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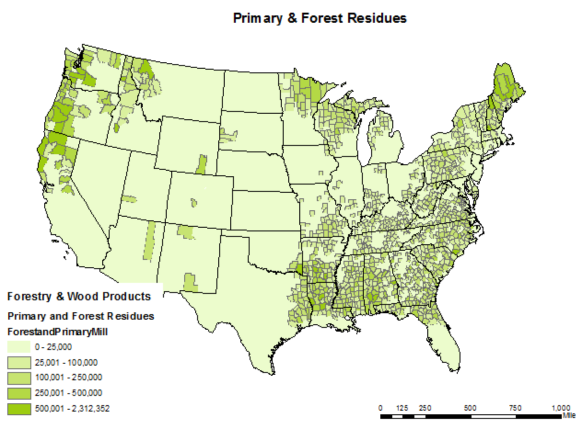
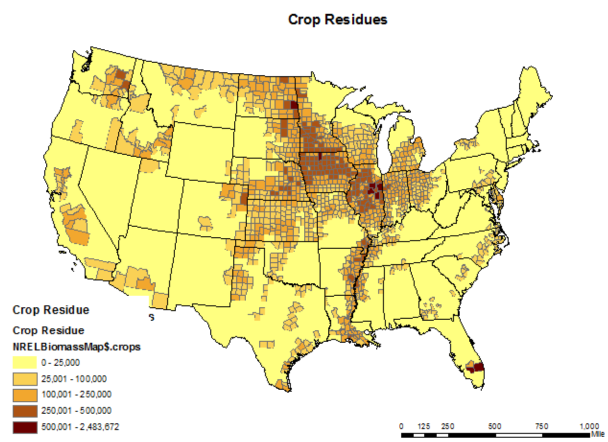
Understanding the Economic Drivers of Originating Biomass for Power Projects

Participation in the emerging biomass-to-energy industry requires knowledge of the origination, logistic, storage and handling challenges involved with the various biomass resources.

By Scott McDermott

Ascendant Partners Inc. has been working with a number of power, combined-heat-and-power and densification projects to better understand and implement options for lowering energy cost, for energy diversification and for lower carbon energy. What makes this analysis different today from past economic and business energy assessments is that many of the fuel sources being considered today were rarely considered fuel sources even three years ago. It takes a forward-looking approach to understand the current and potential macroeconomic drivers of a structurally higher energy price environment and growing body of greenhouse gas legislation such as the patchwork of state renewable fuels standards and the prospect of legislation for greenhouse gas emissions.





This article focuses on the economic drivers for the utilization of biomass as a feedstock for coal-fired boilers, biomass boilers and biomass gasification. There are many intelligent researchers focused on the technology of converting biomass to energy in all of its forms. What seems to be less understood are the economics and business challenges of biomass origination, logistics, storage and handling. The fact is, we are in the early stages of the evolution of the biomass-to-energy supply chain. While woody biomass residues, crop biomass residues and energy crops will be distributed across the country, their economics vary greatly.

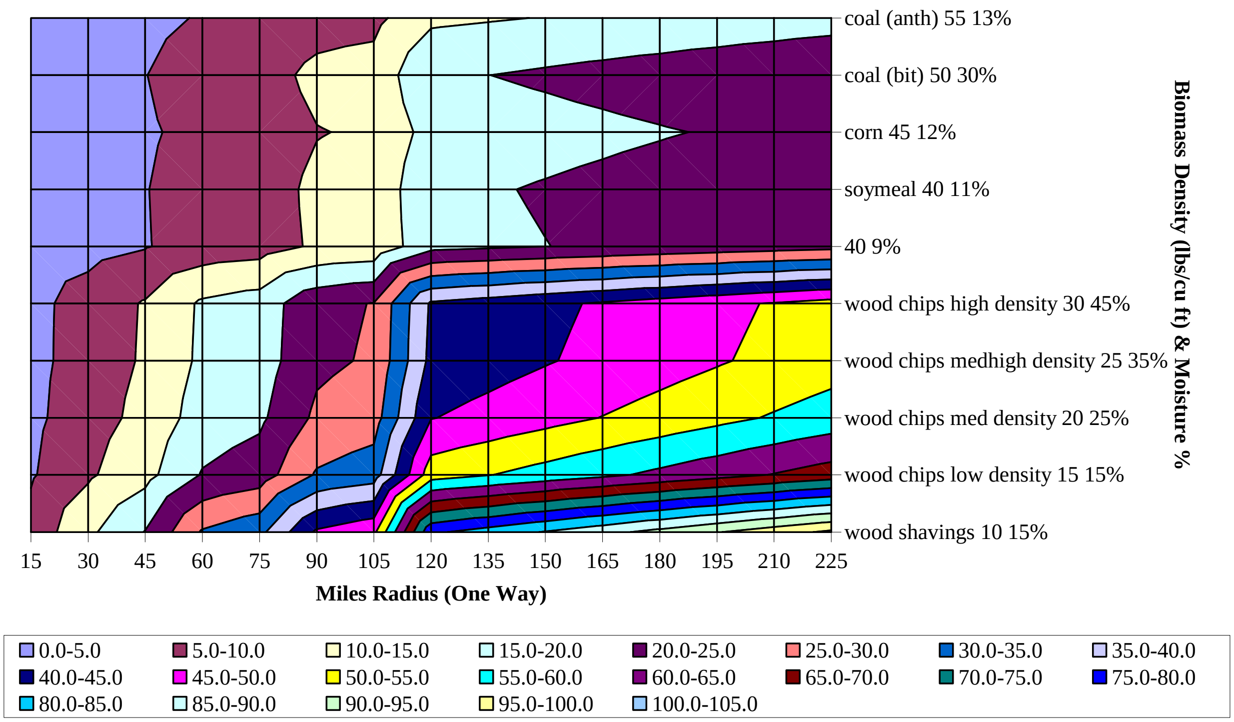
One of the most important points to keep in mind regarding the economic drivers of biomass resource acquisition is that all of the potential feedstocks being considered as a fuel source are either not being utilized today or are being utilized in other applications because of their relatively high cost and technical challenges as a fuel source. Most agricultural residues are returned to the soil because of their nutritive benefit in the crop-production cycle. Forest and wood residues are often either left in the forests, or the wood scraps are used as a base for compost, mulch or animal bedding or are recycled or go to the landfill. It is yet to be seen if energy crops' agronomic and indirect land use characterization will drive energy crops to be grown in more traditional growing areas or in new growing areas.

Manage Acquisition Costs

If energy prices continue to rise and carbon emissions become more regulated, more groups will be attempting to utilize these biomass energy resources. It is inevitable that their value will rise under these scenarios. Therefore, a key economic driver to consider for any group looking to utilize biomass as a feedstock is a long-term strategy to manage biomass acquisition costs. Many groups looking at biomass as a feedstock observe the current market pricing structure and assume it will stay constant. They, therefore, lock counterparties into contracts that will not stand the test of time or believe they will have time to renegotiate contracts when prices start to rise. A more prudent approach would be to work directly with prospective feedstock suppliers in contract relationships for some part of the biomass feedstock requirements. The long-term goal of these contracts should be energy competitiveness relative to an energy index such as natural gas that will allow the biomass supplier to participate in higher prices while prices are depressed.

The other economic drivers for biomass sourcing include bulk density and moisture content, storage, handling, logistics and energy quality. It does not matter if the discussion concerns energy crops, wood residue, agricultural residue or traditional agriculture and energy products, the fundamental economic drivers are the same. Bulk density defines how much mass can be loaded into a truck, train, barge or ship. The chart on page 91 shows a range of transportation costs per dry ton given different distances. A comparison can be made of the cost to move coal 120 miles to moving wood chips the same distance—the cost for wood chips being almost three times that of coal with the cost to transport wood shavings being as much as five times that of coal on a dry and moisture-adjusted basis. That is why densifying the biomass to manage acquisition costs when moving biomass long distances can be the lowest cost biomass feedstock option.

Biomass $ Transportation Cost / Dry Ton / Day



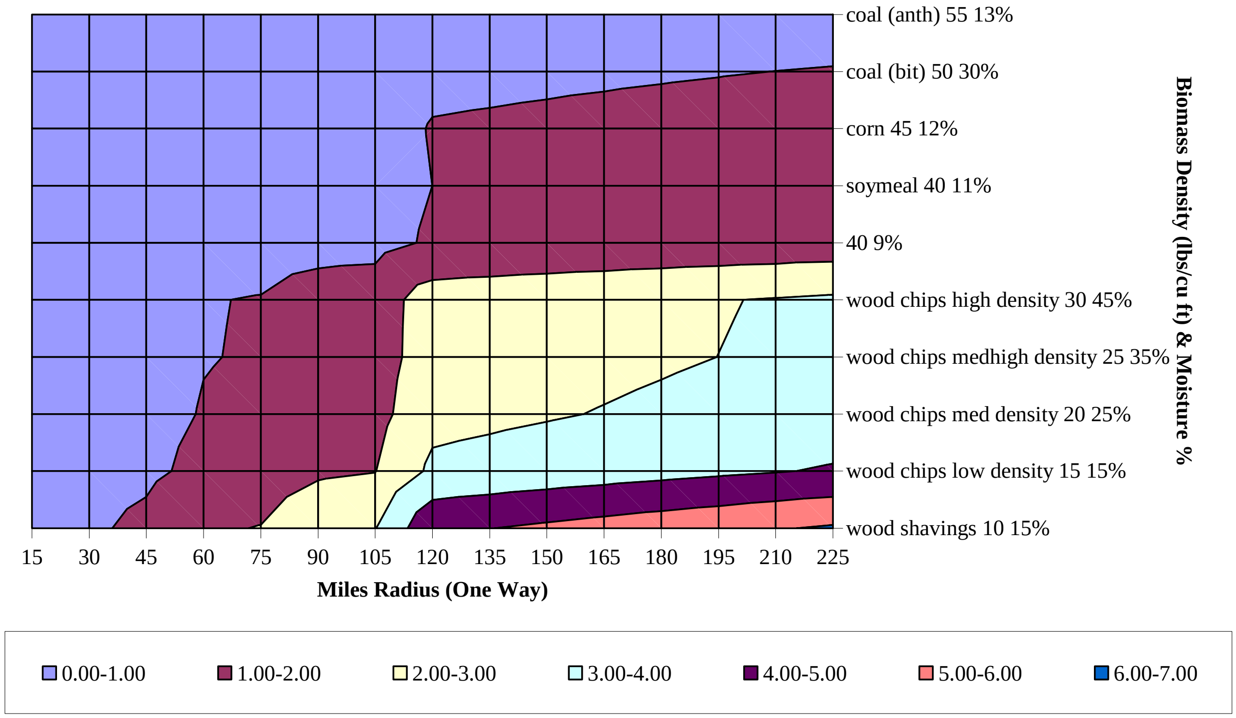
No one wants the additional expense of densification included in the cost of the biomass fuel; but if the biomass is being moved a long distance, this option may have to be considered. The densification process produces a product that is materially denser and drives moisture levels down. Another consideration is that densified biomass products can often be moved and handled in an established handling and storage infrastructure. As stated previously, the biomass-to-energy supply chain is in its early stages; and some of the collection, storage and handling systems that will be used in the future have yet to be developed. Being able to leverage existing infrastructure and technology can lower the capital requirements of the new biomass-to-energy systems.

Understanding Energy Quality

The concept of energy quality may seem strange, but when it comes to biomass energy feedstocks it is important. Unlike coal, biomass energy feedstocks are susceptible to the elements and degrade over time. This is a particularly important consideration when it comes to energy crops and agricultural residues because they degrade relatively quickly as they are exposed to weather. This has implications to the additional cost of storage and handling and the additional capital it takes to minimize degradation.

The final economic driver to consider is the energy or Btu content per unit of biomass feedstock. Powder River Coal, for example, has an energy content of about 11,000 Btu per dry pound compared with wood or agricultural residues, which are mostly 7,500 to 8,500 Btu per dry pound. The chart on page 91 shows a range of transportation costs per million Btu (MMBtu) given different distances. If the analysis above is extended to include energy cost per MMBtu, the cost to move coal 120 miles compared with wood chips increases to 3.75 times that of coal and wood shavings to almost 5.75 times that of coal. If the biomass feedstock is stored in a location that is susceptible to the elements, it can lose as much as 25 percent of its energy content, increasing the transportation cost disadvantage to five and 7.5 times, respectively.

Biomass $ Transportation Cost / MMBTU / Day



In the end, utilizing the best technology to convert your biomass feedstock to energy is important; but there are other material economic factors that drive the competitiveness of different low-carbon energy solutions. A power producer considering low-carbon emission biomass energy resources should understand the fuel's economic competitiveness and the business challenges of sourcing, storage, handling, transportation, infrastructure and energy quality and content in addition to conversion and purchase price. It is important to consider the biomass economic drivers in context of a forward-looking view about how the biomass feedstock will compete in future energy price environments and quantifying the lower carbon fuel benefits under current and proposed greenhouse gas and carbon regulation regimes. This combination will be beneficial in calculating the timing and best energy mix for the facility over the long term. BIO

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