November 18-19, 2010

INFORMATION ITEM
Biomass Project
The University of Montana

Attachment 1: Project Scope and Objectives

In 2007 The University of Montana became a charter member of the American University President's Climate Commitment (AUPCC). The first step in this commitment was to conduct a Green House Gas Inventory to identify the major sources of CO2 pollution generated on the Missoula campus. This inventory was completed in 2007. The second effort required by the AUPCC was to use the Green House Gas inventory as the basis for the creation of a Climate Action Plan (CAP). The CAP was completed in 2009 and created a list of approximately 15 separate strategies to manage or reduce CO2. The three most significant strategies that were identified to reduce CO2 emissions were: 1) substitution of a renewable energy source for the natural gas used at the steam plant, 2) renewable generation of electricity, and 3) changing the energy use behavior of the faculty/staff/students. After considerable analysis and discussion the option that was selected was to produce steam for campus use by constructing a biomass fueled gasification/steam plant that would be co-located with the existing natural gas fired steam plant. For the purpose of this analysis, biomass is defined as the branches, stumps, and other non-marketable timber left on the forest floor after a commercial logging operation is complete. This material is also commonly known as slash or hog fuel.

The plant that the University proposes to construct has the following characteristics:

- By substituting biomass for natural gas, the plant will use 70% less natural gas than the current steam plant. The plant will burn approximately 20,000 ton of biomass per year.
- Using a proprietary gasification technology, air emissions produced by the plant will be fully permittable.
- Biomass fuel will be sourced from our local forest products market.
- There will be an opportunity for the College of Forestry to provide biomass from the Lubrecht Forest and to conduct research on sustainable forestry practices.
- In conjunction with the College of Technology, the biomass plant will become part of the Energy Technician program.

Attachment 2: Project Cost Estimates and Construction Timeline

Project Cost

At the onset of the biomass project, the University contracted with McKinstry, a performance contracting firm based in Seattle, to represent the University in negotiations with equipment suppliers, biomass providers, and local air emission regulators. This relationship essentially puts McKinstry in the role of general contractor for the project. The following preliminary cost estimates have been provided by McKinstry's Industrial Construction Group:

- Project cost: $16,000,000

Construction Timeline

Assuming that the Board of Regents approves this project during the November Board meeting, we anticipate giving McKinstry a notice to proceed in mid-December 2010. This will generate the following check points:

- Finalization of design, preparation of construction drawings
  - Jan-May 2011
- Put project out to bid:
  - June 2011
- Commence Construction: August 2011
- Construction Complete: August 2012

INFORMATION ITEM (continued)
Biomass Project
The University of Montana

Attachment 3: Due Diligence Report

When this project transitioned from the concept phase to that of an operational project, it became apparent that considerable research needed to be done to ensure that the right technology, fuel availability, air emissions guarantees, etc. were selected. To that end, the following due diligence efforts have been made:

- Trip to Vancouver & Victoria B.C. to meet with Nexterra (high tech manufacturer of biomass gasification equipment) to determine applicability of this type of equipment to our situation.
- Numerous emails/phone calls to Nexterra customers to verify system performance.
- Contracted with McKinstry, a Northwest based performance contracting and energy services firm with considerable experience in biomass fired boilers to assist the University in understanding the dynamics associated with this type of project.
- Hired Fellon-McCord, a nationally known energy services firm to conduct a Missoula specific 20 year natural gas price projection.
- Solicited price quotes from numerous forest product firms to establish a reliable price range for biomass fuel.
- Sent 100 tons of Montana harvested hog fuel to Kamloops, B.C. for the purpose of conducting a multi-facet test at the Nexterra research facility. Air emissions, fuel pile characterization and burn tests were successfully conducted.
- Using our in-house engineering and financial staff, conducted independent evaluations of the various pro forma's provided by both McKinstry and Nexterra to validate project cost estimates.
- Hired by McKinstry, retained several engineering firms to conduct independent analytics of the estimated characteristics of the gasification system.
- Partnered with the Montana Department of Natural Resource Conservation and the U.S. Forest Service to collaborate on "best practices" that could be incorporated into the project.
- Hired a Professor from UM's College of Forestry to conduct an independent analysis of how biomass from the Lubrecht experimental forest can factor into the project.

INFORMATION ITEM (continued)
Biomass Project
The University of Montana

Attachment 4: Financing Plan

The pro forma for a biomass project is based on a number of operating assumptions. The following are the assumptions for this project. Refer to the attached spreadsheet to see how it all fits together:

- Natural Gas. The current NG price is $6.90/deccatherm. The Fellon-McCord future price averages $10.15. Future price increases, assuming a relatively constant price for biomass provide savings that will be used to pay for debt service on the project.
- Biomass. We have quotes to secure a five year contract for hog fuel at a price of $38.00/bone dry ton (bdt). However, given the potential for price fluctuations, the pro-forma assumes a conservative starting cost of $40 per bdt.
- Gasifier performance. Nexterra's gasifier is rated, and tested, to deliver an efficiency rating of 69.5%.
- Operating at 69.5% efficiency the gasifier can provide UM's annual "base load" need for steam (194,579 million BTU's). Depending on average heating degree days, it will require 16,500 bone dry tons of biomass to produce this amount of steam.
- Using biomass in lieu of natural gas will reduce displaced CO2 by approximately 8000 metric tons per year. In the renewable energy market, these displaced tons of CO2 can be sold to users of non-renewable energy such as coal fired electricity plants to help them meet their emissions targets. At the current rate of $5.00/metric ton, we will be able to gain $40,000/yr by selling these credits on the open market or utilize credits to further offset UM's carbon footprint .
- Initial project cost estimates indicate that the cost of the plant will be approximately $16,000,000.
- O&M of the plant, to include the salary of one additional operator, are estimated at $365,000/yr.
- UM's steam plant (old and new) will be converted to an auxiliary enterprise which bills the cost of utilities to individual users. This allows steam plant net revenues to be pledged to the Biomass project debt under the master indenture.
- We estimate that upward of $7.0 million Qualified Energy Conservation Bonds (QECB's) could be available for this project. The U.S. government underwrites 70% of the interest costs associated with QECB's. The State of Montana has allocated $6.7 million in QECB's for the Biomass project. Additional authority has been allocated throughout the State which appears may not be utilized. Therefore, making it available for UM application. UM Bond Counsel is in the process of determining if the Biomass project qualifies for QECBs. If so, UM will make application to the State for the full amount available. The remaining cost of the project will be financed with traditional tax exempt revenue bonds. Estimated debt service is $1.2 million/yr including capitalized interest during project construction. For the purposes of debt service, the project will have a 20 year life.
- A $180,000 grant has been awarded from the Department of Natural Resources (DNRC) for this project
- Other US government subsidized funding programs also are being investigated for potential funding.
- The project is expected to be cost neutral but is dependent on the fulfillment of performance guarantees, natural gas pricing and biomass pricing to accomplish this.

Attachment 5: Performance Guarantee with McKinstry

In the last legislative session, institutions such as The University of Montana gained access to a contracting method know as Performance Contracting (PC). PC essentially guarantees certain aspects of an energy efficiency related contract. In this case, the guarantee is structured around the operation of the overall biomass gasification system typically; the guarantee identifies key factors within the system or a specific piece of equipment and quantifies the performance level required. In this specific case, the following performance guarantees are being negotiated:

- The amount of steam needed to cover the "base load" of steam needed to heat the campus. We anticipate this will be 32,000 pounds/hour.
- The efficiency of the system which will result in savings from switching from natural gas to biomass. These savings will substantially fund the debt service and operations of the biomass plant. We anticipate an efficiency rate of 70%.
- A guarantee that the technology will be fully compliant with all local and state air quality permit requirements. The operational "up time" of the plant needed to make the financial pro forma produce the savings needed to pay for debt service and plant operations. We anticipate this will be 90%.
- Repair and maintenance of the plant will be consistent with appropriate industry standards for similar equipment.

INFORMATION ITEM (continued)
Biomass Project
The University of Montana

Attachment 6: Technology Selection

In May 2010 when this project transitioned from a concept to an operational project, several assumptions about the appropriate technology were made. These were:

- The technology must comply with all local and state air quality permit requirements. The technology must produce steam at 175 PSI in amounts that will cover the "base load" needed by the campus. This equates to approximately 32,000 lb/hr.
- The technology selected must be capable of producing high quality steam for use in a co-generation facility.
- The technology must be able to handle the biomass fuel produced within a 100 mile area adjacent to Missoula
- The technology selected must be of an advanced nature so that it can be incorporated into the Energy Technician program at the COT

Using these criteria as a guideline, technical solutions were solicited from three vendors who offered distinctly different approaches to our proposal. The vendor that met our criteria most closely was Nexterra, a firm located in Vancouver, B.C. Nexterra's solution is a multi-stage gasification system that uses an electrostatic precipatator to further minimize air emissions. Nexterra has similar plants located at the University of South Carolina, Oak Ridge National Laboratory, Evergreen College and the University of British Columbia.

Attachment 7: Fuel Supply Analysis

For the purposes of this analysis two fuels were extensively analyzed; natural gas and woody biomass.

Natural Gas. Fellon-McCord, a nationally known forecaster of natural gas was engaged to produce a 20 year prediction of natural gas prices as it applies to the Missoula market. Perhaps the most critical thing that came from the report was that while natural gas will be at an unusually low price during the 2010-2012 period, the long term price escalation is projected to be approximately 3% per year over the 20 year period of the analysis. This produces an average price of $10.15/mmbtu over the period versus a current price of $6.90/mmbtu.

Biomass. There are two inter-related biomass characteristics that are key to this project. First, the fuel delivered must be three inches or less in size and must have a moisture content of 40% or less. These two factors will allow the fuel to perform at the required efficiency points in the gasifier. The second characteristic that is required is that the fuel be delivered to the plant at a price of $40.00 or less per bone dry ton. In surveying a wide variety of forest product supplies in the Missoula area it was discovered that both the needed size of the fuel and the price of the fuel can be achieved. Of note, local suppliers are only willing to enter into a five year contract.

Attachment 8: Educational Opportunities

Lubrecht Experimental Forest.

Lubrecht Forest is affiliated with the College of Forestry and serves as a laboratory/classroom for many of the educational programs offered at the college. In working with Professor Beth Dodson from the College of Forestry, preliminary analysis of a sustainable wood harvest from Lubrecht is 5,000 tons per year. As a reference point, the biomass plant will consume approximately 20,000 tons of biomass per year. We anticipate that students will participate in the study of how Lubrecht will sustainably provide biomass to the gasification plant.

College of Technology.

Because of the advanced gasification technology that will be used at the biomass plant, and because the plant is located on campus, it is anticipated that the operation and maintenance of the plant will be incorporated into the Energy Technician program offered at the COT. This will provide students with an opportunity to see firsthand and work with some of the most advanced alternative energy technology available in the United States.

INFORMATION ITEM (continued)
Biomass Project
The University of Montana

Attachment 9: Sustainability

When the University completed its Climate Action Plan earlier this year, approximately 15 different actions/strategies were identified that would help reduce UM's carbon footprint. With the current carbon footprint being estimated at 46,500 metric tons of CO2 per year work to achieve a substantial CO2 reduction will require both substantial and long term efforts.

To this end, the University has undertaken the following strategies to reduce it's CO2 emissions:

- Use of compact fluorescent light bulbs
- Adoption of LEED Silver building standards
- In-house re-commissioning of existing buildings. Re-commissioning a building is to inspect and repair all of its operating systems - heating, cooling, lights, etc. – to ensure that they are working as designed.
- Purchase of energy efficient vehicles
- Purchase of Energy Star appliances only
- Energy efficient HVAC/window/lighting projects
- Campus wide behavior change campaign
- Installation of a biomass fired (renewable fuels) boiler to provide steam to the campus

In combination, we estimate that the above actions will reduce our overall carbon footprint by 47%.