

Attachment G



Renewable Heat New York Biomass Boiler Program Manual

PON 3010

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New York State Energy and Research Development Authority

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1.0 PROGRAM SUMMARY

1.1 What Is The Renewable Heat NY Biomass Boiler Program?

The New York State Energy Research and Development Authority (NYSERDA) provides incentives for the installation of approved residential and small commercial pellet boilers and advanced cordwood boilers with thermal storage for eligible customers. The goal of the program is to spur wider market adoption and foster a long-term commitment to help the high-efficiency and low-emission wood heating industry reach commercialization scale. Direct incentives for residential and small commercial boilers initially target high-emitting outdoor wood boilers (OWB), indoor wood boilers (IWB), and older wood stoves for retirement. Replacements include low-emission pellet stoves (identified on the EPA Certified Wood Heaters list) and high-efficiency pellet boilers with thermal storage or advanced cordwood boilers with full thermal storage that have been tested by the Brookhaven National Lab method and accepted by the New York State Department of Environmental Conservation (NYSDEC). Residential and small commercial boiler incentives will be provided on a first-come, first-served basis.

1.2 How Does the Renewable Heat NY Program Work?

Financial incentives are available for qualified customers who wish to install qualified wood or pellet boiler systems through applications submitted by an Eligible Installer/Contractor. Low-interest rate loans are also available through the Green Jobs Green New York (GJGNY) Financing Program. Renewable Heat NY incentives are granted on a first-come, first-served basis, and applications will be accepted through December 31, 2018, or until funds are fully committed, whichever comes first. Financial incentives are available for qualified customers through applications submitted by an Eligible “Installer/Contractor.”

Eligible Installers/Contractors must have demonstrated technical competence in the design and installation of advanced cordwood boilers and pellet boilers and have signed a written Participation Agreement with NYSEDA agreeing to the RHNY Program terms and conditions. Incentives are paid directly to the Contractor but must be passed on in-full to the customer as a reduction in the customer’s out-of-pocket cost. Eligible Installers/Contractors are responsible for preparing and submitting all necessary incentive paperwork to NYSEDA.

For more information on the Renewable Heat NY, the Customer Step-By-Step Guide (Attachment A) explains the various steps to participating in RHNY.

1.3 Eligible Technologies

Eligible technologies are advanced cordwood boilers and pellet boilers that have an output of 300,000 British thermal units per hour (Btu/hr) or less, as described below.

Pellet Boiler Heating Systems (<300,000 Btu/hr)¹ with Full Thermal Storage: Incentives are available for pellet boiler heating systems with full thermal storage per requirements outlined in Table 1. All pellet boiler heating systems must include a high-efficiency pellet-fired boiler with a thermal storage (buffer) tank meeting the requirements in the table below and as described in the Program Manual. Pellets must be stored outside of the building as outlined in the Program Manual (Attachment G).

Table 1: Pellet Boiler Heating System Minimum Requirements:

High-Efficiency and Low-Emissions Pellet Boiler Performance for All Systems	
Thermal Efficiency (HHV)	85%
Particulate Emissions	<0.080 lb/MMBtu ²
Carbon monoxide (CO) emissions	<270 ppm at 7% O ₂

Advanced Cordwood Boilers with Full Thermal Storage (<300,000 Btu/hr): Incentives are available for advanced cordwood boiler heating systems with full thermal storage for installations in the residential and commercial sectors. The installation must include full thermal storage as outlined in the Program Manual (Attachment G). All systems must include eligible boilers meeting the requirements outlined in the Program Manual and must (i) meet testing requirements of the Brookhaven National Lab method for advanced cordwood boiler with thermal storage, and (ii) have been accepted by the New York State Department of Environmental Conservation (NYSDEC). Eligible boilers will be listed on www.nysed.gov/renewableheatny.

1.4 Installer/Contractor Qualifications

Installer/Contractor Experience Requirements

Interested qualified Installers may apply to participate in the Program at any time while the program is open. To qualify to participate as an Eligible Installer/Contractor, an Installer/Contractor must meet one (1) of the following levels of experience:

- Have at least three (3) years of relevant experience with the design and installation of hydronic systems;

¹ Information on incentives for installation of large commercial pellet boilers is available on www.nysed.gov/renewableheatny.

² Pound per million British thermal unit (lb/MMBtu)

- Have at least two (2) years of experience installing hydronic systems including a minimum of one (1) successful installation of equipment meeting the full requirements of this solicitation (i.e. solid fuel pellet boilers or advanced cordwood boilers defined as low mass (low water jacket volume), staged combustion (sometimes referred to as gasification) boilers with sensors and controls to optimize system performance) and thermal storage and outside bulk pellet storage;
- Be a licensed Master Plumber or Journeyman Plumber, with at least two (2) years of relevant experience with the design and installation of hydronic systems;
- Be a New York State-licensed professional (Registered Architect or Professional Engineer) and have at least two (2) years of relevant experience with the design and installation of hydronic heating systems.

Installers/Contractors will be evaluated on past experience installing boilers, including system design and sizing; customer satisfaction; and other relevant experience (i.e. installation of thermal storage). Once approved, Eligible Installers/Contractors will receive designation as a Provisional Eligible Installer/Contractor and will then be eligible to apply for boiler system financial incentives as outlined in the Program.

Installer/Contractor Training Requirements

All approved Provisional Eligible Installers/Contractors, must have completed manufacturer’s training for the boiler brand they are installing. A certificate of completion or a letter from the manufacturer must be submitted as evidence of having successfully completed manufacturer’s training.

In addition, at least one individual from the company or firm must successfully complete Renewable Heat NY biomass training: “Hydronics for High-Efficiency Biomass Boilers” or other approved instructor-led training * within six (6) months of submission of your application to participate in the Program. No Project Applications will be approved until this training is completed and the Installer/Contractor is approved as a Provisional Eligible Installer/Contractor under the Program.

- Renewable Heat New York biomass training: “Hydronics for High Efficiency Biomass Boilers.” This training is recommended for all installers interested in participating in this Program, and at least one individual from the company or firm must successfully complete it. The training will help guide installers to ensure properly sized and safe installation practices, reduced component failure, lower operations and maintenance costs, increased system longevity and reduced system design and installation costs. Scheduled Instructor-led training and online training will be available during the Program period, and registration is available from the website: <http://www.nyserda.ny.gov/renewableheatny>

*** Note:** Online training, or other approved instructor-led training deemed by NYSERDA to cover required learning objectives previously established for the Hydronics for High Efficiency Biomass Boilers training must be approved in advance by NYSERDA to qualify for meeting this training requirement.

Installer/Contractor Business Requirements

Minimum of two (2) years experience in business related to hydronic heating design and installation. An Eligible Installer/Contractor may use any business structure that is legal for conducting this type of business in the State of New York (corporation, LLC, sole proprietorship, etc.). An Eligible Installer/Contractor must be able to meet all Program requirements including required insurance coverage and have the capability to provide warranty services on all installed systems, as required by the Program and NY State law. Eligible Installer/Contractor must comply with all local authority requirements for registration and licensing that apply to the installation of advanced cordwood or pellet boiler heating systems with thermal storage.

When completing the Installer/Contractor application (Attachment F), the qualified Installer/Contractor should provide the name and resumes of key personnel including ownership, management, sales, installation and design/engineering as well as three Company/business references. Eligible Installers/Contractors must employ at least one individual who has met the training requirements outlined in the Program Manual.

Three (3) verifiable customer references for specific projects should be included. For one (1) of these completed projects, the customer must complete the Biomass Boiler Installer Reference Questionnaire which includes a brief description of the system installed and the applicant's role in the project. Contact information for customers references must be provided to allow for verification. To demonstrate design capability, one sample Manual J load analysis calculation must be included with the Instructor/Contractor Eligibility Application (Attachment F) when submitted to NYSERDA.

Note: Manual J is the Air Conditioning Contractors of America (ACCA) approved method of calculating room-by-room and whole house heating and cooling loads.

Eligible Installer/Contractor Insurance Requirements

A current Certificate of Insurance in accordance with Article 7, Insurance, of the RHNY Installer/Contractor Participation Agreement (Attachment F) must be provided. You may send your Certificate of Insurance to Nancy Marucci, via email nancy.marucci@nyserdera.ny.gov or via fax (518) 862-1091 Attn: Contracts Department. The insurance certificate must include the following:

- (1) \$1 million dollars of general liability (unless your contract requires additional liability insurance)
- (2) state that NYSERDA & the State of New York are listed as additional insured in the Description of Operations box located on the certificate
- (3) Workers Compensation, Employers Liability, and Disability Benefits as required by New York State

2.0 GENERAL PROGRAM RULES

2.1 Program Incentives

Incentives are available on a first-come, first served basis, and will only be reserved for customers once an application has been approved by NYSERDA. Incentive Applications must be submitted by an Eligible Installer/Contractor. Eligible installers may request 40% incentive payment up-front, after all approved system components have been delivered to a customer’s site, all permits and approvals have been obtained, and the Incentive Payment Request Form (Attachment C) is completed and submitted to NYSERDA for approval. Incentives are paid upon approval by NYSERDA directly to the Installer/Contractor and must be passed on in the full amount to the customer. They will not be provided directly to customers purchasing or installing the new system. Incentives are only available for new equipment and systems that have not been installed (partially or completely) prior to NYSERDA approval of a Project Application. Additional recycling incentive for proper retirement of old outdoor or indoor wood boiler, or wood furnace is also paid to the Installer/Contractor and must be passed on in the full amount to the customer.

NYSERDA reserves the right to adjust incentives without notice. Incentives are available for systems meeting requirements of this PON as outlined in Table 2 and Table 3 below:

Table 2: Incentives for Eligible Equipment

Residential	Advanced Cordwood Boiler with Thermal Storage	25% installed cost up to \$5,000 per unit, with an additional \$5,000 for documented recycling (removal and destruction) of old outdoor or indoor wood boiler, or \$2,500 for recycling whole-house wood furnace. Up to \$5,000 per installed unit is available for customers with existing oil heat or propane.
	Wood Pellet Boiler with Thermal Storage	45% installed cost up to \$20,000 based on system size, with an additional \$5,000 for documented recycling (removal and destruction) of old outdoor or indoor wood boiler, or \$2,500 for recycling whole-house wood furnace.
Small Commercial	Advanced Cordwood Boiler with Thermal Storage	25% installed cost up to \$5,000 per unit, with an additional \$5,000 for documented recycling (removal and destruction) of old outdoor or indoor wood boiler, or \$2,500 for recycling of old wood furnace. Up to \$4,000 per installed unit is available for customers with existing oil heat or propane.
	Small Pellet Boiler with Thermal Storage Less than 300 MBtu/h (88 kW)	45% installed cost up to \$36,000 based on system size, with an additional \$5,000 for documented recycling (removal and destruction) of old outdoor or indoor wood boiler, or \$2,500 for recycling whole house wood furnace.

Table 3: Maximum funding for Pellet Boiler by Size

Boiler Size (kW)	Boiler size (Btu/hr)	Maximum Incentive
≤25	≤86,000	\$10,000
≤35	≤120,000	\$16,000
≤50	≤171,000	\$23,000
≤88	≤300,000	\$36,000

2.2 Low-Interest Financing

Renewable Heat NY residential and small commercial customers may be eligible to finance the purchase of their biomass boiler system through NYSERDA’s low-interest financing options. Financing is available to all New York State electric and natural gas utility customers who meet the eligibility requirements described herein. NYSERDA, in coordination with Energy Finance Solutions (EFS), offers New York State residents reduced-interest rate loan option to finance qualified biomass boilers, as authorized by the Green Jobs-Green New York Act of 2009 and the Power NY Act of 2011.

Residential Financing

Residential customers may use either the On-Bill Recovery Loan or the Smart Energy Loan for loan amounts up to \$13,000 (up to \$25,000 if the simple payback is less than 15 years, calculated by dividing the loan amount by the first year estimated energy cost savings). There is a \$1,500 minimum loan amount and the term can be 5, 10, or 15 years. With the On-Bill Recovery Loan, your monthly payments may not exceed your estimated average monthly energy cost savings. Your loan payments are built right into your utility bill so you will not have an extra bill each month. Your energy savings essentially pay for your work. For the Smart Energy Loan, repayments are made directly to NYSERDA’s loan servicer via monthly statement billing or automatic bank withdrawal (ACH). The loan is issued to the homeowner once the project is completed and approved by NYSERDA. To apply for financing, please inquire through your an Eligible Installer/Contractor. For additional inquiries related to low-interest financing, e-mail RHNY@nyserdera.ny.gov for more information.

Small Commercial Financing

Small commercial customers may use either the On-Bill Recovery Loan or the Small Commercial Participation Loan. On the Small Commercial Participation Loan, NYSERDA partners with lenders to help small business and not-for-profit organizations access up to \$100,000 in financing at half the market interest rate. NYSERDA offers 50% of the project cost, up to \$50,000 at 0% interest and the participating lender provides the remainder of the loan at the market interest rate. The other low-interest financing option is On-Bill Recovery Financing, which makes it possible for small businesses and not-for-profits to use the savings on their energy bills to pay for their energy-efficiency upgrades.

For the Small Commercial Participation Loan, Borrowers make loan payments directly to their lender like a typical loan.

For customers that participate in the GJGNY loan program, the incentive will not be affected by the “buy down” cost or other cost incurred by NYSERDA to make the loan product available, however the total incentive for any customer, including cash and loan product, cannot exceed the owner’s out-of-pocket system cost. To apply for financing, please inquire through your Eligible Installer/Contractor. For additional inquiries related to low-interest financing, e-mail RHNY@nyserda.ny.gov.

Contractor Applications to Participate in Financing Programs

All work financed with a GJGNY loan must be installed by an Eligible Installer/Contractor. To be considered to offer GJGNY Financing, an Eligible Installer/Contractor must sign the Contractor Participation Agreement for Consumer Financing and forward via e-mail a completed ***GJGNY Contractor Financing Application (Attachment I)*** and insurance certificate to: efs@energyfinancesolutions.com

Upon approval to offer GJGNY Financing, the Eligible Installer/Contractor will receive a confirmation letter and all required forms for participation.

2.3 Incentive Payments

Payment Options:

Option 1) Under this option, the Eligible Installer/Contractor receives project incentives in two installments, which are tied to specific installation milestones. The initial incentive payment, totaling **40%** of the total approved incentive amount for the project will be paid after all approved system components have been delivered to a customer’s site, all permits and approvals have been obtained, and the *Incentive Request Form (Attachment C)*, with the section titled “Items to be Included with 40% request” completed and submitted to NYSERDA for approval. Installers who choose this option must submit for the initial 40% incentive payment within 120 days of the project approval date.

The Eligible Installer/Contractor will then have 90 days from the approval date of the initial 40% incentive payment to complete the project. The final project incentive payment, or the remaining **60%** of the total approved incentive amount, will be paid upon receipt by NYSERDA of *the Incentive Request Form*, with the section titled ‘Items to be Included with 60% request’ completed and submitted to NYSERDA for approval.

To receive the final (60%) incentive payment, the *Incentive Request Form* must include a **one of the following**:

- (a) Final inspection certificate issued by authorities having jurisdiction or
- (b) Digital photo of inspection sticker issued by authorities having jurisdiction or
- (c) Documentation of a successful inspection by NYSERDA or its representatives.

NYSERDA will consider alternate documentation verifying that the system has been completed and complies with all programmatic and relevant code requirements. An Eligible Installer/Contractor must submit the alternate documentation to NYSERDA for approval prior to the submittal of an Incentive Request Form.

Option 2) The Incentive will be paid to the Eligible Installer/Contractor in one final payment and will be tied to the completion of the installation and acceptance by NYSERDA. Eligible Installers/Contractors have 120 days from the date of award by NYSERDA to complete the installation. The NYSERDA incentive payment will not be paid until all documentation for all applicable utility, state, city or town permits and other inspections and approvals, as appropriate, are obtained and submitted to NYSERDA together with the “Attachment C – Incentive Payment Request Form.” The Incentive Payment Request Form must include the following:

- (a) Final receipt showing detail of all costs for equipment and labor for the installed system
- (b) Final inspection certificate issued by authorities having jurisdiction, including digital photo of inspection sticker issued by authorities have jurisdiction
- (c) Documentation of successful inspection by NYSERDA or its representatives.
- (d) Names for all primary crew members who worked on the installation.
- (e) Recycling Form (Attachment E) and receipt demonstrating required recycling (removal and destruction) of existing boiler, as required for replacement of existing cordwood boiler.

Documentation for all applicable state, city, or town permits and other inspections and approvals must be provided as part of any incentive payment requests. If the local authority having jurisdiction does not require a permit for a system, you may substitute a copy of a letter from the local authority stating that no permit is required.

All **Incentive Payment Request forms (Attachment C)** must be e-mailed to: RHNY@nyserda.ny.gov and use the following subject line naming convention:

Renewable Heat NY (4 digit installer # + Application #) - Name of Customer

Each scanned incentive request should be named **using the naming convention outlined above and all documents must be scanned together as a single pdf.**

2.4 Tax Credits

Customers may also be eligible for State and Federal tax credits. It is recommended that Renewable Heat NY Program participants contact a tax adviser to determine eligibility for tax credits.

2.5 Change Orders, Project Extensions, & Cancellations

Installers must complete Attachment J- Change Request Form for any change orders, project extension requests, or project cancellations. For change orders, the new design drawing must be included, if applicable. For project extension requests, Installer must indicate the length of extension up to a maximum of 90 days, and include a reason for the extension. A reason must be provided for project cancellations also. To ensure all parties are in agreement of the project change, the Change Request Form must be signed by the Installer and the customer in order to authorize the change order, extension or cancellation.

3.0 SPECIFIC PROGRAM RULES AND GENERAL SYSTEM REQUIREMENTS

3.1 Project Design Requirements

The following project design information must be submitted to NYSERDA for approval along with the Project Application (Attachment B):

- **AHJ approval and copy of all permits required** – provide a copy of all approvals and permits as required by the local authority having jurisdiction (AHJ). If no permit is required, please provide documentation from the AHJ stating that no permits or approval is necessary.
- **Equipment Specification** – provide Manufacturer and Model number, and capacity of all major components as listed in the Project Application
- **Description of the System Operation** – describe the sequence of operations including all actions that initiate demand for heat (space heating, domestic hot water, etc.) and all actions that shut off operations.
- **Pipe Schematic** – show all components of the system as required by the Program (boiler, thermal storage, etc.) and other components important to the proper functioning of the system (circulating pumps, mixing valve between boiler and thermal storage tank for inlet water protection, etc.)
- **Electrical Controls and Wiring Diagram** – line diagram including temperature controls, sensors, wiring, and other pertinent components of the controls system.
- **Heat Load Calculation Requirement** – The Air Conditioning Contractors of America (ACCA), Manual J protocol determines how much heating or cooling a house actually needs. A Manual J heat load calculation must be performed and submitted to NYSERDA along with the Project Application for approval in order to demonstrate proper sizing of the boiler and thermal storage system pursuant to the heating needs in the home. Manual J Heating Ventilation and Air-conditioning (HVAC) load calculations require entry of relevant data, such as the home's orientation, insulation levels, window types, areas of all the surfaces that gain or lose heat, and more. The output of the calculation is how much cooling and heating the house needs in Btu per hour for each room, each zone, and the whole house. A room-by-room load calculation is required to use the results and the

equipment specifications to select equipment and design a duct system that will perform at its maximum efficiency using ACCA's other design protocols, Manuals S, T, and D, as appropriate.

The Installer/Contractor should survey the entire home or building, including the exterior to look for any insulation or air-sealing gaps that may result in lost efficiency. Customers will not be required to implement other recommended energy-efficiency measures as a pre-requisite of receiving a Renewable Heat NY incentive.

Homeowners are encouraged to call (toll-free) 1-877-NY-SMART or visit www.nyserdera.ny.gov/homeperformance to apply to the Home Performance with ENERGY STAR to implement additional energy-efficiency measures.

Small commercial customers should also call (toll-free) 1-877-NY-SMART or visit <http://www.nyserdera.ny.gov/Governor-Initiatives/Green-Jobs-Green-New-York/Small-Business-and-Not-for-Profits.aspx> for information on incentives for other energy-efficiency improvements.

3.2 New Components

All components installed as part of an approved biomass boiler system must be new. The use of used or refurbished equipment is not permitted under the Program.

3.3 Structural Requirements

The Eligible Installer/Contractor is responsible for determining that a building is structurally able to support the addition of a biomass boiler and thermal storage system as described in all relevant National and New York State codes and standards. NYSERDA encourages consulting with a Licensed Professional Engineer.

3.4 Other Plumbing and Electrical Components

All plumbing and electrical components of each boiler system including, but not limited to, piping, fittings, tanks, vessels, valves, controls, safety devices, and associated wiring must be certified as meeting the requirements of all relevant national and New York State codes and standards.

Biomass boiler (cordwood and pellet-fired) heating system components, like those of oil-fired boilers, require electricity to power the blower and circulate hot water through the heat distribution system in the home. It is important that a boiler heating system (cordwood only) has a heat dump zone, usually a group of radiators next to the boiler with a valve that opens when the power goes out.

3.5 Compliance with Laws and Codes

All approved biomass boiler systems, system components, and installations must comply with any and all manufacturers' installation requirements, applicable laws, regulations, codes, licensing and permit requirements including, but not limited to, the New York State Environmental Quality Review (SEQR), the New York State Building Code, New

York State Plumbing Code, the National Electric Code, Fire Codes and all applicable State, city, town, or local ordinances or permit requirements.

Effective February 22, 2010, Amanda's Law went into effect in New York to help protect families from the #1 cause of accidental poisoning deaths in the US, carbon monoxide (CO). This law requires carbon monoxide (CO) alarms to be installed in all new and existing one and two-family dwellings, multifamily dwellings and rentals having any fuel-burning appliance, system or attached garage. To comply with the law, CO alarms must be listed to comply with UL (Underwriters Laboratories) 2034 or CSA (Canadian Standards Association) 6.19 and installed in accordance with manufacturer's instructions.

3.6 System Warranty

The Eligible Installer/ Contractor must provide the purchaser of the boiler system with a one-year, full-cost warranty including labor, repair or replacement of defective components or systems, and an additional two-year period for the repair or replacement of all parts. The Installer/Contractor is responsible for providing warranty coverage in a timely manner regardless of the level of support from the equipment manufacturer. The Installer/Contractor has the option to extend the required warranty through an extended warranty offer via an optional customer service agreement.

3.7 Maintenance/Manufacturer Manual

Upon final completion of the installation, the Installer/Contractor shall provide the customer with a manufacturer or maintenance manual containing manufacturer information on all the major components along with a schedule of any regular required system maintenance to be performed.

3.8 Mechanical Execution of Work

All boiler equipment and accessories shall be installed in a neat and professional manner according to manufacturers' requirements and instructions. Any manufacturer warranties for workmanship and/or materials that are compromised and/or voided as a result of work performed by CONTRACTOR will become the responsibility of CONTRACTOR. Labeling equipment and related controls is encouraged to ensure proper maintenance and design specifications. As with all heating systems, it is important that installation of all equipment is performed to manufacturer specifications to allow for routine maintenance to be conducted by other heating technicians and/or plumbers.

3.9 Annual Follow-Up Visits

The Eligible Installer/Contractor must conduct annual follow up visits for the first two years of operation in order to verify that the system is operating properly and make any necessary adjustments to improve system performance.

3.10 Retirement and Recycling Requirement

For projects retiring an OWB, IWB, or wood furnace replaced by an approved advanced cordwood or pellet boiler heating system for an incentive, proof of retirement (proof the old boiler was recycled) is required. The recycled wood furnace must have a rated output

capable of meeting the demand of the residence (range example. 70,000-200,000 Btu/hr) and must be connected to the forced hot air ductwork as a central heating appliance (this will often be in paralleled or series with another heating appliance).

The Eligible Installer/Contractor must sign and submit the Recycling Form (Attachment E) to NYSERDA for approval. The recycling incentive for proper retirement of the old outdoor or indoor wood boiler will be paid directly to the Eligible Installer/Contractor and must be passed on in the full amount to the customer.

4.0 ADVANCED CORDWOOD BOILER REQUIREMENTS

4.1 Approved System Design

Advanced cordwood boiler heating systems with full thermal storage must be installed in accordance with the design submitted in the application and approved by NYSERDA. Any change in the cordwood boiler heating system design from the approved design must be approved in writing by NYSERDA prior to installation of the cordwood boiler heating system. Incentives will not be paid for cordwood boiler heating systems that are installed prior to the NYSERDA project approval, or for cordwood boiler heating systems that are not installed according to the design submitted to and approved by NYSERDA. Under no circumstances will cordwood boiler heating systems without full thermal storage be approved.

4.2 Fuel Type (Properly Seasoned Wood)

The eligible fuel type is properly seasoned cordwood. Wood that will be used for fuel in advanced cordwood boilers must be properly dried and seasoned so that the moisture content of the wood is approximately 20%. To properly season the wood, it typically must be dried for at least 2 years. The wood should be stored under cover with sufficient ventilation to allow the wood to dry to approximately 20% moisture content. It is imperative that the wood fuel be at moisture content of 20% or below so that good combustion of the fuel is achieved. When wood above 20% moisture content or greenwood is used in advanced cord wood boilers seasonal efficiency decreases significantly while smoke emissions drastically increases. Awardees must agree to use only the eligible fuel type in the cordwood boiler for a minimum of the length of pay-back time on the system from fuel-cost savings.

4.3 Advanced Cordwood Boiler Performance

All advanced cordwood boilers must be Qualified Technologies for RHNY. A list of Qualified Technologies can be found on NYSERDA's website <http://www.nysERDA.ny.gov/renewableheatny>

All Qualified advanced cordwood boiler technologies must have been tested by the Brookhaven National Laboratory (BNL) Test Method and approved by NYSDEC and have a minimum annual thermal efficiency of 60% using the higher heating value (HHV) of wood. Any cordwood boilers not tested by the BNL Test Method and approved by NYSDEC will not be considered for incentives in this program. Boilers must have staged

combustion, low mass (low volume) and have sensors and controls to optimize combustion performance. This is most easily achieved using a staged combustion design with oxygen sensor and variable fan controls. The cordwood boiler must have a minimum annual thermal efficiency of 60% using the higher heating value (HHV) of the fuel and all systems must be installed with full thermal storage. All projects must also conform to all applicable NYS residential codes.

<http://publicecodes.cyberregs.com/st/ny/st/b400v10/index.htm>

4.4 Proper Boiler Sizing

Sizing advanced cordwood boilers with thermal storage to the design day heat demand of a home is not done using the boiler’s rated output. This is because the heat release rate is variable over the course of the burn of a charge of cordwood fuel and because heat stored in the thermal storage tank will also be used. Instead, size the boiler by the number of batches an operator is comfortable with which will be between two and three batches for a design day. An example is given below.

Consider an average 2,500 ft² ranch in central Upstate NY with a design day heating load of 1,100,000 Btu. The owner wants to heat using an advanced cordwood boiler with full thermal storage and will use seasoned hard wood (20% moisture content).

Consider the two advanced cordwood boilers below.

Advanced Boiler	Useable Firebox Volume (ft ³)	Annual Thermal Efficiency (% based on HHV)	Water Jacket Volume (gallons)
A	5.0	70	32
B	6.3	60	42

Will either of these be suitable for heating this home?

Note: 8,600 Btu/lb (HHV) of Red Oak

For a single charge of fuel-

A:

5 ft ³	15 lbs	8,600 Btu	0.70 Thermal efficiency (HHV)	0.80 (1-%MC)	=	361,200 delivered Btu
	ft ³	lb				

B:

6.3 ft ³	15 lbs	8,600 Btu	0.60 Thermal efficiency (HHV)	0.80 (1-%MC)	=	390,096 delivered Btu
	ft ³	lb				

Number of batches needed:

1,100,000 Btu	charge	=	3 charges
day	361,200 Btu delivered		day

1,100,000 Btu	charge	=	2.8 charges
day	390,096 Btu delivered		day

4.5 Stack Height

The design of the exhaust stack and location should be done carefully to prevent exposure to building occupants and visitors or to people in frequently occupied outdoor areas and meet NYS code requirements, with reference specifically to NYS Department of Environmental Conservation Part 247 for installations where the advanced boiler is defined as an outdoor wood boiler. <http://www.dec.ny.gov/regs/71720.html>

4.6 Boiler Placement and Set Back

Under New York State Department of Environmental Conservation’s Part 247, advanced cordwood boilers could be considered outdoor wood boilers which are required to some setback limits. A residential-size new outdoor wood boiler shall not be located less than 100 feet from the nearest property line. Notwithstanding the previous, a residential-size new outdoor wood boiler installed on contiguous agricultural lands larger than five acres shall not be located less than 100 feet from the nearest residence not served by the outdoor wood boiler. (<http://www.dec.ny.gov/regs/71720.html>)

4.7 Thermal Storage

Thermal storage is a key component of the advanced cordwood boiler heating systems, allowing the boiler to operate at a high burn rate with high efficiency. Heat that is not needed for the building is stored in the thermal storage tank for use at a later time. On the coldest days, this heat may be needed just a few hours after the charge is burned but

during the early and late parts of the heating season, this stored heat may allow for several days of heating without needing a fire. Full thermal storage is required for all advanced cord wood boiler systems in RHNY, minimum volumes for pressurized and unpressurized tanks are given in the table below for each of the Qualified Advanced Cordwood Boiler Technologies in the RHNY program. Thermal storage tanks are engineered with thermodynamic considerations, achieve thermal stratification, and communicate with the heating control system. Thermal storage tanks must be installed vertically and have supply and return placed far apart vertically on the tank (unless engineered to achieve the same performance with an alternative design), have piping, baffles, diffusers, or screens to prevent turbulent mixing, be designed to sense the thermocline, and have an insulation of R-24 or greater. Only vessels designed as thermal storage tanks may be used. No repurposed domestic hot water, propane tanks, or thermal storage units that are self-made or fabricated by the installer may be used. Some homeowners, due to the need to be away from home, may wish to size their thermal storage larger than the full thermal storage required in this program.

Ex:

	Minimum Thermal Energy Storage Volume (gallons)	
Boiler	Pressurized	Unpressurized (open)
Froling	525	600
Econoburn	600	700
Drummer	400	420

5.0 PELLET BOILER REQUIREMENTS

5.1 Approved System Design

High-efficiency low-emitting pellet boiler heating systems must be installed in accordance with the design and the pellet boiler heating system components submitted in the application and approved by NYSERDA. Any change in the pellet boiler heating system design from the approved design must be approved in writing by NYSERDA prior to installation of the pellet boiler heating system. Incentives will not be paid for pellet boiler heating systems that are installed prior to the NYSERDA project approval, or for pellet boiler heating systems that are not installed according to the design submitted to and approved by NYSERDA.

5.2 Fuel Type

The eligible fuel type is a premium wood pellet (Figure1) delivered in bulk. No systems using bagged pellets will be approved. Premium wood pellets are 100% wood composition with no construction or demolition debris such as pressure treated or painted wood (which may contain heavy metals such as copper, chromium, arsenic, lead and cadmium) or plastic binders or fillers. Pellets must have a calorific value of no less than 8000 Btu/lb, low ash content (<1%), low moisture content (<8%), chlorides less than 300 ppm and no other additives (0%). Other commercially available fuel types in NYS (for example green wood chips and grass pellets) cannot facilitate high-efficiency and low emissions performance even in advanced technology boilers at this time. Awardees must agree to use only the eligible fuel type in the wood pellet boiler for a minimum of the length of pay-back time on the system from fuel-cost savings. Applicants should identify and obtain a bulk fuel price quote from two pellet suppliers where possible.

Figure 1: Premium Wood Pellets (Photo courtesy of Curran Renewable Energy)

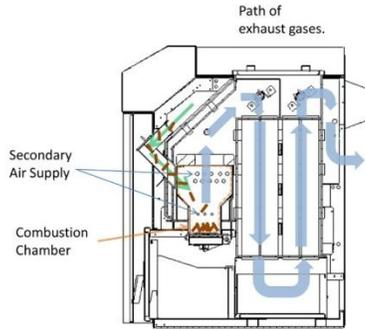


5.3 High-Efficiency and Low-Emissions Pellet Boiler Performance

All advanced pellet boilers must be Qualified Technologies for RHNY as listed on NYSERDA's website <http://www.nyserdera.ny.gov/renewableheatny>. All projects must conform to all applicable NYS residential code. (<http://publicecodes.cyberregs.com/st/ny/st/b400v10/index.htm>)

Boilers must be fully automatic, low mass (low volume) and have sensors and controls to optimize combustion performance (Figure 2). This is most easily achieved using a staged combustion design with lambda control.

Figure 2: Schematic of a high-efficiency pellet boiler with pellet introduction and exhaust flow path through the heat exchanger (Courtesy of EVOWORLD)



The wood pellet boiler must have a minimum thermal efficiency of 85% at rated output using the higher heating value (HHV) of the pellet fuel if tested using an input/output method as outlined in Table 4.

Table 4: Performance Requirements for High-Efficiency and Low Emissions Pellet Boilers

Thermal Efficiency (HHV)	85%
Particulate Emission	< 0.080 lb/MMBtu
Carbon monoxide (CO) Emission	< 270 ppm at 7% O ₂

5.4 Proper Boiler Sizing

The high-efficiency wood pellet boiler must be properly sized for the application with particular attention to avoid over-sizing the boiler. Boilers must be sized and systems planned to optimize performance throughout the heating season using thermal storage. A well-designed residential or small commercial system must be sized based on the heat load of the building where the heat load is determined by Manual J of the Air Conditioning Contractors of America (ACCA) or an equivalent energy simulation program. For commercial systems that anticipate keeping an existing oil or propane heating system long term, it is better to size the pellet boiler at 60% of the design heating load as estimated using ACCA Manual J (or equivalent).

5.5 Stack Height

The design of the exhaust stack and location should be done carefully to prevent exposure to building occupants and visitors or to people in frequently occupied outdoor areas and meet NYS code requirements.

(<http://publicecodes.cyberregs.com/st/ny/st/b400v10/index.htm>)

5.6 Thermal Storage

Pellet heating systems must include installation of thermal storage to maintain high-efficiency and low emissions performance throughout daily and annual cycles, minimize boiler cycling, maintain optimum combustion conditions, assist in energy management strategies including the quick response to a call for heat, meet intermittent calls for heat

without starting the boiler, and temper return water temperatures to prevent thermal shock to the boiler. The minimum size thermal storage for pellet boilers $\leq 25\text{kW}$ (85,000 Btu/hr) is 119 gallons or 2.0 gallons per 1,000 Btu/hr. For boilers $>25\text{kW}$, thermal storage should not be less than 2.0 gallons per 1,000 Btu/hr. Thermal storage tanks must be engineered with thermodynamic considerations, achieve thermal stratification, and communicate with the heating control system. Thermal storage tanks must be installed vertically, have supply and return placed far apart vertically on the tank, have piping, baffles, diffusers, or screens to prevent turbulent mixing, be designed to sense the thermocline, and have an insulation of R-24 or greater. Only vessels designed as thermal storage tanks may be used. No repurposed domestic hot water tanks, propane tanks, or thermal storage units that are self-made or fabricated by the installer may be used.

5.7 Outside Pellet Storage

All bulk pellet storage must be a minimum of 3.5 tons, and must be located outside of the building. Pellets can produce high levels of dust and off-gas carbon monoxide (CO) in storage presenting health and safety concerns. Carbon monoxide is a colorless, odorless gas that has health effects below the levels at which common CO detector alarms are triggered. Research is underway in Europe, Canada and NYS to better understand the chemical reaction that produces the CO. According to the US EPA:

“CO can cause harmful health effects by reducing oxygen delivery to the body’s organs, such as the heart and brain, and tissues. At extremely high levels, CO can cause death. Exposure to CO can reduce the oxygen-carrying capacity of the blood. People with several types of heart disease already have a reduced capacity for pumping oxygenated blood to the heart, which can cause them to experience myocardial ischemia (reduced oxygen to the heart), often accompanied by chest pain (angina), when exercising or under increased stress. For these people, short-term CO exposure further affects their body’s already compromised ability to respond to the increased oxygen demands of exercise or exertion”.

Due to concerns regarding CO exposure and the absence of a documented effective ventilation strategy for pellet storage, all bulk pellet storage must be outside of the home (Figure 3).

Applicants may request funds for outdoor bulk pellet storage containers and pellet conveyance systems, but large capital construction costs for residential bunkers or modification of coal bins will not be considered. A sign communicating potential CO hazards associated with bulk pellet storage must also be posted.

Pellet delivery to outside bulk storage does not require the homeowner to be present for the delivery, for the boiler to be turned off during the fill, or create dust or CO in the basement, resulting in quicker, more convenient, and cleaner pellet deliveries.

Figure 3: Outside residential bulk pellet storage bin. This 4.5-ton unit has a ventilated soffit and two ports for pellet delivery (Courtesy of Vincent’s Heating and Fuel Service LLC.)



6.0 APPLICATION PROCESS

6.1 Project Application Form

The Project Application includes general project information, including the proposed equipment manufacturer/model, size and costs, Manual J heat load calculation, and other requirements stipulated in Section 3.1 of this Program Manual. All copies of permits as required by authorities having jurisdiction must be submitted and attested to as true and correct. The Installer/Contractor must submit all application documents by U.S. mail or electronically via email to: RHNY@nyserda.ny.gov.

6.2 Photos of Major System Components

There must be photo(s) of the of the project site, including boiler, thermal storage unit, controls and other related components of the boiler system. A manufacturer’s equipment datasheet may satisfy this requirement.

6.3 Schematics Drawing

All applications will require a legible piping diagram and electric wiring and control diagram to clearly describe the biomass boiler system as installed. The diagrams shall include, but not be limited to, boiler, thermal storage unit, controls and other related components of the boiler system. Manufacturers’ catalog numbers for the key components and other relevant equipment as applicable shall be provided.

6.4 Permits

Copies of all necessary permits, approvals, certificates, etc. must be attached to the Project Application. Requests for eligible boiler systems without permits will be rejected. All permits must clearly reference installation of the approved system at the customer site. If permit(s) are not needed for installation, a signed letter from the Town Code Officer or Authority Having Jurisdiction (AHJ) must be submitted stating that no building permit is required. These systems may also require plumbing and electrical permits.

6.5 Customer Purchase Agreement

The Customer Purchase Agreement is an important document as it is the contract between the homeowner/small commercial customer and the Installer/Contractor. The Customer Purchase Agreement must include the Addendum to Customer Purchase Agreement (Attachment D), completed and signed by both the customer and the Eligible Installer/Contractor.

The Customer Purchase Agreement should include the following and must be signed by both parties.

- Installation location; including town, street, and number, if applicable;
- Installation schedule (a realistic installation schedule that takes into account NYSERDA design review requirements. For example, incentive applications should not have an expected installation date that does not include adequate time for NYSERDA to receive, review, and notify an Eligible Installer/Contractor and the customer regarding the status or approval of an application;
- System description, including a description of the Boiler and Thermal Storage system being purchased and an outline of system specifications, the make and model of major system components, etc.
- Estimate of annual energy output in kWh that summarizes the results of the System Loss Analysis;
- Total system and itemized costs broken down as follows: equipment (boiler, thermal storage, pellet storage, pellet conveyor, controls, breaching and venting, piping, circulator, hydronic components and labor and overhead (labor, permitting, etc.);
- Applicable incentives. The Customer Purchase Agreement must reflect the entire amount of the approved NYSERDA Incentive, and all incentives must be passed onto the customer under contract;
- An explanation and estimate of any and all costs that the customer will incur associated with the development, installation, and commissioning of Boiler and Thermal Storage Systems that are not included in the Eligible Installer's price quote;
- Payment schedule;
- System Warranty. A system warranty to the purchaser of the biomass boiler system installed under the Agreement per the warranty requirements stipulated in Section 3.6 of this Program Manual. Under no circumstance will Customers be responsible for any costs of defective components or systems subject to the warranty requirements of this Program over the term of this Agreement;
- Addendum to Customer Purchase Agreement (Attachment D) completed and signed by both the customer and the Eligible Installer/Contractor.
- Incentives and warranties must pass to the customer. As an Eligible Installer/Contractor, a Participation Agreement with NYSERDA enforces the Eligible Installer/Contractor to abide by the program rules.

7.0 QUALITY ASSURANCE AND COMPLIANCE

7.1 Field Inspection of Completed Projects

NYSERDA selects specific “completed” projects for QA field inspection following a sampling protocol. The sampling protocol utilizes random sampling of completed units with sampling rates primarily based upon the program status of the Eligible Installer/Contractor.

7.2 Handling Non-Conformance and Corrective Action

The QA report generated from the field inspection will provide details of all evaluated elements of the project and list any non-conformances that were identified and whether this result passes or fails program requirements.

Projects that have non-conformances related to critical (Health & Safety) or major (System Performance) attributes will automatically fail. Projects that have only non-conformances to minor or incidental attributes may pass or fail based upon their overall merits.

All non-conformances are expected to be addressed and corrected for the installed project, and are expected to be addressed during commissioning of future work conducted in the Renewable Heat NY program. Acknowledgement and plans for preventing future problems may be requested with the report.

While some non-conformances cannot be corrected post installation, others can be remedied through corrective action to the documentation, incentive applied to the project or remediation of the installation or its components.

When NYSERDA seeks specific corrective action, a Corrective Action notice will be provided with the QA report. The Corrective Action notice must be either disputed within 15 days by contacting NYSERDA or remedied within 30 days. Sufficient evidence of the remediation must be provided to NYSERDA to document the completion of the required corrective action. NYSERDA may at its option conduct a field verification of the remediated installation.

NYSERDA retains the right to provide a copy of the QA report or specific information from the QA Field Inspection directly to the owner, all authorities having local jurisdiction based upon health, safety and compliance concerns. In an emergency NYSERDA or its representatives may shut down the system. NYSERDA will notify the installer or contractor whenever it takes such action as soon as is practicable.

NYSERDA may, at NYSERDA’s discretion, communicate by voice and/or written format with any System customer with respect to any matter relevant to a proposed or installed System. Such communications may be in reply to an inquiry from a customer or at NYSERDA’s initiation.

7.3 Prescriptive Probation and Disciplinary Action

When an installer or contractor either fails to consistently complete projects which pass NYSERDA’s QA evaluation or fails to respond to or remedy Corrective Action notices, NYSERDA will review the contractor or installer status in the Renewable Heat NY Program.

An installer or contractor may be moved to either a probation status in which specific results and a timeline for demonstrating those results will be prescribed and monitored or to a disciplinary status such as suspension or termination from the Renewable Heat NY Program.

8.0 OTHER INFORMATION

Information for Installers/Contractors and Customers

Customer Step-by-Step Guide	Attachment A
Project Application Form*	Attachment B
Incentive Payment Request Form*	Attachment C
Addendum to Customer Purchase Agreement	Attachment D
Recycling Form*	Attachment E
*Needs to be completed by Installer/Contractor	

Information to Become an Installer/Contractor

Installer/Contractor Eligibility Application, Instructions and Participation Agreement	Attachment F
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Specific Program Rules

NYSERDA RHNY Program Manual	Attachment G
<u>GJGNY Pro-Forma Financing Tool</u>	Attachment H
<u>GJGNY Financing</u> – Contractor Application Package for EFS	Attachment I
- Contractor Application	
- Contractor Participation Agreement	
- ACH Authorization Form	

<u>Change Request Order Form</u>	<u>Attachment J</u>
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