

XCEL ENERGY

BAY FRONT PLANT

ASHLAND, WISCONSIN

A Local Mutually Beneficial Relationship - Barriers, Trust, and Partnerships

*“We realize that suppliers need to stay in business just like us.”
David Fulweber - Bay Front Plant Manager*

SUMMARY

Xcel Energy’s Bay Front Plant is located in Ashland, Wisconsin, on the south shore of Lake Superior. The plant operates by burning wood, coal, and limited amounts of shredded tires. The plant has a production capability of 73 megawatts and has burned approximately four million tons of non-coal products since 1979.

Northwest Wisconsin is heavily forested. Wood products and related industries have played and continue to play a significant role in the regional economy. Now, with energy security, climate change, and higher energy prices all becoming significant issues, the region is looking to its forest resource again. Xcel Energy, the community, and the lumber industry have an ongoing relationship that, as energy prices continue to rise, is allowing the region to turn to forest resources to help solve energy challenges.

HISTORY AND BACKGROUND

Bay Front was constructed in 1916 and has seen numerous updates over the past century. In 1979, improvements were completed to allow the plant to operate partially on wood and not solely on coal. Over the past three decades, the plant has increased its percentage of power that is produced by wood. The plant was updated in 1999 to improve efficiency when biomass is burned.

OPERATION

The power plant employs 35 people and has three boilers that produce steam, which in turn power three turbines which produce electricity. Two of the three boilers can operate using biomass. The boilers and turbines are cross-connected to allow any boiler to power any turbine. The plant currently operates using approximately 60 percent wood and 40 percent coal, with two percent shredded tires. In 2007, the plant burned 206,000 tons of wood. To operate fully on wood, it would have to burn roughly 350,000 tons of wood annually.

At this time, the plant has approximately 25 different contracts with biomass suppliers. The plant currently signs one year contracts with their suppliers. There are limited specifics in the contracts and each contract is based on the quantities and kind of biomass each supplier can deliver annually. The plant takes a sample of the wood and analyzes the moisture, ash, and BTU levels. The samples help the plant determine how much energy will be produced by each supplier. Ideally, the plant would be able to determine the BTUs in each delivery, but it is not currently a viable option.

The plant has made a commitment to not compete for pulpwood that is used in the wood or paper industry. Instead, the plant sources scrap material from local wood product firms, and tree tops and slash by-product from logging operations. In 2007, the plant purchased \$4.4 million of woody biomass to burn in the plant.

The wood passes through several steps from the time it enters the facility until it is burned. First, supply trucks bring the wood to the plant and the load is weighed. After weighing, the trailer is lifted by a hydraulic lift so that the wood is emptied into a large holding area. From there, the wood is

The plant purchased \$4.4 million of wood in 2007. 99% of the wood came from a 60 - 70 mile radius.

To further the biomass potential of the Bay Front plant, Xcel Energy is in the process of doing a feasibility study to convert its third boiler to accept biomass. Since 2004, annual coal consumption for the two wood burning boilers has been reduced from 68,000 tons to 36,000 tons in 2007. The projected usage of coal for 2008 is expected to be less than 29,000 tons for these two boilers.

CATEGORY

Woody bio-mass power plant

PROJECT START DATE

1979

POSSIBLE ADJACENCIES

Studied steam heating in Ashland, ash sold to third party.

STAKEHOLDERS

Xcel Energy, local companies involved in wood economy, several units of government

PROJECT STATUS

Continued reduction of coal usage

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Xcel Energy's Bay Front Plant sits along the Chequamegon Bay of Lake Superior in Ashland, WI. The 73MW plant is phasing out its use of coal. In 2007, 206,000 tons of wood was burned at the plant.

loaded onto a conveyor belt and transported into a staging area. The wood is then dropped into the boiler and the wood sits on a moving grate that is as long and wide as the boiler. The wood is burned and the remaining ash is dumped at the end of the grate and collected. The ash is currently sold to Beneficial Reuse Management Company in Ashland, which uses it as base material for asphalt construction pads.

The two wood burning boilers operate at full biomass capacity throughout most of the year. Every Monday morning there is a wood stoppage to allow the plant to perform routine preventive and corrective maintenance. The spring weather prohibits some wood waste collecting and therefore slows down the availability of wood biomass for a period of time depending on the weather. In addition, the plant receives lower volumes of wood during the Christmas holiday season and at the end of November during deer hunting season.

GOVERNMENT AND COMMUNITY RELATIONS

The plant and suppliers have built a relationship which makes the burning of biomass possible. A few groups have stated that tree tops and slash should remain in the forest to allow for the return of their nutrients to the soil. Some studies show that as much organic material should be left in the forest as possible. On the other hand, there is also data that indicates a certain level of organic material can be sustainably removed from the forest with no long-term adverse impact on the nutrient cycle, water quality, or biodiversity.

Xcel Energy tries to work closely with different stakeholders in the region.. The plant provides public tours of the facility and works closely with the environmental programs at Northland College, which is also located in Ashland. Recently, Xcel Energy worked with the City of Ashland to determine if it would be feasible to implement steam heating for the city using waste heat from the plant. Results from the study indicated significant technical barriers to overcome, making the steam heating system not financially viable at this time.

VIEW OF A LOCAL SUPPLIER

One of the suppliers for the Bay Front Plant is Craig Vernon who operates OEI, Inc. and Northern Renewables, LLC. Both companies are located in Ashland. Among other things, OEI operates a sawmill that produces sawdust and other wood material that is sold to Xcel Energy for use in the Bay Front Plant. Previously, OEI would take this waste product to Rhinelander, WI. Due to different costs including increasing fuel costs and the price Xcel Energy pays for the wood, it is now more profitable for OEI to sell their waste products to the Bay Front Plant.

Northern Renewables was created in 2006 to specifically supply the Bay Front Plant. The three owners of North-



(top to down) The front of the wood burning boilers. The wood is dumped onto a moving grate where it is then burned. Two of the three boilers can burn wood. / The rear side of the wood burning boilers. / The control room at Bay Front allows for the continued observation of all activities going on in the plant.

ern Renewables were able to justify the creation of the company due to the commitment of Xcel Energy to continue to purchase significant quantities of biomass for the Bay Front Plant.

Northern Renewables is one of ten small companies that have been created by the local private sector specifically to provide biomass to the plant. Northern Renewables works primarily within a 35 mile radius of Ashland and works closely with loggers in the region. Their primary job is to retrieve the allowable amount of tree tops and slash that are left after logging operations are complete.

Northern Renewables is one of several companies that have been created to provide woody biomass to the Bay Front power plant.

CHALLENGES AND BARRIERS

The major challenge for Xcel Energy and the local biomass suppliers was building a mutually beneficial relationship. The relationship between the plant and suppliers has progressively improved in recent years. During the past two years, the plant has focused on improving communication involving the supply of wood that is needed at any given time. This can include material problems, upcoming maintenance needs, and planned boiler outages, etc. Because 99 percent of the biomass suppliers are located within a 60-70 mile radius of the plant, Xcel believes that the plant cannot benefit unless the local economy that supplies the plant with biomass also benefits. An example of this is the plant sponsoring a Wood Conference in January 2007 for

their suppliers and other interested parties. The venue allowed the plant to discuss their goals and concerns and gave suppliers an opportunity to express their ideas on how the two parties could form a better working relationship. While the local economy has benefited from the plant using woody biomass, there are still sev-

The creation of a mutually beneficial relationship between the plant and suppliers has been addressed, and the relationship between the two stakeholders is vastly improved.

eral existing barriers that limit the region's ability to supply the plant with additional biomass. Barriers include lack of investment dollars; high fuel prices; availability of biomass; and harvesting technology.

With regards to more efficient equipment, there are a variety of technologies that would allow suppliers to operate more efficiently and serve a larger geographic area. These include forwarders, grapple skidders, and grinders. Better technology would allow suppliers to chip more wood at a more efficient pace, carry more wood out of project sites with each load, and increase efficiency of gathering wood at a project site.

As Xcel's demand for biomass increases, a challenge is that additional trucks are needed to service areas beyond where biomass is currently being collected. Adding capacity is a challenge for existing biomass suppliers, many of which are small and have limited resources to invest. The high cost of fuel also makes transporting biomass longer distances a real challenge.

(left to right) A City of Ashland vehicle dumps wood waste. The City of Ashland has the option to dump their wood waste at the Bay Front Plant. / One of two large drills releases wood waste from the enclosed storage container onto the conveyer belt which eventually takes it to the boilers to be burned.





Northern Wisconsin is heavily forested and home to a well established wood products industry. With proper management, it is believed that the region can also supply excess biomass to emerging industries in need of feedstock.

Like elsewhere, another challenge facing renewable energy development in northern Wisconsin is funding. The federal and State government have implemented numerous funding opportunities for renewable energy projects. However, there is some concern with the amount of funding available for small woody biomass suppliers. The population centers of Wisconsin are located in the southern and eastern parts of the State. At the same time, the more discussed and popular bio-energy sources like ethanol and bio-energy from dairy operations are located in the southern two-thirds of the State. Therefore, some stakeholders in the far northern portion of the State feel that more funding should be available and more attention given for woody biomass, specifically for smaller operations that are providing woody biomass for renewable energy.

Policies for working on public lands can also be a challenge. In northwest Wisconsin, there is a patchwork of public entities which own forestland, including

Federal, Tribal, State, and County entities. Management practices and regulations vary by ownership. Different logging and harvesting requirements need to be correctly interpreted and understood by those in the industry.

There has been discussion of possible wood pellet facilities in northern Wisconsin that would produce wood pellets and export them overseas.

Finally, despite all the forestland, the future of wood supply in the northern part of the state may be a barrier itself to more renewable energy development. The supply is limited and coming under increased pressure. For example, there has been discussion of possible wood pellet facilities in northern Wisconsin that would produce wood pellets and export them overseas. Increases in the number of schools and local governments using wood to heat buildings may create additional competi-

tion for biomass feedstock. If cellulosic ethanol technologies advance and woody biomass becomes a feedstock for the liquid biofuels market as well, the increased competition for feedstock will most likely force the Bay Front plant (and others) to look for more innovative ways to satisfy biomass supply needs. Alternative feedstocks such as short rotation woody crops or perennial polyculture grasses may need to be researched and deployed.

RECOMMENDATIONS

The Bay Front example provides valuable lessons for other biomass suppliers and buyers seeking to grow local bioenergy industry. Key points include:

- Communication between supplier(s) and end user (s) is essential.
- Purchasers need to understand the supplier's issues and work with them.
- Biomass quality should be clearly defined when establishing contracts.
- Both parties must understand that poor quality material will not be accepted.
- Try to establish long-term contracts (Eg; 3 years or longer). This makes it easier for suppliers to

finance equipment.

- For community support of the operation, provide tours and an overall open door policy demonstrating what is being done at the project site.

THE FUTURE

The future of the Bay Front plant seems to rest in the hands of the future of biomass, the local economy, and obviously Xcel Energy. The increased globalization of trade, even in northern Wisconsin, and the ongoing discussion, changing policies, and introduction of new facts regarding bio-fuels will determine the future of the Bay Front plant. As the demand for wood to be used for bio-fuel increases, prices for wood will also most certainly increase. Due to state, national, and international interest in bio-energy, it is likely that this trend will continue. The Xcel Energy Fuels Department is actively working on finding solutions in a more competitive market, where the material that they receive is no longer considered as waste.

Xcel has stated its intention to use 100 percent wood to provide power at the Bayfront Facility. For 2008, Bay Front has a goal to fuel the two boilers that can burn biomass with as close to 100 percent wood as possible.

(left to right) Semi trailer parked on a lifting machine. / The hydraulic machine lifts the trailer in the air and the wood is dumped into a holding area. The process takes less than 15 minutes.



Xcel Energy is planning to continue to work towards helping the local wood industry. They worked in the past to develop different pieces of legislation that would provide incentives, such as low interest loans or grants to loggers to invest in new equipment, which would then

The Bay Front plant's demand for wood has helped the local economy by introducing a specific new economy to the larger wood and lumber economy.

provide more waste wood to the market. However, these efforts did not successfully get approved. Recently, the Governor of Wisconsin has instituted the Energy Independence Fund, which can be used to financially help local loggers. Plant managers and Xcel Energy have been vocal supporters of this program.

In conclusion, the region has a history of working with lumber and profiting from wood products. It also has had a history of entrepreneurship. The Bay Front plant's demand for wood has helped the local economy by creating a new market for woody biomass to compliment existing wood and wood product-related industries, resulting in additional revenue streams for woody biomass suppliers in the region.

"I feel that we have worked hard to achieve a strong and mutually beneficial working relationship. We have improved communications from all parties so that any issues that arise can be readily solved with minimal impact for us as well as the wood suppliers. Many of our suppliers are small firms and the absence of that close coordination (as well as understanding their concerns) could lead to their failure as well as us not achieving our 100 percent biomass goal."

David Fulweber - Bay Front Plant Manager





The Bay Front Power Plant is a visual presence along Ashland's lakefront.

The wood industry is vital to northern Wisconsin. Statewide, there are 1400 forest products companies in Wisconsin. The forest related industry is a \$20 billion a year industry and employs 2.8 percent of the total employment in Wisconsin. The percentage of employment is significantly higher in the northern third of the state with Ashland County having 7.3 percent of its workforce in the forest related industry. There are 72,000 direct forest product manufacturing jobs in Wisconsin. Forest products manufacturing jobs also pay above the state average income.

As a whole, 91 percent of the timber harvested in Wisconsin is processed by Wisconsin wood manufacturers. Statewide, for every 10 forest related industry jobs an additional 23 jobs are produced in other sectors as a result of forest industry purchases and employee household purchases.

Of the 72 counties in Wisconsin, forest industry manufacturing ranks number one for employment in industry jobs in 23 of the counties, and either second or third in 14 of the counties.

Source: UW-Extension Forestry Team