PHASE I BIOMASS FUEL AVAILABILITY REVIEW FOR A PROPOSED BIOMASS POWER COGENERATION FACILITY AT FAIRMONT, MINNESOTA

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BACKGROUND AND INTRODUCTION

During the week of March 1, 2010 TSS Consultants (TSS) traveled to Fairmont, Minnesota to conduct a review of potential renewable energy fuel sources within a 75-mile radius of the community. This investigation represents the initial step towards verifying practical fuel resources for the development of a large-scale bioenergy facility located in the City of Fairmont.

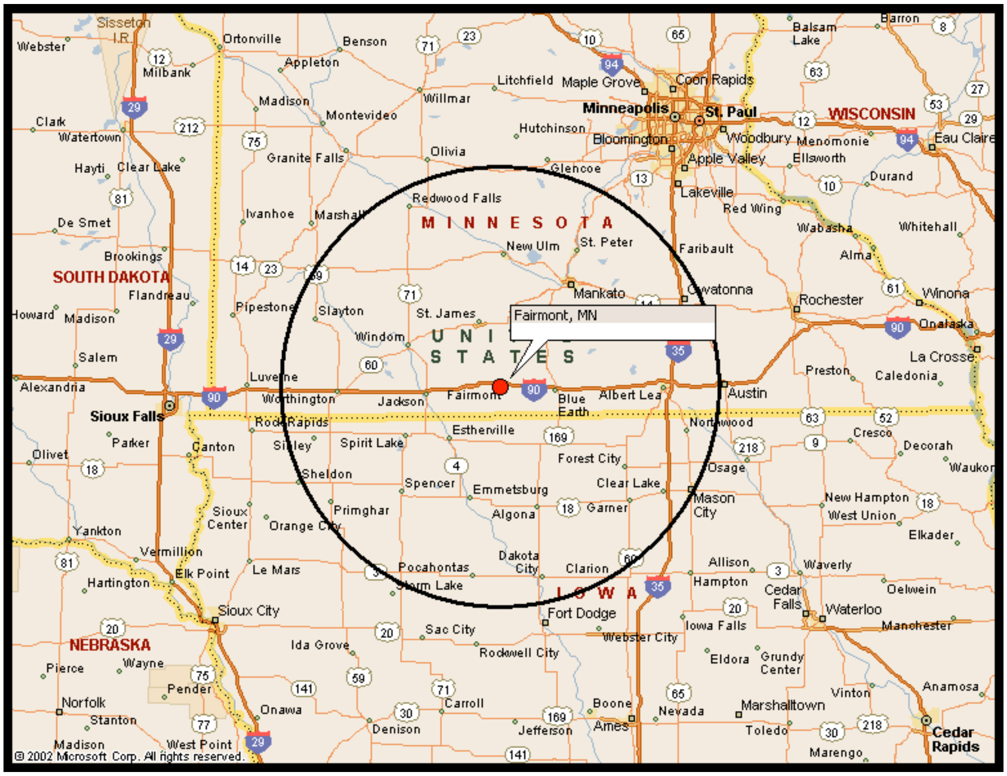
Fairmont is located in Martin County approximately 155 miles southwest of Minneapolis near the Iowa border. This rural south central region of Minnesota is prime agricultural country, producing commercial crops including corn and soybeans, and is also a major hog producing area. In recent years the City of Fairmont has done an exceptional job attracting new industry into the community, the most recent being BioFuel Energy's 115 million gallon per year Buffalo Lake Energy ethanol plant. This facility has a consumption capacity of 40 million bushels (1.1 million tons) of corn per year.

During the course of this investigation, TSS traveled throughout the region including visits to refuse derived fuel (RDF) combustion facilities in Mankato, Minnesota and Ames, Iowa and an alternatively fueled cement kiln in Mason City, Iowa. Additionally, TSS visited and talked with several wood waste processors in the region including Southern Minnesota Construction (SMC, now a division of Old Castle Materials), Hansen Sanitation, and Veit and Sylva Corporation.

FUEL STUDY AREA

In consideration of Fairmont's relatively remote location and agricultural land base, TSS has focused on those biofuel resources which lend themselves to this rural environment. In addition, based on TSS experience with biofuel supplies, a reasonable supply area radius of 75 miles was utilized for this study. The map in Figure 1 shows the location of Fairmont and the 75-mile fuel study area (FSA).

Figure 1. Map Showing the Location of Fairmont, Minnesota and the 75-mile Radius Fuel Study Area



BIOENERGY FUEL SOURCES

Within this 75-mile radius study area there are numerous potential bioenergy fuel sources. TSS considered the following:

- Urban
  - Urban wood waste – construction and demolition (C&D), pallets, miscellaneous residential and commercial wood waste.
  - Tree trimmings – plant material generated from residential and commercial landscape maintenance activities and power line right-of-way clearing.
  - Refuse Derived Fuel (RDF) – the combustible portion of waste found in the municipal solid waste (MSW) stream.
  - Used rail ties – used rail ties generated through replacement by the railroad companies.
  - Biosolids – the solids portion of waste derived from wastewater treatment plants.

- Agricultural
  - Crop residues – that portion of agricultural corps remaining after harvest, such as corn stover and straws.
  - Process residues – combustible by-products from ethanol production.
  - Discarded seed – excess, obsolete or substandard seed that needs disposed.

- Forest
  - Timber harvest residuals – limbs and treetops generated during commercial timber harvest activities.
  - Sawmill residues – sawdust and wood waste generated from lumber processing.

Urban Sources

Urban Wood Waste

Within the FSA there is an estimated population of 587,242 residents.[1] Based on TSS's experience with urban wood waste generation, approximately 11.5 pounds per capita of waste are generated daily with 10.5% of this consisting of urban wood waste. Using this generation factor, TSS estimated that approximately 129,410 tons of urban wood waste is generated annually within the FSA.

While this procedure provides a macro level estimate of the potential urban wood generated within the FSA, it does not take into account the practically available urban wood waste. For purposes of estimating this practically available volume, TSS assumes that about 35% of the urban wood waste would not be available either because it is too contaminated or commingled with other waste. This approach results in an estimated practically available volume of 84,116 tons per year.

In addition to this urban wood waste generated within the FSA, TSS also considered sources of construction and demolition (C&D) wood waste that is currently being hauled into the FSA from the surrounding areas, such as the Minneapolis/St. Paul region. Although much of this C&D wood is currently being landfilled, TSS did learn that efforts are underway to encourage more recycling of the C&D waste stream. While only limited efforts are currently being undertaken to divert the C&D waste from landfills, TSS did identify some interested parties that are currently investing in C&D recycling equipment. These firms indicated that with proper economics they would be capable of generating an estimated 8,000 to 10,000 tons per year of C&D wood waste. This would result in approximately 93,116 tons practically available wood waste from within the FSA. Assuming 20% moisture content results in 74,493 bone dry tons (BDT[2]) per year.

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[1]U.S. Census Bureau State & County Quick Facts – 2008.
[2]One bone dry ton is the equivalent of 2,000 pounds of fiber at zero percent moisture.

Tree Trimmings
Based on previous studies performed by TSS, it is estimated that approximately 100 dry pounds of tree trimmings suitable for fuel is generated annually on a per capita basis. Based on a population of 587,242, approximately 29,362 BDT of tree trimmings are estimated to be generated annually. TSS assumes that approximately 65% of this wood generated is actually recoverable for biomass fuel. Therefore, approximately 19,085 BDT of tree trimmings are practically available each year from within the FSA.

Refuse Derived Fuel
In addition to the woody waste portion of the urban waste stream, there is also the combustible portion of MSW known as Refuse Derived Fuel (RDF) that can be utilized as a renewable fuel under Minnesota Statute 116.90. This statute allows a bioenergy combustion facility to utilize RDF in an amount up to 30% by weight (see Appendix A) with minimal additional environmental permitting required. Using Minnesota MSW generation data provided by the Minnesota Pollution Control Agency,[3] TSS estimated that approximately 174,595 tons of MSW are landfilled annually within the Minnesota portion of the FSA. An estimated 32% of this MSW is landfilled outside of Minnesota, primarily in Iowa where 45,385 tons of MSW are disposed of at Waste Management Company's Lake Mills landfill. In addition to these landfilled tons, there are almost 25,000 tons per year of MSW estimated to be disposed of on-site, either burned or buried at residences. Using solid waste data compiled by the Iowa Department of Natural Resources Waste Management Section, TSS estimates there are approximately 276,793 tons of MSW landfilled annually in the Iowa portion of the FSA. Combining these total tons results in an estimated 451,388 tons of MSW landfilled annually within the FSA.

Based on the economics and politics associated with waste disposal, TSS believes it is not realistic to assume that all of the 23 Minnesota counties and 20 Iowa counties considered in this FSA would practically participate in supplying MSW to an RDF fired power plant located in Fairmont. For purposes of this review, TSS has assumed that Martin, Jackson and Faribault would continue to utilize the Prairieland Compost facility in Truman, which produces RDF. TSS estimates that these three counties generate approximately 17,630 tons of MSW. Assuming an RDF recovery rate of approximately 80% results in 14,104 tons of RDF potentially available on an annual basis. Assuming a 25% average moisture content results in 10,578 BDT per year.

Based on this relatively low volume of RDF from these three counties, TSS believes that a regional approach would need to be taken in order to access sufficient MSW for development of an RDF fired power plant. Considerable efforts would need to be undertaken to assess the interest level from the remaining counties as well as the impact on current waste flows throughout the region. Of primary concern is the impact to local county landfill volumes and reduced tip fee revenues; in addition, the impact to the two privately operated landfills in Iowa could result in tip fee reductions. Such an in-depth waste flow analysis is beyond the scope of this review. However, for purposes of estimating the feasibility of such an option, TSS has generated a list of select counties as

[3] Report on 2007 SCORE Programs.

possible participants in a regional Resource Recovery Facility. Table 1 provides a list of targeted counties to consider.

Table 1. Estimated Refuse Derived Fuel Potential from Select Minnesota Counties Within the FSA

COUNTY	MSW DISPOSAL (TONS)[4]	POTENTIAL REFUSE DERIVED FUEL ESTIMATE (BDT)[5]
Martin	7,316	4,390
Faribault	9,697	5,818
Jackson	5,216	3,130
Blue Earth	14,732	11,785
Freeborn	25,140	15,084
Waseca	4,174	2,504
Watonwan	8,887	5,333
Nobles	9,888	5,933
TOTAL	**85,050**	**53,977**

Additional tonnage could be available from Iowa counties; however, developing an interstate regional waste organization would be a complex undertaking. TSS did discuss the possibility of additional MSW tonnage deliveries to the Prairieland facility with a local waste hauler. Initial estimates indicated approximately 28,000 tons of MSW could be delivered to the Prairieland facility.

TSS also discovered a densified RDF production facility in Iowa just outside the FSA. Located at the Cherokee County Landfill in Cherokee, Iowa, this facility just began operation in March 2009. Although currently they are working on a contract with Great Plains Ethanol LLC, a Poet facility located in Chancellor, South Dakota for the sale of this fuel, Cherokee County indicated that they may have additional product available. Their current plan is to produce 50 to 70 tons per day of densified RDF pellets.

Combining these potential sources of RDF results in an estimated volume of 27,400 to 53,977 BDT per year of RDF fluff and an additional 11,200 BDT of densified RDF.

Used Rail Ties

Used rail ties are an acceptable biomass fuel and are in widespread use in the upper Midwest. Currently Minnesota Power in Duluth, Xcel Energy in La Crosse, Wisconsin and Xcel Energy in Ashland, Wisconsin are estimated to be burning over 1.5 million used rail ties per year. A 2008 survey conducted by the Railway Tie Association found that approximately 17.1 million wood ties were replaced in the United States in 2008. Of this total, roughly 9.6 million were combusted or gasified. At approximately 182 lbs per tie, this represents approximately 720,000 tons of used ties annually.

[4]Minnesota Pollution Control Agency, SCORE 2008.
[5]Assumes 80% RDF recovery factor and average moisture of 25%.

From previous work by TSS, it was estimated that railway companies in the Minnesota region generate approximately 1.3 million used ties per year or 118,300 tons per year. This volume is very close to the estimated annual consumption of Minnesota Power and Xcel Energy in La Crosse. However, recent discussions with RTI Railroad Services indicated an interest in supplying up to 1,000,000 rail ties per year to a bioenergy project located in Martin County. An important consideration for RTI Railroad Service is rail line access to the Union Pacific Railroad. The Union Pacific line runs through Fairmont, adjacent to the proposed project site. Based on these preliminary findings, TSS believes that up to 75,000 tons of used rail tie fuel is potentially available for this project. Assuming a moisture content of 25% results in approximately 56,250 BDT per year of used rail tie fuel.

Biosolids

Previously known as treated sewage sludge, the term biosolids refers to the organic by-product of municipal wastewater treatment that can be beneficially and safely recycled. In Minnesota, approximately 180,000 dry tons of biosolids are reclaimed from wastewater annually.[6] Over 200 cities and sanitation districts in the state recycle biosolids as a soil amendment and fertilizer, which is reportedly well received by the commercial agricultural community.

While TSS is familiar with two systems currently operating in California to produce a dried biosolids fuel or fertilizer product, the costs of these operations appear to limit the feasibility to very large municipalities. In addition, the fuel specifications for one product, known as EnerTech E-fuel, indicate an ash content of 47% to 63% (by weight). TSS believes that the poor fuel quality of biosolids and the limited volume generated within the FSA, as well as the readily available agricultural land for soil application, greatly reduces the feasibility of biosolids as a part of the fuel supply mix at Fairmont.

Table 2 below summarizes the potential volumes of urban sourced fuel within the FSA.

Table 2. Summary of Urban Sourced Fuel Within the FSA

FUEL TYPE	ESTIMATED VOLUME (BDT)
Urban Wood Waste	74,493
Tree Service Debris	19,085
RDF – Fluff	27,400 to 53,977
RDF – Densified	11,220
Used Rail Ties	56,300
TOTAL	**188,498 to 215,075**

*The upper end volume assumes formation of regional waste management organization to aggregate additional MSW from surrounding counties.

[6]Metropolitan Council Environmental Services (MCES), April 9, 2008.

Agricultural Sources

Crop Residues
The FSA is a prime agricultural area, with over 2.6 million acres of corn harvested annually in the Minnesota portion of the FSA and over 2.1 million acres in the Iowa portion of the FSA. In recent years much interest has been focused on corn stover, that portion of the stock, leaves and cobs remaining after harvest, as a potential feedstock for both energy production and cellulosic ethanol. In fact, it was recently announced that Abengoa Bioenergy has teamed up with Mid-Kansas Electric Co. LLC to develop a cellulosic ethanol and power plant in Kansas to produce 15 million gallons per year (MMgy) of ethanol and 75 megawatts (MW) of power per year using corn stover, wheat straw and switchgrass as feedstocks.[7]

Using data from USDA National Agricultural Statistics Service,[8] TSS estimated that over 900 million bushels of corn were harvested within the FSA in 2009. Based on information provided by the University of Minnesota Extension,[9] which indicates for every 35 bushels of corn harvested there is one bone dry ton of corn stover per acre, TSS estimates that there are potentially over 25 million BDT of corn stover available in the FSA annually. TSS believes that due to economic and logistic constraints, it is not realistic to consider this entire volume as practically available. For the purposes of this phase I review, TSS estimates that 65% of this volume or 16.7 million BDT would be practically available within the FSA.

Based on this large volume, it is easy to see why there is so much interest in corn stover as a feedstock. However, TSS believes that caution is in order, as large-scale power production with herbaceous crop residues such as corn stover and straw (e.g., wheat) is challenging. TSS is unaware of any large-scale facility burning significant amounts of corn stover or straw in the United States. Technical challenges with boiler slagging and fouling are significant.

Ethanol By-Products
During the course of this review, TSS contacted Buffalo Lake Energy's ethanol plant located in Fairmont. In addition to ethanol, this facility also generates 2,400 tons per day of wet cake and 150 gallons per minute of syrup, both by-products of the corn to ethanol process. Typically the syrup is added to the wet cake and the mixture is processed through a drier. A bottleneck for many ethanol facilities is the drying capacity and as such, there is often an excess amount of wet cake produced, which has limited shelf life and must be disposed of quickly (within days).

Considerable interest and research has been directed at utilization of these ethanol by-products as an alternative fuel source. In fact recently, Corn Plus, a 49 MMgy ethanol plant in Winnebago, Minnesota, installed a fluidized bed boiler to burn syrup and

[7]Biomass Magazine, March 2010.
[8]USDA National Agricultural Statistics Service – Quick Stats U.S. & All States County Data–Crops 2009.
[9]University of Minnesota Extension Forage Program – Forage Quarterly, Vol. 1: Issue 2, November 2007.

generate process steam. The company is now considering a high pressure boiler to run a turbine generator and produce electricity.

TSS has had preliminary discussions with Buffalo Lake Energy management, and they have indicated an interest to pursue the Corn Plus cogeneration strategy at the Buffalo Lake Energy facility. Locating a bioenergy power plant near the Buffalo Lake Energy ethanol plant would create a very synergistic opportunity (see Appendix B for a map of the proposed project site). Such a facility could provide process steam and electrical power to the ethanol plant and offer a stable disposal option for excess wet cake and syrup. At this time, TSS has estimated approximately 2% to 3% of the wet cake (15,000 tons to 23,000 tons) and 50 to 100 gallons per minute of the syrup could be available. Buffalo Lake Energy has indicated they will provide a summary of their by-product volumes and fuel analysis for wet cake and syrup. Until such time as actual volumes are available, TSS is estimating approximately 17,000 to 27,000 tons per year of wet cake and syrup could be available from Buffalo Lake Energy.

In addition, TSS believes that additional syrup could be obtained from other ethanol facilities within the FSA at little or no cost. Not including Buffalo Lake Energy and Corn Plus, there are 17 ethanol plants operating within the FSA, producing almost 1.2 billion gallons of ethanol per year and an estimated 1,550 gallons per minute of syrup or approximately 140,000 tons per year. At an average moisture of 65%, this would equate to 49,000 BDT per year of additional syrup available within the FSA. Combining this total with the Buffalo Lake Energy by-products results in an estimated 57,000 BDT of syrup and wet cake potentially available annually in the FSA.

Discarded and Treated Seed

Periodically, seed companies need to dispose of excess, obsolete or substandard seed that has been treated with crop protection products and/or subjected to processes that make it unfit for other uses. One such disposal option is to use this material as fuel in a power generating facility. During the course of this review, TSS contacted several of the major seed producers in the region including Monsanto and Pioneer. Based on preliminary discussions, TSS estimates that 15,000 to 25,000 BDT per year of discarded seed product could be available within the FSA.

Table 3 provides a summary of the various agricultural products potentially available in the FSA.

Table 3. Agricultural Fuel Products Potentially Available in the FSA

FUEL TYPE	POTENTIAL VOLUME (BDT)
Corn Stover	16,700,000
Ethanol By-Product	57,000
Discarded/Treated Seed	15,000 to 25,000
TOTAL	**16,772,000 to 16,782,000**

Forest Fuels

Timber Harvest Residuals and Sawmill By-Products

Within the FSA there is very limited forestry activity. TSS visited with two sawmill operations in the course of conducting this phase I review. Both operations were extremely small and the owners indicated no trouble disposing of by-products (sawdust, bark, chips). In fact, it was indicated that they could sell even more by-product if it were available. Prices of up to $33 per BDT were reportedly being offered for sawdust sold at the sawmills.

TSS utilized the United States Department of Agriculture Forest Service Forest Inventory EVALIDator version 4.01 and Iowa Department of Natural Resources[10] data to estimate the potential forest harvest levels within the FSA. Based on this data, TSS estimated approximately 2,000 BDT of forest residues available annually.

Table 4 summarizes the estimated forest fuels potentially available in the FSA.

Table 4. Forest Fuels Potentially Available Within the FSA

FUEL TYPE	VOLUME (BDT)
Timber Harvest Residues	2,000
TOTAL	**2,000**

Combining these fuel sources, TSS estimates that there are approximately 280,787 BDT of potential biomass fuel available within the FSA. Table 5 provides a summary of these fuel types and volumes. Note that TSS has not included corn stover in this total due to challenges related to boiler slagging and fouling.

Table 5. Summary of Fuel Types Within the FSA

FUEL TYPE	VOLUME (BDT)
Urban and Tree Service	93,578
RDF	51,909
Agricultural	77,000*
Forest	2,000
Other – Used Rail Ties	56,300
TOTAL	**280,787**

*Due to combustion technology concerns, corn stover was not included in this total.

[10]The Use of Wood Biomass for Distributed Energy Generation in Iowa. Midwest CHP Application Center and Iowa Department of Natural Resources. January 2008.

BIOFUEL AND WOODFIBER DEMAND

Within and adjacent to the FSA there is demand for biofuel and woodfiber. TSS identified several commercial-scale facilities during this assessment. Table 6 provides a summary of these potential competitors.

Table 6. Fuel and Woodfiber Competitors Within and Adjacent to the FSA

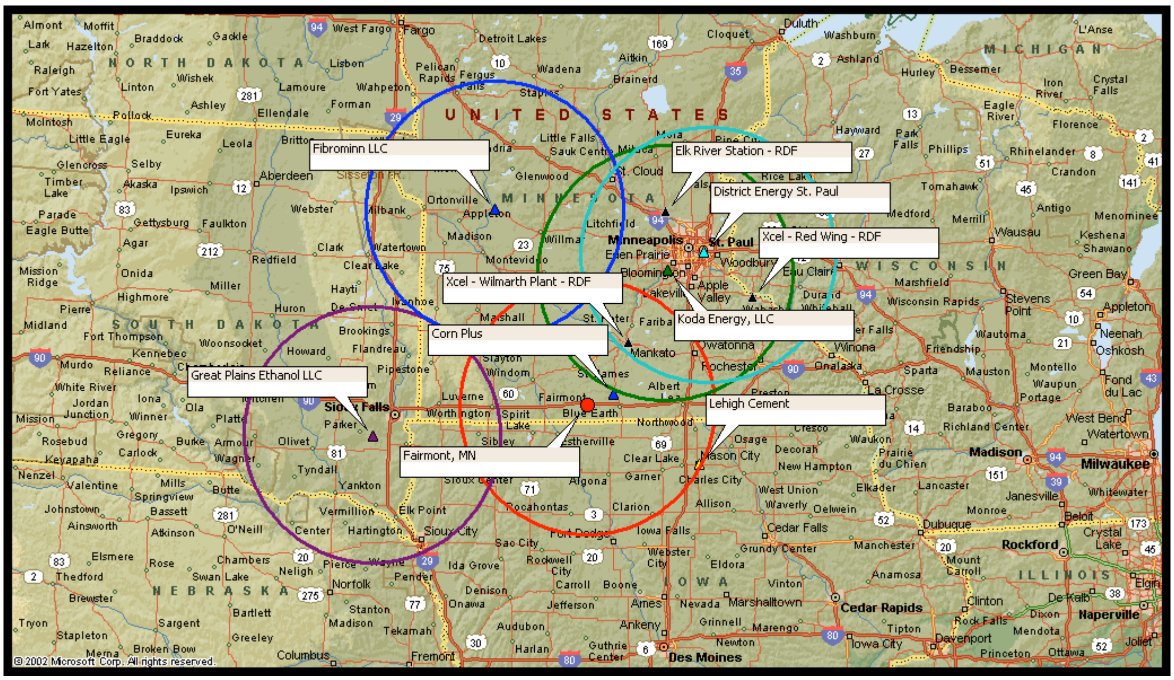
FACILITY/LOCATION	FUEL TYPES	EST. VOLUMES (TONS)
District Energy – St. Paul, MN	Urban Wood and Tree Service Debris	280,000 tons
Koda Energy – Shakopee, MN	Wood and Oat Hulls	50,000 (wood)
Fibrominn – Benson, MN	Turkey Litter and Wood	85,000 (wood)
Great Plains Ethanol – Poet Chancellor, SD	Wood and Natural Gas	95,000 (wood)
Corn Plus – Winnebago, MN	Ethanol By-Products (syrup)	5,000
Xcel - Red Wing – Red Wing, MN	RDF	190,000
Xcel - Wilmarth – Mankato, MN	RDF	140,000
Great River Energy – Elk River Station – Elk River, MN	RDF	300,000
Lehigh Cement Company – Mason City, IA	Discarded Agricultural Seed	(several thousand tons)

In addition to these users, TSS also identified Herman's Landscape Supplies in Jordon, Minnesota as sourcing woodfiber from the FSA. Volumes were limited to clean sawmill bark and slabs as well as some tree service residues. As the map in Figure 2 shows, all of these facilities except Lehigh Cement are located outside the FSA. However, Great Plains Ethanol's fuel processor did indicate they do operate in Jackson County (within the FSA). The remaining users appear to be concentrating their procurement efforts in and around the Minneapolis/St. Paul area. TSS found evidence of Fibrominn sourcing C&D wood from downtown Minneapolis.

Although difficult to determine accurately, TSS has estimated, based on overlapping procurement areas, that approximately 26,750 BDT per year of fuel and woodfiber are obtained by these competitors from sources located within the FSA. Reducing the potentially available volume of 280,787 BDT by 26,750 BDT results in a net potentially available volume within the FSA of 254,037 BDT per year. Based on TSS' experience with biomass power project development, most developers and private financial lenders prefer a fuel coverage ratio (fuel available/fuel usage) of 2.0:1 or higher. In this case, to achieve a coverage ratio of 2.0 would suggest a project fuel usage of approximately

127,019 BDT per year. Furthermore, assuming a burn rate of approximately 1 BDT per net MWhr and 7,800 hours per year of operation annually would indicate a potential project scale of approximately 15 MW to 16 MW using approximately 390 BDT per day. It is important to note that TSS has not included the use of corn stover in this calculation. If technological advances in large-scale combustion of corn stover prove to be successful and large-scale project development efforts such as the Abengoa project in Kansas are able to obtain project financing, then Fairmont should revisit corn stover as a fuel opportunity.

Figure 2. Map Showing Competing Users of Wood Fuel and Fiber



Fuel Characteristics and Pricing

As previously discussed (regarding firing characteristics of corn stover), the combustion characteristics of bioenergy fuels are critical to the success of a project. TSS has repeatedly conducted fuel assessment analyses where the initially intended fuel source was found to be operationally impossible to combust. With this in mind, TSS has attempted to focus this review on fuels with a well established history of successful combustion. Even in the case of ethanol by-products such as syrup and wet cake, which are relatively new bioenergy fuels, there is an operational ethanol plant combusting these products within the FSA. Obviously more in-depth discussions will need to be undertaken with Buffalo Lake Energy regarding their by-product characteristics and pricing. However, for purposes of this review, TSS has used publicly available information as well as discussions with leading experts in the field.[11] [12]

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[11]Personal communications with R. Vance Morey, Professor, Department of Bioproducts and Biosystems Engineering, University of Minnesota, St. Paul, Minnesota.

Table 7 summarizes the fuel characteristics and estimated prices for fuels identified in this assessment.

Table 7. Biofuel Characteristics and Estimated Prices

FUEL TYPE	MOISTURE (%)	ASH (%)	HHV[13] (BTU/LB) DRY BASIS	ESTIMATED PRICE ($/BDT)
Urban Wood	20% – 25%	5% –10%	7,500 – 8,500	$40 - $45
Tree Service Debris	35% - 45%	1% - 4%	8,000 – 8,600	$30 - $40
RDF – Fluff	20% - 30%	12% - 20%	6,500 – 7,500	0
RDF - Densified	15% - 20%	10% - 12%	8,000 – 9,000	$45 - $55
Used Rail Ties	15% - 20%	5% - 10%	6,500 – 8,000	$43 - $50
Corn Stover	5% - 20%	5% - 10%	7,500 – 7,800	$75 - $85
Wet Cake (DWG)	67% - 68%	3%	9438	$60 - $78
Syrup	65% - 67%	7%	9,000	$15 - $20
Discarded Seed (Corn)	10% - 15%	1% - 3%	7,000	$20 - $25
Discarded Seed (Soybean)	10% - 12%	4% - 6%	8,000 – 8,500	$20 - $25
Timber Harvest Residues	35% - 50%	1% - 8%	8,200 – 8,900	$50 - $60

CONCLUSIONS AND RECOMMENDATIONS

TSS believes there is an abundance of renewable fuel resources available within the Fairmont FSA. However, much of the volume is made up of herbaceous crop residues, particularly corn stover, which entail significant technological obstacles for successful development as a large-scale fuel source. Without consideration of these herbaceous crop residues, TSS concludes that there are sufficient fuel resources for development of a biomass power generation project with a net generation capacity in the 15 MW to 16 MW range.

Perhaps most interesting from a project development standpoint is the possibility of utilizing ethanol by-products from the existing Buffalo Lake Energy ethanol plant, currently operating adjacent to the proposed Fairmont project site, as well as from other ethanol plants in the FSA. The utilization of ethanol by-products as a bioenergy fuel source is relatively new, and Minnesota appears to have taken the lead nationally as regards to utilization of this potential renewable fuel. In fact, the Corn Plus ethanol plant located in Winnebago, Minnesota is the first of its kind in the U.S. to utilize its by-products as a fuel source. In addition, the University of Minnesota, with funding from

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[12]Personal communications with Doug Litwiller and Mark Kingland of Alliant Energy, Value Added Products and Services Division.
[13]High heating value.

Xcel Energy, has established the Biomass Electricity Generation at Ethanol Plants Project for the primary purpose of expanding the use of ethanol by-products as a renewable fuel source at ethanol plants.

Preliminary discussions with Buffalo Lake Energy management suggest a high degree of interest in providing by-products to a bioenergy project that would generate process steam and electricity for use at the ethanol plant. At this time, Buffalo Lake is collecting detailed data on the volumes and actual heating values of their by-product streams. Once this data has been compiled, TSS recommends that discussions continue with Buffalo Lake to determine the specific fuel characteristics and firing potential.

A bioenergy project anchored with the ethanol by-product streams from Buffalo Lake offers an interesting development opportunity. While Buffalo Lake could be a core fuel supplier, a well-diversified fuel supply would enhance the prospects for the development of a biomass power generation project at Fairmont. The fact that Buffalo Lake could provide fuel to a new biomass power project but could also offer a ready market for low pressure process steam makes this an attractive opportunity and certainly worthy of additional study. TSS experience indicates that biomass power facilities that not only sell power but also process steam have a better return on investment profile due to the fact that two revenue streams are generated.

In addition to the Buffalo Lake facility, the Prairieland compost facility provides a unique fuel supply option for a bioenergy project in Fairmont. Prarieland is currently processing over 15,000 tons per year of MSW into RDF from within the three county area (Martin, Faribault and Jackson). Currently this RDF is hauled to the Xcel-Wilmarth facility at Mankato. However, if Prairieland had an RDF market at Fairmont, TSS believes additional MSW could be obtained and additional RDF produced.

Furthermore, TSS found that several large agricultural seed companies located in the Midwest, including Monsanto and Pioneer, were interested in a long-term and consistent outlet for their discarded seed. Based on preliminary discussion with these companies, TSS has estimated that 20,000 BDT per year of discarded seed could be available within the FSA. This discarded seed is typically generated over a three month period and is shipped in 100 pound sacks on pallets. In order to accommodate this short shipping period, it will be necessary for the power project to have sufficient storage area to stockpile the entire season's shipments in approximately a three month period. The Prairieland facility has over 60,000 ft^2 of storage area that is currently used for compost production. If the facility converts to RDF processing and no longer requires the enclosed storage areas for compost, these storage areas could be an ideal option for storing the discarded seed. Appendix C provides a site map of the Prarieland facility.

Other bioenergy sources uncovered during this review include densified RDF from Cherokee County, Iowa, used rail ties from the Union Pacific Railroad, and mixed C&D wood waste from SMC and Hansen Sanitation. While competition for these biofuels does exist within the FSA, Fairmont is well located at the outer edge of the major competing facilities' procurement areas.

In summary, the findings of this review suggest that a 14 MW to 15 MW bioenergy project, anchored with the by-product streams from biofuels and increased RDF production from Prarieland as well as other bioenergy fuels identified in this study, could be feasible. As a follow-up to this assessment, TSS would recommend specific discussions be undertaken with key suppliers to obtain a firmer level of commitment in the form of letters of intent or other document specifying their actual fuel volumes. The City of Fairmont should consider development of a strategic fuel procurement plan.

APPENDIX A

116.90 REFUSE-DERIVED FUEL.

Subdivision 1. **Definitions.** (a) The definitions in this subdivision apply to this section.

(b) "Agency" means the Pollution Control Agency.

(c) "Minor modification" means a physical or operational change that does not increase the rated energy production capacity of a solid fuel fired boiler and which does not involve capital costs in excess of 20 percent of a new solid fuel fired boiler having the same rated capacity.

(d) "Refuse-derived fuel" means a product resulting from the processing of mixed municipal solid waste in a manner that reduces the quantity of noncombustible material present in the waste, reduces the size of waste components through shredding or other mechanical means, and produces a fuel suitable for combustion in existing or new solid fuel fired boilers.

(e) "Solid fuel fired boiler" means a device that is designed to combust solid fuel, including but not limited to: wood, coal, biomass, or lignite to produce steam or heat water.

Subd. 2. **Use of refuse-derived fuel.** (a) Existing or new solid fuel fired boilers may utilize refuse-derived fuel in an amount up to 30 percent by weight of the fuel feed stream under the following conditions:

(1) utilization of refuse-derived fuel involves no modification or only minor modification to the solid fuel fired boiler;

(2) utilization of refuse-derived fuel does not cause a violation of emissions limitations or ambient air quality standards applicable to the solid fuel fired boiler;

(3) the solid fuel fired boiler has a valid permit to operate;

(4) the refuse-derived fuel is manufactured and sold in compliance with permits issued by the agency and:

(i) is produced by a facility for which a permit was issued by the agency before June 1, 1991; or

(ii) is produced by an agency-permitted facility designed as part of a regional waste management system at which facility the waste is mechanically and hand sorted to avoid inclusion of items containing mercury or other heavy metals in the waste that is processed into refuse-derived fuel, and the refuse-derived fuel producer has contracted with an end user to combust the fuel; and

(5) the owner or operator of the solid fuel fired boiler gives prior written notice to the commissioner of the agency of the amount of refuse-derived fuel expected to be used and the date on which the use is expected to begin.

(b) A facility that produces refuse-derived fuel that is sold for use in a solid fuel fired boiler may accept waste for processing only from counties that provide for the removal of household hazardous waste from the waste.

(c) The agency may not require, as a condition of using refuse-derived fuel under this section, any additional monitoring or testing of a solid fuel fired boiler's air emissions beyond the monitoring or testing required by state or federal law or by the terms of the solid fuel fired boiler's permit issued by the agency.

History: *1991 c 337 s 56; 1992 c 593 art 1 s 33*

APPENDIX B

Fairmont Industrial Park

Proposed Project Site (shown in red) Buffalo Lake Energy Plant Site (shown in yellow)

APPENDIX C

Prairieland Facility Site Map