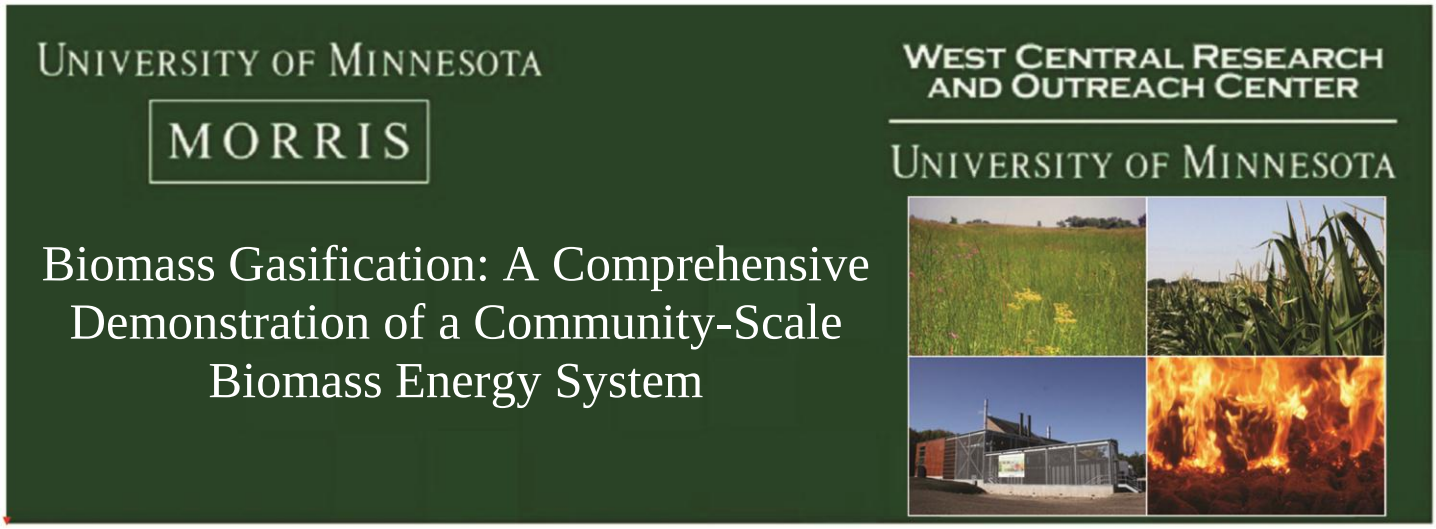

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Chapter 3: Market Contract Templates

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1. Contracting Process Explained

Biomass has been highly touted as an alternative energy source for the replacement of traditional fossil fuels. However, significant logistical challenges exist in using bulky, low energy materials in place of energy rich fossil fuels which have well established and highly developed infrastructures. Recently, the high costs and potential environmental problems associated with fossil fuels, along with a tightening supply, have made biomass energy systems much more attractive from both economic and environmental perspectives. To further develop biomass as an alternative energy source, the logistical challenges in working with biomass must be resolved.

One major challenge in biomass energy is ensuring that a sustainable biomass supply can be collected/harvested for conversion to energy. Though some infrastructure exists in the forest biomass supply, the largest potential for sustainable biomass feedstocks is agricultural residues and energy crops (Perlack et al, 2005). Unfortunately, the agricultural sector has little experience in industrial-scale, low density biomass production and marketing. Little infrastructure exists in agriculture to produce, transport, or use the vast quantities of biomass that could be needed for energy. Similarly, the business of marketing agricultural biomass has few examples of established supply chains from which to model the wider adoption for biomass energy. The supply and pricing terms of biomass contracts are one of the key concerns for moving biomass energy facilities from the drawing board to reality.

This report examines the biomass purchasing contract development for the University of Minnesota, Morris Biomass Gasification Facility. The University of Minnesota, Morris (UMM) is a liberal arts campus of the University of Minnesota located in the west central Minnesota town of Morris. The campus has an existing heating plant that is roughly 30 years old, with an aging natural gas boiler system. Rather than replace the existing equipment with a new natural gas fired boiler, the campus chose to construct a biomass energy system. In addition to heating campus, the new facility will be an important component of renewable energy research by UMM and the West Central Research and Outreach Center (WCROC). The WCROC is a traditional agricultural research station located next to the UMM campus. Both campuses are part of the University of Minnesota system. The biomass gasification facility is part of an effort to use community resources to develop clean renewable energy.

A key step is developing a community based biomass supply chain by pairing biomass consumers like the UMM with regional producers. Guiding the interaction of these parties is both the documented contract between the parties and a general understanding of what is expected of each party and why. The templates developed by the University of Minnesota and the process of creating them are described in this write-up. It is a 'living' document that describes past, present, and potential future contracting activities.

The chief source of biomass in West Central Minnesota is agricultural residues and our contracting process was centered on capturing these feedstocks for campus energy needs. In full operation, it is estimated that UMM's annual purchase of approximately 8,000 tons of biomass will distribute $400,000 or more to local biomass producers.

2. Creating the Contracting Plan

With an anticipated spring 2008 start-up of the biomass facility, UMM began developing a contract in June of 2007 to purchase agricultural biomass harvested in fall 2007. The UMM project team reviewed a handful of contracting documents and plans, some of which were relayed orally and others by accessing public copies online (Appendix A). Though the core of each contract was securing reliable and timely sources of biomass, the reference contracts varied widely in their approach and terms. Each contract was designed for a unique business model that relied on biomass with specific properties.

A number of the agricultural and forestry contracts which we reviewed were established so that the biomass purchaser is responsible for harvesting/collection of material. This type of contract is beneficial to a seller who does not care to invest the time or capital for harvest, collection, or transportation equipment. The owner / producer simply sells the material as it lay on the ground or forest floor, albeit at a lower cost. This works well for a farmer or forester who has already captured/produced the primary value out of the crop by harvesting grain or lumber. However, this model transfers the burden onto the purchaser who must then provide the labor, capital, and management time for collecting biomass.

Another strategy for developing a biomass supply chain is the 'aggregator' model of contracting. In this strategy, an intermediary business entity, who can handle biomass logistics, facilitates activities between the biomass producer and consumer. The range of services can vary greatly depending on the capacities and needs of the producers and consumers. A basic level of service for an aggregator may be as a storage facility who collects and holds smaller shipments of biomass from individual suppliers, that combined, will fill the larger demand of a biomass facility (see Supply Chain Chapter 6). A more advanced model might be that the aggregator will harvest/collect the material on the ground, transport it to a central location, process it to the specifications of the facility, and then deliver to the facility as needed.

The long term goal of UMM is to find an aggregator who can deliver the biomass as needed and thus reduce the administrative and logistics burden on its campus employees. However, without a proven track record for biomass demand or plant operation, it would be unlikely that an aggregator would dedicate capital and assume risk by entering into an agreement with UMM. Therefore in the first few years, the Morris Campus purchased directly from producers using single season contracts.

3. Designing the Contract

The first step in developing the University of Minnesota contract was identifying the type(s) of biomass feedstocks needed for the UMM facility. Though corn stover is known to be the largest source of biomass in the West Central Minnesota region, the facility was designed to be fuel flexible. This flexibility is critical for researching different biomass feedstocks, and will likely be financially important as prices of different types of biomass change over time. Therefore, the contract was written to allow for the purchase of almost any biomass feedstock that was 'clean burning'. Clean burning was defined as biomass that did not contain contaminating substances which would be hazardous in either the gasification ash or the air emissions stream. While agricultural residues and wood biomass were pointed to as the prime candidates that fit the contract terms, the option was left open for other available biomass sources. The only explicitly excluded type of 'clean' biomass was 'ditch hay', hay from roadsides that has a much higher likelihood of containing debris thrown/falling from vehicles.

Availability and delivery of biomass was the next major contract issue to be addressed. Most agricultural biomass production in the northern plains states is seasonal with the majority of all agricultural biomass available for harvest between August 1st and November 30th. The reference contract schemes used as a guide for developing UMM's contract fell into two groups dealing with availability and delivery. The first, and arguably somewhat simpler, concept was to contract all biomass for delivery immediately after harvest. The biomass would arrive in good condition and then would be stored for easy access throughout the years. This option requires a large effort at a particularly busy time of year in rural areas, adding to an increased demand for labor, trucking, and harvesting equipment. Also, it requires a large, dry, accessible, and 'community friendly' site to store what can be a massive amount of feedstock. Collecting all the material at once is beneficial if there is a need to guarantee availability and assure that the biomass remains in good condition throughout the year.

The second option of arranging biomass availability is setting up a schedule for contract delivery dates. In northern climates, this relies on the ability and desire of suppliers to deliver in snowy winter weather, wet springs, or during planting; all long after the material has been harvested and equipment is put away for the winter. It also means that the material will have to be properly stored on the supplier's site until the contract comes due. Using this option requires more organizational work, including year-round staff availability to accept deliveries, added effort to track usage and feedstock on-hand, and work with suppliers to bring in product at agreeable dates and times. However, the need for dedicated storage space is greatly reduced. Spreading the storage out to individual farms also reduces the risks associated with fire and the potential to lose all of a year's feedstock in a storage site fire.

After a great deal of discussion, the UMM project staff agreed that the large amounts of biomass required could not be stored near the campus gasification facility. Though the campus is in a rural community and may have been able to lease adjacent land, there were too many

problems associated with storing biomass immediately adjacent to the campus and city of Morris (population 5000). One of the chief issues was the danger of the feedstock catching fire. Other problems included potential or perceived problems with rodents, dust, mud, visual appearance of the storage site, heavy truck traffic, and the need to maintain the cleanliness of campus.. Therefore, it was decided that the biomass would be delivered throughout the year as needed.

Unlike a typical business, the University of Minnesota system requires a somewhat more detailed contract and competitive bidding for many materials, supplies, or consulting purchasing contracts. To direct and monitor UMM's biomass purchasing activities, the University Purchasing Services group and associated staff in the Office of the University General Counsel were contacted for guidance and policy help. As expected, there was little precedence at the University for biomass purchasing.

The first and most significant contribution made by the purchasing and legal staff was setting up the contract as a "Request for Proposal" (RFP)-based contract. In an RFP, the University tells interested parties what the University needs and asks them to make a proposal on the price and terms at which they will supply the material. Once all the proposals are received, the University reviews them and selects the ones that are most beneficial for the University. Even though price is an important factor, it is only one of many considerations to determine beneficial value. Upon University acceptance, the proposals become a formal contract with the supplier.

Over the course of two months, the draft RFP was added to and fine–tuned to produce the final copy (Appendix B). The RFP contained a template proposal worksheet for the supplier to fill out and submit. In fine tuning the RFP and proposal template, there was an effort to balance the University's need to protect its interests with the desire to keep a small document that would be readily understandable and easy to complete by biomass producers. The contract was formed as a "requirements" contract, which technically allowed the University to decline purchase of contracted biomass if any problem arose and biomass was not needed. The legal language was mainly kept to a two page, 11-point font section of the document. The proposal template was also modified so that respondents would more distinctly specify the type and form of biomass they proposed the University to purchase.

The largest section of the RFP, aside from the legal terms and conditions, is the proposal worksheet matrix that allows the responding producer to specify when they are able to deliver and the price they want for their biomass at that time. This was set up so that biomass suppliers would not be forced to deliver at times that were difficult for them. Similarly, they could specify that a higher price be paid for a given delivery date to make up for any inconvenience. By letting them select the availability and any premiums for delivering at a busy time of year (i.e. harvest or planting), it was felt that a better relationship with the producers could be maintained.

Another important item in the contract was a maximum contract size, which was limited to 400 tons. The limit was established for two main reasons. The first was the need to collect and evaluate biomass from as many suppliers as possible. A research goal of the project is to look at setting up biomass systems at various scales with different feedstocks. Using as many suppliers as feasible would provide the best data on biomass collection. The other reason for the 400 ton limit was the need to maintain the community nature of the project. While larger biomass projects might use 100,000 tons of biomass per year, it is estimated that the UMM facility will use less than 10,000 tons in full operation and around 3,000 tons in this first abbreviated season of operation. One well organized supplier could potentially supply UMMs entire need. To maintain the community nature of the project, it was important to make sure that multiple biomass producers were involved and thus a contract limit was set at 400 tons for the first season.

As with most contracts, this contract specifies the quality of the material to be delivered. The quality of biomass needed for gasification is much lower than that used in other process/industries. For example, baled alfalfa is typically used as animal feed. Degraded alfalfa loses nutrient value and can contain fungi that may sicken animals. Material used for animal bedding also has much less value if it has been degraded. Degraded material will gasify successfully, provided that it is not overly moist. Therefore, the contract allows for a fairly substantial variation in quality. The term 'reasonable' is used to describe acceptability, but the contract does state that biomass is accepted at the sole discretion of UMM. Therefore, if biomass is clearly unacceptable, UMM has the right to reject it.

Another quality measure included in the first contract was the use of sufficiently strong plastic bindings on baled material. This was added to help reduce the labor required for cleaning up broken bales that were secured with sessile twine, which is much weaker and decays relatively quickly. In full operation, the facility will use around 15,000-20,000 bales of material per year. Each bale that breaks open in handling due to weak strings or poorly tied knots could take as much as 15 minutes to clean up. Furthermore, net wrapped bales minimize the amount of material that falls off on roads and highways, which is an important consideration especially in transport through towns. Therefore, plastic twine was specified and net wrapped bales were indicated as preferred. Net wrap is a webbed plastic mesh that is wrapped around round bales. It offers high strength and can be slightly damaged without losing integrity. Net wrap will most likely not be used on large square bales as it is primarily used with round bales.

Being the first year of plant operation and having not yet established a feedstock quality analysis testing plan, it was decided that having too many quality benchmarks would be difficult. Similarly, the contract did not require payment based solely on dry weight basis, which would require moisture testing of purchased feedstocks to calculate biomass on dry weight basis. Project staff used the first abbreviated season to develop quality control

protocols that fit in with plant operations and fuel handling. Data from this testing was implemented for the second season's biomass purchasing (see next section).

4. Building an Informed Biomass Supplier Pool

An important part of the contracting process is keeping potential producers and suppliers informed before starting project operations. Well before RFPs are released and contracts made, there should be a well-established dialog with biomass providers. The agricultural community is often viewed as somewhat resistant to change. However, the reality is that people in this community are staking their familys' livelihoods on the decisions being made. Therefore, most producers will wait to adopt new practices until they feel fully informed or need drives them to make changes in their operations.

The biomass gasification project was several years in development, during which time the local newspapers covered the process and issues regularly. Staff from the West Central Research and Outreach Center regularly discussed biomass supply issues with its agricultural stakeholders and workshop participants. As the contract release approached, meetings were planned to further explain the project as a whole and the contracts. The goal of the meetings was not to sell people on supplying biomass to UMM, but to provide them with the facts and let them decide whether harvesting and supplying biomass was something they felt would benefit their operation. Approximately 2 weeks before being held, the meetings were advertised in the local press and on local radio stations and an article on the contracting process was in the local newspaper.

Producer Meeting Outcomes

Two meetings, one during the day and one in the evening, were held on the contract release date, September 25, 2007. This was to allow producers busy with grain harvesting to select which meeting best fit their schedule. Cool wet weather limited harvesting activities that day and the mid-day meeting was the largest, attended by roughly 30 people in addition to University staff, local reporters, and presenters. The evening meeting was smaller with only around 10 participants. Participants in both meetings generated numerous questions and very good discussions during and after presentations by staff from University Purchasing, WCROC and UMM. There were a range of practical contract-related questions dealing with terms and conditions. Several questions addressed the quality of biomass and how it would need to be stored. Questions were also raised about the sustainability of removing biomass from agricultural lands. Potential biomass suppliers also asked about the likelihood of contracted biomass not being purchased if the University's facility was not operating.

The producer's questions were answered using the best available knowledge with the goal that both the benefits and risks for supplying biomass be properly discussed. The meetings lasted until the participants had their questions answered and had an opportunity to discuss their

concerns, which was around 1.5 to 2 hours for each of the meetings. All the participants left with a copy of the contract and purchasing team contact information should they have any follow-up questions.

Timing for the meetings was designed so that the respondents to the contract (RFP) had two weeks from the RFP release date Sept 25th) to submit the completed contract (proposal) (October 9th). The RFP and meeting notes were available electronically and in-person on the RFP release date. Additionally, staff welcomed anyone with questions to call or email prior to proposal submission. Within a week the University selected the contracts that were best suited to its needs (October 16th). The timeline for the University review process was limited so that producers would know whether their proposed contracts were accepted before harvest. Most agricultural residues are not harvested unless there is a definite market or on-farm use for them. This challenged the University to work much more quickly on contract (proposal) review and acceptance than is typically done. Staff at Purchasing Services and at UMM/WCROC maintained close communication and quickly routed documents to help move the process along.

5. Reviewing the Proposed Contracts

Contract review began a week after the meetings and evaluated each of the 19 proposals (Table 1) received from 15 different suppliers. The contracts ranged considerably in the type of biomass supplied, the price, and the quantity. In all, 8 different feedstocks were proposed (Table 2). The asking prices for the feedstocks were between $44 and $120 dollars per ton, with the submitted proposals averaging $75.11 per ton.

It was decided that only a portion of the fuel needed to run the plant in the first season would be purchased during this contract period. Predicting that the construction would be finished on time and that the plant would operate 100% of the expected time seemed unrealistic. Therefore only two thirds of the calculated biomass demand was scheduled for purchase, approximately 2,000 tons.

In selecting which proposals to formalize into contracts, three factors were considered: price, biomass type/immediate usability, and the relative efficiency of the contract. The facility was designed for fuel flexibility and can switch biomass feedstocks based on their costs. The contracts were first ranked based on price per ton as is shown in Table 2. The next factor considered was whether the UMM facility was immediately permitted to gasify the type of biomass in the proposal. The Minnesota Pollution Control Agency, the regulatory agency for air quality, had given tentative approval for gasification of wood and corn stover. These were permitted based on preliminary studies of corn stover by UMM and documented gasification of wood. While other fuels will likely gasify with less emissions than corn stover, and we expect no problems with them, added research and analysis is required for the MPCA to fully approve their use at the UMM facility. The final consideration for contracts was whether the amount of

biomass and corresponding price were a good value to UMM when factors such as transportation, contract management, and overhead were calculated. While the contract had no set minimum tonnage of biomass, quantities less than a full semi-truck load (roughly 20 tons) are not particularly efficient for either the supplier or the University.

After examining all the feedstock proposals, the contracts under $65 per ton were selected with the exception of the small contract (4.5 tons) for soybean straw. The selected contracts amounted to 1,700 tons of material almost evenly split between woodchips and corn stover. The average per ton price for the biomass in the selected contracts was roughly $54 compared to $75 per ton for all the submitted contracts.

6. Expectation Versus Outcome

One of the first observations that we made after the process was complete was that the level of interest (based on calls, e-mails, and media participation) did not translate into a large number of contracts. Only 9 individuals responded with proposals for our main feedstock, corn stover. There could be several reasons for the low participation rate. One very likely reason is that there are few projects or farmers with a history of producing and consuming agricultural biomass. Without these early adopters as examples, farmers are reluctant to quickly embrace this new venture. Another commonly expressed view was that potential suppliers did not feel that it was good for the soil to remove the material as it would reduce fertility. It is also likely that many farmers did not want to add another operation to the harvest season as it would increase the labor, equipment, and time demands in the busiest portion of the year. While these observations are not in conflict with the early discussion of biomass energy (DOE 2003), the 'human' side of the biomass supply might not have been fully addressed in early planning for transitioning to biomass energy. It should be noted that in this particular case, the contracting process was occurring during harvest. If contracting had occurred prior to harvest, results may have changed as producers could have had more time to consider a proposal.

The expected price of corn stover feedstocks prior to the contracting was around $50 per ton. This estimate was based on government studies suggesting that biomass would initially be available at $50 per ton (Perlack et al. 2005), but would decline in price as improved harvesting technology was developed. However, the stover prices in proposed contracts averaged around $74. The flexibility to purchase lower cost wood feedstocks brought the overall costs of biomass close ($54) to the expected value for stover. The 9 contracts submitted for corn stover totaled 2,085 tons, which was less than 1% of the available stover in the county based on the 2006 corn acreage report (NASS-2007). However, the average cost would likely have decreased and availability increased if the 400 ton limit was not imposed on individual suppliers.

This first years' contracting process was successful in providing the facility with around 2,000 tons of biomass at reasonable prices. The process of developing the contract and working with producers has also shown that some of the expectations of cheap, easy to procure biomass may

not be as accurate as has been suggested in reports by others. It is likely that had UMM needed a standard full year's worth of biomass that UMM would have had to spend significantly more than the $54 per ton. In addition, the amount of biomass needed for a typical year would not have been met by the number of bids that were received.

7. Changes for a New Season

The first season's contract was successful in securing the biomass needed to begin plant operation and provided learning opportunities for future purchasing. With lessons learned, staff from the gasification project, purchasing services, and legal began revising the next season's RFP in the Summer of 2008. While we had hoped to have a fully operational facility needing several thousand tons of biomass by spring of 2008, construction and technical issues had pushed startup to spring of 2009. Effectively, this meant that we would once again purchase only a fraction of what would be needed in normal operation.

The major change in the 2008 contract centered on the moisture level of the biomass. The University, like many other energy firms, did not want to pay for moisture (water) in its fuel. Low moisture is desired for the conversion process. Removing moisture during the gasification or combustion process takes energy away from the bottom line. Water is removed as steam using a portion of the biomass as an energy source. To avoid paying for the moisture in the biomass, most energy facilities calculate biomass payments on a zero percent moisture (or bone-dry ton) basis and have a dockage system for moisture. In our case, we went with a hybrid approach which utilizes a dockage system that docks payment for biomass that is too wet to properly be stored and tonnage payments based on bone-dry tons. Most agricultural producers are familiar with dockage of grain that is too moist, however payment based on bone-dry tons is not commonly used in regional agricultural business. To explain these, specific examples were given in the 2008 contracts (Appendix C). The dockage levels were set based on the following moisture percentages: below 20%, 20 to 30%, and above 30% moisture. Below 20% there was no penalty as the material should store without significant issues. Biomass with between 20% and 30% moisture cannot be stored very long and therefore, should be used very quickly. The dockage for biomass with moistures between 20 and 30% was set at 15%. Above 30%, we would not accept shipments as the biomass has a high danger of spontaneous combustion due to decomposition. As in the previous season, the producer is responsible for the quality of biomass until the negotiated delivery date. Therefore, they should be monitoring moisture at harvest and periodically during storage.

The addition of staff and testing of sample analysis protocols allowed us to begin using the bone-dry ton as the basis for payment. Biomass moisture levels can fairly quickly and accurately be assessed with microwave drying and then payments quickly routed to the biomass supplier. Since dry tonnage is not commonly used for agriculture, it was specifically mentioned in the contract meetings held in the fall of 2008. Additionally, examples for

calculating payment were given both at the meeting and in the RFP. It was also mentioned that prices for the biomass should be proposed that would compensate for reduced tonnage.

Another section that was added to the contract was space to add any other charges. High diesel fuel costs in the spring of 2008 had increased transportation costs greatly. One of the suppliers had a 180 mile round trip to bring their shipments of storm-downed wood to our facility. They asked for, and because of the dynamics of the situation, were granted permission to add fuel surcharges to their sale price. Though not specifically stated, the extra space for additional terms was meant for items such as fuel surcharges. This informational section would alert the University to any additional charges that they might expect and what conditions would precipitate these charges. If at all possible, the University would like to avoid paying fuel surcharges on top of the agreed-to contract price. One possible way to avoid problems such as this is limiting the geographic range from which biomass is purchased. However, it is still hard for biomass producers to be able to predict transportation costs that heavily depend on diesel fuel with rapid increases in fuel costs. While the University is willing to help limit extreme risks for producers, it has to be protective of its budget for biomass purchasing. Producers requesting fuel surcharges would likely have to document that fuel prices had changed substantially, that the transportation distance is sufficient to increase costs, and that the overall request is reasonable given the situation. Additionally, the post-contract addition of a fuel surcharge can be unfair to other proposers as their original proposal may have ultimately resulted in a lower price.

The tonnage limit for each contract was also expanded to 800 tons per contract. This was done to help those farmers who felt that a 400 ton limit would not allow them to make enough money to invest the time and energy into supplying biomass. It also would prepare us for future contracting, when we would need 8,000+ tons of material.

A final addition to the contract was the stipulation that all material would be weighed at a facility within 10 miles of the University of Minnesota, Morris campus. As before, it was expected that the facility have a state certified scale suitable for commerce. However, we wanted to make sure that we knew who was weighing the material. Part of our arrangement with producers was that we would cover the cost of weighing materials at local facilities that we have had good working relationships with in the past.

8. Follow Up for Season Two

Unfortunately for our project, the facility did not begin operation in fall of 2008. With little hope of operations in spring of 2009, the few contracts made in fall of 2008 were cancelled except for material purchased for research. While this could have been a significant problem for contracted suppliers, it coincided with outside factors which limited potential negative feelings on the part of suppliers. One factor was the particularly wet fall, which limited the chance to harvest dry (storable) biomass. In fact, the sole corn stover vendor called the

University to cancel on his part as he was not able to harvest. The other factor was that the wood vendors were not seeing the supply of by-product from industry due to the economic downturn beginning in fall of 2008. Therefore, they had less supply than predicted and did not seem particularly troubled by the University cancelling the contracts. It may have helped that the wood volume requested by the University was fairly small in a field where contracts are typically much larger.

It's difficult to draw solid findings from the 2008 contracting process regarding pricing and participation. The low number of biomass purchases and ultimate cancellation of contracts, pricing and participation resulted in a fairly small data set. The new terms were in general well received, although the bone-dry ton pricing combined with the dockage for moisture may have been confusing for some.

Further contracting for the project has been delayed by engineering issues. An issue has been the final size and density of material being used in the gasifier. Testing is being conducted to identify the best configuration of equipment and specifications of biomass to make the system function properly. Until then, the University has a stockpile of biomass which is being used for testing.

9. Conclusions

In reviewing other contracts and developing our own, the primary conclusion is that almost any contract is going to be tailored to a particular project with a specific set of biomass suppliers. Factors such as the biomass needed, the regional production patterns, the local infrastructure, and the local business climate vary so greatly that generic biomass contracts will probably not yield good results in most situations. Therefore, it is best to have someone with an understanding of the local conditions on the contract development team. In establishing contracts with farmers and foresters, it is an important goal to develop a long term business alliance with these local biomass producers.

The majority of biomass suppliers are small agribusinesses or forestry enterprises, which typically do not operate in the same regimented way a large energy concern might function. It is important to bridge this gap both in contract language and approach. A key is flexibility; precise delivery dates and times are not always achievable by small operations. Similarly, quantities of biomass can be outside the control of a farmer who may have had a poor production year. In fact, due to weather or other factors, there may be some years where it is impossible to hold a supplier to their contract. Attempting to legally compel them to deliver material may actually prompt them and surrounding neighbors to never do business with a firm again. At the same time, end users must use discretion in enforcing contracts and seek reasonable explanation. For example, if a price and contract is agreed upon and the supplier finds a better deal, the contract then should most likely be enforced.

Another important consideration for contract development is planning for the future. Increased competition for biomass is more likely as more biomass facilities are brought on-line. This could be an emerging and significant issue in the forestry sector, which has had a longer history of biomass use and is probably going to be the first sector to have new facilities on-line. Agricultural biomass demand is likely to be limited in the near term by the slow research and development phase of agricultural-biomass to energy-facilities. Ideally, long-term contracts are a good option for a facility with a proven track record; however, the industry is fairly new and long term contracts could present added risks for all involved. Maintaining producer participation with a given firm may depend on the level of trust that the firm has developed with its biomass suppliers.

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DOE, 2003, Roadmap for Agriculture Biomass Feedstock Supply in the United States, United States Department of Energy, Document Number: DOE/NE-ID-11129

NASS (National Agricultural Statistics Service)- USDA, 2007 Census of Agriculture- Minnesota County Data, http://www.agcensus.usda.gov/Publications/2007/Full_Report/%20Volume_1,_Chapter_2_County_Level/Minnesota/%20st27_2_001_001.pdf

11. Appendix A: Reference Contracts

Several of the reference contracts were found online at sites that indicate potentially copyright protected material. Rather than include them in this report, links are provided and a small summary given to differentiate the contracting terms. Be aware that these organizations are in their infancy and this list will likely become out of date relatively quickly.

Chariton Valley Biomass Project

Switchgrass
Co-firing with coal for electricity
100,000 tons per year

The Chariton Valley Switchgrass project was/is a research project designed to test the feasibility of harvesting Switchgrass from conservation acreages in Iowa, USA. The project used an aggregator model to purchase the biomass from producers and deliver it to a coal fired power generating station. A great deal of information on the project is available on their website (www.iowaswitchgrass.com).

Contract can be found online at:
http://www.iowaswitchgrass.com/__docs/pdf/Draft%20Fuel%20Supply.pdf
http://www.iowaswitchgrass.com/__docs/pdf/Draft%20Sales%20Contract%20Report.pdf

Glacial Lakes Chemical Corporation
Dickey Environmental Systems Corporation

Bioprocessing/bio-refining
Corn Stover
100,000 + tons per year

These companies used corn stover to process/refine into other value added products. Glacial Lakes Chemical Corporation (GLCC) produced furfural from cobs and Dickey Environmental System Corporation used the stalks and leaves for horse bedding. A joint report on their experiences is online.

http://www.p2pays.org/ref/40/39095.pdf

Future Energy Yorkshire, UK

Mixed biomass fuels
Organization set up for biofuels promotion

Future Energy Yorkshire offers contracts templates for different forms of biomass from the residential to industrial scale. Registration on their site is

required to review the contracts, but they have a very good selection of contracts that could be helpful in different buying/selling situations.

http://www.fey.org.uk/

NextStep, Inc.

Corn Stover
Cellulosic Ethanol

Next Step Biofuels is an aggregator for biomass in the cellulosic ethanol field. Located in Nebraska, they are currently offering contracts for corn stover at $20 per ton (Website text as of 12/20/2010) per acre for the right to collect stover after grain harvest.
http://www.energygrainsbiomass.com/

Common Purpose Institute
Lakeland Electric
Tampa Electric Co

Energy Crops
Conversion to electricity

Though it does not appear that this project got beyond the feasibility stage, a good deal of effort was put into developing a contract to supply a conversion facility with crop biomass that would be co-fired with coal or MSW. In addition to the thorough contract, its development was discussed in a paper similar to this document.

Contract:
www.treepower.org/papers/fuelcontract.doc
Paper:
www.techtp.com/Cofiring/Model%20Contract%20Cofiring%20Biomass%20with%20Coal.pdf

Minneapolis Biomass Exchange

Mixed Biomass Fuels

The Minneapolis Biomass Exchange was established to provide a service that links biomass producers and suppliers. Listings include a wide variety of materials from small to large (10 to 100,000 tons).

Contract:
http://www.mbioex.com/assets/MBioEX_Biomass_Supply_Agreement.pdf

Appendix B: Biomass Contract Documents

2007 RFP Notification

UNIVERSITY OF MINNESOTA

Twin Cities Campus

Purchasing Services for Facilities Management and Capital Planning & Project Management

400 Donhowe Building
319–15th Avenue S.E.
Minneapolis, MN 55455
Office: 612-626-8577
Fax: 612-624-5796

September 25, 2007

To: Morris Area Biomass Producers

RFP # 268-2007-0925

Regarding: Biomass Contracting with the University of Minnesota Morris

Background: The University of Minnesota Morris (UMM) is a liberal arts campus of the University of Minnesota located in the West Central Minnesota town of Morris. The campus has a natural gas boiler heating system that is roughly 30 years old. After much discussion and study, construction has begun on a new facility that uses agricultural crop residues and other biomass as a fuel for campus heating needs. In addition to heating the campus, the new facility will be an important part of UMM's renewable energy research. Once completed, the facility will have emissions monitoring equipment to gather data on converting biomass to a low BTU gas that will be combusted to generate steam. The facility is part of an effort to use community resources to develop clean renewable energy. In full operation, we estimate UMM will distribute as much as $400,000 to local biomass producers.

Biomass: There are many different acceptable forms of biomass that can be used by UMM's gasification facility. In general, we are looking for plant material that is relatively dry and free of contaminants. This may include by-products from different processing facilities. We do not want municipal wastes or any other waste product that may contain an unacceptable level of toxic/polluting substances. Our target biomass is corn stover; however, most agricultural residues would be usable. Other fuels we will need as part of our research are soybean straw, native grass hay, wheat straw, hybrid poplar, and corn earlage. We are open to considering novel biomass feedstocks and are willing to discuss whether they are suitable for the UMM gasifier.

Contract: With a Spring 2008 start-up, UMM is interested in identifying and contracting available biomass supplies by Fall of 2007. UMM is using a contract that both specifies the material to be delivered and a time frame for its delivery. This system was set up so that providers could ask for a higher price if delivery is needed at a time when it would be more difficult for them to deliver. It allows UMM to organize delivery to limit the size of the storage area. Attached is an example contract that shows the price and delivery schedule. Based on the information received from producers and our needs, UMM will select the best value at a given time.

It is important to understand that our contracting is based on estimates of how much biomass we will use this first season. This is a first of its kind facility and there is the possibility that unexpected issues could limit our operations during the first year or that heating needs will be less than estimated. The contract specifically says that if for some reason we don't need the biomass, we are not obligated to purchase the biomass. While we are spending a lot of time and energy in planning our biomass needs, unanticipated changes may require some flexibility on the part of producers supplying our biomass.

Delivery: The contracts require delivery of biomass to UMM or a site within 3 miles of UMM. Weight tickets from a local scale will be needed to document delivered biomass. UMM is looking into the possibility of using a third party to store material and deliver it daily to UMM. This would allow producers, working with the third party, to deliver entire contracts to a storage yard at one time. Following receipt of the biomass, accounting staff at UMM will issue payment using the standard University time frame of Net 30 days.

Contact: For further information on supplying biomass to the UMM gasification facility, please contact the Biomass Project Coordinator, Joel Tallaksen. For questions regarding the bidding process, contact Dennis Moore.

Joel Tallaksen, Ph.D.
Biomass Gasification Project Coordinator
West Central Research and Outreach Center
University of Minnesota
46352 State Highway 329
Morris, MN 56267
Phone: 320-589-1711
Fax: 320-589-4870
Web: wcroc.cfans.umn.edu
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Dennis Moore, Senior Buyer
University of Minnesota
Purchasing Services
319 – 15th Avenue S.E.
400 Donhowe Building
Minneapolis, MN 55455
Phone: 612-626-2870
Fax: 612-624-5796
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a. 2007 Biomass Feedstock Requirements

EXAMPLE ONLY

Biomass Contract for UMM

Background: The University of Minnesota Morris (UMM) is interested in contracting with several people to provide and deliver biomass for fuel, such as corn stover, native grasses, soybean straw, and hybrid poplar (not roadside cuttings or "ditch hay") to UMM between December 1, 2007, and November 30, 2008 (the "Contract Term"). We will need approximately 3,000 tons of biomass, delivered on a schedule accepted by UMM.

The contracts will be "requirements" contracts so the UMM will be obligated to take only the amount of biomass it needs. Generally, Contractors will be scheduled to deliver product in the order of bid price, with the lowest-priced biomass purchased first. To obtain a broad base of supply, however, UMM anticipates purchasing no more than 400 tons from any one contractor. This project is experimental so UMM may change its requirements or specifications as the project is developed.

Details:

- All costs, including delivery and storage, must be included in the per ton cost.
- UMM will schedule deliveries as set out in the Terms and Conditions.
- Delivery is FOB UMM-designated dock not more than 3 miles from UMM. (Supplier is responsible for biomass until UMM or its 3rd party storage/delivery company receives it.)
- What form will the biomass be delivered in? (*circle one*):
  Large Round Bales Large Square Bales (Bulk)
- Large-round or large-square (not small-square) bales secured with suitably strong plastic baling twine, unless otherwise pre-arranged. Biomass will be reasonably dry and free of debris. Biomass that does not meet these specifications may be rejected.
- Bids are non-confidential and non-proprietary. The successful bidder(s) will be those whose proposal(s) is/are the most advantageous to the UMM. The UMM is not bound to accept the lowest priced proposal if that proposal is not in the best interests of the UMM as determined by the UMM in its sole discretion. The UMM may enter into multiple contracts with respondents, and may negotiate terms and conditions with respondents, if the UMM deems that in its best interests.

PRINTED NAME: John Doe

I have read and understood this Biomass Contract for UMM, and agree as follows.

1. I will supply biomass as set out on the attached Biomass Bid Price and Availability Bid Sheet.

2. This agreement and all resulting sales will be governed solely by the UMM's Terms and Conditions. **UMM objects to and rejects all other or additional terms.**

3. This is a firm, fixed offer. If the UMM accepts it, it will be a binding contract.

Signed: John Doe Date: 9/25/07

Address: 1300 Atlantic Ave, Morris, MN, 56267

For Research Information Only: – Location(s) biomass was obtained from (County, township, section, quarter): Stevens, Morris, 15, NE 1/4

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Biomass Feedstock Bid Price and Availability Bid Sheet

EXAMPLE ONLY

UMM Biomass Bid Price and Availability Bid Sheet

Name: __John Doe_____ Biomass Type: __Almond Shells_____

Total Biomass Committed to This Contract: _200__Tons

Please select a period in which you can deliver your allotted quantity and fill in your price in the table below.

Are you flexible on selected periods?

__X__yes ____no . If "yes," please mark an X under available periods.

Month	Start	End	Per Ton Price at Delivery	Available for Delivery	Month	Start	End	Per Ton Price at Delivery	Available for Delivery
February	2/17/08	2/23/08	$ 40	X	**July**	7/6/08	7/12/08	$	
	2/24/08	3/1/08	$ 40	X		7/13/08	7/19/08	$	
March	3/2/08	3/8/08	$ 40	X		7/20/08	7/26/08	$	
	3/9/08	3/15/08	$ 40	X		7/27/08	8/2/08	$	
	3/16/08	3/22/08	$ 40	X	**August**	8/3/08	8/9/08	$	
	3/23/08	3/29/08	$ 40	X		8/10/08	8/16/08	$	
	3/30/08	4/5/08	$ 60	X		8/17/08	8/23/08	$	
April	4/6/08	4/12/08	$ 60	X		8/24/08	8/30/08	$	
	4/13/08	4/19/08	$			8/31/08	9/6/08	$	
	4/20/08	4/26/08	$		**September**	9/7/08	9/13/08	$	
	4/27/08	5/3/08	$			9/14/08	9/20/08	$	
May	5/4/08	5/10/08	$			9/21/08	9/27/08	$	
	5/11/08	5/17/08	$			9/28/08	10/4/08	$	
	5/18/08	5/24/08	$		**October**	10/5/08	10/11/08	$	
	5/25/08	5/30/08	$			10/12/08	10/18/08	$	
June	6/1/08	6/7/08	$			10/19/08	10/25/08	$	
	6/8/08	6/14/08	$			10/26/08	11/1/08	$	
	6/15/08	6/21/08	$		**November**	11/2/08	11/8/08	$	
	6/22/08	6/28/08	$			11/9/08	11/15/08	$	
	6/29/08	7/5/08	$			11/16/08	11/22/08	$	

If the UMM needs additional biomass, how many additional tons can you provide with less

than two weeks notice? ____200_____tons at $___70____ per ton

Keep for your files

Biomass Contract
UMM Terms and Conditions

1. Deliveries. UMM will schedule delivery dates and quantities by notice to Supplier the week prior to the requested date. UMM will not be responsible for biomass delivered at times or in quantities other than as scheduled.

2. Payment. UMM shall pay undisputed invoices within thirty (30) days after receipt.

3. Warranties. Supplier owns all biomass provided under this Contract and has the right to sell it to UMM. The biomass is of the type described, meets the Specifications, is fit for the UMM's needs, and is grown, harvested and delivered in compliance with applicable laws. Supplier will correct any warranty breach at its expense, pay direct damages, and defend and indemnify UMM, its regents, faculty members, students, employees, and agents from any resulting claim.

4. Hazardous Substance. "Hazardous Substance" is any pollutant, contaminant, hazardous or toxic substance or waste, solid waste, petroleum or any byproduct thereof, or any other chemical, substance or material regulated by any state or federal law. No Hazardous Substance will be brought upon UMM's property, and Supplier shall immediately notify UMM in writing if any biomass is found to contain Hazardous Substance.

5. Inspections and Improper Delivery. The UMM shall have a reasonable time after receipt to inspect any biomass and reject any that is, in the UMM's sole judgment, nonconforming or in excess of quantities ordered. Rejected biomass may be returned to Supplier at Supplier's expense. The UMM reserves the right to refuse any biomass and to cancel all or any part of this Contract if Supplier fails to deliver all or any part of the biomass in accordance with this Contract.

6. Assignment. Neither party may assign any part of this Contract without the other's prior written consent.

7. Taxes. The UMM is exempt from paying Minnesota sales and use taxes. Except as provided in Minnesota Statute, Section 297A.70, Subd. 2, Supplier shall not charge UMM for such taxes.

8. Use of UMM Name or Logo. Supplier will not use the name, logo, or any other marks, colors or music owned by or associated with the UMM in any form of publicity, without written permission of the UMM's Office of General Counsel and Office of Institutional Relations.

9. Delay and Termination. Neither party shall be responsible for any delays or failure to perform under this Agreement due to acts of God, mechanical failure, strikes, war, insurrection, embargoes, acts of government, or any other cause beyond the control of such party. UMM may terminate this Contract in whole or in part for its sole Convenience. Upon notice of termination, Supplier shall immediately stop all work under this Contract.

10. Independent Contractor. The relationship of the parties is solely that of supplier and purchaser, not employees, agents, partners, or joint ventures of any kind.

11. Non-Waiver. No waiver by any party of any default or nonperformance shall be deemed a waiver of any subsequent default or nonperformance.

12. Limitation of Liability. IN NO EVENT SHALL A PARTY BE LIABLE FOR ANY INDIRECT, CONSEQUENTIAL, INCIDENTAL, LOST PROFITS OR LIKE EXPECTANCY DAMAGES ARISING OUT OF THIS CONTRACT. The UMM's total obligation under this Contract shall be the price of the biomass accepted by the UMM under this contract.

Keep for your files

13. Changes. UMM may at any time by a written notice change time and place of delivery and/or amount of biomass to be provided under this Contract. Promptly upon receipt of notice of such change, Supplier shall furnish a statement of any necessary changes in the time or price of delivery. Failure to so advise the UMM shall constitute Supplier's consent to the change without increase price or time of delivery.

14. Insurance. Supplier will adequately insure and safely operate, maintain, and repair facilities, supplies, materials, and equipment necessary to performance of this Contract, and will furnish proof of such insurance to the UMM upon request.

15. Indemnification. Supplier will release, defend, indemnify and hold harmless the UMM, its regents, faculty members, students, employees, and agents from all liability, injuries, claims, damages (including claims of bodily injury, property damage, or negligence), or loss, including costs, expenses and attorneys' fees, which arise in connection with, in relation to, or as a result of (i) the negligent acts and omissions of Supplier, (ii) the breach by Supplier of any of its obligations under this Contract, and (iii) the presence of any Hazardous Substance (as defined in Section 3) supplied by or introduced onto UMM property by Supplier, knowingly or unknowingly. For purposes of this Section, Supplier shall include the Supplier, its employees, officers and agents, and sub-contractors. The foregoing shall not apply to the extent such liability, injuries, claims, damages, or loss was caused by the intentional, willful, or wanton acts of the UMM.

16. Compliance with laws. Supplier will comply with all applicable laws in performance of this Contract, including without limitation, the Copeland "Anti-Kickback" Act (18 U.S.C. 874 and 40 U.S.C. 276(c)) as supplemented by Department of Labor regulations (29 CFR part 3, *"Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"*); and Supplier represents that it is not currently debarred or suspended or listed on the General Services Administration's List of Parties Excluded from Federal Procurement or Nonprocurement Programs in accordance with Executive Orders 12549 and 12689, *"Department and Suspension"*. Supplier shall notify UMM if it becomes debarred or suspended during the term of this Contract.

17. Contract. This Contract consists of the Biomass Contract for UMM, UMM Biomass Bid Price and Availability Bid Sheet, and Biomass Contract for UMM Terms and Conditions, and shall be construed under Minnesota law (without regard for choice of law considerations) and the policies and procedures of the University, as amended from time to time. Any action arising out of this Contract shall be heard by a state court in Minnesota, and Seller specifically consents to such jurisdiction. No amendments to this Purchase Order shall be effective unless in writing and signed by both parties.

18. Severability. If any provision of this Contract shall be invalid or unenforceable, the remainder of the provisions, or the application of such provision to persons other than those as to which it is held invalid or unenforceable, shall not be affected and each provision of the remainder of the provisions shall be valid and be enforceable to the fullest extent permitted by law.

19. Survivability. All of the terms and conditions of this Contract shall survive the delivery of goods, the provision of services, and the expiration or termination of this Contract.

i. Tables

Table 1. Supplier Proposed contracts

Biomass type	# of Contracts	Contract Average price	Total tons	Total Tonage average price
Bean straw	2	$ 71.00	54.5	$ 78.51
Corn Stover	9	$ 74.00	2085	$ 68.65
Wheat Straw	2	$ 77.50	525	$ 78.80
Wood	2	$ 50.00	800	$ 50.00
Corns Screenings	1	$ 105.00	400	$ 105.00
Edible bean culls	1	$ 69.00	400	$ 69.00
Grain Screenings	1	$ 75.00	400	$ 75.00
Corn Earlage Bulk	1	$ 120.00	50	$ 120.00
Total/Average	19		4715	$ 70.84

Table 2. Purchased Biomass

Biomass type	Tons Biomass	Price Per Ton
Wood (Processed)	400	$44
Corn Stover	400	$50
Wood (screened ch	400	$55
Corn Stover	100	$63
Corn Stover	400	$64
Total/Average	1700	$53.85