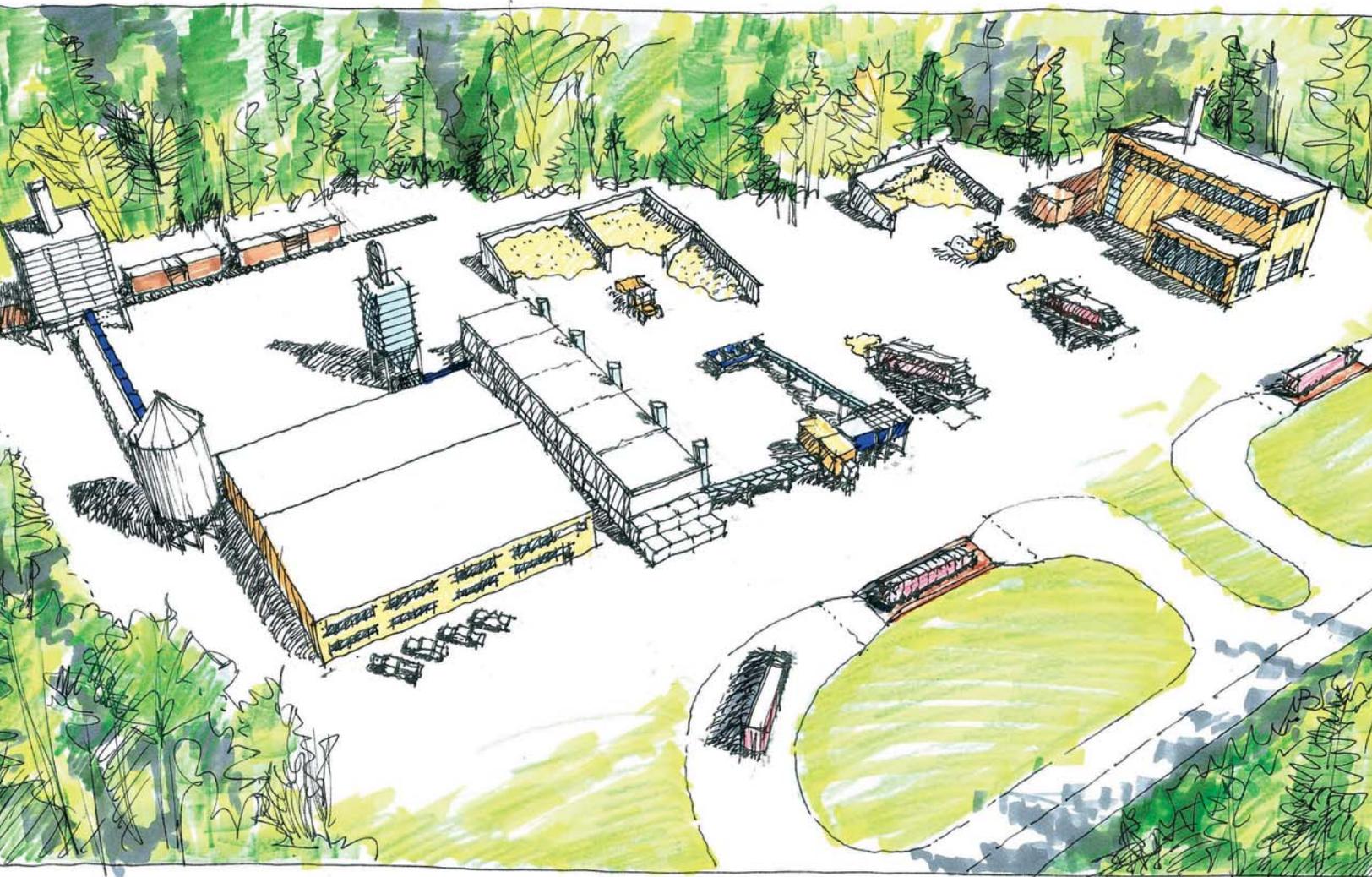




Fond du Lac Band of Lake Superior Chippewa

Biomass Co-generation & Wood Pellet Production Project



Greetings from the Tribe

The Fond du Lac Band of Lake Superior Chippewa is pleased to present our plans for a wood pellet manufacturing, district heat and co-generation project here in northern Minnesota. The following pages will introduce our people and how this project benefits the environment, the regional economy and national energy security.

Native peoples have a close relationship with the earth and the creatures with which we share the air, forest and water. By efficiently producing energy from sustainably harvested wood using the latest environmental control technologies, this project demonstrates Fond du Lac's leadership and commitment to the Kyoto Protocol, improving our environment, strengthening our regional community with green jobs and lower cost home heating, and preparing a better life for the generations that follow us.

We invite your questions, support and participation as we embark on this journey to a cleaner energy future.

Sincerely,

Karen R. Diver

Karen R. Diver
Chairwoman
Fond du Lac



Advantages

- 75 new, good paying, green jobs for northeast Minnesota
- Local carbon-neutral fuel that reduces home heating costs by about 50 percent
- Uses primarily underutilized wood species
- Conceived to demonstrate the highest energy and emission control efficiency technologies available in wood pellet production
- First biomass fueled Organic Rankine Cycle co-generation plant in North America
- 100,000 tons per year of high quality pellets that can displace up to 12 million gallons of oil or 18 million gallons of propane

Introduction

The Fond du Lac (FDL) Band of Lake Superior Chippewa is proud to announce the development of an innovative renewable energy biomass facility which will utilize co-generation combined heat and power (CHP) for light manufacturing. This “Green” energy facility will make use of local woody biomass fuel, sourced via sustainable harvesting methods, to provide electricity and district heating services to the Tribal community and also power an extremely efficient renewable, zero carbon wood pellet, manufacturing facility.



Figure 1: Schematic drawing of the project. Courtesy of the LHB Corporation.

For centuries, Native Americans have led by example when it comes to using natural resources efficiently and sustainably, serving and sharing within the community and taking into account the long range impact of decisions. This biomass facility is a perfect fit with the traditional values of the Tribe, as it will use local resources and local labor to ensure the highest local economic impact while preserving the environment for future generations.

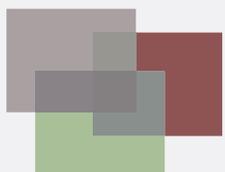
This biomass co-generation CHP facility will be the first of its kind in North America and will serve as a model for all other biomass and wood pellet facilities in America.



True Economic and Environmental Benefits

When this facility is up and running the economic impact on the local community will be vast. The new CHP biomass plant is a \$32 million dollar investment in the Fond du Lac Reservation. Expected benefits include:

- Creation of 75+ “Green” jobs (40 logging and trucking, 23 plant, and at least 12 more in the distribution of wood pellets and sale of wood pellet stoves)
- An annual revenue stream in excess of \$15 million at full capacity
- Production of a wood pellet product which is made from a local carbon -neutral fuel that reduces home heating costs by about 50 percent
- Retaining 75 percent of the biomass within the community, providing for heightened efficiency of fuel use
- Reduction of the Tribal carbon footprint and demonstration of Fond Du Lac’s Kyoto compliance leadership
- Further economic diversification
- Improve economic and energy self-sufficiency and security



Wood Resource

Currently, Minnesota has over 15 million acres of forests with wood harvest levels at less than 50 percent of the sustainable allowable cut benchmark. This results in a large area of unsafe forest land in need of fuel reduction and maintenance and provides for a great available inventory of wood which will serve as a stable, renewable source of feedstock to the biomass facility.

Even with this large biomass fuel source, 280,000 homes within the state still heat with non-renewable propane and fuel oil. Wood pellets can reduce home heating costs by 50 percent and are carbon-neutral, and an excellent alternative. Studies have shown that 75 percent or more of biomass energy dollars stay within the local community, as opposed to only 5 percent or less of fossil fuel energy dollars.

The Fond du Lac Logging Enterprise will be the primary supplier of cord wood for the wood pellet plant and biofuel, in the form of slash waste material, for the CHP facility. This vertically integrated model will keep all operations within the Tribe, ensuring the maximum level of tribal employment and the highest security of source material for the facility.



Furthermore, the Tribal Logging Enterprise will make certain that the wood products used within the facility have been *sustainably harvested*. The use of sustainable methods will require the continual updating of forest management plans (FMPs), provide for the highest and best use of currently underutilized wood species, and will lead to a safer, healthier forest. This CHP biomass facility will truly be a model of environmental stewardship.

Location and Climate

The Fond du Lac Reservation is located in northeastern Minnesota, adjacent to the city of Cloquet, and approximately 20 miles west of Duluth. The reservation is made up of three districts - Cloquet, Sawyer, and Brookston - and sits on approximately 23,000 acres of lush forests and wetlands, with about 96 miles of rivers and streams crisscrossing the area. The St. Louis River forms the reservation's northern and eastern boundaries. (See Figure 2)

The region's summer temperatures average in the high 70s with average winter temperatures in the 20s.



Figure 2: Location map

Infrastructure and Access

Interstate 35 and state highways 2 and 210 provide vehicular access to the reservation. Commercial truck and bus lines cross the reservation. Cloquet Airport is located on the reservation while commercial air service is available at nearby Duluth. The St. Louis River runs through the reservation with full port services available at Duluth. (See Figure 3)

Wood pellets can reduce home heating costs by 50% for this region.

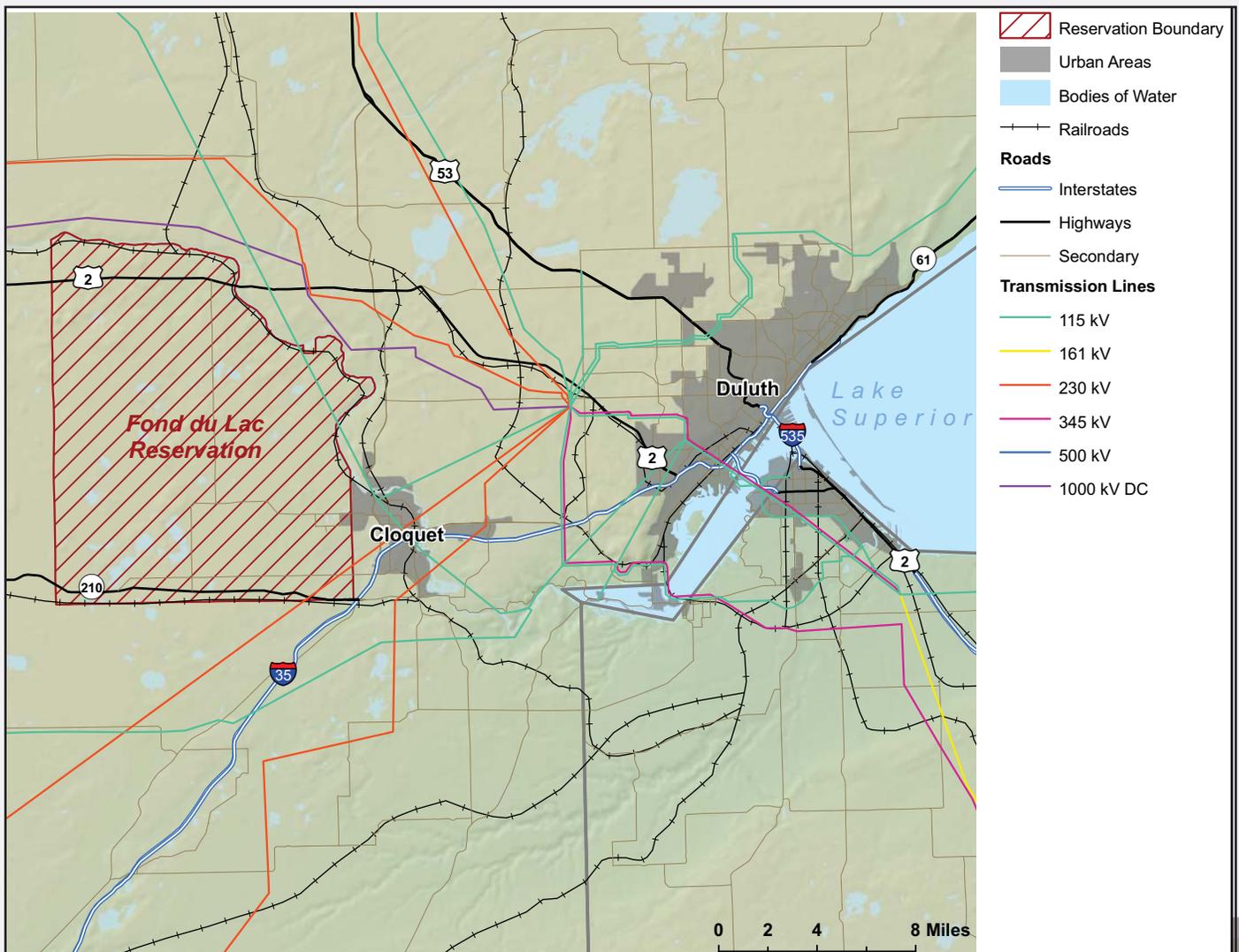


Figure 3: Infrastructure and access map

Pre-Development Steps

The Tribe has been extremely proactive in pursuing the development of this CHP biomass facility. To date the tribe has completed a biomass business plan, has successfully engaged outside governmental agencies and universities to assist with marketing and financial feasibility studies, and has completed a preliminary engineering study.

Biomass Business Plan

This project will integrate three complimentary business entities. The FDL Band will build, own and operate each of the following within one unique and revolutionary biomass facility.

1. **The FDL District Heat (DH) Plant** will consist of a biomass thermal oil heater, back-up natural gas hot water boilers, co-generation system waste heat recovery and buried hot water distribution piping. Hot water from the plant will heat the dry pellet feedstock, displacing natural gas. Eventually, the piping system may be extended to cover Tribal buildings and homes or potentially service new business and industrial developments.
2. **The FDL Co-Generation 2.5 MW Organic Rankine Cycle (ORC) System** fueled by waste wood will produce the electricity needed for the DH system and pellet plant. About 1.6 MW of the electricity will be consumed by the pellet plant, about 0.4 MW by the DH system and the remaining 0.5 MW will be net-metered to displace electricity purchased by the tribe.

3. **The FDL Wood Pellet Plant** will be a 100,000 + ton per year manufacturing plant which will also use waste heat from the co-generation plant for pellet feedstock drying. Pellets will be sold to Tribal members, other Tribes, retailers, wholesalers, and institutions (schools, etc.).

Marketing

Wood pellets can be manufactured and delivered for about half the cost of propane or fuel oil, but to date, pellets have not caught on in the upper Midwest to the degree they have in the Northeast. A 100,000 ton per year pellet plant would need about 16,000 of the 280,000 homes in Minnesota that use propane or fuel oil to switch to pellets. There are also hundreds of potential commercial and institutional pellet customers in Minnesota that could take advantage of cost effective bulk sales (see Table 1 for energy saving comparison).

An ample wood resource is available and no other pellet plants exist within a 75 mile radius of the proposed location, leaving a huge untapped opportunity available. Market studies currently undertaken by the University of Minnesota will serve to clarify the true market potential for a 100,000+ ton per year pellet plant in the region.

Competitive Advantage

FDL Pellets will enter the renewable energy and “Green” product business as the first producer in North America of sustainable and stably priced wood pellets using European co-generation and low emission technology. The utilization of this technology offers a number of extremely distinct, competitive advantages. First, it allows FDL Pellets to enter into the market as a regional low cost producer and distributor of premium pellets. Second, FDL Pellets will pursue “Green-e!” certification and will be the only pellet on the market which is made solely with CHP renewable energy.

Fuel	Cost per unit	Cost per mmBtu (adjusted for efficiency)	Approximate Net lbs CO2/mmBtu
Biomass DH	\$22/ton	\$3.26	0
Pellets at Cost	\$125/ton	\$8.42	0
Bulk Pellets	\$160/ton	\$10.77	0
Nat. Gas (residential)	\$1.06/therm	\$12.93	117
Retail Pellets	\$200/ton	\$13.47	0
Propane	\$2.30/gallon	\$30.62	139
Fuel Oil	\$2.60/gallon	\$22.38	161
Electricity	\$0.09/kWh	\$26.37	600 (coal based)

Table 1: Energy savings comparison. Courtesy of the LHB Corporation.

Engineering Study

Producing electricity sequentially with heating (co-generation) is one of the most efficient means of converting fuel into electricity. At about **75 percent efficiency**, co-generation is roughly **2.5 times as efficient** as conventional utility produced power. In this revolutionary facility, the waste heat from electrical generation will dry pellet feedstock and heat Tribal buildings.

A full engineering study has been completed with funding provided by the Interior Department's Division of Energy and Mineral Development. Engineers with significant forest products industry operating, project management, and construction experience obtained quotes for all site work and major equipment, as well as detailed building and installation costs.

The engineering study also provided a site plan (Figure 4) and a pellet production flow chart (Figure 5), which provide a visual representation of how the three distinct businesses operate in harmony to produce electricity, hot water, and a high quality wood pellet product. An artist's rendering of the site can be found on the front cover.

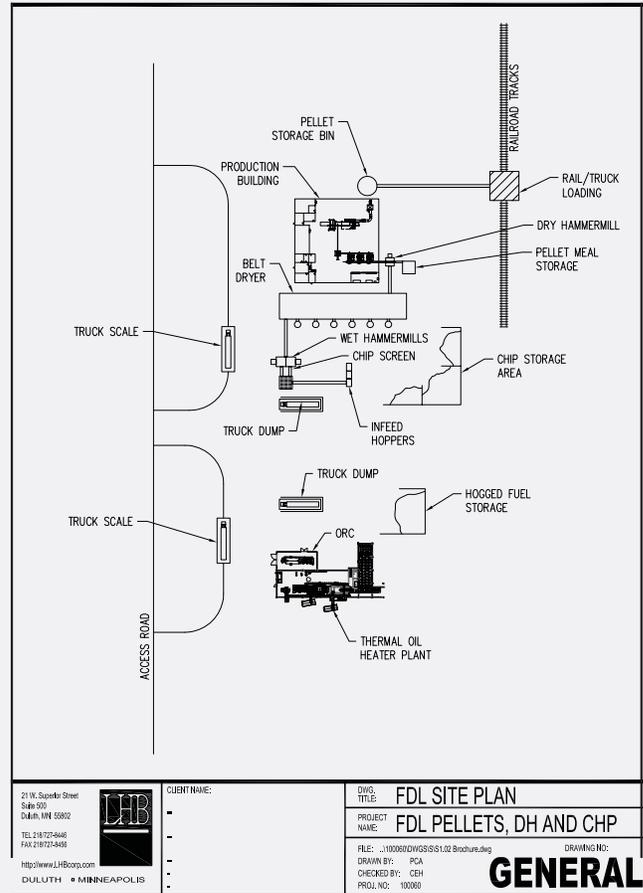


Figure 4: Fond du Lac site plan. Courtesy of the LHB Corporation.

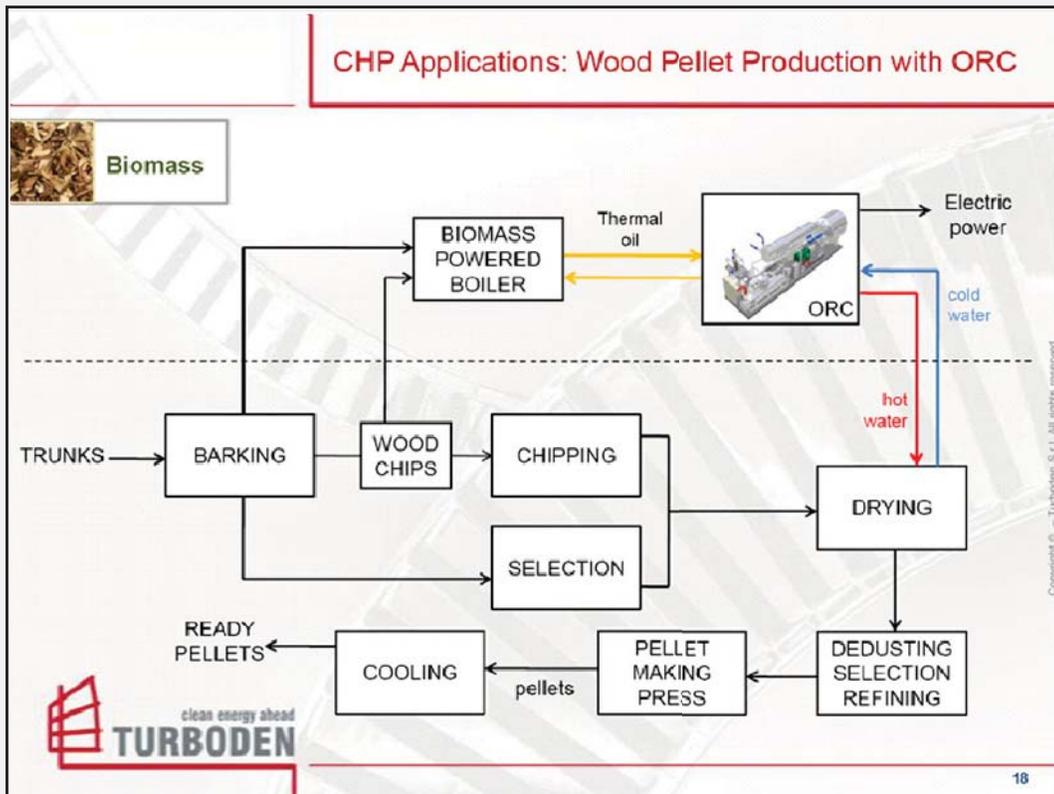


Figure 5: Pellet production flow chart. Courtesy of Turboden, a Pratt & Whitney Power Systems company.

Engineering Study

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I HEREBY CERTIFY that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

SIGNATURE: _____
TYPED OR PRINTED NAME: _____
DATE: _____ REG. NO.: _____

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NO	DATE	REVISION

PROJECT NAME:
**FDL BIOMASS
ENGINEERING STUDY**

ADDRESS

DRAWING TITLE:
**PELLET, DH & COGEN
FLOW DIAGRAM**

FILE: DWGSS/.....
DRAWN BY: PCA
CHECKED BY: CEH
PROJ. NO: 100080
DRAWING NO:

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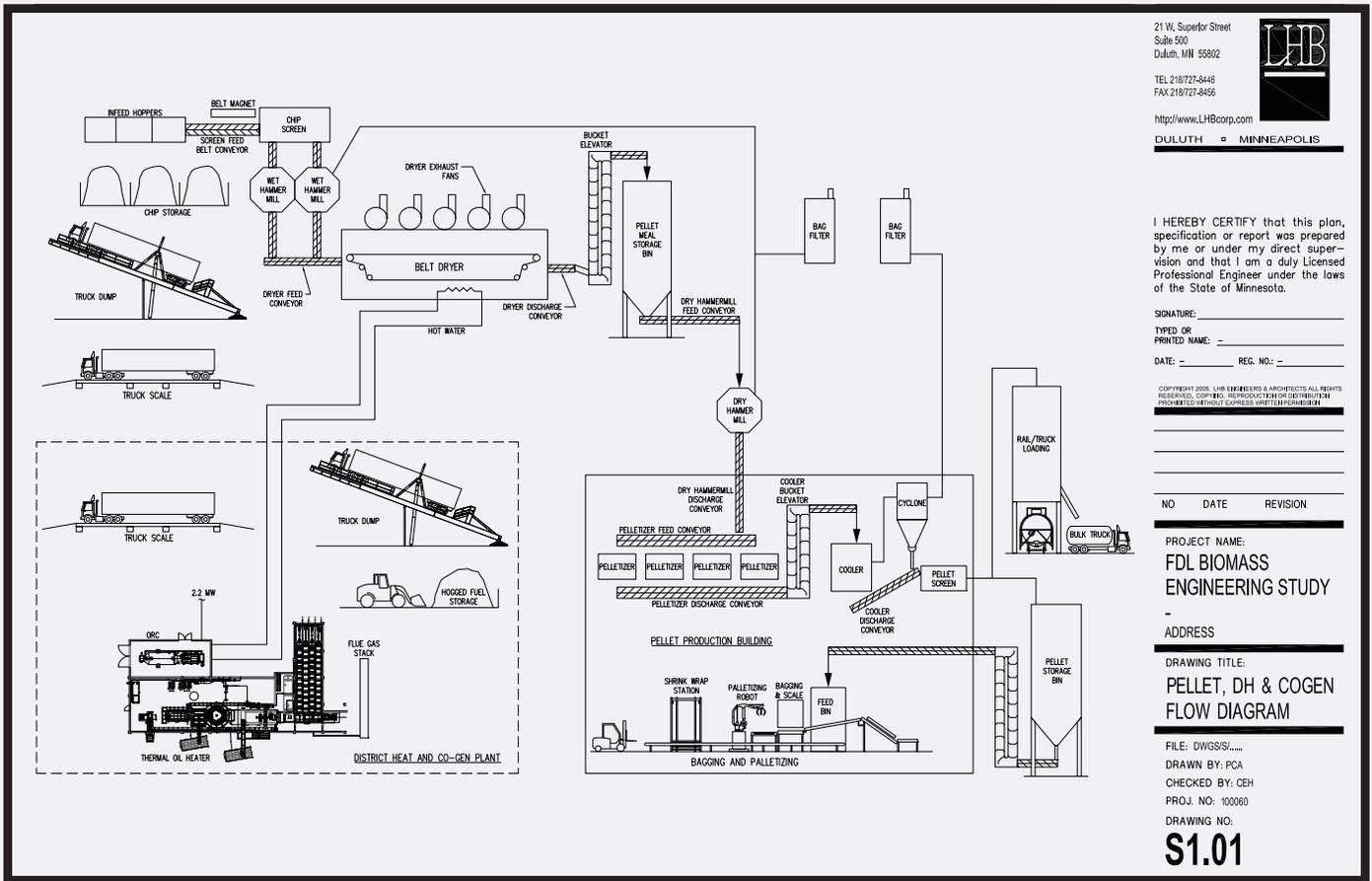


Figure 6: Fond du Lac pellet flow diagram. Courtesy of the LHB Corporation.

Thermal Oil Heater

The production of co-generation electricity and district heating hot water begins in the thermal oil heater. Wood refuse, also known as “hogged” fuel from logging slash, brush, whole tree chipping, etc., will be trucked to the plant in self unloading, 24 ton tractor trailers. Trucks will be unloaded directly into a 3 day capacity storage bin, allowing for full weekend unattended operation.

The bin will have a hydraulically driven walking floor that continuously delivers fuel to the infeed conveyor(s) which are also hydraulically driven. The infeed conveyor(s) push fuel into the combustion chamber which produces 1,900°F combustion gases. Bottom ash is collected, discharged, and stored in a steel ash dumpster.

The 1,900°F combustion gases travel to the thermal oil (TO) heater. By not having radiation heat transfer and fluid temperatures lower than conventional Rankine

(steam) boilers, tube corrosion and fouling is reduced, allowing for the use of air soot blowers and sonic horns to maintain the cleanliness of convection heat transfer surfaces. The TO travels around the perimeter of the heater, heated to 600°F by the flue gas traveling on the outside of the tubes.

Flue gas temperature is reduced to about 750°F as it exits in the TO heater and enters the economizer sections where TO is preheated in two stages for maximum efficiency. Fly ash from the economizer hopper is also discharged into the steel bottom ash storage bin.

Particulate emissions are controlled by a multi-clone dust collector and an electrostatic precipitator (ESP). The ESP fly ash is then discharged into the steel bottom ash storage bin.

Engineering Study

Turboden Organic Rankine Cycle (ORC) Plant

The 600°F heated thermal oil (TO) transfers its heat into the evaporator section of the ORC unit (see Figure 7, grey unit with the dome). An organic fluid, octamethyltrisiloxane (OTMS) is pre-heated and evaporated by the TO and piped to the turbine generator (green) where it turns the turbine which spins the generator to produce electricity. This electricity is then used within the district heat (DH) and pellet plants, with the excess fed onto the grid.

The OTMS gives up some of its heat as it spins the turbine and is then further cooled in the regenerator (gold vessel) and is used to preheat condensed OTMS from the condenser (red horizontal shell and tube heat exchanger). Overall, the unit has an efficiency of 75 percent with 15 percent of the energy contained in the biomass converted to renewable energy in the co-generation mode with about 60 percent converted to relatively high-grade waste heat.



Turboden ORC Installation. File Photo.

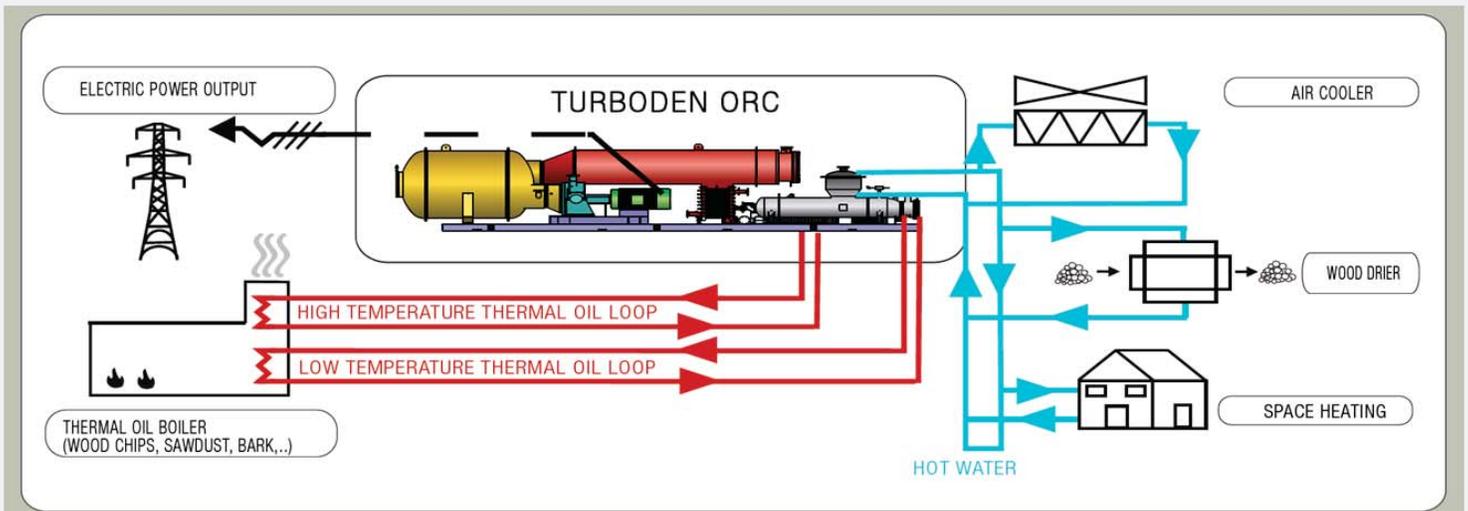
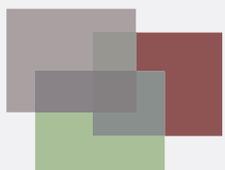


Figure 7: Turboden ORC. Courtesy of Turboden, a Pratt & Whitney Power Systems company.

The combination of these two units produce energy and heat for the pellet plant and Tribal buildings.



Business Advantages

HUBZone Status

A Small Business Administration program known as Historically Underutilized Business Zones, or HUBZones, provides contracting assistance to small businesses located in economically distressed communities. The goal is to promote job growth, capital investment and economic development in these areas, including all federally recognized Indian Reservations.

The Federal government plans to award three percent of all dollars for Federal prime contracts to HUBZone-certified companies.

Accelerated Depreciation

Businesses located on reservation property may be eligible to depreciate assets quicker than is allowed outside the reservation. This can result in tax advantages if applicable. Regardless of whether or not this provision is incorporated into current tax law, the Fond du Lac Tribe has the ability to pass on these tax savings to non-Indian owners when they are involved in a joint venture entity with the Tribe.

The advantages of locating a business within tribal jurisdiction depend on the type of business and corporate structure. Consult your tax professional to help determine the actual benefits available to your organization.

Foreign Trade Zone Status

The Fond du Lac Tribe can be a grantee for general purpose Foreign Trade Zones (FTZ) - a major advantage for companies that import components to manufacture finished goods for export.

FTZs are considered to lie outside of U.S. Customs territory for the purpose of customs duty payments. In other words, goods entering an FTZ are not subject to tariffs until they leave that zone and enter U.S. Customs territory. Merchandise shipped to foreign countries from an FTZ is exempt from U.S. duty payments.

Tax Credits

There are numerous tax advantages for businesses operating on Tribal Trust lands. Property and sales taxes are not applicable on Trust lands, under certain conditions, and depending on the form of business ownership, exemptions from Federal, state, and local taxes could also occur. Accelerated depreciation schedules also serve to decrease taxation for firms with a tax appetite.

The People

The Anishinaabeg (an Ojibwe/Chippewa word meaning "The People") of the Fond du Lac Reservation, established by the LaPointe Treaty of 1854, are primarily members of the Lake Superior Band of Minnesota Chippewa. Members of the Algonquin linguistic family, the Chippewa nation is the second largest ethnic group of Indians in the United States. Archaeologists maintain that ancestors of the present day tribe have resided in the Great Lakes region since at least 800 A.D. Historically, they were nomadic hunters and fishermen who also developed some agriculture. During spring, families came together in camps to collect maple sap, which was boiled down into sugar, and in autumn, families gathered to collect wild rice, which was abundant in many areas.

Today, the Fond du Lac are a highly diverse people who are focused on preserving their traditional values, while also looking to boost their economy.



Photo courtesy of the Fond du Lac Band.

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Photo courtesy of Brian Borkholder.

