Woody Biomass Feedstock Yard Business Development Guide

A resource and business guide to developing a woody biomass collection yard

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Chartered under the Biomass Research and Development Board

Abstract

This Guide provides an overview of the challenges and opportunities to establish a woody biomass feedstock yard in the United States. It includes information on biomass sourcing; facility site selection and equipment; biomass sort yards; biomass collection, concentration, and distribution; biomass handling, sorting, and economic considerations; business planning; marketing and distribution; financial feasibility analysis; and sources of technical assistance and funding. Additional references and resources are included.

KEYWORDS: woody biomass; biomass feedstock yard; biomass sort yard; biomass collection yard; biomass concentration yard; biomass distribution yard; biomass handling, sorting, storage, and inventory; weight scaling.

COVER PHOTOGRAPHS: (Upper Left) Wheelabrator biomass yard, Anderson, CA. This large feedstock yard supports a 54 MW power plant in northern Sacramento Valley. Forest residues from a variety of forest thinning operations create a colorful mix of feedstocks; mixing of the fuel reduces any inconsistencies in quality and moisture content. Date unknown. Source: Steve Jolley, former Wheelabrator employee. (Upper Right) Small mill residue loading station. Source USDA Forest Service. (Lower Left) Screening chipped woody biomass. Source USDA Forest Service. (Lower Right) Conveyor belt system and chip pile at Mt. Lassen Power plant, Westwood, CA. The truck driver operated hydraulic chip truck unloaders are at the far left of the photo. September 18, 2002. John Stewart.

AVAILABILITY: This publication is also available online at:
http://www.forestsandrangelands.gov/Woody_Biomass/documents/feedstock_yard_guide.pdf

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http://www.forestsandrangelands.gov/Woody_Biomass/contact.shtml

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Foreword

A woody biomass "feedstock yard" is a collection point or location for collecting and concentrating biomass from various sources. Biomass is collected, sorted, consolidated, processed and distributed to a variety of markets and uses. It provides an alternative in the biomass supply chain that could have benefits over traditional woods-to-processor delivery scenarios.

This guide has been designed for those interested in developing a business to supply woody biomass for forest products, wood energy and other uses. The guide provides information about the development, operation and management of a woody biomass feedstock yard.

For example, a woody biomass feedstock yard could be developed to help solve a disposal problem, recover and utilize a natural resource, contribute to the local economy and the environment, or as a way to be a better steward for taxpayers.

A woody biomass feedstock yard could help guide a "woods wise" person to own and operate a small business enterprise. Woody biomass is an abundant and renewable feedstock for energy and other uses and may present an opportunity for those willing to make investments. This guide provides information and guidance on the establishment of a business and ways to improve the operation of an existing business.

Investors looking at renewable energy may see opportunities for tapping into the potential of woody biomass, but may be uncertain how to make the connection between the available biomass resource and opportunities associated with emerging biofuels and bioenergy markets. This guide helps provide a way to make that connection to the biomass supply chain and to evaluate woody biomass opportunities.

This guide is only one of several resources. It is only a guide – one instrument in the creation of a new business in the area of renewable energy. All those contemplating the development of a biomass feedstock yard are urged to carefully study this guide and consider the resources available in evaluating opportunities. Success is based on objective planned programming approach to business development as described in chapters 3, 4, 9, 10 and 11. As always, individual and collective creativity, resourcefulness, and flexibility will also help determine any resulting success.

Introduction and Overview

The emerging importance of reliable domestic sources of renewable energy has brought renewed emphasis on utilizing wood and woody biomass as a source of thermal heat, electrical generation, combined heat and power, transportation fuels, and a wide range of biobased products that are currently produced from fossil fuels. These potential uses, combined with the need to address forest health issues nationwide, present unique new economic opportunities for those who are well prepared to seize the moment and act on them. Such economic opportunities may not work everywhere or every time, but these new demands for woody biomass combined with the right business location, practices, and financial acumen might just work for the prudent investor. Hence the need for the preparation of this woody biomass feedstock yard business and resource development guide.

Opportunities for improved utilization and marketing of woody biomass can provide economic development opportunities while helping to reduce the buildup of hazardous fuels and address the widespread risk of catastrophic wildfires to communities and the environment. The cost of removing dead trees and excess forest fuels can be prohibitively expensive, primarily because of their bulky nature and low quality. Markets and economical outlets for such biomass are needed to help offset the cost of these treatments. One approach is to provide economically feasible woody biomass utilization options. Reestablishing integrated forest products utilization capacity and retooling the existing industry for processing small-diameter material, salvaged dead trees, and woody biomass are critical needs. A principal step in this process is developing long-term and/or year round, reliable and sustainable supplies of woody biomass – the biomass feedstock yard concept.

Biomass feedstock yards may have several benefits over traditional woods-to-processor scenarios in that they:

1. Can be located on land between the source(s) and the processing facility(s) where land is typically less expensive and allows for redirecting low value materials prior to incurring the additional haul cost to the processing facility for further sorting. The feedstock yard may also be co-located with a biomass processing facility and still provide materials for other customers;
2. Provide a larger sort and storage area and also greater feedstock delivery flexibility than typically exists at the processing facility;
3. Allow continued biomass removal when the processing facility has adequate supplies or is down for maintenance or repairs; and
4. Typically have lower start-up costs because, at least initially, they do not require the expensive processing equipment and infrastructure of manufacturing plants.

Biomass Feedstock Yard Purpose

The idea of a "biomass feedstock yard" is to provide a central point for collecting woody biomass from various sources to consolidate, concentrate, and distribute for economic purposes. The biomass can come from forestry cultural practices such as harvests, thinnings, and salvage; from fuels reduction and forest restoration projects; from urban and industrial wood waste, or other sources.

The approach of using this concept for collecting biomass is novel and innovative but a largely unproven concept. Historically, sort yards and other collection yards have been used with traditional forest products in order to reduce transport costs or to improve value recovery. A woody biomass feedstock yard can potentially perform these functions and serve other innovative purposes. This suggests that the purpose of a woody biomass feedstock yard be more closely considered based on goals and unique opportunities.

Community wood sort yard, Missoula, Montana. October 12, 2005. John Stewart

For the landowner, these feedstock yards really provide a service of taking woody biomass off of their hands, possibly saving them a landfill fee or perhaps providing the feeling that they are doing the right thing in recycling the material for some other use. A feedstock yard might consider charging a tipping (disposal) fee for certain biomass rather than paying a nominal dollar amount for the biomass. Thus it is important to rethink the purpose and services of a biomass feedstock yard as it applies to potential customers and suppliers (landowner, homeowner, logging and tree service firms, sawmill, firewood processors, post and pole enterprise, mulch operation, government agency, and the community). Services can include a mechanism to help reduce the spread of insect or disease problems, or to minimize smoke/prescribed fire impacts and risks.

A biomass user, such as an industrial bioenergy operation, could potentially consume all of the available woody biomass. The question then becomes "So why bother trying to sort potential higher value sawlogs or post and pole material from the biomass when there is a ready market for all the material?"

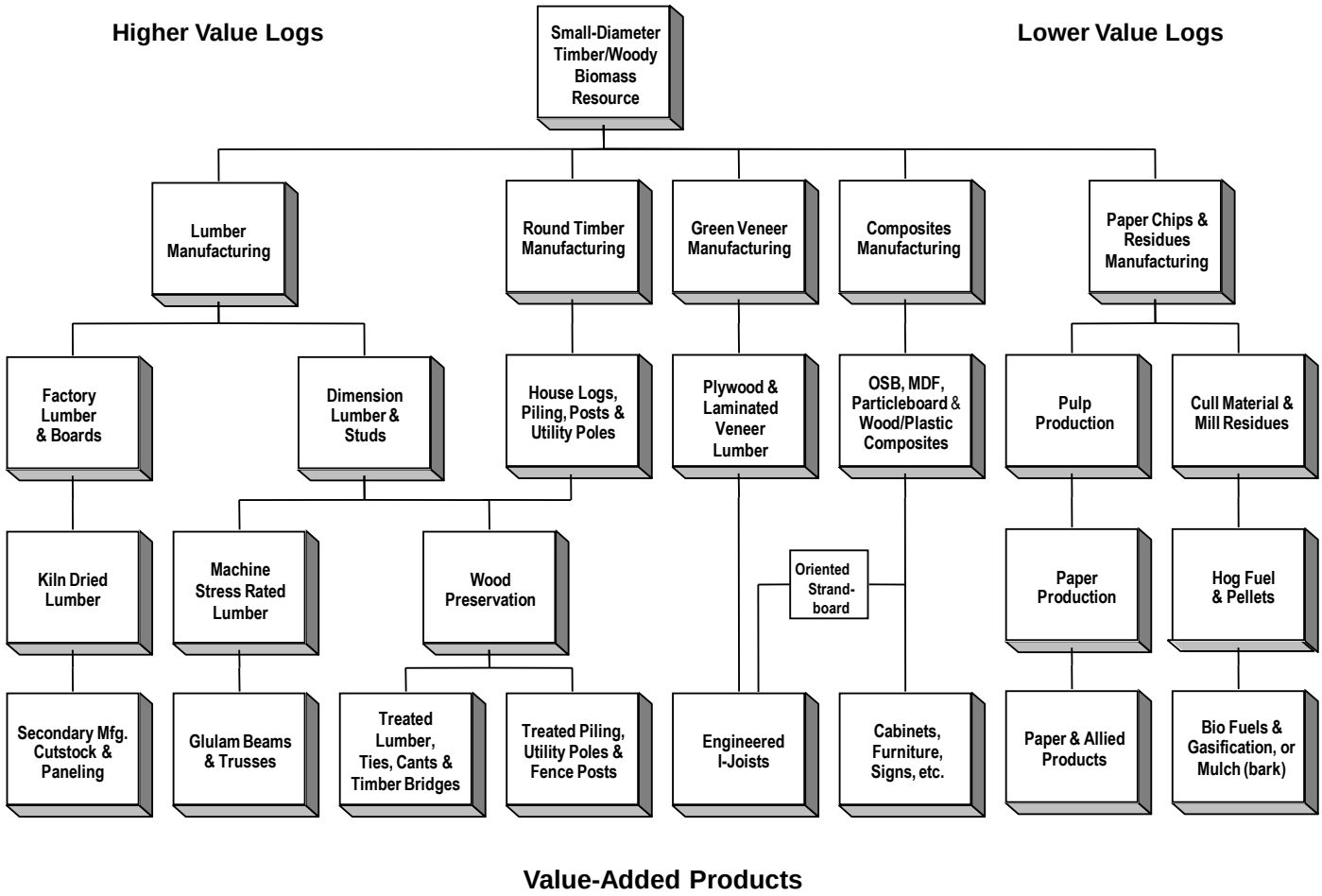
It is difficult for biomass feedstock yards to recover enough value to justify sorting and transporting costs of higher-valued biomass products like saw logs. Costs often exceed the value added or there is not enough high valued material to justify sorting.

Often times, the best bet is to move all of the "clean" woody material to a pellet manufacturer and yard debris (bark) to a local landscape contractor to use as mulch. However, the possibility of procuring and merchandising logs should not be discounted as an option, particularly with hardwoods. There can be considerable potential in merchandising and marketing logs, particularly where the feedstock yard has purchased tracts of standing timber or have made arrangements that are favorable to the timber owner moving all the wood products to the yard.

Products and Market Opportunities

There are a number of potential opportunities for using small-diameter material and other woody biomass, including most of the major forest products and related business sectors (Figure 1). These potential opportunities include a full range of low to high quality small-diameter and underutilized material. An interesting dynamic to note: when you correlate the value-added potential, moving from left to right, value-added decreases but volume of biomass potentially utilized increases; this highlights the problem with small profit margins in processing woody biomass. Technically, there are many potentially viable options for producing products from small-diameter material.

Figure 1. Potential Market Opportunities for Small-Diameter Timber and Woody Biomass



The real questions become: are there markets and is it economically feasible to produce, transport and sell the potential products? Also of interest are the material properties of small-diameter material: are they suitable for the intended use?

Initial Questions to Ask Before Considering Developing a Feedstock Yard

Before entrepreneurs go any farther, there are a few "back of the envelope" questions that need to be answered before proceeding:

1. Who is already doing this in the area? (These people are potential sources of material, customers, and /or competition)
    a. Who is receiving biomass?
    b. Are they paying for it, and how much, on the average?
    c. What products are they making?
    d. What biomass products are being sold in the area?
    e. Are there products being developed from outside the area?
    f. If this business is profitable, why hasn't someone else done this before and will my success create additional competition?
2. What is the "available" resource? (Not currently being used, and not in someone else's expansion plans)
    a. What is the volume and characteristic of each potential resource?
    b. What is the cost today?
    c. How will demand affect the price in the future? If adding value, will the resource value increase?
    d. What products can be produced from this resource?
    e. How long will this volume be available?
    f. What can be done with the rest of the material?
    g. What is the source of the feedstock: small ownerships; industrial lands; certain types of private lands; public lands, including state and county?
    h. Can a yard be located with access via road or rail networks, legal weight limits, etc.?
3. What is the market situation?
    a. What is the existing local market for potential products?
    b. What is the potential market for new products?
    c. How much of the existing market is served by local suppliers and how much is imported?
    d. Can the market grow enough to accept additional product without cutting prices, or can a local product be competitive with an imported product?
4. Can long term contracts be obtained to provide resource assurance and price stability?
5. Can a new facility be competitive?
6. What is a ballpark projection of profit and loss?

A more detailed Checklist can be found in Chapter 16. If the answers are positive to each of the above questions, then this Guide should be of help in developing a woody biomass feedstock yard.

Chapter 1. What is a Woody Biomass Feedstock Yard?

Preface

A feedstock yard is a site or location where woody biomass can be transported and concentrated for use in creating and distributing a wide-range of potential products and services.

A woody biomass feedstock yard in its most simplistic form can be a site used by a community to gather bulky yard and tree waste that would otherwise go to a landfill and manage it instead to produce compost and mulch for use by local citizens. It can be as complex as an industrial site for sourcing and accumulating woody biomass to produce wood pellets, transportation fuels and high value end products. It could also involve the concept of "clustering" where multiple wood using industries (different ownerships) in close proximity to each other could potentially share a feedstock yard or transfer residue from one company to another.

Origins of Feedstock Yards

The idea of a woody biomass feedstock yard is a relatively new concept that is just beginning to be explored. Creation and development of woody biomass feedstock yards generally occur because there is the recognition of a potential economic opportunity or the need to address a resource problem. It can also involve a combination of the two.

Shrink wrapped firewood. Source: USDA Forest Service

Opportunity driven woody biomass feedstock yards usually are the result of an enterprising individual who recognizes there is a financial opportunity in creating a business that makes and sells products made from woody biomass for financial gains in areas where there is an abundance of resource material or there is a gap or seasonal variation in supplies for biomass producers and/or between industries which use the resource.

Problem driven woody biomass feedstock yards are ones that are created to address a specific local or regional natural resource issue. Examples are feedstock yards designed to handle biomass removed in forest sanitation efforts to combat an insect or disease outbreak or which are designed to reduce hazardous fuel accumulations and the risk of wildfire to homes and business in local communities. Another example might be a community that has been devastated by a tornado or hurricane and there is a need to remove and store woody biomass rather than burning or disposing in a landfill. In these cases, biomass supplies are probably exceedingly large, but may not be "sustainable" in the long-term.

A combination of the two would be a feedstock yard to handle and dispose of massive quantities of downed woody debris resulting from a natural disaster occurring in a heavily forested area. A long-term sustainable supply may eventually develop to support other commercial operations.

Woody biomass that comes into a feedstock yard can take many forms: bark, chips, roundwood, slabwood, tree stems and branches, construction and demolition wood residues, mill wastes, as well as other sources of small diameter wood. It can even include larger diameter materials resulting from fire salvage, hazardous fuel, disaster debris and/or insect and disease treatments. Non wood items are often mixed with biomass and may require extraction and treatment/handling consideration.

As discussed in the introduction, woody biomass tends to be bulky, as well as difficult and expensive to handle. A distinct advantage of having a feedstock yard is the opportunity to sort the materials into higher-value uses and potentially increase the financial bottom line for operators and entrepreneurs. Last, but not least, it is essential to carefully locate the feedstock yard so as to minimize biomass transportation and handling costs.

Urban wood waste, Carson City, NV. Source: USDA Forest Service

Chapter 2. Woody Biomass Basics

Preface

It is important to have a basic understanding of the terminology associated with woody biomass utilization when contemplating the development of a woody biomass feedstock yard. Biomass is any organic matter that is renewable over time. Be aware that the U.S. Congress has numerous definitions for what qualifies as biomass for renewable energy, even within the same piece of legislation, so read legislative laws carefully as to what does and does not qualify as biomass. There are many sources of biomass, including agricultural residues such as corn, rice, and wheat stover (plant stocks that remain in the field after harvesting grain from these crops). Other sources of biomass include manure; wood; and landfill gas. This chapter provides an overview of wood or woody biomass as a biomass resource. Readers should also cross-reference the information in this chapter with Chapter 4, which addresses sourcing issues associated with the different sources and types of biomass.

In its broadest sense, woody biomass is the accumulated above and below- ground mass of roots, wood, bark, and leaves of living and dead woody shrubs, vines, and trees.

Sources and Types of Woody Biomass

The principle sources of woody biomass in the United States are in-forest residues from forest management, forest restoration, commercial logging (slash) forest health and hazardous fuels reduction treatments; sanitation cuttings in the wake of major insect and disease outbreaks; downed woody debris following major wind and ice storms; and residues from clearings along utility corridors and transportation rights-of-way – generally these are unmerchantable materials as compared to sawlogs or pulpwood which can be sold for higher value uses. However, depending upon existing markets and prices, pulpwood sized material (roundwood) can be a source of woody biomass for renewable energy applications.

Woody biomass also includes residues left on-site from forest harvesting operations such as branches and tops; low-quality commercially grown trees, dead wood, and other noncommercial tree species. Other potential sources and types of woody biomass include wood that has been cleared during land conversion; construction and demolition wood; forest products manufacturing residuals (e.g. bark, sawdust, chips, and slabwood, etc.); orchard trimmings, municipal solid waste (MSW), green waste; and wood harvested from short rotation woody crop plantations.

MSW includes items such as discarded furniture, pallets, packaging materials, processed lumber, and yard and tree removals and trimmings (green waste). This material is generally recycled as mulch or compost; sent to a landfill; or burned for heat, power, and electricity. In recent years, small, portable wood chippers and bailing units that press yard debris into “logs” similar in appearance to that of traditional firewood have emerged. Some municipalities provide large yard debris carts or roll-off bins, which are collected weekly. Others work with local businesses to ensure collection options such as drop-off bins and designated collection facilities or special roadside collection dates.

A good example of a successful woody biomass feedstock yard that uses wood waste is Biomass One in White City, Oregon (http://www.biomassone.com). Biomass One is a 25 megawatt, wood waste fired cogeneration plant that annually recovers 355,000 tons of wood waste. Everything that comes into the center is processed for its highest and best use and what's left over goes to the boiler. They get a tipping fee from wood waste that is brought to the feedstock yard and market value-added products (colored mulch, rebuilt pallets, decorative bark, etc) to customers as they drive out of the facility.

Scale shack and urban wood waste at Biomass One plant in White City, Oregon. Date and photographer unknown. Photo obtained from Craig Rawlings of the Montana Community Development Corporation.

Fast growing tree species such as hybrid poplars, willows, and other species can be specifically grown to be an energy feedstock (short-rotation woody crops). Short rotation woody crops have shown promise as an economically viable resource for producing a sustainable supply of wood biomass. Fast growing species can be planted at relatively low costs and harvested in less time than traditional species. Although not yet proven economically, biotechnology is expected to substantially increase energy crop yields and higher product yields (conversion rates) in the future.

These short rotation woody crops may be grown on lands devoted specifically to large-scale feedstock production, or as part of smaller scale agroforestry plantings that have other conservation purposes (e.g. riparian forest buffers that include extra rows of trees for energy feedstock while still protecting water quality and providing other benefits and values). A good example is the fuelwood plantation at the Arbor Day Foundation's Lied Lodge and Conference Center in Nebraska at http://www.arbordayfarm.org/conservation3.cfm.

Collection, Transportation, and Handling Woody Biomass

Woody biomass feedstock is generally delivered in one of the following three forms: unconsolidated material, comminuted material (chipped), and bundled or baled material.

Unconsolidated material is what remains after the trunk of the tree has been harvested. This may include stumps, bark, leaves, needles, branches, and sometimes even the trunk itself. Historically, this material was considered unmerchantable and left on the logging site or piled up at a landing —the place where wood is delimbed, bucked into various products, sorted, and loaded onto trucks for transport. Advances in biomass utilization promise new opportunities for the utilization of unconsolidated woody biomass feedstock. In many cases, unconsolidated harvesting residue is used as hog fuel at wood manufacturing or bioenergy facilities. Hog fuel is a combination of chipped wood and wood waste used to generate power or on-site combined heat and power.

A major obstacle with unconsolidated material as a source of woody biomass is the cost of collection, transportation, and handling. This material has a low bulk density in its native form, and is usually transported by dump truck or roll-off bin. Compressing the material by chipping, bundling, or crushing helps increase bulk density and reduce costs.

A more conventional method of increasing the bulk density of woody biomass is reducing its size significantly by chipping, grinding, or shredding to make it smaller and easier to handle and transport. Reducing the size of woody biomass residues is usually done on site but is sometimes delayed until the feedstock reaches the processing facility.

In-woods biomass grinder loading energy chips. Source: USDA Forest Service

Chipping is the most common method of increasing bulk density. This is because commercial chippers are well integrated into conventional harvesting and other tree removal operations. Chippers have high output and can blow chipped material into truck vans or roll-off truck bins for hauling. Tub grinders and large scale stationary commercial chippers are usually employed at wood processing facilities. In-woods operations need to avoid the incorporation of non- wood debris and pay attention to the required specifications for chip size, bark content and species mixing.

Biomass bundler on a Valmet 860 forwarder frame; shown at an equipment demonstration believed to be in Elmira, Oregon. June 2005. Photographer unknown

A recent innovation in increasing bulk density involves the compaction of woody biomass residues into cylindrical bales called composite residue logs, or biomass bundles. Typically, these bundles have a diameter of about 2.0 to 2.5 feet and are about 10 feet long. One of the most appealing aspects is that they can be handled similarly to round logs; however, production of these bundles requires specialized and expensive machinery.

Unlike unconsolidated and chipped woody biomass, bundles can be stored for longer periods of time without decomposing. Although technically feasible, the current market price for wood-based fuel in the U.S. rarely supports the cost of bundling. And at the other end of the spectrum, the current price of wood-based fuel does not support the transport of unconsolidated material, especially with the fluctuation of prices for petroleum-based fuels. At this time, chipped woody biomass is the most economically feasible. There is no universal answer as to when or where to reduce the size, but it is often decided based on the haul distance. Light loads hauled a short distance to a highly efficient size reduction operation may trump size reduction in the woods to obtain heavy loads.

In areas where the cost of transporting wood remains a challenge, portable wood-to-energy conversion units may one day be an option. Small-scale, portable pyrolysis (a system that turns wood directly into an oil and char) and gasification (a system that turns wood directly into a gas) units could eventually be towed to a harvesting site and utilized to produce fuel on-site.

Mobile pellet plant technology may come into use. However, these technologies are still largely in their experimental stages and costly. Once these systems become commercial they may have an advantage in transporting highly densified energy (charcoal, pellets, oil, or gas) directly from the woods.

An excellent publication on the basics of how to decrease the costs of collecting, processing, and transporting woody biomass is listed in Appendix 2 (Rawlings, et. al. 2004).

Woody Biomass Uses and Potential Products

Renewability, versatility, and local availability of woody biomass resources in many places make wood an attractive option for various applications. Woody biomass can be used to produce heat, power, electricity, and a variety of other products. Potential renewable energy applications include firewood, briquettes, and wood pellets for home and institutional heating and as a feedstock for creating cellulosic-based transportation fuels such as ethanol and diesel (although the commercial use of wood for transportation fuels may be five to ten years down the road).

Other potential uses of woody biomass or small diameter material include posts and poles, landscape mulch and animal bedding materials, and novelties as well as biochemical products such adhesives, solvents, plastics, inks, and lubricants.

Post and pole mill, Hayfork, CA. Source: USDA Forest Service

Animal bedding from biomass shavings, Escalante, UT. Source: USDA Forest Service

Residues from forest products manufacturing such as sawdust, black liquor, and bark, are commonly used to create on-site energy in the form of thermal heat and power. These residues come from primary and secondary wood processing mills and pulp and paper mills. This type of biomass feedstock is highly desirable because it tends to be clean, concentrated, uniform, and low in moisture, and requires little or no transportation. Sawdust can be used for residential heating in special sawdust furnaces as well as for smoking meats. Sawdust is typically either densified into pellets or directly gasified, combusted, or pyrolized (made into an oil) to generate electricity, heat, and/or combined heat and power. Charcoal, pellets, particleboard, composite wood materials, and nonstructural panels can also be produced from wood processing residues.

Tribal biomass plant, possibly in Warm Springs, Oregon. 2002. Unknown photographer

Black liquor is a recycled byproduct formed during the pulping of wood in the papermaking process. More specifically, it is the substance that remains after cellulose fibers have been broken down and removed from the original chemical slurry (a thick mixture of solids and liquid) to form paper. It consists of lignin, water, and other chemicals used in the extraction process.

It is an important liquid fuel in the pulp and paper industry, typically recovered and recycled either through combustion or gasification in on-site boilers or gasifiers. The results of these processes are thermal heat, carbon dioxide, and recoverable chemicals. The steam generated during the black liquor recovery process contributes significantly to the energy needs of pulp and paper mills.

In summary, there are many different sources and types of woody biomass available for producing heat, power, electricity, fuel, and other bioproducts. Availability, accessibility, land ownership, cost, distance to the processing facility, end-product, and other factors will determine the feasibility of using any particular type of biomass for energy and other uses. For more detailed information on woody biomass basics, readers are referred to the U.S.D.A. Forest Service Woody Biomass Utilization Desk Guide and the Woody Biomass Desk Guide and Tool Kit published by the National Association of Conservation Districts at the following internet web sites:

http://www.forestsandrangelands.gov/Woody_Biomass/documents/biomass_deskguide.pdf

http://www.nacdnet.org/resources/guide/biomass

Chapter 3. Critical Factors for Feedstock Yard Success

Preface

In reading and studying this guide, it is important to be aware of the "***Seven Critical Factors for Success***" (Dramm 2004). These factors are key to forest products business development and are best addressed in the following order beginning with the most limiting factor—raw material resource supply:

1. Woody biomass raw material resource characterization and assessment along with availability, price, location, quality, potential products;
2. Potential product options from available biomass resource including types of products, product mix, volume recovery, technical feasibility;
3. Market feasibility of potential biomass product options and transportation infrastructure including competition, commodity and specialty markets, transportation and integrated industrial infrastructure required;
4. Biomass processing technology and facility design requirements for handling and processing raw material into products; and technical feasibility, equipment selection, manufacturing methods;
5. Management team and other business management considerations such as business structure, business controls, management team know-how and experience, and work force availability;
6. Financial feasibility and pro forma projections (projections of the balance sheet, income statement and cash flow analysis) of the proposed biomass operation are of greatest importance as it provides the core of the financial analysis of the business plan;
7. Safety, health, and environmental considerations along with regulations and licensing requirements that could limit project success. Social acceptance, community collaboration and support are also critical to success.

All of the critical factors can have profound influence on the success or failure of any forest products/woody biomass enterprise, especially in light of biomass resource availability and volatile forest products and energy markets. Weakness in or omitting one or more of these factors could lead to enterprise failure. In particular, in some areas there is not nearly enough available wood supply to meet demands.

Raw Material Resource

Of primary interest to woody biomass enterprises--as well as the forest products industry overall—is a sufficient raw material supply. Resource supply—what the biomass is and where are the sources—includes things like: resource inventory, availability, biomass harvesting guidelines (if in place), timberland ownership patterns, sufficient and consistent supply, seasonal access and demand variations, stumpage price, harvesting and biomass transportation costs, location in relation to manufacturing facilities, transportation infrastructure, the physical properties of the material, as well as any unique attributes that can influence the product and its markets.

A consistent biomass raw material supply is the long-term major overriding factor for establishing and maintaining a sustainable woody biomass feedstock yard. This cannot be overstated. One of the primary objectives of a feedstock yard is to help smooth out supply flow problems for customers by providing a more consistent supply of desired biomass for their operations. This means that there must be a seasonal and consistent, several year supply of biomass available for the feedstock facility to procure, process, and market. Uncertainty of supply creates significant difficulties.

The Scotts Company, Naturescapes mulching operation, Waverly, Virginia. Trucks are dumped by hydraulic lift or vans that use moving floors, then material is sorted into piles and conveyors for processing. May 18, 2006. John Stewart

Feedstock yard managers that rely on federal biomass may need to collaborate and engage directly with timber sale planners, including involvement in NEPA project planning, timber sale/hazardous fuels contracts, and road maintenance implementation phases. The question should also be asked: "who's controlling the supply?" Biomass feedstock yards should consider taking direct control of fiber supplies the same way sawmills do: become the purchaser of timber sales, or the contractor for stewardship projects or for road maintenance vegetation clearing work to reduce or minimize supply fluctuations.

Knowing the characteristics of the biomass supply—quality, quantity, location in relation to the feedstock yard and potential customer(s)—is critical. Understanding biomass supply characteristics helps identify potential products, product prices, and processing equipment performance requirements of the proposed feedstock yard. A breakdown of products produced from the biomass resource is also needed. Product volumes and market prices for each product determine profit contribution. This again is tied back to the available resource. Specific raw material characterization is necessary to be able to determine suitable products that could be made from this resource.

Products

Once the available biomass resource has been identified and characterized, the next step is to determine what can be made from the available raw material. Material properties of the available biomass will suggest potential products that can be produced. Market trends for various biomass products, existing product shortages, and new technological developments help further refine potential products. Careful consideration of product mix and differentiation (e.g. competitively priced, good quality) are crucial in today's biomass markets.

Figure 1 (Introduction and Overview) provides a general list of potential biomass primary and value-added products ranging from sawlogs on down to biomass energy feedstocks.

It is extremely difficult today to produce only low-value products given relatively high biomass removal costs, substantial distances from primary biomass markets, and general lack of an adequate transportation infrastructure. When there is limited capital to invest, it can be especially difficult for a biomass feedstock yard to compete in the marketplace. Where applicable, biomass product mix should include higher value products if the additional cost of processing yields higher net profit.

Markets and Infrastructure

An integrated forest products industry, with the ability to utilize and market all biomass products including forest and mill residues, urban wood waste and material from fuels reduction and restoration projects is key to a successful feedstock yard venture. Successful operations will market biomass products to a range of customers. Products may include logs, post and pole material, pulp chips, roundwood for composite panels, mulch and other soil amendment products, and several forms of biomass energy feedstocks. Success is predicated on getting the greatest net value from each green ton and distribution to available markets. Markets must be matched with the available biomass resource supply.

Woody biomass can be used as a feedstock for fiber-based panel products and other composite materials, as well as pulp for paper. Likewise, small-diameter material from the forest can also be used as a feedstock for manufacturing these products. Landscape and commercial mulch operations may also be a viable alternative for mill residues for producing products such as mulch and organic fertilizer. Residue markets often times provide the difference between profitable operations and operations that struggle to exist. Good markets for traditional sawmill residues are a must for the feedstock yard. The opportunity is to provide these former mill residue markets with biomass from the feedstock yard where sawmill infrastructure is now missing.

Efficient transportation and integrated industrial infrastructure are required to realize adequate economic return to make processing small-diameter trees and other woody biomass a viable option. Greater distance to markets and lack of transportation infrastructure are barriers to effective market development. Transportation infrastructure is a crucial consideration in selecting a site for a feedstock yard. Poor transportation infrastructure limits product distribution. Access roads should not be subject to seasonal restrictions.

The Scotts Company, Naturescapes mulching operation, Waverly, Virginia. Mulch is chipped and colored before bagging or bulk sale. May 18, 2006. John Stewart

Processing

Biomass processing is an especially important consideration for successful ventures. Consideration must be given to available technology and equipment and their ability to process the available resource into suitable products efficiently. In many cases, biomass feedstocks from different tree species have different processing technology requirements. In addition, appropriately scaled technologies for a particular product and application will be important when conducting an economic feasibility analysis. Adequate infrastructure support (water, land, electrical, air quality) and zoning will often dictate processing options.

Visitors to the Mt. Lassen Power boiler control room, Westwood, California. July 17, 2003. John Stewart

Management

Careful consideration must be given to how the enterprise will be structured and managed. This includes an honest assessment of the management team running the business: do key management personnel have the experience and know-how to run a woody biomass feedstock yard enterprise? What business controls will be used to assure a viable venture? Who are the business advisors (i.e., board of directors, lender, attorney, accountant, marketer, production and procurement experts) to help guide the venture? Is there an adequate work force of skilled and unskilled labor available to run the enterprise? A good place to start is with the Small Business Administration (SBA), Cooperative Development Center (CDC), and Small Business Development Center (SBDC) which provide a number of resources on the business management issues.

Financial Feasibility Analysis

Financial analysis of the potential business investment assesses potential profitability. The financial feasibility of the business investment involves the preparation of *Pro forma* projections covering all aspects of the potential enterprises' financials. Specifically these are: balance sheet, profit/loss statement and cash flow analysis statements. Refer to "Log Sort Yard Cash Flow Analysis (LSY)—a spreadsheet-based model for log sort yard cash flow analysis" by Ted Bilek, Forest Products Economist, USDA Forest Service Forest Products Laboratory in Appendix 1.

The market feasibility study and financial analysis are core elements of the business plan in order to secure venture capital and, as such, are usually included as appendixes to the business plan.

Field trip to view biomass harvested completed in Northern spotted owl habitat at Iron Mountain, near Red Bluff, California. July 17, 2003. John Stewart

Safety, Health, and Environmental Issues

Non-financial factors, including safety, health, and environmental concerns, take priority over financial measures and may become a limiting consideration in an otherwise successful venture.
It is necessary to overcome any environmental, safety, or health issues that might occur. The economic cost of meeting such regulations must be factored into the financial evaluation of the enterprise. Regulations and permits are important considerations and must be in place before construction of the biomass project can begin.

Thin-kerf band sawmill operation. Dubois, WY. Source: USDA Forest Service

Social license, community support, and compliance with environmental policies and regulations are increasingly important in the success of operations (please see Chapter 13, Enlisting Community support for additional questions). Insuring linkages with collaborative groups, Community Wildfire Protection Plans, Forest Plans and State Assessment priorities will be important to successful projects.

Chapter 4. Sourcing Woody Biomass

Preface

As discussed in Chapter 2 woody biomass can be obtained from a variety of feedstock sources. With the exception of forest products manufacturing residues, woody biomass feedstocks can come from a variety of forest land ownerships across the landscape and from trees on agricultural lands (e.g., short rotation woody crops, agroforestry plantings) and urban lands. Each ownership category comes with its own unique sourcing issues.

In the U.S. the major forest land ownership categories are public (33%), private (57%) and reserved (10%). Public forest lands are those held by federal, state, and county government with the preponderance being federally owned and located in the West. Seventy-six percent of all public forest acres are in the Western U.S. The opposite is true for private forest lands - eighty-three percent of the private forest lands are in the Eastern U.S. Most protected (reserved) forests are in public ownership and most production forests are in private ownership. The majority of private land acres are concentrated in the South, Northeast, Lake States, and the Pacific Northwest.

Of the forest land in private ownership, 77% (or 44% of total) is owned by 9.6 million non-industrial private forest land owners (NIPF land owners). NIPF owners represent a diverse group of people with many reasons for owning their forest land. The remaining private forest lands (13% of total) are held predominately by partnerships and corporations, often for commercial timber production. NIPF lands provide 60 percent of the Nation's timber harvest. (Smith and Darr, 2004).

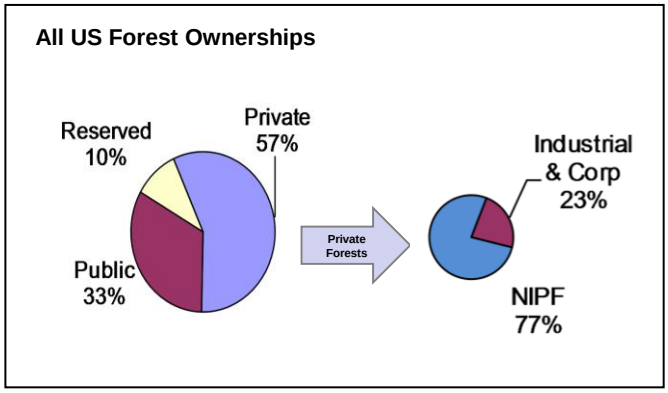


Chart of ownerships of all US Forest Lands (left) and a breakdown of the private forest land ownerships (right). Prepared by Fred Deneke, December 7, 2009, based on information derived from the USDA Forest Service publication "U.S. Forest Resource Facts and Historical Tends" by W. Brad Smith and David Darr, 2004.

There is no national inventory explicitly of trees on agricultural and urban lands. However, the volume of urban woody biomass could be large and sustainable (e.g. street tree maintenance residues). Although it is not a long-term sustainable feedstock, the volume of woody biomass on these lands can be even larger in areas locally impacted by storm events (e.g. hurricane, tornado, ice storms) or by insect and disease outbreaks (e.g. mortality caused by pine beetles and emerald ash borer).

In light of the above statistics, one needs to understand that the land from which woody biomass is sourced needs to be taken into consideration. This chapter addresses sourcing issues from a landownership perspective as well as individual woody biomass source perspective.

Sourcing Woody Biomass Supplies from Federal Lands

Environmental documents for one timber sale. Date and photographer unknown

Federal lands have extensive supplies of woody biomass, but only a limited amount is available for sale or use. Federal law requires the responsible agency to manage lands within their jurisdiction for a variety of resource objectives, whether it is for wildlife habitat, watershed protection, forest products, or recreation and scenic values. Each agency has an "Organic Act" which defines those mandates; individual tracts of land may be modified by specific laws written during the establishment of the National Park, National Wildlife Refuge, or National Scenic or Monument Area. These authorizing laws, as well as the land management plans which guide project implementation, may limit the harvest of forest products or specify the conditions for vegetation management practices.

Congress has designated certain lands, such as Wilderness or Wild and Scenic Rivers, as unavailable for timber harvest. The federal agencies have also designated lands which may have potential for Wilderness designation: roadless areas, wilderness study areas, national conservation areas, etc. The President or the Congress has also declared some areas with unique features as National Monuments or National Scenic Areas, which in general, do not allow commercial forest product harvest. Within the areas where forest product harvest may be available, forest land management plans generally designate lands as "capable" (has the biological capability to grow timber), "available" (the plan allows timber harvest to occur, although there may be significant restrictions on what can be removed), and "suitable" for timber production (this is the land designation of most interest). Within the capable, available and suitable lands (referred to as CAS), the federal land manager sets five or ten year harvest goals, based on resource management needs. From the "five year plan", the agency then develops timber sale schedule (typically 2 or 3 years out), which is often made available to interested parties.

Two principal agencies – the US Forest Service (USFS) in the Department of Agriculture and the Bureau of Land Management (BLM) in the Department of the Interior – have the largest land holdings and share the common objective of multiple use management. As a general rule, while multiple uses cannot occur on every acre, the land manager must consider a variety of possible resource considerations before implementing land management treatments.

Federal land managers may identify specific forest health problems and then plan projects to address those problems, such as a timber sale to improve tree growth; a salvage sale and road building to capture the value of dead or dying trees; hazardous fuel reduction treatments (chipping, crushing, burning, etc) to protect communities from wildfires; or wildlife habitat modifications to meet specific forest conditions (crown cover, species composition, small openings, layered stands, wildlife "edge", etc). The critical factor is that before any forest products can be made available, each of these projects must undergo public involvement, comment period, and the agency must complete an environmental review document as required under the National Environmental Policy Act (NEPA).

Biomass thinning in a goshawk habitat management area, Eagle Lake Ranger District, Lassen National Forest. September 2000. John Stewart

Agencies often publish a public notice and maintain a list of NEPA scoping (request for public comment and interest) in the local paper or other paper of record. This is the first notice of the official intent of the agency to implement a land management practice which may yield woody biomass feedstocks (the notice may never mention woody biomass, so it is important to peruse the list and make inquiries). For the USFS, the NEPA documents are usually prepared well in advance of the timber sale advertisement; for BLM, the NEPA decision is generally published at the same time as the timber sale announcement. Again, input may be provided or early knowledge of projects may be obtained by contacting the local federal agency office and requesting notice of their NEPA projects. Biomass removals have to be addressed up-front in NEPA, so engage with the project planners to alert them to the availability of the yard to utilize material that may otherwise be burned or left on site. This includes being involved with NEPA for "pre-commercial" tree thinning and service contract work such as site preparation or road clearing projects. The agencies will usually seek the least cost method for disposing of residues, which is usually burning or mastication, unless a cost-effective or environmentally preferred alternative is suggested. If equipment use in these areas is not addressed in the NEPA document, it will result in a lost opportunity.

Many National Forests and BLM District/Field Offices have participated in joint levelized feedstock assessments termed Coordinated Resource Offering Protocol. A CROP study is an assessment of woody biomass resources across ownerships (federal, state, county, and private) in a particular area (CROP studies will be discussed in more detail in Chapter 5). If a CROP study was done locally, this is the first place to start in determining what local federal agencies will be offering.

Potential purchasers of Federal timber or other forest products should contact their local agency office(s) and make their interests known to the appropriate agency personnel, such as the forester or fuels specialist. Agency personnel can advise them on how potential bidders are notified and put their name on any mailing lists that may be used to advertise forest product availability.

Tribal Lands

Tribal governments are sovereign nations, and thus have unique flexibility in making decisions on what biomass to offer for sale or make available for commercial purposes. Nonetheless, the Tribes must still complete NEPA documentation for each project. Tribal forest management, as a whole, is excellent, partially due to this decision flexibility, but also due to the cultural values and an ingrained close connection to the land and resources. Many Tribes with forest resources are actively pursuing woody biomass, either for their own use, or as a commodity to market to bioenergy facilities. There are risks involved in relying solely on Tribal biomass feedstocks (for example, the Tribe may decide to award logging contracts or divert feedstocks to Tribally-owned operations), but there can also be substantial rewards – plan accordingly and remain flexible.

Winter logging operation. Date and photographer unknown

Log and biomass yard for Warm Springs Forest Products, a Tribal enterprise in Warm Springs, Oregon. The Tribe is expanding their

Timber Sales Contracts

In general, the land management agency will publish notice of the offering of a federal timber sale contract, usually in a local newspaper of record. Typically the sale is through a sealed bidding process or through an open bidding or public auction process. Bidders usually are required to submit a sealed bid along with a small bid guarantee (refundable down payment). Timber sale contracts are limited to three (BLM) or five year (USFS) maximum contract length. Under exceptional conditions, such as a severely depressed timber market or a major catastrophic event which affects local timber supply, these contracts may be extended for a few additional years (supplemental payment, or performance guarantees are usually required). Although these short term contract arrangements may appear inadequate, one can quickly see that the two year schedule and five year plan, along with the long term forest management objectives of the federal agencies can build a series of contracts to supply the feedstock yard over the longer period required for amortizing costs. While minor changes may occur with differing political administrations, the federal agencies will continue to practice forestry and implement forest health and restoration treatments for the long run.

Federal timber sales, however, are subject to administrative delay and/or litigation and the time and effort required to prepare contracts has increased. If supply cannot be diversified across other forest ownerships, and federal timber contracts are the principal feedstock source, there needs to be a larger ”cushion” in the supply chain to allow for interruptions due to personnel changes, delays due to budget, appeal/litigation, and planning or NEPA compliance issues. Bank and finance experts, for example, often reduce federal agency biomass supply estimates by 40-60% to allow for these fluctuations.

Much of the federal estate, especially in the West is remote and difficult to access for removing forest products which presents challenges to commercial operations. Note that land the federal agencies designate as CAS may include productive timber lands in very remote areas or areas with very steep terrain and/or limited access which may require expensive or advanced logging systems such as helicopter or cable logging and extensive road building or road improvements. The profit margin and logging challenges of removing low-value woody biomass under these conditions may make biomass removal infeasible. Nonetheless, federal land managers continue to seek solutions to these challenges and, after making assumptions and giving an appraisal allowance, may offer the timber and biomass for sale at what appears to be “bargain rates”; carefully review the appraisal and contract requirements.

If an oral auction is conducted, each bid is opened and certified complete so that bidders may compete during the oral auction. Unresponsive bidders (those that did not win the contract or were not certified) get their deposit back immediately after selection of the winning bid (unless there is a bid protest or bidding procedure error, in which case unresponsive bidders are usually given the option to cancel their bid).

The winning bidder then signs the contract, makes additional performance guarantees (often in the form of a letter of credit or a performance bond), and identifies their planned harvest schedule. As part of the harvest schedule, purchasers are often asked to identify where, when and how they intend to harvest and haul the woody biomass or timber. Having knowledge of and a working relationship with each timber sale purchaser can help market the services of the feedstock yard. Therefore it is worthwhile to network with members of the local forestry and logging community, and provide them information about company services and costs; recognize, however, that if bidding against them in acquiring the timber sale contract one could be in direct competition and there may be resistance to supporting the feedstock yard.

Each timber sale contract has specific terms and conditions -- called "provisions" or "stipulations" —designed to mitigate the environmental impact of the project. Examples include "limited operating periods" or "sale operation schedule" for wildlife which may identify specific times of the season or the day when timber harvest or hauling operations can be conducted; "low ground pressure equipment" to minimize impact to the soil; special erosion control measures, such as backblading, ripping and tilling; or costly slash disposal techniques, such as 100% removal or piling. Bidders should carefully review these contract terms, as they may be very costly or could dramatically affect any planned harvest schedule. By visiting the local land management agency timber sale prep staff and asking about their intended utilization specifications one may be able to take advantage of an opportunity to increase available supply from timber sale/stewardship contracts. Local managers may adjust minimum utilization specs and slash disposal requirements during the contract package development phase if they are aware of a local demand for biomass.

High flotation tire for low ground pressure skidder; photo taken at SmallWood 2006 Conference in Richmond, Virginia. May 19, 2006. John Stewart

The contract may be modified to accept alternative harvesting or hauling methods, but in general the alternative measure must have a lower impact on the environment ("as good as or better"), and may result in an increase in payment rates if other bidders were not given a equal footing or the timber sale appraisal inadequately reflects cost-cutting methods. Like all contracts between two parties, the specific terms of such a contract modification must be agreed to by both parties. Where disagreements result, the timber purchaser may make an appeal under the Contract Disputes Act (The Contract Disputes Act of 1978, as amended: 41 U.S.C. 601-613).

Service Contracts

Woody biomass is also available through "service contracts" which identify specific services requested by the federal agency to meet their land management objectives. Examples of interest include hazardous fuel reduction projects (reducing wildfire risk); precommercial thinning of small diameter trees to improve forest health; road building and clearing; timber stand release (clearing brush around planted trees), or site preparation for reforestation (piling debris and preparing the soil prior to tree planting). Service contracts vary in length, but are generally short in duration (typically much less than two years). While not a "sustainable" supply, they may fill in voids in the feedstock chain, and over the years, through a series of thinning or hazardous fuel reduction contracts, could be a major source of biomass feedstocks.

The US Department of the Interior has a regulation (48 CFR 1437.72) which allows the service contractor to remove woody biomass whenever it is "ecologically appropriate". Some of the woody biomass may be retained to meet wildlife requirements or to conduct a prescribed fire, but surplus biomass could be removed – payment for the material may be required depending on local conditions and agency regulations. The decision whether or not biomass removal is ecologically appropriate resides with local managers. A clause in the service contact notifies the contractor of the availability of this material and requires that a sales contract for the material be negotiated before it can be removed. The US Forest Service does not have a similar regulation, but leaves the biomass removal decision to local managers. In either case, a request for biomass removal must be made to the Contracting Officer.

Stewardship Contracts

An alternative to timber sales (which have clear commercial timber values), and service contracts (which are mostly environmental services needed by the federal agency, but may yield some biomass), is a "stewardship contract." This unique contracting mechanism was temporarily authorized for the USFS and BLM and is due to expire in 2013. The concept is that the commercial timber value is used to offset at least a part of the cost of the environmental services required in the contract (the timber value "pays" for work). The contract term may be up to ten years in length, which could provide a reliable supply for the feedstock yard. Although it is possible, it is unlikely that Congress will let this valuable forest management tool expire without providing a suitable replacement tool. The US Fish and Wildlife Service has similar authority to that of the USFS and BLM in stewardship contracting (50 CFR 29.2, Cooperative Land Management).

The stewardship contract is essentially a service contract designed to achieve a resource management objective whereby timber and biomass value is essentially traded for service work, and is usually far less complex than a standard timber sale. For more information on these contracting tools, please see the agency specific guides: USFS stewardship contracting guidance is available at: http://www.fs.fed.us/forestmanagement/projects/stewardship/direction/index.shtml. BLM specific guidance is available on the internet at: http://www.blm.gov/pgdata/etc/medialib/blm/wo/Information_Resources_Management/policy/im_attachments/2006.Par.83709.File.dat/im2006-058attach1.pdf.

Hauling, Storing and Disposition of Federal Woody Biomass

Federal regulations require that the agency bill timber purchasers for timber prior to the cutting and transportation of the material. Advanced deposits may be used to cover the initial costs, with full payments generally due within 30 days. Entrepreneurs must plan for this advance payment prior to acquiring the feedstock; failure to make timely payments is one sure method to get cross ways with the local agency and possibly be suspended or prevented from bidding on future timber sale offerings (called "debarment"). Timber sale contracts may require additional advance deposits or bonding, some of which may be held several months until harvesting is completed. So be aware of these deposits and how they may be affected by logging season.

The USFS and BLM usually require individual transportation tags or log branding to haul timber from a timber sale area to an approved disposal or distribution site (feedstock yard, for example). These load accountability measures are critical to proper payment and therefore gets close scrutiny from law enforcement operations. Loads transported without proper accountability may be suspected of timber theft, and could mean fines and additional costs or unnecessary delays for future operations.

Log deck with US Forest Service transportation permit (also called scale or load ticket), Hayfork, CA. Source: USDA FS

Once a load arrives at an approved scaling location, payment is assured, but the federal agencies role may not be complete; with some exceptions, export and substitution regulations west of the 100th meridian (generally west of Kansas and the Dakotas) prevent the processing of USFS timber outside the US (36 CFR 223.159 thru 185). If buying USFS timber in the West, the agency may have the right to enter the feedstock yard for periodic inspections and ask for copies of transportation records to ensure the feedstock was not exported or used in substitution.

One is well advised to maintain a clear record of timber disposal outlets and transportation records for any USFS timber. These export regulations generally apply to "unprocessed" timber, such as raw logs or large cants (lumber over 8.75" per side). Woody biomass chipped in the woods is considered "processed", and the export and substitution regulations do not apply.

Sourcing Woody Biomass Supplies from State or County Lands

Regulations and forest practices vary widely from State to State, but suffice it to say that most state forest lands have similar rules and regulations to federal lands when it comes to harvest and use of wood from their lands, although contracting mechanisms will vary. Many of the lessons learned in understanding federal sourcing issues will also assist in dealing with State biomass supplies. Probably the best source of information is the State Foresters office (see the following web link for point of contact information from the National Association of State Foresters: http://www.stateforesters.org).

Most States maintain a link to their timber sale offerings (type in "notice of timber sale" in most State Forester websites). Pennsylvania, for example, advertises all their sales and a listserve that provides email notices for each sale (link: http://www.dcnr.state.pa.us/forestry/timbersales/bids.aspx); and their bidding and performance procedures are similar to the federal agencies (http://www.dcnr.state.pa.us/forestry/timbersales/biddinginfo.aspx). Just as with federal agencies, a visit or call to the local forestry department is usually a good place to start.

Many County or local governments also have forested lands which may schedule periodic harvesting. Check with your County or township forester for details.

Sourcing Woody Biomass Supplies from Private Forest Lands

As mentioned, 13 percent of private forests lands are held by industrial forestry companies, partnerships, and corporations. In recent years an increasing amount of these private forest lands has shifted to ownership as Timber Management Investment Organizations, (TIMO's) or Real Estate Investment Trusts (REIT's). For the most part, the potential woody biomass that could be sourced from the lands held by all of these various types of private sector firms may not available. Why? Because the forest industries that harvest wood from these lands are increasingly using the logging and other residues for generating heat and power for use in their own industrial processing and production, or they sell it to other users. Still, it is important to contact these owners and advise them of one's services, especially if providing a low cost alternative or disposal service. A recent biomass conference in West Virginia highlighted the largest TIMO in the U.S., the Forest Land Group. Surprisingly, very little of their extensive timber harvest portfolio has included woody biomass removals. Large and sophisticated TIMO's, therefore, haven't necessarily exploited all avenues for woody biomass. (BTUs from the Forest, available at: http://wvbiomass.org/index.php?option=com_jdownloads&Itemid=66&task=view.download&cid=28: see presentation by Kaarsten Turner-Dalby).

Community wood sort yard, Missoula, Montana. October 12, 2005. John Stewart

While private non-industrial forest lands produce 60 percent of the Nation's timber harvest it is important to note that 57 percent of the owners of these lands hold fewer than 10 acres of forest land. The majority of private forest land is held by owners with 100 acres or more of forest land. This land base of non-industrial landowners is perhaps the greatest untapped resource. However, for the most part, even on larger parcels, obtaining a sustainable supply of woody biomass from NIPF lands is problematic unless one has sourcing arrangements with a wood harvester (logger) to obtain logging or harvesting residues. Hence it will be important to work with the state forester to understand private forest land ownership patterns and know who are the primary wood users and logging contractors in the region where the feedstock yard is being contemplating. Another option may be a biomass cooperative designed to provide or address local biomass feedstock issues.

An example might be a supply contract with a group of suppliers (landowners or loggers) who have organized themselves into a cooperative. The members of the cooperative control the supply and thus would have a vested interest in making a value-added concept work as it would make them more profitable and give them added security. The Woody BUG has recently completed a White Paper on this topic, including issues surrounding long term biomass supply agreements and sourcing biomass from private lands, especially in the hardwood region (Hassler, 2009).

Some examples of biomass "drop off sites" or community collection facilities, whether with or without a tipping fee, have yielded supplemental biomass supplies. While they may be transitory in nature and erratic in delivery, this could prove to be a good supplemental source of biomass; and may generate community support by offering free or low cost services to assist or supplement their operation.

Opportunities and Challenges Associated with Woody Biomass Sources

As discussed in Chapter 2, there are unique handling and access issues for each category of woody biomass. The following feedstock sources are listed by the potential quantity available, but may vary dramatically from the rank listed here due to local conditions.

Woody biomass feedstock sources, availability, and sustainability vary region-to- region, state-to-state, and within any given region or state. When evaluating net feedstock costs, the following factors should be considered, regardless of feedstock: price history; production patterns and trends in the area from which the facility is most likely to acquire the primary feedstock; and the quantity and quality of feedstock historically available in the area and other sources of competition for the feedstock.

Forest Harvesting and Thinning Residuals

Chip truck loading in a hot landing, Eagle Lake Ranger District, Lassen National Forest. July 18, 2003. John Stewart

Woody biomass includes residues from forest harvesting and thinning operations such as branches and tops left on-site; low-quality commercially grown trees, dead wood, and noncommercial tree species. Harvest residues represent the largest current and probable future feedstock resource. Due to existing harvesting and transportation infrastructure, and if operations are conducted commensurate with, or with due consideration of biomass extraction, the costs can be reduced. Most commercial biomass production is conducted in conjunction with a traditional harvest of sawlogs and pulpwood. That is, trees are skidded to the log landing as whole trees and then merchandised into various products, including biomass which is generally processed with a chipper located on the landing. Some operations conduct a separate chipping and trucking operation immediately after the higher valued products are removed. This reduces the risk of additional road maintenance costs, wildfire or slash concerns, and equipment moving and maintenance costs. It is also important to note that many biomass enterprises require "clean" biomass (biomass that does not include rock and dirt). Thus handling biomass during harvesting for eventual removal reduces cost and increases value (rather than bulldozing harvesting and thinning residues into a pile with recovery as an afterthought).

Forest Products Manufacturing Residuals

Other potential sources of woody biomass include residuals from forest products manufacturing facilities. This includes sawdust, shavings, chips, and slabwood as well as black liquor from pulping operations. Except for the hardwood region, much of the residuals are used for energy production by forest products industries and are often unavailable to woody biomass feedstock yards. However, at the local level there may be smaller wood related manufacturing facilities such as small sawmills (less than one million board feet) and cabinet shops which may have available residual materials.

Hazardous Fuel Reduction (HFR)

Catastrophic wildfire is increasing across the US, but especially in the West and in Florida. Many communities and State and federal agencies are attempting to reduce the risk and threat of wildfire by removing or rearranging the fuels for these fires. Millions of acres are treated each year and could yield tens of millions of tons of woody biomass.

Doodles laid out for grapple skidding on the North Dusty Timber Sale, Almanor Ranger District, Lassen National Forest. September 18, 2002. John Stewart

Many communities have prepared Community Wildfire Protection Plans (CWPP's) to address this fire threat. The CWPP usually includes a set of priorities and possibly a list of projects for fuel reduction. This would be a good place to start, but contact with the local agencies, including local fire departments, may yield better data. The HFR feedstocks are not "sustainable" due to their transient nature, but follow up treatments will be necessary to maintain the effectiveness of the fuel reduction – especially in areas of rapid regrowth such as Florida. A national list of communities at risk of wildfire was published in the Federal Register in 2001: http://www.forestsandrangelands.gov/resources/documents/. Most State Forestry offices maintain a more current list (for the 2008 National Association of State Foresters report please see: http://www.stateforesters.org/node/1077). The USDA Forest Service Woody Biomass website has a link to all of the State Biomass Assessments and Plansavailable on the web, to access go to http://www.fs.fed.us/woodybiomass/strategy/supply.shtml and choose "related links.

Sanitation and Salvage Wood

Sanitation treatments are often used by counties and communities in the wake of major insect and disease outbreaks to reduce the competition for water and nutrients (improve tree vigor); salvage is done to capture timber product value before deterioration and to mitigate the spread of diseases and insects. The objective is to remove dead, dying and weak trees as quickly as possible. Biomass sort yards are often used as a means to dispose of the source of the disease or insect outbreak whether it is in a community (emerald ash borer) or across the landscape (pine beetle).

Significant mortality on Ashurst Mountain, Eagle Lake Ranger District, Lassen National Forest; the green stripe in the upper right is a road where trees had less competition for water and were able to resist insect attack. July 18, 2003. Mike Jablonski

The state of Colorado has been working extensively on addressing a major outbreak of mountain pine beetle on lodgepole pine and has created a number of woody biomass feedstock yards to help communities cope with the large number of dead and dying trees in their surrounding areas. This has led to the creation of a major pellet mill with an accompanying feedstock yard to handle the large amounts of sanitation cuttings needed to reduce the wildfire threats from this major insect epidemic in the Rocky Mountains. The yard must plan to handle "hot logs", those infested with insects or disease, in order to avoid movement of bugs into forested stands.

As with hazardous fuel cuttings, relying on sanitation or salvage wood as a sustainable supply of wood for a feedstock yard may be problematic and underscores the need to have a reliable assessment of the amount of wood that will be available over a ten to fifteen year period to supply the particular woody biomass facility that is being considered. Dead wood will tend to have lower moisture content, but loses commercial value within one to two years; safety of operations in handling, hauling and hazardous tree felling must also be considered.

Municipal Solid Waste (MSW)

MSW may include solid woody waste, construction and demolition wood, trees and woody debris from land conversion, and green waste. For the most part, when MSW goes to a landfill there is usually a tipping fee assessed to the entity dropping off the woody debris. In developing a woody biomass feedstock yard it would be advisable to have a part of the yard devoted to receiving and processing MSW. In the process, a tipping fee could be waived as an incentive in obtaining the feedstock. Again, depending on the purpose of the facility, MSW should not be considered a sustainable feedstock source in and of itself.

Tornado damage on the Menominee Reservation, near Neopit, Wisconsin. Note the shattered nature of the woody debris; such heavily damaged material may have no other use than to be chipped for fiberboard or bioenergy use. July 2007. John Stewart

Disaster Debris

Downed woody debris following major wind and ice storms can be a significant, but generally short term, feedstock source. In the case of major hurricanes that impact large acreages the opportunity may be more long-term. Several major wood pellet mills were created in the wake of Hurricane Katrina. Part of this was due to the large amount downed woody debris resulting from the scope and magnitude of the wind event. As with MSW and sanitation wood, downed woody debris should not be considered a long-term sustainable feedstock yard source. Disaster debris also presents a problem if sorting higher valued products is part of the business model: wind damage (shear, breakage, shake), can negate the opportunity for value-added products and also presents significant problems in harvesting, transportation and felling (root sprung trees present one of the most dangerous tree cutting conditions).

Energy Crops

Dedicated energy crops, such as short rotation woody crop plantations (hybrid poplar, willow, coppiced trees, etc) are grown primarily to provide feedstock for bioenergy facilities. There are several examples around the country:

Hybrid poplar is grown commercially in central Minnesota to provide fiber for Verso Paper's TMP pulp and coated paper mill in Sartell, Minnesota. Since 1995, approximately 23,157 acres have been established on highly productive farmland. Harvesting of these plantations began in the fall of 2007.

The Dunkirk power plant in western New York State, working with Syracuse University has tested over 242 ha (600 acres) of willow biomass crops. Regional trials have also been established in nine states and Canada. The near term use for willow biomass crops is co-firing with coal. The Greenridge power plant has demonstrated continuous co-firing for several years.

This is the only woody biomass category that qualifies as "closed loop biomass" under most Congressional definitions; as such these feedstocks are available for several special federal tax incentives or rates (such as a higher Production Tax Credit as discussed in Chapter 14). Much attention has been given to switchgrass as a biofuel energy crop; it is not included here because switchgrass may compete with the above woody biomass categories as a bioenergy feedstock. Several forest industries are also considering intercropping short rotation trees with switchgrass.

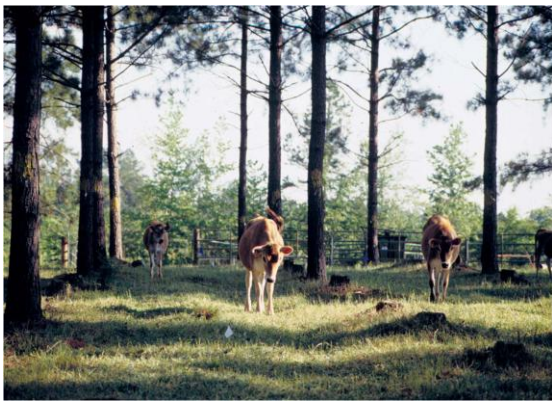
Four year old plantation of hybrid poplar feedstock for the Dunkirk, New York co-fire power plant. October 29, 2003. John Stewart

Aerial photo of the Potlatch plantation near Boardman, OR, now managed by GreenWood Resources. 2000. Source: GreenWood Resources, Inc. which manages about 30,000 acres of high yield, fast growing poplar plantations in the area.

Agroforestry and Silvipasture crops

Increasingly, farmers throughout the Midwest and the South are including tree or woody crops amongst their row crops. Nut crop trees, such as walnuts, can be grown on a wide spacing without materially affecting row crop production. When tree crop production declines or passes maturity, the woody material may become available for utilization rather than disposed of through burning or mulching. A similar source of wood may come from "silvipasture", areas designed to produce grazing feed for livestock but also having scattered tree cover. Harvesting on either of these options must be scheduled around the principal crop/livestock operation, but many farmers would be receptive to putting their surplus trees into a productive use.

Alley Cropping Agrofrestry Practices. Date unknown.
Source: USDA National Agroforestry Website



Silvopasture Agroforestry Practice. Date unknown.
Source: USDA National Agroforestry Website

Chapter 5. Assessment and Procurement of Feedstock Sources

Preface

The feasibility of woody biomass utilization enterprises and feedstock yards depends, in part, on the cost, quantity, and availability of the biomass resources in close proximity (typically a 25 to 50 mile radius, since as much as 60-70% of total project costs can be tied up in transportation) to the facility in question. One of the most critical steps in creating a successful woody biomass feedstock yard is conducting a thorough and realistic assessment of the sources of woody biomass that exist in and around the area for proposed for locating the feedstock yard.

However, this assessment cannot be limited to the quantities of biomass that exist in proximity to the facility--one also needs to know if, how, and when with regard to availability and accessibility to the feedstock sources. Having unfettered access to a reliable, sufficient, sustainable, supply of feedstock sources will mean the facility can operate at peak economic production capacity day in and day out on a yearly basis. Thus the initial assessment must take into account all potentially available feedstock sources and an understanding of any seasonal, environmental, or other restrictions on their availability and access. The feedstock source(s) must also be economically available and in quantities and from diverse sources that will support project financing. Usually this means having a minimum 10 to 15 year supply contract and agreement with biomass suppliers.

Business owners need to understand that not all the feedstock can be obtained for free or at a low cost; the average price may be significantly greater than the one they're probably hoping for. The appeal of collection yards is that some of it may actually be free, even a lot of it if there are significant private lands in the area. However, once the initial wave of free stuff is over, landowners will start to demand payment if they realize a market is emerging. Some experts stress, when estimating delivered price, the need to double the cost of the first ton through the gate at the collection yard, in order to account for the range of prices (or a supply curve based on cost of biomass).

The feedstock yard can certainly elect to operate in a spot market environment for both their supply and sales. This does provide some flexibility and allows the yard to use price to increase or decrease biomass receipts and sell product to the customer that provides the best price. As an example, the pulp and paper mills in the hardwood region have traditionally not entered into long-term supply agreements with roundwood suppliers. While they do have a contract with the supplier, it does not stipulate volumes per time period. Instead, they have a procurement staff that works with suppliers to ensure the mill maintains sufficient raw material deliveries. Many of these mills have been successful in their procurement activities, and have used price and quotas to control receipts.

It is important to recognize that the markets for the products and/or the purpose associated with the feedstock yard will also drive the scope of the initial assessment. A small community based biomass yard designed to handle excess urban wood residues or to fire a school boiler for thermal heat does not require as much feedstock on a daily and yearly basis as a large 50 megawatt wood fired electrical facility, let alone a major wood-based transportation fuel facility. Certain facilities also require cleaner feedstock sources than others.

Sources of Woody Biomass

Chapter 2 covers in detail the major feedstock sources that may be available to a woody biomass yard/facility. A summary of the principal biomass sources follows:

- Forest improvement and forest restoration treatment removals and residuals;
- Forest health and hazardous fuels reduction treatment removals and residues;
- Timber harvesting residuals;
- Roundwood;
- Wood residues from road construction and maintenance and vegetation clearing along utility corridors, and other rights-of-way;
- Forest products manufacturing residuals;
- Downed woody debris from wind and ice storms;
- Wood from trees cleared during urban development;
- Municipal solid waste;
- Urban green waste;
- Wood from short rotation woody crop plantations;
- Used pallets and crating materials;
- Urban wood waste; and
- Agroforestry and agricultural byproducts.

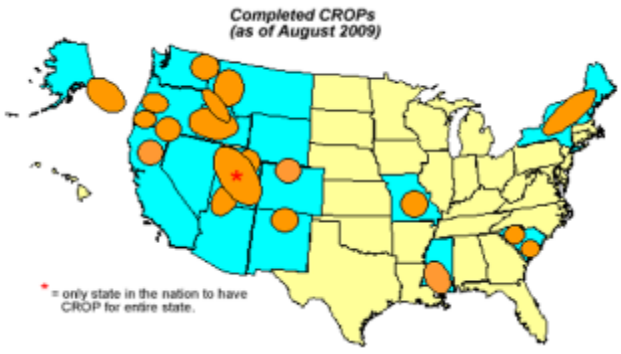
Ponsse woody biomass forwarder, Neopit, WI. Source: USDA Forest Service

Depending upon existing markets and prices, pulpwood or roundwood can also be sources of woody biomass for a feedstock yard.

Coordinated Resource Offering Protocol (CROP)

The US Forest Service, in cooperation with the Bureau of Land Management, has conducted a number of feedstock studies across the nation; for the latest locations and summary data see http://www.forestsandrangelands.gov/Woody_Biomass/supply/CROP/

The CROP studies are essentially a feedstock/ timber supply analysis for a community or subregion which seeks to include supplies from all landowners (federal, state, county, and private). The Forest Service objective is to "levelize" the offering of federal timber, in consideration or cooperation with other agencies and landowners. The benefit to the wood products industries is a more consistent and reliable offering of timber sales.



Coordinated Resource Offering Protocol (CROP) study areas, taken from the US Forest Service website, December 8, 2009: http://www.forestsandrangelands.gov/Woody_Biomass/supply/CROP/index.shtml

Historically, many Ranger Districts push to meet their annual timber targets and offer a larger proportion in the last quarter of the year. The unbalanced offering reduces the demand for the timber, as the local market for sawlogs gets flooded in August and September (especially when timber buyers are already busy with the field season).

CROP Studies include a listing of planned timber offerings by species, size and quantity for a five year or longer period, and may even identify a product stream (satwimber, pulp, biomass, etc). Since not all owners are willing to make their proprietary data available, perhaps the greatest benefit of the report is in predicting and stabilizing the federal timber offerings. In areas dominated by federal ownership, this becomes a critical analysis tool in feedstock assessment, as the local decision makers have probably agreed to the proposed outputs and targets.

Steps in Feedstock Assessment

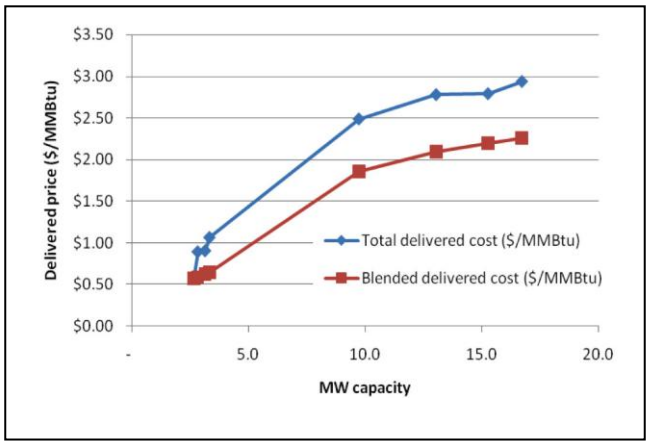
A woody biomass feedstock assessment usually requires at least 5 steps:

1. A survey of the quantities of potential biomass resources across the landscape and ownerships within a 25 to 50 mile radius of the proposed facility. An example may be planned harvest levels from federal or state agencies (with suitable adjustments for type of biomass, location, and probability of successful offer), or agreements or contract arrangements with private or industrial landowners;
2. A survey of the actual availability and accessibility of these resources (e.g. what types and amounts of biomass were actually harvested and made available over a designated period, say the last three or five years); some of this data could be gathered from the USFS Forest Inventory and Analysis Timber Product Output program which provides County-level data on logging residues and forest product removals http://fia.fs.fed.us/;
3. An estimate of the costs of obtaining available biomass resources including the cost of the raw material itself, logging and transportation costs, assessment of biomass quality (clean chips versus hog fuel) and quantity (small amounts with high logging costs versus larger contracts or low logging costs) of the biomass sources, and overhead or administrative costs (e.g. deposits or bonds for procurement contracts, etc.); this detailed information may be available from the State Tax Board or State Forester's office;
4. A ranking of the biomass resources from cheapest to most expensive delivered to the proposed feedstock location; and
5. The creation of a supply curve to determine the price of a biomass resource at a given quantity of demand. As part of this assessment make any adjustments for the seasonal and/or traditional "woodshed" for each of the biomass users in the area to identify where or when competition may drive up prices.

The task of conducting a thorough assessment may seem daunting. Though techniques and procedures for conducting a thorough assessment is beyond the scope of this document, there are many sources of data and technical assistance that are available in helping to conduct such an analysis. Chapter 14 provides insights with respect to sources of financial assistance. Probably the best source of information and understanding the process of conducting a woody biomass feedstock assessment is found in the NACD Woody Biomass Desk Guide and Tool Kit (Chapter 6) titled "Do-It-Yourself Supply Curve: Tools to Help You Get Involved in an Entrepreneurial Woody Biomass Project" (http://www.nacdnet.org/resources/guides/biomass/pdfs/Chapter6.pdf).

Also see the NACD publication Chapter 8 and Appendixes D, E, and F for sample supply and cost examples from Alaska, Florida, and Massachusetts.

The implication from the above assessment is that biomass originating from timber harvests is the primary component of the biomass supply and therefore, the focus of the feedstock assessment. The process may be simpler, as there are two necessary conditions for biomass procurement success: a sufficient standing timber resource and an existing wood products infrastructure. Therefore, availability may be directly dependent upon the logging sector and its ability/desire to produce biomass. Any assessment can then proceed with determining logging capacity, pricing, etc. directly from the logging community and to a certain extent from other entities in the wood supply chain.



Biomass supply cost curve, taken from the NACD Woody Biomass Desk Guide website, December 8, 2009: http://www.nacdnet.org/resources/guides/biomass/pdfs/Chapter6.pdf

Developing a Feedstock Procurement Plan. According to the work of TSS Consultants (2004) the main economic driver in a operating a feedstock yard is the cost of collection, processing, and transporting material to the facility. TSS Consultants (2004) have developed the following information to guide the feedstock acquisition process: "To attract the equity and debt capital needed to develop, construct and operate a new biomass to fuel facility, usually requires 50 – 70% of the biomass raw material supply be secured under long-term contracts (usually a minimum of 10 years) from multiple vendors who control the raw material and who appear like they will be in business five years from now. Since development of a small industrial scale biomass to fuel facility usually will take from 2 ½ years to 3 years this means before obtaining financing or started construction, contracts will have to be obtained for a long term supply of raw material, or at least under a binding letter of intent. In addition, a rule of thumb for available biomass inventories to a proposed facility is to have 2 ½ to 3 times more biomass inventory available than is needed for the proposed commercial facility that is economically and environmentally available."

Visitors to the Mt. Lassen Power biomass yard, Westwood, California. July 18, 2002. John Stewart

Thus, once a thorough biomass assessment has been conducted the next critical step is to develop a biomass procurement plan in order to meet the feedstock yard's raw material needs as outlined in the previous paragraph. This involves contacting the owners or growers of the biomass feedstocks, determining if they actually have biomass available in the quantities desired, and then obtaining binding letters of intent or, better yet, actual procurement contracts with each entity involved. Procurement contracts should spell out in detail the volumes to be delivered, frequency, and material specifications for the biomass to be acceptable at the feedstock yard gate.

Contracts should also specify prices for delivery and penalties for non-delivery. In addition, due diligence should be conducted with respect to the desired suppliers to assure their reliability in delivering biomass feedstocks to the yard during the term period of the contracts.

As part of the procurement plan, the feedstock yard may need a full-time procurement person or staff once operations are up and running. The procurement plan is not a one-shot assessment, but will be a critical part of ongoing operations and the associated cost should be included in the economic feasibility that will be conducted and discussed later in this Guide.

Large chipper operating at Tricon Timber, St Regis, Montana. October 12, 2005. John Stewart

Chapter 6. Planned Programming Approach for Developing a Biomass Feedstock Yard

This section discusses how to evaluate preliminary financial feasibility and provides an objective planned programming approach for the development of a woody biomass feedstock yard. Deficiencies in understanding of the basic principles in planning startup and expansion projects are rooted in: (1) planning by subjective opinions instead of informed decision-making; (2) using poorly thought out assumptions; (3) deviation from the accepted wood products business development model; or (4) deficiencies in one or more of several critical factors.

Given the uncertainties of biomass resource supply, forest products market volatility, and financial viability of biomass operations, it is essential that serious consideration be given to the planned programming approach presented here.

A biomass processing facility's viability depends in part on the dynamics of the available biomass supply including biomass cost delivered to the yard, cost of converting the biomass into saleable products (processing cost), and forest products markets (revenue from the sale of biomass products). Evaluation of product value v. delivered biomass cost and processing cost provides a good starting point for preliminary feasibility of biomass processing facilities projects.

Planned Programming Approach

Rather than basing a feedstock yard's business model on subjective "I think this and I think that" thinking, a planned programming approach is recommended. Planned programming leads to strategic, marketing, business, and operational plans to help guide the development and operation of the enterprise (Howe 2005, Dramm 2004).

A planned programming approach to woody biomass feedstock yard development can help guide the development and operation of the biomass enterprise. Project planning based on subjective opinions rather than objective investigation can quickly turn into a deep emotional attachment when extensive effort, time, energy, and money have been expended. It then becomes very difficult to give up on a bad idea once this emotional attachment has been made.

Planned programming involves a step-by-step logical progression through several developmental planning stages: (1) feasibility and business planning; (2) biomass feedstock procurement and market development; (3) permitting, environmental site assessment, and zoning; (4) site selection, plant design and equipment selection; and (5) operations and business management. Planning aspects need to be considered during each phase of the proposed biomass processing facility project and eventual operation.

Project Planning Team

Undertaking a biomass enterprise requires knowledge in several disciplines. Seldom found is the unique individual who knows all there is to know about all of these subjects to put a successful biomass business together. For most, a project planning team approach is the best chance for success. An alternative may be to hire a private consulting firm which performs feasibility studies and provides other professional services and advice.

Chip truck off-loading via hydraulic lift at the Mt. Lassen Power plant, Westwood, California. September 18, 2002. John Stewart

The project planning team should consist of those individuals who will design, construct, and operate the biomass feedstock yard. The team should be responsible for developing and analyzing potential options and choosing a workable plan to meet the proposed goals and objectives of the feedstock yard. Project development is led by a project planning team of specialists that may include a biomass procurement forester, marketing specialist, and management consultant. In addition, key personnel who will manage and operate the operation should be part of the team. Professional assistance will be required at various stages of planning including the services of an accountant, lender (banker), and attorney. The facility supervisors should play a critical role on the biomass project planning team.

Govett (2005) recommends that a generalist head the project planning team. Specialists tend to lose interest outside their area of expertise and too often attempt to redefine issues in terms of their expertise. Additional suggestions include the following:

- Beware of becoming emotionally attached to a project analysis or of advice from anyone who has become emotionally attached to the analysis.
- Beware of project cheerleaders who will not give up on a bad idea.
- Beware of placing too much weight on advice from experts on the fringe of their expertise—watch out for phrases like "I'm not an expert in this area, but…"
- Beware of placing too much weight on the advice of experts who have something to gain or lose as a result of selection of alternative courses of action such as equipment vendors.
- Beware of placing too much weight on industry averages, general rules of thumb, or past experience.
- Always justify any assumptions that are made; the most important question is to ask "Why this assumption?" and be able to back it up.

Knowledgeable members of the project planning team should be able to handle the preliminary financial feasibility analysis of options, as well as the assessment of initial resource supply and forest product markets. Planning the biomass facility and determining the feasibility of alternatives is a screening process that evaluates the available log or biomass supply, lumber and residue products, markets and product distribution (transportation infrastructure), and financial analysis.

Truck-to-rail wood chip reload facility. Fort Apache Timber Company, Snowflake, AZ. Source: USDA Forest Service

Screened woody biomass feedstock, Carson City, NV. Source: USDA Forest Service

Potentially viable scenarios are constrained by technical, economic, and market limitations. Finding feasible opportunities, then, is an elimination process, filtering through each of several constraints of the several critical factors for success. Technical constraints limit the types of products possible from the available resource supply and will suggest suitable facility design and appropriate processing equipment. Available markets further refine suitable product options. Financial analysis determines which marketable products will generate sufficient revenue to justify the operation. Also remember that what is not feasible today might be tomorrow. So it is important to keep options open, know what current limitations are and if they change be ready to act (new technology, new markets, new incentives, etc.).

Chapter 7. Developing a Marketing Plan

Preface

This and the next few chapters are three critical building blocks for creating a successful woody biomass feedstock yard enterprise: namely a marketing plan, a business plan, and a preliminary financial feasibility analysis. This chapter addresses the first of these building blocks – developing a marketing plan. Marketing is a very broad area to cover in one chapter. Fortunately there are two Forest Service publications that cover the topic of forest products marketing in detail ("A Planning Guide for Small and Medium Sized Wood Products Companies" by Jeff Howe and Steve Bratkovitch dated 2005 and "A Marketing Guide for Small and Medium Sized Primary Forest Products Processors" by Robert Smith, Edward Cesa, and Patrick Rappold dated 2008). Most of what is found in this chapter has been directly taken from or adapted from these publications.

What Is a Marketing Plan?

A marketing plan is a brief written report that summarizes the details of the firm's marketing activities for a given period in the future, usually the next year. It is the primary instrument for conducting a marketing program. As such, it is the blueprint for the construction of a marketing program. The marketing plan differs from the strategic plan, in that it focuses more narrowly on a specific product, market, or both. It provides a detailed framework for the marketing process, including an entire set of specific activities to be performed to meet management's strategic goals and objectives. The marketing plan is limited in that it primarily deals with strategy as it relates to the company's marketing mix. The marketing plan directs the feedstock yard marketing efforts.

Initial Steps in Developing a Marketing Plan

A key first step in developing a marketing plan for a woody biomass feedstock yard is conducting an assessment of the biomass supplies and their availability in proximity to the yard (25 to 50 mile radius). Chapter 5 covers this process in some detail so it is not repeated here.

The second step is to understand what other entities are in competition for the same biomass supplies. Along with knowing the competition, it is important to determine what price competitors are paying for their biomass supplies and have an understanding how increased competition may affect raw materials cost.

Once woody biomass sources, availability, and competition have been determined a third step is to survey the range of potential goods and services that can be produced and provided from the range of biomass resources available. See Figure 1 (Introduction and Overview) for an idea of some potential products. In addition research the potential for other possible products like wood pellets, mulch, compost, and wood shavings for animal bedding, etc.

When the full range of goods and services that can be produced is determined, the next step is to identify the customer base. For most feedstock yard products, there may be only one or two large customers (power plant, pellet plant, etc.) for the hog fuel or chips. There may a host of retail or wholesale customers for other products such as decorative bark, bagged or bulk pellets, wood flour, pallets, compost, or mulch, etc. It is important to know the customer base and what their market share may be. It is also important to know and understand the costs and competition for that customer base.

This will guide in honing in on the products with which there a competitive advantage. From there one can determine the technology and equipment to help achieve market place entry and potential advantage.

Marketing Fundamentals

The four fundamentals "P"'s of marketing are: product, promotion, pricing, and placement.

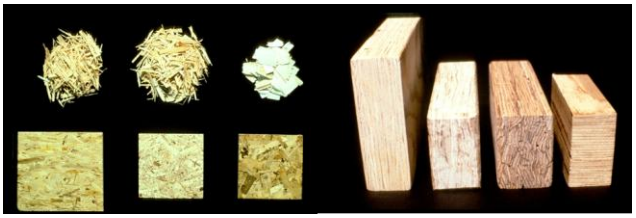
1. Product

The first "P" is product. A product is any physical object, service, place, organization, idea, or personality that satisfies a customer want or need. The three main types of products are:

A. Commodity products;

B. Specialty products; and

C. Differentiated products.



Wood composites from woody biomass furnish. Forest Products Laboratory, Madison, WI. Source: USDA Forest Service

Commodity products are manufactured to more or less a standard set of specifications. Examples of commodity items include hardwood lumber, dimension lumber, and plywood. For commodity items there is little differentiation in products between manufacturers. For this reason, competition in the commodities market is primarily based on price. It is often a surprise to small and medium size manufacturers of hardwood lumber just entering the marketplace how little control they have over the selling prices of their products.

Specialty products, on the other hand, are developed and offered to a small group of customers or small market segment. Competition in the specialty products market is typically based on all product features and less on price. Because there is greater product differentiation with specialty products, compared with commodity products, the potential for higher profit margins increases.

Differentiated products have differences or variations in order to satisfy different market segments. Compared with commodity and specialty products, differentiated products provide manufacturers with the greatest amount of control over selling price. In the wood industry, however, it can be difficult to create a differentiated product due to competition and financial constraints. Product differentiation is one of the most effective methods to increase the value of any given product. Product differentiation involves developing a real or perceived difference between a company's product and that of competitors. As a small to medium sized firm, one of the most effective methods of product differentiation is by manufacturing a product that satisfies customer desires for quality, while at the same time, providing superb customer service. Product differentiation also involves such things as price, reputation, communications, delivery, and credit.

As a feedstock yard owner or operator, a goal should be to move products from a commodity to specialty or differentiated products. Careful analysis of local markets and entrepreneurial ingenuity can help accomplish this goal.

Total Product Concept (TPC)

TPC includes not only the physical product, but also the variety of image and service features that can impact customer satisfaction. Three key TPC components important to small and medium sized firms are:

- Quality;
- Reputation; and
- Service

By concentrating on these three components small and medium sized firms can differentiate their product from those of competitors.

2. Promotion

The second "P" is promotion. The objectives of promotion are to inform, persuade, remind, and associate. Promoting the business and products serves to:

- Build awareness among potential users;
- Differentiate the firm's services of from that of competitors;
- Communicate the firm's benefits;
- Build a favorable image;
- Attract and secure customers;
- Eliminate preconceived misconceptions; and
- Advise existing and potential clients of new services.

Shrink wrapped firewood. Source: USDA Forest Service

A commonly used promotional method for small and medium sized operations includes paid advertisements in local newspapers and trade publications. Paid advertisements should state the services being offered and the competitive advantage of using these services. An important aspect of paid advertisements is that the message in the advertisement should suit the target audience. If only small to medium volumes of the product(s) or services can be provided, that should be stated in the advertisement.

Developing a brochure about the company can also be an effective promotion tool for the business. A brochure should include these elements:

- A clear, positive image of the company;
- Benefits available to clients;
- Factors that make the company unique;
- Products and/or services offered;
- Qualifications and background of the company and its owner(s);
- Company name, address, telephone number, and web link; and
- A mission statement for the company.

Another promotional method that is often just as effective as paid advertisements is the practice of networking. Networking can help expand the number of people that are aware of the business.

By joining a professional association, networking efforts can be focused on those who will be directly interested in the services or products of the business. Getting involved in local community efforts, such as by donating lumber to the local Boy Scout troop or even the local high school wood shop class, can dramatically increase the number of network contacts. Involvement in community activities and efforts can also help to generate good publicity, which in turn is free advertising. Good publicity can create awareness of the company or product, build confidence in the buying public, and keep influential industry members apprised of progress.

3. Pricing

The third "P" is pricing. Price is the amount of money that a customer gives up to acquire a given quantity of goods or services. For businesses in general, the major factors affecting pricing decisions in addition to management costs include:

- Customer reaction to pricing—price elasticity;
- Government actions;
- Impact of wholesalers and retailers;
- The competitive environment; and
- The costs of developing, manufacturing, and distributing of products.

Price elasticity is the sensitivity of customers to a price change in terms of increases or decreases in the quantities that they will purchase. If demand is elastic, a small change in price will result in a large change in demand. If demand is inelastic, changes in price have little impact on changes in demand. Customer reaction depends in part on availability of acceptable substitutes and the urgency of their need. The distribution channel (wholesalers and retailers) affects pricing decisions by the different roles they play in the warehousing, distribution, and selling process. The degree of influence a company may have over pricing is affected by the competitive environment. In a market controlled price environment competition is high, products from competing suppliers seem similar, and there is little control over pricing.

Pricing has an impact on sales volume, profits, cash flow, inventory levels, image, potential for government regulation, and market competitiveness. Consequently, it is important to establish pricing objectives in order to clarify the role of pricing in overall corporate strategy. For a small to medium sized company, pricing objectives are typically profit-oriented. The goal is to maximize profits, achieve a target return on investment or sales, and realize satisfactory profits. Larger companies tend to be more sales oriented when deciding on the pricing of their products. The goals of a sales oriented pricing objective are to increase market share, maximize sales revenue, and generate traffic to the company.

Once the objectives of the pricing method have been established, a strategy is implemented to achieve them. A competition-based pricing strategy is typically used by small and medium size producers. For commodity items, competitor pricing is the main determinant of price. In some instances companies can differentiate their products either through service or quality, and create a greater perceived value for their product.

With competition-based pricing, a price leader is a firm usually with a dominant market share that literally tends to lead the industry in terms of pricing. Competitors will usually watch the price leader and change their prices accordingly. Some price leaders can be so dominant that they have the ability to "force" competitors out through their pricing practices.

Eureka premium pellet being manufactured at their plant in Superior, Montana. October 12, 2005. John Stewart

As small and medium sized companies start developing specialty and differentiated products, it becomes important to move from a competitive-based pricing strategy to a cost-based pricing strategy. The first step in developing a cost-based pricing strategy is to determine a break-even point. A break-even analysis determines the number of units required to attain break-even between the sales of an item and the total cost of producing and selling that item.

The break-even point in units sold is expressed as follows:

Fixed Costs Break-Even Point = Unit Selling Price - Unit Variable Costs

The break-even point formula permits calculation of how many units must be sold at a given price to break-even. Although performing a break-even analysis in this fashion is oversimplified, and frequently even further simplification is made in practice, it is a useful tool that can indicate whether or not a competitive price can be reached on a proposed new product. Break-even analysis can also be used to determine how quickly a new product will become profitable, and whether cost reduction moves are needed on an existing product.

To determine fixed and variable costs, examine the monthly banking statements for the past year. Fixed costs are incurred whether or not the operation is running, and often include property taxes, insurance, and payments on bank loans. Variable costs accumulate when the business is running and are often items such as fuel expenses, raw material purchases, and equipment costs.

Once the break-even point is established one can begin to mark up prices in order to make a profit. If the company is not making a profit and simply paying bills, then it becomes difficult to grow the company. Consider the scenario in which it costs $150 to produce the product. If a 25 percent profit is desired on that product ($150 x 0.25 = $37.50), then the selling price should be $187.50. Ultimately, one should strive to set the price at a point that customers are willing to pay for the value they perceive in the product. The value of the product that customers perceive can be difficult to quantify. If the local market is saturated with companies offering the same product or service, then customers will usually choose the lowest priced one, unless they perceive a product to be superior.

Common Pricing Strategies Used By Wood Products Companies (Gathered From Industry Insiders):

- In establishing prices use some form of markup method that is logical, applicable, and relatively simple to implement. The problem comes in what the markup actually is, and whether or not that amount adequately covers operating expenses.
- The most successful wholesalers appear to achieve some differentiation from competition through non-price issues. Many wholesalers attempt and achieve little or no differential advantage and, consequently, compete solely on the basis of price. Many of these firms have not survived and others struggle.
- Among manufacturing firms, there is considerable variation in pricing methodology. Even the successful manufacturing wood processors do not always use the "proper" pricing techniques.
- In the case of small wholesalers and manufacturers, frequently pricing is more of an art than a science. Manufacturing or purchase costs, overhead, general, administrative and selling costs, and a reasonable allowance for profit are certainly considered, but often in more of an intuitive fashion than as part of a formalized pricing methodology.
- A practical pricing approach would be to establish prices using a well thought out, frequently updated methodology, and then to use a lot of intuition in formalizing the prices that are quantitatively determined. Obviously, if prices are not managed, the result will be low margins or lost sales.

4. Placement

The fourth "P" of marketing is placement. Placement deals with the distribution channels that will be used to market the product. Whatever the product is, somehow it has to get to the customer. The distribution channel is the method by which the product reaches the final consumer. Collectively the distribution channel is an inter-organizational system made up of all of the agencies involved in moving things of value (products/services) from points of production to points of consumption.

Examining the distribution channel reveals how most efficiently to get a product to the intended customers. Because small and medium size firms often deal in less volume than their larger competitors, they often have the option of distributing their product to one or more of the intermediaries along the distribution channel: manufacturers, consumers, suppliers, raw materials, wholesalers, and retailers.

The Distribution Channel

In order to choose the best distribution system, one must have a good idea of who the customers are. Once customers are identified, then there are three aspects of distribution to evaluate in choosing a method for each customer.

1. Feasibility of the system. What are the following: market needs and wants, capital requirements, reliability of distribution channel, speed of product delivery, and suitability for target markets and market sizes?
2. Desirability of the system. Is the system practical? Does it meet business and personal needs?
3. Profitability of the system. Can margins be maintained at each distribution step to make a reasonable profit? Who will promote the product? What costs are involved at different levels of the distribution system?

When choosing a distribution channel it is also important to understand the role of intermediaries. The main functions of intermediaries are to:

- Maintain contact with buyers;
- Negotiate on price and delivery;
- Establish contacts and agreements;
- Transfer title;
- Provide credit/collection;
- Service the product;
- Provide inventory and storage;
- Provide bulk breaking service; and
- Arrange transportation.

Post and pole production, Wallowa, OR. Source: USDA Forest Service

Intermediaries fall into two classifications,
those who take title to the product and those who do not. Merchants, who take title, include retailers, lumber yards, cooperative buying centers, jobbers, industrial distributors, distribution yards, wholesalers, reload centers, and home centers. Agents, who do not take title to the product, include brokers and manufacturer's reps. Type of product and type of customer determine the type and number of intermediaries to use. As the number of intermediaries increases so does the length of the distribution channel. In general, the longer the distribution channel the lower the profit margin and the wider the distribution network.

Short and Long Distribution Channels

A number of factors, i.e., number of customers, geographic concentration, and order size should be considered when deciding on a short or long distribution channel. Typically, a longer distribution channel equates to lower profits, but it may make it easier to sell the product. A short channel typically requires more networking and work on the seller's part, which can translate to higher profits. As a small to medium sized manufacturer of lumber one will probably be able to capture the most value by selling products though short channels.

Summary

STEP 1. Analyze the existing market:
Find out who the customers are, who the current players or competitors in the market are, what product or product lines and services are being offered, what prices are being charged, and what distribution channels are used in bringing products to customers.

STEP 2. Identify neglected or underserved market segments:
Determine if any segments in the existing market are currently neglected or underserved. Information may be obtained through personal observations, interviews with current market participants, consultants, trade publications, government publications, market information, or newspapers.

STEP 3. Evaluate company strengths in serving identified segments:
Determine the resources and skills needed to be effective in satisfying the needs of perceived underserved or neglected market segments. Consider the raw material, equipment, skills, financial, and managerial resources required to be competitive. Also consider marketing requirements, such as sales force size and distribution channel intermediaries. Additionally, determine the competition or rivalry, if any, to be expected in the market segments.

STEP 4. Select the niche where there is a competitive advantage:
Choose one or more market segments based on the company's strength, skills, location, and resources. Niche marketing can be risky as it may be temporary, or it may be attacked by competitors. Specializing in more than one niche may lower the risk and increase the chances of success. How will the position in the market niche be protected?

STEP 5. Develop a marketing program to meet the needs of this market:
For each niche chosen, determine the appropriate or best product, price, promotion, and distribution system to serve customers efficiently and profitably. Superior service can help build and retain customer loyalty.

Chapter 8. Developing a Business Plan

Preface

The Golden Rule, "he who has the gold, rules" is still the law of the land. Thus it will be necessary to convince the lender (banker, investors, or family members) to loan the money to purchase or lease land, buy or rent equipment, hire employees, etc. The financial expert will, seemingly, do everything possible to not loan the money! Therefore one must prepare a sound Business Plan, explore funding sources and options, and work with the business development community or Chamber of Commerce. This Chapter outlines some of the hurdles to overcome, and provide some guidance in reaching out to business experts. Chapters 9 and 12 discuss the tools needed for planning and securing financing. Chapter 14 will discuss possible sources of financial assistance.

Importance of Business Planning

The importance of business planning cannot be overemphasized. Most startup businesses fail within the first 5 years. The business planning process points out weaknesses and deficiencies through market and financial feasibility analyses. Consequently, a properly developed business plan improves the chances for success. Howe and Bratkovich (2005) provide an excellent step-by-step guide for planning wood products businesses.

Business planning accomplishes four basic things:

- It forces the project planning team to think strategically and take a critical objective look at starting or expanding the business;
- A formalized business plan provides a business owners' manual for developing and operating their business. It is a working roadmap to success;
- A business plan is essential to obtain financing. It provides the lender with a basis to evaluate venture startup or expansion plans. The business plan communicates to others the value of the new enterprise;
- The rigorous process of business planning improves the likelihood of success by identifying difficulties, risks, problems, and strategies to overcome barriers or abandon enterprises where problems cannot be overcome, thereby saving time, energy, and money.

Business planning typically begins with preliminary feasibility studies to explore potential viable opportunities. Feasibility studies evaluate markets and financial aspects of the proposed operation. These studies help identify strengths, weaknesses, opportunities, and threats (SWOT Analysis) to the potential biomass operation; assess risks; and carefully consider a number of critical factors for success. A formalized business plan is developed for strategically guiding the business, identifying operational procedures, and securing financial backing. The detailed market feasibility and financial analyses, risk assessment, and supporting documentation are included in the business plan, generally as appendices.

The rigorous process of developing a business plan involves considerable work in identifying likely difficulties, hurdles to be overcome, and risks. This process requires that those who proceed with the plan—bring the business to fruition and then execute it—have rigorously considered the overall environment. It is frequently the case that in the development of the business plan, problems or hurdles that cannot be overcome are identified and the enterprise can be abandoned before financial losses have accrued. In contrast, starting a business with less research and being unaware of problems can lead to failure, often at great cost. The use of the business plan reduces the risk of failure where an incorrect decision to proceed is rejected in the planning process. In cases where the decision is made to proceed, the business plan can help to identify factors that will need to be closely monitored in order to ensure success. A good business plan reduces uncertainty and minimizes risk.

Rottne 2002 "mini-harvester". This machine is less than 8 feet wide and can reach about 23 feet with the harvester head. The machine is shown operating in an overgrown grand-fir Christmas tree plantation in Bonners Ferry, Idaho on private lands in 2008. Photo by Barry Wynsma, USFS October 2008

Preparing a Business Plan

One will need a business plan to document the feasibility analysis and support an application for financing (see Chapter 10 for financial considerations). The business plan is important, so take the time to present facts and information in the most professional and organized manner possible. Anticipate questions and try to answer them in advance in the business plan.

Perhaps the best independent advice one can get on assessing and preparing a business plan is through the Small Business Administration (SBA). The SBA has extensive resources and advice on writing a business plan at: http://www.sba.gov/smallbusinessplanner/plan/writeabusinessplan/SERV_ESSENTIAL.html. Also contact the Regional SBA office, read their quarterly publications, or ask for advice or technical assistance.

Another great resource is an SBA-sponsored program called SCORE, through which successful senior business managers can provide personal counseling to small business entrepreneurs (for sample Plan documents see: http://www.score.org/template_gallery.html). Contact the local SCORE representative (please see http://www.score.org/explore_score.html and enter the zip code to find a local counselor). Many of their services are provided free of charge or at minimal cost.

The USDA Rural Development has advice on developing a cooperative venture; many of the lessons and advice are also applicable to commercial business planning (http://www.rurdev.usda.gov/rbs/pub/cir7/cir7rpt.htm).

Another resource is the regional or County Resource Conservation and Development Council: http://www.rcdnet.org/about.php or a State-sponsored business or economic development expert: http://www.eda.gov/Resources/StateLinks.xml. Some of these advisors have extensive knowledge of the forestry and energy development challenges and can be of great assistance in assessing the marketing and financial aspects of a proposed business.

Log truck with hydraulic self-loader. Source: USDA Forest Service

Board edger, DuBois, WY. Source: USDA Forest Service

Chapter 9. Preliminary Financial Feasibility Analysis

Preface

Early development of financial feasibility analysis can avoid wasting time, energy and money. This will help one focus on the big picture, identify critical business data needs and assumptions, and narrow down potentially viable opportunities to match the available resource. Preliminary financial analysis helps depersonalize feasibility analysis so that decisions as to "Go" or "No-Go" are made on an objective rather than subjective basis. This approach helps prevent emotional attachment to bad ideas. Preliminary financial analysis also helps convert passive discussion into action as it illuminates opportunities and problems.

What woody biomass business planners and managers really need is an effective and simple way for biomass processing facilities to simultaneously consider both revenue and costs. Enterprise viability depends in part on the dynamics of the available timber or biomass supply (cost of biomass delivered to the processing facility), cost of converting the biomass into products (processing cost), and products markets (revenue from the sale of biomass products). Evaluation of product value to delivered log cost and processing cost provides a good starting point for preliminary feasibility analysis of the proposed enterprise.

In the final calculation, ***gross margin***[1] will be of greatest interest and importance to the biomass processing enterprise planning team. Specifically, the gross margin is used to identify both the biomass feedstocks and product mix that offer the greatest potential for economic return, as well as those that pose the greatest problems, risk of losses, or unacceptably low margins.

Preliminary financial analysis done using "best-case" scenario assumptions can help present the financial picture early on in the planning process. It should be developed using a reasonable pair of "rose-colored" glasses. This quick and easy analysis will identify projects that are unattractive even under the best-case assumptions. When this is found and demonstrated, it is obviously the case that attention should be focused elsewhere. This saves time and energy from chasing after a poor investment scenario.

Loading urban wood waste into a screen hopper; Carson City, NV. Source: USDA Forest Service

Under a best-case scenario, a positive gross margin indicates a scenario worth further investigation and more intensive financial analysis. A negative gross margin indicates a nonviable scenario[2] that is not worth further investigation and pursuit of the nonviable option can be dropped before extensive time and energy have been expended.

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[1] Gross margin equals product revenue minus delivered biomass cost and processing (variable manufacturing) cost.

[2] In some cases, the preliminary financial analysis may indicate that the original concept is flawed or otherwise unworkable. However, a more appropriate dimension of undertaking may be identified as a result of interactive discussion in doing the

[2] In some cases, the preliminary financial analysis may indicate that the original concept is flawed or otherwise unworkable. However, a more appropriate dimension of undertaking may be identified as a result of interactive discussion in doing the analysis and more broadly considering problems and opportunities.

Planners are advised to include a sensitivity analysis in all their cost projections (for more detail, please see Chapter 12). When options have been narrowed to perhaps three to five, a more detailed analysis of raw material supply, products and markets, processing, and financial aspects of the project can be pursued.

At this stage, consider a wide range of cost figures and project variables; use a broad focus, and leave the serious quantification until later. The objective during initial site selection and preliminary feasibility analysis is to identify whether further analysis is warranted and to have a general understanding of the economic and administrative barriers that will have to be quantified and addressed in the more detailed financial analysis and business plan. Do the homework now, before going a long way down the path and finding it is a dead end.

Armed with this kind of preliminary feasibility results, project planners are in a position to begin an in-depth study of forest products enterprise feasibility, problems, and possible solutions in terms of several critical factors.

Woody Biomass Feedstock Yard Economics

Every consideration should be driven by the need to procure biomass and process it at the lowest per unit cost ($/green ton) possible and minimize inventory and overhead costs. At the same time, it is essential to recover the highest value from the biomass processed. The key to minimizing costs and recovering the highest value is processing efficiency. The most important factor to reducing biomass-handling costs is to reduce the number of unnecessary moves in the yard.

This topwood hogfuel material was transported from an overgrown Christmas tree plantation thinning operation using a small forwarder and neatly arranged for future grinding. The thinning project is located on a private tree farm in Bonners Ferry, Idaho. The large ends are less than 2-inches in diameter. Photo by Barry Wynsma, USFS October 2008

Effort expended processing logs should be in proportion to the value of the biomass product. Too often, too much time, money and effort is spent processing and handling woody biomass. It makes no sense to spend $5 processing $4 biomass material. Low-value biomass needs to be handled and processed quickly and efficiently. Speed and efficiency are most important. Such a focus helps control per unit processing costs ($/green ton) of low-value, high-piece-count, small-diameter wood and biomass, leading to improved efficiency and productivity.

Some Thoughts on the Economics of Woody Biomass Utilization

Small-diameter material and other woody biomass offers moderate to low quality and lower valued products. Furthermore, small-diameter material and woody biomass is disproportionately much more expensive to process than other traditional forest products like sawlogs and present several challenges for the woody biomass operator. Cost reduction and recovery of the highest value from the available biomass resource, are more critical with small diameter material.

Lowering Costs—focuses on reducing per unit ($/green ton) cost of woody biomass delivered to the feedstock yard, processing costs, and overhead (fixed costs):Use "Economies of Scale" to spread capitalization costs over larger production volumes:

- Incorporate linear processing and other improvements in processing equipment (grinders/chippers);
- Concentrate on efficient biomass yard and plant layout and design;
- Minimize effort in processing low-value woody biomass, which includes just about all of the biomass one might deal with. In other words, don't waste time sorting and processing woody biomass if there isn't enough additional value to cover the cost of sorting and processing. Sometimes the best answer is to run all of the biomass through a grinder/chipper and blowing it directly into a chip van and getting rid of it quickly. It should be readily apparent, then, that to sharpen the pencil and figure what makes the best economic sense when handling and processing biomass;
- Handle and process biomass efficiently and minimize biomass handling; and
- Processing woody biomass in like batches improves production rate and the quality of the biomass products (more uniform = better quality).

Raising Value—Several things can be done to raise the value of biomass products and revenue generation:

- Improve marketing—don't just give away the product—find better markets and prices for biomass products—get the best price possible;
- Match processing equipment capabilities to the available woody biomass feedstock characteristics and available biomass markets;
- Incorporate quality control—control the percentage of dirt and/or bark content and improve biomass recovery;
- Use the right tools and equipment to produce a quality biomass product that meets product specifications. Conformance to proper woody biomass fuel specifications is a good example of where this is especially critical;
- Merchandise the woody biomass for net highest value—that is, target value-added markets only if the additional product value exceeds the cost of extra processing; and
- Marketing by-products and residues are a must.

Wood pellets. Photo captured from the internet by Bob Rummer, US Forest Service . Date and photographer unknown.

Final Steps in Assessing Project Financial Feasibility

A wide variety of factors affects the economics of a woody biomass project/enterprise and includes feedstock and energy costs; capital and debt financing costs; the value of products produced; and plant design and efficiency. A host of other factors will also affect production costs and profitability. Many of these factors should be discussed and additional factors should be quantified during the site specific feasibility study. Value assumptions typically include input from the project development team as well as consultants and other advisors on the project.

A sensitivity analysis will need to be conducted as part of the financial evaluation of project economics to help determine economic viability of the proposed yard. This process will also help identify variable costs that will have the most profound impact on project economics. The preliminary feasibility analysis should incorporate a variety of these factors, but in lesser detail. A more detailed feasibility analysis is discussed in Chapter 12. Readers are also encouraged to use the spreadsheet-based model, LSY (Log-sort Yard Cash Flow Analysis), referenced in Appendix 1.

Photo of a Field Shelterbelt. Date and location unknown.
Source: National Agroforestry Center Website

Chapter 10. Biomass Feedstock Yard Site Selection

Preface

Much of this Chapter is based upon a 2006 publication titled "A Guide for Evaluating the Requirements of Ethanol Plants" which was developed by the Clean Fuels Coalition and the Nebraska Ethanol Board in Cooperation with the U.S. Department of Agriculture: http://www.cleanfuelsdc.org/pubs/documents/ethanol_plant_guide.pdf.

As noted previously, a variety of factors are creating interest in woody biomass related feedstock yards and enterprises. Initial interest is usually expressed by an individual or small group of individuals or an organization interested in creating a woody biomass facility or enterprise in response to a problem or a potential economic opportunity. Key initial considerations are the underlying purpose for the project/enterprise along with the projected scale and cost. If not deterred by the capital cost requirements, the second step is a request for assistance in conducting a preliminary feasibility analysis.

The goal of the preliminary feasibility analysis is to determine if the proposed project is practical by answering this question: Can a well designed, well built and well run woody biomass storage or distribution facility located in this area either address the problem in question and/or make money and provide a competitive return to owners and operators? This question forces those involved to evaluate objectives and analyze available resources. It also provides an opportunity to evaluate alternatives. The initial feasibility analysis will determine if a more detailed and costly technical and engineering analysis is warranted. The preliminary feasibility analysis is also known as a fatal flaw analysis.

Initial Considerations

The initial evaluation should include but is not limited to:

- An overview of woody biomass related industries and related markets in the project area including competing products and prices;
- An assessment of available feedstock sources and their sustainability, demand and cost (feedstock analysis);
- An assessment of co-products and by-products from available feedstocks and production processes along with associated markets (the feedstock assessment, procurement plan, and marketing plan will assist in identifying the optimal site);
- A review of available utilities and related infrastructure including transportation system (highway, rail), electricity, gas, water, and sewage;
- A review of federal, state, and local environmental laws, rules, permitting requirements and regulations;
- A review of weather and prevailing wind patterns which should also include knowing when and where woods operations may be limited or curtailed;
- An assessment of skilled, unskilled, and technical labor availability;
- An estimate of the capital, operating costs and environmental impacts;

- An assessment of economic impact on the local area;
- A review of a financial model that is applicable to the proposed facility;
- A review of the business structure;
- A review of additional potential financial resources that may be available;
- And confirmation of community acceptance.

Following completion of the preliminary feasibility analysis, a conclusion must be reached regarding the practicality of the project/enterprise. The analysis may find it is simply not feasible. If so, the parties involved should be prepared to accept this result.

Project Variables

During the preliminary analysis steps should also be taken to identify specific factors that can change the conclusion. For example, if targeted incentives become available, what impact will these and other incentives have on the proposed project and/or competing projects? If infrastructure exists in a specific location that substantially reduces the capital cost of the proposed project, will this factor substantially change the conclusion of the study? If feedstock materials have little or no cost of acquisition, will this materially affect the conclusion? What is the impact of combining the proposed project with an existing asset like low-cost combined heat and power generation?

Evaluating Options

If the preliminary study supports a more detailed economic and site assessment, the next step would be to work with state or local economic development organizations. These organizations often have a database of sites that meet specific infrastructure requirements. Utility companies often have business development divisions that can provide similar assistance. In addition, there are consulting groups that have experience in leading detailed feasibility studies. It should be understood that a detailed analysis requires a commitment of time and money.

Google map of Mt. Lassen Power in Westwood, California and proximity to road and rail access, as well as a large abandoned mill site which may be able to serve as a feedstock yard. Image captured and processed by John Stewart, December 8, 2009

Conducting a Full Feasibility Study

A number of approaches can be used in organizing a detailed analysis. The approach is usually shaped by the skills of people associated with the proposed project/enterprise, the availability of financial resources, and resources available from other partners, such as economic development organizations or woody biomass related companies and businesses. The goal of the detailed study is to determine the most economically viable combination of site, technology and feedstock that, when combined with other key location criteria, results in optimum project/enterprise economics.

The full project evaluation typically includes:

- Detailed technical and engineering analysis;
- An initial environmental analysis and permitting plan;
- Development of a business plan, including a risk assessment;
- Marketing plan development;
- Confirming community support; and
- Site selection.

The remainder of this Chapter will focus on site selection.

Project/Enterprise Site Selection

Site selection criteria should be identified and ranked in terms of importance. Such criteria provide guidance in the selection of a specific site and are helpful in evaluating competing locations. Feedstock and energy costs are typically among the highest input costs but other factors are important in determining cost estimates, profitability and competitiveness of the project/enterprise.

Proper selection of the site for the woody biomass project/enterprise, including the optimum location of the facility on the site itself, is most important. This should be based on a broad range of parameters designed to optimize the economic viability of the facility and the opportunity for successful, sustained operation of the facility.

Site Selection Factors

1. Feedstock

Woody biomass feedstock supply sources were covered in detail in Chapters 2 and 4, however for the most part, the primary feedstocks for most woody biomass facilities are:

- Timber harvest residuals;
- Forest fuel treatment residuals;
- Urban wood waste;
- Forest products manufacturing residuals.

Screen sorting log yard debris, Fort Apache Timber Company, Whiteriver, AZ. Source: USDA Forest Service

Given the bulky nature of woody biomass, sourcing and transporting of raw material is the single greatest input cost in operating a woody biomass facility/enterprise. Even targeted policies such as waiving fuel surcharges or subsidizing biomass hauling have minimal effects on project/enterprise costs. Thus proximity to the primary feedstock source is the paramount consideration in site selection (Becker, et. al, 2009). A general rule of thumb is a 25 to 50 mile sourcing radius for transporting feedstock supplies to a woody biomass facility.

In addition to proximity of the feedstock, consideration also needs to be given to methods of transporting and handling feedstock on a year around basis along with on-site and off- site feedstock storage options and methods of moving required feedstock volumes. This becomes an even more important factor with increasing complexity and size of the feedstock yard.

2. Energy Requirements

If operating a biomass facility with a feedstock yard, other than the cost of acquiring and transporting feedstock, the greatest cost will probably be energy to support on site operations -- one of the key variables in site selection that affects profitability. In some instances, facilities are able to lower energy expenses by locating near existing industrial or power generation facilities that produce excess steam or by using their own biomass resources for combined heat and power applications. The feedstock yard must, therefore, consider the energy impacts of related businesses and industries.

When evaluating potential sites, energy cost factors for consideration should include:

- Proximity to energy source (electricity, natural gas pipeline, coal, propane, co-generation, etc.);
- Historic price, availability and reliability of the preferred energy supply;
- Emission control costs and permit issuance time for selected energy sources;
- Current utility rates; and
- Contract options for all energy sources.

A variety of energy price information sources are available to project developers. State energy offices typically maintain an energy price and supply database that may be useful. The U.S. Energy Information Agency provides a variety of energy related information that may also be helpful (see www.eia.gov). The U.S. Department of Energy publishes a fuel price report through the Clean Cities Program. This report provides price data for fuels including natural gas and propane. The Alternative Fuel Price Report can be obtained via the Department of Energy web site http://www.afdc.energy.gov/afdc/pdfs/afpr_12_19.pdf.

3. Transportation

As mentioned previously the cost of sourcing and especially transportation of raw material to the site is the single greatest input cost associated with woody biomass related facilities and enterprises. Access to reliable, cost-competitive transportation is an important factor in supplying materials to the facility. Thus it is important to evaluate the availability and cost of these modes at prospective sites.

Cost and mode of transportation is also an important marketing consideration. With regard to marketing costs, an initial market analysis conducted during a pre-feasibility or feasibility study phase should identify primary markets for the facility. Depending on proximity of the feedstock yard to population or manufacturing centers, marketing costs may be based on a variety of transportation modes (e.g., truck, rail, barge).

Truck and rail transportation are usually the primary modes of transportation of woody biomass products to markets. Thus the location of the facility should also take into consideration the modes of transportation by which the bulk of finished products will move to market. Rail or barge access is often viewed as an essential requirement for large scale woody biomass facilities (pellets and transportation fuels). The cost of transportation varies considerably depending on location, mode and shipment volume. Transportation related factors for consideration should include:

Truck-to-rail reload showing the truck dump, Fort Apache Timber Company, Snowflake, AZ. Source: USDA Forest Service

- Major rail, highway and interstate access to target markets;
- Bridge capacities or other road or load restrictions;
- Potential for disruption of travel on these routes based on projected construction and historic weather patterns;
- Proximity of mainline rail to site and estimated cost of related rail siding and switching services;
- Orientation of highway and rail access in relationship to the plant location on site;
- Number of transportation providers in each sector;
- Options for barge transport; and
- Options for competitive transportation services.

A variety of sources are available for transportation information. State transportation agencies typically maintain detailed information on highway and rail service and infrastructure. Transportation firms also provide information on rates and service schedules.

4. Water Requirements

Water quality, quantity and infrastructure for handling water treatment are important factors in site selection. The water requirements factor into capital cost of the facility, operating costs and permit issues that will become important during construction. An understanding of specific water use and discharge requirements is useful during the site selection process. Local resource agencies can provide information about water use and potential discharge restrictions.

Typically, several water related options to be considered when evaluating sites:

- Potential availability and cost of water provided by a community water system;
- The cost, volume, quality and accessibility of water from on-site wells;
- Overall water quality (pH, mineral content, etc.);
- Existing infrastructure for water supply and wastewater treatment; and
- Water supply issues affected by local law or regulation.

5. Site Size and Location

Site size is often determined by geographic constraints, land cost and proximity to pre-existing infrastructure. A typical woody biomass storage yard involves 8 to 20 acres. The actual footprint for a woody biomass facility depends on product, technology and configuration. Wood fired electrical generation plants require a footprint from 15 to 100 acres in size depending on the megawatt capacity of the power plant and any buffering areas involved (personal correspondence with Decker Energy President Mike Whiting, October 1, 2009).

The new Range Fuels wood to ethanol plant under construction in Soperton, GA has a foot print of 100 acres (personal correspondence with Range Fuels President Bill Shafer, October 1, 2009). However, factors such as air permit considerations, rail and on-site transportation patterns, and future facility expansion needs, often can dictate a larger initial site footprint. Sites should be large enough to accommodate an expansion in facility size and related infrastructure.

Factors to consider when determining facility size and location include:

- Prevailing wind patterns and proximity to community or residential neighborhoods;
- Desirable site buffer to accommodate aesthetic goals and air permit requirements;
- Adequate room for future expansion or to accommodate allied business partnerships;
- Adequate space for on-site road and rail configurations and expanded storage;
- Additional space for waste water or other pollution mitigation options; and
- Sufficient space to accommodate facility re-configuration to meet future needs dictated by changes in production output or regulatory changes.
- Excess storage space or sorting area to accommodate spikes in feedstock delivery or variations in feedstock quality/product mix;
- The area, if any, that must have a concrete or hard surface.

6. Community Considerations

Interaction with community officials and representatives can play an important role in determining the extent to which the community will support the project/facility. Potential negative impacts on communities can be minimized with proper planning, site selection, and community input. A properly located facility can minimize potential problems for the community and area residents. Factors that can impact residents living in proximity to the facility include:

- **PREVAILING WIND DIRECTION:** Odors can be controlled with a variety of pollution and odor control equipment. However locating the facility downwind from the community and thus moving odors away from area residents will reduce potential complaints.

- **TRAFFIC:** Most facilities generate an increase in traffic flow in the area around the community. Increased truck traffic may raise concerns about safety or wear on local roads and bridges or in and through downtown business districts or school locations, and impacts and disruptions to other commercial or community enterprises. Proper traffic planning and scheduling can minimize these concerns.

- **DUST:** Increased traffic especially on gravel roads located near the facility or on-site storage areas may raise concerns about air quality and visibility during certain driving conditions. Additionally, fugitive emissions from biomass material processing (fine wood particles) may be an issue, especially if prevailing winds are significant. Dust control is an area covered by pollution control agencies. Dust from any facility source, including traffic, or biomass material processing is considered particulate matter (PM). PM controls are included in plant permit applications and must be approved by the state air pollution control agency.

Dust generated at biomass feedstock yard. Date, source and location unknown. Photo obtained from Craig Jones of CSFS.

- **INFRASTRUCTURE:** In many cases woody biomass facilities can be integrated into water and waste treatment systems operated by a community. These community services can generate fees for the community, thereby increasing revenue required to amortize the community system. In other cases, the facility may propose to provide revenue for an expanded system that can be shared with the community. Proper planning with community officials is essential to design a system that is advantageous to both entities.

- **SAFETY:** Facility safety coordinators deal with a wide range of safety and emergency preparedness issues. Good communication between the safety manager and local safety officials will help to ensure that plans are in place for dealing with potential fire and other safety issues.

Potential fire threat from fine dust particles at the Eureka pellet in Superior, Montana. October 12, 2005. John Stewart

- **PLANT EMISSIONS:** Best available control technology, typically the "newest and best" emission control technology, is generally required by state and local regulatory officials.

- **NOISE POLLUTION**: Noise can be a source of complaints if the facility is located near residential areas and many communities today have noise ordinances that need to be considered. Site buffers and other noise abatement tools can generally be included in the site design to minimize potential problems.

- **LIGHTING:** Lighting should be carefully considered so light pollution complaints are minimized. This is an issue during construction and operation of a facility but potential problems can be minimized with proper planning and design.

FIRE: Woody biomass is, by nature, flammable. Wood chip piles may spontaneously combust under certain moisture, temperature, and air conditions. Once started, chip pile fires may take months to suppress. Local fire protection agencies typically will be the lead enforcement agency regarding on-site fire suppression systems. A more detailed discussion of spontaneous combustion is found in the next chapter on Biomass Feedstock Operations.

Other Factors Related to Site Selection

In addition to factors discussed above, there are other aspects of the site selection process such as the various required permits covering safety, health, and environmental concerns. This includes point number 7 of the "Seven Critical Factors for Success. Several of these were briefly covered in the pre-feasibility study discussion. During the feasibility study, these factors need additional attention. Regulations and permits are important considerations and must be in place before construction of the biomass yard can begin. Another factor may be State or County investment zones which encourage business development.

A. Regulatory Permits

During the site selection process, initial contact should be made with state and local authorities who are responsible for ordinances, environmental regulations and relevant zoning permits. The project team should confirm that no pre-existing conditions exist that may make the site difficult or impossible to permit in a timely fashion. The permit process varies from state-to-state and local jurisdictions may also require specific action steps that can affect the project development time-frame. An initial review of permit requirements will help familiarize the project team with state and local contacts in the various regulatory agencies. Discussions with regulatory officials will also help define the time-frame in which a project can reasonably be expected to receive permits. Permit applications require technical data that is generally supplied by the engineering or development firm(s) selected to design and build the facility. Attention to regulatory issues can accomplish the following:

- Orient project developers to tasks the engineering firm or permit consultant will be performing;
- Familiarize state and local regulatory officials with constituents who will be involved in development of the project, thereby providing a local contact;
- Familiarize project developers with state and local contacts in the regulatory agencies that will have jurisdiction during the various permit processes;
- Determine any pre-existing conditions that may make a site unsuitable; and
- Familiarize the project developers with the time-frame in which various permits can be issued.

B. Emissions

Steam and smoke emissions at the Eureka pellet in Superior, Montana. October 12, 2005. John Stewart

It is important to be familiar with regulated pollutants. Emissions may vary slightly depending on process, design, facility type and feedstock. This usually involves feedstock delivery and feedstock handling and processing whereby tiny particles (particulate matter less than 10 microns in diameter, or PM10) are released into the air. Other air emissions may result from associated activities; these may include: hydrogen sulfide and VOC's released from a wastewater treatment process; fugitive PM10 and VOC emissions from haul road traffic, material processing/handling and equipment leaks; PM10, NOx, SOx, CO and VOC's from emergency equipment; and potential VOC evaporative loss emissions from storage piles.

C. Air Quality Permits

Virtually every state has enacted air quality regulations that require facilities with the potential to emit air pollutants above specified levels to obtain construction and/or operating permits. State regulations may vary in terms of permit requirements and the time-frame for authorizing and issuing permits.

D. Construction Permits

Before a new facility is built or an existing facility expanded a construction permit may be required. A construction permit cannot be issued if the plant will cause or significantly contribute to violations of the ambient air quality standards.

E. Operating Permits

A woody biomass facility may also need to obtain an air quality operating permit. There are two types of operating permits: major source (federal program) and minor source (state program). Again, the potential air emissions from the plant will determine whether a facility must obtain a major or minor operating permit.

F. Solid Waste Permits

A woody biomass facility may also need to obtain a solid waste permit from the state or local government. For example, in Montana a solid waste permit is required and a public comment period is involved.

G. The Permit Process

Project developers should take steps to understand the time requirements of the various permits issued by federal, state and local authorities. Permits dictate the pace of project development and permit conditions may affect the operating parameters of the facility. Permits are typically filed by an engineering firm or permit consultant. The best source of information is typically the state regulatory agency staff.

H. Permit Application Tips

State regulatory officials understand there is a significant volume of information required in construction and operating permit applications. In addition, waste water treatment and drinking water permits will likely be required. Several tips that may make the process go more smoothly include:

- Start early, recognize the permit requirements and the time frame for permit issuance by federal, state and local authorities;
- Generate a permitting plan that provides a critical path timeline for acquiring all necessary environmental permits;
- Talk with the regulatory agency staff as communication is a key to a successful permitting process;
- Make sure the permit application is complete and accurate. If plans change after permit applications have been submitted, there is an obligation to submit updated information, or face the risk of delays;
- Address confidentiality issues appropriately, if such issues are important;
- Include calculations and citations with the permit application as this information will assist the regulatory staff during permit review;
- Research - generally, woody biomass facilities are subject to federal standards as well as state regulations and such requirements can influence decisions regarding plant equipment;
- Be aware of current regulatory issues - as more emissions data is gathered, state agencies face new and often times challenging issues and such issues are best dealt with during the early planning stages of the project - communication with state regulatory officials will help the project development group address these issues; and
- Get as much additional help as needed. Although not required, state regulatory officials generally consult with people or companies that are familiar with the specific state permitting requirements. A qualified consultant that is familiar with the process and professional staff can help minimize the cost and time required for successful completion of the permit process and familiarity and professional relationships can help move the permit process toward a successful completion in a timely fashion.

I. Maintaining Compliance

Following are a few tips that can help a facility maintain compliance, and reduce the potential for adverse economic consequences that may impact the plant owners:

- Read and reread permit on a routine basis;
- Understand permit requirements;
- Keep records in one place and in a logical order;
- Properly operate and maintain control equipment;
- Designate an "environmental manager" and train a backup;
- Ask state regulatory officials questions to avoid misunderstandings and mistakes; and
- Plan ahead!

As noted, state and local regulatory agencies are the best source of information that is specifically applicable to woody biomass facilities. Information about federal permit requirements can be obtained from regional EPA offices and by visiting the EPA website: www.epa.gov.

Chapter 11. Biomass Feedstock Yard Operations

Preface

As in any manufacturing setting, day-to-day woody biomass feedstock yard operations are routine—biomass is weight scaled, unloaded, sorted, processed and inventoried. Efficient operation of the biomass yard requires a balance between product quality and operational productivity. Effort should focus on assessing yard performance and making quality and productivity improvements. This covers all phases of the operation, from procurement to balancing yard productivity and quality, marketing and sales, safety, and employee training.

All biomass yards share the same basic operational functions. These are materials handling (unload–reload and transport), processing (scaling, chipping/densifying and sorting) and storage/inventory. Value-added and semi-processing are also found in some biomass operations.

Materials Handling Principles for Biomass Processing Facilities

Handling biomass materials successfully depends on using the right machine for the type, weight, size, and production rates of biomass processed. Operations involve material handling (that is, unload–reload and transport) with processing and inventory functions. Materials handling using mobile log handling equipment (e.g., front end loader) involve a "pick" where a load is picked up, transported, and then set down. There are three primary rules in materials handling: (1) the shorter the distance traveled, the cheaper the cost; (2) the greater the weight-per-move, the cheaper the cost per unit, and (3) every additional time the material is handled adds to feedstock yard costs.

The principles of material handling applied to yard operations (Sinclair and Wellburn 1984) are:

- Reduce or eliminate unnecessary movements and combine movements;
- Increase the size, weight, or quantity of material moved wherever possible;
- Standardize types and sizes of equipment where feasible;
- Use equipment that can perform multiple tasks unless specialized equipment is needed, but be cognizant that it may be cheaper and faster to use smaller equipment to move material two separate times than to make one move with a large machine;
- Select equipment to match all aspects of material and flow in the system;
- Minimize the ratio of dead weight to total weight on all moves;
- Maximize the load and minimize the distance on high-intensity moves;
- Make low-intensity moves, if long distances must be covered;
- Pick up and set down whole loads whenever possible;
- Restrict the use of rolling stock to an absolute minimum.

Large scoop for moving and loading wood chips at Burney Mountain Power, Burney, California. July 17, 2003. John Stewart

Logs are easier and cheaper to handle than chipped material. If logs have value it is affordable to keep them segregated, if not they are chipped.

A heavy load moved a short distance is the least expensive move. The most expensive move is a light load moved a long distance. Log sort yard layout should focus on maximizing loads transported within the yard and minimizing distances they are moved. Light loads should be combined if possible. Frequency of light loads transported long distances should be minimized.

Extra handling decreases yard productivity and increases costs and risks of biomass degrade and damage. Handling does nothing to add value to biomass. Unnecessary picks (picking up, transporting, and setting down a load) and handling of low-value biomass material should be minimized. Biomass should be handled in full loads to take full advantage of log handling machine-lifting capacity.

It is also important to what is going to be done with the material before the truck arrives at the feedstock yard. Yard layout will play a very important role in operating costs, as will the method of unloading. Total yard volume will also dictate the degree and efficiency of automation. If volume is large, it may be efficient to unload chips, take them through processing, sort and move to storage without touching. Chips can also be recovered from storage automatically for loading or reloading.

Measuring Biomass

Weight scaling is a fast and inexpensive method to determine quantities for payment, transport, or inventory purposes. Weight scaling involves weighing a loaded truck on a truck scale, then unloading and reweighing the empty truck. The tare weight (empty truck weight) is subtracted from the loaded truck weight to determine weight of the load; one cost-cutting method is to determine the average tare weight and use that, or a random sampling method, rather than re-weighing each empty truck every time. Truck fuel can be a significant part of a tare weight, so consider the cost/benefit of weighing out each time.

Weight scale and Scalemaster's shack at HL Power's 35 MW power plant in Wendel, California. November 12, 2002. John Stewart

Weight scaling has some disadvantages—primarily that weight varies with biomass moisture content and species density and a full load weight will also vary considerably from season to season. Woody biomass stored on the landing for a period of time weighs less per volume (due to moisture loss) than fresh cut woody biomass. To overcome these problems, a sample of the load may be checked to determine the percent moisture content. Sample multiple locations in each load of chip material and obtain a mix for a test sample.

Sorting

Sorting involves separating individually graded and scaled logs into groups of logs with similar characteristics from the biomass feedstock. Logs are generally sorted by species, log grade, and/or product. Logs are then bunched (accumulated) and transported to sorted log inventory decks. Sorting is necessary when there is a distinct financial advantage in separating potential products.

Sorting clean chips at the Eureka premium pellet plant in Superior, Montana. October 12, 2005. John Stewart

Generally, it is not economical to sort the typical small quantities of logs and other higher value products from woody biomass. Sorting small-diameter logs from woody biomass material presents several challenges that require efficient materials handling at minimum unit cost. Small softwood logs offer moderate and relatively uniform quality and low volume per piece, which require high production with minimal handling to be economical. Log handling and sorting equipment productivity is most limited by the piece count production rate. The smaller the average diameter processed, the increasingly expensive the log becomes to handle and process. The characteristic uniformity and low to moderate quality of small-diameter logs sometimes makes it difficult to recover enough value-added to justify effort to grade, scale, and sort these logs from the woody biomass feedstock.

Determining the number and types of log sorts is an economic problem. Given available markets, log sorting improves the overall value of the log resource. This is realized by trading logs. However, the fewer the number of sorts made in the log yard, the lower the cost per unit (fewer sorts decreases costs and volume of logs in inventory). The number of log sorts is subject to the "Law of Diminishing Returns." Consequently, there must be a sufficient added benefit (that is, increased log value created by the sorting) to justify each additional log sort. When considering additional sorts, the added benefits must offset the added costs of sorting and handling. In the end, it is critical to weigh the additional cost of sorting logs and other higher valued products from woody biomass. Value-added revenues must more than cover the costs of the additional sorting and associated costs.

However, the economics of sorting logs and biomass may not necessarily translate when working with hardwoods or with all local market conditions. Depending on what the feedstock yard is purchasing, hardwoods offer some significant opportunities to add value at a sort yard. The potential for veneer, sawlogs, and fence material can offer the facility some significant value-added potential that can enhance the economics. The question then becomes, what is being purchased from suppliers, and does the local market offer cost-effective opportunities to spend the time and money to sort products?

Biomass Storage & Inventory Control

Biomass storage provides five functions that improve the efficiency of a biomass processing facility's yard:

- Provide adequate biomass volumes for efficient processing;
- Provide surge leveler or buffer such as for accumulating supply for spring breakup/mud season;
- Decouple yard functions for safety and efficiency purposes;
- Smooth out fluctuations in biomass material flow through the yard; and
- Provide log inventory for feeding the processing facility.

Most biomass yards try to store only enough inventories to supply their customers for several weeks. While storage should be controlled and kept to a minimum, it may be necessary to temporarily store biomass for longer periods to meet one or more of the inventory functions listed above. Storage is used to decouple production phases in a yard to improve workflow. Decoupling separates production flow from one process to the next. This is accomplished by providing temporary storage or a surge area in the yard. In addition, decoupling operations and "in-process" biomass inventory provides for a safer yard by separating mobile equipment away from yard workers.

Some yards also store biomass to balance daily and seasonal surges in deliveries to the yard. This may reduce investment in equipment and overtime costs and increase the working year of the crew, but it may also reduce efficiency, increase investment in land, and subject the biomass to degrade. Some storage is unavoidable, but the inventory should be controlled. Large inventories in biomass yards are a concern, and every effort should be made to reduce and control the yard inventory.

As mentioned earlier, many wood energy markets require "clean" wood sources which is best served by having all or portions of the yard paved for biomass storage. Placing biomass on gravel or dirt surfaces can reduce the delivered value of biomass to certain buyers/users. Likewise, many buyers place restrictions on the ash content of their supply which is directly related to the amount of dirt and other inorganic materials in the delivered biomass. Here, surfacing the yard or a portion of the yard with asphalt paving is recommended.

Excessively long biomass storage reduces productivity, increases costs, and increases degrade of the biomass feedstock such as from loss from insects and decay. Sometimes, there is no alternative to long-term biomass storage, and without it, productivity would be lower and costs higher. Yards with extreme variations in biomass input require biomass storage–surge areas to smooth out yard flow. Generally, yards that store a large amount of biomass have lower productivity than yards that store smaller amounts, and the cost to procure and hold the inventory escalate. Minimizing biomass inventories and shortening turnaround times help reduce yard costs and improve productivity. Every effort should be made to minimize unnecessary storage. First In–First Out (FIFO) inventory control should be used to reduce losses.

Preventing Spontaneous Combustion in Woody Biomass Feedstock Yards

Spontaneous combustion is defined as combustion of a material that occurs in the absence of forced ignition. Spontaneous combustion is an infrequent but real hazard during the storage and handling of woody biomass and thus is an important safety consideration in the development of a woody biomass feedstock yard. This is especially true when the woody biomass is in the form of sawdust, wood chips and pellets. Because of the danger of spontaneous ignition, many pulp mills limit the height of their piles of clean debarked chips.

A very thorough treatment of the phenomenon of spontaneous combustion can be found in a 2002 paper by Richard Buggeln and Robert Rynk: *Self-Heating in Yard trimmings: Conditions Leading to Spontaneous Combustion*. A more specific treatment of the phenomenon in the wood industry is found in a 1979 USDA Forest Products Laboratory paper by Edward L. Springer: *Should Whole-Tree Chips for Fuel Be Dried Before Storage?* Following are some excerpts from both of these references:

Everything that rots produces heat. Rotting happens as a result of microscopic bacteria and fungi feeding on moist cellulosic materials. It is important to avoid creating conditions that trap heat inside piles of sawdust and wood chips such as running heavy equipment on top of piles as it compacts any rotting material and promotes the chance for "hot spots" to be created inside a pile. Also avoid creating alternating layers of wet and dry materials as rotting and heat generation will occur in the wet layers and the heat will be transferred, via the "chimney effect" to the dry layers, which will facilitate spontaneous combustion in the dry layers.

Wood dried below its fiber saturation point (20-24 percent moisture content) is not subject to bacterial or fungal attack. Proper drying also kills any living wood cells. A storage pile of dried wood chips will not deteriorate or evolve a significant amount of heat. Mills in the Southeast limit pile height to less than 25 feet. Mills on the West Coast using Douglas-fir and other western species limit pile height to 50 feet.

Springer, in the conclusion of his paper says: "Because of the danger of spontaneous ignition, fresh, moist, whole tree chips can be stored in outdoor piles for only short periods of time. Maintaining a given inventory of such chips in storage thus requires that the chips be rotated frequently and, as a result, handing costs are very high. The ignition hazard can be eliminated by drying the chips and maintaining them in a dry condition. In many instances, drying costs can be entirely recovered when whole-tree chips are burned for fuel. The cost of maintaining an inventory for fuel purposes in these cases is thus simply the cost of providing a cover for the dry chips and of moving the chips into and out of storage. This method is much less expensive than frequent rotation of moist chips.

Woody Biomass Feedstock Yard Equipment Needs

Woody biomass feedstock yard equipment needs are closely tied to the purpose of the facility involved. As the purpose and products increase in complexity so does the technology and associated costs. It is important to get an understanding of the types of equipment needed to operate the feedstock yard and woody biomass facility as it will be needed in preparing cost estimates for equipment lease or purchase and operation and preparing financial and business plans.

Bark mulch recovered from sorted log yard debris, Maine. Source: USDA Forest Service

If the purpose of the facility is to handle and recycle urban green waste into compost and mulch, the footprint for the feedstock yard will likely be small and involve rather minor equipment needs such as a chipper, a small tractor with a front end loader, and some type of device to windrow and turn the chipped material on a periodic basis to prevent spontaneous combustion.

A community based feedstock yard to provide thermal heat to a school, community college, a hospital, or municipal building might require a chipper but most likely may simply require a large hopper to receive.

A feedstock yard supplying a wood pellet plant, for example, will require an area to receive sawdust along with tree and wood residuals and other woody biomass feedstock sources including small diameter and larger timber from hazardous fuel and other types of forest restoration thinnings. As such, there will likely be a need for commercial grade front-end loaders, debarking capability, and other equipment to unload log trucks and move such material to a large commercial grade chipper or grinder. Also needed are conveyor systems and high pressure pellet mills along with pellet storage hoppers and mechanized bagging systems. Last but not least will be the need to have room at the facility to store pallets for shipment, forklifts, docking stations for tractor trailer trucks and rail car loading with the latter requiring a rail spur for access to rail transportation of the finished product.

When supplying a larger combined heat and power or a wood fired electrical generation the facility footprint can range from 8 acres to 100 acres depending upon the contemplated kilowatt or megawatt production. Larger units may require sophisticated equipment to allow for dumping semi-truck or railcar loads of chips. A hydraulic lift system to lift and dump entire chip vans, or collection bins and conveyors for unloading of traveling floor trailers or dump trucks may also be necessary. A drop off facility with large tub grinders and commercial grade front-end loaders are also a possibility. There may also be a need to convert feedstock sources into heat and power through the use of a traveling grate stoker or fluidized bed combustion system, boiler, and steam turbine. Needless to say a very complex wood to transportation fuel facility would require an even larger feedstock yard and conversion facility and related processing equipment.

A complete equipment description along with diagrams and photo's of equipment used in any or all of the above woody biomass facilities and feedstock yards is much too complex to present in this guide. The best suggestion is to seek out and identify a successful woody biomass facility that is similar to the one being contemplating and then go and see first hand the type of equipment that is involved. Talk to the owner/operator about pros and cons associated with the equipment they purchased along the magnitude of capitalization costs associated with such equipment. Also talk to the major local area processing facilities and see what quality of biomass they are seeking (clean chips, hog fuel, roundwood, etc), as this will also have a bearing on feedstock handling equipment needs. From there initiate contact with equipment manufacturers to get more information and data.

Large tub grinder; photo taken at SmallWood 2006 Conference in Richmond, Virginia. May 19, 2006. John Stewart

One last suggestion is to talk with the owner/operator and ask this question: "If doing it all over again today what would be done differently in the way of feedstock yard and facility design and types of equipment chosen?"

Chapter 12. Financing a Feedstock Yard

Preface

At the outset, it is important to focus on the organizational structure of the entity that will take an active role in this evaluation process. This requires a commitment of time and resources. Formation of this entity can be informal but the initial steps in the process should be undertaken, however, caution may be necessary. Some states have strict banking and securities laws that regulate the raising of money. Even "passing the hat" to collect start-up funding may be legally interpreted as a violation of securities laws. An initial step in this process should be a check with state banking and securities officials to determine the laws that govern the process.

Conducting a Sensitivity Analysis

An important second step is to conduct a sensitivity analysis as part of the financial evaluation of project economics to will help determine economic viability of the proposed project. This process will also help identify variable costs that will have the most profound impact on project economics. The detailed economic analysis should incorporate a variety of factors. The sensitivity analysis should consider differing prices, interest rates, profit margins, internal rates of return and cost scenarios and should include:

FEEDSTOCK COSTS. The source of raw materials including feedstock and other inputs should be considered. Sources of the feedstock, price history, supply and access on a year around basis should be evaluated. Consider the procurement costs and the time value of money when holding large or long term inventory.

ENERGY COSTS. Energy costs are a major economic factor in site selection.
Pricing history and supply options should be considered. While risk management should address many areas of operations, energy and feedstock costs are key input factors where risk mitigation strategies should be developed and considered during the economic evaluation.

MARKETS. A range of projected values for the primary and secondary product markets should be developed. Elasticity of the products and the markets should be considered, as well as an analysis of competing producers.

CONSTRUCTION. Qualifications, experience and responsibilities of the design and build firm(s) should be thoroughly evaluated. Construction cost(s) and tasks should be fully identified and the total project cost should be clearly understood. Project time lines should be established and the cost of potential design, materials or construction changes should be identified.

SITE AND INFRASTRUCTURE. The rationale for selecting a specific site should be understood and advantages relative to competing sites should be calculated. Costs for utilities, energy, process and sanitary water, waste treatment and permits should be confirmed. Detailed planning and diligent supply negotiations can help control capital costs and operating expenses.

TRANSPORTATION AND STORAGE. Biomass production requires transportation and storage of feedstock and other inputs, and export of raw or finished and intermediate products. Cost competitive transportation modes should be evaluated and storage requirements should be calculated to determine the impact on capital and operating costs.

PERSONNEL. The cost of recruiting, training and retaining personnel should be assessed.

CAPITAL COSTS AND DEBT FINANCING. A range of projected costs should be considered during the economic assessment. The business model and impact of various tax laws and incentives should be estimated in the financial pro forma. A comprehensive sensitivity analysis will help evaluate the need for cost control measures and can provide an early indication of potential profitability.

Governance, Selection, and Formation of a Business Entity

With assistance from legal counsel, the project development team should consider and understand the requirements of applicable governance concepts and legal documents including:

- Articles of Incorporation;
- By-laws of the organization;
- Disclosure statements;
- Advantages of various organizational structures;
- Responsibilities of the Board and management team;
- Confidentiality issues;
- Actions that constitute insider trading or conflicts of interest; and
- Concepts of fiduciary responsibility.

Biomass bundle from John Deere Bundler. Source: USDA Forest Service

As the project development team or organizing board considers the needs of the venture and evaluates business entity options with the aid of legal and financial counsel, the group should determine the best form of governance for the specific project. Regional differences may have an impact on this decision. Business entities formed for feedstock yard development may include:

- Cooperatives;
- Limited Liability Companies;
- Partnerships;
- "C" Corporations; and
- "S" Corporations;

This document does not intend to recommend any one form of business entity over another. However, a variety of issues should be thoroughly evaluated before finalizing an agreement to form a business entity. The choice of business entity should be beneficial for investors and the community near which it is located. The preferred business entity should be designed to incorporate federal and state tax incentives and other advantages that accrue to the business entity formed by the organizing board. As the project development team continues to assess the prospects for developing a biomass facility they should consider the type of business entity that is most practical. The team should consider a range of options and factors that include:

DEBT AND EQUITY SOURCES: Some business structures may be qualified for targeted financing programs geared specifically toward cooperatives or other entities. The target market for equities placement may also be a factor in determining the business structure. For example, state and federal securities laws generally dictate investment thresholds, securities licensing requirements for single and multiple state sales activities and other factors relevant to the business structure.

TAX LAWS AND TAX INCENTIVES: Several tax provisions are based on the specific make-up of the owners of a business entity. It is important to consult a tax advisor or attorney on the ramifications of forming any of the mentioned business entities.

An "excaliner" yarder is capable of yarding biomass from small diameter timber stands growing on steep ground. It can also operate off-road to some degree. Bonners Ferry Idaho, June 2004. Photo by Barry Wynsma, USFS

GRANTS: Provisions of the current Farm Bill include grant programs specifically targeted to woody biomass business entities. As the project development team considers formation of the business entity, the group should evaluate these and other factors that may affect development of the project, eligibility for financing through various sources, or tax eligibility implications. The project development team may wish to engage financial advisors and legal counsel to assist in evaluating the most beneficial business entity for the specific venture. One caution when it comes to grants: many community based log sort yards and biomass feedstock yards have come about as a result of grant funding, unfortunately when the source of grant funding dries up the yard/facility often goes away. Thus it is better to develop a self-sustaining biomass enterprise rather than one supported by grant dollars.

Capitalization Options

As noted, this document makes no recommendations regarding the most appropriate business entity or capitalization alternative for a specific project. If the feasibility study suggests that capitalization options should be evaluated, the project development team should examine the options discussed above. The following are two of the more common options:

COOPERATIVES: Cooperatives may offer some unique advantages over incorporation; one example is in financing: farmers have often been influenced by the fact that ethanol projects developed by a cooperative can generally qualify for financing through the Bank of Cooperatives (http://www.cobank.com/). Cooperative banks have specific charter requirements and business detail requirements that are often suited to the cooperative structure. Under this structure, the business is owned and controlled by members and profits are distributed according to a formula based on member participation in the cooperative. The project development team should evaluate potential benefits and disadvantages of this option. A more thorough discussion of biomass cooperatives and related financing issues in included in the WBUG White Paper (see Appendix 1 – Additional Resources).

LIMITED LIABILITY COMPANY: The LLC is a legal business structure that combines the limited liability of a traditional corporation with the single tax treatment of a partnership. Generally, the LLC option allows broader participation for equity investors and greater flexibility in distribution of tax benefits than the cooperative option. The growing involvement of capital management firms and national project development companies is not covered in this Guide.

Local leaders in areas where such projects are contemplated often negotiate an ownership structure that allows some level of local equity participation. This practice can benefit the majority owners in a variety of ways and should be considered as an option by project developers and local residents.

Advice on Potential Project Hazards and Risks

Based on extensive experience with rural based renewable energy projects, the St. Paul Bank of Cooperatives has developed the following guidelines for consideration. These guidelines were initially developed for farmer owned cooperatives but they may be generally applicable to many new woody biomass projects. The St. Paul Bank of Cooperatives identified ten project related "hazards" and five "major risks" that can result in jeopardy for the project and investors. Following are the Project Hazards identified in the published guidelines prepared by the St. Paul Bank of Cooperatives, as modified by Erlin Weness, University of Minnesota Extension (available on the web at: http://swroc.cfans.umn.edu/SWFM/Files/fin/eval_invest.htm:)

Meeker Park Collection Site/Sort yard showing the loading of Boulder County's Air Curtain Burner, Date: Summer 2008. Photo by Craig Jones, CSFS Project Manager for Peak to Peak Wood.

- Plant specifications are not met;
- Construction contract problems, such as delays and overruns;
- Lack of serious commitment by the owner-members;
- Location that puts the business in a noncompetitive situation;
- Market projections are overly optimistic;
- Unrealistically low operating cost projections that cannot be met;
- Faulty marketing assumptions;
- Problems with management or managers;
- Excessive debt-to-equity ratios; or
- Led by an outside promoter rather than local owners-investors;

Financial Risk and Market Risk Factors

Many of the same risk factors identified by the project development team will likely be issues that require attention during the project finance phase. The St. Paul Bank of Cooperatives published a series of questions that can serve as guidelines during preparation for meetings with prospective project financiers. An assessment of these questions can help identify risks from a lenders perspective and resolution of these issues can help prospects for project financing. The importance of specific risk factors may vary from project to project but both the project development team and the lender will likely encounter these issues as the prospectus and loan documents are developed:

- Is there a need for the product(s) to be produced?
- Does the company have only one product or are they diversified to lessen risk?
- Is profit and return projections realistic and positive? Are projected returns on investment high enough to pay back interest plus principal in a reasonable time?
- Who are potential customers and where are they getting feedstocks now?
- Is there a complete understanding the type of business organizational structure and the tax and legal implications?
- What market barriers exist?
- What advantages exist over the competition?
- How large is the market?
- What is the projected market share? and
- Is management capable of developing a solid marketing plan?
- Have you considered the time value of money and risk of lost opportunities in alternative investments?

Gilpin County Sort Yard and Launch of Peak to Peak Wood Project. Photo of private landowner delivering wood from forest management work and being unloaded by Gilpin County personnel at the Gilpin County Collection Site/Sort yard. This wood is placed in bunks, weighed and the owner is paid $26 per ton for the material. July 30, 2008. Photo by Craig Jones, CSFS Project Manager for Peak to Peak Wood.

Financial Considerations

As discussed previously, the business entity (Cooperative, LLC, S Corp, etc) selected as the vehicle for project development may have a bearing on debt to equity ratios, applicable tax incentives, equity sources, eligible financial institutions and a host of other factors noted. However, the St. Paul Bank of Cooperatives developed basic financial issues that may be generally applicable to proposed biomass projects:

EQUITY: Permanent assets to be financed include land, plant, equipment, other assets, start-up losses, and a minimum level of permanent working capital. Feedstock yard owners should have as much invested in their permanent assets as do their lenders. The rule of thumb for permanent asset financing is 50% equity and 50% debt. Risk reducers, such as project feasibility, firm marketing contracts, turn-key construction costs and quality management can lower the equity requirement, but rarely to less than 35 to 40 percent.

WORKING CAPITAL: Minimum permanent working capital is (a) required to annually "zero-out" for 30 days, or (b) required to margin loan advances of approximately 65% of acceptable inventories and 80% of acceptable receivables. Operating capital is available through short-term seasonal loans to finance fluctuations in current assets. The maximum seasonal loan typically does not exceed three times permanent working capital.

Peak to Peak Wood Site manager Joe Turner talks to local landowner Gary Williams about purchasing material from the Meeker Park Collection Site/Sort Yard. Mr. Williams, owner/operator of a 3000 acre ranch, custom mills material for local community projects as a side business. August 2008. Photo by Craig Jones CSFS Project Manager for Peak to Peak Wood.

LOAN DURATION: The length of a loan depends on its purpose. Loans for new plants and equipment usually are repaid in 10 to 15 years, or less, in recent years.

CASH-FLOW REQUIREMENTS: Annual principal repayments should take no more than 50-65% of annual cash flow (after taxes and less the profits or patronage refunds received plus depreciation).

INTEREST RATES: Rates typically will be the prime rate plus 2 to 2.5% for farmer owned cooperatives projects. Some fixed-rate options and rate-reduction incentives are usually offered for successful construction management and start-up.

Lender Considerations

Financial lenders will carefully scrutinize all details of a project, as the differing aspects of each biomass project require due diligence on the part of the lender. In much the same manner as the project development team evaluated significant project variables the lender will also evaluate key points of consideration. These include:

- Economic and competitive environment in which the project will operate and the proposed management team and the character and experience of the management team;
- Critical financial developments that may have an impact on the project and the financial and economic trends that will likely have a bearing on the plan;
- State and federal government policies that may fundamentally impact feedstocks, products produced at the plant, markets and incentives; and
- Underwriting guidelines that are most applicable to the specific project.

Economic Assessment by Lender

The lender will review many of the economic and competitive assumptions made by the project development team. The lender may ask for extensive information and validation of information contained in the feasibility study.

The lender will also review:

- The corporate structure of the business entity, the proposed ownership of the plant and the business plan developed by the management team;
- The projected cost of the project, contract guarantees and a source and use statement developed during financial deliberations;
- An assessment of the project engineer and contractor to determine experience and past performance on related projects;
- The overall feedstock yard management, transportation issues, risk management strategies and the marketing plan;
- The proposed location of the biomass yard, feedstock cost projections, transportation costs, community acceptance and participation, utility cost estimates and market information for all products; and
- Confirmation of feedstock supply and cost, delivery strategies and marketing agreements.

Financial Developments and Trends

Financial assumptions made in the feasibility study and financial pro forma will be evaluated and tested by lenders. Key factors reviewed by the lender will be similar to the critical financial elements considered by the project development group, including:

- Supply, demand and pricing history of woody biomass and co-products in target markets served by the feedstock yard;
- Experience of management team and personnel;
- The type and scope of feedstock contracts and the marketing strategies developed; and
- Risk management strategies for acquiring feedstock and selling raw material or finished products.

The sensitivity analysis (report) should include a statement of opportunities and potential problems for project developers and other affected parties, including the community. The report should contain a recommendation to proceed or not, depending on findings of potential for profitability and suitability of the process and site. If a recommendation to proceed with the project is stated, the report should provide guidance on site selection factors discussed in this document. The report should also consider pertinent technology, engineering and feedstock modifications that may be applicable. The report should identify more than one entity for financial, marketing, engineering and legal tasks that may be recommended by the consultant(s). Include a discussion of internal rates of return and the cash flow challenges of procuring and holding a large inventory or the inability to quickly turn over surges in inventory.

Chapter 13. Enlisting Community Support

Preface

Woody biomass and bio-based products such as renewable electricity are becoming important topics of discussion among politicians, natural resource professionals, environmental groups, and the general public. Much of the discussion includes conflicting myths, facts, opinions and questions—all indicators that improved communication, outreach and education are needed. The Woody Biomass Utilization Group is working on some communication tools to help address some of these common misunderstandings; the tools will be posted on the WBUG website when completed: http://www.forestsandrangelands.gov/Woody_Biomass/wbug.shtml .

Whether the feedstock yard is a private business or a community-led facility, it is important to develop and maintain broad community buy-in and support in order to be successful. Both the biomass feedstock suppliers (resource owners) and the environmental community will want some assurance that the operation, the feedstock it is based upon, and the markets proposed (bioenergy, wood manufacturing, and/or value-added products) are sustainable.

Corporate Citizenship and Community Relations

A business which attempts to meet the community needs, at least as a secondary objective (profit and financial stability are the first considerations) has greater stability and sustainability. Therefore, relationships with community leaders and interested public are key to building that support and to the financial success of the business.

Hopefully potential negative impacts have been discussed and addressed during proper planning and site selection in Chapter 10 (please see #6 Community Considerations). The location of a feedstock yard in or near a community presents a host of challenges. Conducting the project review process in an open, constructive manner can help overcome potential pitfalls that could slow project development and strain working relationships with local and state officials. Mistakes made during this process may result in near and long term consequences that hamper the development of the facility. Strive to be a good corporate citizen – it is usually a sound financial decision.

Front end loader provides versatility at a satellite chip mill, North Lapwai, ID. Source: USDA Forest Service

Corporate Communications

Prior to selection of a specific site, contact should be made with officials who will play a role in the pace at which the project develops and can help facilitate project development. Conversely, failure to communicate project needs and goals can impede project development and add costs to the facility. Following are some key official contacts that should be made during early stages of the project.

STATE ECONOMIC DEVELOPMENT AGENCIES: State agencies generally maintain a data-base of sites that may meet project criteria. These agencies often also administer state and federal incentive programs, many of which include infrastructure development and job training funds for which the project may qualify.

State regulatory officials: Early contact with regulatory officials will help clarify permit requirements and can help mitigate confusion that can delay permit issuance.

STATE TAX OR REVENUE AGENCIES: These agencies often administer tax credit programs that may have an impact on the project. They can also provide information about tax compliance matters that can affect development and operation.

ELECTED OFFICIALS: Elected officials including county commissioners and state legislators are interested in economic development projects and can often be enlisted as project supporters if they are aware of the project at an early stage.

Field trip to Dunkirk, New York 600 MW coal fired power plant undergoing State environmental review for a 10% biomass co-fire. October 29, 2003. John Stewart

ENERGY AND TRANSPORTATION SERVICE PROVIDERS: Representatives of gas, transportation and utility companies provide useful information and can serve as project advocates.

LOCAL CONTACTS: These include the local economic development directors, utilities managers, Chamber of Commerce, and City Hall. These contacts can orient the project manager to the community, to community expectations, regulatory requirements and resources, local incentives, and they can facilitate community acceptance of the project. These contacts can also assist with public information meetings that help orient and influence potentially vocal citizens or groups to the benefits of the proposed project.

Facilitating Buy-in via Effective Communication

To the extent the community perceives a partnership in the project, the process of acceptance and support will be enhanced. This is important in permitting, zoning, incentive package negotiations, local investment, and public perceptions about the project.

Laying the groundwork for supportive community involvement can pay dividends at the time of public hearings on permits, zoning variations, and the inevitable complaints about various facility impacts; document this involvement and interaction for the record.

Involvement of public officials, local development organizations and chambers of commerce, community organizations and other dignitaries during groundbreaking ceremonies and the eventual ribbon cutting ceremony can help facilitate community buy-in and a sense of partnership.

Compliance with regulations, codes of conduct and the expectations of communities and state officials is good business. The consequences of violating laws, regulations, ordinances or community expectations can be severe.

Consequences can range from delays or fines to legislative repercussions that may have an adverse consequence on the financial stability of a project. Ultimately, these responsibilities are up to the entity that owns or controls the facility. Project owners should make it part of their business to know about regulatory compliance requirements and they should understand the consequences of failing to meet these standards.

Woody biomass facilities are frequently located in sparsely populated areas. Jobs created by the plant generally have a significant economic impact on the community. Job related benefits, taxes generated by the project/enterprise, infrastructure improvement stimulated by the facility, and goods and services required are all important factors that can have a positive impact on the community. This information should be provided to area residents as part of a series of outreach efforts to generate support for the project and address any concerns.

NACD Woody Biomass Desk Guide and Tool Kit

Perhaps the best single source of how-to information on biomass project/enterprise related community outreach and education is found in Chapter 7 of the NACD Woody Biomass Desk Guide and Tool Kit (http://www.nacdnet.org/resources/guides/biomass). Rather than "reinventing the wheel" and reprinting the information in this document, readers are encouraged to visit this internet website when designing and conducting their community outreach efforts. Though the concepts presented in the NACD Woody Biomass Desk Guide and Tool Kit focus on energy, most tools and strategies could easily be used with other woody biomass related facilities and products. Use of the NACD Desk Guide combined with the previous suggestions and those that follow are essential to project/enterprise success.

Forestry Specific Outreach Considerations

Biomass Field Consultation, Date: September 2008, Photo source and details unknown according to Craig Jones of CSFS.

One of the best methods to build confidence with constituents is through field tours. Take people to the woods and look at actual harvest operations. Pick some sites of both recent and older harvests to show best management practices and how quickly the stands heal from harvesting and that the desired outcome was achieved. Let members of the community also select some areas to view so that a balanced perspective can be presented. If damaged soil or wildlife resources are noted, turn this into a learning experience for all, and note what standard practices could improve the field operation or how new practices, monitoring or specialized equipment would have prevented the damage.

Another technique to build trust is to pick a sample harvest area near the community (public land, whether federal, state or county ownership may be best for selection). Let all members select which trees they would harvest to meet whatever objective they want to achieve (wildlife, wildfire reduction, recreation, growth and yield, etc). One idea would be to use socks full of different colors of chalk to mark the trees (either cut tree or leave tree selection, although agreeing to what is left behind gives people a better idea of what is trying to be achieved from a land management or restoration perspective). It may be surprising to see the commonality in marking objectives! After an understanding and agreement on harvest trees is reached, leave the sample area intact and, following the agreed marking guidelines, harvest a small area nearby to see if the guidelines can be met (one may find there are unforeseen or unrealistic expectations of the timber operator). This practice will build trust while providing a monitoring strategy and adaptive management feedback loop which ensures that the community is engaged and that the best practices are being followed.

Once the community understands that good harvesting practices will be employed, consider similar trust-building efforts with the feedstock yard operation. Show the community that the company is concerned and is addressing issues of noise, air and water pollution, traffic and public safety (see a listing of common community concerns in Chapter 10). Again, a field trip or show-me tour is usually far more effective than just a written document or public speaking campaign. Document the tour so that others can see what has been done and can visit the sites on their own to verify the efforts made to meet community sustainability concerns. To the extent possible, work with local bioenergy or wood products industries to also demonstrate their corporate and community responsibility to the environment.

BIOMASS HARVESTING GUIDELINES: Several States have developed requirements for forest management plans as a basis for ensuring sustainable practices across the landscape. The planning team and feedstock yard operators are advised to be aware of and conversant in biomass harvesting practices in their area. Minnesota was one of the first states to develop biomass harvesting guidelines:

> **Minnesota Forest Resources Council. 2007**. Biomass Harvesting Guidelines for Forestlands, Brush lands and Open Lands. 44 p. Last accessed on the internet October 19, 2009 at: http://www.frc.state.mn.us/documents/council/site-level/MFRC_forest_BHG_2001-12-01.pdf

Even with such guidelines, well-intentioned members of the environmental community may attempt to block these projects, or delay implementation through legal, political or public activism campaigns. The feedstock yard enterprise may be well advised to help establish local standards for land management activities, harvesting techniques, and environmental protections. A forest stewardship plan may meet those needs but is often too costly for most small landowners. One option may be for a consulting forester to pool several projects together into one harvest plan.

University of California Cooperative Forestry field tour of biomass harvesting, Eagle Lake Ranger District, Lassen National Forest, just outside Old Station, California. July 18, 2003. John Stewart

Whether or not it is not cost-effective to hire a consulting forester or to write a forest management plan for very small blocks of land (especially ownerships under 20 acres), an alternative may be developing standard business practices and desired forest structures with the local community. For example, the community, county or regional governing body could convene a discussion and reach consensus on a scientifically credible set of forest conditions which consider forest type, age, aspect, slope and other physical and environmental parameters (wildlife habitat connectivity, streamside management zones, visual corridors, etc), then could list the relevant retention parameters of crown cover, basal area, species composition and diversity, snags and downed logs which could be met (assuming this would be a voluntary system, rather than mandated by regulation). Many loggers today are trained and certified with respect to best-management practices. Thus one way of ensuring these criteria are met is by insisting on the use of certified loggers.

The community will want some assurance that the business, and clients in the bioenergy and wood products industries, is sustainable, and that they contribute to the social and economic health of the community. The company may be well served to go beyond a standard supply analysis of a feasibility study and engage with community leaders in jointly assessing the cradle-to-grave environmental impacts of the operation. Participating in or leading the discussion of harvesting practices and sustainable ecosystem services (clean air and water, healthy and diverse wildlife habitats, retention or improvement of recreation and scenic values, etc) can help to engender trust and understanding of the business model and corporate ethics – it may even bring in additional feedstock from landowners that have common objectives and a desire to improve their own forest lands. It is important to be viewed as not only a good corporate citizen, but also as a respected environmental leader.

University of California Cooperative Forestry field tour of biomass harvesting, Lassen Volcanic National Park, just outside Old Station, California. Discussion centered on the Quincy Library Group proposal to remove biomass along public roads to protect public safety and reduce wildfire threats to communities. July 18, 2003. John Stewart

University of California Cooperative Forestry field tour of biomass harvesting, Lassen Volcanic National Park, just outside Old Station, California. LVNP was considering biomass harvesting this over dense stand of invasive white fir trees which contribute to the declining vigor of old growth pines, reduced scenic and recreational values, and an increased public safety and wildfire threat. July 18, 2003. John Stewart

Networking with the environmental community

There are many members of the environmental community that see the value in sustainable management and, with the proper approach and attitude, may support the business model. Some, however, see no value in ever harvesting a tree for any reason (even though they may use wood products). The latter may never agree to agree, but may be willing to understand that woody biomass utilization has many social and environmental benefits, and that "no action" is actually a decision to let nature decide when and how to manage the forest (which can result in far more dramatic environmental impacts and swings than those caused by humans).

Environmentalists want to be heard and have their concerns addressed or acknowledged. Holding a truly open dialogue, in a relaxed setting such as in a field tour or "tailgate session", may yield significant positive results. At least this could be a forum for a non-confrontational exchange, and may reduce or prevent many misunderstandings down the road. Document the meeting in an informal letter to the other party, and accurately portray the common ground or differences to be discussed or agree upon (this is not the time to get the last word in, just restate the factual discussion). Seeing the similarities and differences in writing may shine new light on respective positions. This documentation may also help build broader support for the business, set a high professional and ethical standard, and even strike a positive note with other similarly interested constituents.

Chapter 14. Sources of Financial Assistance

Preface

This Chapter provides an overview of the various sources of financial assistance that may be available for developing and operating a woody biomass feedstock yard, including public grant programs and other funding opportunities. There is a dearth of financial advice on the web, so the focus here is on services from public entities.

So much has been written about applying for loans and grants, but little of this material is directly applicable to the forest products industry. Excellent resources on forest industry economic considerations are found in several of the reference materials in the Appendix and are not repeated here. However, the material in this chapter borrows very heavily from an outstanding paper, **A Guide for Evaluating the Requirements of Ethanol Plants** prepared for the ethanol industry by Todd Sneller and Douglas Durante, and available on the web at: http://www.cleanfuelsdc.org/pubs/documents/ethanol_plant_guide.pdf.

Parts of this document have been modified or adapted to so that it is more applicable to woody biomass feedstock yard establishment. Seek local counselors as discussed above and remain flexible and adapt advice to local conditions.

Sources of Financial Assistance

A host of business development assistance programs are currently available at the local, state and national level. Several federal programs, including portions of the current USDA Farm Bill titles, authorize grant funds for this type of preliminary economic assessment. Authorization of a new program does not mean the program is operational. Funding must be provided by Congress so apply your time and resources wisely as you pursue federal assistance programs.

Business Incentives

As project developers evaluate the impact of incentives on the proposed project, it is important to understand the net value of incentives and the benchmarks that must be met to qualify for specific incentives. Can the business sustain itself in the market without the incentives?

Value of Incentives

A valuable biomass incentive is generally production credits or payments. Such incentives have periodically been available from the federal government. Several states also provide some form of production incentive. Project developers should review applicable federal, state and local business incentives that may have an economic impact on the project. Such incentives may also be a consideration during the site selection process. Perhaps the best single resource is the Database for State Incentives for Renewables & Efficiency (DSIRE), available on the internet at: http://www.dsireusa.org which reportedly lists all state, local, utility, and federal incentives and policies that promote renewable energy and energy efficiency.

Project developers can also obtain detailed information about general business incentives from state and local economic development authorities. Project developers should develop a value estimate of incentives that may be available to the facility.

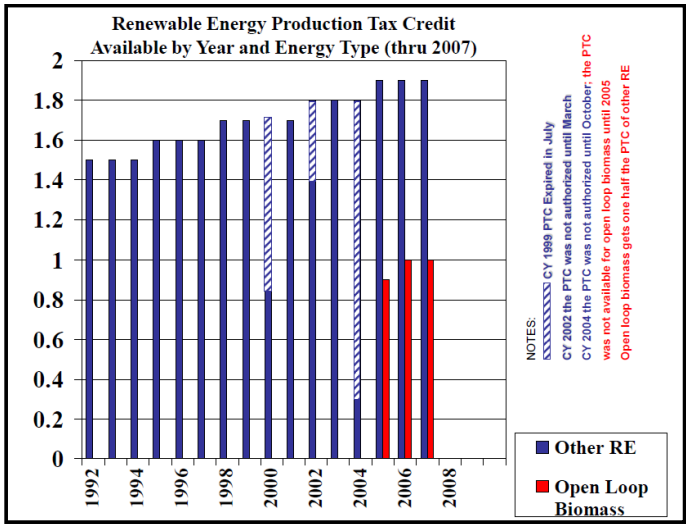
Tax incentives can play an important role in the profitability of woody biomass entities. Project financers will also expect an analysis of incentives for which a proposed facility may be eligible.

Federal Incentive Programs

Various incentives have been crafted to encourage development of production facilities. During the past fifteen years, a variety of incentives have been available through federal government programs. Some of these incentive programs are summarized below.

RENEWABLE ELECTRICITY PRODUCTION TAX CREDIT (PTC)

The PTC is a per-kilowatt-hour tax credit for electricity generated by qualified energy resources and sold by the taxpayer to an unrelated person during the taxable year. Closed-loop biomass (energy crops) may receive the full credit; the credit is usually halved for open-loop biomass. Originally enacted in 1992, the PTC has been renewed and expanded numerous times, most recently by H.R. 1424 (Div. B, Sec. 101 & 102) in October 2008 and again by H.R. 1 (Div. B, Section 1101 & 1102) in February 2009. The tax credit is reduced for projects that receive other federal tax credits, grants, tax-exempt financing, or subsidized energy financing. Feedstock yards will not qualify for the PTC unless they actually produce the renewable power, but large, energy producing customers can receive the PTC and therefore may be able to pay a higher price for feedstock.



Graph of the cents per kilowatt hour tax credit available for closed loop and open loop biomass. Note the tax credit has expired several times, and that open loop biomass receives only 50% of the tax credit. Chart made by John Stewart in 2007

INVESTMENT TAX CREDIT (ITC)

The American Recovery and Reinvestment Act of 2009 (H.R. 1) allows taxpayers eligible for the federal renewable electricity production tax credit (PTC) to take the federal business energy investment tax credit (ITC) or to receive a grant from the U.S. Treasury Department instead of taking the PTC for new installations. The Treasury Department issued Notice 2009-52 in June 2009, giving limited guidance on how to take the federal business energy investment tax credit instead of the federal renewable electricity production tax credit. The Treasury Department will issue more extensive guidance at a later time. What is known now is that the credit is for up to 30% of the investment and may be taken immediately as a grant. Like the PTC described above, unless the feedstock yard actually produces the renewable power, it cannot receive the ITC but large, energy producing customers can and therefore may be able to pay a higher price for feedstock.

LOANS AND LOAN GUARANTEE PROGRAMS

The Departments of Energy and Agriculture have administered loan and loan guarantee programs for which biomass projects were eligible. Under the programs, qualified applicants were eligible for loans or loan guarantees that provided direct financing or guaranteed loans for capital construction. Here is a sampling:

Recently completed biomass harvesting on the Signal Butte Timber Sale, Eagle Lake Ranger District, Lassen National Forest. September 17, 2002. John Stewart

Under the U.S. Department of Energy's Loan Guarantee Program Established under Title XVII of the Energy Policy Act of 2005, the Secretary of Energy is authorized to make loan guarantees to qualified projects in the belief that accelerated commercial use of these new or improved technologies will help to sustain economic growth, yield environmental benefits, and produce a more stable and secure energy supply. A new program, the Financial Institution Partnership Program (FIPP), is a streamlined set of standards designed to expedite DOE's loan guarantee underwriting process. Proposed borrowers and project sponsors do not apply directly to DOE but instead work with financial institutions satisfying the qualifications of an eligible lender. The purpose of the USDA Business & Industry Guaranteed Loan Program (B&I) is to improve, develop, or finance business, industry, and employment and improve the economic and environmental climate in rural communities. This purpose is achieved by bolstering the existing private credit structure through the guarantee of quality loans which will provide lasting community benefits. B&I loans are normally available in rural areas, which include all areas other than cities or towns of more than 50,000 people and the contiguous and adjacent urbanized area of such cities or towns. Loans may be used for business conversion, enlargement, repair, modernization, or development; purchase and development of land, easements, rights-of-way, buildings, or facilities; and purchase of equipment, leasehold improvements, machinery, supplies, or inventory.

GRANT PROGRAMS

In past years the Departments of Energy and Agriculture have administered grant programs for which biomass projects have been eligible. The DOE and USDA both administer programs for which projects meeting specific criteria may qualify. Here are the goals of the US Forest Service 2010 Hazardous Fuels Woody Biomass Utilization Grant:

- Reduce forest management costs by increasing the value of biomass and other forest products generated from hazardous fuels reduction and forest health activities;

Small-scale forwarder unloading smallwood pulp and hog fuel "logs" from overgrown Christmas tree plantation thinning operation in Bonners Ferry, Idaho. October 2008. Photo by Barry Wynsma, USFS

- Create incentives and/or reduce business risk for increased use of woody biomass from priority forestlands identified either by the Forest Service or through local Community Wildfire Protection Plans (or equivalent documents) as forestlands and other areas at high risk from wildfires and in need of hazardous fuels reduction work;
- Implement projects that target and help remove economic and market barriers to using small-diameter trees and woody biomass; and
- Produce renewable energy from woody biomass, including the use of new technologies.

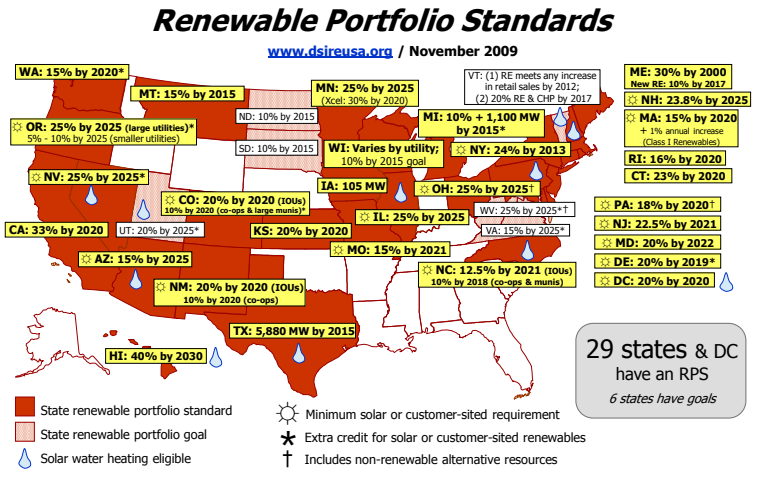
Again, as mentioned in Chapter 12, a caution when it comes to grants: many community based log sort yards and biomass feedstock yards have come about as a result of grant funding, unfortunately when the source of grant funding dries up, the yard/facility may face a new challenge. It is important to develop a self-sustaining biomass enterprise rather than one supported by grant dollars. There might have been a public interest identified in obtaining the public grant assistance, if so, local public assistance may be part of the business model for the long-term.

FEEDSTOCK INCENTIVES

On many occasions the federal government has provided commodity incentives to meet specific needs or policy objectives. This market mechanism has also been used as a production incentive for biomass. At present, a federal biofuels production incentive is available for new or expanded biomass production, known as the Biomass Crop Assistance Program (BCAP). The Program will provide cost-share payments (also called matching payments) for the collections, harvest, storage, and transport of biomass crops to user facilities at a rate to match the biomass sale price, up to $45 per dry ton for two years. Delivery payments are made to producers of eligible crops or to persons with the right to collect or harvest eligible materials. To receive delivery payments, producers must be within an economically practicable distance from a conversion facility based on the expected cost of transporting a feedstock to the facility. These provisions are included under the Energy Title (IX) of the Food, Conservation, and Energy Act of 2008. Details of the agreement and of the Bioenergy Program are available via the Internet at http://www.fsa.usda.gov/Internet/FSA_File/bcap09.pdf.

STATE INCENTIVE PROGRAMS

Like the federal government, many states have elected to encourage biomass use through a variety of incentive mechanisms. The specific components of incentive programs vary from state to state as a result of differing public policy objectives and state constitutional provisions.



States with Renewable Portfolio Standards (RPS), taken from the Database for State Incentives for Renewables & Efficiency (DSIRE), available on the internet at: http://www.dsireusa.org website, December 8, 2009

PRODUCTION PAYMENTS AND CREDITS

States have provided production incentives directly, through a payment from the state to the biomass producer, or indirectly, through a credit mechanism that can be sold for cash. Production incentives are typically performance-based incentives requiring a producer to process specified quantities of biomass in order to earn the incentive.

LOAN AND LOAN GUARANTEE PROGRAMS

Like the federal loan programs described earlier, several states have adopted loan and loan guarantee programs to provide a source of funding for biomass and other alternative fuel projects. These programs balance conventional lending practices with the risk of starting a new or unconventional venture in biomass market development or processing. Risk may be attributable to uncertain feedstock availability or price, inexperienced management or other factors. Coupled with the risk assessment factors is the need by project developers for favorable loan terms. Conventional lenders tend to impose extremely difficult terms on high-risk ventures if they participate. Such terms may be contrary to the needs of the project. Loan and loan guarantee programs, to be effective, must recognize these challenges at the outset. One variation of these programs is the so-called "forgivable loan", which is, in effect, a grant to the project in the event of project failure. This feature is attractive to project developers and can be designed with more stringent eligibility criteria to help improve the prospects of a successful venture.

EQUITY INVESTMENT PROGRAMS

Several states have offered targeted equity investment programs specifically designed to provide capital financing for renewable energy projects.

OTHER PRODUCTION INCENTIVES

States use a variety of incentive packages to attract processing facilities to their respective states. Many of these conventional incentives can be adapted to biomass projects. These preferential incentives are typically tied to a specific public policy objective. For example, Iowa designed a program specifically intended to spur investment in value-added processing facilities located in rural areas of the state. Feedstock cost rebates are another mechanism that can be used to encourage biomass production. Feedstock rebates may be used to offset the cost of specifically targeted materials. This approach provides more stability to projected economics of a project and may help mitigate risk for potential lenders or investors. Guaranteed purchase contracts are another form of incentive that can lend stability to the economics of a start-up venture.

LOCAL INCENTIVES

Local incentives are typically in the form of site concessions that may include cost underwriting or similar concessions to make a specific location more attractive. The competitive nature of industrial recruitment generally fosters an environment in which the developer of a project can negotiate a variety of concessions that make the project more economically attractive to lenders and investors. These factors should be recognized and quantified when specific sites are considered. Project analysts should also review existing incentives for projects constructed in specified areas of the state. These incentives should be quantified to determine value within the context of the total project cost.

References

A number of websites and organizations provide funding guides. One of the most recent publications is from the Michael Fields Agricultural Institute (MFAI), National Center for Appropriate Technology (NCAT). The publication called, Building Sustainable Places Guide covers 64 grant, loan, and other resources from USDA and other federal agencies. The Guide is available in hard copy and also on the website of NCAT's Appropriate Technology Transfer for Rural Areas (ATTRA) program: http://www.attra.ncat.org/guide/.

Chapter 15. Sources of Technical Assistance

Preface

If contemplating sourcing woody biomass and/or establishing a woody biomass feedstock yard and have limited knowledge on the why's and how's of getting started it is wise to seek out technical assistance.

State Forestry Agencies

Most, if not all, state forestry agencies have personnel that are trained and skilled in the area of wood utilization and marketing. The address and phone number for the local office of the state forester can usually be found in the state government section of the local phone book. Another way to get contact information for the state forester is through an internet search of state government offices or the National Association of State Foresters (NASF) (www.stateforesters.org). The NASF internet website has a page showing a map of the U.S. and with a click of the mouse on a state, the state forester's phone number, email address, and webpage is obtained.

The internet website of each state forestry organization will usually provide a listing of key offices and personnel. A quick call to the state forester's office will determine if they have a wood utilization and/or woody biomass specialist available with a wealth of information on any questions on woody biomass utilization and/or setting up a woody biomass feedstock yard. They will also be a tremendous asset in terms of additional sources of information and technical assistance to answer questions and provide a thoughtful process for next steps in the journey. The state forester may also be able to identify someone in the state who has an operational woody biomass enterprise and feedstock yard.

State Colleges and Universities

Additional information and support for woody biomass technical assistance can often be found at the state level in forestry colleges or forestry departments at state universities (http://www.csrees.usda.gov/qlinks/partners/state_partners.html).

Nearly every county seat in the U.S. has a county extension office that is linked to a state university. If not a local county office, there is usually a multi-county extension service office. In both cases they are an important link to forestry as well as woody biomass expertise at state colleges or universities. As with state forestry organizations, the county extension service office can usually be found in the listing of state governments in the local telephone directory.

Federal Agencies

The Federal Woody Biomass Utilization Group (Woody BUG) maintains a website with a variety of technical information, including desk guides for each federal land management agency. (http://www.forestsandrangelands.gov/Woody_Biomass/wbug.shtml). The desk guides provide federal land managers advice on site selection and preparing biomass projects and may give insights into the planning and contract mechanisms for local projects. Woody BUG also has current information on federal grant programs, equipment and bioenergy conversion technology, as well as research and development: http://www.fs.fed.us/woodybiomass/.

Other sources of technical assistance are the USDA Forest Service and U.S. Department of Energy. The USDA Forest Service has two primary resources. One is the Forest Products Laboratory (FPL) in Madison, Wisconsin (http://www.fpl.fs.fed.us). The second primary source of woody biomass related technical assistance is through the State and Private Forestry offices in the regional offices of the U.S. Forest Service. The regional offices can be accessed through the USDA Forest Service website (http://www.fs.fed.us).

USFS State and Private Forestry provides support for special units or centers that directly assist State Foresters and others. The Technology Marketing Unit (TMU) located at FPL which is dedicated to utilization and marketing of woody biomass (www.fpl.fs.fed.us/tmu). The TMU staff serves as a primary source of expertise and information for wood utilization and administers the Hazardous Fuels Woody Biomass Utilization Grants Program. In addition, the TMU staff convenes a major biannual Smallwood Conference to bring biomass and smallwood practitioners and professionals together for networking and learning. For a sense of the types of topics covered here are the results of the 2006 and 2008 Smallwood Conferences:
http://www.forestprod.org/smallwood06powerpoints.html,
http://www.forestprod.org/smallwood08powerpoints.html.

The Wood Education Resource Center (WERC) provides managerial and technical support to help businesses stay competitive. The center offers state-of-the-art training, technology transfer, networking opportunities, applied research, and information to the 32 hardwood states of the eastern US. There services can be found at (http://www.na.fs.fed.us/werc/). The National Agroforestry Center (NAC) combines agriculture and forestry to create integrated and sustainable land-use systems. Agroforestry takes advantage of the interactive benefits from combining trees and shrubs with crops and/or livestock. Short rotation woody crops can be an important addition to developing and sustaining a supply of woody biomass feedstock. The NAC provides technical assistance in the training and application of agroforestry practices. There service can be found at (http://www.unl.edu/nac/#about).

In addition, the offices of USFS Forest Supervisors and District Rangers as well as state and local BLM offices can also be an excellent source of information and technical support particularly when it comes to conducting an assessment of the availability of local federal woody biomass resources.

The U.S. Department of Energy (http://www.energy.gov) is another great source of information and technical assistance, especially in regard to renewable energy including biomass. The DOE Office of the Biomass Program (http://www1.eere.energy.gov/biomass) has information on federal grants, advanced science and technology, and deployment for all forms of biomass. Also within the Energy Efficiency and Renewable Energy program area is the Federal Energy Management Program (FEMP), which provides advice along with technical and financial assistance to federal agencies interested in developing renewable energy projects.

The DOE Energy Information Administration (http://www.eia.doe.gov) maintains data and statistics on energy production and use including renewable energy and biomass.

DOE also has a number of laboratories which specialize in biomass energy applications and research, such as the National Renewable Energy Laboratory in Golden, CO (http://www.nrel.gov/biomass) which maintains information on research & development, project deployment, and financial assistance.

The Oak Ridge National Laboratory (http://www.ornl.gov/) in Oak Ridge, TN has information on biomass feedstock development (http://bioenergy.ornl.gov/main.aspx). The National Energy Technology Laboratory in Pittsburgh, PA and Morgantown, WV have staff focused exclusively on woody biomass and landfill gas project development (Biomass and Alternative Methane Fuel Program) and may be able to provide advice on developing new woody biomass feedstock yards and bioenergy facilities (For more information contact Craig Hustwit, BAMF Program Manager, NETL, 412-386-4532).

The Environmental Protection Agency has an office of State and Local Climate and Energy Programs (http://www.epa.gov/cleanenergy/energy-programs/state-and-local/recovery.html) and has recently published a handbook titled "State Bioenergy Primer" which contains information and resources for states on issues, opportunities, and options for advancing bioenergy (http://www.epa.gov/cleanenergy/documents/bioenergy.pdf).

Other State Agencies

As with state forestry agencies, every state also has offices that are equivalent at the state-level to DOE and EPA and which will have technical information and resources on energy and environment issues. Again, contact information can easily be accessed from most state government internet websites.

A good partner in land conservation practices and active forest management is the National Association of Conservation Districts (NACD). NACD has been a significant supporter of wildfire hazardous fuel reduction through woody biomass utilization. NACD is the nonprofit organization that represents America's 3,000 conservation districts and the 17,000 men and women who serve on their governing boards. Conservation districts are local units of government established under state law to carry out natural resource management programs. Districts work with cooperating landowners and operators to help them manage and protect land and water resources on all private lands and many public lands in the United States. NACD also works closely with the National Association of Resource Conservation and Development Councils (RC&DCs). The local RC&DC may have programs to support small businesses working in land conservation and resource development. Check with your local land management agencies and economic development advisors for a local contact.

Industry and Non-Profit Associations

There are a number of industry associations which may be able to provide technical assistance or political support. For example, the Biomass Power Association is the nation's leading organization working to expand and advance the use of clean, renewable biomass power. The Association represents 80 biomass power plants in 20 states across the U.S., and feedstock issues are always of great interest to their members (http://www.usabiomass.org/index.php).

The Biomass Thermal Energy Council (BTEC) is a nonprofit association dedicated to advancing the use of biomass for heat and other thermal energy applications. BTEC is an association of biomass fuel producers, appliance manufacturers and distributors, supply chain companies and non-profit organizations that view biomass thermal energy as a renewable, responsible, clean and energy-efficient pathway to meeting America's energy needs (http://www.biomassthermal.org/).

The Pellet Fuels Institute is a non-profit association that serves the pellet industry, which is comprised of pellet mills, pellet appliance manufacturers and industry suppliers. The Institute is active in educating consumers about the convenience and practicality of using wood pellet fuel in both residential and commercial applications (http://www.pelletheat.org/2/index/index.html).

The Montana Community Development Corporation in Missoula, MT provides an excellent service titled the Smallwood Utilization Network (SUN). SUN offers a broad network to address and keep practitioners informed on the complex set of challenges in supply, production, and marketing for emerging biomass and smallwood industries. In addition, SUN publishes Smallwood News which provides an email newsletter and on-line forum for practitioners to keep abreast of the latest developments and opportunities associated with these industries (http://www.smallwoodnews.com).

Chapter 16. A Feedstock Yard Project Checklist

Biomass Feedstock Yard Project Checklist (modified from Sneller, 2006)
Project Development Tasks

Action	Responsible Party	Due Date	Status
Equity Formation/Agreements			
Selection of Legal Business Entity & Articles of Organization			
Retain Legal and Financial Advisors			
Raise Seed Capital			
Identify Project Development Team			
Identify Initial Board of Directors			
Conduct Preliminary Feasibility Study			
Develop Business Plan			
Negotiate Letter of Intent with Design/Build Firm			
Investigate Public Funding Sources			
Conduct Initial Meetings with Biomass Suppliers			
Evaluate Transportation Options			
Evaluate Primary Site Options			
Draft Operating Agreement			
Negotiate Contribution Agreement			
Develop Memorandum of Understanding Amongst Equity Partners or Agencies			
Review Environmental Permit Process			
Develop Draft Permitting Plan			
Develop Confidentiality & Nondisclosure Agreements			
Review Plant Layout Options			
Site Evaluation and Selection			
Determine proximity to Biomass Supplies			
Conduct Water & Soil Tests			
Conduct Plat Survey			
Conduct Historical & Archaeological Assessment			
Assess Community Concerns & Ordinances			
Conduct Property Identification & Acquisition			
Determine Prevailing Wind Direction			
Submit Air Permit Applications			
Assess Transportation Needs & Availability			
Design Transportation Plan & Agreements			
Submit Construction Permit Applications			
Apply for Water Permits & Negotiate Allocation			
Obtain Title Commitment			
Obtain Deed			
Obtain Bill of Sale			

Site Evaluation and Selection (continued)

Conduct Closing			
Check out Zoning Requirements			
Submit Applications for Zoning and Permits			
Prepare Public Announcement of Intent			
Conduct Media Relations			
Implement Community/Site Outreach			

Due Diligence

Site Access			
Finalize Highway Plan & Funding Sources			
Provide Development Details to Local & County Commissioners			
Provide Final Site Plan to State Transportation Dept.			
Conduct Road Transfer to State			
Conduct Traffic Study			
Finalize Transportation Plans			
Finalize Letters of Intent for Construction			
Negotiate Contract Details			
Negotiate Agreement on Scope of Work			
Finalize Utilities Services Agreements			
Complete Fire Prevention & Water Storage Plans			
Negotiate Use and Consumption Rates for Water, Sewer, Electric, and Natural Gas			
Finalize Annexation Plans			
Obtain Necessary Easements			
Determine any Existing Domination or Restrictive Easements			
Complete Water Rights Contracts			
Determine Any Existing (source/purpose of use/ Place of use/season of use) Restrictions			
Apply for Any Necessary Transfers			
Select/Retain Project Manager			
Monitor Environmental Permit Applications			
Determine Soils, Drainage, & Ground Water Levels			
Conduct Periodic Physical Inspections			
Check out Zoning Requirements			
Review Comprehensive Planning/Zoning Ordinances			
Determine Need for Special or Conditional Use Permits			
Develop County Contracts			
Develop City Contracts			
Assess Existing Leases, Agreements, Orders			
Obtain Extended Title Coverage			
Conduct Flood Plain Assessment			

Transportation Plans & Costs Finalized/Bid

Review of Permit Status and Public Hearings With County, State, and Federal Governments			

Final Review of Water Permit & Use

Wastewater			
Receiving Water			
Water Quality Designation			
Process Water			
Storm Water			
Discharge Temperature			

Air Emissions Control Plan Finalized

Conduct Pre-Application Site Visit			
Conduct Permit Review & Application			
Conduct Permit Negotiations			
Obtain Construction Permit			
Determine Attainment/Non-Attainment Areas			
Determine Any Special or Conditional Uses			
Complete Zoning Resolutions			
Conduct Plant Tours			

Financing

Make Debt/Equity Determinations			
Develop Business Prospectus			
Conduct Insurance/Risk Mitigation Studies			

Tax Incentives

Develop Contracts			
Develop Block Grant Agreements			
Finalize Terms of Financial Agreements			

Feedstock Contracts

Identify Biomass Supply Sources			
Conduct Biomass Availability Assessment			
Develop Biomass Procurement Plan			
Develop Letters of Intent & Supply Contracts			
Execute Supply Agreements & Contracts			

Negotiate Final Project Capitalization

Negotiate Requirements With Senior Lenders			
Complete Final Business Plan & Financial Projections for Private Placement Memorandum or Public Offering Documents			
Finalize Sources of Project Equity			
Negotiate & Sign Loan Documents			
Conduct Securities Registration			
Determine Securities Exchange Commission Requirements			
Determine State Registration Requirements			
Maintain Investor Communications			
Develop Local Contracts			
Finalize Construction Timeline			
Obtain Required Permits for Construction			
Proceed to Construction Phase			

Appendix 1. Additional Resources

A good source of information about biomass cooperatives and the examples of success and failures can be found in the following WBUG White Paper:

Hassler, C. C., T. L. Pahl, and S. T. Grushecky. 2009. Woody Biomass: Cooperatives, Pricing, and Supply Agreements. http://wvbiomass.org/index.php?option=com_jdownloads&Itemid=66&task=finish&cid=36&catid=6

Several general publications to planning and assessing needs include:

Ashton, S. and L. Mcdonnell. 2009. Woody biomass desk guide and toolkit. National Association of Conservation Districts. Washington, D.C. 188 p. http://www.nacdnet.org/resources/guides/biomass/#reference

Wynsma, B; R. Aubuchon; D. Len; M. Daugherty; and E. Gee. 2007. Woody biomass utilization desk guide. U.S. Department of Agriculture, Forest Service. National Technology and Development Program. Forest Products Laboratory. September 84 p.

There are numerous publications on Business Plan Development, some of the best, targeted at the forest products industry, is:

Howe, J. and S. Bratkovich. 2005. A Planning Guide for Small and Medium Size Wood Products Companies, US Forest Service, Northeastern Area State and Private Forestry, 1992 Folwell Ave., St. Paul, MN 55108. USFS publication No. NA-TP-03-05. http://na.fs.fed.us/spfo/pubs/misc/keys/wp_planning_guide.pdf

Pepke, E. 1993. How to write business plans for forest products companies. Northeastern Area, State and Private Forestry, USDA Forest Service, 1992 FoIwell Avenue, St. Paul, Minnesota 55108. USDA FS publication # NA-TP- 17. http://ir.library.oregonstate.edu/jspui/handle/1957/12299

A good resource for developing a marketing plan is:

Smith, R.L., Cesa, E., and P. Rappold. 2008. A marketing guide for small and medium sized primary forest products processors. US Forest Service, Northeastern Area State and Private Forestry, 1992 Folwell Ave., St. Paul, MN 55108. USFS publication # NA-TP-02-07CD. http://www.na.fs.fed.us/pubs/forest_products/marketing_guide_na-tp-02-07cd.pdf

US Forest Service Utilization Specialist Rusty Dramm, and Ted Bilek, Forest Research Economist have done work on log sort yards. Much of the technical information found in this Guide is drawn from their research and knowledge. Here are their principal papers on log sort yards:

Bilek, E.M. 2009. LSY: a financial analysis tool to evaluate the economics of log sort yards. General Technical Report GTR-184. Madison, WI: U.S. Department of Agriculture, Forest Service. Forest Products Laboratory. June 38 p. (*refer also to section "Woody Biomass Feedstock and Related Business Spreadsheet Tools"*)

Dramm, J.R. 2007. Truck to rail woodchip loading facility. State and Private Forestry Technology Marketing Unit, Madison, WI: U.S. Department of Agriculture. Unpublished report.

Dramm, J.R.; Govett, R.; Bilek, T.; Jackson, G.L. 2004. Log sort yard economics, planning, and feasibility. FPL–GTR–146. Madison, WI: U.S.D.A. Forest Service, Forest Products Laboratory. 31 p.

Dramm, J.R.; Jackson, G.; Wong, J. 2002. Review of log sort yards. FPL–GTR–132. Madison, WI: U.S.D.A. Forest Service, Forest Products Laboratory. 39 p.

Han-Sup, H; T. Bilek; R. Dramm; D Loeffler; and D. Calkin. 2009. Financial feasibility of a log sort yard handling small-diameter logs. In Proceedings of 2009 COFE: Environmentally Sound Forest Operations 32nd Annual Meeting of the Council on Forest Engineering. June 15-18, 2009. North Tahoe Conference Center, Kings Beach, California

Other References:

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Bergman, R. and J. Zerbe. 2004. Primer on wood biomass for energy. USDA FS, State and Private Forestry Technology Marketing Unit, Forest Products Laboratory, Madison, WI. 10 p.

Govett, R.; S. Bowe; T. Mace; S. Hubbard; J.R. Dramm; and R. Bergmann. 2006. Wood fueled boiler financial feasibility user's manual. University of Wisconsin Forestry Extension. Madison, WI. 13 p. (*refer also to section "Woody Biomass Feedstock and Related Business Spreadsheet Tools"*)

Sneller, Todd and Douglas Durante. 2006 A guide for evaluating the requirements of ethanol plants. Developed by The Clean Fuels Coalition and The Nebraska Ethanol Board in cooperation with the U.S. Department Of Agriculture. 52 p.

U.S. Environmental Protection Agency. 2009. State bioenergy primer: Information and resources for states on issues, opportunities, and options for advancing bioenergy. 104 p.

Woody Biomass Feedstock and Related Business Spreadsheet Tools:

Online downloadable financial feasibility and product recovery spreadsheets for sawmills an related forest products.

Log Sort Yard Cash Flow Analysis (LSY)—a spreadsheet-based model, LSY (Log-sort Yard Cash Flow Analysis), has been constructed to aid in the pre-feasibility and financial feasibility analysis of log-sort yards. The spreadsheet analysis program is meant to be referred to concurrently with the LSY documentation.

Available from the Forest Products Laboratory website at:

http://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr184/LSY3.01.xls (*program*)

http://www.fpl.fs.fed.us/documnts/fplgtr/fpl_gtr184/fpl_gtr184.pdf (*manual*)

Wood Fueled Boiler Financial Feasibility—the Wood Fueled Boiler Financial Feasibility program provides a starting point for interested parties to perform financial feasibility analysis of a steam boiler system for space heating or process heat. Manual provides an overview of "Wood Fueled Boiler Financial Feasibility," a spreadsheet program designed for easy use on a personal computer. The program provides a starting point for interested parties to perform financial feasibility analysis of a steam boiler system for space heating or process heat.

Available from the University of Wisconsin's Forestry Extension website at:
http://www.fwe.wisc.edu/extension/BoilerProgram.xls (*program*)

http://www.fwe.wisc.edu/extension/boilermanual.pdf (*manual*)

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Appendix 3. Success Stories

Examples of successes and failures in developing biomass feedstock centers

Private Enterprise Biomass Sort Yards

Community Smallwood Solutions, Wallowa, Oregon was originally formed through a community partnership (Wallowa Resources) that saw a need for a small wood enterprise to meet their forest restoration goals. Community Smallwood Solutions is a manufacturer of posts, poles, house logs, etc. One service is serving as a log and biomass sort yard (the local school is the first Oregon school to convert from fuel oil to woody biomass for heating).

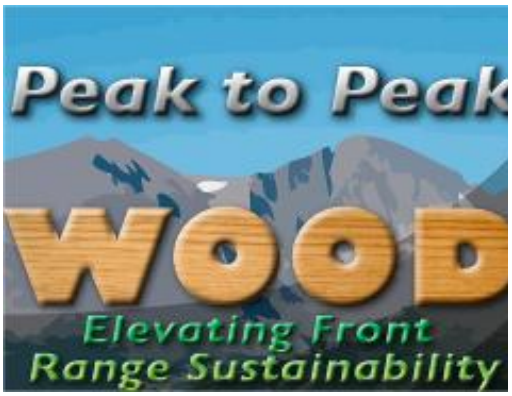
http://www.communitysmallwood.com/home.html

Creston Valley Forest Corporation was originally formed by a coalition in order to secure a Forest License (long term timber management contract) from the British Columbia government. The original coalition went into incorporation (the corporation originally had five shareholders, each with 20% of the shares: the Town of Creston, the Regional District of Central Kootenay, the Creston Area Economic Society, the Lower Kootenay Indian Band, and the East Kootenay Environmental Society) and operated a log sort yard amongst other enterprises. The log sort yard is now managed by the Tribal enterprise. Also see background information at: http://www.familyforestrysymposium.wsu.edu/Proceedings1/httpdocs/table-of-contents/pdfs/low-res/Smith.pdf

http://www.forrex.org/JEM/ISS15/vol3_no1_art4.pdf

Community-based Biomass Sort Yards

Peak to Peak Wood, in the Front Range of Colorado, is funded through a US Forest Service grant for the marketing and utilization of forest products, and administered by the Colorado State Parks and Open Space and the Colorado State Forest Service (CSFS). Peak to Peak Wood is a five-county effort (Boulder, Clear Creek, Gilpin, Jefferson, Larimer) in Colorado's northern Front Range to create markets for products coming from fire-threatened public and private forests in order to lower treatment costs. Landowners can deliver small logs to the community sort yards (minimum specifications must be met) http://www.peaktopeakwood.org/



Logo for Colorado's "Peak to Peak Wood" Project. Date and source unknown per conversation with Craig Jones of CSFS.

FSCNC Fire Prevention Wood Use Center, created by the Fire Safe Council of Nevada County (FSCNC), and funded by a Community Wildfire Protection Grant through the Bureau of Land Management (BLM). The Nevada County Fire Safe Council pioneered this idea in the Sierra Nevada with the development of a "Fire Prevention, Wood-Use Sort Yard". They had planned to turn the wood chips generated from their community yard-chipping program that helps homeowners create defensible space into landscaping mulch to be sold around the state and other wood products as markets develop. The sort yard was supported by a local environmental coalition, the Sierra Forest Legacy (see biomass utilization on SFL website at http://www.sierraforestlegacy.org/)

http://www.firesafecouncilnevco.com/woodcenter.htm. The project ultimately failed due to concerns over the noise and traffic, as well as challenges in securing a reliable supply of biomass (the Sierra Forest Legacy, for example, did not really support active management).

"Virtual" Biomass Sort Yards

TimberBuy/Sell, created by the Montana Community Development Corporation (MCDC) in Missoula, Montana, and with the help of the local US Forest Service State and Private Forestry expert (Dean Graham), the TimberBuySell.com allows users to create, post, and search for information about sales of forest resources and related transactions. The website covers core products such as standing timber, logs, forest residue, and mill by-products in the U.S. and Canada. http://www.timberbuysell.com/Community/Default.asp

UP Woody Biomass Exchange, a creation of BURN-UP (Biomass Utilization and Restoration Network for the Upper Peninsula). Developed by the local Resource Conservation and Development Council in the Upper Peninsula of Michigan, this woody biomass network looks like a "virtual sort yard" concept, much like the network that Craig Rawlings has done in MT (TimberBuy/Sell). The goals of BURN-UP are: promoting increased use of wood as a fuel for a wide variety of applications because of its many economic and environmental advantages over non-renewable fossil fuels, and providing information about the environmental risks of excessive or poorly located biomass harvesting. The UP Woody Biomass Exchange seeks to stimulate the development of a sustainable woody biomass industry in Michigan's Upper Peninsula by providing a central clearinghouse for information on all aspects of woody biomass production and utilization in the region and a free, interactive service for buyers & sellers of woody biomass.
http://www.upwoodybiomass.org/markets.asp