

PROJECT PROFILE

State Energy Program
Renewable Energy

F. H. STOLTZE LAND & LUMBER CO. 2.5 MW CHP Combined Heat and Power

SITE DESCRIPTION

FH. Stoltze Land & Lumber operates a multi-product sawmill located between Whitefish and Columbia Falls, Montana. The company began operations in 1912 and has been in continuous operation since that time. Fredrick H. Stoltze came to the Flathead Valley in the late 1880s after contracting with the Great Northern Railway to establish town sites across the highline rail route from Minnesota. Operation at the current mill site began in 1923. Stoltze is one of the few family-owned lumber companies remaining in the Northwest. This mill employs about 120 people on a 145-acre site that includes administrative offices, a sawmill, dry kilns, and a planing mill. The company owns and manages about 38,000 acres of timberland.

Project Location:	Columbia Falls, Montana
Market Sector:	Lumber Mill
Type of System:	Biomass-fired boiler, extraction turbine-generator
Main Equipment:	Wellons water-tube steam boiler (725F); Dresser Rand extraction turbine
Fuel:	30,000-35,000 bone-dry tons wood residue annually
Capacity:	3.75 MW max capacity Toyo Denki Power generator
Installed Cost:	\$22 million
Payback:	20 years
Operation Start:	August 2013, Power purchase agreement began October 1

REASONS FOR COMBINED HEAT AND POWER (CHP)

- Diversify Stoltze's business beyond solid-wood products to include electricity generation;
- Replace aging boilers to increase lumber drying efficiency in dry kilns;
- Develop an outlet for woody biomass residues from forest management activities, and add market security to manufacturing activities for by-product values;
- Improve air quality by reducing boiler emissions and reducing slash pile burning in the forests. This new boiler has the capability to use logging slash and forest residues, whereas the old boilers did not.

EQUIPMENT CONFIGURATION AND OPERATION



Figure 1. F. H. Stoltze Land & Lumber Combined Heat and Power (CHP) Facility

F. H. Stoltze contracted with Wellons Inc., Vancouver, Washington to provide final design and installation of a combined heat and power (CHP), or cogeneration, system and with L. D. Jellison Inc., also of Vancouver, to integrate the CHP with the manufacturing facilities. A cogeneration system is one that provides both heat and electric power simultaneously, which uses less fuel than would be used by a system that produces both heat and electricity separately. The Stoltze system includes a new high-pressure steam boiler, turbine, generator, electrostatic precipitator (for particulates), cooling tower, fuel storage, conveyers for fuel delivery systems, and piping for the steam delivery system for the dry kilns (Fig. 1). The new single-cell boiler replaces five very old boilers utilizing about eight tons per hour of 40-50% moisture content fuel from both sawmill by-products and forest residues. The fuels consisting of bark, sawdust, planer shavings and forest and log yard hog fuel all exit from one of the two fuel silos or the fuel storage building (Fig. 1). This fuel is fed into the boiler (middle right blue building, Fig. 1). The boiler can produce 40,000 pounds per hour (lbs/hr) of superheated steam (725F) at 650 pounds per square-inch gauge (psig).

The steam is first sent to the extraction turbine (Fig. 2) for generation of electricity. Steam is extracted part way through the turbine to supply dry kilns for production heat, and to heat facility buildings before being condensed back into water for re-use.



Figure 2. Dresser Rand Turbine

This turbine can extract 30,000 lbs/hr of steam at 310 F. The turbine drives the Power Systems Generator. The CHP system sells 2.5 megawatts (MW) of electric power to the grid through Flathead Electric Cooperative.

About 85 to 88 percent of the water through the system is recycled by mechanically filtering, softening, and reverse-osmosis purification before returning to the boiler.

ENVIRONMENTAL BENEFITS

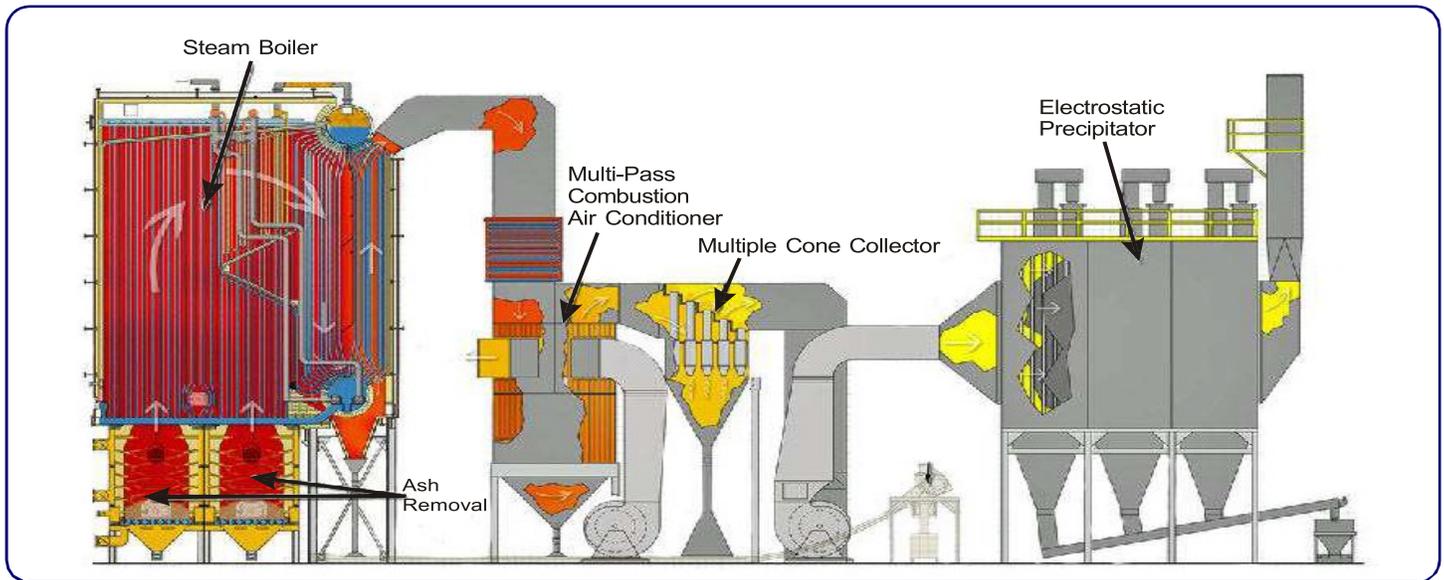


Figure 3. Diagram of boiler and emissions-equipment

The new boiler produces far fewer emissions than the five boilers it replaced. The new boiler accomplishes this through computer-controlled combustion that reduces carbon monoxide, carbon dioxide (CO₂), and other emissions. The CHP system uses the best available technology to remove particulates, including multi-cones and an electrostatic precipitator (middle, Fig. 3). These improvements reduced enough regulated pollutants to reclassify the facility from a major source to a minor source of air pollution. This improves

the up-wind air quality of Glacier National Park, a Class I airshed. Other environmental benefits include:

- Significantly reduced CO₂ emissions through greater energy efficiency;
- Reduced regulated emissions, especially particulate (as described above); and
- Maximized water use efficiency through recycling (as noted above).

OTHER BENEFITS

One of the goals for this project was to increase efficiency in drying lumber by replacing the five existing boilers. These 100-year old mill residue-fueled boilers ranged from 50 to 60 percent efficient, or lower. With computer controls, the new boiler greatly increases combustion efficiency, resulting in substantially less wood consumed per pound of steam produced. The new boiler was designed to use forest residues and slash from Stoltze's own timberlands and other forest management activities. Using these forest residues reduces the need for slash burning of forest wastes at the harvest site, reduces potential wildfires, and reduces overall carbon emissions because the slash is now burned in a boiler equipped with the Best Available Control Technology (BACT) emissions controls.

The installation of the high-pressure boiler for this project created a need for licensed boiler engineers certified to

operate such systems. Flathead Valley Community College partnered with Stoltze to add college curricula to train engineers in the operation of high-pressure boilers. Stoltze provided facilities for classroom work, aided in teaching, and will provide a state-of-the-art boiler facility to demonstrate operational techniques to future classes. Other benefits of the project include:

- Source of locally produced electricity, reducing dependence on foreign energy sources;
- Increased maintenance costs for operation of a large, new, and more complex facility are offset by the added revenues from electricity sales;
- Creation of nine to ten new jobs that help stabilize the other existing jobs operating and administering the mill.

LESSONS LEARNED

Green electric power is produced by renewable resources like wind and biomass. Many states require their utilities to purchase this type of power. Although many utilities would like to purchase the green power produced by this plant, transmission line access in this area of Montana is extremely limited. This limited market access constrained generation by the facility to 2.5 MW. The plant would have enjoyed greater economies of scale had it been able to be sized larger. Area fuel supply capacity would indicate up to 25-MW CHP capacity at a cost of \$43 to \$45 million total, or \$2 million per MW. The actual cost for the 2.5-MW CHP project was about \$9 million per MW.

Green electric power can also generate Renewable Energy Credits (RECs), sometimes referred to as a renewable energy certificate, or “greentag.” This is an environmental commodity that represents the added value, environmental benefits, and cost of renewable energy above conventional methods of producing electricity. RECs help to develop biomass projects, wind farms, and other renewable energy facilities by adding additional value to the energy, making them more financially sound. The Stoltze project generates RECs because it uses renewable biomass for fuel.

These RECs can also generate revenue for the project, but the value depends on the amount generated, and the specific buyer of the RECs. Stoltze negotiated to have its RECs certified in the State of Washington.

Most Bonneville Power Administration (BPA) power lines are built to receive power from a single source, and distribute it to customers along that line. Stoltze was the first new power producer to be added to the power line, meaning that changes had to be made at the substation and communications infrastructure to accept two or more sources of power onto the distribution line. This one-time cost to upgrade infrastructure was in addition to the interconnection agreement between Stoltze and Flathead Electric. This cost was unexpected, and was discovered late in the process. The costs for the substation protection and power controls were paid by Stoltze. Any future power production projects on that section of power line will not have to pay those costs again since the equipment is now installed.

In addition to electric power sales, wood ash from this new boiler presented as another potential product. Previously, ash from the five old boilers was combined with other wastes and placed in the county landfill. The ash from the new boiler is free of other wastes. In other locations such as at Kettle Falls, Washington, the wood ash is sold as a soil amendment. After October 1, 2015, Stoltze was no longer able to take the woody biomass from the county landfill in exchange for their utilization of Stoltze’s ash. Stoltze is working with the DEQ Solid Waste Program and Energy Office to identify potential markets.

POWER PURCHASE AGREEMENT, FINANCING AND PARTNERS

A Power Purchase Agreement (PPA) between Flathead Electric Co-op and Stoltze took effect October 1, 2013 and extends over a 20-year term. All electricity produced will be sold to the grid. Flathead Electric agreed to purchase an annual average of up to 2.5 MW of power, 8,400 hours a year, at an average wholesale rate estimated at 9 cents per kilowatt-hour (kWh). This long-term agreement assisted Stoltze in securing financing to replace the 100-year old boilers and construct a biomass-fueled electric generation facility. Stoltze was able to meet deadlines and receive a grant in-lieu of tax credits available through the Department of Treasury’s Section 1603 Investment Tax Credit.

Partners

- F. H. Stoltze Land & Lumber Co.
- Flathead Electric
- Northwest Farm Credit Services
- Wellons, Inc. (boiler)
- Montana Department of Natural Resources and Conservation
- Montana Department of Environmental Quality (DEQ) State Energy Program
- Flathead Community College
- Bonneville Power Administration
- LD Jellison (engineering and design services)
- USDA Forest Service

CONTACTS FOR MORE INFORMATION

Montana Department of Environmental Quality

Renewable Energy Program
Brian Spangler, Manager
(406) 444-6459 • bspangler@mt.gov

Kathi Montgomery, Program Specialist
(406) 444-6586 • kmontgomery@mt.gov

F.H. Stoltze Land & Lumber Company

P.O. Box 1429
600 Halfmoon Road
Columbia Falls, MT 59912
Trevor Kjensrud, Plant Manager
(406) 892-7022 • tkjensrud@stoltzelumber.com





Co-Generation Tour Handout

Along with our local utility partner Flathead Electric Co-op, Stoltze has four goals for our new Co-Generation Facility:

- ❖ Diversify our business beyond solid wood products.
- ❖ Replace aging boilers to increase lumber drying efficiency in dry kilns.
- ❖ Develop an outlet for woody biomass and sawmill residuals to facilitate forest management activities and bring security to our manufacturing operations.
- ❖ Improve regional air quality by reducing emissions from the boiler plant and reducing open burning smoke by reducing slash pile burning associated with forest management operations.

System Details

- **Boiler System:** Wellons, single cell, watertube modular construction. Delivers up to 40,000 lbs/ hour of superheated steam at 650 psig and 725^oF. Provides steam to the kilns to dry lumber, heat for the sawmill, and spins the turbine generator.
- **Biomass Fuel:** Bark, sawdust, planer shavings of various species and woods direct hogfuel when needed. Consumes 8 tons/hour, 192 tons/day, 67,200 tons per year or 2,240 +/- truckloads.
- **Turbine:** Dresser Rand extraction turbine with a name plate rating of 2500 KW. Extraction steam of up to 30,000 lbs/hour at 50 psig and 310^o F.
- **Generator:** Toyo Denki Power Systems, with maximum capability rating of 3750 KW. This can power up to 3000 homes in the Flathead Valley.
- **Air System:** Maximum combustion air flow is 92,125 lbs/hr. Induced and Forced draft fans control combustion in the boiler.
- **ESP System:** A series of plates (60,000 volts DC) remove particulate matter prior to the exhaust air leaving the stack. We are working with a variety of partners on outlets for the fly ash.
- **Water System:** 46 Million gallons of water per year treated to supply the boiler and cooling towers. Water is mechanically filtered, softened and purified with a Reverse Osmosis System. A 5000 gallon makeup tank holds several hours of makeup water. About 85% of the water is recycled in the process.
- **Permitting:** Air Permit from DEQ. Discharge permit for industrial waste water from DEQ. Water rights obtained through DNRC for both a deep water well and creek.
- **Economics:** The project cost is between 21 and 22 Million dollars. A 20 year Power Purchase Agreement was formed with Flathead Electric Co-op and Bonneville Power Administration to provide an annual average of 2.5 MW/hr for 8,400 hours (350 days/yr).
- **Personnel:** 11 full time employees run the Power Plant. In addition, 5 electricians, maintenance and equipment operators are shared part-time with the mill operations. More than 20 different contractors and more than 100 employees contributed to the construction effort which took more than 1.5 years to complete. Several years of research, planning and engineering were completed prior to construction.



F. H. STOLTZE LAND & LUMBER COMPANY

Lumber Manufacturers

Box 1429 • Columbia Falls, Montana 59912

Phone (406) 892-7000 • FAX (406) 892-1612

E mail info@stoltzelumber.com

www.stoltzelumber.com

Established in 1912
Affiliations:



MONTANA
Wood Products
ASSOCIATION

Charter Member

HI, GLAD YOU CAME TO SEE US!

We are part of the Forest Products Industry. In Montana there are 7,660 of us earning \$318 million in wages and producing \$565 million worth of lumber, fiber and paper products. Wood products are a vital industry in Western Montana in terms of Economic Base. For our raw material supply (timber), we are dependent on the Multiple-Use of National, State and Private Forests. We use these same forests for recreation, watershed and wildlife habitat.

This mill site has been owned and operated by F.H. Stoltze Land and Lumber Co. since 1923. We are a small family owned company. We also own and manage 38,367 acres of forestland under stewardship guidelines. We're proud of our employees, our mill and our tree farm.

In 2015 we represented:



Employees	115
Payroll (gross-including benefits)	\$8,522,454
Loggers/Contractors	55
Supplies and Services	\$5,304,745
Property Taxes	\$ 414,206
Contract Logging/Rd. Construction	
Trucking	\$6,930,752
Private Log Purchases	<u>\$7,523,487</u>
Total Spending	\$28,695,644
Spending Per Employee (170)	\$168,798
Health Care Spending	\$1,601,255
Individuals Covered by Health Care Program	302
Lumber Production (million board feet)	61.7 MM
Method Shipment	Rail 24% Truck 76%
Source of Logs	<u>2014</u> <u>Historical Ave.</u>
USFS	29.6% 50%
BIA	0.0% 2%
Mt. State	18.9% 2%
Private	51.5% 46%

Primary Products - Dry Planed Lumber
Residues - Chips, Sawdust, Bark,
Shavings, Hog Fuel

We plan to be in business in the Flathead County for the long term, utilizing the renewable forest resources from Federal, State and Private lands. The forest industry serves as the resource management tool of professional forest managers. This effort maintains a healthy forest environment and provides output for a better human environment - food, fiber, shelter, jobs, tax base, community services and recreation opportunities as well as products.

We want you to enjoy your visit. Thank you - Come back again.

The Employees of F.H. STOLTZE LAND & LUMBER CO.

Flathead Valley



Member Since 1960