A Crash Course
Supply-Shed Economics

By Pete Stewart

Opportunities for those entering the wood bioenergy industry abound. With a seemingly ample supply of feedstock and a policy environment that encourages construction of renewable energy plants as well as the production of renewable energy, the risk associated with entering this space has decreased considerably over the past several months. Still, many risks accompany embarking on this endeavor. The largest risks at earlier stages of development include the ability to raise the necessary capital and to demonstrate profitability over the long-term. Reducing the risks associated with feedstock procurement can help wood bioenergy companies meet both of these challenges.

From a purely existential perspective, forest resources are abundant. "The Billion-Ton Study," for instance, suggests that 368 million dry tons of forest resources are available for bioenergy production in the contiguous United States annually: "52 million dry tons of fuelwood harvested from forests, 145 million dry tons of residues from wood processing mills and pulp and paper mills, 47 million dry tons of urban wood residues including construction and demolition debris, 64 million dry tons of residues from logging and site clearing operations, and 60 million dry tons of biomass from fuel treatment operations to reduce fire hazards."

Just because the supply is abundant does not necessarily mean it can be delivered to a bioenergy plant on a regular and consistent basis or according to a strict schedule, however. In other words, there is a gap between forest inventory numbers and actual availability, or the amount that can reasonably be removed from the forest. In fact, feedstock availability depends on multiple factors that cannot easily be managed with supply agreements. These factors include the fluctuating economic cycles of the forest and wood products industries, seasonality, weather patterns and events, and the availability of timber for harvesting in a given supply shed at a given time.

Because of the complexity of these dynamics, determining a successful procurement strategy requires both knowledge of the economic factors in the specific supply shed in which a plant is operating and a strategic plan that accommodates these realities.

Feedstock Chain

The availability of feedstocks, whether it is in-woods biomass, mill residues or urban wood waste, will be limited by the fact that each is a byproduct of some other—primary—process. Each of these primary processes—harvesting, sawmill production, pulp and paper mill production and construction—occurs in a market where supply and demand dynamics vary. The economic cycles associated with these processes ultimately determine the amount of feedstock available for purchase.

When demand for pulpwood and sawtimber rises, for instance, an increased volume of timber is harvested, thereby creating a more robust supply of in-woods biomass. When markets for sawtimber or pulpwood are depressed, on the other hand, biomass supply will shrink. Demand for lumber and other building materials and paper products will drive availability of mill residues in a similar way. When demand for these products is high, the supply will expand; when demand is lower, the feedstock supply will contract.

When demand for primary products (and therefore feedstock supplies) shrink, loggers and mills have very little incentive to deliver residues to bioenergy companies. Why? Production of this feedstock will almost exclusively be an ancil-

lary process for bioenergy suppliers. Loggers, sawmills and pulp and paper mills make their profits from their primary processes—harvesting longwood, manufacturing lumber and building materials and producing paper and containers. Selling residue is an adjunct process that will contribute only marginally to their bottom lines.

In addition to market ups and downs driven by macro- and microeconomic factors, the primary industries producing the feedstocks are subject to seasonal patterns of supply and demand. Spring brings an uptick in homebuilding activity. The impending start of school marks an upswing in demand for paper. Holiday seasons generally set off vacation and maintenance curtailments at sawmills.

Weather patterns and events also expand or shrink the supply of residual materials. Harvest schedules are often at the mercy of the weather. In certain terrains, harvesting is difficult and costly in wet weather. Hurricanes can mean significant expansion in municipal wood waste and represent good opportunities for bioenergy companies to build inventory.

Another factor affecting feedstock supply will be timber availability. Loggers and brokers who enter into supply agreements to deliver material to a particular facility rely on the willingness of timberland owners to sell. Often, though, owners withhold timber from the market in an attempt to garner a better price and maximize profits. Though loggers make good faith efforts to supply the contracted material, a prospective buyer does not have much recourse when timberland owners are unwilling to sell.

Because of these largely uncontrollable factors, a longstanding practice in the industry favors supply agreements that contain loose volume controls—they recognize the difficulties associated with volume guarantees in a market where certain risks are beyond human control. As a result, supply agreements traditionally contain no penalties for failure to deliver; they merely specify the price to be paid when materials arrive at their destination.

Plan For Efficiency

Because supply agreements cannot regulate the delivered volume of feedstock, the onus is on bioenergy companies to grasp the interplay of the factors affecting feedstock availability within individual supply sheds. In effect, no two supply sheds are alike. Success will chiefly be determined by whether a company builds into its business plans—from the outset—a thorough understanding of the specific supply shed in which it will be operating. Following are several guidelines:

- Right size the plant to the supply shed. There are two options here: choosing the size of the facility then finding a supply shed that will support the facility or finding a supply shed and then right sizing the plant to the supply available in the area. Our recommendation is to choose a smaller plant size and find a supply shed that can support its feedstock needs. Larger facilities carry more risk because they are more likely to have to reach into higher-cost classes of material or extend hauling distance to meet demand. Both of these will increase costs. Larger plants also require larger staffs in order to manage the complexities associated with the procurement, logistics and traffic flow involved with consuming large volumes of feedstock.
- Design plants with receiving capacities large enough to weigh and unload the required amounts of feedstock. A 50 MW wood biopower facility will require 500,000 tons of feedstock per year, approximately 2,000 tons per day. At approximately 25 tons per load, the facility will need to cycle 80 loads of feedstock per day through the facility. Accepting trucks 14 hours a day, a facility would need a minimum of one set of scales and two sets of truck dumps to handle this capacity. And that's just the beginning. Further layers of complexity are added by the intricate logistics of moving that many trucks through a facility.
- Design plants with inventory capacity large enough to accept feedstock when it is available and store it until it is needed for production. Planning a larger holding facility will allow a facility to take advantage of lower cost materials when they are plentiful.
- Build redundancy into higher risk feedstock sources. Wood products manufacturers represent the least risky suppliers. Relying on wood waste from landfills will involve considerable risk because it is seasonal and opportunistic in nature. In-woods biomass also involves significant risk, since it depends on available longwood harvests and because there is a shrinking infrastructure—both the number of loggers and the right equipment—to remove the material from the forest. Suppliers of these higher risk feedstock sources should be carefully vetted, and companies should plan to low-ball volume from each of these suppliers in order to avoid risk exposure. If the vetting process determines that a supplier has a capacity of 100,000 tons of material per year, contracting for a smaller portion of this number will reduce the risk the material won't be delivered. A company following this rule will be required to enter into agreements with multiple suppliers for each type of feedstock, and—here is the downside—this in turn will necessitate additional staff to manage these relationships.
- Acknowledge that a broad feedstock portfolio is both necessary and realistic. Thinking more broadly than biomass will result in plans that are pragmatic about feedstock costs, a key to receiving funding and long-term viability.
- Control price risk by indexing supply agreements and power purchase agreements to fair market prices. Just as companies manage the risk associated with variability in operational costs by indexing them to the producer price index, projects that manage risk this way will be more bankable.
- Understand the competition. What traditional forest and wood products companies operate in the supply shed? Which classes of materials do they consume? Which classes do they produce? What is the cost structure of these businesses? Based on capacity, how much additional supply might a competitor use/produce in the future? From this perspective, choosing a supply shed that can accommodate both new facilities and traditional industries is essential. If the supply is not sufficient to support both, price pressures could cause mill closures and job losses.
- Develop strategies for expanding the amount of in-

woods biomass available. Currently, there is a finite supply of in-woods biomass. State and federal laws determine the definition of biomass, sometimes in a way that limits what can be used to produce energy and qualify for incentives, grants and loans. Supporting legislation that expands the definition of woody biomass will lead to expansion of the supply.

- Partner with existing wood products companies to expand the amount of biomass that can be effectively removed from forests. One example would be to work with loggers, who have been hardest hit by the anemic housing market and the recession. Many have gone out of business. Others have postponed capital investments in equipment due to the lack of profits and credit. At a time when biomass markets are opening up, however, the credit needed to fund the purchase of biomass harvesting equipment is non-existent. By offering assistance to loggers, a company can mitigate much of the risk that comes with relying on biomass.
- Establish ties with state timber producer or logging associations. These associations are an invaluable source of information about local logging practices and regulations.

The single biggest factor for success for a wood bioenergy plant will arise from how well it understands the nature and characteristics of the forest resources and industries within its supply shed. In the course of our work at Forest2Market, we continue to hear bioenergy companies and others talk about the unlimited supply of biomass and the minimal costs of these materials. But, in addition to being myths, these ideas fail to reflect the complexity of the wood fiber supply chain, the economic cycles and seasonal patterns that govern supply and demand for wood fiber, and the effects of the introduction of new bioenergy facilities on both forest resources and the communities in which these resources exist.

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