

BIOMASS BOILER SYSTEM AT 310 MARLBORO STREET, ADDS TO NET-ZERO PATH FOR KEENE, NH

Jim Van Valkenburgh

The last issue of *G.E.T.*, included an article titled, "The Path to Net-Zero in Keene, New Hampshire" about significant energy-focused renovations being done to an old factory building. The article described the new owner's long-term goals, and the multiple strategies they are using to ultimately get to net-zero. The project is called: 310 Marlboro Street and most of the renovations occurred in the summer of 2022. This article is focused on a new renewable fuel central heating system that now heats most of the old factory.

The 78,000 s.f. building consists of two main sections: a 66,000 s.f. all-masonry portion built in 1947 and a 12,000 square foot steel structure built in 1984. About 80% of the building was heated by a very large oil-fired steam boiler that they were advised was 60% larger than is actually required. This is the area that we will focus on in this article.

The 1961 vintage steam boiler had a maximum output of 2.4 million BTU per hour and consumed 19,415 gallons of oil per year (a four-year average) in a building that was only 30% occupied. Steam heat is rarely specified today, because it is not very efficient and is notoriously difficult to control: On a cold day some tenants would be too cold while others had to open their windows to cool off. The new owners knew that a new boiler system was needed!

Old buildings with solid masonry walls are difficult to insulate and 310 was no exception to this truism. Insulating on the inside would mean adding a layer

of foam on all exterior walls and then refinishing them along with changes to the electrical services involved. Their tenants could not afford the downtime caused by this remodeling. Insulating on the outside would radically change the look and durability of the building's exterior and the cost of either approach



was simply not in the budget. Only a few windows were replaced, but there are plans to do more. Since the flat roofs of the steam-heat sections of the building were in good shape, no new insulation will be added until roofs need to be replaced.

Many new tenants have moved into 310 Marlboro Street, including a regional magnet school, a gym, two bakeries, and many small offices.



Above: A new high efficiency dried wood chip boiler was installed at 310 Marlboro Street in Keene, NH resulting in a 15% reduction in fuel use while the building occupancy rate went up 60%. The new boiler is a Schmid UTSK with 500 kW or 1.5 million BTUs/hour peak output. Left is the 1961 vintage steam boiler that was replaced. It had a maximum output of 2.4 million BTU per hour and consumed 19,415 gallons of oil per year. (Froling Energy)

Goal #1 was to get rid of the use of fossil fuels. Goal #2 was to boost energy efficiency of the heating system. Both were accomplished by the installation of a new high efficiency dried-wood-chip boiler and a new forced hot water heating system to go along with it. The new Swiss-made boiler is a Schmid UTSK with 500 kW or 1.5 million BTU/hour peak output. This very low emissions, highly efficient boiler was the best choice for

installation in an in-city building where a school and many businesses will be active.

A dry chip boiler must have a fairly large storage silo nearby. The owners of 310 decided to locate their silo in a large indoor space that had once operated as a kiln for drying wood. It was reconfigured and now holds 35 tons of precision-dried wood chips (PDCs) that are blown in through a six-inch pipe from a blower delivery truck.

The conversion from an old steam system to hot water heat distribution usually accounts for a 15% reduction in heating fuel use. Data indicates the new Schmid boiler is 10% to 15% more efficient than the old boiler. Further efficiency was added with a new room-by-room building

control system that was installed to precisely manage room temperature needs to actual use. These are all significant changes that radically improved 310's energy picture.

Froling Energy predicts that the new heating fuel use for this winter for the old steam heated portion of the building will be about 233 tons of PDC dried wood chips in the new heating system, which is the equivalent of

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Watching NYS – Cont'd from p.27

heat pump will use approximately the same size electric breaker(s) and ductwork as a comparable central air AC unit. The Energy Catalyst heat pumps come as a kit that can be assembled in about an hour and uses the same labeling system for furnace thermostats and zone controls, so traditional contractors can easily adapt to the new system. The hardest part is the geothermal design, which does require special expertise and certifications, but some geothermal companies offer a properly sized geothermal design, boreholes, and heat pump(s) as a package so that a



Above: Horizontal geothermal heat exchanger installation in progress. Energy Catalyst offers design and installation of an accompanying geothermal heat exchanger with their heat pumps.



350 ft vertical geothermal heat exchanger being installed by Energy Catalyst. (Images courtesy of Energy Catalyst)

home builder can have access to geothermal without changing their HVAC contractor.

The new laws may also bring new incentives to homeowners and businesses, which can be coupled with the funding from the implementation of the

310 MARLBORO ST., KEENE, NH

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about 21,809 gallons of #2 fuel oil. Wait a minute—that's 2,394 gallons more than the prior year's oil use!

Yes, that is true, but today the building is 90% occupied. In the past it was less than 30% occupied. That means nearly 40,000 square feet of the steam portions of the building were only minimally heated and now they are fully heated to 70°F. With all of these changes considered, it looks like the building will only use 12% more fuel than in the past years.

However, the real cost of heating is a far more significant change—and for the better. Imagine if they had to pay over \$4.50 a gallon for oil this past winter!

233 tons of dried wood chips is the equivalent of 21,810 gallons of oil. At \$4.50 a gallon, that would cost \$98,145.

At \$3.50/gallon, the cost is \$76,335. At \$2.50/gallon, it is \$54,525.

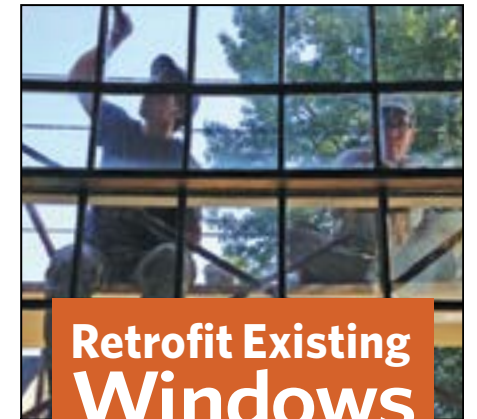
If the prediction of 233 tons of PDC dried wood chips is accurate for a 90% occupied building, they will have a cost of \$33,785. In New Hampshire these will generate at least \$11,185 in NH Class 1 Thermal REC income which results in a net annual cost of heat of \$22,600. That is the same as buying oil at \$1.04/gallon (or \$1.55/gallon in Vermont without T-RECs)!

So far, the remodeling and reuse of the building at 310 Marlboro Street has been a big success. Next, the owners plan to add 57 housing units to the property in new structures which will have their hot water supplied by the dry chip boiler system.

Jim Van Valkenburgh is the Vice President of Marketing at Froling Energy. ♻️

Inflation Reduction Act. In Upstate NY, a household who makes less than \$112,000 may qualify for a \$14,000 IRA incentive, \$10,000 NYS tax credit, \$4,500-\$9,000 heat pump rebate and 30% Federal Investment Tax credit on the remaining cost. If your boiler or furnace barely made it through the last winter, there may not be a better time to switch to geothermal!

Matthew Desmarais is the founder of Energy Catalyst Technologies. ♻️



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