

## Supply Chain Logistics and Concerns

*Background Report to Dovetail Partners on community involvement activities associated with “Supporting Community-Driven Sustainable Bioenergy Projects”*

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*December 2012*

Community district energy based on locally-grown biomass is a complex network of resources, activities, people, and technologies. Supply chain logistics begins in the forest, with long-term and short-term management plans and guidelines. Timber harvest, brush management, or other activities follow, and then the processing, hauling, and storage of woody biomass for energy production. The end user, the energy consumer, completes the chain. Throughout the entire process, different businesses come into play, often with competing interests and very limited knowledge of other links in the chain.

In mid-2012, exploratory discussions were held with potential participants in supplying and consuming biomass energy in Ely and Grand Marais. The objective was to improve practical understanding of key considerations in each segment of the chain, to promote whole-system thinking and partnering, and hopefully to find “win-win” strategies for cleaner energy, improved forest management, and stronger community economies. Over 75 people from different sectors of community were brought into these discussions.

### **I. Forest Management**

The 60-mile radii biomass supply zone around Ely and Grand Marais are a mix of federal, state, county, and private forestland. Forest management plans outline goals and dictate where different activities, including timber harvest, should occur and whether biomass material can be removed as part of a timber harvest. Issues related to forest management and biomass harvest were discussed in several rounds of summer meetings with forest managers from US Forest Service, Minnesota Department of Natural Resources, and the counties of St. Louis, Lake, and Cook.

There is a general concurrence with biomass availability projections<sup>1</sup> contained in the Becker assessment, and general concurrence that a much smaller (i.e., 30 mile radii) zone is sufficient to cover biomass demand of district heating options. These estimates are based on current harvest rates and historic rates (which are significantly higher than in today’s wood products market).

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<sup>1</sup> Becker, 2012

- *Biomass harvest restrictions.* State and federal forest management plans restrict biomass removal on a sizeable proportion of harvestable and non-harvestable lands to protect peat, low nutrient, and other sensitive soil types, habitat and biodiversity, water quality, and other cultural resources. Digital information (e.g., geographic information systems, GIS) exists that would refine biomass estimates. Even where biomass harvest is allowed, DNR believes that only a small proportion (i.e., ~ 10%) of loggers collect the material because of low market demand. Biomass restrictions vary on county (School Trust) lands based on forest certification. At present, removal rates are high on St. Louis County forestland and relatively low on Cook and Lake County land because of market demand.
- *Biomass from brush clearings.* Brush removal during or separately from commercial timber harvest is not currently included in estimates because volume numbers are not currently available. In general, the high cost and low market value for brush clearings restrict these activities. This could change if bio-energy increases demand or if partner funding increases for habitat conservation, forest restoration, or other projects. This option is dictated by forest management plans and reflects a growing need expressed by some managers for tools other than commercial timber harvests to manage forests.
- *Need for monitoring impacts of biomass removal.* Estimating wildlife impacts of biomass removal requires more monitoring of use (or lack of use) of (1) biomass harvest guidelines, (2) wildlife habitat changes resulting from harvest, and (3) species diversity and population at harvest sites.
- *Supply assurance and other contracting.* Opportunities exist for long-term agreements or contracts for providing management services on federal land. USFS managers expressed openness to finding new approaches for managing forests in addition commercial timber harvest.
- *Fuel business viability.* Public forest managers cautioned that the viability of the logging labor force issues is more critical than resource issues in evaluating long-term feasibility of community bioenergy. Loss of operators is a very significant issue in some parts of NE Minnesota. The logging work force is aging and few younger people are able to replace retirees or those departing for better-paying jobs. The competitiveness of Ely and Grand Marais compared with other markets will be determined by haul distances (and price of diesel fuel) rather than harvest and processing costs. One suggestion is that interested operators in the supply zones should be identified and a business model for a municipal fuel operation be developed. The communities and interested operators can evaluate what is feasible.

## II. Biomass harvest, handling, processing and delivery

The critical link between forest and district heating is the logger, the on-the-ground operator responsible for harvesting, processing, and delivering biomass feedstock to an energy production facility. In summer and fall, 2012, a number of conversations were held with loggers to capture their attitudes and ideas about biomass energy market opportunities. Topic areas included:

- Views on whether supplying biomass fuel can be a stand-alone business or must be integrated with a larger logging operation. Would a logger be interested in a chipping business if is not already set up to harvest logs?
- Would Ely and Grand Marais district heating programs be competitive with other markets? What would it cost each community to get X loads of wood a week?
- What investment would be required to supply biomass feedstocks (hogfuel or chips)? What incentive would a logger need?

The topics below are meant to help frame up a continuing dialogue between the municipalities and timber operators about optional arrangements for supplying biomass energy feedstocks.

**(1) Long-term Stewardship Contracting:** A collaborative forest management approach increasingly being used by public agencies and communities to expedite hazardous-fuel reduction, forest restoration, and other stewardship projects. In contrast to traditional individual timber sale contracts, stewardship contracts authorize a contractor to conduct a variety of tasks (e.g., hazard fuel removal) in a designated area for periods up to 10 years. Such arrangements give forest agencies a tool for implementing long-term forest plans (potentially with outside funding).

Pros: Contracts give a logger long term assurances for investments in equipment and management practices.

Cons: Loggers might be reluctant to commit to providing services for long periods of time but would find short-term contracts more acceptable.

**(2) Guaranteed annual purchase.** A key consideration for loggers is the low volume of biomass material used by the relatively small district heating options being considered in Ely and Grand Marais (approximately 900 – 4000 green tons per year). Some loggers suggested 3 - 5 year contracts for a guaranteed annual purchase, with a fuel adjustment clause, could make this a more attractive business venture.

Pros: Purchase agreement would provide stable supply and price for communities and assure suppliers of a return on investment.

Cons: Contracts longer than 2 years could present challenges for either party if biomass market changes.

**(3) Focus on improving health of forests that are in decline (e.g., over-aged birch):**

A large amount of mature, small diameter birch in regional forests is currently unused for lack of market and uneconomical to harvest or manage through traditional timber sales. Marketing and treatment of these stands could focus on utilizing this material for biomass energy.

Pros: Would provide market for low value trees. Could produce more standardized, cleaner feedstock (chips with a smaller proportion of bark and branches as compared to harvest residues and hogfuel).

Cons: May need to subsidize harvesting of low-grade material (or do as part of a stewardship contract)

**(4) Central chipping facility:** Loggers could deliver raw logs to facility and be paid by weight. All costs of processing from raw log to chip and final delivery to biomass energy plant would be handled by facility. The facility could be publicly or privately-owned (Hedstrom Lumber currently operates such as facility in Grand Marais). It is also possible that the energy plant would have its own chipping operation and contract with an operator to run the process. Details would need to be worked out about what processing could be done on-site and what at the facility.

Pros: Greater control over chip standards. Allow loggers without processing equipment to participate in growing market.

Cons: Expenses of locating, financing, staffing, and operating a weighing and chipping facility.

**(5) Logger-delivered chips to biomass plant:** Loggers would process slash into hog fuel or chip roundwood from timber sale and deliver to biomass energy plant. One option is to move the chipper or grinder to timber harvest site and process chips at the same time as timber harvest. Alternatively, biomass could be transported to a privately owned chipper/grinder to be processed off-site.

Pros: A number of operators already produce wood chips for other facilities. Providing a new market for their wood chips would help maintain a viable core of businesses capable of doing work on the ground.

Cons: Some loggers would find it difficult to invest in chipping or grinding equipment based on the low volume of biomass energy demand. Transporting processing equipment to different sites could be impractical because of additional labor, transport costs, and access difficulties.

**(6) Whole tree processing:** There has been considerable discussion in Grand Marais regarding the potential growth of a market for “field” chips as a biomass

feedstock. Field chips are defined as the product resulting from the on-site chipping of low-value and non-merchantable trees. Expectations are that the next 1-2 years will see the market improve sufficiently to motivate one or more local loggers to produce a volume of field chips far in excess of any demand for a local district heat plant. The recent announcement by the Canadian firm Resolute Forest Products of plans to build an industrial wood pellet plant in Thunder Bay, Ontario, seems to support this expectation.

Pros: Processing whole trees could result in relatively clean chips given the ratio between roundwood and bark. Chips could be stockpiled on site to dry (see below).

Cons: Because of limited market demand, few operators presently possess the equipment needed for whole-tree processing. Field chips are more uniform than hogfuel, but could present some problems in combustion process.

**(7) *Piling on-site for removal later:*** Following harvest, slash (treetops, limbs, and leaves) could be gathered into manageable piles and left to dry for a year (as is done in Europe).

Pros: Allows material to dry so that less water is being hauled down the road. Allows for stockpiling of fuels offsite from the biomass facility.

Cons: Some loggers expressed preference for removing slash at same time as forest harvest. This would avoid cost and impact of bringing equipment back to the harvest site. Chips may also be cleaner with less handling.

### **III. Consumer participation**

District heating is an attractive option for many communities, offering efficiencies and economic opportunities unavailable for stand-alone systems. These advantages are quickly lost however if end users are widely scattered. A key consideration in designing district heating networks is heat density, the amount of heat demand in a given area. Distributing heat to an area of low building (and heat demand) density results in more construction, excavation, heat losses, and environmental impacts compared to distribution to a high building density area.

To find an optimum size for a district heating system, both Grand Marais and Ely identified areas where major heating loads are in close proximity and determined whether connecting them was competitive with stand-alone heating systems. If these major-user clusters appear viable, expansion to smaller and less densely built areas could be considered.

After the viability of high-density clusters in Ely and Grand Marais was confirmed, building owners in potential expansion areas were surveyed to determine their interest in connecting to a district heating system. Interviews focused on (1) whether owners had plans to replace furnaces in coming five years; (2) whether they had any interest in connecting to a district heating network; and if so, (3) what is their estimated annual heat demand.

In Ely, there is interest in expanding a district heating complex between Ely-Bloomenson Community Hospital, Sibley Manor, and ISD 696 to downtown businesses. To evaluate this option (Option 3A), the Alternative Energy Task Force interviewed owners of fifteen businesses, primarily located on Sheridan Street. Together, these businesses use approximately 5,000 mmBtus annually for heat, for which they spend \$153,557 on propane, heating oil, or electricity. Most of the business owners expect to replace their fuel systems in the next five years and all expressed interest in a biomass district heating opportunity. If preliminary assessments indicate that an expansion is viable, these owners would need information about the cost of hooking up to the system, annual operating expenses, expected pay back time for initial investment, who would own and operate the district heating system, and whether it would be possible to hook up at a later time.

In Grand Marais, an initial study conducted in Cook County explored seven variations on biomass-fuelled district heating for Grand Marais. Each configuration was evaluated for fuel suitability, economic and technical feasibility, and community acceptability. This evaluation narrowed the field to the two configurations offering the greatest promise. These were subsequently submitted to an outside engineering firm to obtain a review of the original work and a “second opinion” on the conclusions. The outcome of this review was the proposal of a “hybrid” configuration that focuses on the customers who constitute the bulk of heat demand. The “hybrid” design finds significant savings by initially eliminating piping costs incurred by providing service to more widely dispersed, low demand customers. In Grand Marais, sixteen public or commercial buildings have been identified as representing 80% of the non-residential heat demand. Of these, nine are county-owned or operated, five are lodging properties, and two are retail or service establishments.

The primary concerns of these potential customers are 1) potential short- and long-term savings compared to current and projected fossil fuel usage; 2) cost to the customer for interconnections and conversion of existing building systems to utilize hot water heat; 3) emissions generated by a locally sited biomass energy plant. While the answers to item 1) are still to be determined, it has been decided that the costs identified in item 2) will be part of the initial capital construction costs and will not be paid by the customer. It has also been decided that any plant built will include electrostatic precipitators in addition to the standard emissions control

equipment. This will effectively eliminate the particulate emissions that have been the principal cause of concern.

#### **IV. Community Concerns**

For the residents of Cook County and Grand Marais, issues or concerns have been raised from two perspectives: those relating to biomass utilization on a large scale and over an extended period of time; and those that are immediate and specific to a possible biomass-fuelled district heating plant in Grand Marais.

Regarding the first perspective, the environmental community has expressed concern that impacts are only being considered within a limited time frame. In one individual's opinion, even the 20-year span that has been discussed is too short for meaningful environmental assessments.

People generally concede that the volume of biomass needed for district heating as now described is minimal and its environmental impact negligible. Their concerns stem from a fear that escalating fossil fuel prices may generate an increasing demand for biomass, and the development of an embryonic biomass energy industry within the county may make future control and restriction more difficult.

Concerns regarding a district heating facility in Grand Marais tend to be more specific and some, such as the control of particulate emissions, can be readily addressed. Others are not so straightforward. A segment of the community (its size undetermined) simply is not persuaded that the potential benefits outweigh the costs and uncertainty. Others are opposed to a multi-million dollar investment that they view as unnecessary. There is also a degree of skepticism that the information and data compiled to date is reliable and believable. In one of the small group discussions, a resident said he found a proposed simple payback of 5 years on a district heat system "just too good to be true."

There are also some who lack confidence in the ability of county or city government to undertake a project of this scope and manage it on budget to a successful conclusion. Some people argue that a biomass plant, if financially viable, should be attractive to private enterprise without the need for public financing.

## Acknowledgements

Thank you to the following individuals for participating in meetings and interviews on supply issues:

**Forest management:** Mark Akeson, Craig Merriam Erica Hahn, Patty Johnson, Gene Dressley, Dennis Neitzke, Chad Kirschbaum, Myra Theimer, John Glazen, and Casey McQuiston from USFS; Mike Magnuson, Roger Nelson, Dan Prazak, Bob Slater, Steve VonGroven, and Anna Dirkswager from MDNR; Bob Krepps, St. Louis County; Nate Eide, Lake County; and Mary Black, Cook County.

**Loggers and forest industry:** Eric Mayranen, Clifford Shermer, Elroy Kuehl, Stan Pelto, Mike (Mac) West, Peter Wood, Scott Dane, David Chura and members of Minnesota Logger Education Program, and Howard Hedstrom.

**Consumers:** Ely institutions and businesses: Vermilion Community College, Ely-Bloomenson Community Hospital, Sibley Manor, ISD 696, JD Mills Company, Pengal's Basswood Trading Company, Piragis Northwoods Company, Ely Car Wash, Zups Market, Boathouse Brew Pub, A Taste of Ely, Beaver's Liquor, Laundry Room Inc, Steger Designs, Steger Mukluks, Hand Done T Shirts, Mealey's Gift & Sauna Shop, Pebble Spa, Ely Steak House. Grand Marais: North Shore Hospital and Care Center, Sawtooth Mt. Clinic, Cook County ISD 166, Cook County Courthouse and other county facilities, Best Western Superior Inn & Suites, Aspen Lodge, East Bay Suites, Cobblestone Cove Condominiums, Shoreline Motel

## References

Dennis Becker, Steve Taff, and David Wilson. 2012. *Pre-Feasibility Financial and Wood Supply Analysis for Biomass District Heating in Ely and Cook County, Minnesota: University of Minnesota of Minnesota Report to Dovetail Partners, Inc.*

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This project was undertaken by Dovetail Partners, Inc. with funding provided by the *Minnesota Environment and Natural Resources Trust Fund* as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR). The Trust Fund is a permanent fund constitutionally established by the citizens of Minnesota to assist in the *protection, conservation, preservation, and enhancement of the state's air, water, land, fish, wildlife, and other natural resources.*