

Establishing Long-Term Supply Agreements for Wood Energy Facilities



A Project of the
Empire State Forest Products Association

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Introduction

Wood supply is a critical piece of developing a biomass power project, and often one of the most challenging. Wood fuel can represent 80% or more of the operating cost of a biomass energy project. However, unlike most commodities and energy sources (e.g. coal, natural gas, and oil), wood fuel (or futures) cannot generally be securely purchased on long-term, fixed (or known) price contracts. In the Northeast, where wood energy has a long history of success, and public policy currently favors the increased use of biomass energy, there are a number of reasons for this, including:

- A disconnected supply chain, where no one party (e.g., a logger) controls other parts of the supply chain (e.g., land) sufficiently to guarantee future supply;
- A generalized belief on the part of potential suppliers that biomass markets will improve over time, and that entering into longer-term contracts will prove to be a disadvantage;
- Inability of suppliers to accurately forecast and hedge against changes in their cost structure, particularly volatility in diesel prices, a major component of biomass fuel prices;
- For suppliers that may consider entering into long-term supply arrangements, they are often small (by energy company financing standards), and not viewed as sufficiently “credit worthy” to enter into long-term contracts.

For biomass developers, and the institutions that finance them, the lack of a secure and known price fuel supply is a major obstacle to development. Developers are understandably nervous, and too often unwilling, to spend tens or millions of dollars (or more) on new biomass projects without knowing, with a high degree of certainty, what their fuel supply and costs will be. There have been biomass energy projects in the Northeast that have not moved forward because of fuel supply price / availability uncertainty.

This project evaluates models that meet the needs of all parties (supply chain, developers and financial backers), with a goal of determining a business model that can allow developers to purchase wood fuel with security of price and supply, addressing the challenges outlined above and other issues identified during research.

Methodology

In order to evaluate the needs, drivers, and business models that work best for the suppliers, developers and financiers of biomass energy facilities, surveys were conducted through interviews with a number of individuals, identified by participants in this project as having current or potential interest in biomass energy in New York.

The results of these surveys, slightly different for each party, are presented in the following sections. These surveys reveal critical information about how parties – particularly developers and suppliers – view the challenges and risks associated with biomass energy projects, and provide unique insight into how parties can recognize and potentially meet the needs of one another.

Following the completion and analysis of these surveys, a workshop was designed to engage participants in the subjects of what the business needs and risks of each party are, as well as identify business models that would help meet those risks.

The findings of this workshop are presented later in this report; the day provided a unique opportunity for developers, suppliers and others interested in the development of a biomass marketplace in New York.

Findings and Next Steps

Based upon the work conducted, the following next steps should be taken to help build the biomass supply infrastructure in New York.

1. **Establish a “Biomass Roundtable”**, where suppliers and developers can come together to mutually identify and address challenges. Through the surveys and workshop, it became apparent that these two groups, which rely upon one another, do not fully understand the business pressures and drivers of one another. The survey and workshop were recognized by many participants as a good first step in moving this discussion forward. The development of a more formal group, involving both developers and suppliers, could help move biomass energy issues forward...
2. **Evaluation of diesel (for diesel adjustment clause)** – In order to better understand how diesel fuel impacts the price of delivered biomass fuel, and thus allow buyers and sellers to adjust fuel prices based on changes in diesel fuel prices, information should be developed that allows all parties to better understand the role of diesel in biomass fuel production
 - a. Diesel used in different steps (harvest, skidding, processing, transporting)
 - b. Variables (skidding distance, prescription type, distance to market, etc.)
 - c. Differences based on product type (biomass chips, bole chips, roundwood, etc.)
3. **Development of briefing on how biomass developers can provide supplier financing** – A number of suppliers and developers expressed a willingness to explore opportunities for facility-based financing of biomass production equipment. In order to move this effort forward, models used in the forest industry and other industries should be explored and shared, and a legal review should be conducted delineate what steps need to be taken to avoid developing a “employee – employer” relationship between a lender / fuel purchaser and a borrower / supplier.

Biomass Supply Chain Survey Summary

The following summarizes the results of a phone survey of potential biomass energy developers in upstate New York. These suppliers were surveyed via phone by the Antares Group as part of a project of the Empire State Forest Products Association to find ways that suppliers, developers and financiers can work together to enhance the biomass supply chain. This project was funded by the USDA Forest Service and the New York State Energy Research & Development Authority (NYSERDA).

Biomass Energy Project Developer Survey

Participant Description: This survey's participants included 13 individuals that are involved in the development or operation of biomass or biofuel energy facilities in New York and the Northeast. The individuals belonged to three companies developing cellulosic ethanol facilities, one wood pellet manufacturing firm, and nine firms involved in the development of biomass electricity or combined heat and power projects.

Costs: Managing feedstock supply for biomass energy plants is one of the most important issues in the biomass energy development industry, accounting for just over 50% of operation costs and being the most difficult cost to predict. Most developers surveyed noted that this expense has the greatest impact on the price of their end product (i.e., electricity, cellulosic ethanol, etc.). Having a large percentage of the feedstock supply under contract is a crucial factor in obtaining financing, with some financial partners wanting up to 100% under contract. Contracting for so much of the fuel supply upfront is nearly impossible, showing one way that the biomass industry is not currently compatible with the banking industry, making it difficult for developers to finance their projects.

After feedstock, equipment and capital costs are the next largest expenses for developers and similarly have the next largest impacts on the product price. However, for some developers, the price of their end product is not based on costs, but is determined by the energy market.

Supply Procurement: Consistent biomass supply procurement is a labor-intensive task that relies on sustaining relationships with the small logging companies that constitute the majority of the feedstock suppliers in the Northeast. It has been difficult for developers to find suppliers willing to sign long-term contracts for a fixed volume of woodchips, leading to shortages that have halted operations in at least one developer's experience. However, if enough attention is paid to the availability of feedstock from suppliers, one developer says that a consistent supply in terms of quantity and price can be maintained.

Cash Flows: Guaranteed operating revenue is commonly the most important factor in a project's economic viability. In particular, long-term off-take agreements are crucial to obtaining financing. In one developer's opinion, if the price of energy is high enough, this agreement is not necessary. Variable operating incentives and fixed operating incentives were the second and third most important cash flows for economic viability. However, many developers mentioned that operating incentives have a limited availability to biomass energy plants because of qualification standards. Finally, low-interest loans or loan guarantees were fourth in importance, while attaining government grants is not worth the effort to most developers.

Demand: The market for biomass energy is more influenced by public policy than voluntary consumer demand, developers agreed, particularly where power prices are low. LEED standards, carbon prices, and the potential inclusion of thermal energy in renewable policy boost demand for biomass energy, which helps with project finance. Some developers have found that commercial, industrial and governmental voluntary consumer demand can be important.

Development challenges: The most important developer challenge is competing with other energy sources for long-term off-take agreements, especially with fossil fuels. Several developers cited aspects of the feedstock supply chain—such as the impact of weather, and creating a consistent supply plan with a reliable price—as important difficulties. Another challenge is the perception of biomass plants as dirty and messy, which can hinder permitting, a process already more costly than for natural gas plants, and prevent recognition of the benefits of biomass energy versus other incineration processes. Finally, identifying and procuring desired technology and accessing affordable capital can be challenging.

Long-Term Contracts: Two-thirds of the developers surveyed have had experience with long-term contracts, and that was usually positive. The contracts generally included a premium and an inflation escalator. Several developers mentioned that the forestry industry and particularly loggers are not currently doing long-term contracts, which is one of the obstacles to obtaining financing.

Developers commented on several contract structures that could be used to stabilize feedstock costs. Nearly all of them expressed interest in fixed price contracts with diesel fuel adjustment clauses, one calling them indispensable. Developers were less enthusiastic about variable cost contracts dependent on the market price for electricity, noting that often this happens by default and that biomass suppliers do not like it. Finally, 80% of the developers surveyed were interested in financing processing equipment for suppliers in return for supply commitments.

Market Hedges: Most developers expressed a low level interest in purchasing natural gas or oil futures to hedge against risk in biomass price changes, mainly due to the lack of a clear relationship among the market prices of the fuel types.

Perception of supplier challenges: Towards the end of the survey, developers gave their perception of the greatest challenges facing the feedstock suppliers. Many developers said that small firms cannot offer stable, long-term contracts due to tight profit margins coupled with operating costs that are difficult to predict. Also, suppliers who want to build large facilities are often in competition for their own biomass supply, which can be exacerbated by weather, storage and other conditions. Finally, developers mentioned that the forest products industry is tied to markets that are hard to predict, such as housing and paper, and that adequate delivery infrastructure is not presently available.

Other Comments: After the survey, many developers mentioned the need for suppliers to work together across the state and across sectors—agriculture and forestry. Also, they reiterated that the biomass energy industry is threatened by the uncertainty of the current feedstock market, mainly composed of small, disjointed suppliers. Another developer expressed hope that citizens would support improved renewable energy policies.

Survey of Potential Biomass Suppliers

Participant Description: The survey participants include 26 individuals identified as important parts of the biomass supply chain in New York, including nine logging firms, six sawmills, five landowners, five consulting foresters or forest management firms, and one concentration yard. The figure below shows the geographic distribution of survey respondents

Importance of Biomass Energy Market: Biomass suppliers gave over 45 responses on the importance of a biomass energy market on their business. Common themes were that the market will be more important in the future, it can boost revenue, it can allow suppliers to more efficiently use their wood, and it can improve forest management. Currently, wood chip markets are important to biomass suppliers, and several exist. It seems that all suppliers value such markets for low-grade or even otherwise-waste materials, and among those the importance of the biomass energy market varies from supplier to supplier. It appears that demand was weak in the past but is growing in importance, and is expected to be more important in the future. Several suppliers mentioned that they expect this to be linked to rising fossil fuel costs and the growing importance of renewable energy. Landowners' opinions on biomass energy can also impact the importance of the market to biomass suppliers.

Financially, some suppliers said that the price for biomass feedstock is currently too low to have a big impact on their business, but others described positive impacts. Many suppliers mentioned biomass-energy-market-related increases in their revenue and sales, one saying it makes up 5% of their total revenue and another saying it was 5% of their total sales volume. In turn, this helps maximize net present value and return on investment for timberland investors.

From a separate value-adding perspective, the low-grade materials demand encourages forest management improvements. Timber stand improvement (TSI) waste can be sold, and clear cutting—which some think improves species regeneration, and stumping can be more profitable. On the other hand, landowners or loggers who try to take advantage of the woodchip markets without wisdom and restraint could severely undersell their long-term profits by chipping logs that could be valuable in the future.

Challenges and Opportunities: Challenges for biomass suppliers include access to material they can chip, the cost of energy needed for chipping, and market prices for the product. Specifically, one supplier mentioned that chippers can use \$3,000 of fuel a week. Also, small landowners (under 1,000 acres) tend not to use clear-cutting, limiting available supply for chipping. To balance the objectives of preserving valuable growing stock and efficiently using other stock, a supplier suggested developing management plans with approved practices for uneven-aged stock.

Costs of Doing Business: Biomass suppliers mentioned fuel costs, property taxes, equipment expenses and labor as the costs with the biggest impact on their business with each of these also having a large component of unpredictability. Fuel prices have been increasingly high and volatile in recent years, affecting trucking costs (gas? [Diesel?]), logging costs (loggers paid based on mileage), and what it costs to run machinery (diesel). Property taxes have also been increasing in recent years. This is tied into rising land values and rising real estate and property taxes (1%-11% increases per year). Equipment costs are significant, and accessing the equipment is also difficult now that some manufacturing has been outsourced. These costs are more predictable than fuel costs in suppliers' experience. Fourthly, paying sustainable wages is not easy when demand is not constant. One supplier mentioned that frequent down-time at a nearby biomass plant makes it hard to pay staff consistently. In addition, truck drivers demand high salaries. Finally, local ordinances have significantly increased logging costs in some areas, making compliance the most significant cost in at least one supplier's case.

Future Importance of Biomass Markets: 80% of the biomass suppliers believe that the biomass energy market will be more important to their business in five years. Those that do not think so cited concerns that the prices biomass plants offer for feedstock would stay too low. Among the suppliers that do expect the market to grow in importance, some had more aggressive expectations than others. Interestingly, one mentioned that the market-share of biomass energy would depend largely on whether paper mills stay open: if they close, biomass energy demand for woodchips will be very important, but not if they stay open.

In order to prepare their businesses for this potential market shift, many biomass suppliers are looking into buying chippers. Some would need additional new equipment, such as grinders, live bottom trailers and new tractors. Some suppliers are already starting these purchases while others cannot yet cover or justify the costs. Otherwise, suppliers are continuing to study the market and opportunities, are looking into building and owning co-generation biomass energy plants, and communicating to biomass energy developers that they can supply feedstock.

Perception of Challenges Faced by Developers: The most important perceived problem for biomass energy developers is that they do not offer suppliers a competitive enough price to procure feedstock. Suppliers also mentioned that finding available feedstock and establishing long-term supply seem to be challenges. From the supplier perspective, it is difficult to offer steady supply and still make a profit. One factor impacting the situation is the decreasing availability of logging land in the Adirondacks due to tax increases. Suppliers mentioned that siting can also be an issue for developers, but that choosing a location near good transportation networks and biomass supply could improve their feedstock procurement.

Long-Term Contracting: 70% of the suppliers interviewed have not had experience with long-term contracting. Among those that had at least considered long-term contracts, 1 to 2 years was the norm with some considering only 6 months to a year. Two suppliers had considered 5 or 6 years, and one said they contracted out to 25 years. Many suppliers did not consider such a commitment because they were too small of an operation, did not want exposure to long-term price volatility, or conducted seasonal operations. A few suppliers mentioned that they had been supplying operations consistently over a few years but that it was not within an official agreement. One supplier said he would prefer a steady off-take agreement if the weather, and thus the market, wasn't so hard to predict.

Some suppliers had tried long-term contracting and had bad experiences, and many others were familiar with such situations. Reportedly, off-takers have been able to back-out of long-term contracts mid-way, which they often did when feedstock prices fell. On top of needing security in terms of the contract commitment, suppliers mentioned other provisions they would like to see in a long-term contract: a significant premium, a fuel surcharge, an inflation adjustment, up-front payments, stepped increases in prices, and a market guarantee.

Thirty percent of the suppliers had received price premiums in the past for long-term contracts, but only half of those had included escalators based on inflation. Some had received small premiums that they were not happy with. On the other hand, two suppliers mentioned good experiences with a premium where both they and the supplier were satisfied with the agreement.

Supply Contract Arrangements: Among five suggested supply contract arrangements (see graph), suppliers seemed to prefer one with a fixed price and diesel adjustment. This is currently a common structure in the market, though it leaves much room for interpretation. Also, for contracts under one year, suppliers were partial to fixed volume contracts for a non-fixed delivery price. Beyond one year, they generally said they would need a significant price premium. Suppliers were much less interested in an arrangement where delivery volume was fixed but the price depended on the biomass energy market. If the price was instead fixed to the woodchip market or there were fixed parameters around the price, suppliers would be more interested. If the price were linked to the biomass energy or energy market, suppliers were wary that they would be short-changed by unfair business practices or one-sided judgments.

Use of Other Commodities to Hedge Risk: Most suppliers had not tried using #2 fuel oil futures as a way to hedge against future fuel price changes. Only two respondents had tried it, and another was considering it for the future. Several suppliers were not very familiar with the concept, and others felt they were not in a position to manage that kind of risk.

Other Comments: In their final comments after the survey, suppliers reiterated that prices needed to be competitive for biomass suppliers to sell to energy plants, that rising fuel and labor costs were impacting their business capabilities, and that the demand for woodchips could be good from a forest management point or bad depending on the course of action. They seemed to be split in personal opinions about the biomass energy industry, some saying they supported it because of patriotism or the importance of cleaning our energy supply, while others expected that growth in the industry would start to cause bad side effects.

Financier Survey

Survey & Participant Description: This summarizes the results of a telephone survey of biomass project financiers during October 2007 through February 2008. The response to the survey effort was limited. Three interviews were completed out of 15 total contacts identified for the effort. Two respondents worked for investment banking companies that have biomass energy projects as part of their investment portfolio, while one was an investment professional that worked for a firm that acts as an intermediary between its investor clients and project developers. One respondent's firm had direct experience financing biomass power projects, while the others had direct experience with ethanol, biodiesel and landfill gas projects. One respondent's firm has recently formalized renewable energy as a growth vehicle for their investments, with a primary emphasis on wind power, secondary on solar with biomass third. Another respondent simply viewed renewable energy as part of a long-term investment strategy, while a third served as an investment advisor so they adopt client expectations as their own.

Because of the small number of responses, quantitative responses cannot be considered to be reflective of the population as a whole and any numerical analysis is likely to be unjustified. However, the interviews provided qualitative information that is valuable in considering the attitudes of this group, especially when contrasted with data collected from project developers and biomass suppliers.

Key Factors & Risks in Biomass Energy Investment: Respondents mentioned many factors that are important in their analysis of biomass energy projects, including fuel supply contracts, supplier credit-worthiness, off-take agreements, developer track record, government incentives, political support, and debt coverage/cash flow to cover unexpected changes.

Long-term feedstock supply contract are particularly important, since without them, projects are at risk of indeterminable feedstock costs. For other energy projects, there are investment-grade suppliers who are able to sign long-term contracts. However, this is not the case with biomass suppliers, who are affected by unique local markets and volatile transport and other costs. Another key risk for financiers is the lack of correlation between input and output prices, for instance wood prices could be up and power prices down. These perceptions of risk are reflected in the 33% higher-than-average debt coverage ratio they require and 100% feedstock price escalations they said they apply in their models.

Government Incentives: In general, financiers said that they assess renewable energy projects differently from other energy projects. Tax equity issues and government involvement with renewable energy credits (RECs) and producer tax credits (PTC) set renewable projects apart from other energy projects, creating a different investor pool. In the northeast, RECs are particularly valuable, however the PTC for biomass has never been very high. Also, there is a lot of political uncertainty around if and for how long the PTC will be extended, which affects the amount of available tax equity for biomass projects. In addition, loan guarantees and grants are

sometimes available for renewable projects, and local governments have recently been offering significant amounts of money for renewable projects.

Analytical Tools: Respondents employ a variety of different analytical tools to manage their financial risks, including in-house financial models, analysis of power futures specific to the project region, and energy forecasts. Power purchase agreements are often tied to oil, gas and coal prices rather than wood, so they need to forecast prices for these commodities in order to ensure that income analyses have the right price assumptions. For biomass power projects they typically use a third party consultant to do fuel supply study.

Surveys of Selected Parties Conducted Prior to the Workshop

As part of the research for this project, a number of biomass developers, suppliers (existing and potential), and financial institutions were surveyed to better understand their needs and preferences for biomass supply arrangements. The results of those surveys, conducted via phone, are summarized on the following pages.

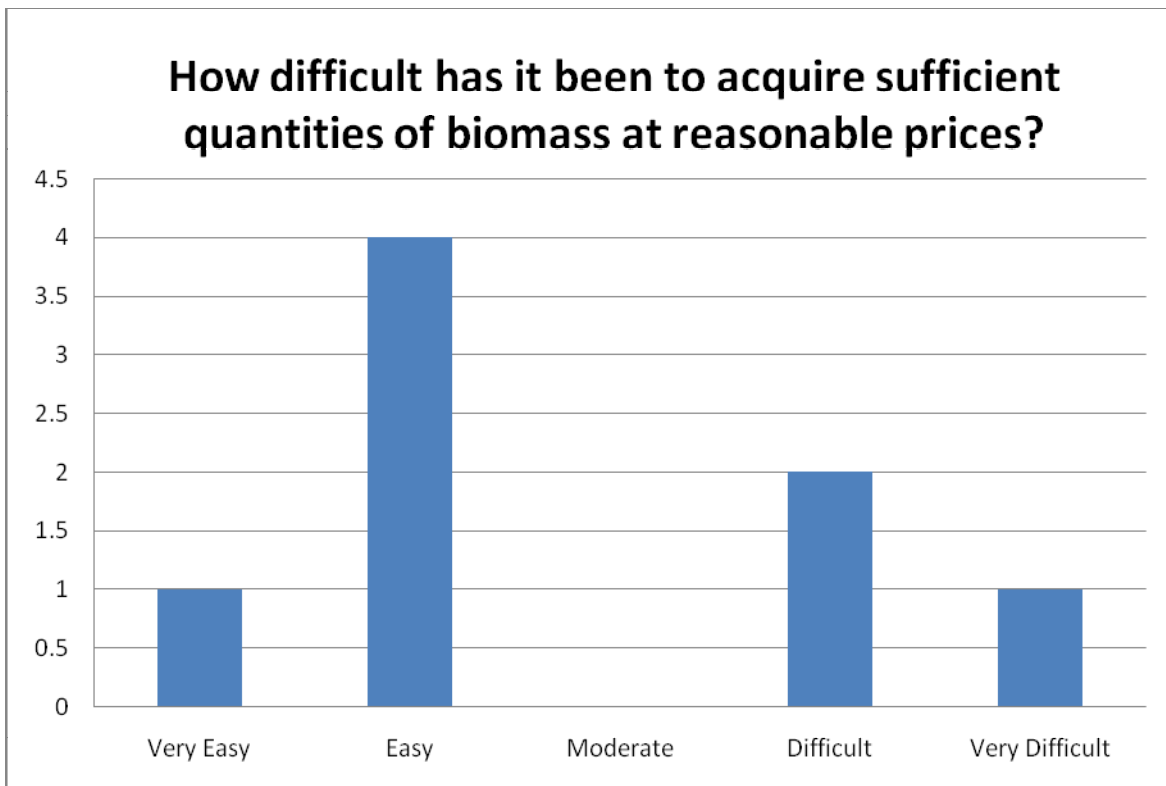
- 1. Biomass Energy Project Developers**
- 2. Suppliers (Existing and Potential)**
- 3. Financial Institutions Currently or Potentially Engaged in Biomass Projects**

Survey of Biomass Energy Developers

The following summarizes the results of a phone survey of potential biomass energy developers in upstate New York. These suppliers were surveyed via phone by the Antares Group as part of a project of the Empire State Forest Products Association to find ways that suppliers, developers and financiers can work together to enhance the biomass supply chain. This project was funded by the USDA Forest Service and the New York State Energy Research & Development Authority (NYSERDA). All comments are provided as received, with the exception that references to specific companies have been modified [noted in brackets].

Survey participants

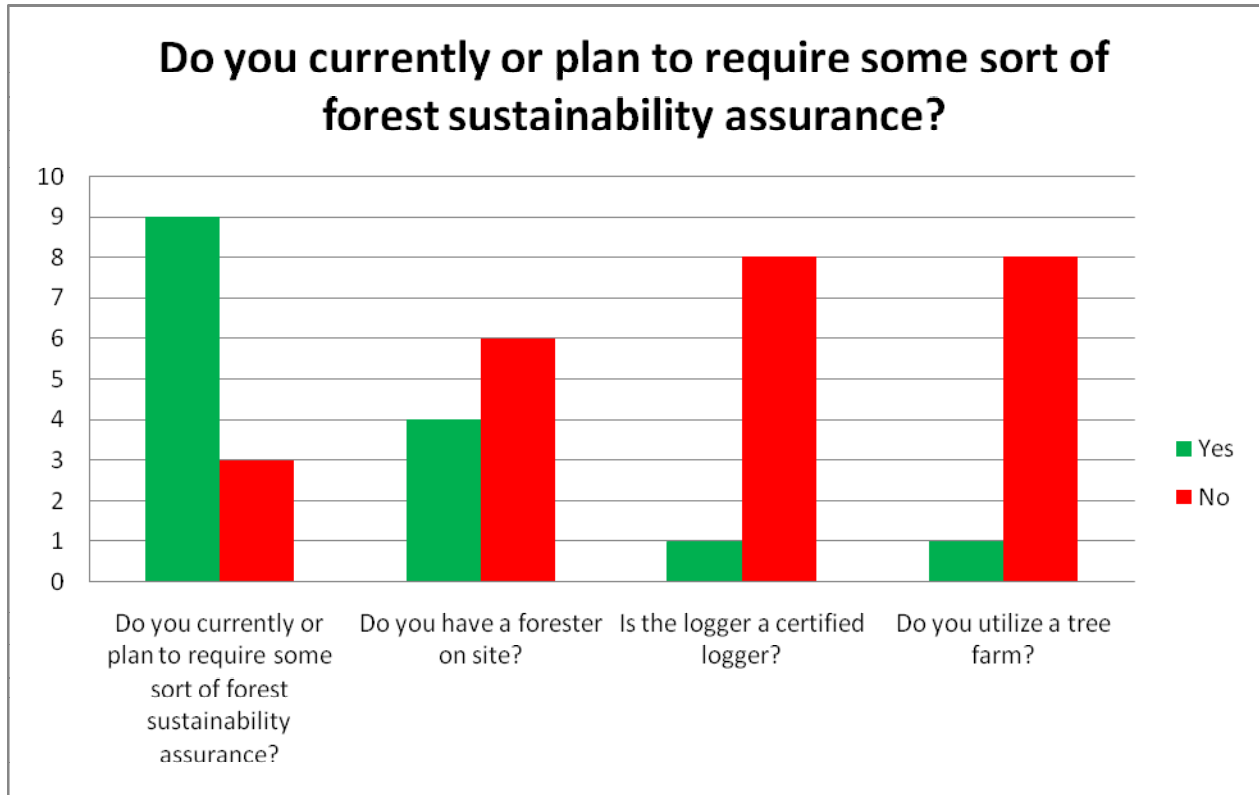
The survey participants include 13 individuals that are involved in the development or operation of biomass or biofuel energy facilities in New York and the Northeast. These included three companies developing cellulosic ethanol facilities, one wood pellet manufacturing firm, and nine firms involved in the development of biomass electricity or combined heat and power projects.



How difficult has it been to acquire sufficient quantities of biomass at reasonable prices?

- Can't categorize it that way. It's a labor-intensive, relationship oriented business. If you pay attention it's easy, if not it's hard
- No projects to point to, but consulting studies suggest its available from multiple sources, many of them small
- Able to get them financed due to 10 year fuel supply contracts (prior to [current position]), no difficulties since them
- Rural area with pellet guy down the road - small plant, not running all the time. Have had issues in NY for prospective plants (Catskills, Sullivan County, Central NY) - infrastructure to provide chips not there. Several upcoming/new outfits gearing up to meet that need. Want someone who can sign a contract and show up every day.
- Not applicable - haven't done it yet. In case of biomass in general there are places where supply exists and capacity is there, in NY there's not as much industry - contractors burned in past. They're reluctant to sign long-term contracts, or will but may back out. Comfortable to sign contracts that make sense for them. Price premium not likely to kill project - rather optimize plant operation.
- Do not know yet - have only done preliminary due diligence, need to do confirmation study
- [Operating biomass plant is the] only one doing it - difficult - many independent producers, independent people
- Have had to stop running due to shortages
- Not relevant for a demonstration project, not far enough down the road for planned facilities. Expect it to be a bigger challenge.

Forest Sustainability



Do you currently or plan to require some sort of forest sustainability assurance?

- No, they're typically forest products residues. The suppliers typically adhering to those standards. They don't require it
- Not yet - no roundwood, several steps removed from forest
- Yes - in every case where it's applicable, NY definitely
- No need too small - projects kept under 100,000 tons per year
- Not yet discussed in detail, but want to operate plant sustainably in order to comply with requirements for carbon credits and comply with overall environmental philosophy
- Don't know much about issue, would think it's part of plan - real point is that there is no way biomass industry can go forward without risk management related to supply.
- We helped design biomass handbook used for RPS, based on [operating biomass facility]. There is a sustainable forest management standard for New York, and is hard on them but it's needed.
- Pretty sure but don't know details and/or haven't decided on specific plan. Based on corporate mission.

Do you have a forester on site?

- Have had procurement officers and consultants who are foresters
- No projects now - so not applicable
- Using a consultant who is a forester
- Planned - some cases will be required
- No - hope is not needed because industry will have developed, want 10 year contract
- Don't know - depends on RECs or verification stipulations - don't see need right now
- Not operational yet
- Do not know
- About to get another at [facility]
- Not relevant for pilot plant. Doubt they'll have one on site but would expect suppliers to have a point contact - maybe in long term

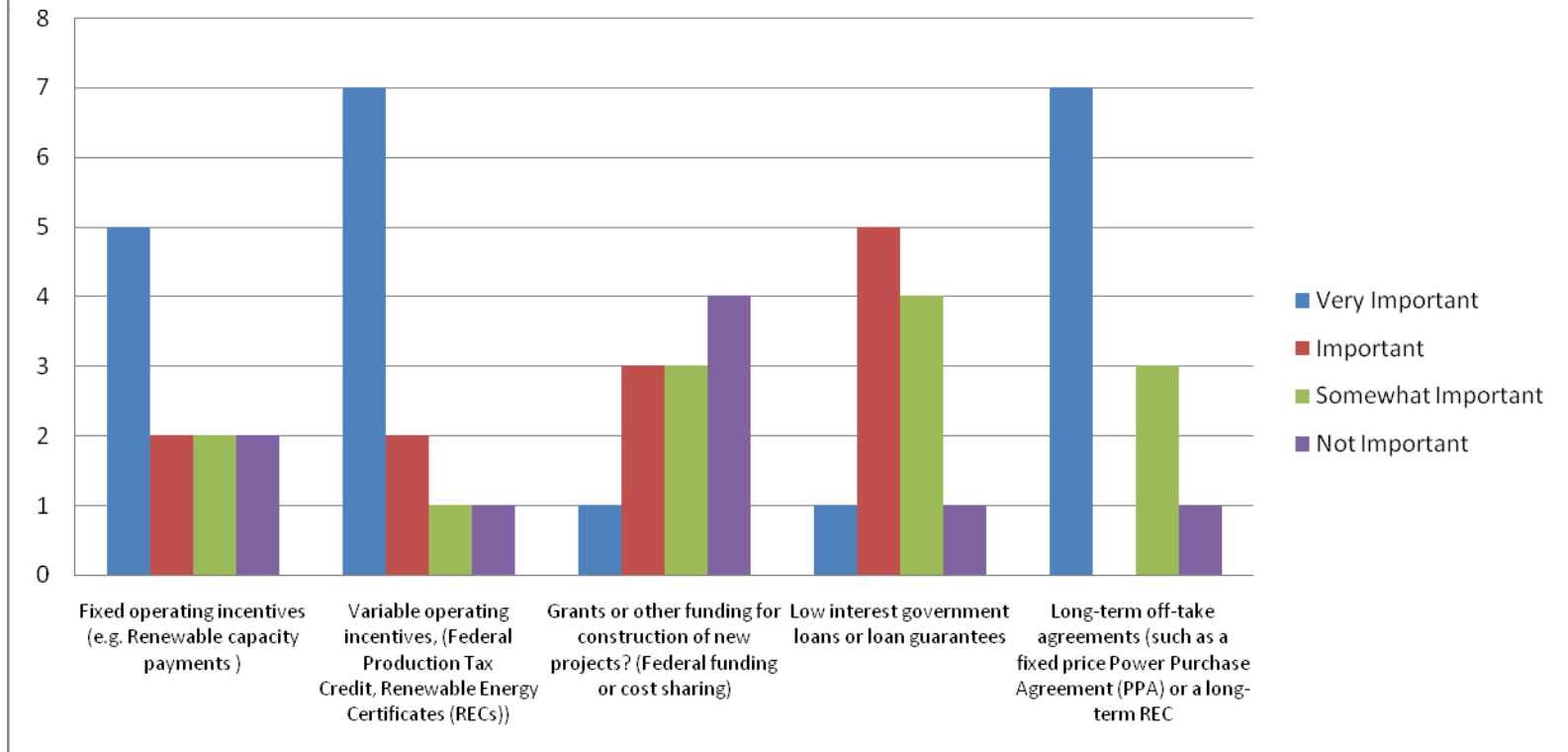
2e) Is the logger a certified logger?

- No projects now - so not applicable
- Not certain for New York projects
- May be required
- Not applicable
- Don't know
- Not operational yet
- Do not know
- No particular certification that they've done - but [operating facility] has to supply to state a breakdown on every harvest management plan, so logging jobs are registered.
- Not applicable

2f) Do you utilize a tree farm?

- No projects now - so not applicable
- Some
- Don't know
- Not applicable
- Don't know
- Not operational yet
- Do not know
- A few - most are individuals not large landholders
- Not applicable

There are a number of factors and incentives that influence the economic viability of biomass energy projects.



3a) Fixed operating incentives

- Matter of how contracts are structured. Both are important. Can do without capacity payment if contract structured appropriately.
- Hugely helpful when available - rare that renewable can qualify because it needs to be dispatchable
- Annual or up front? In NY there is a payment available per kW of peak reduction - really depends on amount of payment, one program is \$300/kW fixed payment
- Should be part of RPS
- Problem in NY is incentives are set up for wind so biomass does not get credit

3b) Variable operating incentives

- Matter of how contracts are structured. Both are important. Can do without capacity payment if contract structured appropriately.
- Projects don't fly without help
- Unless state-mandated RPS that raises price it's not crucial
- Very important, but not really there that [company] can use in RPS

3c) Grants or other funding for construction of new projects?

- Never used one. If get grant, capacity payment not as important. Matter of off-take contract structure
- Too much hassle
- Don't know - haven't done a project and not sure about application process
- Very helpful

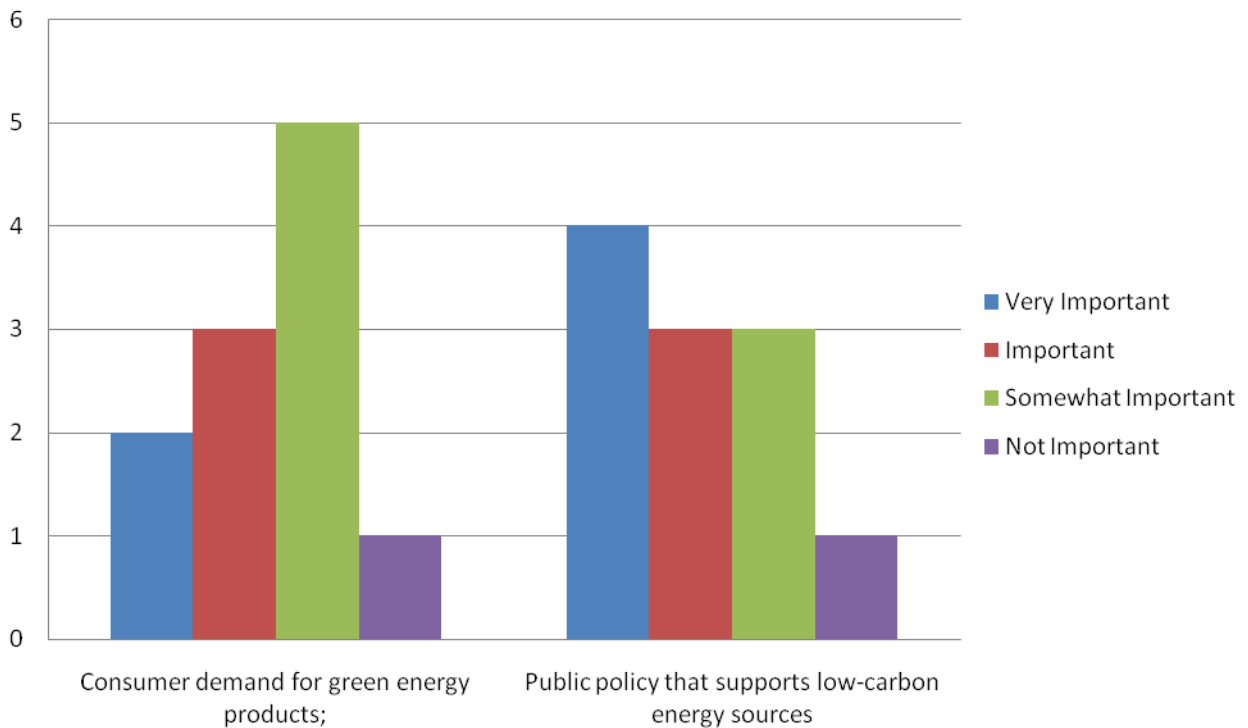
3d) Low interest government loans or loan guarantees

- Have used tax exempt financing
- Important for new technologies
- Conventional financing impossible - need some form of loan guarantee due to feedstock issues

3e) Long-term off-take agreements

- Borrowing money, have to have it. Has to be financeable contract.
- Indispensable
- If you limit risk it's not a big issue, even [power company in southern state] is buying power for \$65/MWh
- Power used behind meter - not sure it will be important to this plant
- Very - not possible without

How would you classify the importance of the following market conditions using the criteria:



Consumer demand for green energy products

- Businesses important, individuals not important - like commercial/industrial and government sectors
- Very
- Too disconnected from project finance, need mandated renewable attributes
- RPS - 24 states have them, 20 have mandates with penalties attached to them

Public policy that supports low-carbon energy sources

- Writing [other state's] legislature to include thermal in renewable standards
- To extent that it puts a price on carbon emissions
- Need more public support from the federal side - really looking at industrial co-generation, so hoping for partner who wants to integrate this into their business. LEED certified district energy systems another motivating factor
- Hasn't passed yet - helps areas with low power prices, areas with high prices it doesn't matter- focus on lots of small projects

Other

- Price transparency - real cost of energy and capacity- particularly in terms of next available MW.
- Long term contract needed -10 year PPA, not permitted in NY, needs to change or plants won't get built
- Unevenness of incentives for different renewables, particularly in NY - not going to get it with wind, sun doesn't shine enough. Long term power market and REC market. [Existing biomass plant] operates perfectly because it's paid for. Meeting project finance standards hard in 10 years.
- gasoline prices

What percentage of operating costs does biomass fuel / feedstock represent in your business?

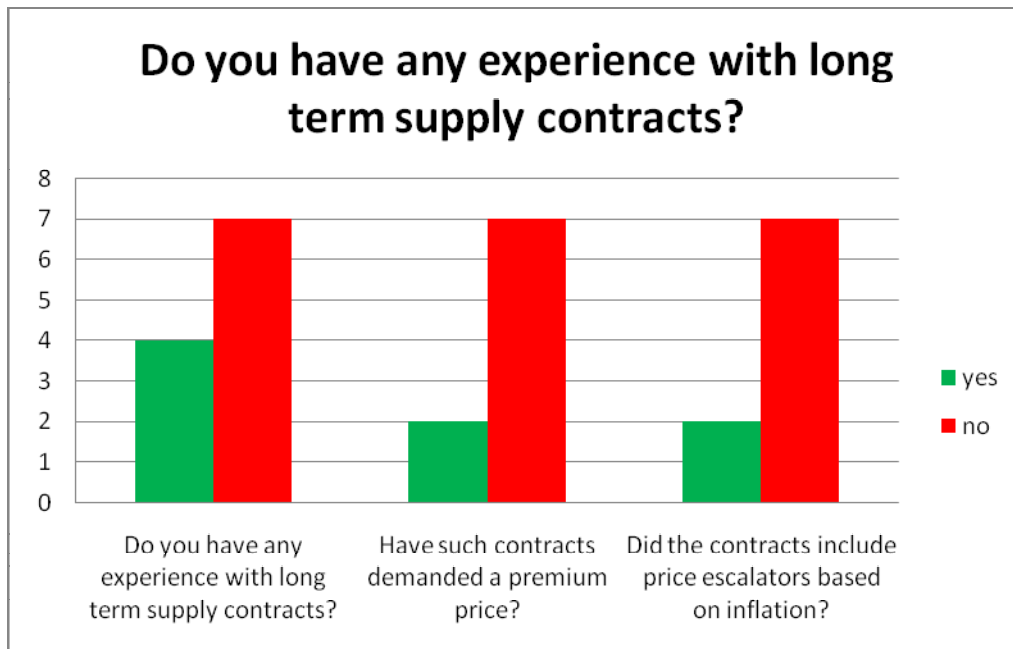
50 median
52.8 mean

7) What are the biggest challenges you (expect to) face as a biomass producer?

- Suffers under misconception that it's a big dirty messy operation. Depends on marketplace - in one with strong bias against forest products industry, difficult to overcome. Not an issue in area with bias for forest products industry. Unique issue is size of plant compared to conventional power plants. Not going to build 1000 MW biomass plants. Smaller developers because plants are too small to be on radar screen of bigger companies.
- Finding customer who's willing and able to sign long-term (10 yr plus) contract; Cost competitive offerings - right now capital costs dominate projects - has to be \$0.10/kWh or more to make a project work; Concerns about permitting challenges (natural gas is relatively easy, biomass - expectation is that it will be harder and cost more/take more time)
- Competition with fossil fuel, growth & demand, weather (affects heating/pellet demand)
- About to get fuel supply plan - availability not a problem, logging infrastructure an issue, have a couple of years to put that together - that's biggest challenge for plants.
- Often get lumped with biomass combustion and incineration in regulatory process; better recognition of this technology needed. Sometimes new categories need to be created
- As energy producer - commercialized system identification is hardest part. Weeding through promises from vendors. Also biomass resource assessment is crucial.
- Very few - interconnect agreements with renewables, little utility companies helping out - wood biomass specifically, other fuels have challenges e.g., manufactured wood product wastes.
- Reliably priced fuel, infrastructure for long-term contracts
- Feedstock supply

- 4 things as producer:
 - feedstock reliability and cost,
 - markets,
 - NIMBY (same as for developer - permitting easier for industrial customers – [Upstate NY] project was never going to be permitted),
 - layers of government (same as for developer)
- Technological breakthroughs, capital for new construction and feedstock supply infrastructure

8) Do you have any experience with long term supply contracts?



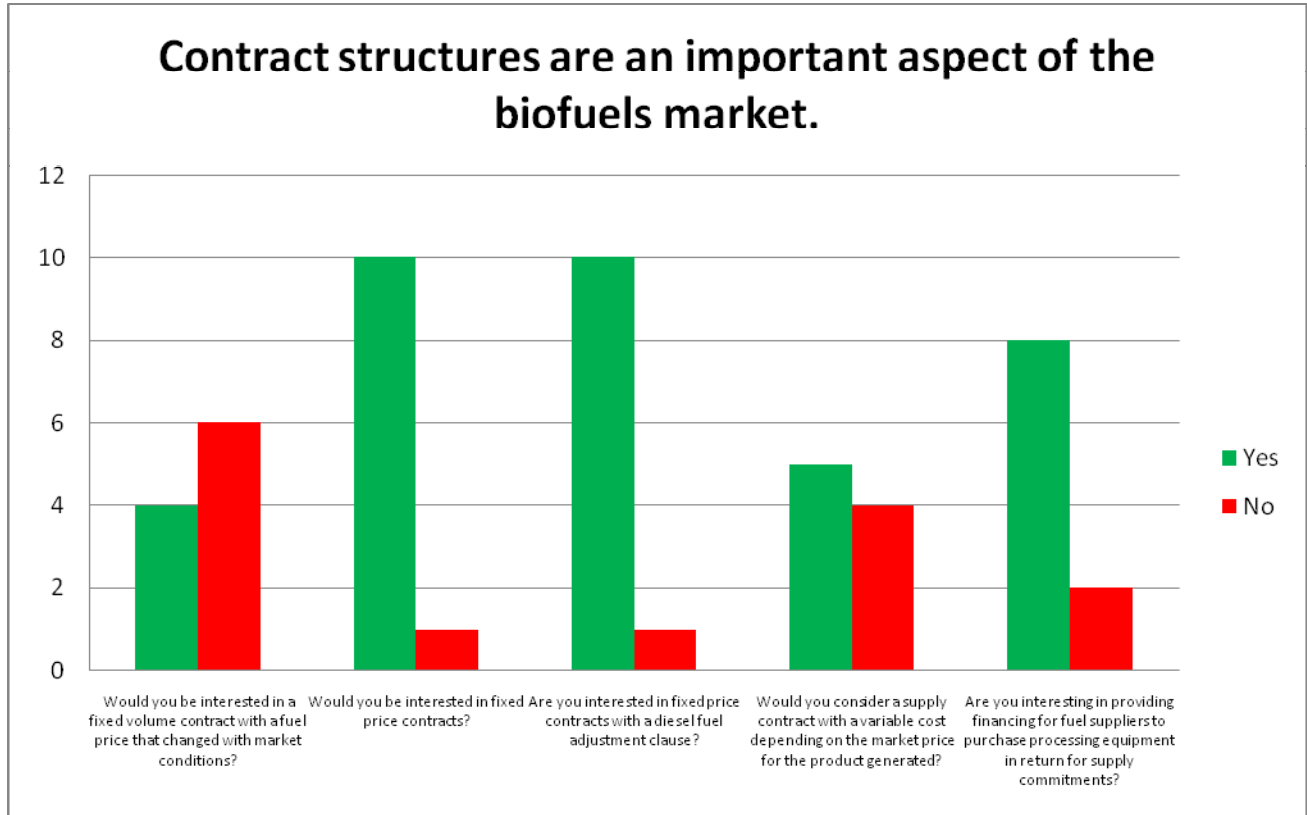
What has your experience been?

- If they have financially strong counterparty good, else useless - typical thing is that financially stable party not interested in long-term contracts (at least >1 year). Difficult things is that banks think of LT contracts and the industry doesn't work that way
- multi-year, helpful
- Positive - expired in 10 years but then not renewed, market wasn't doing it
- 5 years

What are the maximum and minimum terms you have considered in the past?

- 6 months to 15 years
- 0 - 2 years
- 3 - 5 years up to 10 (would like up to 15)
- Just 5-year term
- Lumber market affecting loggers right now. No multi-year contracts with loggers

Contract structures are an important aspect of the biofuels market.



Would you be interested in a fixed volume contract with a fuel price that changed with market conditions?

- Would like relatively little change. Some percentage of biomass cost tied to diesel fuel. If some percentage of cost tied to diesel that's OK, want some other costs to be relatively fixed. Minimum volatility to offer customers very valuable (mostly fuel volatility)
- Not for wood supply
- Depends on whether fuel price changes with Power Purchase Agreement terms
- Certainty most important - if some way to minimize
- What that says is some other plant is coming on line - not interested, rather have " we got there first so we get cheaper fuel" situation
- Last resort - possibly 60% fixed, 40% floating

Are you interested in fixed price contracts with a diesel fuel adjustment clause?

- Already do this
- Couldn't do it without it

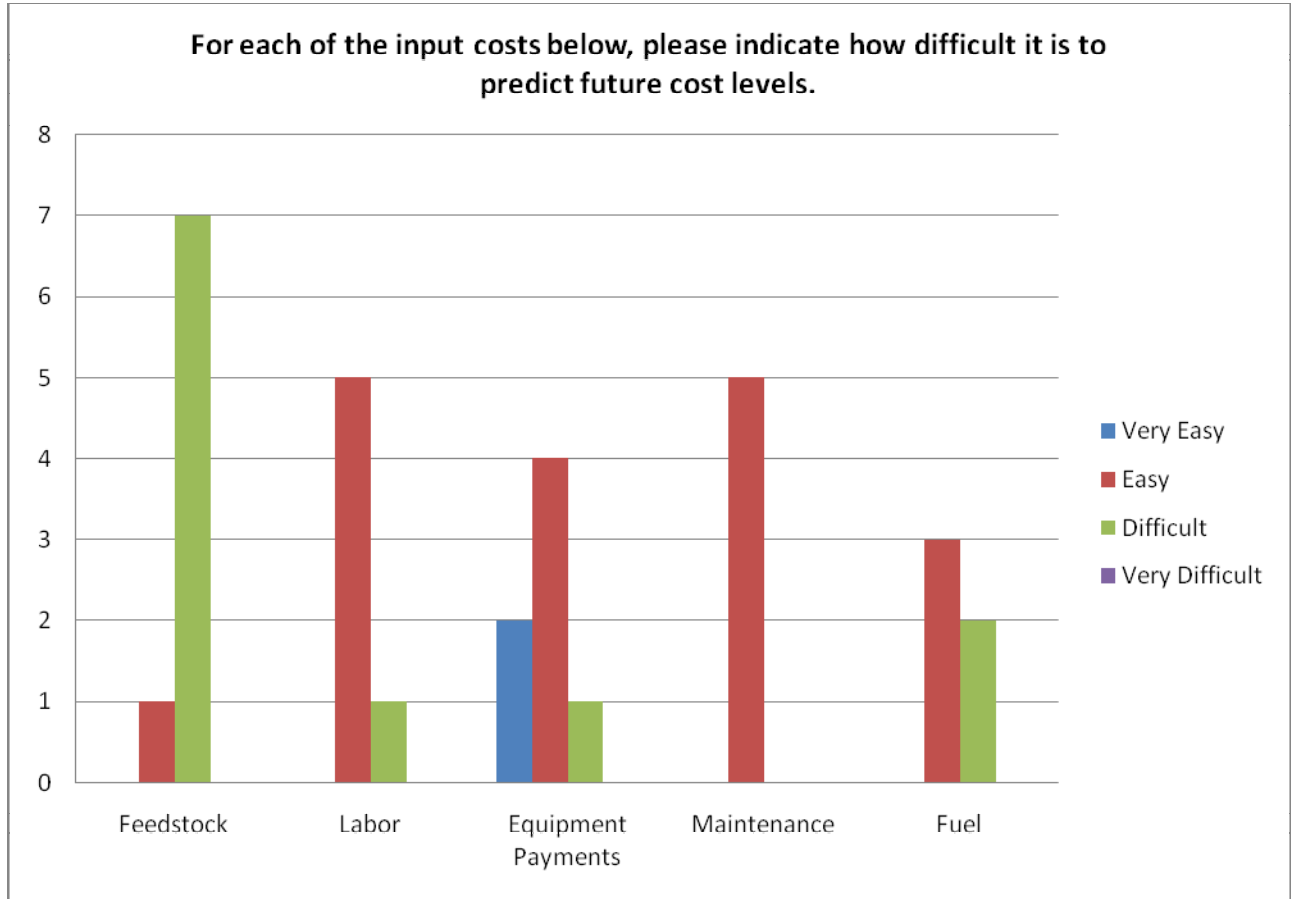
Would you consider a supply contract with a variable cost depending on the market price for the product generated?

- Kind of happens by default
- Yes - but with some caution. Customers would view biomass as less volatile than market place. Customers find prices less volatile than market attractive – [this firm] thinks biomass will be less volatile
- Yes but supplier got skittish after market dropped
- Have done that on one occasion – [facility] that was feedstock supplier and end user - harder time financing it
- A little bit more attractive, but still not good
- Do not know - not sure how it would be feasible
- Do not know
- Doesn't help loggers
- Possibly

Are you interesting in providing financing for fuel suppliers to purchase processing equipment in return for supply commitments?

- Fuel supplier may need a contract to finance their equipment – similar
- Maybe eventually will be required
- If it is possible
- Yes
- Depends on partner willingness
- Yes - doing it themselves

What are the types of costs that have the biggest impact on your business, such as labor, capital payments, maintenance, and fuel?

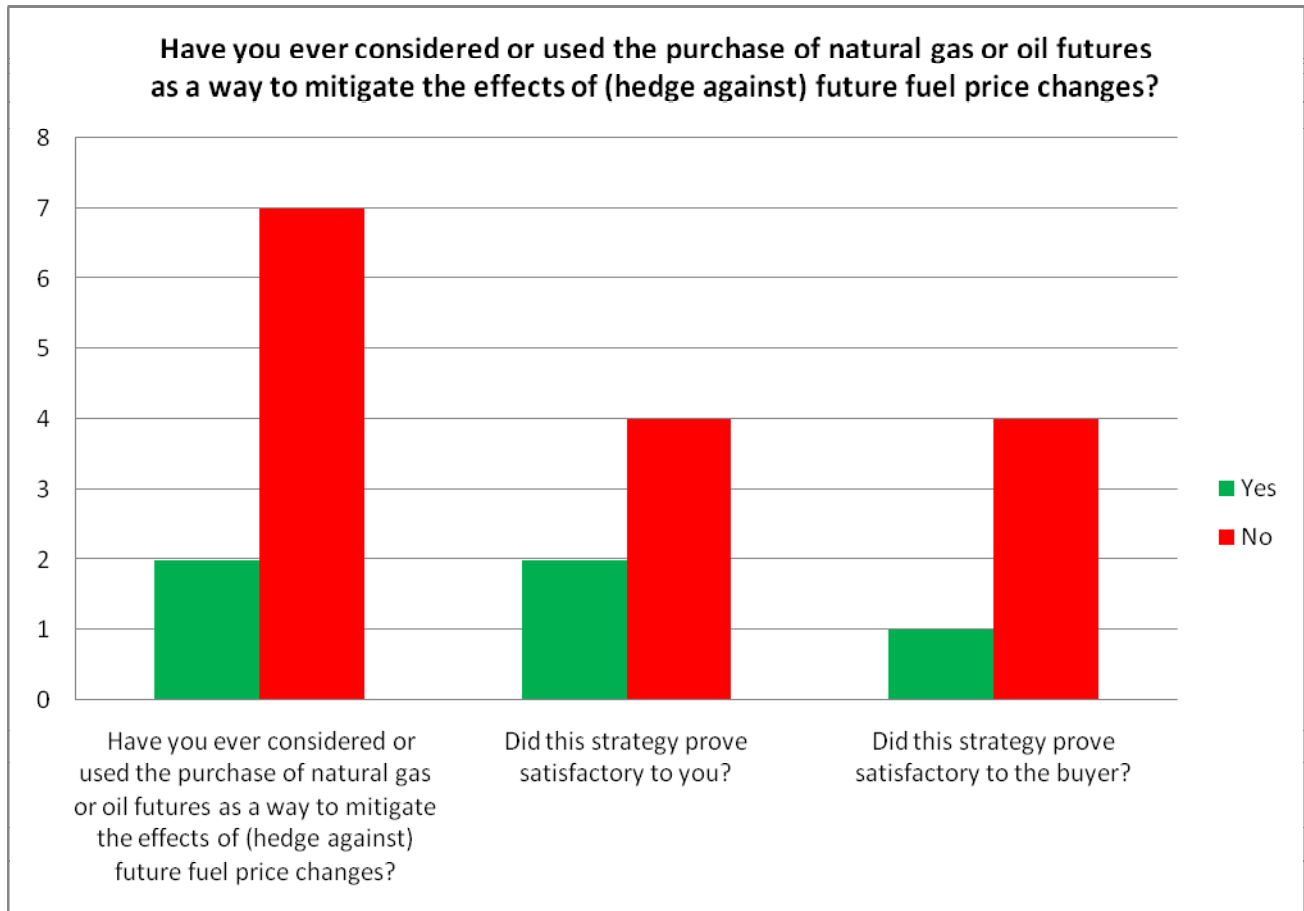


Over the past five years, which expense (or expense type) has had the greatest impact on your existing projects?

- Fuel – biomass
- Equipment/capital
- Wood
- Equipment
- Wood fuel

Which expense has had the greatest impact on how you price your products?

- Price on value basis not cost basis so not applicable
- Capital costs and O&M and fuel
- wood
- Equipment
- May not be selling energy - but feedstock costs are biggest part of cost
- Do not know
- Wood fuel
- Costs won't impact pricing - they won't have a choice



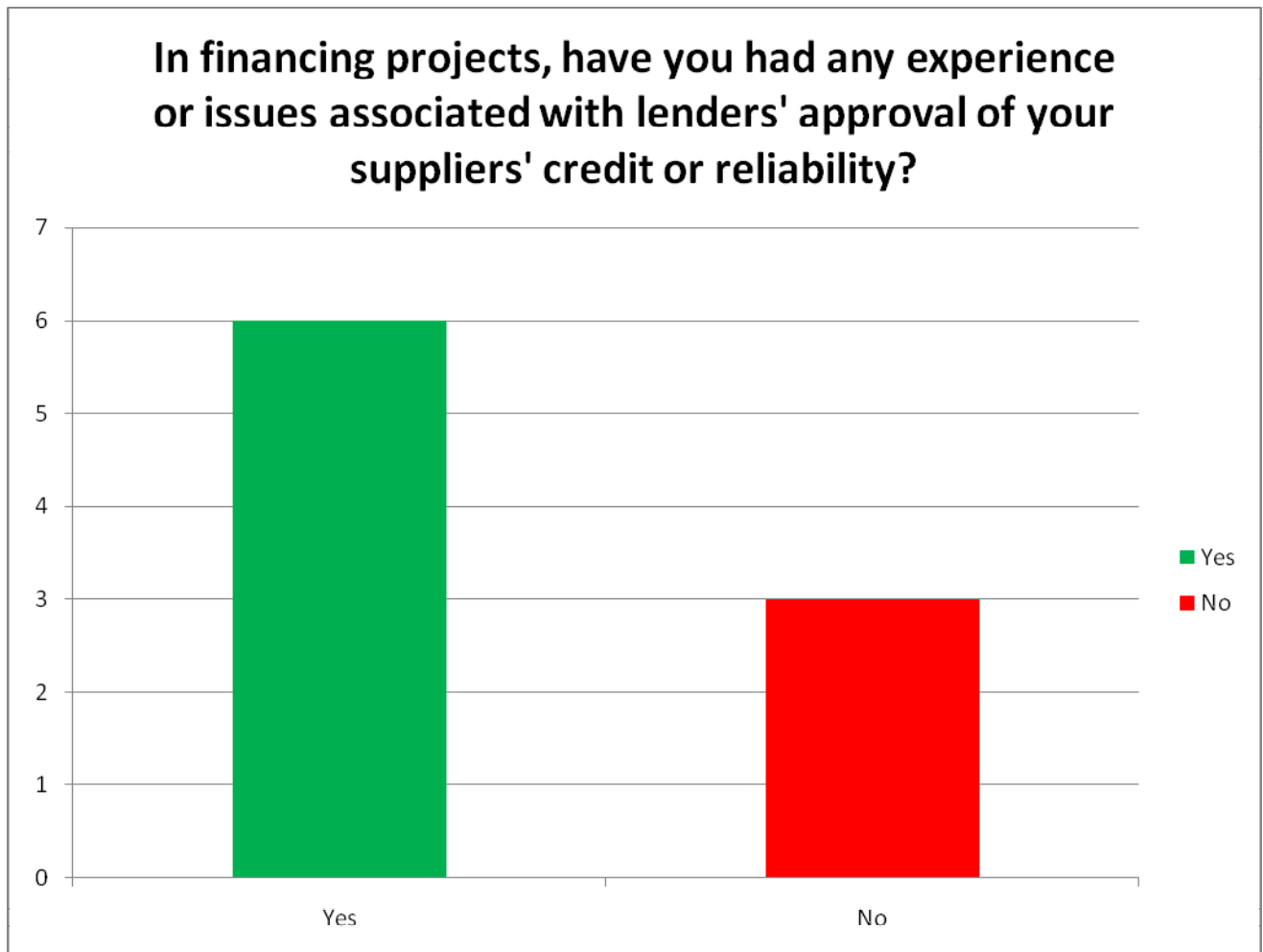
- Competitive information (declined to answer)
- Parent company does that every day
- Not yet
- Wood not correlated with natural gas or oil costs - might be challenging to do
- No - not really linear - not good surrogates for wood prices. They do diesel adjustment to fuel costs at [operating facility].
- Not yet, probably not

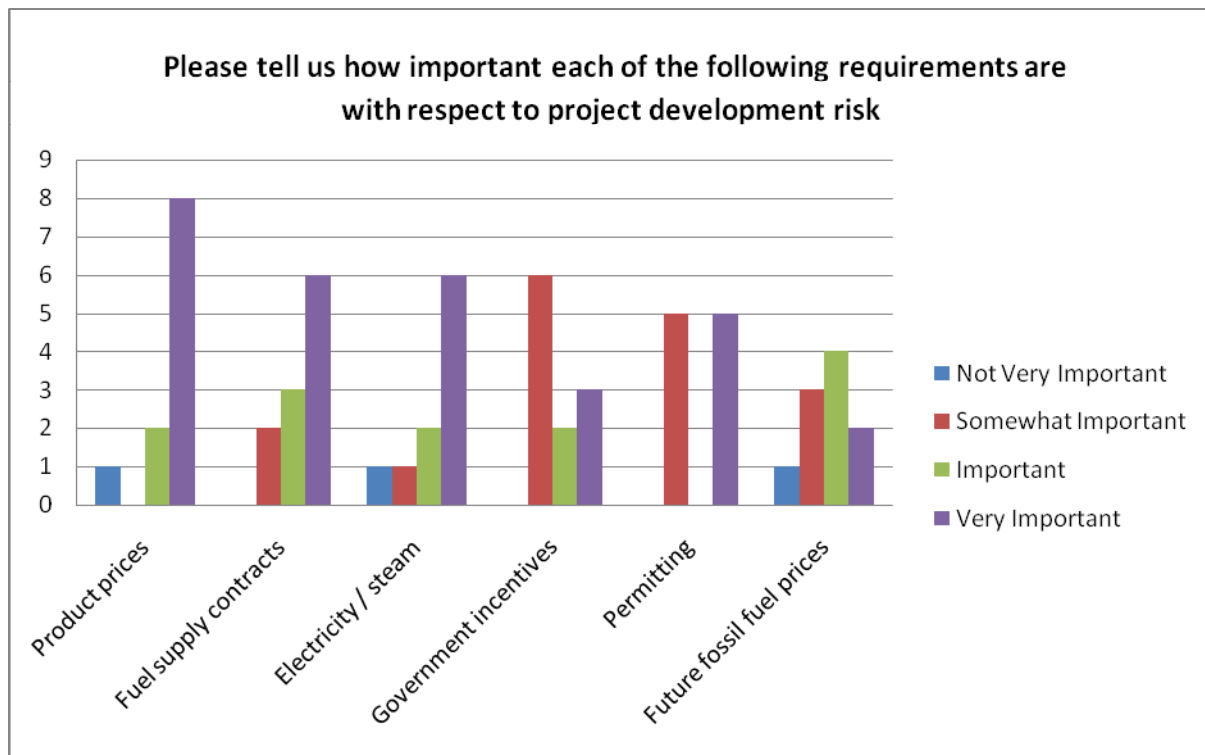
Did this strategy prove satisfactory to the buyer?

- Competitive information (declined to answer)
- Don't know. Manage about 24,000MW of power, most is natural gas and oil, so trading strategies focus on both

As a percentage, what is the minimum level of fuel supply you would need to have under contract before deciding to build / buy / finance a facility?

- Driven by financial partner. Do fuel studies to determine fuel availability, if they decide that they can manage fuel its ok. Banker will want contracts. Could be 50 to 100 percent of fuel supply. If latter, those projects don't get off ground
- 50%
- 50-75
- At least 50, closer to 75 desired
- 80 percent
- Going to have to show 100% for new project finance, but not all contracted - much shown as part of plan, existing sources, etc.





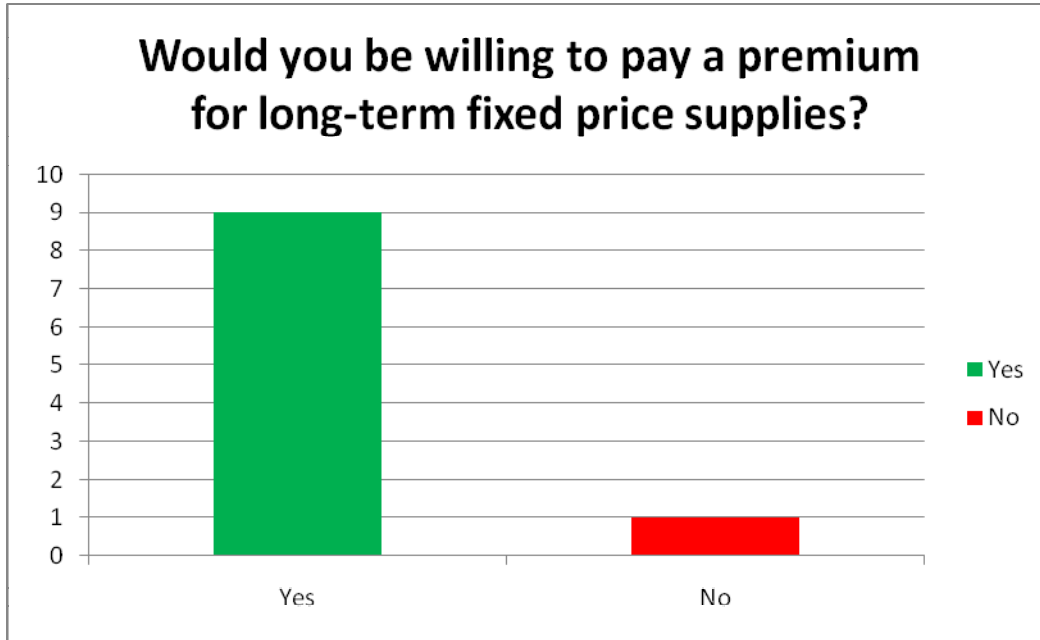
What is the single biggest issue / concern you have with respect to the future of your bioenergy plant's financial viability?

- Existing: more to do with (depends on contract- LT fixed contract) fuel supply price if ST contract less sweat about fuel price, but major equipment failures are more a concern. New plants: Changing environmental regulations
- Customer viability
- Steady demand growth
- Long term off-take contracts
- Technology availability/suitability
- Fuel availability and cost
- Fuel prices, market price, regulatory changes in that order
- Technology

What do you think are the greatest supply challenges faced by your biomass fuel suppliers?

- Current forest products industry tied to lumber, housing/pulp paper markets that are hard to predict. Their biggest problem is controlling their own expectations rather than managing to real conditions today.
- Offering up stable, long-term contracts (very very large firm not an issue, small firm with 2 men and a truck it's a real problem)
- Tight margins, operating costs that they can't predict (e.g., insurance, workers comp)
- logging infrastructure - procurement

- Somebody who's in business - go to yellow pages and look up biomass suppliers - nobody's there
- Don't know - could be equipment reliability, fuel prices, storage logistics
- Lot of folks trying to build huge plants - competition for large quantities of wood waste, esp. when projects are looking for 300,000 tons of waste
- Consistency of supply availability due to weather, other factors, storage capacity and price
- Near term - infrastructure to deliver



- Slight premium to current value, yes, if premium to projected future no
- If power market / off-take justifies, yes

Is there anything else you would like to tell us?

- Average citizen doesn't understand the energy driven economy. All renewable energy conversion technologies by their nature need them to deal with less dense energy resource. Can't do it as cost-effectively as coal, natural gas and oil. Needs to be taken into account in public policy or we'll just have constant huge public policy. We're dependent on carbon.
- Very interested in identifying new product opportunities. Also pretty important - even though today they don't have biomass on balance sheet, management team has significant past experience.
- Advice to forest industry - should work with agriculture guys, don't create two separate markets, one coming off agricultural land and one off forest land. Should be working in lock-step.
- Takeaway - looking at biorefinery aspect, future is not in boiler/steam plants - break down to components and used in most efficient manner for high-value products
- He's glad we're doing this.
- Trying to create reliable predictable fuel supply issue, which is key. Huge opportunity for the state and we all need to work together on it.
- Knows some background for this study - have some concern especially in New York about numerous small suppliers, ability to work with handful of suppliers rather than dozens of people. Risk too high with managing large numbers of suppliers.

Survey of Potential Biomass Suppliers

The following summarizes the results of a phone survey of potential biomass suppliers in upstate New York. These suppliers were surveyed via phone by the Antares Group as part of a project of the Empire State Forest Products Association to find ways that suppliers, developers and financiers can work together to enhance the biomass supply chain. This project was funded by the USDA Forest Service and the New York State Energy Research & Development Authority (NYSERDA). All comments are provided as received, with the exception that references to specific companies have been modified [noted in brackets].

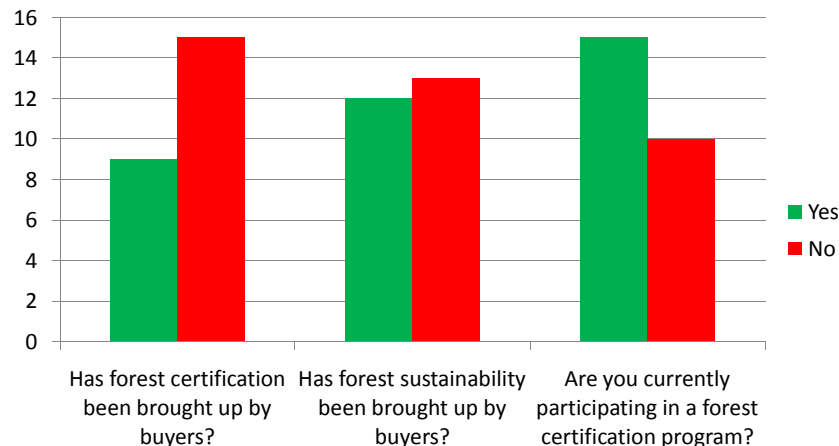
Survey participants

The survey participants include 26 individuals identified as important parts of the biomass supply chain in New York, including nine logging firms, six sawmills, five landowners, five consulting foresters or forest management firms, and one concentration yard. The figure below shows the geographic distribution of survey respondents



Forest Sustainability and Certification

Questions regarding forest sustainability programs



Note: in this section, SFI refers to the Sustainable Forestry Initiative and FSC refers to forest certification through the Forest Stewardship Council.

Has forest certification been brought up by any buyers?

- 22,000 acres he manages are certified - FSC. Smaller owners - some are Tree Farms, others not.
- A little discussions
- Most of work done under a forester
- Paper companies interested - he's not in woods so he's not involved. Started certifying loggers in NY decades ago.
- Seems to be an issue in last 2 months. Both energy and pulp
- Says it's a joke.
- Some end using mills are concerned but haven't addressed directly with them
- Once in a while
- One of the biomass mills would like to get certified wood, if not need harvest plan. Gentlemen - are you paying us to do that? 75,000 acres will soon be certified through SFI, 50,000 acres now certified by FSC
- On the NE Loggers Board back in 93-95. Logger certification. Game of Logging, [insurance company training]
- Mill [in specific location] would like FSC; they're SFI certified right now. They haven't required it yet.

- Yes, he's aware of it but it hasn't been involved
- SFI - third party audit this year, manage 1.8 million acres in northeast.
- Sell to [paper company] - in process of FSC certification. Before this [previous owner] was going through SFI, supporting SFI
- Yes, but sales haven't hinged on it
- It's a concern, but it's not something that's controlled sales
- Paper mills yes, pellet mills no
- Probably will be more of an issue in future
- Paper end especially - in fact thinking of FSC with pellet plant

Has forest sustainability been brought up by any buyers?

- Depends on wealth of the client - many people just need money. No not really
- Brought up for sawlogs and pulp but not energy products
- Yes, foresters, mills and insurance companies. Try to do best job they can - other guys, fly by night companies are the problem, no insurance, timber theft - lack of enforcement. Their insurance is through [agent] - good enforcement
- Don't know really
- Says it's a joke.
- Some end using mills are concerned but haven't addressed directly with them
- No - was a part of it but it's a fraud. Good idea but certified users aren't doing it. It is not applied in business - couldn't put signs out there. Too competitive in New York
- Not from biomass folks
- Some of mills may be demanding in future - not around there.
- Part of SFI since last year, been through audit.
- Pride themselves on management but hasn't been brought up
- Was on SFI Committee/Board, not now
- No sustained yield calculation, growing more than he's cutting. Sustainability definition is largely unknown.
- Yes, but sales haven't hinged on it
- It's a concern, but it's not something that's controlled sales
- Yes - have 2 professional foresters (ESF grads) - their practice is that foresters walk through lot - look through and at neighbors lot

Are you currently participating in a forest certification program?

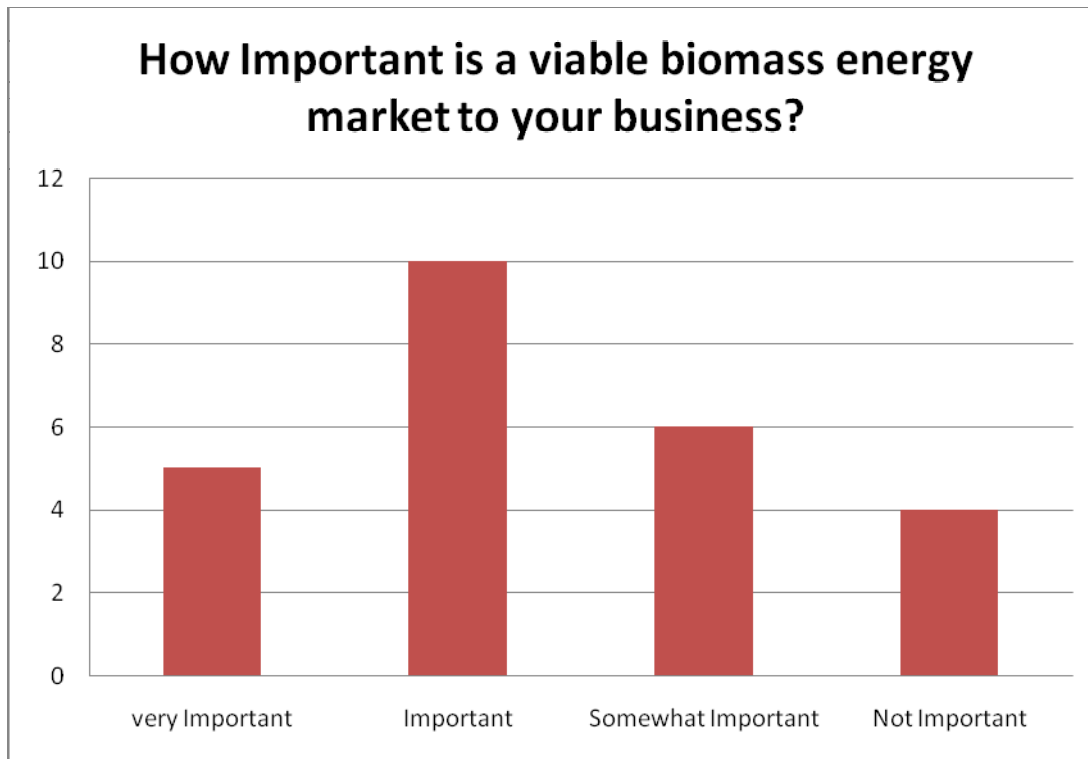
- Not relevant to their company, but with clients 40-60% aren't even aware of it
- Not sure
- Buy logs, very little timber purchased, therefore not applicable
- Him and 2 or 3 others are NY Certified loggers ESFPA
- Says his land and practices are certifiable but not currently certified.

- Company does employ Tree Farm standard, No SFI, FSC.
- Was doing logging, timber sales but now it's not really applied. [Company x] says they're green but they were terrible in terms of harvest practices when they were harvesting in NY.
- Clients participating in SFI, FSC both
- Not relevant to his business
- Substantial written forest management plans, maybe not
- Not active -seems to be hypocritical that large landowners/companies are most likely to participate, do worst job on forest management
- ISO 14001 Certified, BMPs and certification, 3rd party audit
- Taken some classes

What would be the market conditions required for participation?

- Compensation is minimal right now for certification programs, costs high for FSC, SFI
- If program was coherent he might
- He works on federal, state and city lands. Biggest problem he sees in terms of sustainable forest management is consultant foresters. Logger tells forester it's not ready to cut but consultant marks it for cut and puts it out for bid. What message do you send this way to loggers who want to manage for higher value stands? State has a lot of timber it lets rot. Consultants need to work on per acre basis rather than as a percentage or else they just mark every tree in sight. He buys best timberland and takes care of it - ownership is the best way to ensure quality management
- Don't think its necessary for their business - they're very expensive and they're doing it anyway through Tree Farm
- Hardwood naturally regenerates so in a way it is sustainable itself. Elimination of pulpwood mill was great for forest sustainability - trouble was pulp mill capacity far exceeded residues, so loggers cut out young maples, cherry to supply pulp mills. 10-inch trees going into boiler fuel once market is created. Now all waste is being used. Trucking eating out of profitability but it's being used. He's really hesitant about chipping operations - he deals with sawlog quality material. Other side is that TSI can be paid for by pulp materials. He thinks biomass should be done on plantations. State has allowable cuts - but they're way below what they could actually do.
- Purchaser pays for development of forest management plan
- Marginal use for it - do some public service work, on nature center board, but quite frankly for monetary reward there's nothing that's excited him. True concern about government regulation, paper exercises that don't contribute to bottom line

Importance of Biomass Markets



How important is a viable biomass energy market to your business? Why?

- Could be important - depends on landowner preferences and education
- Could get by without it
- Rome outfit going in for wood energy, pellet plant near Utica, burn plant - all in about 30 mile radius. Where are they getting wood? They don't own land - some landholding outfits bought land and they'll control the wood supply. Most of timberlands have been cut over to remove higher quality material - a veneer log today wasn't a number 2 sawlog 50 years ago. Used to cut 5mmbf/year with 7-8 logs/1000bf, now its more like 14
- 5 percent of sales volume
- If it paid fair price
- Future, more important
- But their power costs from NYSEG are very high. If it would reduce his costs it could be
- Biomass is nice benefit, not essential
- If it came into fruition, great from a wood utilization perspective
- Hard to measure because opportunity hasn't been there now - spent 35 years in northern PA, now in southern NY. In past it made a difference, couldn't remove

poles, slash without it. However, sum total of zero value or negative for landowner in past and now. Quite a concern that loggers could throw small log in pulp pile and landowner would lose big. Stumpage needs to come up to cover those mistakes, won't cover value of cherry. Don't know what that number is, maybe \$5/ton rather than \$1/ton. Terrifically price sensitive. Some don't know markets so it's not important to him, but that's not a service to landowner. Bad lumber market creates incentive to put small sawtimber in the chipper.

- See as opportunity - if it can help maximize net present value, add value through product sales for low-grade materials
- Chip market pretty important, make 40-60,000 lb chips/day, lose markets then you're stuck with it. Have at least 3 chip markets right now, which is comfortable
- In future, improves ability to do forest management for clients
- Revenue source. Makes up 4-5% of total revenue
- Ability to manage assets for volume
- Revenue
- Reduce trucking to markets
- Low grade market
- Very important - lots of low grade material, need them to survive
- Soft or no markets in past
- Money, aesthetics, alternate energy source
- Sell logging equipment - could impact sales
- Forest management practices
- Good for job cleanup
- Byproduct on landings they are able to use and sell
- Productivity. More productive when you bring whole tree out - you can also do TSI work. Some clearcuts cut help restore land. Look at regeneration on 30-40 years later and you can see results in terms of species composition. Currently beech, soft maple and hemlock have replaced hard maple and cherry.
- Better forest management, growth on residual stands. Limited pulpwood markets now to effect that kind of growth stimulation. Bio-fuels in particular
- Revenue
- Allows loggers to harvest wood lots that would normally not be viable, generating additional logs
- Sales
- Help industry, make \$3/ton on top of that put it into sales.
- Market for low grade material
- Low grade markets to help maximize NPV
- In future, markets may be competitive to permit appropriate use of biomass
- In future, If we had one could permit more forest management

- Ability to manage lands for value
- Waste disposal
- Improve forestry
- Price of oil and natural gas - could be part of solution
- All landowners overloaded with timber stand improvement (TSI) material they can't get rid of, overabundance of resource, goes to waste
- Expanded markets and revenue for wood products
- Revenue if price was higher
- Clean up landings
- Material utilization
- Support for thinning undesirable species/release thinning (countered by risk of stand damage and use of growing stock species for whole tree chips)
- Return on Investment for timberland investment
- Totally mechanical harvester, feller buncher, slasher, grinder - next purchase bigger knuckleboom with delimeter for grinding, put material in live bottoms.

Challenges and Opportunities

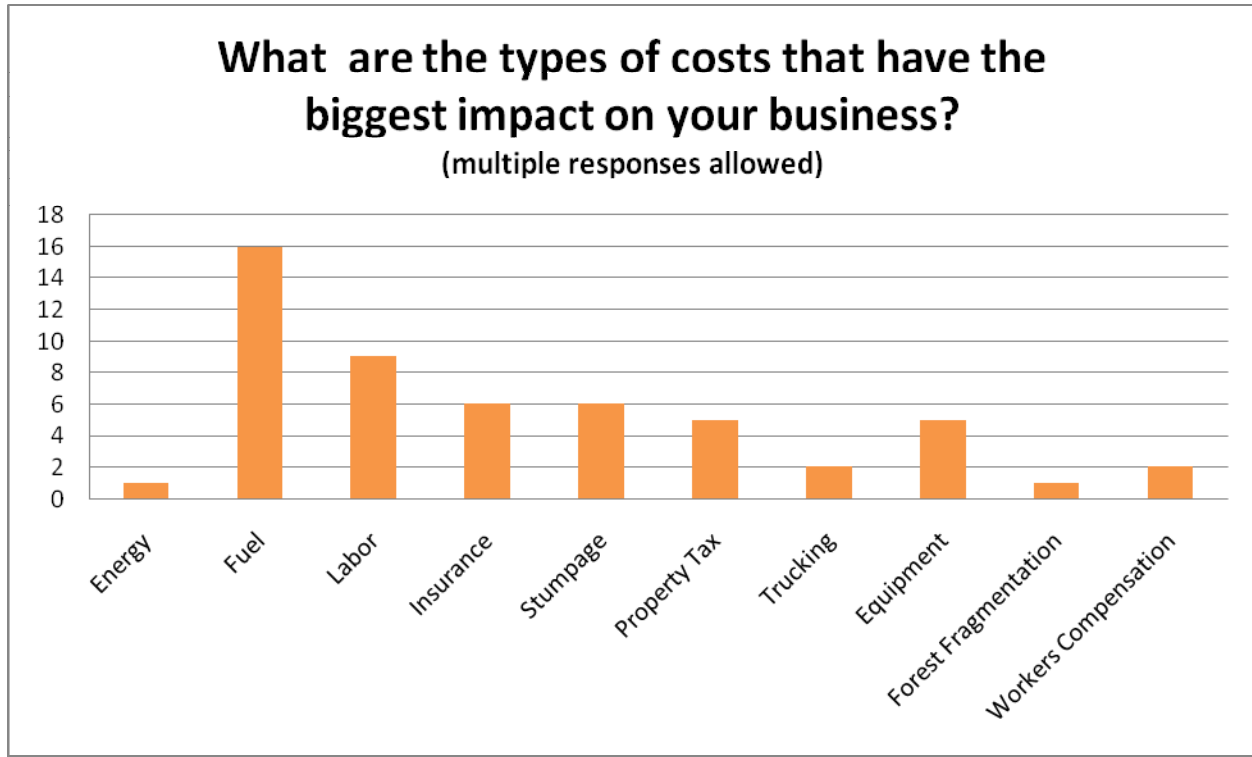
What are the biggest challenges you expect to face as a biomass supplier?

- Most landowners less than 1,000 acres don't look at clearcutting as an available tool. Maybe a patch clearcut. This is probably a high percentage of owners, so a lot of those small trees will be there for future generations.
- Some chipper operators spending \$3,000/week on fuel.
- Assuming there was a market with attractive price

What are the biggest challenges the buyers will face?

- If price is there you can buy it
- Pole mill, smaller mills are his suppliers
- Another chip plant in [nearby location], need clean chip that he can't provide. Somebody else tried it and couldn't do it
- E.g. nature center board - management plan called for even-aged management and board didn't know what it meant. Landowner needs clear objectives and preserve valuable growing stock. We should try to come up with approved practice that works with uneven aged management and acts as good forestry tool to make projects better for landowner.

Costs of Doing Business

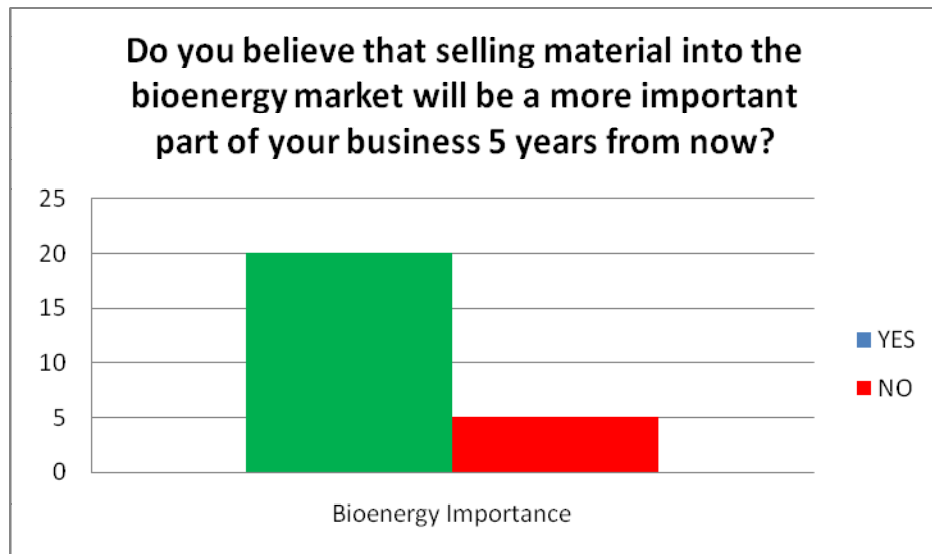


What are the 2 or 3 types of costs that have the biggest impact on your business? For each type identified, how easy is it to predict future cost levels?

- Lot of downtime at [local biomass plant] - pumps built by Japanese, now they can't get parts
- Have to be able to pay people, need sustainable wage for sustainable workforce
- Afraid they're all going to escalate but hard to predict. Definite that land values will go up. Harvest tech problem will be biggest problem
- Use forwarder 2 - 4 times a year, but couldn't get away without buying it. Grapple skidders - have 2 of them, need them most of the time. Takes smarter employee. Grinder small, takes 25 gal/hour
- More intensive management in southeast - can speak for that area in greater detail
- Tries to be straight shooter, doesn't enter into shady deals, makes it hard to be competitive but keeps him motivated to stay in business
- Property taxes - stepped up percentage each year
- Truck fuel, labor - drivers want \$65-80k/yr
- Logs - farmers doing better with dairy
- Fuel 30 cent/gal fuel swing in last 45 days

- Logging costs - well defined range but can vary within that range from job to job. Passed through in bidding process.
- Land/real estate taxes. PA taxes 1/4 or less than NY. Decisions from management are extreme. Bought tracts - in NY harvest timber and sell it to avoid taxes. PA taxes \$3-5/acre, NY range from \$15 - 30/acre, insane from long-term management. Look closely at \$12-15/acre range and may reconsider ownership. More of an engine to the locomotive than people recognize. Have had consequences of taxes increase considerably following purchase. Jargon known as "Welcome stranger" from out of state owner. One tract went up 400% after purchase. Kingdoms of town assessors yet when state gets involved they make things worse.
- Always going up, pay loggers based on mileage
- Taxes - real estate - go up every year greater than inflation
- Local logging ordinances. Secondary to real estate taxes
- Labor (if they do sale they don't let loggers cut in rain, on their own they don't care). Cost per skid to get wood out, some just understand volume out in terms of revenue/cost
- Equipment, but maybe not as volatile as fuel
- Real estate taxes - all they do is increase, magnitude hard to predict, sometimes 1%, sometimes 11%. This is biggest factor

Future Importance of Biomass Markets



Do you believe that selling material into the bio-energy market will be a more important part of your business 5 years from now?

- Even two years from now
- More - there's an alternate energy source to foreign oil
- Just as important
- Could be if price were higher
- Number of phone calls
- Huge component
- Not with current markets
- Jury's still out, figure out where it makes sense.
- Good chance of that - dictated by price
- Rayonier is focused on timber and non-timber income
- Qualified yes
- Hope so
- Yes if markets there - better job
- Yes -- very if paper mills close, but not if paper mills stay open

What are the steps you are taking to prepare your business?

- Am prepared - will need chipper. Is just now completing grinder purchase
- Need to be able to react to market changes with people able to harvest it - have seen that happen in NH, ME and NY over last 2 years. Buy chippers, etc.
- Looking into delimeter purchase that would enable him to grind more at landing, purchase of horizontal grinder and researching ability to do clean chips from chipper
- Primarily in southeast - not sure about specifics. Has a good inventory in NY, can dive in as needed.
- Examined addition of chipper, live bottom trailer, couldn't make pay right now
- Study markets and opportunities - every day
- Communicating that resource is available and that they're talking to end user
- Not much they need to do
- Look at chipper, buy new tractor (no sleeper - won't need it)
- Would do more if markets supported it
- Would like to build own co-gen plant - created energy company to do that

Perception of Challenges Faced by Developers

What do you think are the biggest supply challenges faced by biomass developers and/ or large wood fiber users seeking to buy existing or build new wood energy or wood to biofuels facilities?

- No supply challenge - make the phone call and they'll get buried in that area
- Pay loggers enough to bring the material out
- Getting raw material
- Adirondacks - loss of forest land, taxes are causing land to be sold, some easements are done but there's loss of acreage in production. More forest land overall in NY due to regrowth in forest land, but in Adirondacks state is buying tracts and large tracts are being sold. Weather too
- Finding wood at right price
- Wood supply availability
- Just like [local developer], we want 5 trailers/day. People aren't in market for that unless you want to pay a lot of money. There's a lot of people trying to do the same thing. Not as much understanding out there about competition. Want to make sure buyer's going to be around longer than a year. 4 or 5 pellet plants within 100 miles
- Contractor base - older and smaller, luckily more efficient
- Pick right location they'll be OK, Deposit NY was epicenter of many studies (highway, rail, power, gas other)
- Steady supply network from stump to door - have considered aspen, salix growth on marginal land. Need to have processor at landing, otherwise sawlogs end up in chipper because skidder operator doesn't want to get out and buck 1 or two trees in woods. It's OK if you're doing a pre-commercial thinning, but otherwise marginal red maple that could be a good sawlog in 15 years gets chipped. Pulpwood operations already have delimeter, slasher at landing.
- Don't know - supply, but that's all relative to price
- Ability to attract, pay logging contractors
- Ability to pay enough to get material produced
- Tough to answer, in Adirondacks, go through APA, rest of NY hard to say. Taxes are an issue.
- Steady, reliable market (feast or famine). Couldn't run woods operation that way
- Located in Adirondack Park, which is obstacle to siting
- Getting material - can't see getting it out of woods economically
- None if price is competitive.
- Don't know, siting is one (NIMBY), lag time to ramp up supply.
- Long-term material supply - need long-term commitment and suppliers need to remain profitable.

- Depends on type of plant. Pellets are different than pulp vs. ethanol. Resource is there. Competitive price has to be there.
- Capital costs and supply agreements.
- Depends on where and not overnight, but generally no problem.
- Price
- Ability to pay adequate price
- Winter time - many mills burn waste, bark doesn't burn well. Some problems with ash species due to use of wrong debarker head, bark is wood, not like bark. Mix of various hardwoods caused chemical reactions and odor problems with bark
- Problem can be solved on small scale, monitor crews, keep them in work. Pulpwood part was more manageable because you had that market and temper with sawmill market.

Long-Term Contracting



Parties involved in the financing and development of bio-energy facilities are interested in long term supply contracts. Do you have any experience in long term supply contracting?

- 5 years at most
- No long term contracts - if you had larger landholder or FT logger if they knew they had large landholder
- Some with pole companies
- In past long term was 6 months, now they can sign up to 3 years
- Familiar with them but hasn't don't them. [Regional biomass plant] has done some, then renege on them
- Pretty standard short term timber sale contract, 50-100 acres for most. They sell timber for clients, do not do logging
- Know about them, no personal experience
- Other than a little work with Keystone, most tops go to firewood
- Company as a whole does in the southern US
- To some extent with pulp mills
- He doesn't
- Don't sign them - tend to be self serving for receiver. Then they shut them off
- Spot market mostly
- No - they make nervous, hard to commit to long-run price

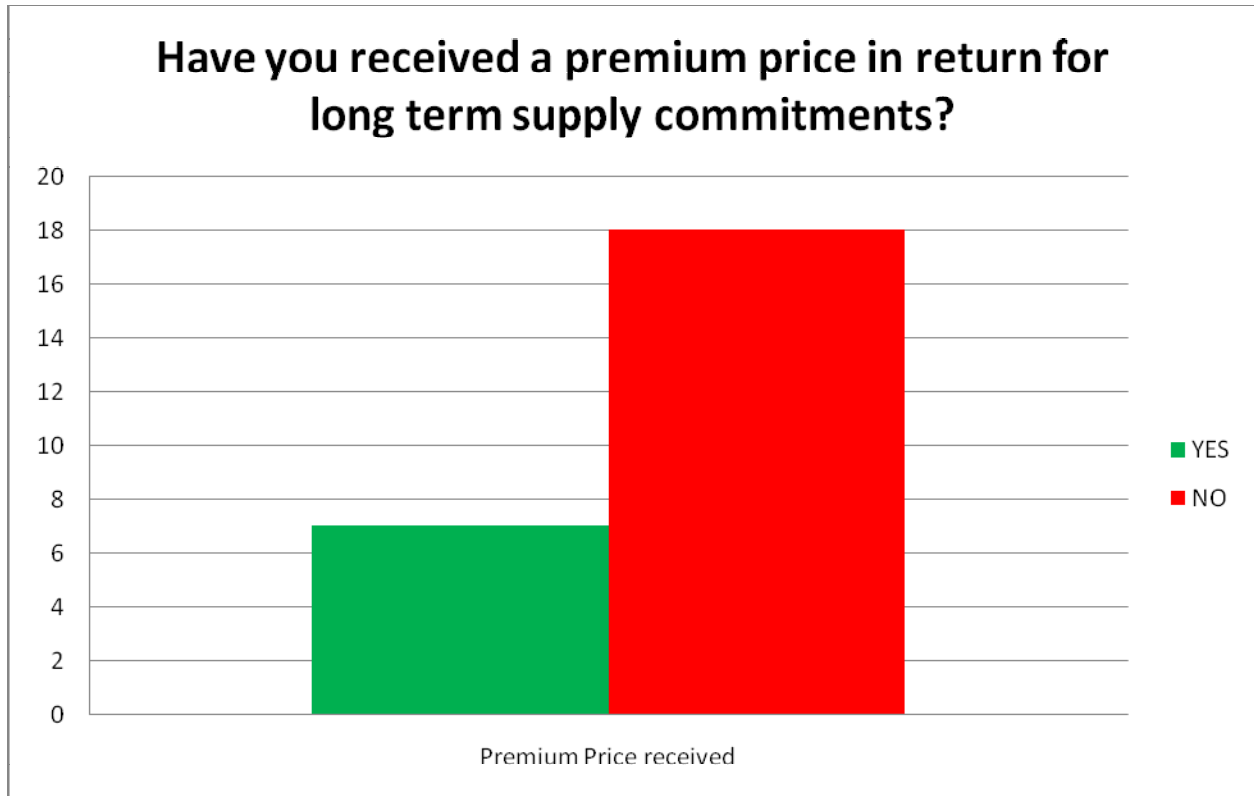
What has your experience been?

- Negative experience - power company was able to back out in 3rd year contract
- 2 year contracts
- Not applicable due to seasonal access
- 2 years longest, single sales
- Not applicable
- Been bitten by some - not very interested
- Good - worked well, need room for negotiation and fuel adjustments
- Can handle long-term contract but hasn't done it much - did it for [panel manufacturer]
- Very one sided
- Not big fans, but if terms are right it could work
- Fine - limited experience, up to 1 year max for higher value products
- Great if you can get them
- No long-term contracts. Long-term gentlemen's agreements
- Poor
- Other parties could talk about this in more detail in their organization - could do this type of contract if price was where it should be
- If someone came to him today with long-term contract would want significantly higher price for long-term agreement
- 1 year longest with fixed volume

Can you describe some of the key provisions?

- Contract breach shouldn't have happened, but challenged contract with Public Service Commission. Stepped increases in price, min/max supply quotas (not honored) - quite common. Currently supplying facility with no contract (since 1997)
- Guarantee volume, inflationary aspect - price goes up and fuel surcharge
- Problem was litigation
- Whole tree chipping for [local manufacturer] in past at 300 tons/day capacity. Property size is an issue. If you have 5-10 acre parcels you need front men to stage landings ahead of time. State/city land has larger blocks. Need more than 40 acres.
- Want guarantee of volume but no corresponding daily market guarantee. Suppliers want to talk in terms of days, mills want annual guarantee
- Up-front payment with certain buyer obligations. Biggest problem was change of ownership on property - new buyer doesn't understand what you're doing. Have smaller properties with private ownership.
- Contract compliance varies with supply/demand, contracts go out window in down markets when a lot of material is available

- Variations for price increases and even price deductions - in Canada have currency issue and fuel surcharge, cost of living issue



Have you received a premium price in return for long term supply commitments?

- No - premium only for short term (weather, adverse markets)
- Happy to get it so was buyer
- [Pulp mill] - a little bit, contracts work in favor of big guys. Basically he thinks [buying company] (jokingly) run by Satan
- Always gets premium due to quality of work. Could ramp up to 1,000 ton a day, 3 chippers, in wet weather chip in yard
- Premiums were paid in desperate need situations (mill needed wood fast)
- Small bump, maybe \$20/thousand board feet occasionally
- Usually on buying end and yeah, would pay premium

What are the maximum and minimum durations you have considered in the past?

- 1 to 6 years
- 1 time sale to 2 years
- 2 or 3 years
- 6 months to talking about 5 years, longest didn't go through

- No contract to 6 months
- All less than 1 year in duration
- from no contract up to 1 year (needs to be 2 sided)
- Do not know
- No contract to 1 year
- 1 month to 25 years
- Spot market (weekly) up to 1 year in length
- For biomass/pulp materials - joke, could sign up 1 yr contract for X cords/week and contract meant nothing if purchaser shut down temporarily, or reduce quantities
- Normally contracts are between 6 months and 2 years
- Prefer steady outlet to one that varies from week to week - at same time weather is hard to predict

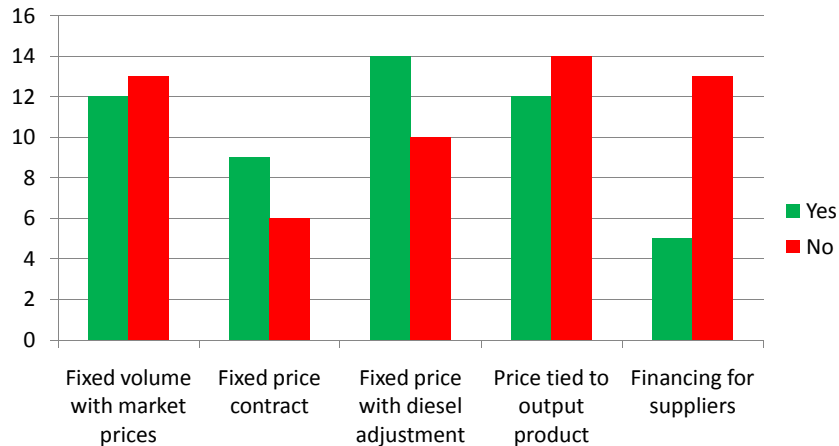


Did the contract include price escalators based on inflation?

- Every two years (3 times in 6 years), based on inflation
- Fuel price
- Fuel price
- Based on volume- pay more for fewer suppliers

Various Supply Arrangements

What supply contracting arrangements would you favor?



Fixed Volume with market prices

- Overall not interested in long term agreement, their production depends on production schedules
- Market value should be tied to price of chips not end product
- If there were parameters on the variation in price
- Defeats purpose of long-term contract if there's no price guarantee

Price tied to output product

- But trust would come into play - who gets to decide what energy price is.
- Maybe if there's a price floor
- Somewhat in favor because he tends to favor markets
- With a price floor
- Possible - more fair business practice

Financing for suppliers

- Locks you in, could be good or bad
- Many do that - he hasn't done that - get supplier and product price you want, but if you bid too low guy goes out of business

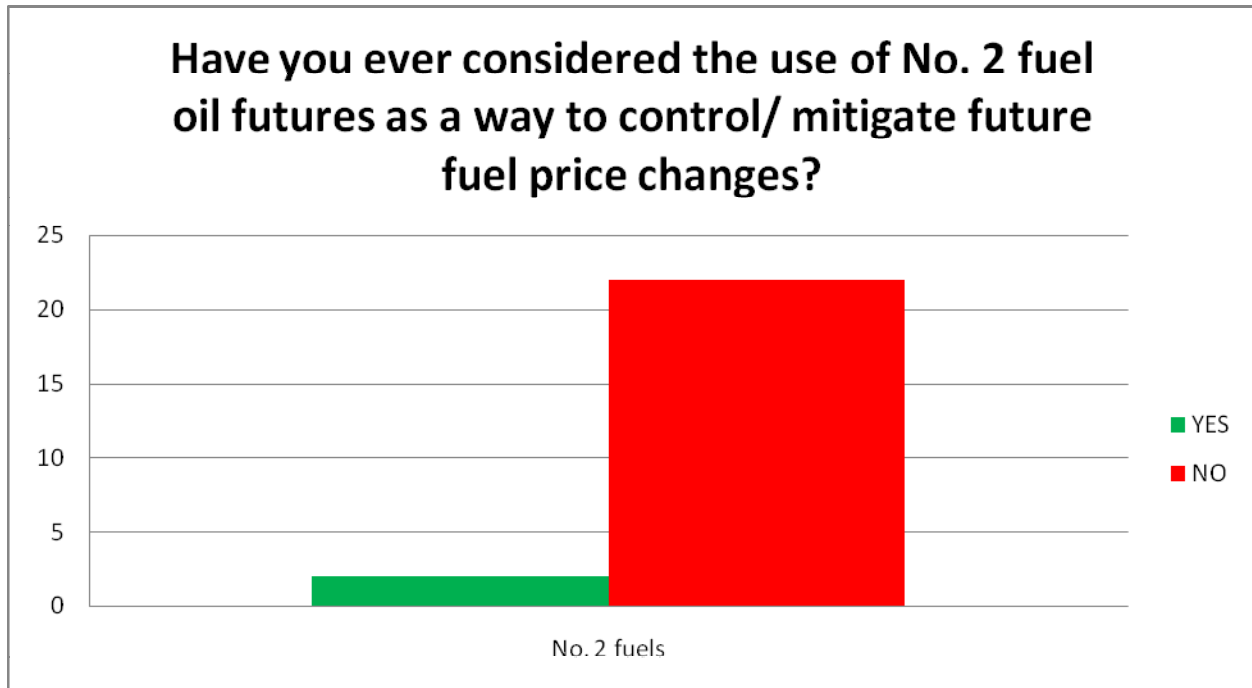
Fixed price for delivered biomass

- Depends on length - hard time unless high premium for contract longer than 12 months
- Nothing wrong with that as long as you don't go out too far
- Needs to ensure everyone makes money. Can't have market shut downs during year, people have to eat
- One year at a time

Fixed price with diesel adjustment

- Common nowadays
- Don't like it. Too much room for interpretation

Use of Other Commodities to Hedge Risk



Have you ever considered the use of No. 2 fuel oil futures as a way to control/ mitigate future fuel price changes?

- Yes - that's what they prefer
- Considering that with some logging contractors
- Not very knowledgeable about contract language
- Heard about it don't know much about it
- Don't know that much about futures
- Not really relevant
- Burns sawdust, had oil boiler, tore it out
- Actually purchased futures 2 or 3 years ago - not included as part of contract
- As a separate investment, but not in this business
- They buy generator fuel on futures markets but not related to supply contracts
- Not seriously - for guys like him by the time the price gets high enough they get too nervous to commit - thinking it will fall again. Even large vendors won't look at futures for anything greater than known sales volumes

Other Comments

Is there anything else you would like to tell us?

- Biomass markets would make it able to sell timber better to landowners. May be better service but may not always be best thing for forest. Leaving tops may keep more organic material, prevent over browsing
- Located on main highway in [town] with rail, processing, logging equipment business, know every contractor in NY so if they could work a [local] facility it would be mutually beneficial. Certainly would be dependable product
- Whole issue is very important, very excited about potential. A lot of details unknown. Have to have this as part of strategic supply, keep land in forest cover and forest management (both biomass and biofuels)
- One issue - biofuels, debating what to use for biofuels. Corn demand increases raise food prices. He doesn't think that's a good thing if you have other ways to produce ethanol. Wood should be mostly plantation wood.
- Note that [management company] does their management.
- Fairly pessimistic about biofuels as fuel in the future, [local facility] proposed project, siting issues, willow plantations pie in the sky; Syracuse and other projects. When [company] left [town], guys who could haul pulp left town so now nobody's geared up for it. [Pulp mill] is state of the art and is making money - buy chips. [Another firm] buys roundwood, shut down a line, only make OSB now.
- Just reiterate that price needs to be competitive for wood producers and in energy market for this to continue to be viable
- Would do what he could to support it from professional and patriotism point of view. Heats own home with wood.
- 4-5 years ago, could do more w skidder but now labor and fuel costs don't make it possible

Survey of Financial Institutions

This summarizes the results of a telephone survey of biomass project financiers during October 2007 through February 2008. The response to the survey effort was limited. Three interviews were completed, out of 15 total contacts identified for the effort. Two respondents worked for investment banking companies that have biomass energy projects as part of their investment portfolio, while one was an investment professional that worked for a firm that acts as an intermediary between its investor clients and project developers. One respondent's firm had direct experience financing biomass power projects, while the others had direct experience with ethanol, biodiesel and landfill gas projects. One respondent's firm has recently formalized renewable energy as a growth vehicle for their investments, with a primary emphasis on wind power, secondary on solar with biomass third. Another respondent simply viewed renewable energy as part of a long-term investment strategy, while a third served as an investment advisor so they adopt client expectations as their own.

Of the respondents that did not complete interviews:

- 1 contact could not identify appropriate party to respond to questions,
- 2 contacts no longer work for the identified organization,
- 7 were left messages with no return call or email, and
- 2 returned calls but we were unable to schedule interview.

Because of the small number of responses, quantitative responses cannot be considered to be reflective of the population as a whole and any numerical analysis is likely to be unjustified. However, the interviews provided qualitative information that is valuable in considering the attitudes of this group, especially when contrasted with data collected from project developers and biomass suppliers.

Criteria for Project Investment

All respondents indicated that fuel supply contracts, supplier credit-worthiness, off-take agreements, government incentives were either important or very important in their analysis of bioenergy projects when these factors were listed. Two indicated that the project owner/developer and political support for the project were very important, while one responded that these were somewhat important. There is insufficient data to support whether any of these criteria should be weighed more heavily than the other, although the anecdotal data suggest that all of these criteria are significant to financiers in their consideration of project viability.

When asked explicitly what their project investment criteria were, respondents listed:

- Fuel supply certainty (described as inclusive of long-term contracts, supplier credit-worthiness, power purchase agreement/financial hedge for financing term);
- Developer track record and presence in market;
- Off-take agreements; and
- Debt coverage and cash flow to deal with changes in sales and other factors.

When financiers were asked if they assess renewable energy projects differently from other energy projects, two indicated that they did, with one adding that government involvement with renewable energy credits and producer tax credits creates a different investor pool than for non-renewable projects, more so for biomass power than for ethanol projects. Two mentioned that that tax equity issues associated with renewable projects is not present for nonrenewable energy projects.

When differentiating decision-making for biomass projects from other renewable energy projects, one respondent noted that for other energy projects, there are investment-grade suppliers who are able to sign long-term contracts. This is typically not the case with biomass and local markets, transport costs and overall costs are volatile. Without long term contracts you are at risk of indeterminable feedstock costs.

Critical project funding requirements cited by respondents included the following issues:

- Conventional projects require cash flow covering debt investment in a 1.5:1 ratio to ensure that a project can cover the debt in the event of market deterioration. They require a 2:1 ratio for biomass projects. In addition, to model fuel price assumptions they assume a 100% fuel price increase is feasible in expenditure calculations.
- A wrap on construction project tends to lend itself to investment equity - downside protection for construction debt useful if a plan does not begin operating on time.

Respondents placed either a moderate or high value on government incentives in the form of loan guarantees and grants, special tax considerations such as the federal Production Tax Credit (PTC), and green premiums during the financing process (e.g., Renewable Energy Credits, or RECs). Regarding government incentives, they are particularly important if they can affect cash flow, although this depends on the magnitude of the incentive. In addition, recently there has been a significant amount of money from local governments for projects. The PTC value for biomass has not been very high in the recent past. The value for RECs is highly state dependent. One respondent cited RECs as high as 5 cents per kWh in the northeastern U.S. but only 0.5 cents per kWh in Florida.

Analytical Tools and Use of Other Commodities to Hedge Risk

Respondents employ a variety of different analytical tools in order to manage their financial risks, including in-house financial models, analysis of power futures specific to the project region, and energy forecasts. One respondent stated that power purchase agreements are often tied to oil, gas and coal prices rather than wood so they need to forecast prices for these commodities in order to ensure that income analyses have the right price assumptions. For ethanol projects, one respondent stated that they look at a wide variety of futures markets, including natural gas, reformulated gas blend stocks for oxygen blending (RBOB), corn and oil. For biomass power projects they typically use a third party consultant to do fuel supply study.

Perceptions of Project Risks

Respondents cited a wide variety of key project risks, including the following:

- Biomass feedstock supply and price
- When small developers build one-off plants it creates uncertainty regarding developer financial wherewithal to complete and execute viable projects
- Political risks such as uncertainty regarding PTC extension and other issues are significant. Availability of the PTC every year affects the availability of tax equity for biomass projects.
- A lack of correlation between the price of inputs and product outputs is cited as a risk for alternative fuels projects, i.e., ethanol prices are down but corn prices are up. This is perhaps more the case for biodiesel. Natural gas is another major input with recent price increases.

Workshop Information

In April 2008, the Empire State Forest Products Association held a workshop in Rome, New York to bring together biomass energy developers, suppliers, and others interested in the development of a biomass energy industry in New York. This sold-out workshop, titled *Building a Profitable and Sustainable Biomass Supply Chain*, attracted nearly one hundred participants.

The workshop was divided into three portions:

- An introduction to issues surrounding biomass energy projects in New York;
- A “market simulation”, where workshop attendees were assigned roles, placed in pairs and asked to negotiate a long-term biomass supply contract; and
- A facilitated group discussion of the market simulation exercise, the business models that can provide for long-term biomass supply, and next steps.

The initial portion of the workshop included presentations on biomass supply issues in New York, including:

- Biomass and biofuel development in New York;
- Understanding New York’s forest resource;
- The marketplace for biomass electricity in New York; and
- The results of supplier and developer surveys.

Following these presentations, participants participated in a market simulation, designed to engage participants in thinking about the critical aspects of a biomass supply arrangement. Attendees were assigned roles, when possible opposite the roles they actually hold (e.g., developers played suppliers in the market simulation). Individuals with the same role were then provided with confidential instructions, telling them what arrangements were acceptable given their role. Groups were given time to discuss issues and develop strategies with individuals playing the same role, and then attendees were the paired off (one individual paying a “developer”, one individual paying a “supplier”) and asked to negotiate a long-term supply arrangement, addressing three issues:

- Price
- Business model
- Forest sustainability auditing

The “general instructions” for this market simulation are provided in this report. These are the instructions provided to all parties, and set the overall conditions that participants operate under. Each party also received “confidential instructions”. These instructions are not presented here, as disclosure of these instructions would make future use of the market simulation difficult. Individuals wishing to use this market simulation may contact Raab Associates, Ltd (www.raabassociates.org) to inquire about use of this simulation. The tabulated results of the

market simulation were shared with the attendees, but are not presented here for the reason described above.

Following the simulation, attendees were asked to engage in a facilitated discussion about:

- Issues identified and lessons learned during the market simulation;
- Business models that can be used to develop biomass supply arrangements; and
- Findings and next steps to build New York's biomass supply infrastructure and the business relationships that can facilitate this.

Biomass Energy Contracting Negotiation¹

Bioenergia has already built several electricity generating facilities around the US that use wood and wood waste as a fuel source. Bioenergia is currently considering building a new 30 megawatt (MW) facility in the Northeast, in response to an RFP for renewable power issued by one of the larger states in the region. For Bioenergia to successfully respond to the RFP, it needs to be able to bid a fixed and competitive price for its output over a ten year period, and to provide financial security. Unlike some renewable resource generators, like wind turbines, which can only operate when the wind blows, the proposed biomass facility would function much like other baseload generating facilities (such as nuclear or coal plants), operating 24 hours per day, 7 days per week (except when down for periodic maintenance),

Bioenergia has been in negotiation with Silver Wood Products Consortium (SWP), a regional consortium of forest-based wood suppliers. In order to bid in the upcoming RFP process, Bioenergia needs a biomass contract with SWP that provides sufficient certainty in fuel supply and pricing.² There have been several preliminary meetings between Bioenergia and SWP, but today's meeting is the final chance to reach a deal before the RFP deadline.

In order to strike a deal, Bioenergia and SWP need to come to agreement on three issues.

- 1) Pricing Structure; 2) Price Level; and 3) Sustainability Requirements

The first issue is the overall pricing structure of the arrangement. Structural options that have been discussed include:

- A) Spot prices; B) Fixed price; and C) Fixed price but with a diesel price adjustment

All three structural options would include fixed quantity—i.e., all the wood needed to supply the 30 MW generating facility over ten years. Moreover, Bioenergia and SWP have already agreed on the fuel specifications (i.e., the allowable chip size and moisture content parameters) and Bioenergia is satisfied that SWP is a credit-worthy entity.

¹ This negotiation simulation was created by Dr. Jonathan Raab, Raab Associates, Ltd. with assistance from Bob Grace, Sustainable Energy Advantage, LLC and Eric Kingsley, Innovative Natural Resource Solutions LLC with financial support from the New York State Energy Research and Development Authority (NYSERDA). ©2008, all rights reserved.

² Bioenergia already has a contract for some of the biomass needed for its proposed 30 MW facility with suppliers of biomass from land clearing. This far larger contract with SWP would be for the remaining biomass needed.

The second issue is the actual price of the contract.

1. For the spot price option (#A above), the price would fluctuate in accordance with the wood and wood waste market price over the ten year contracting period.
2. For the fixed price-based options (#B and #C above) the parties would have to come to agreement on a specific price relative to today's spot price. The diesel price adjustment proposed by SWP at the parties' last meeting would have 25% of that fixed price contract indexed to the spot market price for diesel fuel, since approximately 25% of its production costs are diesel fuel.

The third issue involves sustainable management of the biomass fuel supply. Although RPS³ eligibility requirements for sustainability already exist, requirements could become more stringent over time, presenting certain risks to both buyer and supplier. For example, legislation was proposed last month containing specific provisions which would raise the standards for sustainability above the levels currently required. Three options have surfaced in the course of negotiations:

1. Current Eligibility Standards Only—SWC would agree to abide by and self-certify that it is meeting current forest sustainability requirements mandated by the state as the RFP-issuer, and to agree to sign annual statements that it abides by today's eligibility requirements. If Bioenergia has reason to suspect a violation of these standards, it may investigate, at its own expense.
2. Higher Standard, Plus a Willingness to be Audited— SWC would agree to abide by the specific higher standard of sustainability reflected in the recently proposed legislation, and to be willing to keep records and be subject to outside audit as part of a system wide random audit process.
3. Higher Standard, Plus Third Party Certification-- SWC would agree to abide by the specific higher standard of sustainability reflected in the recently proposed legislation and to participate in an annual outside (third party) forest sustainability practices certification program, which would proactively assure and confirm eligibility under the proposed higher sustainability standard.

In addition to these general instructions for the negotiations, both Bioenergia and SWP will receive their own "Confidential Instructions" containing additional information on each of the 3 issues above, including their relative preferences and priorities regarding the options for each issue.

³ Renewable Portfolio Standards

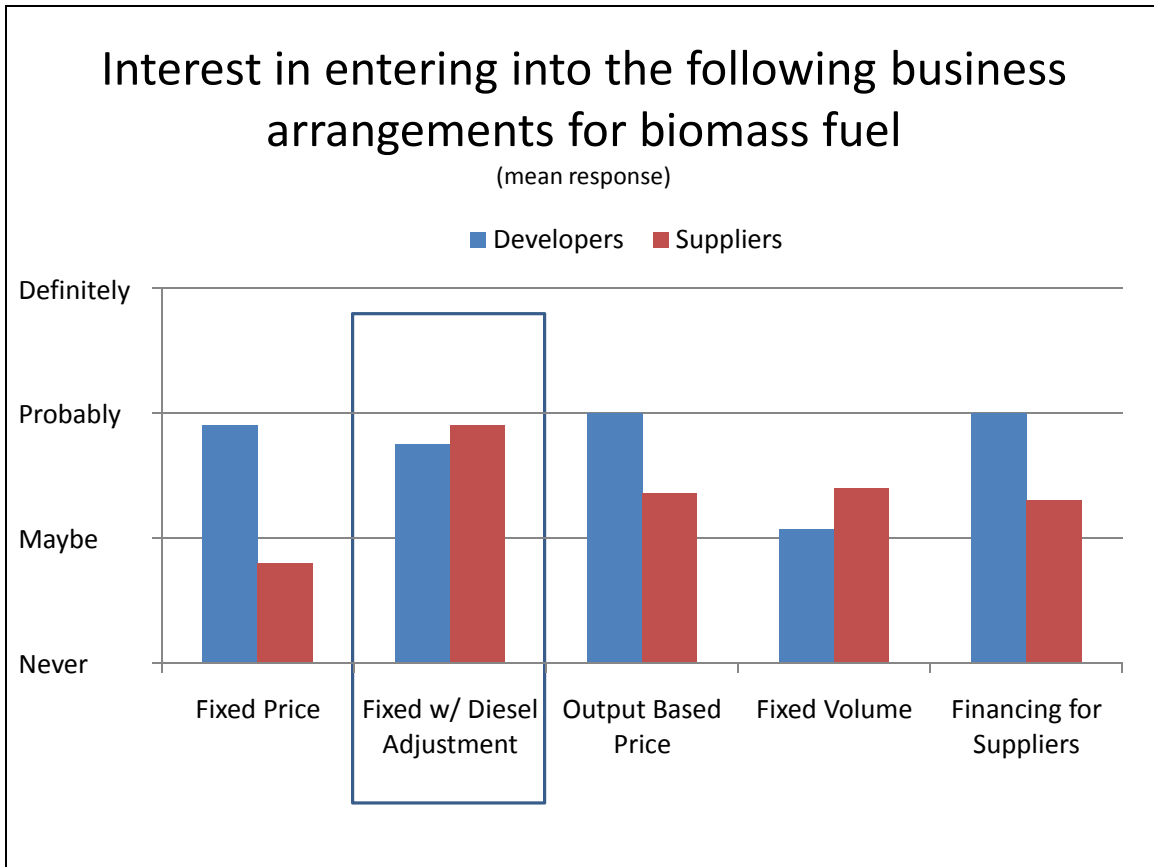
Negotiation Logistics

The way that the game will work is as follows:

1. After distributing your confidential instructions, you will be given approximately 30 minutes to read them over and to prepare for your one-on-one negotiations. During that time you will be clustered with people who will be playing the same role in the negotiations (e.g., all the Bioenergia people will be clustered together) and you can use this as an opportunity to brainstorm strategies and to bounce ideas off one another. You can also seek clarification from the simulation moderators.
2. Each of the confidential instructions will be numbered. The actual negotiations will be one-on-one (e.g., the #22 Bioenergia' representative will negotiate with the #22 SWP' representative). You will have 60 minutes to reach a deal on all three issues. Note: You may choose to embellish deals beyond the discrete choices provided in your confidential instructions, as long as the deal is generally consistent with your instructions, but this is not required in order to reach a solid deal.
3. After the negotiations have concluded we will debrief the negotiation exercise. During the debriefing we'll present all the deals in a concise fashion and then discuss some of the ramifications of what we have collectively learned

Business Models that Meet the Needs of Biomass Suppliers and Developers

At the conclusion of the workshop, participants were asked to rank their willingness to engage in five business models discussed during the workshop. Individuals were asked if they would participate in each business model, using a ranking of “never” (1) through “definitely” (4). The figure below shows the mean response to each business model for suppliers and developers.



For each business model, there were participants willing to consider engaging in that practice, with one model having notably high acceptance with both supplies and developers. The business model of “fixed price fuel supply, with a diesel adjustment clause” ranked high for both parties.

The following pages provide a description of each business model, as presented and discussed at the workshop, as well as the level of interested expressed by both developers and suppliers.

Biomass Supply Business Structure Summary

Definition: Fixed Prices are prices contracted for a known volume of biomass fuel at a known and certain price for a specified period of time.

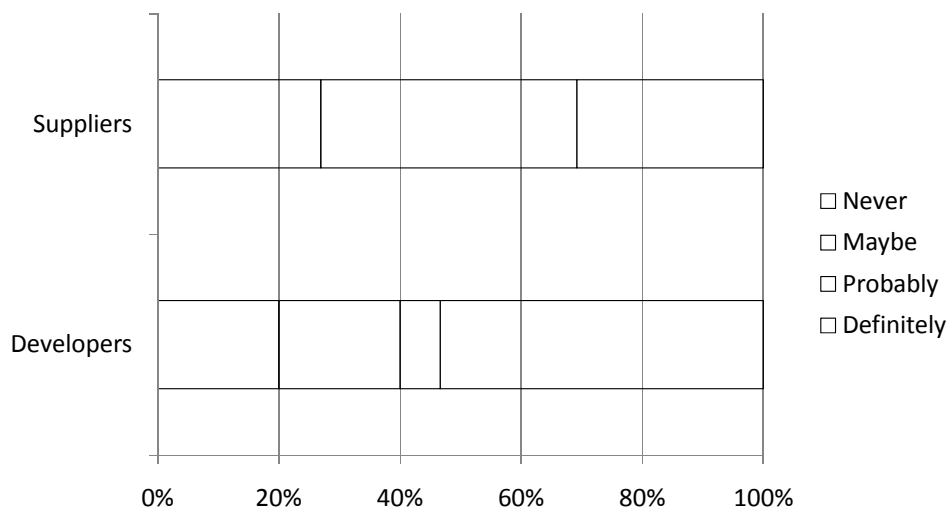
Benefits:

- Long-term fixed contracts provide all parties the greatest price certainty
- Some developers report that this is a critically important piece of financing a new biomass facility

Issues / Challenges:

- Exposes both parties to up-side and down-side risk if market prices change dramatically
- Definition of “term” needs to be ironed out – supplier and developers may view “long term” in different ways (e.g., 6 months to a year vs. 10 or even 20 years)
- Some suppliers suggest that they cannot possibly consider deals longer than the expected life of their equipment – typically around five years
- Suppliers expressed a need to have market certainty – what happens if the facility does not operate? Will suppliers still get paid for their biomass (i.e., are these “take-or-pay” contracts)?

Willingness to Enter Into Biomass Supply Arrangement Fixed Price Contract



Biomass Supply Business Structure Summary

Definition: Biomass fuel is contracted at a known volume, with a fixed base price that changes using an agreed to formula based upon the price of diesel.

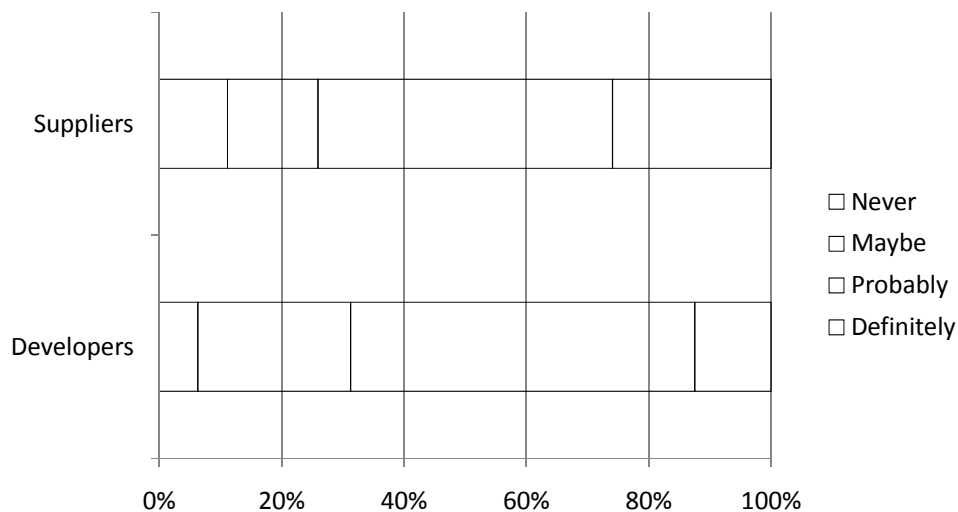
Benefits:

- This provides all parties with volume and price commitments, subject to a single variable
- Allows suppliers to manage risk associated with their largest variable input cost, and some indicated critical piece of “long-term” deal

Issues / Challenges:

- Developers may be able to “hedge” future diesel changes with purchase of oil futures or home heating oil futures
 - Suppliers may be able to do this as well, but are challenged by modest volume and access to sophisticated financial tools
- Formula needs to be worked out that allows certainty for both parties
 - How much of the price is fixed, and what percents floats on the price of diesel
 - Agreeing on what serves as the “rack” (benchmark) price of diesel is critical
 - Frequency of adjustment must be agreed upon

Willingness to Enter Into Biomass Supply Arrangement Fixed Price with Diesel Adjustment



Biomass Supply Business Structure Summary

Definition: The contract is for a fixed volume of wood, and suppliers are paid based upon a formula derived from the price of the output product

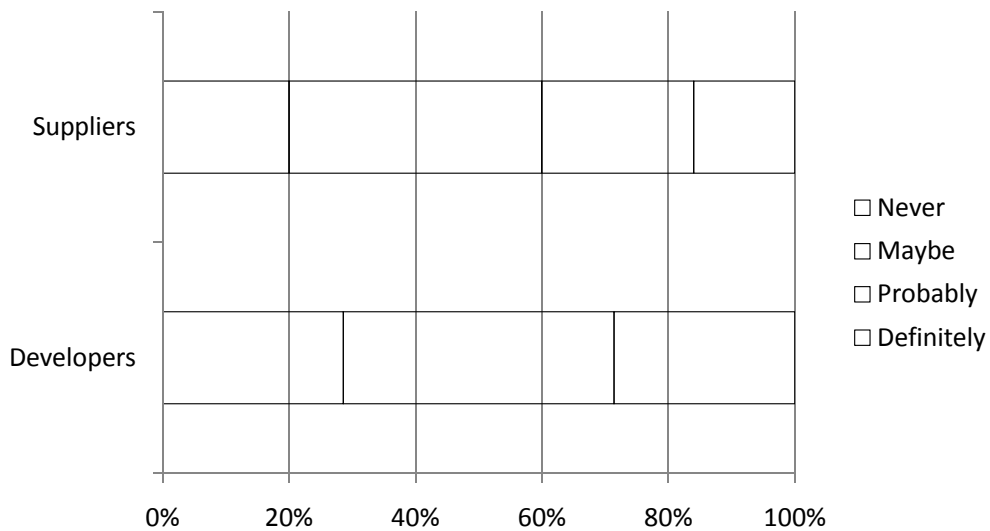
Benefits:

- This provides developers with a way to “self hedge” – as prices for their output change, their input prices will change as well
- It also allows suppliers to directly and measurably benefit from significant upside opportunities that are perceived to exist for biomass projects

Issues/Challenges:

- Formula needs to be worked out that allows certainty over price structure
 - Agreeing on what serves as the “rack” (benchmark) price of output is critical
 - Frequency of adjustment must be agreed upon
 - “Output” must be agreed upon – renewable energy certificates, carbon credits, tax credits, and other revenue not core to the product stream must be agreed to in advance
- This exposes suppliers to risks in markets they know little about – electricity, liquid transportation fuels, etc.
- Only useful to developers / buyers who have variable output revenue
- Could be structured as a “collar”, with agreed to ceilings and floors for biomass fuel prices

Willingness to Enter Into Biomass Supply Arrangement Biomass Price Tied to Output Product Price



Biomass Supply Business Structure Summary

Definition: Suppliers and buyers agree upon a known volume of biomass wood, and allow price to be set by market conditions

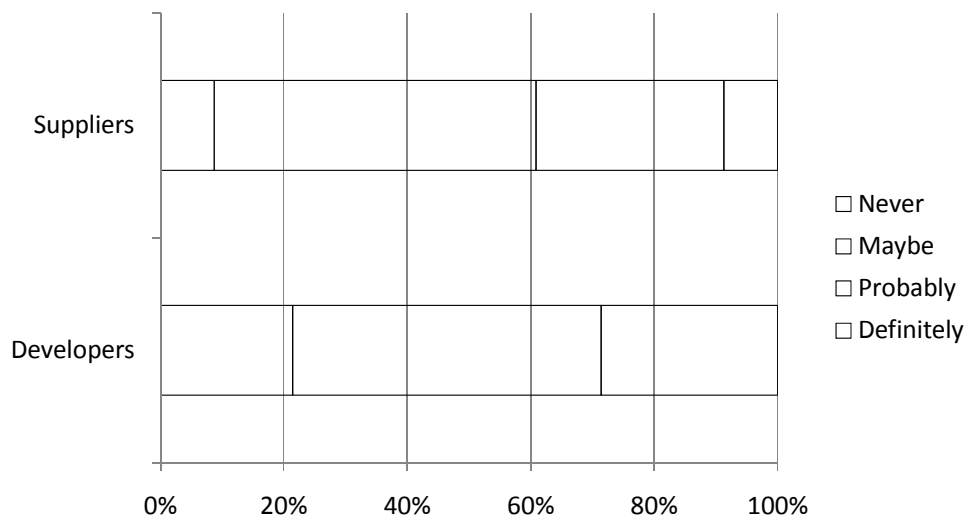
Benefits:

- Volume agreements provide all parties with a known supply and market, important for both buyers and suppliers

Issues / Challenges:

- No parties have any level of certainty regarding future price, and market could move dramatically in either direction (e.g., impact of new market entrant)
- Some parties suggested that this could work with “price collars” – floors and ceiling in which prices could fluctuate based on market conditions
- Potentially solves developer concerns regarding fuel availability, but does nothing to address price risk

Willingness to Enter Into Biomass Supply Arrangement Fixed Volume, Market Price



Biomass Supply Business Structure Summary

Definition: In order to increase supply capacity, biomass developers provide low-cost financing for suppliers to purchase equipment necessary to process biomass fuel

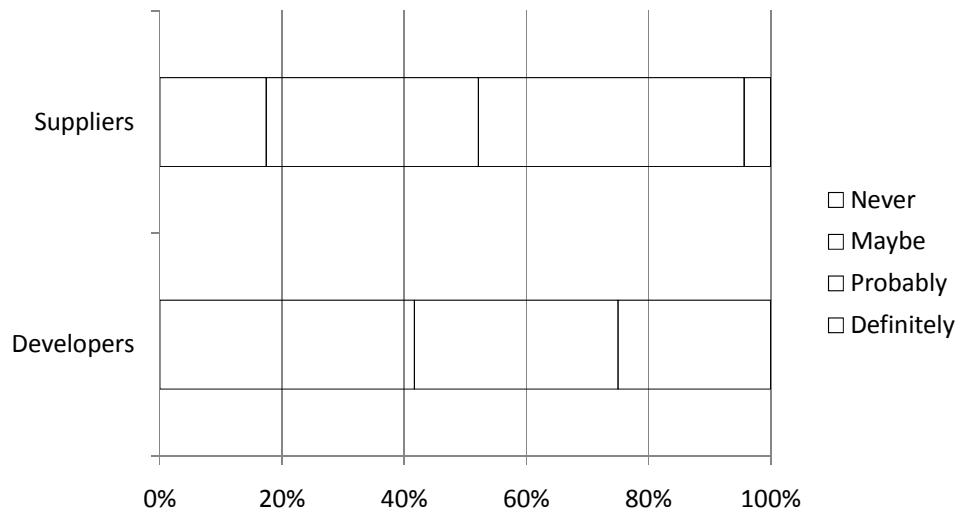
Benefits:

- Allows developers to create a biomass supply infrastructure
- Provides suppliers with a low-cost financing option

Issues/Challenges:

- This works only if the developer has access to an interest rate or access to capital otherwise not available to the supplier
- Suppliers can pay off loan through a small per-ton deduction from fuel deliveries
- Most important in areas without an established biomass market and infrastructure, where a large number of suppliers may need to add equipment and trucks to existing operations
- Caution needs to be exercised so that an “employee – employer” relationship is not established
- May add business risk to developer without necessarily increasing control

Willingness to Enter Into Biomass Supply Arrangement Plants Provide Financing for Suppliers



Comments Provided by Workshop Participants on Feedback / Evaluation Sheets

At the conclusion of the workshop, participants were asked to provide answers to four questions, helping to identify issues and next steps. Below are the responses provided, grouped by respondent type and edited only for clarity.

What do you see as the most promising solution(s) for biomass suppliers and developers to reach common ground?

Developers

1. Common understanding of challenges facing each / both
2. Continued dialogue between the interested parties, It will take time to change the culture / system
3. Keeping each other whole
4. Reaching a true partnership and understanding of each others needs, especially economic
5. Risk sharing (supplier stake in project success in exchange for favorable supply terms); Protection for supplier against catastrophic financial loss
6. Smaller equipment to gain access to small timber stands
7. Sharing information so both sides understand critical issues
8. Understand each other's business
9. Growth of large suppliers providing supply for multiple biomass industries
10. Probably necessary for outside help (government maybe) to underwrite a working relationship between suppliers and developers
11. Development of different supply streams to maturity to provide true market competition
12. Understanding the drivers on both parties
13. Diesel hedging, equipment financing

Suppliers

1. Public awareness of long term benefits
2. Partnerships - the relationships must be win - win
3. Equipment financing, sustainability certification
4. Compromise
5. Just from panel discussion sounds like those who know something feel government help needed and a level playing field with other renewable generation sources
6. Partnership between landowners, loggers and end users
7. Government involvement in timber harvesting
8. Supplier working together with mills or biomass
9. The suppliers can deliver material at a profit
10. Working cooperatively vs. adversarial business - seek win-win business arrangements
11. More honest education and cooperation
12. Better understanding of each other's roles
13. Pricing fairness

14. To work towards a partnership that benefits both sides
15. An understanding of each other's business
16. "Partnership" approaches - customer focused relationship
17. Approach of industry to landowners or farm industry
18. Price
19. It is in the best interest of both parties to be profitable
20. The state government should get fully behind green energy with more tax incentives and purchases
21. Reasonable pricing for the supplier
22. Groups getting together
23. Each one to be fair and profit
24. The suppliers have a product that the developers want
25. Understanding the issues and problems each face and that both need to make a profit

Others

1. For big energy it is in the capital financing to build supply capacity
For small project it is in localized supply chain
2. Opportunity exists for a distributed type of cooperative or company
3. Developing a true market outlet, like a merchantile exchange, for suppliers to sell into
4. Partnership
5. Working together and more closely
6. Continued dialogue
7. Fiber supply - long-term supply and pricing stability
8. Mutually share both benefits and risk
9. A shared desire to survive and grow
10. Keep communication open through sessions like these
11. More liquid market and a price that would sustain non-sawlog harvesting
12. Collaboration, recognition of common concerns and dilemmas. A central networking infrastructure, a central operation w/ many tentacles
13. Creating partnerships rather than seeing others as adversaries. This workshop was a good first step.

What unresolved issues exist for assuring biomass supply?

Developers

1. Definite demand
2. Some new technologies are not proven as of yet. Need to address infrastructure supply chain.
3. Impact of biomass harvest on ecosystem, secondary succession, species diversity, wildlife habitat, runoff water quality
4. Plan for sustaining of resource and supply
5. Infrastructure, government support
6. How to organize and aggregate a large, reliable supply
7. Government help (or lack of it)
8. Infrastructure
9. Massive lost supplies due to market / regulatory inefficiencies. As one significant example, the inability to use MRF-separated wood under the RPS for electric generation
10. Suppliers rising cost of operations. They need to make a profit to stay in business
11. Making clean C&D available from transfer stations
12. Pricing
13. Enforceable contracts

Suppliers

1. Price
2. Money
3. Financial viability of loggers
4. Money
5. Fuel costs
6. Incentives for "family forests" to be involved and suppliers to make living
7. Can plants afford to pay enough for loggers to be profitable
8. None - there will always be low-grade wood
9. Fair, stable pricing
10. Infrastructure of the supply chain >> aging loggers, expensive, no growth
11. Government, regulation, permits, etc.
12. Fuel costs
13. Good silviculture practices
14. Building a biomass power plant
15. Long term contracts
16. Equipment, haul distance
17. Future value of fuel and energy production
18. Who will supply in the future with so many loggers getting out of the business
19. Private fuelwood increased consumption; landowner value changes - ownership changes; decreasing tract size - 24 acre average size parcel now; owners don't want to pay extra for being "green"; conflicting existing laws / rules

20. Pricing structure
21. An interest in loggers to take more risk with equipment investments
22. Price
23. Aggregating a diverse supply base
24. Cost
25. Price of biomass
26. Not really understanding what costs are and the variables involved in wood production (costs)

Other

1. How do small scale users fit into big equation?
2. When prices for supply increase will the suppliers appear in enough abundance to fill demand
3. New technology
4. Dependence on fixed / assumed supply, long term in order to gain financing! This is unresolvable, given that competing energy developers (gas fired, etc.) don't have guaranteed supply prices
5. More commitment and risk should fall to government entities
6. Keeping prices down and more insensitive
7. 85% of timberland is non-industrial private owners
8. Regulatory, raw material pricing
9. Biggest "downside" is the risk tied to getting in and then staying in, can you afford to operate, and can you continue to operate
10. Establishing a fixed schedule or rate for biomass that is industry accepted
11. Where are carbon credits headed
12. Why this industry needs contracts
13. Diesel fuel, regulation, government support
14. Price
15. Lots of items discussed today - risk and uncertainty are large on many fronts. Seems like a role for government to minimize early front-end risk

What can be done to move this issue forward, and who should take responsibility for next steps?

Developers

1. Everyone must work together
2. Coalition of forest / energy groups
3. Tax on wood harvest with proceeds allocated to university research centers for qualified not-for-profit. Wood sales from lands under sustainable management are exempt.
4. Evaluate resources, supply and demand in area. Plan life cycle requirement
5. I think the ESFPA is in a great position to move this forward and I'll gladly support this any way I can
6. ESFPA or independent aggregator facilitate developers organizing supply
7. Keep fuel prices going up
8. Partnerships
9. Possibly some initial subsidies to start a working supply chain (government again) as they have with a \$0.51 subsidy for corn ethanol. There should be sunset clauses on subsidies after establishment
10. Right policies, such as tax incentives
11. Developers / owners, landfills, NYSERDA
12. This needs to be done in an open forum with both sides

Suppliers

1. Everyone should take responsibility
2. Developers and loggers need to approach government with a plan to succeed what will it take?
3. Government support
4. NY stimulate opportunities so they can get jump started, projects worked on, and the supply chain started so future growth can happen, stimulate w/ small scale projects (schools, small businesses)
5. A panel of outstanding timber harvesters
6. Realistic evaluation of the supply price requirements
7. Expand existing partnerships beyond the wood industry
8. Less government
9. A coalition of the right groups
10. Government interest / development
11. Both the suppliers and developers and public in general
12. The forest products industry as a whole. We have to find a way to at least meet the developer needs / expectation, and the developer the same
13. Local and state government, landowner / supply group
14. Extension foresters and department
15. Make it more profitable for supplier
16. Two parties have to sit down and work through it
17. ESFPA

18. Tax credits will be important to get off the ground
19. You really need to understand what happens in the wood industry

Others

1. Government subsidies and less regulation on clean burning technology
2. Developer / supplier in a legislator's office together is a great idea
3. Need to see results of cellulosic ethanol - a promising commercial venture
4. Perhaps NYS or US loan guarantees to developers
5. ESFPA represents more parties involved than any other in NYS
6. Keeping everyone involved (government, suppliers, developers, etc.)
7. Another workshop
8. Combined interests - capitalize on experience of existing biomass and forestry professionals
9. Technical and financial assistance to get facilities built; coupled with incentives to help assure profitability
10. Look to have the PSC have a biomass only procurement
11. Collaboration, fair trade guarantees, forestry groups already in place
12. Negotiations on price. Developers paying more.
13. More open discussions and forums. SUNY ESF is planning a biomass supply logistics workshop in the fall and would be glad to work with others to move this forward.

Is there anything else you would like to tell us?

Developers

1. Have a workshop each year
2. I wish we had more input from loggers in the meeting
3. Look carefully at a broad-based cellulosic alcohol program that could use a variety of feedstocks
4. Keep fighting the fight

Suppliers

1. Great day
2. We spoke of other players to get involved - public schools need to heat, get them involved in incentives for cheap fuel (biomass) such as Vermont
3. We need low-grade markets like biomass
4. Consulting firms, supply consortiums, brokers, etc., rarely have an accurate assessment of harvesting costs and dynamics
5. Need incentives for loggers and landowners to practice sustainability
6. Great workshop
7. The good of the state and the country relies on getting off oil and onto cellulosic biofuels
8. Excellent session
9. I have many years of experience and I have a concept of what works. There are some principals like water runs downhill. Knowing how to control it and use it is the issue. Although I have been involved in wood fuel procurement for 22 years, I have always tried to keep an open mind on how my job can be done not differently but better. Therefore, I felt my attendance at this conference might provide me with insight on how to improve my business methods.
A lot of what was said I find to be great in theory, further many of these ideas have been suggested to me by bankers, financial people, lawyers, developers, etc. Great in theory, but not the way it works. Maybe what needs to be focused on is how do you establish a sound biomass fuel policy.
Data on the cost items fuel, labor, equipment insurance, taxes, regulation, overhead, etc. Not individual costs but items such as production, equipment, gallons of fuel used, would be more helpful. Bringing together producers might be the way to go.

Others

1. I am wondering about the implications of climate change on the future of biomass - regardless if global warming is viable or not there are other climate factors which are intriguing and influential to NY's varying climate - i.e., flooding, drought, ice storm. These will increase as biomass increases in usage and production
2. The afternoon presentation where he read the 5 cases to us was least valuable
3. Well done! It is good to get to many of these issues.

Business Relationships That Satisfy Developers and Suppliers

A key outcome of this project was to identify business models or relationships that meet the needs and abilities of both biomass project developers (or operators of existing facilities) and biomass suppliers. Only by identifying structures or relationships that can meet the needs of both parties is it likely that biomass energy can be fully realized as an opportunity for New York.

Through the surveys conducted prior to the workshop and through the feedback received at the workshop, two models were potentially acceptable to a large number of both developers and suppliers:

- Fixed Price Contracting with a Diesel Adjustment Clause; and
- Developers Providing Financing for Suppliers.

For fixed price contracting with a diesel adjustment clause, both developers and suppliers appear to like the idea of a formula pricing that includes a base for wood pricing, as well as a component that accurately reflects changes in diesel costs for the harvesting, processing and trans

Diesel Fuel Adjustment

A diesel adjustment clause that works for all parties should be based upon actual diesel use, and use diesel pricing that is transparent and independently verified. Any effort to establish a diesel price adjustment should consider the following:

1. Actual diesel use in each step of the process, and determine what processes are relevant for each supplier (e.g., biomass chips derived from timber harvesting operations and chips derived from sawmill residue have different diesel inputs):
 - a. Harvesting
 - b. Skidding
 - c. On-landing management
 - d. Chipping
 - e. Transport
 - f. A formula may wish to consider which components use on-road diesel and which use off-road diesel, as the tax structure for these products differs significantly.
 - g. If the formula changes as supplier circumstances change; e.g., does the mileage from each particular harvesting operation to the facility get adjusted, and if so how is this reported and verified.
2. Identification of a diesel index that is transparent and independent and agreement on interval of diesel adjustment
 - a. Examples of independent diesel indexes include:
 - i. The US Department of Energy, Energy Information Agency has a weekly Gasoline and Diesel Fuel Update, which includes weekly updates by region (<http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp>)
 - ii. Supplier and buyer may agree that the price posted at a local service station at a certain time of the day / week / month is the price used for adjustment
 - iii. Supplier and buyer need to agree how often the price of diesel is used to adjust pricing; the adjustment cannot be more frequent than the reporting of diesel prices
3. Sharing of a formula that all parties can agree on
 - a. In addition to sharing the formula itself, the parties should run some “typical” scenarios so that all parties have a concrete understanding of how changes in diesel cost or other factors impact biomass pricing.

Financing of Biomass Production Equipment

The following is adapted from a case study INRS prepared highlighting the way one biomass firm uses equipment financing to strengthen their supply chain. This case study, prepared for the Massachusetts Technology Collaborative, examines the practices of Boralex, a firm with five wood-fired power plants in Maine and one in New York. Boralex is considered a leader in this supply chain strategy. This case study can be found in the report *Forest Harvesting Systems for Biomass Production: Renewable Biomass from the Forests of Massachusetts* (<http://www.mass.gov/Eoeea/docs/doer/renewables/biomass/bio-init-report-r1.pdf>).

The financing program is a “lease to buy” agreement, where payment is based on wood deliveries (i.e., \$/ton). The program is available to any reputable contractor who is interested in establishing an in-woods biomass processing operation. Each agreement is tailored to meet the mutual needs of the contractor and the facility. The agreements are governed by a contract that states the annual volume to be delivered to the biomass facility and respective prices. The typical contract length is five years with an annual volume of approximately 50,000 to 60,000 tonsⁱ. The annual volume is expected to be delivered in a 40 week time periodⁱⁱ. Volume obligations and delivered prices are renegotiated annually to provide flexibility for the contractor and the power plant. The contractor is responsible for negotiating the purchase price with the equipment dealer, and the power plant pays the invoice for the machine plus the cost of the manufacturer’s recommended parts inventory.

Under the terms of the agreement, the contractor pays back the principal, and interest at 7.0%, through wood deliveries. The contractor is not required to make an equipment payment if they do not deliver wood. When a load of chips or hog fuel is delivered, a dollar per ton amount (e.g., \$2.50/ton) is withheld from payment to the contractor and credited towards money owed on the machine (see table below). With prior approval from the power plant, the contractor can use the equipment for deliveries to competing facilities, however, the contractor is required to make the same dollar per ton equipment payment to the power plant on the volume. The ownership title transfers to the contractor and payment withholding ceases when the money owed equals zero. Once the contractor owns the machine, they are still required to fulfill their annual volume obligation for the remaining term of the contract, but they do not need the power plant’s prior approval to make deliveries to other wood-fired power plants.

The contractor has the option to forfeit the agreement prematurely, however, doing so eliminates all accrued ownership in the financed equipment. If the wood-energy industry becomes uncompetitive and all of the power plant’s wood-energy facilities close, a force majeure clause would be triggered, thus elevating the obligation for the contractor to continue to make equipment payments. In the occurrence of such an event, the contractor has the option to pay the remaining balance on the equipment liability, however, they are not required to.

Cash flows with facility financing of biomass equipment (example only)

Load #	Price per Delivered Ton	Equipment Payment per Ton	Volume (Tons)	Total Revenue	Payment to Contractor	Money Owed on Equipment
						\$ 300,000
1	\$ 24.00	\$ 2.50	30	\$ 720	\$ 75	\$ 299,925
2	\$ 24.00	\$ 2.50	27	\$ 648	\$ 68	\$ 299,858
3	\$ 24.00	\$ 2.50	28	\$ 672	\$ 70	\$ 299,788
4	\$ 24.00	\$ 2.50	29	\$ 696	\$ 73	\$ 299,715
5	\$ 24.00	\$ 2.50	30	\$ 720	\$ 75	\$ 299,640
6	\$ 24.00	\$ 2.50	32	\$ 768	\$ 80	\$ 299,560
7	\$ 24.00	\$ 2.50	26	\$ 624	\$ 65	\$ 299,495
8	\$ 24.00	\$ 2.50	28	\$ 672	\$ 70	\$ 299,425
9	\$ 24.00	\$ 2.50	30	\$ 720	\$ 75	\$ 299,350
10	\$ 24.00	\$ 2.50	31	\$ 744	\$ 78	\$ 299,273

The contractor is required to pay for inland marine insurance, and all operating costs (e.g., labor, maintenance and repair, fuel, etc.) associated with the financed machine. The contractor is also directly or indirectly (i.e., via subcontractors) responsible for the ownership and operating costs related to loading (e.g., excavator, loader on crane carrier, etc.), transport (e.g., tractor trucks, chip vans, etc.), and any support equipment/assets (e.g., pick-up truck, garage, etc.). The wood-fired power plant pays a diesel fuel surcharge based on the prior month’s fuel price movement. The Energy Information Administration’s “weekly retail on-highway diesel price” dataⁱⁱⁱ is used to determine the surcharge.

Boralex indicated that while the program requires more oversight, communication, and financial risk than traditional means of procuring wood material, it sends a message to their contractors/suppliers that they think the wood-energy industry has a strong future and that they want a long-term relationship with them. Four contractors have already reused the program, thus indicating they are pleased with the arrangement.

ⁱ This volume applies to large chippers or grinders. The typical annual volume obligation for a smaller chipper is 10,000 to 15,000 tons.

ⁱⁱ This equates to an average daily delivery of approximately eight to nine loads.

ⁱⁱⁱ http://tonto.eia.doe.gov/oog/info/wohdp/diesel_detail_report_combined.asp