



Integrated Biomass Center Wallowa, Oregon

Two 50-kW Organic Rankine Cycle Units



Two 50 kW ElectraTherm+ 4400 Organic Rankine Cycle “Green Machine” power generators.

Quick Facts

LOCATION: Wallowa, Oregon

MARKET SECTOR: Forest Products

SYSTEM SIZE: 100 kW

EQUIPMENT: Two 50 kW ElectraTherm Organic Rankine Cycle power generators

FUEL: Wood waste biomass gasifier

USE OF SECONDARY THERMAL ENERGY:

Timber product drying kilns

TOTAL PROJECT COST: \$1.3 million

YEARLY ENERGY SAVINGS: \$61,000 in gross value (electrical and thermal sales plus waste management). Supports 20 jobs at campus.

PAYBACK: 7 years (when grant funds are taken into account)

SYSTEM IN OPERATION SINCE: 2014

Site Description

Wallowa Resources Community Solutions is a community organization that was established to deal with the economic downturn due to the shutdown of saw mills in the 1990's. With economic development grant money, they established an Integrated Biomass Energy Center (IBEC), located at a former industrial sawmill site near Wallowa, in Northeastern Oregon. The Energy Center's project provides both thermal and electrical energy to an integrated biomass campus. The project at this small-scale district heating site consists of a 4.7 MMBtuh Uniconfort biomass-fueled modular gasifier that provides 230°F hot water for wood product drying. Waste heat in the form of excess hot water is used to power two ElectraTherm 50 kW Organic Rankine Cycle (ORC) generators.

Reasons for Project Development

Industries at the biomass campus use various tree species to manufacture a variety of wood products. Tenant businesses at the facility utilize small-diameter wood—less than three inches in diameter—from forest restoration to make commercial products, including fence posts and poles, animal bedding, densified heating fuels, landscaping timbers, particleboard furnish, kraft (pulp) chips, and premium (dry and pest-free) bundled and bulk firewood. The campus's forest products firms accommodate and beneficially use thinnings from overstocked forest lands. Residuals from wood products produced there are used to fuel the gasification boiler. In addition to producing both thermal and electrical energy for use by on-site tenants, the Integrated Biomass Energy Center and campus district heating concept captures environmental benefits while promoting economic development.

The Integrated Biomass Energy Center and Campus project received energy, jobs, and economic development funding support from the U.S. Department of Energy Efficiency and Renewable Energy (EERE) Biomass Program, USDA, Oregon Department of Energy, US Endowment for Forestry and Communities, Energy Trust of Oregon, Northwest Community Capital Fund, and Pacific Power and Light's Blue Sky Fund, among others.

Equipment & Configuration

The Uniconfort two-chamber biomass gasifier was manufactured in Italy and has the ability to use green chips with high moisture content (55% to 60%). Fuel cost savings are obtained when chip pre-processing is minimized. The gasifier provides 230°F hot water for wood product drying needs and for the ORC units. The gasifier is easy to integrate into an existing or new facility due to its compact size. Gasifier operation does not require special skills or advanced training. Waste heat provided to the closed cycle ORC units boils a working fluid into a pressurized vapor that drives a twin screw rotor expander. The rotor spins an electrical generator to produce power.

Project Benefits

Benefits of the Integrated Biomass Center and Campus design include a higher biomass material recovery and use rate; reduced harvest cost per acre due to smaller landings and reduced in-the-woods sorting and processing requirements; reduced raw material costs for campus businesses; reduced trucking costs; job creation (both on-site and in the woods); decreased fire suppression costs and wildfire hazards due to removal of more raw material from the woods; and improved air quality due to reduced slash burning. Electrical energy production is net metered by the local utility (Pacific Power). Campus forest products companies currently utilize all of the heat and up to 2/3rds of the electricity produced by the energy center. When efficiency losses and parasitic pumping and compression loads are deducted, the net power generation is between 70 and 75 kW.

Energy Efficiency Benefits

Wallowa Resources Community Solutions staff notes that the project converts a solid waste liability into an asset—a feedstock for the production of both electrical and thermal energy. Annual electrical energy sales under a net metering agreement are valued at \$60,480 while thermal sales account for an additional \$60,000 in revenue. Fuel costs (at \$18/ton) amount to \$42,768 annually while labor and maintenance expenses add up to \$20,400 per year. Energy sales benefits thus equal about \$57,300 per year. Best, the dollars spent for energy remain in the local community. Total project costs exceeded \$1.3 million, yielding a simple payback on investment of 7 years when grant money is taken into consideration.

Replicability

The Integrated Biomass Energy Center serving as an “anchor tenant” for a forest products-oriented business park is a concept that can be replicated in many distressed rural communities that were once dependent upon sawmill operations. The concept complements forest management activities, but does require a committed and knowledgeable management team and public sector financial support to be cost-effective.

For More Information

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More Project Profiles:
www.nwchptap.org/

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The 4.7 MMBtuh Uniconfort biomass gasifier (left) and the in-feed from the wood chip bin (right)

“The biomass gasifier has been awesome. The ORC units provide an opportunity for the highest and best use for the available thermal energy.”
Christoffersen noted that since the ORC warranty expired, maintenance costs have increased and power generation costs are being re-evaluated.
---Nils Christoffersen, Wallowa Resources Community Solutions

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