Other programs may qualify for the alternative approval process as determined by the Department of

[2] Links to more information on these programs are provided in the "Acronyms" section of the report.

Public Service, or its designee. Acceptable certification programs, other than those listed above, must include the following:

1. Adherence to management practices which conserve biological diversity, maintain productive capacity of forest ecosystems, maintain forest ecosystem health and vitality, conserve and maintain soil and water resources, and maintain forest contribution to global carbon cycles;
2. Independent third party auditing that monitors, measures and reports compliance with system or program principles and guidelines.

3.3 FOREST MANAGEMENT PLAN OUTLINE

Provided below is a section-by-section outline for the development of a forest management plan (FMP) as described in the PSC Orders.

3.3.1 FMP Section 1 Introduction

In this section under the sub-heading "Facility", the owner and operators of the biomass facility should be identified. Basic information describing the facility should be summarized including the production capacity of the facility, location of the power plant, and anticipated sources and volume of fuel that will be used at the facility. In addition, this section should contain sub-headings that identify the general procurement area for the facility, as well as the qualifications and duties of the facility forester.

The FMP should state that the biomass facility's goal is to acquire fuels that have been harvested using sustainable forest management practices and guidelines and that make use of management practices that conserve biological diversity, productive forest capacity, and promote forest ecosystem health. Additional goals and objectives that are important for the biomass facility can also be included in this section.

3.3.2 FMP Section 2 Procurement Policy

Harvested Wood & Silvicultural Waste Wood

This section should contain the following sub-headings:

- Facility Goals and Policies
- Distribution of Facility Procurement Guideline
- Harvest Plans
- Silvicultural Guides
- Potential Cutting Practices
- Oversight and Compliance
- Adherence to Local, State and Federal Laws

This section should state that suppliers of the fuel would be required to possess a copy of the FMP, be in compliance with its principles, and develop and submit a harvest plan for all parcels where biomass is harvested for use at the biomass facility. In addition, a copy of the harvest plan template that will be used by the suppliers should be included.

The contents of the harvest plan will vary depending on whether the land to be harvested is enrolled in one of the alternative approval process programs as described above in

Section 3.2. A model plan is provided in Appendix A. For land that is not enrolled in one of these programs, harvest plans are required and need to have at a minimum the items listed in the PSC Orders including:

- Landowner objectives
- A map of the area to be harvested
- Skid road layout
- Locations of all streams, wetlands and water bodies
- Forest type designation and anticipated volume of wood to be harvested
- Silvicultural techniques and best management practices to be implemented

The FMP should state that when biomass is acquired from land that is enrolled in one of the alternative approval process programs, the harvest plan will identify the organization and certification or enrollment number. The harvest plan template included in Appendix A can be used to document these programs.

The FMP should state that provisions will be made for the monitoring and periodic inspections of harvesting operations when required by state authorities, or to ensure that harvest operations conform to the FMP standards. Harvest plans for the biomass that has been supplied shall be maintained by the biomass facility for general record keeping as well as to facilitate periodic inspections.

The FMP should note that the development of specific silvicultural guidelines for each parcel to achieve the management goals of the FMP and the landowners will require the professional judgment of the participating forester and recognized guides. The FMP should list the guidelines and standards that will be used to guide the management of forestland where biomass is harvested for the facility. While good forest management practices follow general principles, guidelines are often specific for a given region or forest type. The ones that are applicable for the region where the facility will source its fuel should be listed in the FMP. A listing of suggested guidelines is provided below:

- New York State Forestry Best Management Practices for Water Quality. BMP Field Guide. 2011.
- Leak, W.B., D.S. Solomon and P.S. DeBald. 1987. Silvicultural Guide for Northern Harwood Types in the Northeast (revised). U.S. For. Serv. Res. Pap. NE-603.
- Marquis, D.A., R.L. Ernst, and S.L. Stout. 1992. Prescribing silvicultural treatments in hardwood stands of the Alleghenies (Revised). U.S. For. Serv. Gen Tech. Rep. NE-96.
- Frank, R.M. and J.C. Bjorkbom. 1973. A silvicultural guide for spruce-fir in the northeast. U.S. For. Serv. Gen Tech. Rep. NE-6.
- Lancaster, K.F.; W.B. Leak. 1978. A silvicultural guide for white pine in the northeast. U.S. For. Serv. Gen. Tech. Rep. NE-41
- Chunko, S.E. (Compiler). 2001. Best Management Practices for Pennsylvania Forests. The Pennsylvania State University.
- The New Hampshire Forest Sustainability Standards Team. 1997. Good Forestry in the Granite State. Society for the Protection of New Hampshire Forests.

The FMP should state that suppliers will comply with all applicable federal, state and local laws, ordinances, and regulations. The FMP will identify the steps that will be taken by the biomass facility if the suppliers are not in compliance with these or other aspects of the FMP.

3.3.3 FMP Section 3 General Measures to Limit Ecological Impacts

The FMP should list the general measures that will be taken to minimize the ecological impact of harvesting on water quality, wildlife, aesthetics and recreation. These measures should be applicable across a wide range of sites. Since each site is unique, the potential impacts and actions to minimize the impact should be listed on the harvest plan.

3.3.4 Updates

The biomass facility should review the FMP bi-annually and submit any desired changes to the PSC Staff for review and acceptance.

4 BIOMASS FEEDSTOCKS FROM ADULTERATED WASTE STREAMS

This section of the Guide details requirements that are needed for specific subsets of biomass derived from waste streams. The RPS program allows for the use of biomass from adulterated waste streams under specific conditions:

- "Clean MRF Fuel" – Defined in the Guide as clean biomass separated from construction and demolition (C&D) debris at a permitted Materials Reclamation Facility (MRF) or C&D processing facility (any facility permitted to handle C&D debris)
- Landfill biogas
- Biomass from mixed waste and other adulterated sources of biomass
- Animal manure

Further description of these streams follows:

Clean MRF Fuel: Clean biomass that is separated from a C&D mixed waste stream at a material reclamation facility technically arrives at the MRF or C&D processing facility as a mixed waste stream. With sufficient care in separation the clean material separated from the waste may qualify as an eligible fuel, as long as the separated material meets standards set forth in the RPS Program. These standards are discussed in detail in Section 4.1. Facilities and the fuels must meet the standards before the fuel can be used in direct combustion systems like all other eligible unadulterated biomass fuels.

Landfill Gas Conversion Systems: Landfill gas systems perform the primary conversion step in situ. The product is a biogas. No special RPS program eligibility requirements are imposed on landfill gas projects that produce power onsite and that otherwise meet the program's general requirements. Landfill gas that is injected into the natural gas pipeline network under contract for power generation downstream is subject to special accounting requirements. Refer to Section 5, Multi-fuel Power Generation Technologies for additional requirements.

Biomass from Mixed Waste Streams: Biomass typically makes up a significant portion of the municipal solid waste stream. With the exception of the Clean MRF Fuels covered above, this biomass culled from the waste stream must first be converted to a clean liquid or gaseous fuel. Further, the facility must perform a screening analysis for pollutants of concern and develop a plan for comparative emissions testing to demonstrate that the technology used to produce power will do so with emissions that are less than or equal to the emissions produced while using only unadulterated biomass feedstock. This requirement is called comparative emissions testing. This process is discussed more in Section 4.2 of the Guide. A facility may also choose to use adulterated biomass fuels without an approved method of fuel conversion, but in this case, their use will not count towards the eligible power production under the RPS program. Additional record keeping and reporting is required for plants that use a mix of eligible and ineligible fuels.

Animal Manure Digester Gas Conversion Systems: The sole specific requirement for eligibility of these systems is that they demonstrate compliance with New York State Department of Environmental Conservation (NYSDEC) or equivalent regulations[3] for Concentrated Animal Feeding Operations (CAFO). If required to have a State Pollutant Discharge Elimination System (SPDES) permit by NYSDEC regulations[4], a power generation facility using the manure must have and be in compliance with its current Comprehensive Nutrient Management Plan (CNMP) developed by a duly qualified Agricultural Environmental Management (AEM) Planner and must be operating in compliance with any applicable SPDES permit. If not required to have a SPDES permit, the CAFO must be operating in compliance with the best management practices for a facility of its size set forth in the Principles and Water Quality Protection Standards specified in the AEM Framework & Resource Guide developed by the NYS Department of Agriculture and Markets and the NYS Soil and Water Conservation Committee[5].

Facilities who wish to use biomass from mixed waste streams or animal wastes must first convert the raw biomass to a liquid or gaseous fuel. Clean MRF Fuel is the sole exception to that rule, although testing standards apply to the use of this material to ensure that clean biomass has been properly separated from the C&D debris mixed waste stream. Primary Feedstock Conversion Technologies, as defined in this Guide, all involve the conversion of biomass to gaseous or liquid fuels prior to use in an energy conversion system. Processes for the conversion of solid wastes to fuels must comply with requirements, including permitting requirements where applicable, under 6 NYCRR Part 360 Solid Waste Management Facilities Regulations and under NYSDEC Program Policy DAR-3. **The Guide provides only a high level summary of requirements for these regulations and policies. Biomass power project developers must consult and comply with the underlying documents if they intend to use these alternative biomass fuels.**

The natural decomposition of landfill biomass to produce methane is the simplest example and is widely used for energy production. Biogas production technologies include thermochemical conversion and anaerobic digestion. Liquid biofuel conversion technologies include: acid or enzymatic hydrolysis to ethanol; esterification to biodiesel; pyrolysis to bio-oil; and hydrothermal liquefaction. Biogas and biofuel production technologies can produce a clean fuel that can be used in a variety of power generation technologies, including gas turbines, micro turbines, fuel cells, reciprocating engines and boiler-steam turbine generators.

[3] Projects outside of New York must demonstrate that they are operating using equivalent practices and meeting the same environmental requirements as NYSDEC permitted facilities.
[4] See footnote above.
[5] This requirement applies whether or not the project is located in New York State.

4.1 CLEAN BIOMASS SEPARATED FROM C&D DEBRIS AT A PERMITTED MRF OR C&D PROCESSING FACILITY

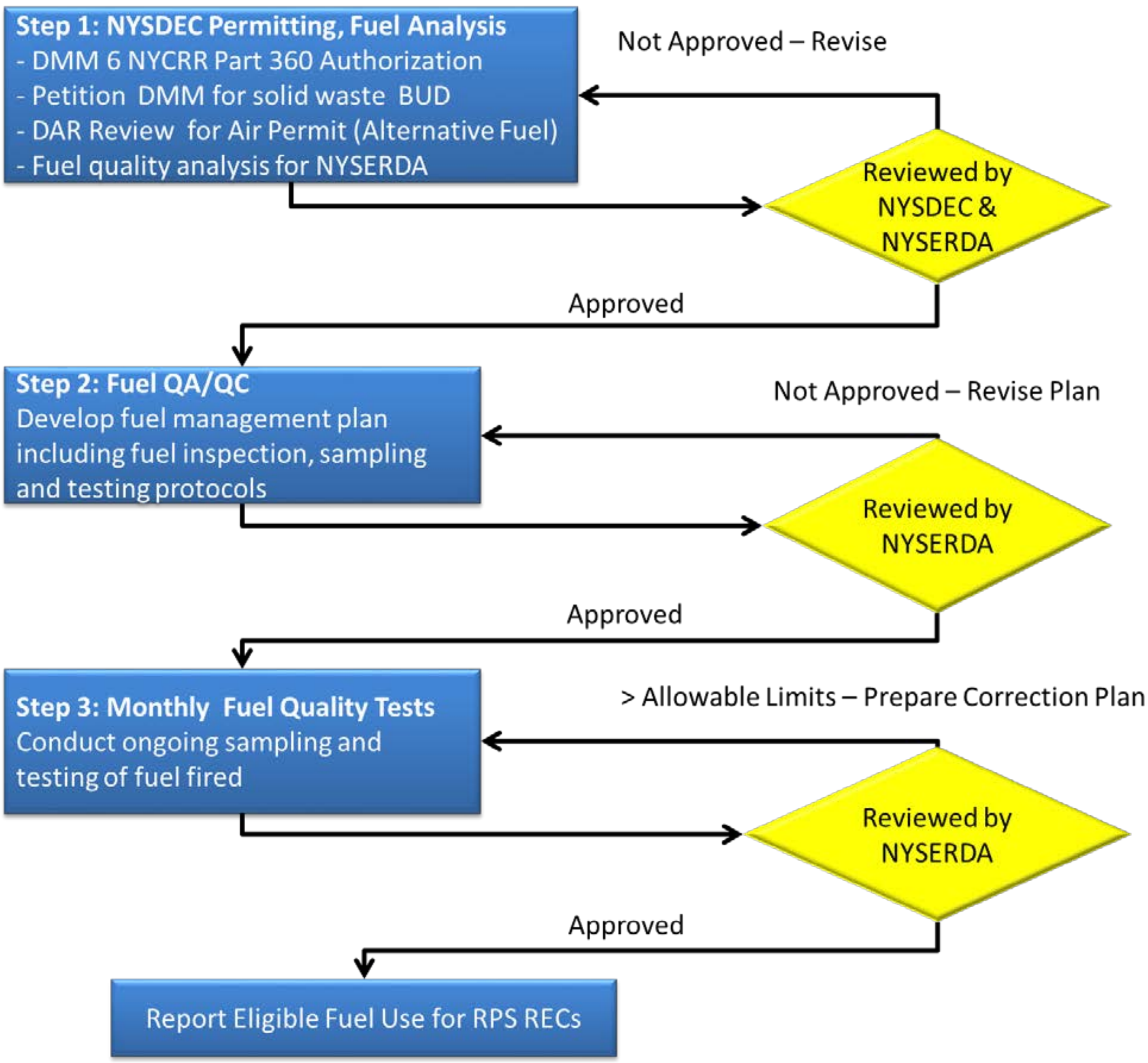
The term "Clean MRF Fuel" referred to in the Guide shall mean clean biomass separated from the mixed waste stream of C&D debris at a permitted MRF or C&D processing facility. Clean wood separated at the source (the construction or demolition site) is an eligible fuel and therefore is not subject to the RPS rules described in Section 4. Provided that the source separated wood remains segregated from adulterated materials, it may be used as fuel by a power generation facility that has an approved Beneficial Use Determination (BUD) for this type of fuel without the additional controls described below and may be transported directly to the power facility or through an intermediate aggregator such as a MRF or C&D processing facility.

The use of Clean MRF Fuel for production of RPS eligible electricity was authorized by the PSC in 2010 ("the 2010 Order")[6]. The process for determining and maintaining eligibility of these fuels is shown in the schematic below (Exhibit 6). The MRF or C&D processing facilities that intend to supply the fuel will have to be authorized under the New York State 6 NYCRR Part 360 Solid Waste Management Facilities regulations (Part 360) and the material (fuel) must have either a predetermined BUD under 360-1.15(b) or a case-specific BUD under 360-1.15(d). The Guide provides only a high level summary of the Part 360 regulations and NYSDEC policies. Biomass power project developers must consult and comply with the Part 360 regulations and other applicable NYSDEC documents. Power Generation Facilities that intend to use Clean MRF Fuel will need to seek approval to use the fuel from the NYSDEC Division of Air Resources (DAR). The power generation facility will then need to create a fuel Quality Assurance/Quality Control (QA/QC) Plan, which includes specific feedstock quality tests. The contents of the QA/QC Plan required by NYSERDA for use of this eligible resource are outlined in Section 4.1.2 below. The sampling and testing protocols that apply to facilities using this eligible resource are described in Sections 4.1.3 through 4.1.5. Monthly fuel quality test results will be compared to the general fuel quality standard adopted by the PSC in the 2010 Order for all sources of Clean MRF Fuels. If the fuel product includes materials designated by NYSDEC as Alternative Fuel then the product will also have to meet the specific fuel quality standards prescribed by NYSDEC DAR in the alternative fuel permitting process (DAR-3) for the generator's facility.[7]

[6] 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

[7] NYSDEC defines alternative fuels as: "a waste that has been approved for use as a fuel in either a combustion or incineration unit. Clean unadulterated wood is not an alternative fuel; it is a traditional fuel which may be fired alone or simultaneously with fossil fuel in a stationary combustion installation."

Exhibit 6: Process Schematic for Use of Clean MRF Fuels



4.1.1 Requirements for Beneficial Use Determination

The first part of this subsection deals with requirements which apply to every MRF or C&D processing facility located in New York that will produce Clean MRF Fuel for the RPS facility as well as the requirements applicable to out of state suppliers. The second part applies to the power generation facilities.

Requirements for the MRF or C&D processing facility producing Clean MRF Fuels
Each MRF or C&D processing facility located in New York requires a solid waste management facility authorization from NYSDEC for the construction and operation of the MRF or C&D processing facility.[8] If the facility is operational already under a permit, a modification to the permit may be required to allow the recovery of the Clean MRF Fuel.[9] In addition, the MRF or C&D processing facility will need to secure a Beneficial Use Determination (BUD) for the wood fuel product. If a BUD is granted, Clean MRF Fuel is not considered a solid waste subject to Part 360 Solid Waste Management Facilities regulations (6 NYCRR Part 360-1.15).

For an out of state MRF or C&D processing facility, the NYSDEC Division of Materials Management must still issue a solid waste BUD, on the facility's representation that it meets applicable facility requirements in its state or province that are similar to New York facility requirements, and that it will meet special conditions of the BUD.

Alternatively, the power generator may petition for the required BUD(s). It is the preference of the DEC that the power generators petition for and hold the BUD(s) and be directly responsible for the fuel meeting all requirements of the BUD(s). The power generation facility is also responsible for meeting the special requirements of the RPS. Out of state fuel products must meet the requirements of the BUD granted to the power generation facility. Discovery by NYSERDA or NYSDEC of non-compliance with the applicable state or provincial requirements and BUD conditions may result in revocation of the BUD and RPS eligibility.

For a MRF or C&D processing facility in New York, the solid waste BUD[10] petition must include information according to Part 360 Solid Waste Management Facilities regulations. General requirements are reproduced here from 6 NYCRR Part 360-1.15d.

1. Description of the solid waste under review and its proposed use
2. Chemical and physical characteristics of the solid waste and each proposed product (DEC-DMM should be consulted as to appropriate chemical and physical characteristics of the solid waste and fuel product. Visual and physical testing may be required in lieu of chemical analysis for a BUD for clean wood fuel)
3. Demonstration of reasonably probable market for the product by providing one or more of the following:
    a. A purchase contract,
    b. Description of the proposed use,
    c. Demonstration that the product meets industry specifications or standards or
    d. Other documentation of a market

[8] Some facilities handling certain types of wood may be exempt or subject to registration pursuant to Subpart 360-16. More information regarding such exemptions is available from NYSDEC DMM.
[9] Chapter 4 Part 360, Solid Waste Management Facilities Regulations (6 NYCRR Part 360-1.8), describes permit application requirements and procedures for solid waste management facilities in more detail. Permit application materials are available on-line at the link presented in the beginning of this Guide.
[10] For this document we distinguish between a solid waste BUD for the MRF or C&D processing facility and a power plant BUD for the power generation facility.

4. A solid waste control plan and contingency plan that together demonstrate that management of the solid waste will not adversely affect safety, health or the environment.

The solid waste control plan must contain a description of the material source (including contractual arrangements), periodic solid waste and end product (Clean MRF Fuel) test procedures to verify material composition, plan for disposition of any solid waste associated with manufacture of the Clean MRF Fuel, storage plan, run-off control procedures and program and schedule for Best Management Practices (BMPs) designed to minimize dispersion of the material before and during its use. The contingency plan must outline a local emergency response procedures and contacts, facility layout, facility entrance/egress, emergency equipment details and evacuation plan.

The NYSDEC Division of Materials Management must determine the precise point in the process at which the waste material ceases to be regulated as a solid waste. This is typically the point of use. The preparer of the solid waste BUD petition must request a reclassification of that point to another location (e.g., Clean MRF Fuel storage at the MRF or C&D processing facility following separation and processing but prior to transport to the end user). NYSDEC will review the request to determine if subsequent handling, storage, transfer or improper disposal of the material would pose a risk to public health or the environment.

Following receipt of the solid waste BUD petition the Division of Materials Management will evaluate the petition using the following criteria:

1. There is a market for the material,
2. The proposed use of the material is a reuse rather than disposal,
3. Facility is in compliance with applicable permitting or registration requirements in Section 360-1.8, in addition to these requirements for fuels:
    a. Minimize leachate release to groundwater from the fuel storage surface
    b. Use approved leachate collection and treatment methods
    c. Prepare and submit annual reports to NYSDEC that detail material received, products and a variety of other operational details, and
    d. Take representative samples to demonstrate that the minimum as-received fuel heat content is 4,000 Btu per pound.

NYSDEC has discretion to determine additional criteria on a case-by-case basis. NYSDEC may approve or disapprove the petition for a solid waste BUD, or allow the use under special conditions.

Other policy factors may influence whether the proposed material is determined to be beneficially used as a fuel by NYSDEC. The proposed use of the material is required to follow a solid waste hierarchy that values reuse over energy recovery, consistent with the requirements of Section 27-0106 of the New York Environmental Conservation Law. In the event that NYSDEC determines energy recovery from a material is preventing reuse or recycling of the same material, particularly of clean wood in some local markets, it is conceivable that the Division of Materials Management may not be able to grant a BUD.

Requirements for the Biomass Power Facility Using Clean MRF Fuels
If a power generator receives clean wood fuel from a MRF or C&D processing facility with a solid waste BUD, and this clean wood fuel arrives in a form ready to fire with minimal processing (other than inspection) at the power generation facility, the power generator needs no further solid waste authorization to use this BUD fuel. If the clean C&D wood is received from sources without a BUD for clean wood fuel, the power generator must obtain a BUD for receiving C&D wood as fuel to cover these sources. As stated above the preferred approach is for the facility to petition for the BUD(s) since the power generation facility has the ultimate responsibility to the RPS program for ensuring that the quality of the fuel meets the RPS specifications. Other NYSDEC solid waste authorizations such as a registration pursuant to 360-1.8(h) and 360-16.1(d)(1)(ii), or a permit, may be required if the wood must be separated, decontaminated or processed (ground or resized) prior to fuel use.

The power facility may need to seek a NYSDEC DAR approval to permit the use of Clean MRF Fuel for the facility, if clean wood fuel is not allowed in its Air Facility Permit. If the DMM and DAR determine that the fuel product was clean, unadulterated wood then NYSDEC-DAR will treat it as a traditional wood fuel. If however the fuel product contains materials designated as Alternative Fuel then the Alternative Fuel review process applies (NYSDEC Policy DAR-3). In this process, NYSDEC Division of Air Resources will compare the fuel analyses for the Clean MRF Fuel and currently permitted fuels. Permitted fuels are those fuels that the facility has already been authorized to use, whether it is currently firing all of those fuels or not. If pollutant precursor compounds in the proposed fuel are present in comparable quantities or less than the permitted fuels, NYSDEC may approve the Alternative Fuel use. ***Meeting the PSC protocol for renewable energy eligible under the RPS does not mean that the project will be permitted. The NYSDEC permitting process is separate and independent from the PSC protocol.***

Periodic inspections are required by NYSDEC to ensure that the recovered materials are being used consistently in accordance with the power plant permit provisions including any condition in the BUD.

4.1.2 Additional Requirements for Using Clean MRF Fuels

Prior to obtaining operational certification, the facility must develop QA/QC procedures for the Clean MRF Fuel procured as a fuel for RPS eligible generation. Initial fuel test results for contaminants specified in the PSC adopted fuel quality standard (listed in Appendix F: Test Reporting Form for Clean MRF Fuels) shall be provided for each Clean MRF Fuel supplier to NYSERDA. The QA/QC methods to ensure biomass fuel eligibility for the RPS should be integrated into the Facility Fuel Management Plan which is outlined in Appendix C.

The QA/QC provisions of the Fuel Management Plan for the power plant must include the following safeguards:

1. Procurement Plan for Clean MRF Fuel. The Plan shall include the standard supply contract provisions which implement the safeguards as they apply to the suppliers. The plan must list all suppliers and provide for NYSERDA review and approval of each supplier (MRF or C&D processing facility) involved. The fuel quality specifications should reference the PSC adopted general fuel quality standards and if a DAR-3 review is required by DEC the additional fuel quality criteria established in the power plant NYSDEC Alternative Fuel permitting process. As stated in the 2010 Order, the facility shall maintain supply contracts only with facilities permitted to receive and process C&D debris by the state, province or other jurisdiction in which they are located. In the case of facilities located in New York, NYSDEC will be the permitting authority.
2. Procedures for recording, inspecting and sampling of Clean MRF Fuel. The Seller must maintain records for all Clean MRF Fuel deliveries. Acceptable sampling procedures are detailed in the following section.
3. Procedures and schedule for testing the samples should be in accordance with the fuel quality standards. The testing methods required for typical contaminants found in C&D wastes are specified in Exhibit 7. 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 power plant owners and must be experienced with the analytical testing specified in Exhibit 7.
4. The power plant must provide the feedstock quality test results in the form of Appendix F to NYSERDA on a monthly basis with their invoices. In addition procedures for excluding power generation derived from fuel deliveries that fail to meet fuel quality standards shall be specified.

4.1.3 Sampling Procedures for Fuel Quality Testing

The primary goal for sampling is to ensure that sampling is random[11] and representative of the fuel delivered. The second goal for sampling is to ensure that the use of a monthly "super sample" for testing is representative of the individual samples from which it is aggregated. To accomplish this goal, two acceptable fuel sampling protocols are provided below and are designated Option 1 and Option 2.

Laboratory analytical testing of fuel samples is required monthly in the protocol. Samples must be combined and mixed thoroughly as they are collected to make up the month's test sample shipped to the lab. Facility owners should review Appendix B, which describes how cofiring facilities account for heat input and generation from multiple fuel streams. Similar methods are required for the use of Clean MRF Fuels at facilities that only use eligible biomass, since this fuel can become ineligible if the fuel fails to pass the Clean MRF Fuel quality standards test. In this event, having systems in place to account for the heat input and power generated from each fuel stream would allow the facility to invoice for the power generated from the eligible fuel streams.

[11] Two standards provide additional guidance for proper biomass sampling procedures: SCAN-CM 41:94 provides guidelines and recommendations for the sampling of wood chips intended for the production of chemical and mechanical pulps; and ASTM E872 - 82(2006) Standard Test Method for Volatile Matter in the Analysis of Particulate Wood Fuels

Up to three weeks should 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 RPS. 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 is identical to the method used for cofiring facilities except that the super sample is aggregated over a much longer period of time. ***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.*** Random and thorough sampling is assured when using this sampling method.

Option 2: Random sampling of deliveries of Clean MRF Fuel at the power generating facility

For this option, grab samples of delivered fuel 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 method for NYSERDA consideration if it minimizes the opportunity for operators to preferentially select the cleanest material in the delivery.

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.

To ensure the proper measurement and accounting for monthly RPS eligible generation for each month the following additional requirements for both Options 1 and 2 must be met:

1. Monthly Samples will be subject to a proximate analysis to determine moisture content and higher heating value.
2. If the fuel test results for the super sample exceeds the limits for contamination then the Clean MRF Fuel portion of the total fuel tons associated with the super sample fired that month and the generation derived from that portion of the fuel will be ineligible under the RPS. Only the generation derived from the eligible Clean MRF Fuel deliveries as determined by the fuel quality test results will be deemed eligible to count toward renewable power generation for the RPS program. Facilities must use the same methods that are prescribed for reporting of cofired eligible and

ineligible biomass fuels described in the guide. Specifically, data regarding the heating value and mass flow of the rejected fuel and the energy conversion efficiency of the unit will be used to determine the amount of energy generation disqualified from the RPS invoice.

4.1.4 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.

4.1.5 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. 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 Exhibit 7. In addition to the test methods specified in this section, the test reporting form, Appendix F, includes the Clean MRF Fuel limits for concentrations of contaminants and lists the full set of Herbicides and Pesticides required to be analyzed. 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 and repeatable as the PSC approved method. If the analysis is accepted by NYSERDA then NYSERDA will make a request to DPS to approve the alternative test method. The alternative method cannot be used until approved by NYSERDA.

Exhibit 7: Test Methods for Clean MRF Fuel (Analysis Basis: Dry Matter (Moisture Free)

Contaminant	Test or Measurement Method	Frequency
Arsenic	EPA SW 846-6010C – Inductively Coupled Plasma-Atomic Emission Spectrometry	monthly
Cadmium		
Chromium		
Lead		
Selenium		
Silver		
Titanium		
Zinc		
Mercury	EPA SW 846-7471 – Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique)	monthly
Total Pesticides	EPA SW 846-8081B – Organochlorine Pesticides by Gas Chromatography	monthly
Total Herbicides[12]	EPA SW 846-8151A – Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzylation Derivatization	monthly
Polychlorinated Biphenyls (PCBs)	EPA SW 846-8082A – Polychlorinated Biphenyls (PCBs) by Gas Chromatography	monthly
O, M, & P Cresols	EPA SW 846-8270D – Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	monthly
Chlorine	ASTM Method D6721 –Determination of Chlorine by Oxidative Hydrolysis Microcoulometry	monthly
Plastics	Visual Inspection	each delivery
Total Non-wood[13]		

[12] EPA SW846-SV 8270 can be used as an alternate test method to EPA SW 846-8151A for pentachlorophenol
[13] Non-wood does not include soil and metal fasteners which are not combustible.

4.2 OTHER BIOMASS RECOVERED FROM MIXED WASTE STREAMS

Power generation facilities that use biomass separated from mixed waste streams must first convert the biomass to clean gaseous or liquid fuels and then demonstrate that emissions from electric energy production from the use of the adulterated feedstocks is equal to or less than the emissions for the process using unadulterated biomass feedstocks

Source-separated clean biomass is segregated at the source and should never be in contact or mixed with adulterated materials and therefore is an eligible biomass fuels for all types of conversion systems. Biomass that has been recovered from a mixed waste stream[14] is different from clean biomass that has been source-separated because it has come into physical contact with adulterated wastes and may not be used directly as a fuel for RPS eligible generation. The sole exception is the use of the clean wood portion of C&D debris that has been extracted from the mixed waste stream at the MRF or C&D processing facility. With proper controls outlined in Section 4.1, this material can qualify as an eligible biomass fuel source.

For biomass recovered from municipal mixed-waste streams or other adulterated biomass listed in the PSC Orders[15], the RPS program requires a primary conversion step to liquid or gaseous fuels. ***For this reason this section of the Guide refers to the raw biomass used at the facility as a biomass feedstock, which is distinct from the final fuel 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 is equal to or less than the emissions for the process using unadulterated biomass feedstocks. This is only possible if the primary conversion step produces a clean gaseous or liquid fuel for the power conversion system.

The biomass feedstock must be produced at 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) and is subject to the NYSDEC BUD review process. The feedstock production facility must have a regular independent monitoring program that pays for NYSDEC monitors (or approved third-party[16]) to ensure that its biomass processing is consistently 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

[14] A mixed waste stream contains both adulterated and unadulterated biomass wastes.

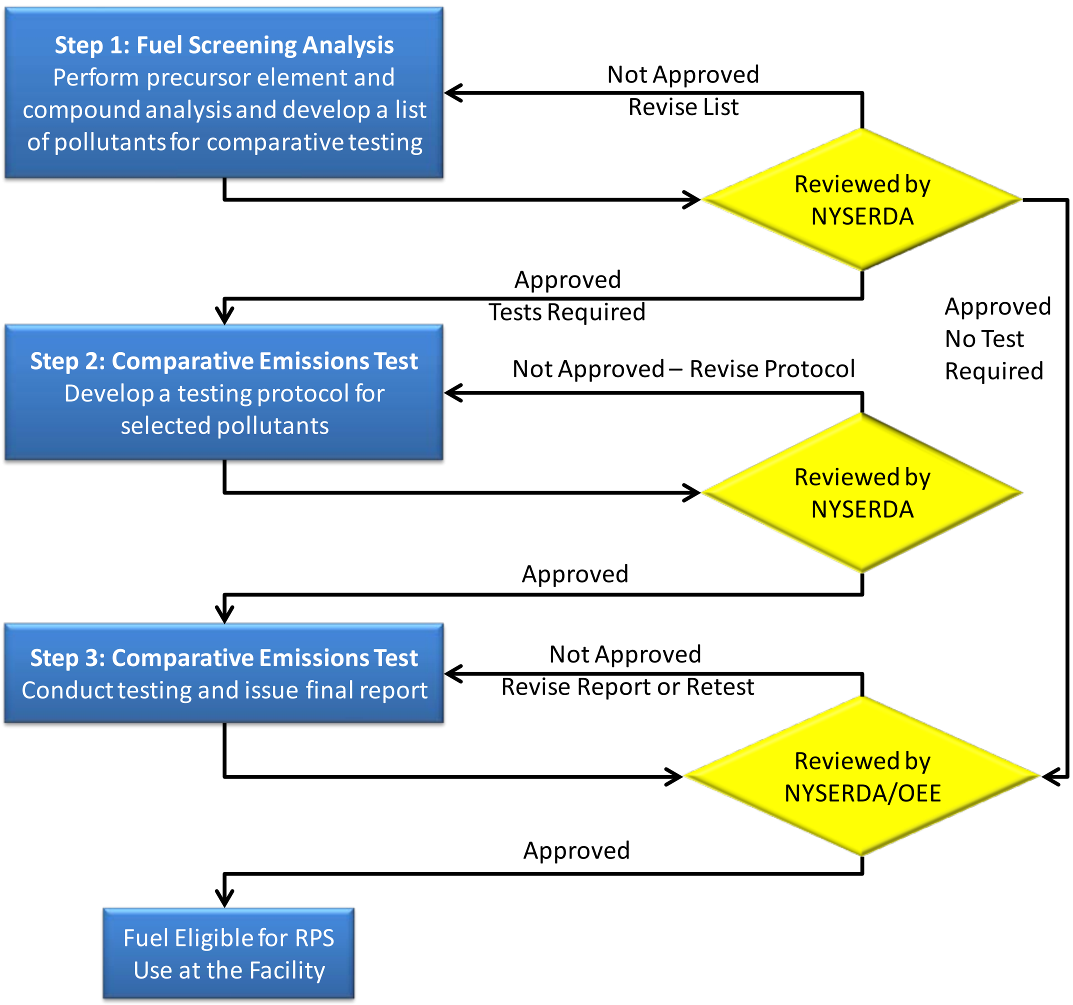
[15] From the PSC Order 9/24/2004 Appendix B: Agricultural by-products such as leather and offal and food processing residues that are converted into a biogas or liquid biofuel. Adulterated forms of wood, such as plywood and particle board, may be used as a feedstock for biogas or liquid biofuel conversion 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.

[16] 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.

process the facility will be required to provide copies of the solid waste BUD and air permits.

The process of demonstrating that the facility meets the standard is called comparative emissions testing and is diagrammed in Exhibit 8.

Exhibit 8: Process for Qualifying Adulterated Biomass



4.2.1 Testing Requirements for Using Adulterated Biomass

To operationally certify a power generation facility using adulterated biomass feedstocks for the RPS program, the following steps must be taken for comparative emissions testing and analysis. The standard for eligibility is demonstration that emissions from electric energy production from the use of the adulterated feedstocks is equal to or less than the emissions for the process using unadulterated biomass feedstocks.

Step 1 – Screening Analysis – The facility must submit an ultimate and proximate feedstock analysis as well as compound- and element- specific analyses of the adulterated feedstock(s). To enable NYSERDA and the facility to determine the air emissions testing regime that will be required to demonstrate RPS compliance, 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. The sampling protocol used to collect samples analyzed must provide assurance that the feedstock analyses presented are representative of the feedstocks that will be used at the facility. The facility owner's analysis plan is required to specifically address the issue of feedstock variability so that the full range of permitted feedstock compositions is evaluated. NYSERDA will either approve this screening analysis protocol or require revision before feedstock analysis may be performed.

The sampling and screening analysis is intended to determine if any precursor compounds are present in the adulterated feedstock in levels that might lead to emissions of the air pollutants of concern at levels greater than those produced by unadulterated biomass. Thus, if any precursor elements or compounds are found in greater concentration than in the unadulterated biomass, a comparative air emissions test will be required for the air pollutant associated with that precursor.

All of the pollutants of concern are considered class "A" substances under the NYSDEC Guidelines for the Control of Toxic Ambient Air Contaminants (DAR 1). An excerpt from DAR-1 listing the current pollutants of concern is provided in Exhibit 9. 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 Exhibit 10. NYSERDA and/or the PSC have identified the precursors listed for each pollutant which include substances identified in the Great Lakes States Air Permitting Agreement, 1988.

The limits shown have been based on typical feedstock analyses for forest-harvested wood, in the expectation that most adulterated feedstock will be significantly wood-derived. In the case of adulterated feedstocks that are not primarily wood-derived, NYSERDA may review the screening limits and adjust them as needed to match the corresponding unadulterated biomass. The limits that will be applied to the feedstock under the screening protocol will be the more stringent of: the precursor limits presented in Exhibit 10; and levels of

Exhibit 9: Pollutants of Concern

- The seven contaminants listed are targeted for stringent control by an interstate compact amongst the governors of the states surrounding the Great Lakes:
  - Alkylated lead compounds
  - Benzo-a-pyrene
  - Hexachlorobenzene
  - Mercury
  - 2,3,7,8 – Tetrachlorodibenzo-p-dioxin
  - 2,3,7,8 – Tetrachlorodibenzofuran
  - Total polychlorinated biphenyl
- All sources of these contaminants within the Great Lakes watershed shall be assigned an "A" environmental rating; all sources of these contaminants are required to be equipped with "Best Available Control Technology" (BACT)

precursors that might lead the facility to exceed its permitted limits for any air toxics that were required to be tested for the facility air permits.

Exhibit 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[17]
	Chlorine (Cl)	hexachlorobenzene; 2,3,7,8-tetrachlorodibenzo-p-dioxin; 2,3,7,8–tetrachlorodibenzofuran; polychlorinated biphenyls	370
RCRA Metals	Arsenic	elemental and organic compound emissions	5
	Cadmium		0.9
	Chromium		17
	Lead		4.4
	Zinc		200
	Polychlorinated Biphenyls (PCBs)	PCBs, PCDDs	*detectable*
	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

The facility will submit to NYSERDA the results of the chemical analyses shown in Exhibit 11 plus any analyses required to address precursors to permitted air pollutants. The results should be accompanied by the proposed list of air pollutants to be measured in comparative air emissions testing. These will be the air pollutants associated with any precursors found in the adulterated feedstock at levels greater than those shown in Exhibit 10 (or, for precursors associated with air permit compounds, levels normally found in unadulterated biomass). The screening analysis report to NYSERDA should also include a copy of the air permit, listing the feedstocks that the facility is permitted to convert. NYSERDA will review and then either recommend approval of the report and pollutant list to OEEE 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.

[17] 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.

Exhibit 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	*not screened for; a function of combustion conditions*
	Chlorine (Cl)	ASTM Method D6721 –Determination of Chlorine by Oxidative Hydrolysis Microcoulometry
RCRA Metals	Arsenic	EPA SW 846-6010C – Inductively Coupled Plasma-Atomic Emission Spectrometry
RCRA Metals	Cadmium	
RCRA Metals	Chromium	
RCRA Metals	Lead	
RCRA Metals	Zinc	
	Polychlorinated Biphenyls (PCBs)	EPA SW 846-8082A – Polychlorinated Biphenyls (PCBs) by Gas Chromatography
	Plastics, Total Non-wood	Flotation or air separation[18]

Step 2 – Comparative Emissions Test Protocol Development – Comparative emissions testing requires that air emissions for both the unadulterated feedstock and the corresponding adulterated 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. Minimum requirements for the plan are listed in Exhibit 12. A protocol for measuring each air pollutant must be provided.

Exhibit 12: Comparative Emissions Protocol

- Identify the facility, owner, and permits
- Include approved pollutant list for testing
- Describe the feedstock sampling procedures and each representative feedstock type that will be tested
- For each pollutant, identify and describe the test procedure to be used and list the permitted limits for each if applicable
- Identify the contractors and laboratories who will conduct each aspect of testing and chemical analysis
- Provide schedule for testing

A partial list of air pollutants and approved test methods[19] are listed in Exhibit 13. The facility owner's comparative test plan is required to specifically address the issue of

[18] The specific methodology for performing this separation and measurement must be submitted to and approved by NYSERDA before the screening tests are performed.

feedstock variability so that the full range of permitted feedstock compositions is evaluated. Sufficient repetitions should be included to permit a statistical analysis for certain pollutants that are not easily measured (i.e., expected emission quantities that are near detection limits or measurement techniques that are sensitive to a variety of test conditions). The facility will submit the proposed test plan to NYSERDA including the approved list of pollutants to be measured and NYSERDA will review the plan and then either recommend approval to OEEE or return it to the facility with a list of deficiencies noted. The facility must resubmit a revised plan.

Exhibit 13: Comparative Air Emissions Tests

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

[19] Please note that the comparative emissions testing protocols should be appropriate for gaseous samples at the conditions present in the flue gas. The protocols shown in Exhibit 11, for example, are appropriate for solid materials, while the protocols shown in Exhibit 13 are appropriate for gases.

The air emissions testing based on the results of the screening protocol, is intended to consist of:

1. Converting and firing an unadulterated feedstock at the power generation facility, then measuring the characteristic air emissions downstream of any air pollution control devices. The emission rates for the unadulterated feedstock will be used as the baseline for comparison.
2. Converting and firing the representative adulterated feedstock(s) at the facility, then measuring the characteristic air emissions at the same stack location as before.
3. Comparing the emissions on a mass per unit heat input basis (e.g., lb/MMBtu) of the baseline and the adulterated feedstock(s).

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 test plan submitted to NYSERDA, and the unadulterated baseline feedstock is subject to NYSERDA approval**.

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. One such example is an anaerobic digester processing pulp mill sludge to produce digester gas for a gas turbine generator. As pulp mill sludge is not explicitly an eligible feedstock, the facility must perform an adulterated feedstock screening, then comparative air emissions testing for any pollutants of concern formed by precursors exceeding the screening limits. However, anaerobic digesters have very long residence times and are sensitive to changes in feedstock composition. An unadulterated feedstock, such as food processing wastes, may not digest effectively under the configuration used, and would require a week or more of exclusively feeding unadulterated material. Even with that effort, it would be difficult to ensure that the material in the digester at the end of the residence time was exclusively unadulterated material. For these reasons, it may be necessary for a digester facility to use an alternate method for comparison.

Under such circumstances, and only with NYSERDA approval, a facility may resort to using another similar installation as a proxy in order to measure the baseline emissions using unadulterated feedstock. For example, a developer may operate a number of digester facilities of similar size and pollution controls, and thus have access to installation processing animal manure as a proxy for an installation processing paper mill sludge. In order for this method to be allowed, the proxy facility should:

- use the same conversion technology and prime mover type;
- be similar in size and operating parameters;
- use only unadulterated feedstocks; and

- have pollution control equipment similar to that of the facility seeking RPS certification

If a facility must resort to using a proxy conversion system, the test plan must explain in detail why the facility cannot effectively perform the comparative emissions testing as prescribed above. Only those facilities with a true technical inability to perform the protocol as intended will be permitted to use this alternative method. NYSERDA will review all such test plans and provide opinions on the acceptability of the proxy facility as a baseline for comparison. If the test plan is approved, the baseline emissions tests are to be performed at the proxy site following the same procedures as for the developer's facility. The adulterated feedstock emissions testing will still be performed at the developer's site.

Step 3 – Emissions Testing and Reporting - 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. A full report including statistical analysis, as required for measurement of certain pollutants, must be submitted to NYSERDA. No statistical analysis is required for the pollutants that are measured and are consistently under the unadulterated biomass emission levels. Pollutants that are measured and are consistently greater than the unadulterated biomass emission levels will be deemed in excess of the RPS program emissions standard. When pollutant measurements for adulterated biomass fall both below and above the levels for unadulterated biomass, an analysis for statistical significance will be necessary. That analysis will be conducted by a qualified consultant selected from a list maintained by NYSERDA and paid for by the facility.

NYSERDA will review the report. Upon completion of the review, NYSERDA and OEEE have three choices:

- Approve the feedstocks that meet the standard for use at the facility for RPS program eligible generation;
- Return the report to the facility with a list of deficiencies noted requiring a revised analysis; or
- Return the report to the facility with a list of deficiencies noted requiring a retest for certain pollutants for which results were inconclusive or for which a deviation from the test plan occurred during the test that voided the test results.

For the latter two cases the facility must submit a revised report and conduct a retest if required.

4.2.2 Test Methods for Using Adulterated Biomass

Exhibit 11 and Exhibit 13 list suggested test methods for precursors and air pollutants, respectively. These methods are encouraged, but other appropriate EPA- and DEC-approved testing methods may be substituted if feedstock type or other facility parameters preclude use of the suggested methods. Use of an alternative test method requires advance approval by NYSERDA.

5 MULTI-FUEL POWER GENERATION TECHNOLOGIES

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

1. An accurate measurement and accounting of the RPS program eligible fuel source's heat input to the conversion device; and
2. An apportionment of total electricity generation based on the fraction of the total conversion device heat input provided by the RPS program eligible fuel source.

Most power generating plants use control systems that measure and log data important to operations, regulatory compliance, and electricity sales. The measured and logged data includes both fuel flow rates and net power output of the plant generator. Coupled with chemical composition data of the fuel, this data is sufficient to describe the total energy input and output of a power generation cycle.

Tracking the relative heat contributions of multi-fuel systems requires some additional complexity. These guidelines offer several approaches including options for solid, gaseous, and liquid fuel firing scenarios. All of the methods primarily rely on accurate record keeping of biomass eligible fuel use, and sampling and characterization of a few key fuel properties. Other plant operational data is also used to ensure practical and accurate renewable generation accounting.

Although some details must be addressed in the context of each specific fuel type, the underlying principle for calculating the renewable fraction of the total electricity generated at a cofiring facility is listed in Exhibit 14.

Exhibit 14: Cofiring Principle

The amount of renewable generation from the plant (or generation unit) is proportional to the amount of input energy provided by the renewable fuel to that generation unit.

In other words, if 10% of the heat input (energy or BTUs) to a boiler/generator is provided by the RPS program eligible biomass fuel (over the same time period), then 10% of the total net electricity generated can be designated as renewable or green power.

5.1 SOLID FUEL BIOMASS COFIRING SYSTEMS

Solid fuel biomass cofiring systems can generally be described as either blended fuel feed systems (the ineligible fuel, typically coal, and the biomass are blended prior to injection into the boiler), or separate injection systems (biomass is injected through dedicated burners separately from the ineligible fuel). The NYSERDA accepted method for accurate measurement of heat input in any given reporting period is to meter and convey eligible fuels separately from ineligible fuels to the main fuel feed line or surge bin or separate dedicated burners at the boiler for firing. The fuel streams may not be mixed until they are in the fuel feed lines for firing the boiler or combustion chamber or loading the surge bin in preparation for immediate firing. Specifically mixing eligible and ineligible fuels on the storage pile or 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. If NYSERDA grants an exception to the separate fuel storage and metering rule the owners must develop and implement a detailed fuel tracking system that permits each load of fuel to be traced from delivery to firing each month and reconciled to ensure the correct proportion of eligible heat input is determined. The guidelines presented below are applicable to both blended and separate firing applications, but measurement points will differ for the two systems.

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

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

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

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

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

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

Similarly the cofiring percentage can be used to apportion the total generation as follows:

Equation 2: Renewable Energy Generation

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

Where the cofiring percentage is calculated as an average across the same time frame as the total generation component

Appendix B provides a guide of acceptable methods for calculating the cofiring percentage and consequently apportioning the total generation as *Renewable* and *Non-Renewable*.

5.2 GASEOUS AND LIQUID BIOMASS FUEL COFIRING

In general, the concepts and principles outlined for solid fuel cofiring also apply to gaseous and liquid fuels derived from biomass feedstocks. For the purposes of this document, biomass-derived fuels include the following:

- Landfill Gas (LFG) or Renewable Pipeline Gas (RPG)[20]
- Biomass syngas derived from pyrolysis or gasification processes
- Gas generated by anaerobic digesters
- Ethanol from grain and lignocellulosic feedstocks
- Renewable Diesel
- Biodiesel

5.2.1 Gaseous Fuel Cofiring

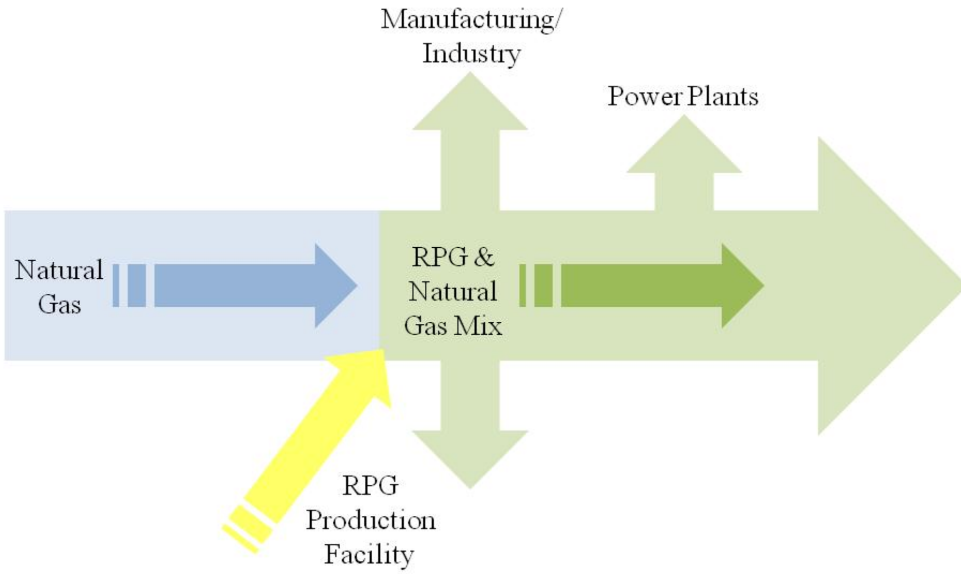
Generally, the treatment of gaseous fuel cofiring follows the rules outlined above. Appendix B provides a guide to acceptable methods for calculating the cofiring percentage and consequently apportioning the total generation as *Renewable* and *Non-Renewable*. However, fungible products can be practically derived from at least one of these sources - there is the potential to use natural gas pipelines as common carriers and pipe RPG to power generation facilities. For this reason, this section includes additional details concerning cofiring gaseous fuels via common carrier pipelines.

5.2.2 Conversion of Common Carrier Pipeline Gas

The use of common carriers (natural gas pipelines) to transport RPG for subsequent conversion is a special case for gaseous cofiring (Exhibit 15). In this special circumstance certain issues associated with the variable chemical composition of biomass fuels are alleviated. Use of a common carrier requires that biomass derived fuels meet the same rigid gas compositional requirements as the rest of the gas being transported through the pipeline. Most notably, this means that the heating value of the fuel will meet very narrow tolerances. Additionally, to use a common carrier for transport, the gas pipeline owner will also impose very strict metering requirements. Therefore, measuring the potential heat input rate of RPG into a project can be readily accomplished using standard heating values for pipeline gas and regular meter readings associated with the injection volumes. Given that the model for contracting for the use of this gas is likely to follow industry standards, sufficient information should be available to verify that contracted volumes (and associated heating value) were delivered.

[20] Renewable Pipeline Gas (RPG) will refer to pipeline quality gas derived from upgrading landfill gas resources. In contrast, Landfill Gas (LFG) refers to landfill gas treated to remove contaminants harmful to conversion or use, but not upgraded to pipeline quality.

Exhibit 15: Common Carrier Illustration



In a technical sense, every user downstream of a RPG production/injection facility is using a blended fuel and relative to a total pipeline volume, the RPG volumes are likely to be very small. In a physical sense a power generation facility is always using a blend of renewable and natural gas with natural gas being the primary component. The intent of the RPS program will be met by counting the full value of new RPG contracts based on new RPG resources and entered into specifically for the purpose of RPS participation by the power generation facility as new renewable generation. New RPG resources include new RPG production sites and expanded collection/processing systems at existing sites. In all cases, the physical production of new RPG (either through new development or expansion) must be equal or greater to the volumes contracted by the generator. At facilities that already collect and flare the gas, adding new facilities to clean and upgrade the gas to pipeline quality will also be treated as new resources.

Based on discussions and information collected during the development of this Guide, the following guidelines have been established for calculating qualified RPS program generation at facilities using RPG:

1. Common carrier RPG resources will be considered eligible only if sourced and used in the same state to generate power delivered to New York.
2. Sufficient metering is in place at the landfill collection/processing facility or other RPG production facility to allow accurate accounting of gas produced, collected, upgraded and injected as RPG into the common carrier;
3. The generator must keep and provide sufficient records on physical delivery from common carrier, gas consumption, and gas quality to pro rate the facilities monthly electrical generation based on the ratio of the total RPG contract gas energy and the total gas energy used.
4. To be RPS eligible, supply contracts for RPG transported over common carrier must be new contracts. The buyer must notify the gas producer as part of the new RPG supply contract or modification that the gas contract is being purchased for

conversion to RPS eligible power and is subject to the accounting rules of the RPS program. The RPG producer must certify that the gas delivered under supply contract is produced from new resources, i.e. new or expanded RPG production systems.

Appendix B provides a guide of acceptable methods for calculating the cofiring percentage and consequently apportioning the total generation as *Renewable* and *Non-Renewable*.

5.2.3 Liquid Fuel Cofiring

Although the technical and economic feasibility of this option has not been commercially demonstrated, cofiring liquid biofuels in boilers, combustion turbines, or reciprocating engines is possible. Renewable-based fuels such as ethanol and biodiesel are being primarily viewed as transportation fuels, but as the production costs of these fuels decline, they may become a source of renewable fuel for power generation as well.

Guidance for using these fuels in cofiring operations parallel what has previously been described for solid and gaseous fuels. Project developers should review the suggested approaches and, to the extent that these techniques are applicable, consider these the preferred approaches in calculating their potential renewable power generation. If special circumstances exist within their project, they should seek additional guidance from NYSERDA.

6 INCREMENTAL CAPACITY ADDITIONS

Many developers are considering options that will increase biomass power output at existing power plants. In some cases, these expansions may be as a result of retrofitting with new, more efficient technologies that will be accompanied by incremental gains in output (repowering). In others, the expansion may simply be a function of adding new processing equipment to increase biomass conversion rates. An example of the latter would be adding more equipment to increase a plant's biomass cofiring capacity.

Projects seeking to increase renewable capacity at an existing site should use the following guidelines in calculating the "new renewable generation component" of their output. Two different methodologies are presented: 1) Facilities increasing biomass power generation by more fully utilizing existing biomass power generation capacity and 2) facilities making substantial investments to increase renewable biomass capacity. Although designed for different situations biomass power generators have the option to choose between the methodologies offered depending on their particular circumstances.

6.1 OPTIONS FOR CALCULATING INCREASED GENERATION/CAPACITY

This Guide provides for two mechanisms for generation facilities to determine their incremental renewable generation. It will be up to project developers to choose the approach they will use and provide supporting documentation to NYSERDA at the time of their application to the RPS program.

6.1.1 Option 1: Incremental Generation above the Average Baseline

For facilities that plan to more fully utilize existing renewable biomass capacity, the increase in biomass power generation will be calculated on an energy basis with the baseline generation calculated as the average of the two highest levels of annual generation within the last five years from the vintage date established by the applicable RFP. For purposes of determining a baseline, only RPS eligible biomass fuels are included in the baseline calculation. In addition, a requirement to track the amount of ineligible fuels consumed will be imposed on projects that wish to continue to use such fuels. Details for calculating the baseline generation, averaging period, and incremental generation are provided below:

RPS Program Generation = Total Renewable Generation – Baseline Renewable Generation

Averaging Period – The averaging period for calculating the baseline will require facilities to provide the monthly production figures for the five most recent years prior to the vintage date established by the applicable RFP.

Baseline Biomass Generation – The baseline will be calculated by averaging the renewable generation (kWh) from eligible biomass fuels for the plant during the two highest years during the averaging period.

Baseline Biomass Fuel Use – The amount (in tons) of eligible biomass fuels used to generate power during the averaging period.

RPS Program Generation – RPS program generation (the incremental renewable generation above the baseline) will be calculated by subtracting the Baseline Biomass Generation from the plant's renewable generation output while participating in the RPS program. RPS program payments will occur only after the Baseline has been satisfied in each contract year. Baseline Biomass Generation itself is not eligible for any RPS payment. In order to ensure the project's benefit, periodic true-ups may be performed to ensure RPS program premium payments result in a net annual increase in eligible renewable generation.

Independent Analysis Report: Facilities will provide an audit report endorsed by independent CPA or professional engineer of its baseline analysis. The analysis report must be supported by a listing of facility biomass fuel purchases identifying the vendor/source, physical description of the fuel, quantity, energy content, RPS fuel eligibility status, date of delivery, approximate period of use, conversion efficiency and energy produced (in MWh).

An additional requirement is placed on projects with biomass power generation that includes conversion of any biomass fuels ineligible for the RPS. Only the net energy content[21] of eligible biomass fuels will be counted in the calculations of the ***Baseline Biomass Fuel Use*** and ***RPS Program Generation*** defined above. These projects will be required to account for the use of all fuels (by type, tonnage, and net energy content). Projects will be required to maintain and provide records sufficient to demonstrate that the facility is in compliance with this requirement, including an annual tally of the type and amounts of biomass fuels used. Periodic true-ups, as described above, will be performed to ensure RPS program premium payments result in a net annual increase in eligible renewable generation. *At a minimum the biomass fuel data requirements for facilities using both eligible and ineligible fuels include the source, weight and fuel composition for each delivery.*

6.1.2 Option 2: Incremental Capacity above Baseline

Facilities making a substantial investment in new processing or conversion equipment may find it advantageous to calculate their incremental capacity in an alternative manner. For this option, renewable generation output from the plant will be determined by the capacity ratio[22]:

RPS Capacity Ratio: The ratio of the incremental renewable generation capacity to the total renewable generation capacity at the plant.

[21] Based on the Lower Heating Value of the fuel to ensure proper weight is given to fuel ratios based on actual energy converted to electricity

[22] In multi-fuel operations where the predominant fuels are non-renewable the baseline and incremental capacity calculations are based solely on the equipment and power production associated with the biomass fuels.

Total Renewable Generation Capacity – defined as the Baseline Renewable Generation Capacity plus the Incremental (New) Capacity added through investment. This value will be expressed in megawatts (MW).

Baseline Renewable Generation Capacity – Baseline Capacity will be determined and documented by either the nameplate capacity of the biomass generation equipment or operational tests conducted at full load measuring the biomass generation capacity. This value is expressed in MW.

RPS Program Generation Capacity – This figure is nameplate renewable generation capacity of new assets or respectively calculated value of the new biomass capacity addition based on operational testing at full load. This is also expressed in MW.

Therefore, the RPS Capacity Ratio = $\frac{\text{Incremental Renewable Generation Capacity}}{\text{Total Renewable Generation Capacity}}$

This ratio will then be applied to all renewable energy generated (in MWh) produced from eligible biomass fuels to calculate the incremental generation eligible under the RPS program. This allows the facility to receive credit for incremental generation each month in proportion to the new renewable capacity.

RPS Capacity Investment: The incremental investment must be properly documented and may only include costs directly associated with the engineering and installation of the new equipment.

Independent Analysis Report: Facilities will provide an audit report endorsed by an independent CPA or professional engineer of its baseline and incremental capacity analysis. The analysis to establish the baseline and incremental capacity must be supported by documentation of either the nameplate capacity or operational tests at full load capacity of the biomass power generated before and after plant modification or upgrade to increase biomass generation capacity. The report must also document the investment in renewable plant equipment for the modification or upgrade.

7 FUEL MANAGEMENT, MEASUREMENT, AND CALIBRATION PLAN

This section applies to all biomass power generation facilities, whether the facility uses exclusively eligible fuels or a combination of eligible and ineligible fuels and Clean MRF Fuels. Facilities that fire exclusively eligible fuels will need to prepare a relatively brief fuel management, measurement, and calibration plan, aimed mainly at fuel delivery inspection and quality assurance. Facilities that fire a mixture of eligible and ineligible fuels or Clean MRF Fuels have additional requirements that must be addressed in the plan and the additional requirements are clearly identified. Such facilities must carefully measure and sample the component fuel streams in order to receive RPS payments under contract to NYSERDA. As a guide to plan layout and presentation refer to Appendix C: Sample Fuel Management, Measurement, and Calibration Plan.

Prior to receiving Operational Certification, an RPS-contract facility must submit a Fuel Management, Measurement, and Calibration Plan for its fuel quality assurance and mass flow measurement systems. This plan is intended to demonstrate to NYSERDA that the facility has in place the procedures to inspect the quality of fuel deliveries and for multi-fuel facilities manage and measure fuel mass flows such that the amount of eligible renewable generation at the facility can be accurately calculated. For facilities firing a mix of eligible and ineligible fuels or Clean MRF Fuels, this capability is dependent on the use of well-calibrated fuel flow measurement equipment and appropriate fuel receiving, segregation, storage, sampling, and handling procedures. The Plan is a comprehensive document that includes all necessary details of how the facility intends to assure fuel quality and measure its renewable generation. The Plan must include the following information:

7.1 FUEL MANAGEMENT AND INSPECTION

How fuel is to be managed and inspected must be documented. The management plan should address delivery, inspection, and storage and management of the fuel up to point of firing. Facilities may receive deliveries of biomass fuels though 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 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 and during unloading and how material will be handled if inspection reveals ineligible fuel contamination that has entered the eligible fuel handling system. If Clean MRF Fuels are used or the facility cofires ineligible fuels, the segregation and transport of fuel streams up to the point of sampling for fuel quality testing must be delineated.

Describe the methods that will be used manage and inspect biomass fuel deliveries to make sure they meet fuel contract standards. These procedures must demonstrate to NYSERDA that fuels entering the eligible fuel stream are uncontaminated with ineligible substances, are well-documented by source and supplier, and are properly sampled if required by the contract. In the case of a facility firing both Clean MRF Fuels and other eligible fuels, the procedures should ensure that Clean MRF Fuels are properly inspected, kept segregated and accounted for separately from other eligible biomass fuels before firing.

7.2 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.

7.3 FUEL FLOW MEASUREMENT AND SAMPLING

The fuel flow measurements required will vary in type and placement within the fuel handling system depending on the type of facility, the physical properties of its fuels, and the heat input accounting method used by the facility. For facilities that fire only RPS eligible fuels 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.

Measurement and Accounting for Heat input from Eligible and Ineligible Fuels

Provisions Applicable to Facilities That Fire a Mixture of Eligible and Ineligible Fuels or Clean MRF Fuels

A key aspect of the plan for facilities that fire a mix of eligible and ineligible fuels is a description of how, where, and with what frequency fuel flow measurement and fuel sampling of fuels will be performed. (This is discussed in more detail in Section 5 and illustrated in Appendix B: Cofiring Calculations.) However, each Plan should provide a schematic of the fuel flows through the facility; locations of equipment by which each fuel flow will be measured and all fuel sampling points in the system. It should provide sufficient detail to satisfy NYSERDA that the facility can accurately calculate RPS-eligible generation. For facilities using Clean MRF Fuels, sampling and analysis is used to verify that the biomass fuel meets the standards for maximum contaminant levels established by the NYSDEC approved BUD and general fuel quality standards adopted by the PSC in the 2010 Order. For Clean MRF Fuels, sampling and fuel handling procedures must be described in sufficient detail to establish the facility's compliance with the procedures in Section 4.1.3.

Fuel sampling of eligible and ineligible fuels fired must be described carefully. The primary purpose of the fuel sampling (and analysis, which is described in the following subsection) is to support an accurate calculation of renewable generation. For cofiring operations, the data also supports an accurate calculation of sulfur dioxide emission reductions attributable to renewable fuel substitution for ineligible fuels and excess sulfur reductions as described in Section 8 of the Guide. Sampling procedures will vary based on the physical nature of the fuels used.

- **Solid fuels.** A proximate analysis including determination of heating value must be performed on a representative "super-sample" of the eligible fuel sampled for every 24-hour generation period in which eligible fuels are fired. The super-sample is composed of 150-200g grab samples collected at three-hour intervals within the 24-hour period, mixed into a single homogeneous sample, then riffled and split into two samples, one to be held at the plant for 30 days, and one to be used for analysis. Both samples should be stored in such a way as to preserve their integrity, including composition and moisture content. These super-samples are collected daily, but analysis may be performed at any time within five business days of receipt of the samples by the lab, and within six business days of collection of the sample[23]. Sampling and sample aggregation procedures are similar for Clean MRF Fuels for purposes of collecting daily as fired samples but for fuel quality testing additional samples must be aggregated to create a monthly super-sample for contaminant testing. (Refer to Guide Section 4)
- **Liquid fuels**. Eligible liquid fuels should be sampled and analyzed similarly to solid fuels. The samples combined into the daily super-sample should consist of approximately 150-200g of liquid. Care should be taken that the liquid is stored in such a way that no evaporation, leaching, or container degradation compromises the sample integrity.
- **Gaseous fuels**.
    - **Non-pipeline fuels.** A continuous analyzer, such as a chromatograph, must be used to determine the fuel's energy content by determining methane content for digester or landfill gas, or CO and H_2 content for syngas, at the facility consuming the gas. The facility should either manually or electronically log gas composition on an hourly (or more frequent) basis. These should be used to calculate and record the daily average fuel composition and energy content.
    - **Renewable Pipeline Gas.** The procedures should be similar to those for non-pipeline quality, but the measurements are to be performed at the biogas production facility, not at the power facility consuming the gas.

The sampling methods used for solid and liquid eligible fuels also apply to their ineligible counterparts, although sampling may be less frequent (semiannual for ineligible fuels with very consistent composition).

Use of alternative methods of measuring boiler heat input may require changes to the daily sampling procedure. This is addressed in Appendix B: Cofiring Calculations, which details heat input measurements methods, and in Appendix C: Sample Fuel Management, Measurement, and Calibration Plan.

[23] "Sample collection" refers to retrieval of the sample from the sampling point within the plant, not to receipt of the sample by the laboratory. The sample date should refer to the date of collection, not the date of receipt by the lab. Collection times for the individual samples comprising the super-sample should also be noted

Measurement Systems Calibration

In this section of the plan the facility must also provide a detailed written description of calibration procedures and schedule for measurement and associated control devices that will be used to measure mass or volume flows that will be used in the calculation of heat input for RPS-eligible generation. The description should include the manufacturer and model number and a description of each system's condition and operating history. At a minimum, NYSERDA expects that the method of calibration will be consistent with the vendor's recommended best practices. These practices will be used as the baseline in assessing the adequacy of the facility's recommended calibration plan.

7.4 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[24], sulfur, 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.

Fuel Quality Tests for Eligible and Ineligible Fuels

(Facilities that fire a mixture of eligible and ineligible fuels or Clean MRF Fuels)

The analyses that must be performed on the fuel samples vary by fuel type and heat input calculation method, but are summarized in Exhibit 16. The testing requirements for eligible fuel samples are intended to establish the heating value of the fuel on a daily basis such that the total eligible heat input to the boiler or engine may be accurately calculated. If the chosen heat input calculation method also requires measurement of ineligible fuel input, ultimate analyses including determination of higher heating value will be required for ineligible fuels. In the case of gaseous ineligible fuels, a statement from the supplier establishing the composition of the fuels fired at the site including heating value must be obtained on a semiannual basis. 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. For directly harvested wood meeting the requirements described in Section 3 of this Guide, only a semiannual fuel sulfur analysis is required.

Regardless of chosen heat input calculation method, sulfur content must be established semiannually for each combination of ineligible fuel supplier and type. This can either be done as part of an ultimate analysis, or as a stand-alone sulfur analysis, depending on the other data required by the chosen heat input calculation method. Details for sulfur analysis are in Section 8.

Whether for as-fired or semiannual fuel analyses, methods must be approved by NYSERDA, and should be stated explicitly in the Plan. Analyses of daily super samples that are performed more than six business days from sample collection must be

[24] "RCRA Metals" refers to EPA analytical method EPA SW-846, for the measurement of lead, arsenic, chromium, selenium, mercury, silver, cadmium, and barium.

documented as such and reported to NYSERDA with the monthly invoice. Three weeks will be allowed for the more extensive testing required for monthly super samples of Clean MRF Fuels which are a special case of eligible fuel.

Exhibit 16: Summary of Fuel Testing Requirements

Fuel Category	Fuel Type	Sub-type	Ongoing Testing Requirement	Semi-annual Testing Requirement
Multi-fuel Facilities: *Eligible Fuels*	Solid (e.g. wood chips)	Directly harvested	Proximate analysis of super-sample	Sulfur analysis
		Not directly harvested	Proximate analysis of super-sample	RCRA metals analysis Copper analysis Sulfur analysis
		Clean MRF Fuels	See Section 4.1.5 and Appendix F	Sulfur analysis
	Liquid (e.g. renewable diesel)	All	Proximate analysis of super-sample	Sulfur analysis
	Gas (e.g. landfill gas)	All	Continuous methane analysis	Ultimate analysis Sulfur analysis
Ineligible Fuels	Solid or Liquid	All	None	Ultimate analysis (if facility uses mass flow method), Sulfur analysis (if facility uses an alternate method)
	Gas	All	None	Statement of gas composition from fuel supplier OR monthly bills with heating value Sulfur analysis
Facilities Using Eligible Biomass Only	Solid (e.g. wood chips)	Directly harvested	None	None
		Not directly harvested	None	RCRA metals analysis Copper analysis
		Clean MRF Fuels	See Section 4.1.5 and Appendix F	None
	Liquid or Gas	All	None	None

8 SULFUR EMISSION REDUCTIONS

This section applies to all facilities that cofire biomass with ineligible fuels that have higher sulfur content than the biomass fuels, where sulfur content is measured as weight of sulfur per unit of heat input (lbs sulfur/Btu). Eligible biomass fuels are usually lower in sulfur content than ineligible fuels such as coal, residual fuel oil and tire derived fuels. Ineligible biomass fuels may also be cofired and generally have higher sulfur contents (creosote treated wood, plywood and particle board). There may be significant sulfur emissions reductions due to the use of an eligible fuel as a replacement for the high sulfur ineligible fuels. Sulfur dioxide emission reductions attributable to substitution of clean biomass for fossil and other ineligible fuels are an important environmental benefit of the RPS program. Cofiring facilities are required to calculate and track these benefits on a monthly basis. Under program guidelines, any such RPS-related sulfur emissions reductions that are generated in excess of the facility's need to comply with Clean Air Act regulations or NYSDEC operating permits shall be considered owned and paid for by payments made by NYSERDA under the RPS contract. In order to accurately measure and transfer ownership of these emissions reductions as part of RPS-eligible Attributes (defined in the Definitions Section of the Guide), RPS contractors will need to account for the differences in sulfur emissions between power production with only ineligible fuel and power production incorporating eligible fuels.

This section will guide such power producers through the accounting procedures used to determine the reductions in sulfur dioxide emissions and the number of RPS-generated sulfur reductions at power facilities if reductions in excess of permitted emission levels are achieved. For facilities using other sulfur control technologies like flue gas desulfurization (FGD) the reductions due to the sulfur controls must be taken into account.

The guiding principle of this method is the following equation:

Equation 3: RPS-Related Sulfur Reductions

RPS-Related Sulfur Emission Reductions = E_{IF} - E_A; where

E_{IF} = the calculated monthly emissions (in tons of SO_2) that would have been produced had only ineligible fuels been fired

E_A = the actual emissions (in tons of SO_2) for that month, measured as per EPA standards

This means that, if sulfur emissions for a given month are below the emissions that would have occurred had only an ineligible fuel been fired, producers will have reduced sulfur emissions through fuel substitution and may generate excess RPS-related sulfur reductions to be transferred to NYSERDA as part of the RPS-eligible Attributes purchased by NYSERDA.

Several factors must be taken into account in order for these excess reductions to be transferred to NYSERDA[25].

1. Monthly SO_2 emissions must be below the monthly allowable emissions permitted by New York State DEC and the EPA. No excess sulfur reductions exist when permitted emissions are exceeded, so even if actual emissions are less than calculated ineligible fuel emissions, the difference in this case cannot be counted as an "excess reduction".[26]
2. The effect of a sulfur control device must be known accurately and taken into account. For example, an FGD with 95% removal efficiency will reduce both E_{IF} and E_A by 95%, leading to a smaller RPS-related emissions reduction than in the same facility without sulfur scrubbing.
3. The sulfur content of the eligible fuels must be known, based on either a recent (at least semiannual) fuel sulfur analysis. This, as well as the ability to accurately measure the removal efficiency of the sulfur control device, should be reflected in the fuel sampling and data collection procedures documented in the Fuel Management, Measurement and Calibration Plan.

A full sample calculation of RPS-related excess sulfur allowances is presented in Appendix D of the *Guide*. The basic steps of this calculation are as follows:

1. **Calculate sulfur reductions test margin**, meaning the difference between the actual monthly emissions and the permitted monthly emissions. If the permitted monthly emissions are less than the actual monthly emissions, no excess reductions exist, and no further calculations must be done. This is shown in Equation 4.
2. If the test margin indicates lower actual than permitted emissions, **calculate the sulfur emissions due ONLY to the use of eligible fuels**, as shown in Equation 5. This includes a factor of 64/32 to account for the fact that the fuel analysis reports weight of elemental sulfur (S), but flue gas emissions are reported as sulfur dioxide (SO_2). If a sulfur reduction technology is employed, its efficiency must also be included in this calculation.
3. If the test margin indicates lower actual than permitted emissions, **calculate the sulfur emissions that would have occurred if only ineligible fuel had been fired**, as shown in Equation 6. This requires that the power production from eligible fuels be known—this quantity is calculated as previously described in Section 5.
4. **Calculate the difference** between calculated ineligible fuel emissions and actual emissions for the test period, using Equation 3.

[25] In the case of coal fired facilities that choose to cofire biomass, the excess reductions may in fact generate marketable emission allowances which are effectively transferred to NYSERDA as well.
[26] A complication not captured in the test margin calculation shown below is the possibility of having calculated ineligible fuel emissions for coal and biomass fired facilities that are higher than the number of allocated allowances, but actual emissions that are lower. In this case, Equation 3 will not apply, and the RPS-related sulfur allowances transferred to NYSERDA will be the difference between the permitted emissions and the actual emissions.

Equation 4: Sulfur Reduction Test Margin

Sulfur Reductions Test Margin = $E_P - E_{A;}$ where

E_P = sulfur emissions (in tons of SO_2) permitted for the facility during the reporting period

If Test Margin ≤ 0, no excess reductions exist.

Equation 5: Sulfur Emissions from Eligible Fuels

Sulfur Emissions from Eligible Fuels = E_E

$$E_E = \text{Dry Tons of Eligible Fuel} \times \text{Mass \% of Sulfur in Eligible Fuels} \times \frac{64\text{ g }SO_2}{32\text{ g S}} \times (1 - \text{Removal Efficiency of Scrubbing System})$$

Equation 6: Sulfur Emissions from Ineligible Fuels

Sulfur Emissions from Ineligible Fuels = E_{IF}

$$E_{IF} = \frac{(E_A - E_E) \times \text{Total Power Production}}{\text{Total Power Production} - \text{Power Production from Eligible Fuels}}$$

Both scrubbed (FGD) and un-scrubbed (non-FGD) facilities should use this calculation procedure, with un-scrubbed facilities entering a sulfur removal efficiency of "0" in Equation 5.

It should be noted that, if a facility produces a higher-than-bid quantity of eligible fuel generation and chooses not to carry this extra generation forward to subsequent contract months, sulfur must be carefully accounted for. Only those excess sulfur reductions associated with *RPS-compensated* power production are to be transferred to NYSERDA.

9 VALIDATION/VERIFICATION PROCEDURES

Throughout this document, validation and verification procedures have been described in context of the nuances associated with various technology/feedstock combinations. The exact agencies, timing, and ongoing audit requirements for ensuring RPS program compliance will be included in the renewable attribute purchase contracts. For biomass projects, these are likely to vary somewhat from project to project. However, a few additional general comments are offered below:

1. A substantial portion of planned and future validation/verification processes will be based on documentation kept by project operators. Failure to keep adequate records such as fuel receipts, fuel supplier contact information and source information, fuel flow data, fuel inspection logs, maintenance records, or any other information that is required to ensure compliance with RPS program related contracts may impact a project's ongoing eligibility.
2. Similarly, fuel end-users are ultimately responsible for ensuring that their fuel supplies are in compliance with the RPS program eligibility rules.
3. Since the renewable generation of cofiring projects is a calculated value based on other data instead of a metered quantity as it is in single fuel biomass plants, operators of these plants have a special burden to maintain adequate records.

Lastly, as stated in the opening section of this document, the RPS program will be willing to consider variances from the protocols described in this document. However, adherence to the guidance will streamline contracting processes. Developers seeking a variance from these guidelines should expect a thorough review and some delay as petitions will be carefully weighed for their impact on existing and future projects.

10 OPERATIONAL CERTIFICATION

Developers who are awarded an RPS contract will need to provide a variety of documentation and verification to NYSERDA before operational certification may be declared and reimbursement for eligible power production may be issued. Operational Certification also ensures that all of the procedures, data and test reports needed to support invoices for the duration of the RPS contract will be ready. The details required depend on the type of facility that is awarded an RPS contract, the type of fuel management, measurement, and calibration procedures required, and the types of fuels fired. This checklist should be considered a general indication of the basic requirements of a typical RPS contract that will be inspected and reviewed for operational certification. It is not all-inclusive. So that developers may better understand what may be asked of them, a sample operational certification checklist is provided in Appendix E. A facility-specific operational checklist will be provided to RPS contractors.

The basic elements of the Operational Certification process are:

Data collection, monitoring, and reporting systems and operating procedures
RPS contractors will need to submit a Fuel Management, Measurement and Calibration Plan and, if the facility uses harvested wood, a Forest Management Plan that demonstrates to NYSERDA and the DPS that the facility is able to accurately monitor fuel specifications and, if cofiring, that the portion of total power generation from RPS-eligible fuels can be precisely calculated. Details of the Plans are described in Sections 3 and 7.

An on-site inspection by NYSERDA
This on-site inspection is intended to verify that actual plant operations are proceeding in compliance with both the NYSERDA contract documents and the Fuel Management, Measurement, and Calibration Plan created by the RPS contractor. This takes place preferably after RPS-eligible fuel generation systems are operational and operating procedures and measurements systems can be observed.

APPENDIX A: HARVEST PLAN TEMPLATE

This appendix applies to all biomass facilities that plan to use biomass harvested from forested land. The Harvest Plan Template provided on the next page, when properly completed, provides all the information required by the RPS program. The biomass facility should include a copy of the final version of its harvest plan in the FMP.

HARVEST PLAN TEMPLATE

Landowner Information		
Landowner:		
Address:		
City/Town:	State:	Zip Code:
Phone:		

Total Property Acreage: ___________________________

Acreage of Area to be Harvested: ____________________

Total Estimated Volume of Harvest: ____________________

Proposed Harvester: ____

Proposed Harvest Date: ___________________ through ______________________

Harvest Plan Prepared by: ____

Phone: ________________________________

Date Prepared: ___________________________

Is this property certified using one or more of the following Forest Management Programs?

- ☐ No. If no, continue to second page and complete harvest plan.
- ☐ Yes. If yes, identify which program and provide number.
  - ☐ Forest Stewardship Council (FSC),
    Certification # ___________________
  - ☐ Sustainable Forestry Initiative (SFI),
    Certification # _________________
  - ☐ American Tree Farm System (ATFS),
    Identification # ___________________
  - ☐ New York State Real Property Tax Law 480A Program,
    Registration # ___________________

A map that shows areas to be harvested, topography, skid road layout, locations of all streams wetlands and water bodies and forest type designation is attached.

Landowner's Objectives for the Property:

Potential Impact from Harvesting on the Ecology of the Site:
(Summary for entire site and actions to minimize the impact should be noted)

Water Quality:

Wildlife:

Aesthetics:

Recreation:

____

____

____

____

Note: A parcel owned by a single landowner may have several forest stands that require different management prescriptions. Information for each stand where biomass will be harvested should be recorded separately.

Stand Number: ___________ Forest Type: _____________________________________

Size (acres): _____________ Age Distribution: ________________________________

Size Class[1]: ______________________________

Dominant Species[2]:

____

____

General Vigor:

____

____

Insect/Disease Problems:

____

____

Harvest History:

____

____

Average Basal Area: ______________ Average Number Trees/acre: _______________

Relative Stocking: ________________________________

Estimated Volume to Harvest: ____________________________

Harvest Objective:

____

____

____

Type of Harvest:

Silvicultural Techniques to be Used:

Best Management Practices (BMPs) to be Implemented:

[1] Size Class Legend	
SS	Seedling/Sapling (1-5" DBH)
SP	Small Pole (6 – 8" DBH)
LP	Large Pole (9 – 11" DBH)
SST	Small Saw Timber (12- 14" DBH)
MST	Medium Saw Timber (15 – 17" DBH)
LST	Large Saw Timber (17+" DBH)
ST	Saw Timber (12 – 17+' DBH)

[2] Tree Species Codes			
Hardwoods		**Softwoods**	
AS	Aspen	BF	Balsam fir
BA	Basswood	BS	Black spruce
BE	Beech	ERC	Eastern red cedar
BC	Black cherry	HE	Hemlock
BO	Black oak	JP	Jack pine
BW	Black walnut	LA	Larch
BO	Bur oak	NWC	Northern white cedar
CO	Chestnut oak	NS	Norway spruce
D	Dogwood	OS	Other softwoods
EL	Elm	PP	Pitch pine
HM	Hard maple/sugar maple	RP	Red pine
HA	Hawthorn	RS	Red spruce
HI	Hickory	SP	Scotch pine
OH	Other hardwoods	TK	Tamarack
PB	Paper birch	WP	White pine
RM	Red maple	WS	White spruce
RO	Red oak		
SBHI	Shagbark hickory		
SVM	Silver maple		
SB	Sweet birch		
WA	White ash		
WO	White oak		
YB	Yellow birch		
YP	Yellow poplar		

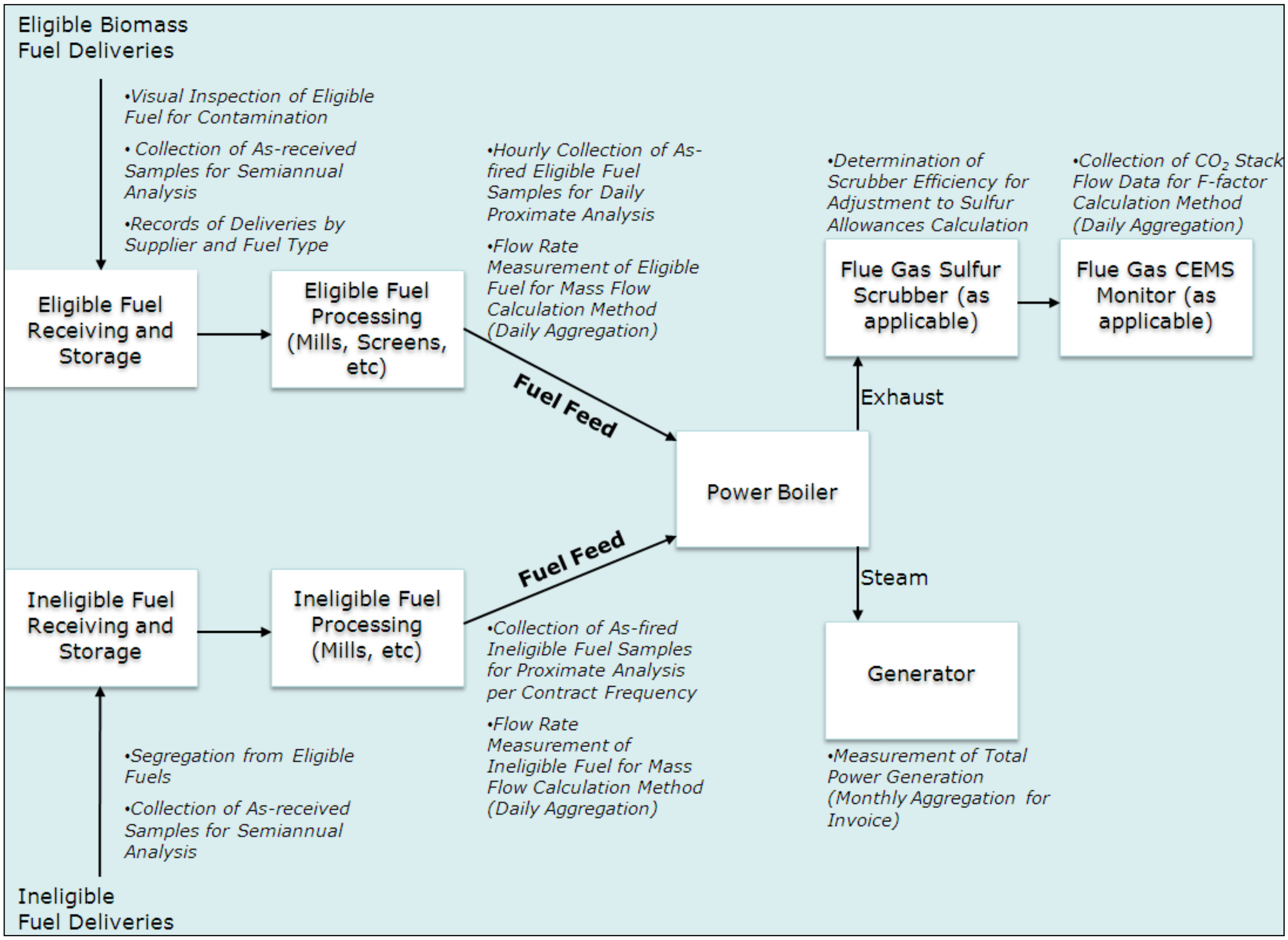
APPENDIX B: COFIRING CALCULATIONS

This Appendix applies to all projects using a combination of eligible biomass fuels, including biofuels and biogas, in combination with ineligible fuels of any type to produce RPS eligible power generation. The calculation methods must be used to determine the amount of power generation that is produced monthly that is eligible for RPS payments under contract to NYSERDA. The appendix begins with calculations for solid fuel cofiring and then discusses landfill gas cofiring, followed by calculations for other biogas and biofuels cofiring operations

SOLID-FUELED COFIRING CALCULATIONS OF RENEWABLE ENERGY GENERATION

A simple block diagram of a sample cofiring arrangement at a RPS-compliant power plant is presented in Exhibit 17. In this diagram, the accounting and measurement concerns related to each step in the cofiring process are listed below that step. This diagram is intended to help illustrate the placement of necessary sampling and measurement points, and may be a useful reference for the following sections. The accepted method to ensure accurate measurement of eligible fuel heat input in any given reporting period is to not mix the fuel streams until they are in the fuel feed lines for firing the boiler or combustion chamber or loading the surge bin for immediate firing. Specifically mixing on the storage pile of other long term storage device is not acceptable. Any exception must be approved by NYSERDA. The principles of cofiring heat input determination and sample calculations are presented below.

Exhibit 17: Typical RPS Measurement Steps in a Sample Cofiring Arrangement



Equation 7: Hourly Heat Energy Input

Two measurements are required to calculate the total heat input of solid biomass into the energy conversion system over time: 1) the mass flow of biomass and 2) the energy content per unit mass. Multiplying these data will provide total biomass heat energy flows. For example:

$$\text{Heat Energy Flow} = \text{Mass Flow} \times \text{Energy Content}$$

$$= 5\ \frac{\text{tons biomass}}{\text{hr}} \times 12\ \frac{\text{MMBtu}}{\text{ton}}$$

$$= 60\ \frac{\text{MMBtu}}{\text{hr}}$$

Given that this calculation is multiplicative, preserving measurement accuracy for the heating value and flow rate of the biomass is imperative. Additionally, the calculation shown above has been conducted on an hourly basis. At a maximum, heat input accounting will be required on a daily basis. Biomass mass flows and material samples may be aggregated to a 24-hour period but the minimum requirements for data collection are mass flow totals reported hourly and material samples taken every three hours.

Biomass Mass Flow Measurements

Regardless of the type of system, tracking the mass flow of biomass fuel into the boiler(s) is a critical component of accounting for the relative contribution of the renewable resource to the unit(s) output. Therefore, the biomass feed system must be designed to meter biomass fuel flows accurately. Acceptable strategies include:

1. The use of differential weighing devices such as loss-in-weight feeders or weigh hoppers properly equipped with devices to track changes in weight over time. These devices can be an accurate and reliable means of measuring biomass fuel flow. In all cases, evidence from field calibration tests and/or manufacturer data for handling biomass materials such as those used on-site for fuel will be required to demonstrate that a high degree of accuracy can be maintained throughout the duty cycle of the equipment. Upon request, projects employing these scales must provide certification that the equipment has been installed by a qualified installer according to the manufacturer's specification and that recommended calibration and maintenance schedules are being followed in accordance with the type of material being weighed.
2. The use of belt scales (integrating weighing device) are also acceptable provided that precautions are taken to ensure continued measurement accuracy. Belt scales make continuous measurements over an extended period of time and it may be difficult to detect measurement drift or the impact that material build-up is having on the readings. External forces such as wind, changes in belt tension and physical interference may introduce measurement errors. Upon request, projects employing these scales must provide certification that the equipment has been installed by a qualified installer according to the manufacturer's specification and that recommended calibration and maintenance schedules are being followed in accordance with the type of material being weighed. This includes, but is not limited to, routine testing for "zero" weight.

Regardless of the individual technology employed, it is imperative that projects demonstrate accurate measurement of the as-fired fuel flow rates

Ultimately, the mass flow measurement data must be recorded and converted into a fuel firing rate, such as tons/hour. Note that projects providing fuel injection sampling and measurements on a near-real-time basis are preferred, but daily accounting of total biomass fuel consumed based on the sampling and measurement intervals described above will be considered acceptable provided the proper tracking protocols are in place. It will be incumbent on plant operators to manage fuel processing in a manner that allows quantitative analysis of fuel flow rates over accurate time frames.

Biomass Fuel Energy Content

Accounting for the biomass fuel's heating value is an equally critical component to measuring fuel heat input. Although some real-time heating value measurement systems are entering the market, they are not in wide use yet. Commonly, fuel heating values are determined via laboratory analysis of batch samples.

It is also important to recognize that fuel moisture content is the single most likely indicator of a biomass fuel's energy content. This fact is easily illustrated by comparing the "bone dry" and "as-received" heating values of different biomass fuels.

Exhibit 9: Heating Value Comparison

Fuel Type	As Received Moisture (Weight %)	As Received Higher Heating Value (Btu/lb)	Bone Dry Higher Heating Value (Btu/lb)
Green Wood	50.0%	4,390	8,780
Willow	10.2%	7,478	8,330
Bark	50.0%	4,185	8,370
Refuse-Derived Fuel (RDF)	20.0%	6,450	8,063
Switchgrass	7.9%	7,370	8,000
Sawdust	52.6%	4,150	8,760

Note that despite the very different nature of the fuels above, the "bone dry" heating values are far less disparate than the differences in the "as received" heating values at the varying moisture levels. In fact, the heating value variance is directly proportional to the moisture in the fuel, so a 50% decrease in moisture content will increase a fuel's heating value by 50%. The effect is similar for ash content, however, non-RDF sources of biomass (especially woody resources[27]) tend to be relatively low in ash, and variations in heating value due to ash content tend to be less dramatic.

Given this data, the following guidelines are offered for establishing baseline fuel composition via chemical analyses and establishing fuel heating values for ongoing heat input calculations via more frequent sampling and testing.

Fuel Supplier/Type Baseline Chemical Analysis

Establishing a baseline fuel composition is described in the Fuel Management and Measurement section of Section 7. Any methodology that relies on infrequent and small samples extracted from large fuel flows assumes that the incoming material is relatively homogenous in chemical composition. When considering biomass fuel supplies, this is a valid assumption if the fuel is being sourced from a reliable broker/supplier with quality

[27] To reiterate discussions from prior sections, solid fuel cofiring projects are limited to using unadulterated biomass resources.

control measures and a contractual obligation to provide a relatively homogenous product of a particular type or blend. In addition to the chemical fuel analyses, plant operators are required to keep fuel supply contracts and other documentation on hand to demonstrate that fuels being converted at the facility are consistent with the RPS program eligibility requirements.

On-site Fuel Sampling/Operations Protocol

Facilities must also perform frequent fuel sampling and analyses to determine as-fired heat content as discussed in the "Fuel Management and Measurement" section of Section 7. The results are used to calculate daily as-fired heating values in the renewable heat input calculations.

Calculation of Total Plant Heat Input

Another key variable in calculating the cofiring percentage is the plant's total heat input while cofiring (shown in the denominator of Equation 1) This Guidebook contemplates two methods of determining the plant's total heat input, both of which are consistent with industry practices.

Method 1: The F-Factor Method

For Facilities with CEMS or CO_2 Emissions Monitors

Most large power plants are required, as a condition of their operating permits, to install and maintain CEMS. The data from these systems are used to report key power plant emissions such as SO_2 and NO_X to regulatory agencies such as the EPA or state air quality organizations. However, these systems are also used to track the total heat input of fuel into the plant. This is useful in measuring the plant's overall efficiency (Plant Heat Rate) and allowing for emissions output to be converted into a rate (lb-pollutant/MMBtu.) Although these heat input calculations rely on fuel chemical characteristics, they depend on measurements of the plant's CO_2 emissions (not fuel flow rates) to determine how much fuel is being consumed. Since these systems are tied to plant environmental performance monitoring, they are also required to be regularly calibrated.

It is also possible that plants not otherwise required to maintain CEMS could install a stack CO_2 emissions monitoring system. Provided that the system and its installation meet the requirements specified for CEMS, the information collected from this type of instrumentation could be used synonymously for the CEMS CO_2 data discussed below.

In addition to being used in single-fuel plants, the underlying EPA methodology also offers guidance on multi-fuel systems. While other methodologies may offer some advantages in calculation simplicity, they do not tie all of the regulatory and plant operational data elements together, and offer less precision in measuring renewable generation.

Calculation mechanics for calculating total plant heat input using plant stack CO_2 emissions relies substantially on a key variable known as a fuel factor or F-Factor for short. There are different values for the F-Factor, but it is primarily dependent on a fuel's carbon content and the way in which CO_2 emissions are being measured at the plant. Assuming the plant CEMS provides CO_2 stack flow data in standard cubic feet (scf) per hour, the F-factor is determined by either (1) multiplying the percent of carbon in the fuel by 321,000 and dividing by the gross calorific value of the fuel; or (2) using the tabulated values set by EPA for the fuel types, as shown in Exhibit 18. To calculate the total heat input of fuel into the boiler over a given time period, the total measured CO_2 flow in the stack is divided by the F-Factor (F_c) with units of scf-CO_2 per MMBtu of fuel input.

Exhibit 18: F-Factors of Common Fuel Types[28]

Fuel Type	Fc (scf/MMBtu)
Coal	
Anthracite	1,980
Bituminous	1,810
Lignite	1,920
Oil	1,430
Gas	
Natural	1,040
Propane	1,200
Butane	1,260
Wood	1,840
Wood Work	1,860

Equation 8: Total Heat Input of Fuel to the Boiler

$$\text{Total Heat Input (MMBtu/hr)} = \frac{\text{Total Measured } CO_2 \text{ flow (scf/h)}}{F_C\text{(scf/h)}}$$

Note that the time frame used in the Equation 8 is based on hourly flow rates. Longer periods are acceptable provided that the guidelines for calculating the composite F-Factor for multi-fuel firing are consistent with the selected time frame. Projects calculating heat input on an hourly rate are preferred, but daily rates will be acceptable if all other data tracking required to support the calculation on this basis are accurate on a daily basis.

Tabulated F_c values for bituminous coal and wood are 1,810 and 1,840 scf per MMBtu, as seen in Exhibit 18 above. Therefore, a cofiring application with 90% bituminous coal and 10% wood has a composite F_c value of 1,813 scf per MMBtu (see Equation 10 below). The proposed method of calculating total heat input during cofiring uses a composite value for F_c based on daily coal and biomass usage. The composite F_c will then be used to determine the total heat input using stack CO_2 flow data. If an hourly cofiring rate (heat basis) is desired, then it can be calculated using hourly biomass heat input data (collected from fuel sampling and mass flow rate data) divided by the total

[28] Procedures for Preparing Emission Factor Documents, Environmental Protection Agency, Table I. F Factors for Various Fuels, November, 1997.

boiler heat input as calculated from the composite F_c-based calculation. Equations for the process are illustrated below.

Equation 9: Total Heat Input from Coal

$$\text{Coal \% Heat In} = \frac{\text{Coal}_{\text{HHV}} \times \text{Coal Flow}\left(\frac{\text{lb}}{\text{day}}\right)}{\left[\text{Coal}_{\text{HHV}} \times \text{Coal Flow}\left(\frac{\text{lb}}{\text{day}}\right)\right] + \left[\text{Biomass}_{\text{HHV}} \times \text{Biomass Flow}\left(\frac{\text{lb}}{\text{day}}\right)\right]}$$

Where HHV is the Higher Heating Value (Btu/lb)

Equation 10: Composite Fuel Factor (F-Factor)

$$F_{\text{C, Composite}} = \left(\text{\% Heat In}_{\text{Coal}} \times F_{\text{C,Coal}}\right) + \left(\text{\% Heat In}_{\text{Biomass}} \times F_{\text{C,Biomass}}\right)$$

After determining these values, the total boiler heat input can be calculated using Equation 8.

Proportion of Eligible Fuels Used at the Facility is Greater than 50%

The measurement of mass flows of the eligible fuel used in production combined with CO_2 data from CEMS and the use of a composite F-Factor is designed to provide the most accurate total heat input value for the calculation of electricity produced from eligible biomass fuel resources. Once the percentage of ineligible fuel fired becomes less than 50% of the total heat input on a consistent basis, it may be more practical to measure the heat input of the eligible biomass fuel using the ineligible fuel input and the inverse equation below.

$$\text{Cofire \% Biomass} = 100 \times \left(1 - \frac{\text{Ineligible Fuels Heat Input}}{\text{Total Heat Input}}\right)$$

This alternative requires that the facility apply the same methodology and standards for measurement to the ineligible fuel that it would have applied to the eligible fuel in the basic method described at the beginning of this appendix. The method is especially useful when only one ineligible fuel with very consistent composition is involved and the percent of the mix is 20% or less on a heat input basis.

Method 2: The Mass and Energy Flow Method

For Facilities with or without CEMS or CO_2 Emission Monitors

The primary issue of universal application of the method described above is that plant CEMS are not required on older (installed prior to the EPA Acid Rain program) fossil fuel-fired boilers under 25 MW. As it would represent an unreasonable burden to impose the installation of such equipment (these systems can be expensive to install and maintain), an alternate heat input apportionment method is offered for facilities not otherwise required to have a CEMS. A facility equipped with CEMS may also choose to use the method described below, provided that the method will employ mass and energy flow measurement systems that will have accuracy comparable to that of the F-Factor method described at the beginning of this section and in the measurement sections of the guide. This will require frequent and accurate measurements of mass flow, not only for eligible fuels, but now also for all ineligible fuels, as well as more frequent proximate analyses. Although gravimetric feeders for ineligible fuels like coal can be as well maintained and calibrated as those for eligible fuels, there is no requirement for maintaining the accuracy of such systems for regulatory compliance and there is usually no built-in device for fuel sampling. Provisions for fuel sampling would have to be added at feeders as they are for the eligible fuel stream.

Although not as precise or rigorous[29], the use of fuel receipts and regular chemical composition data offers a verifiable and analytical measurement technique for determining the total boiler heat input. One acceptable procedure is to combine the biomass mass flow and heating value data with similar information collected for the ineligible fuels used. In other words, regular fuel sampling of the ineligible fuel portion combined with mass flow measurements across discrete time frames will provide a consistent and practical means of measuring total heat input.

For example, calculation of the total heat input to a boiler over a 24-hour period would be based on feeder weight totalizer readings, sample HHV data for the coal, and the same data for the biomass heat input. However, it will be incumbent on plant operators to demonstrate that their separate eligible and ineligible fuel sampling and mass flow measurement systems are accurate enough to provide a high degree of certainty that the total heat input to the boiler is being calculated. Projects employing this methodology can use steam condition and production information coupled with recent boiler efficiency data[30] to cross check results and ensure that total heat input calculations are reliable. Alternatively, a CEMS-equipped facility can cross-check results obtained by the mass and energy flow method with results obtained by the F-Factor method.

SAMPLE CALCULATIONS

Solid Fuel Cofiring—Method 1: F-Factor Calculation Example

New York Boiler 1, with a current net output of 435 MW, consumes 200 tons/hr of bituminous coal and cofires 10 tons/hr of clean wood waste for a 24 hour period. The coal and wood waste have HHV of 12,500 Btu/lb and 6,500 Btu/lb, respectively. The CO_2 stack gas flow at full load is 9,050,000 scf per hour during both cofiring and coal only operation. The calculations below show the renewable power generated for the 24 hour period.

% Coal Heat Input $_{\text{Daily Average}}$ (Equation 9):

[29] Biomass cofiring, particularly at high heat input levels, does have a small but measurable impact on boiler efficiency which is not captured if calculations rely on existing boiler efficiency data.

[30] There are several methods of measuring boiler efficiency data. However, this reference does not imply calculated values based on estimates of heat loss taken from original boiler commissioning data. If the heat loss method is employed, operators should provide recent supporting data provided by third-party measurements of boiler performance.

$$= \frac{12{,}500\frac{\text{Btu}}{\text{lb}} \times 400{,}000\frac{\text{lb}}{\text{hr}} \times 24\frac{\text{hr}}{\text{day}}}{\left(12{,}500\,\frac{\text{Btu}}{\text{lb}} \times 400{,}000\,\frac{\text{lb}}{\text{hr}} \times 24\,\frac{\text{hr}}{\text{day}}\right) + \left(6{,}500\,\frac{\text{Btu}}{\text{lb}} \times 20{,}000\,\frac{\text{lb}}{\text{hr}} \times 24\,\frac{\text{hr}}{\text{day}}\right)}$$

$$= 0.975 \text{ or } 97.5\%$$

$F_{c,}$ Composite (Equation 10):

$$= (0.975 \times 1{,}810) + (0.025 \times 1{,}840)$$

$$= 1{,}811 \text{ scf } CO_2/\text{MMBtu}$$

Total Heat Input in MMBtu/hr (Equation 8):

$$= \frac{9{,}050{,}000 \text{ MMBtu}}{1{,}811 \text{ hrs}}$$

$$= 4{,}997\,\frac{\text{MMBtu}}{\text{hr}}$$

Cofire % Biomass (Equation 1):

$$= \frac{6500\,\frac{\text{Btu}}{\text{lb}} \times 20000\,\frac{\text{lb}}{\text{hr}}}{10^6\frac{\text{Btu}}{\text{MMBtu}} \times 4{,}997\frac{\text{MMBtu}}{\text{hr}}}$$

$$= 2.6\%$$

Renewable Generation (Equation 2):

$$= 2.6\% \times 435 \text{ MW} \times 24\text{hr}$$

$$= 271.2 \text{ MWh}$$

Solid Fuel Cofiring—Method 2: Mass and Energy Flow Calculation Example

New York Boiler 2, with a current net output of 435 MW, consumes 200 tons/hr of bituminous coal and cofires 10 tons/hr of clean wood waste for a 24 hour period. The coal and wood waste have HHVs of 12,500 Btu/lb and 6,500 Btu/lb, respectively. The calculations below show the renewable power generated for a 24 hour period.

Hourly Heat Input (Equation 7):

$$= \left(12{,}500\,\frac{\text{Btu}}{\text{lb}} \times 400{,}000\frac{\text{lb}}{\text{hr}}\right) + \left(6{,}500\frac{\text{Btu}}{\text{lb}} \times 20{,}000\frac{\text{lb}}{\text{hr}}\right)$$

$$= 5{,}130 \text{ MMBtu/hr}$$

Cofire % Biomass (Equation 1):

$$= \frac{6500\,\frac{\text{Btu}}{\text{lb}} \times 20{,}000\frac{\text{lb}}{\text{hr}}}{5130\,\frac{\text{MMBtu}}{\text{hr}} \times 10^6\frac{\text{Btu}}{\text{MMBtu}}}$$

$$= 2.5\%$$

Renewable Generation (Equation 2):

$= 2.5\% \times 435 \text{ MW} \times 24\text{hr}$

$= 261.6 \text{ MWh}$

GAS AND LIQUID FUELED DIRECT CONVERSION CALCULATIONS

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.

Calculation of Biomass Heat Input

As with solid biomass fuels, the chemical composition of biomass gas fuels (LFG, biomass syngas, and gases generated from anaerobic digesters) can vary substantially. For example, gasification will yield different gas compositions based on feedstock type and design, while LFG compositions will vary based on the contents of the landfill, landfill conditions, and the level of gas clean-up required prior to energy conversion. Digesters will yield different gas compositions according to the material being digested and digester conditions.

To reduce the effects of biomass fuel variability on eligible power generation calculations, gaseous fuels will be sampled and analyzed on a daily basis. Assessing the heating value of gases requires specialty equipment. Methane content analyzers are used on a continuous basis at LFG projects for this purpose and may be used for digester gas as well. Gasification projects will need to install gas analyzers that can serve the same purpose for their product gas.

In contrast, liquid biomass fuels (biodiesel, ethanol, renewable diesel, and many more) are expected to be more consistent, as these are produced consistently to a specification such that only fuel flow would need to be measured and totaled monthly. Renewable diesel that is the result of a synthesis process may have a varying chemical composition depending on the synthesis conditions used, but it should be consistent as long as it is from that same process. Annual analyses of the heat content of biofuels should be sufficient for accurate cofiring calculations.

Regardless of type, calculation of the heat input from biomass-derived non-solid fuels requires measurement of the biogas or biofuel flow and heat content as-fired. A single LHV or HHV will be applied to the entire volumetric flow for the day based on fuel analysis data. The necessary fuel analysis data will provide the composition and heating value.

Equation 11: Daily Heat Input for Eligible Fuels

Daily Heat Input for Eligible Fuels = $\text{HI}_{\text{EF}} = \text{HV}_{\text{EF}} \times \sum_{24} \text{V}_{\text{EF}}$;

Where:

HV_{EF} = Heating Value (Lower or Higher) of eligible fuel, (Btu/scf or Btu/gal)

V_{EF} = Daily volumetric flow of eligible fuel, as-fired (scf/day or gal/day)

The Heat Input from Ineligible fuels (HI_{IF}) will be determined by the same method used for Eligible fuels (HI_{EF}). If only one ineligible fuel of uniform composition is used then the calculation is simplified to a single equation (Equation 12A).

If multiple ineligible fuels are fired simultaneously in any day, then the contractor must measure the flows of each type of ineligible fuel prior to blending and use. In this case, Equation 12B is used to calculate the total heat input of ineligible fuels.

Equation 12: Daily Heat Input for Ineligible Fuels

Daily Heat Input for Ineligible Fuels can be calculated using one of the two following equations:

Equation 12A) $$HI_{IF} = HV_{IF} \times \sum_{24} V_{IF}$$

OR

Equation 12B) $$HI_{IF} = \sum_{\text{ineligible fuel types}} HV_{IF} \times \sum_{24} V_{IF}$$

Where:

HV_{IF} = Heating Value (Lower or Higher) of ineligible fuel, as-fired (Btu/scf, Btu/lb or Btu/gal)

V_{IF} = Daily Hourly Aggregate Mass flow of ineligible fuels, as-fired (scf/hr, lb/hr, or gal/hr)

Facilities with CEMS or CO_2 Emissions Monitors

Gas- or liquid-fired facilities equipped with CEMS can use the same F-Factor-based methodology presented for the solid fuel cofiring case. Readers should refer to that section for a detailed explanation of this procedure. However, the composite F-Factor required to complete this calculation for gas- or liquid-fired projects will vary in three ways.

1. The F-Factors for the fossil-derived fuel (most likely natural gas or fuel oil) will be different and the F-Factor value for the biomass-derived fuel will have to be calculated (there are no tabulated F-Factors for biomass-derived syngas or liquid biomass fuels) using EPA guidelines;
2. The exact formula for back-calculating the plant's total heat input from the composite F-Factor may be different based on differences in the way CO_2 is measured in the CEMS.
3. Biomass heat input will be based on volumetric or mass flow meters for the biomass-derived fuel and estimates of the heating value.

As with the solid fuel cofiring case, operators of these plants will still be required to maintain sufficient records about the amounts and times when they are cofiring fuels. Similarly, hourly estimates of the cofiring rate and renewable generation output are preferred, but daily apportionment may be acceptable if gas or liquid compositional variability can be demonstrated to be minimal and repeatable either by management of like feedstock conversion or gas production conditions.

In all cases, facilities should conduct semiannual testing to verify ongoing consistency in fuel composition, as directed in Section 7. More frequent testing may be required if variability is indicated.

Facilities without CEMS or CO_2 Emission Monitors

In some circumstances, the application of the methodology described above may be impractical or impossible. Under such circumstances, alternatives to measuring the total plant heat input and renewable generation are offered below.

Biomass-derived gas cofiring projects that use gas generated and cleaned for on-site conversion, which also demonstrate minimal variation in the gas heating value, should use daily gas flow meter readings and natural gas flow meter readings to calculate total heat input to the conversion device. Renewable generation can then be apportioned on a daily basis using Equation 1 and Equation 2. Similarly, facilities using liquid fuels that demonstrate heating value consistency may use daily flow meter readings and ineligible fuel flow meter readings or weight measurements to calculate total heat input.

If the use of meters is impractical (high temperatures or other concerns), projects are encouraged to develop calibration curves. This method requires project prequalification testing using different fuels at different load levels. The testing protocol will require maintaining the rate of ineligible heat input into the conversion device steady, while progressively introducing more biomass-derived gas across the entire cofiring heat input range. Using data from multiple loads and fuels, a correlation curve can be developed to directly calculate renewable power generation from biomass heat input levels which properly accounts for changes in conversion efficiency. However, before considering this methodology, project developers should seek additional guidance and alternatives will be considered.

RPG-FUELED COFIRING CALCULATIONS OF RENEWABLE GENERATION

This is based on the full quantity of biomass-derived fuel heat input based on the RPG volumes newly contracted for the RPS. The contracted RPG flow rate is 100,000 cf/day for a 70 MW combined cycle plant with a total average daily gas consumption of 13,440,000 cf/day. The contracted cofiring percentage (average daily basis) would be calculated as follows:

$$\text{Contracted Cofiring \%} = \frac{100{,}000\,\frac{\text{cf}}{\text{day}} \times 1{,}000\,\frac{\text{Btu}}{\text{cf}}}{13{,}440{,}000\,\frac{\text{cf}}{\text{day}} \times 1{,}000\,\frac{\text{Btu}}{\text{cf}}} = 0.7\%$$

Using the 70MW base-loaded plant as an example, the renewable generation output calculated using this value is as follows:

$$\text{Renewable Generation}_{\text{contractual}} = 70{,}000\ \text{kW}\ \times 24\,\frac{\text{hrs}}{\text{day}} \times 0.7\% = 11{,}760\ \text{kWh}$$

APPENDIX C: SAMPLE FUEL MANAGEMENT, MEASUREMENT, AND CALIBRATION PLAN

As a guide to plan layout and presentation Appendix C provides a model for organizing the contents of the plan. Topics that apply to biomass power generation facilities that use a combination of eligible and ineligible fuels and Clean MRF Fuels are clearly identified. These facilities participating in the RPS program must carefully measure and sample the component fuel streams in order to receive RPS payments under contract to NYSERDA.

Fuel Management, Measurement, and Calibration Plan

[*Facility Name*]
[*NYSERDA Contract #*]
[*Date Prepared*]

1. PLANT DESCRIPTION:

Describe plant generating capacity, permitted fuels, and proportions of fuel types fired at the facility.

2. FUEL PROCUREMENT:

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

3. FUEL MANAGEMENT AND INSPECTION:

Describe fuel management and inspection procedures will be specific to the facility and types of fuels and equipment used in the receiving area and fuel yard.

Handling and Inspection of Eligible Fuel:

A. Eligible Fuel Handling:
    a. Description of fuel transport from the plant gate to fuel storage areas
    b. Diagram of the receiving and storage area
    c. Mixing and Managing Eligible Fuel Inventory
B. Eligible Fuel Delivery Tracking and Inspection procedures:
    a. Weighing In/Out
    b. Quality Inspection (on arrival and during unloading)
    c. Maintaining Fuel Delivery & Inspection Log

Handling and Inspection for Ineligible Fuels or Clean MRF Fuels (as applicable):

A. Fuel Handling
    a. Segregation of Ineligible Biomass
    b. Segregation of Clean MRF Fuels

c. Description of fuel transport from the plant gate to fuel storage areas
d. Diagram of the receiving and storage areas
e. Managing Fuel Inventory

B. Delivery Tracking and Inspection
   a. Weighing In/Out
   b. Quality Inspection (on arrival and during unloading)
   c. Maintaining Fuel Delivery & Inspection Log

4. OPERATING PROCEDURES:

Present the procedures that will be distributed to facility employees that manage and are responsible for fuel sampling, tracking and flow measurement.

A. Staff Responsibilities
B. Fuel receiving and inspection
C. Fuel Handling and Storage
D. Fuel reclaim and feed
E. Fuel sampling
F. Equipment Calibration

5. FUEL FLOW MEASUREMENT AND SAMPLING:

Describe the fuel measurement system that is intended to provide sufficient information to calculate the quantities specified in the contract. Specifically, describe the equipment that provides accurate energy flow measurement including maintenance and calibration procedures. For facilities the use eligible fuels only this covers the truck scales for solid fuels or liquid fuel deliveries and flow meters for gaseous fuel deliveries.

Measurement and Accounting for Heat input from Eligible and Ineligible Fuels
Required for facilities firing eligible and ineligible fuels or Clean MRF Fuels
This section should include the following topics:

A. Description and layout of fuel loading and transport systems to the boiler including the location of fuel flow measurement and sampling points
B. Fuel sampling procedures (as applicable ongoing heat content and moisture analysis, semiannual analysis or Clean MRF Fuel quality analysis requirements)
C. Flow measurement and recording procedures
D. Schedule for fuel sampling and analysis

Provide description of how fuel heat inputs to boiler are to be determined. Details should cover:

A. List and define the measurement variables that will be collected and equations used to determine eligible renewable power (Appendix E).
B. All the components of the fuel measurement and sampling system: truck scales, weigh belts, weigh hoppers, flow meters, collection methods, etc.
C. Redundancies or systems checks that are in place to ensure accuracy between calibrations or in case of system failure.

D. Data collection and storage and protection
E. Systems in place for measurement of Clean MRF Fuel flows, including determination of glued wood content.

The Plan should make clear how the sampling protocols ensure that the samples are representative of each individual fuel stream. Describe fuel sample handling procedures, including chain-of-custody documents that will be used by both on-site and outside laboratories. State how proof of the laboratories' qualifications and adherence to applicable industry standards will be provided to NYSERDA and where this proof will be maintained as required under the NYSERDA RPS contract. If on-site labs will be used, calibration protocols for all laboratory measurement equipment must be provided to NYSERDA.

Calibration and Accuracy Specifications
State the tolerance of all measurement equipment. Give a calibration schedule for each piece of equipment, stating how often it is to be calibrated and whether by the facility's own staff or a third party. Details of the calibration procedures themselves, including a sample calibration log, should be included as an attachment and referenced here if necessary. Any deviations between these procedures and the manufacturer's recommended calibration procedure should be noted and explained. The plan should provide:

A. As a separate attachment, the facility 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.
B. A calibration schedule for each of these components[31].
C. *Pro forma* calibration log that includes:
    a. Description of the calibration protocol
    b. Certifications for 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.

6. FUEL TESTING AND ANALYSIS:

For eligible fuels derived from secondary sources describe the test protocols and identify the laboratories that will perform the tests to establish a baseline fuel composition for

A. RCRA metals,

[31] Typically, gravimetric scales for ineligible fuels are to be calibrated no less than twice per year; and belt scales for eligible fuels are to be calibrated no less than once per month. Similarly, gas chromatographs or other analyzers used to continuously determine fuel compositions will need to be calibrated at least monthly in those facilities that use these measurements in a cofiring calculation. Gaseous or liquid flow meter calibration requirements depend strongly on meter type, but third-party calibration will typically be required at least annually.

B. sulfur,
C. copper

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.

Fuel Quality Tests for Eligible and Ineligible Fuel Use
Required for facilities firing eligible and ineligible fuels or Clean MRF Fuels
Describe how fuel testing as determined by the facility's fuel types will be performed in accordance with the NYSERDA contract. Identify the test protocols and the laboratories that will perform the tests and the frequency of testing:

A. moisture content,
B. heat or methane content,
C. sulfur
D. proximate analysis
E. ultimate analysis
F. fuel quality analysis for Clean MRF Fuels

Describe the turnaround time for sending samples and receiving results, and what will be done if this turnaround time is exceeded.

ATTACHMENTS

Include all of the attachments noted above, as well as operating manuals for measurement equipment, in order to document calibration procedures.

APPENDIX D: CALCULATION OF RPS-RELATED SULFUR REDUCTIONS

This appendix is applicable to all facilities that cofire RPS eligible and ineligible fuels where the ineligible fuels have greater sulfur content than the biomass fuels and therefore generate excess sulfur reductions, which are claimed by NYSERDA under the RPS contract.

EXAMPLE CALCULATION FOR COAL AND WOOD CHIP COFIRING—NO SULFUR CONTROLS

As noted in Section 8, the basic steps in this calculation are:

1. Calculate Test Margin.
2. Calculate sulfur emissions due to only eligible fuels.
3. Calculate sulfur emissions had only ineligible fuels been fired.
4. Calculate RPS-related emissions reduction

Assume for this example that the EPA permits 1000 tons per month of SO_2 to be emitted from a coal fired power plant with no sulfur control technologies. This plant enters an RPS contract and in one month produces 55,000 MWh, of which 6,000 MWh have been determined (via the methods described above) to be generated from eligible fuels. Actual sulfur emissions were found to be 950 tons of SO_2. The eligible fuels fired during that month were 3,000 tons of green wood chips with an as-received sulfur content of 0.010 weight% and 3,300 tons of wood wastes with an as-received sulfur content of 0.0150 weight%.

Calculate Test Margin

Sulfur Reductions Test Margin (Equation 4) = $E_P - E_A$

$$= 1{,}000 \text{ tons } SO_2 - 950 \text{ tons } SO_2$$

$$= 50 \text{ tons } SO_2$$

As this is a positive value, excess sulfur reductions exist. The RPS rules permit facilities to retain the amount of sulfur reductions necessary to meet permitted emissions for the facility. Reductions in excess of the permitted limits are attributable to the state and any allowances associated with the reductions are retired with each RPS payment for eligible renewable generation.

Calculate Sulfur Emissions Due to Only Eligible Fuels

Here, there are multiple types of eligible fuel. A weighted average must be taken of the sulfur content of the fuels.

Percent Mass of Sulfur in Eligible Fuels:

$$= \frac{\left(3{,}000 \text{ tons wood chips } \times 0.00010 \frac{\text{tons sulfur}}{\text{ton wood chips}}\right) + \left(3{,}300 \text{ tons wood wastes } \times 0.00015 \frac{\text{tons sulfur}}{\text{ton wood chips}}\right)}{(3{,}000 \text{ tons } + 3{,}300 \text{ tons})}$$

$$= 0.000122 \ \frac{\text{tons sulfur}}{\text{ton biomass fuel}}$$

Now, Equation 5 can be used, with zero as the scrubber efficiency to indicate that there is no scrubber:

Sulfur Emissions from Eligible Fuels = E_E

$$E_E = \text{Dry Tons of Eligible Fuel Fired} \times \text{Percent Mass of Sulfur in Eligible Fuels} \times \frac{64 \text{ g } SO_2}{32 \text{ g S}} \times (1 - \text{Removal Efficiency of Scrubbing System})$$

$$E_E = 6{,}300 \text{ tons } \times 0.000122 \ \frac{\text{tons S}}{\text{ton fuel}} \times \frac{64 \text{ g } SO_2}{32 \text{ g S}} \times (1 - 0)$$

$$E_E = 1.59 \text{ tons } SO_2$$

Calculate Sulfur Emissions had Only Ineligible Fuels Been Fired

Emissions from Ineligible Fuels (Equation 6) = E_{IF}

$$E_{IF} = \frac{(E_A - E_E) \times \text{Total Power Production}}{\text{Total Power Production} - \text{Power Production from Eligible Fuels}}$$

$$E_{IF} = \frac{(950 \text{ tons } SO_2 - 1.59 \text{ tons } SO_2) \times 55{,}000 \text{ MWh}}{55{,}000 \text{ MWh} - 6{,}000 \text{ MWh}}$$

$$E_{IF} = 1{,}065 \text{ tons } SO_2$$

Please note that this is greater than the EPA-permitted emissions. Only those emissions reductions below permit levels can be counted as excess reductions. Thus, the RPS-related excess reductions in this case will **not** be the difference between ineligible-only and RPS emissions, but rather the difference between the permit level and the actual emissions.

Calculate RPS-Related Emissions Reduction

RPS-Related Excess Reductions (Equation 3) = E_P - E_A

$$= 1{,}000 \text{ tons} - 950 \text{ tons}$$

$= 50 \text{ tons } SO_2$

50 tons of sulfur excess reductions will be transferred to NYSERDA for that month under RPS guidelines.

EXAMPLE CALCULATION FOR COAL AND WOOD CHIP COFIRING WITH SULFUR CONTROLS

As noted in Section 8, the basic steps in this calculation are:

1. Calculate Test Margin.
2. Calculate sulfur emissions due to only eligible fuels.
3. Calculate sulfur emissions had only ineligible fuels been fired.
4. Calculate RPS-related emissions reduction

Assume for this example that the EPA permits 1000 tons per month of SO_2 to be emitted from a coal fired power plant with sulfur control technologies that are 96% efficient. This plant enters an RPS contract and in one month produces 55,000 MWh, of which 6,000 MWh have been determined (via the methods described above) to be generated from eligible fuels. Actual sulfur emissions were found to be 45 tons of SO_2. The eligible fuels fired during that month were 10,000 tons of green wood chips with an as-received sulfur content of 0.010 weight%.

Calculate Test Margin

Sulfur Reductions Test Margin (Equation 4) = $E_P - E_A$

$= 1{,}000 \text{ tons} - 45 \text{ tons}$

$= 955 \text{ tons } SO_2$

As this is a positive value, excess sulfur reductions exist.

Calculate Sulfur Emissions Due to Only Eligible Fuels

Sulfur Emissions from Eligible Fuels (Equation 5) = E_E

$$E_E = \text{Dry Tons of Eligible Fuel Fired} \times \text{Percent Mass of Sulfur in Eligible Fuels} \times \frac{64 \text{ g } SO_2}{32 \text{ g S}} \times (1 - \text{Removal Efficiency of Scrubbing System})$$

$$E_E = 10{,}000 \text{ tons} \times 0.00010 \frac{\text{tons S}}{\text{ton fuel}} \times \frac{64 \text{ g } SO_2}{32 \text{ g S}} \times (1 - 0.96)$$

$$E_E = 0.080 \text{ tons } SO_2$$

Calculate Sulfur Emissions had Only Ineligible Fuels Been Fired

Sulfur Emissions from Ineligible Fuels (Equation 6) = E_{IF}

$$E_{IF} = \frac{(E_A - E_E) \times \text{Total Power Production}}{\text{Total Power Production} - \text{Power Production from Eligible Fuel}}$$

$$E_{IF} = \frac{(45 \text{ tons } SO_2 - 0.080 \text{ tons } SO_2) \times 55{,}000 \text{ MWh}}{55{,}000 \text{ MWh} - 6{,}000 \text{ MWh}}$$

$$E_{IF} = 50 \text{ tons } SO_2$$

Calculate RPS-Related Emissions Reduction

RPS-Related Excess Reductions (Equation 3) = E_{IF} - E_A

$$= 50 \text{ tons } SO_2 - 45 \text{ tons } SO_2$$

$$= 5 \text{ tons } SO_2$$

Five tons of sulfur excess reductions will be claimed by NYSERDA for that month under RPS guidelines.

APPENDIX E: SAMPLE OPERATIONAL CERTIFICATION CHECKLIST

The following is a sample operational certification checklist. The complexity of the on-site inspection varies greatly by project type. The most complex inspections are associated with cofiring eligible and ineligible fuels or firing Clean MRF Fuels in the fuel mix. *Items in italics below are generally only required for the more complex multi-fuel projects.*

Purpose: The goal is to verify that the contractor has in place the measurement systems, data tracking, reporting systems and operating procedures that will ensure accurate accounting of the RPS-eligible attributes generated at the facility and accurate billing of NYSERDA.

OPERATING PROCEDURES REVIEW PRIOR TO INITIAL OPERATIONAL CERTIFICATION ON-SITE INSPECTION

- ❑ Review pro forma biomass supply contracts to be used as the model for all biomass fuel contracts to ensure that the biomass fuels specification is consistent with the definition of eligible fuels; Review fuel test data for each supplier.
- ❑ Review Forest Management Plan for facilities intending to use forest harvested biomass.
- ❑ Review Fuel Management, Measurement, and Calibration Plan including:
    1. Fuel Delivery inspection and acceptance procedures
    2. *Review procedures for biomass fuels sampling, handling/storage of samples and delivery to the analysis lab. Review the lab's qualifications and background in fuel analysis.*
    3. *To the extent required in the NYSERDA contract, review plans for aggregating data to the hourly, daily, and/or monthly reporting level.*
- ❑ Fuel Analysis Report:
    1. Semiannual fuel analyses for eligible fuels
    2. *Semiannual fuel analyses for ineligible fuels and for waste fuels*
    3. *Initial fuel test reports for Clean MRF fuels.*

ON-SITE PHYSICAL INSPECTION CHECKLIST

- ❑ Discuss all types of fuels permitted to be fired at the facility & annual proportions of heat input.
- ❑ *Inspect mass flow and heat measurement systems in context of the facility's fuel management plan and contract requirements:*
    1. *Inspect placement and types of measuring systems, including gravimetric feeders, weigh belts and truck scales for each distinct fuel stream.*
    2. *Observe method for determining when each type of fuel from storage is crossing the weigh belt on its way to be fired.*
    3. *Inspect sampling points for convenience and access (including sample collection for fuel moisture)*

4. *Inspect the placement of data logs (manual and/or electronic)*
5. *Discuss operational accuracy and any maintenance or repair issues within the last year and results and timing of most recent calibrations.*

- ❑ Inspect the fuel yard and receiving area
  1. Discuss operations and methods for fuel inspection and sampling to assure that only clean unadulterated biomass fuels are accepted. Discuss visual cues to be used for load rejection on inspection.
  2. Observe fuel routing for deliveries to the storage.
  3. Observe inspections: incoming delivery, grid test if required, delivery unloading
  4. If possible observe "simulated" load rejection and recovery at the unloading point.

DATA TRACKING AND REPORTING SYSTEMS

- ❑ *Discuss the implementation and use of the fuel tracking spreadsheets*
  1. *Recording fuel mass flow measurements and tracking*
  2. *Fuel (eligible/ineligible) heat input calculations*
  3. *Review SO_2 tracking and reporting*
- ❑ *Collect/review most current ultimate fuel analysis for eligible and ineligible fuels.*

OPERATING PROCEDURES

- ❑ Review Fuel Management Plan especially with regard to fuel QA/QC procedures. Discuss plans for dealing with delivered fuel if a fuel load fails to meet the specification on inspection.
- ❑ Review fuel procurement contracts to ensure that the biomass fuels specification is consistent with the definition of eligible fuels and that fuel QA/QC requirements are included.
- ❑ *Review calibration recommended frequency per OEM and plans and records for calibration for all mass flow/heat input measurement devices.*
- ❑ *Review the maintenance plans for measurement systems and discuss what steps will be taken to exclude periods of firing when any of the devices goes down.*
- ❑ *Review Plant Information system record keeping procedures and how data will be transferred to the fuel tracking spreadsheets.*
- ❑ *Review procedures for biomass fuels sampling, handling/storage of samples and delivery to the analysis lab. Review the labs qualifications and background in fuel analysis.*
- ❑ *Review written procedures distributed to plant staff on data recording protocols, sampling protocols or other information necessary to ensure that the responsible staff understand their roles and responsibilities for ensuring RPS compliance.*

APPENDIX F: TEST REPORTING FORM FOR CLEAN MRF FUELS

The limits listed in the second column of the reporting form below were adopted by the PSC. [32] Meeting these limits does not guarantee the fuel will meet the requirements for "clean unadulterated wood" for NYSDEC Division of Air Resource permitted facilities[33]. NYSDEC Policy DAR-3 provides the details of Alternative Fuel Policy. Different versions of the same test method as designated by the test method suffix letter are all acceptable.

MRF Fuel Quality Testing				Monthly Super Sample Results (ppm)
MRF Fuel Quality Analysis	**Limit (total)**	**EPA Test Method**		
Arsenic (ppm)	50.00	SW 846-6010C		
Cadmium (ppm)	20.00	SW 846-6010C		
Chromium (ppm)	200.00	SW 846-6010C		
Lead (ppm)	250.00	SW 846-6010C		
Selenium (ppm)	20.00	SW 846-6010C		
Silver (ppm)	100.00	SW 846-6010C		
Titanium (ppm)	300.00	SW 846-6010C		
Zinc (ppm)	200.00	SW 846-6010C		
Mercury (ppm)	0.20	SW 846-7471		
Total Pesticides(1) (ppm)	0.16	SW 846-8081B		
Total Herbicides(2) (ppm)	0.50	SW 846-8151A		
PCBs (ppm)	20.00	SW 846-8082A		
O, M, and P Cresols (ppm)	1,200.00	SW 846-8270D		
Chlorine (ppm)	1,500.00	ASTM D6721		
Meets Standard?				Yes/No

[32] Established in the 2010 Order as maximum limits for any MRF Clean Fuel with all limits in parts per million (ppm)

[33] NYSDEC Policy DAR-3: Unadulterated wood means wood that is not painted or treated with chemicals such as glues, preservatives or adhesives. Any painted wood or chemically treated wood (e.g., pressure treated wood, treated railroad ties) or wood containing glues or adhesives (e.g., plywood, particle board) is considered adulterated wood. [Paragraph 360-1.2(b)(175)]

Specific Pesticides and Herbicides to be analyzed and totaled are listed below:

[1]Pesticides tested for include:			Monthly Super Sample
Analyte	***Cas Number***	***EPA Test Method***	
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	
Total:			-

[2]Herbicides tested for include:			Monthly Super Sample
Analyte	***Cas Number***	***EPA Test Method***	
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	
Total:			-

EPA SW846-SV 8270 can be used as an alternate test method to EPA SW 846-8151A for pentachlorophenol.

Contaminants evaluated by visual inspection on each delivery:

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

Note: Total Non-wood excludes soil and metal fasteners which are not combustible.