Preliminary Feasibility Report

Biomass Heating Analysis for HDK Wood Products

Harrisville, New York
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EXECUTIVE SUMMARY

HDK Wood Products (HDK) is a NeLMA certified Eastern White Pine sawmill, located in Harrisville, NY. HDK produces 10-12 million board feet (MMBF) of timber annually. The campus has seven dry kilns with more than 5,700 square feet of drying space that is currently heated exclusively with #2 fuel oil. HDK also operates a 36,000 square foot sawmill that is heated by fuel oil and wood. When in full operation the fuel requirements of the dry kilns can become too expensive, forcing HDK to air-dry lumber. This significantly slows the production process and is not an ideal alternative.

HDK currently produces approximately 6,750 tons of woodchips, 4,500 tons of green saw dust and 1,250 tons of dry sawdust annually. The facility feels that they could produce the majority of, if not all of, their biomass fuel from by products produced during the milling process, including green dust, dry dust and woodchips.

HDK currently uses approximately 246,135 gallons of fuel oil each year. HDK is currently paying $3.49 per gallon of fuel oil. At that price HDK will spend approximately $859,012 on fuel oil this coming year.

This study analyzes a biomass scenario that would cover 85% of HDKs heating needs, including process heat. The analysis provided in this report indicates that HDK could save nearly $14 million in operating costs over 30 years in today’s dollars even when the cost of financing is included. The analysis shows more than $658,000 in fuel savings in the first year alone. HDK Wood Products appears to be an excellent candidate for a biomass energy system, we recommend the facility take the following steps to investigate this opportunity further:

1. Hire an engineering firm to help refine the project concept and to obtain firm local estimates on project costs. If HDK moves forward with this project, decision-makers should contact Lew McCreery, the US Forest Service Biomass Coordinator for the Northeastern Area to see what assistance can be provided. Contact Lew at (304)285-1538 or lmccreery@fs.fed.us.

2. Investigate the potential for installing a small Combined Heat and Power (CHP) biomass system that was sized to meet the heating requirements of the facility and also offset some of the electricity. While a CHP system was not analyzed in this report, HDK may want to consider further analysis if decision-makers move forward with a biomass system.

3. HDK should consider energy efficiency improvements simultaneously with boiler upgrades. The New York State Energy and Research Authority (NYSERDA) and/or the New York Power Authority (NYPA) should be engaged to develop comprehensive energy efficiency recommendations and proposals for incentives for efficiency upgrades before undertaking a major building project. This should be done regardless of whether or not the business moves ahead with a biomass project at this time. Information on energy efficiency programs and incentives are included in the Resource Binder accompanying this report.
4. Key decision makers should tour facilities that have biomass energy systems and talk with systems operators to better understand the technology. Yellow Wood can help identify sites that have comparable installations to visit if HDK decides to move forward with a project.

5. This report analyzes a biomass system using woodchips supplied by HDK. If HDK decides to move forward with a biomass heating system, an evaluation of all available wood fuel (produced through HDKs processing) should be completed to ensure that the facility is using the lowest value fuel to provide heat, allowing other by-products to be sold. If HDK identifies another, lower value, fuel source annual fuel savings will increase.

This preliminary feasibility study was prepared by Yellow Wood Associates in collaboration with Richmond Energy Associates for HDK Wood Products. Both Yellow Wood and Richmond Energy have extensive community economic development experience and Richmond Energy specializes in biomass energy projects. This study was funded by the Wood Education and Resource Center, Northeastern Area State and Private Forestry, U.S. Department of Agriculture.
INTRODUCTION

There is a significant volume of low-grade biomass in the United States that represents a valuable economic and environmental opportunity if it can be constructively used to produce energy. Commercially available biomass heating systems can provide heat cleanly and efficiently in many commercial applications. Biomass heating technologies are being used quite successfully in over 40 public schools in Vermont alone and the concept of heating institutions with wood is catching on in several other areas of the United States and Canada. Good candidate facilities for biomass energy systems include those that have high heating bills, those that have either steam or hot water heating distribution systems and those that have ready access to reasonably priced biomass fuel.

This report is a pre-feasibility assessment specifically tailored to HDK Wood Products (HDK) outlining whether or not a wood heating system makes sense for this facility from a practical perspective. In March of 2011 staff from Yellow Wood Associates traveled to Harrisville, NY to tour the facility. This assessment includes site specific fuel savings projections based on historic fuel consumption, and provides facility decision-makers suggestions and recommendations on next steps.

The study was funded by the U.S. Department of Agriculture Wood Education and Resource Center.

This preliminary feasibility study was prepared by Yellow Wood Associates and Richmond Energy Associates, LLC.
ANALYSIS ASSUMPTIONS

DESCRIPTION OF THE EXISTING HEATING SYSTEMS

SAWMILL

The 36,000 square foot sawmill is heated November through April with an in-floor hot water heating system, connected to a fuel oil hot water boiler. The hot water boiler is served by two 250 gallon tanks that have to be filled approximately twice a week when the boiler is running. In 2007 the facility installed a wood boiler in an attempt to offset the cost of heating this building. This has proven to be an ineffective solution as the facility managers feel it requires too much attention (requiring staff to return on nights and weekends to replenish the wood supply). Even with the wood boiler running, the sawmill uses approximately 4,000 gallons of fuel oil each month this building is heated, for a total of 24,000 gallons a year.

DRYING KILNS

HDK operates seven drying kilns in two buildings. During HDK’s peak months (October through April) the kilns are running about 25 days per month; in off-peak months they run approximately 18 days per month. Kilns one, two and three are located in a 1,944 square foot building and run on a 4,400 MBH hot water boiler. When these kilns are running, they use approximately 208 gallons of fuel per day. Kilns four, five, six and seven are located in a 3,800 square foot building that uses approximately 635 gallons of fuel oil per day to run the steam boiler when these kilns are operating. Running at this capacity, HDK uses approximately 55,468 gallons of fuel oil to operate kilns 1-3 and 166,668 gallons to operate kilns 4-7 each year.

Figure 1: Average Annual Fuel Oil Usage
DESCRIPTION OF THE PROPOSED BIOMASS SYSTEM

The biomass system characterized for this study envisions installing two 4.2 mmBtu biomass steam boilers in a new boiler house that would be located near the building that houses kilns 4-7. Steam from these boilers would be used directly to heat the kilns in that building. Also included in the analysis are costs associated with converting steam to hot water which would then be piped to the building that houses kilns 1-3 and to provide building heat for the sawmill building.

With biomass energy projects, bigger is usually more cost effective. The reason for this is that biomass energy projects require a major investment in equipment. The best way to offset that cost is to displace as much high cost fuel as possible with low-cost biomass fuel. In this case it was assumed that the most cost effective option for this facility is to install enough capacity to supply both the dry kilns and to heat all of the other buildings on the site in order to take advantage of the very low cost biomass fuel that is produced on-site. We estimate that the system characterized for this project will be able to provide 85% of the site’s total heating needs, including process heat.

It was assumed that the existing hot water fuel oil boilers would be tied into the district energy system and be able to provide back-up and supplemental heat for the majority of heating needs. Furthermore it was assumed that the existing 300 BHP steam boiler that is used for kilns 4-7 would be de-commissioned and could be sold.

The capital cost estimate includes the cost of the biomass boiler equipment, biomass fuel handling and fuel storage, underground insulated piping to connect to all buildings, an allowance to interconnect with existing equipment in order to create back-up and redundancy, a tall stack and pollution control equipment. (We recommend the installation of pollution control equipment, though it may not be required by the new EPA requirements (see Permitting section below).)

It is important to note that the costs estimates used in this analysis are based on generic costs and are not equivalent to an engineering estimate. If HDK decides to pursue this concept further, the first step should be to engage an engineering design team to refine the concept and to develop site-specific construction estimates. While we believe that our cost estimates are reasonable, it is entirely possible that modifying the project concept and/or using on-site labor for some aspects of construction could achieve significant cost savings above the savings that are outlined here.
Costs for a tall stack were included to ensure good emissions dispersal. An allowance for pollution control equipment was also included. Either a bag house or an electrostatic precipitator will likely be required for a system of this size by air quality regulators. The facility should direct its design engineers to investigate the costs and benefits of both before making a decision on which technology will work best in this situation.

It is likely that this facility will need to mix both dry and wet biomass fuels to create a biomass fuel that is consistent in moisture content. Yellow Wood based its assumption on the cost for fuel handling and fuel storage on a conversation with KAB Enterprises, Inc. KAB is familiar with this site and produced a preliminary design for HDK for a biomass fuel handling system in 2008. Fuel storage and handling is one of the most difficult aspects of designing a successful biomass energy system. If HDK does move forward with a wood energy system, Yellow Wood recommends that facility planners work with an engineering design team that has specific experience in handing wood fuel.

**LIFE CYCLE COST METHODOLOGY**

Decision makers need practical methods for evaluating the economic performance of alternative choices for any given purchasing decision. When making a choice between mutually exclusive capital investments, it is prudent to compare all equipment and operating costs spent over the life of the longest lived alternative in order to determine the true least cost choice. The total cost of acquisition, fuel costs, operation and
Maintenance of an item throughout its useful life is known as its “life cycle cost.” Life cycle costs that should be considered in a life cycle cost analysis include:

- Capital costs for purchasing and installing equipment
- Fuel costs
- Inflation for fuels, operational labor and major repairs
- Annual operation and maintenance costs including scheduled major repairs
- Salvage costs of equipment and buildings at the end of the analysis period

It is useful for decision makers to consider the impact of debt service if the project is to be financed in order to get a clearer picture of how a project might affect annual budgets. When viewed in this light, equipment with significant capital costs may still be the least-cost alternative. In some cases, a significant capital investment may actually lower annual expenses, if there are sufficient fuel savings to offset debt service and any incremental increases in operation and maintenance costs.

The analysis performed for this facility compares different scenarios over a 30-year horizon and takes into consideration life cycle cost factors. A 30-year time frame is used because it is the expected life of a new boiler.

The analysis projects current and future annual heating bills and compares that cost against the cost of operating a biomass system. Savings are presented in today’s dollars using a net present value calculation. Net present value (NPV) is defined as the present dollar value of net cash flows over time. This is a standard method for using the time value of money to compare the cost effectiveness of long-term projects.

It is not the intent of this project, nor was it in the scope of work, to develop detailed cost estimates for a biomass woodchip boiler. It is recommended that for a project of this scale, HDK hire a qualified design team to refine the project concept and to develop firm local cost estimates. Therefore the capital costs used for the biomass scenario are generic estimates based on our experience with similar scale projects.

**FUEL OIL COST ASSUMPTIONS**

Due to the recession and increased fuel cost HDK has not been operating at full capacity over the past two years. HDK General Manager, Wayne Ward, looked at historic fuel use to develop an expected annual average for the sawmill, and both kiln buildings. The total anticipated fuel oil usage for these three buildings is 246,135 gallons annually. This was the assumed annual fuel consumption used for the base case in the analysis. HDK is currently paying $3.49 per gallon of fuel oil and asked that this price be used as the base price in this analysis. At that price, and the projected annual usage, HDK will spend more than $859,000 to run the kilns and heat the sawmill next year.
WOODCHIP FUEL COST ASSUMPTIONS

The woodchip heat scenario in this study assumes the facility will meet 85% of the heat load for the facility with biomass and therefore consume the equivalent of 3,115 tons of chips per year. From information provided by facility managers, it appears that HDK has the potential to produce as much as 6,750 tons of woodchips per year, more than enough to supply a woodchip boiler. Therefore it is assumed that all of the biomass fuel will be provided by HDK. HDK currently values their woodchips at $23 per ton, this is equivalent to $0.35 per gallon of fuel oil. $23 per ton is the price used for woodchips in the first year of the analysis. (The analysis places a value on the woodchips consumed by the biomass system because it is assumed that if not consumed by the system, these chips would be sold.) The remaining 15% of the heating needs were then assumed to be provided by the existing fuel oil boilers consuming about 36,920 gallons of fuel oil.

This report analyzes a biomass system using woodchips supplied by HDK. If HDK decides to move forward with a biomass heating system, an evaluation of all available wood fuel (produced through HDKs processing) should be completed to ensure that the facility is using the lowest value fuel to provide heat, allowing other by-products to be sold. If HDK identifies another, lower value, fuel source annual fuel savings will increase.

INFLATION ASSUMPTIONS

Estimating future fuel costs over time is difficult at best. Over the past few years it has become even more difficult as fuel prices have fluctuated dramatically. Nevertheless, in order to more accurately reflect future costs in a thirty-year analysis, some rate of inflation needs to be applied to future fuel costs.

We looked retrospectively over the last 20 years (1990 – 2010) using US Energy Information Agency data and found that the average annual increase for fuel oil in New York was 6.4% per year. The analysis projects this average inflation rate for fuel oil forward over the thirty-year analysis period.
HDK’s fuel rate of $3.49 per gallon was used for the first year of the analysis and then inflated each year at 6.4%.

Over the last twenty years, the overall Consumer Price Index increased an average of 2.6% annually. This is the annual inflation rate that was used in projecting all future labor costs, operations and maintenance costs and scheduled major repair costs for the biomass scenario.

OPERATION AND MAINTENANCE ASSUMPTIONS

For this facility it was assumed that additional staff hours (equivalent to a half-time position) would be required to properly maintain the boiler and to supervise operation. At a loaded rate of $35/hr. it was assumed HDK would need to spend $35,000 in labor costs for the operations and maintenance of a biomass boiler. It was also assumed that the biomass boiler and fuel handling equipment would consume an additional $30,000 in electricity annually.

Another operations and maintenance cost that is included in the analysis is periodic repair or replacement of major items on the boiler such as the furnace refractory. It is reasonable to anticipate these types of costs on a 10-15 year cycle. For this analysis, $150,000 of scheduled maintenance was anticipated in years 10, 20 and 30 and then annualized at $15,000 per year to simulate a sinking fund for major repairs. This $15,000 was then inflated at the general annual inflation rate.

Under any biomass scenario, a case could be made that the existing heating units will require less maintenance and may last longer since they will only be used for a small portion of the heating season. However, all heating equipment should be serviced at least annually no matter how much it is used. Additionally it is very difficult to estimate how long the replacement of the existing units might be delayed. For these reasons, no additional annual maintenance, scheduled repair or planned replacement costs for the existing boiler were taken into consideration as these are considered costs that HDK would have paid anyway. It was assumed that all costs for the operation and maintenance of a biomass boiler are incremental additional costs.

FINANCING ASSUMPTIONS

Financing costs were included in the analysis to give facility decision makers a sense of how this project may impact their annual budget. This analysis assumes that HDK will finance the entire cost of the biomass project with a 7% loan. At this time the analysis does not take into account any potential tax credits, grants or lower interest loans. Other financing schedules could create more favorable cash flows depending on how much of the project costs are financed and how the remaining costs are financed. See the section in this report on Project Funding Opportunities to learn about alternative funding and financing options.
A sensitivity analysis is included in the appendices to this report that show the relative life cycle cost savings under various financing scenarios. If HDK would like to see other cash flows using different financing schemes, Yellow Wood can provide additional analysis.
BIOMASS SCENARIO ANALYSIS

The analysis shows that HDK Wood Products could save nearly $14 million in today’s dollars in operating costs over the next 30 years by installing a woodchip heating system, even including debt service on the cost of the system. Annual fuel savings alone are projected to be more than $658,000 per year in the first year and should increase over time as fuel oil prices climb. If construction cost assumptions, finance cost assumptions and fuel price assumptions are correct, the project will have a positive annual cash flow from the first year.

Table 1: Biomass Scenario Analysis Assumptions

<table>
<thead>
<tr>
<th>HDK Wood Products</th>
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<td><strong>Capital Cost Assumptions</strong></td>
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<td>Two 4.2 mmBtu woodchip steam boiler system including installation</td>
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<td>70 ft stack</td>
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<td>Pollution control equipment</td>
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<td>Woodchip boilerhouse</td>
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<td>Biomass storage and fuel handling equipment</td>
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<td>Interconnection to existing boiler equipment</td>
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<td><strong>Fuel Cost Assumptions</strong></td>
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<td>Current annual fuel oil use (gal)</td>
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<td>Assumed fuel oil price in 1st year</td>
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<td>Projected annual fuel oil bill</td>
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<td>Percentage of wood utilization</td>
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<td>Assumed wood price in 1st year (per ton)</td>
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<td>Projected 1st year wood fuel bill</td>
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<td>Projected 1st year supplemental fuel oil bill</td>
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<td><strong>Inflation Assumptions</strong></td>
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<td>General inflation rate (twenty year average CPI)</td>
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<td>Fuel oil inflation rate (twenty year average EIA)</td>
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<td>Annual Wood O&amp;M cost</td>
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<td>Major repairs (annualized)</td>
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<td><strong>Savings</strong></td>
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<td>Return on Investment from fuel savings</td>
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<td>Total 30 year NPV cumulative savings</td>
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Figure 4: Annual Cash Flow Graph for Biomass Scenario
## Preliminary Life Cycle Cost Assessment

### Woodchips - Heat Only

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### Units
- $1 = 1,000 dollars
- Yr = Year
- Total Annual Heating Costs: $59,912
- Total Fuel oil Cost Savings: $42,135
- Total Project Cost: $156,857
- 30 Yr. NPV: $109,853
- Annual ROI: 26.9%
ADDITIONAL ISSUES TO CONSIDER

ENERGY EFFICIENCY

Whether HDK converts to biomass or stays with fuel oil the facility should use its heating fuel efficiently. The New York State Energy Research and Development Authority (NYSERDA) and/or the New York Power Authority (NYPA) can help identify and prioritize appropriate energy efficiency projects that will improve the facility’s infrastructure and save money. Both of these agencies can help with the evaluation of energy efficiency opportunities and provide financial incentives to upgrade and improve equipment efficiencies. If HDK decides to move forward with a biomass energy project, it should work with one of these agencies to identify other efficiency projects that could be completed at the same time.

General information on NYSERDA and NYPA programs is included in the Biomass and Green Building Resources binder accompanying this report.

COMBINED HEAT AND POWER (CHP)

With a year-round steam load, HDK may be a good candidate for biomass combined heat and power (CHP). If HDK pursues a biomass project the facility may want to explore the potential for CHP at this site. In order for CHP to be valuable to the facility, constant monitoring of the energy use is required to ensure that HDK is able to offset its peak electricity demand with the CHP system (which will result in a decrease in the peak demand charge on the facility’s electricity bill).

The Northeast CHP Application Center has a mission to help facilities understand their CHP opportunities. They often can provide technical assistance at little to no cost to the facility. If HDK is interested in pursuing a CHP system, we recommend contacting them for assistance. For more information, contact Beka Kosanovic, NAC Co-Director for Technical Assistance at:

Northeast CHP Application Center
(413) 545-0684
kosanovi@ecs.umass.edu
http://www.northeastchp.org/nac/

COMMISSIONING

Building, or systems, commissioning is a process that verifies that a facility and/or system is functioning properly. The commissioning process takes place at all phases of construction, from planning to operation, to confirm that facilities and systems are performing as specified. Commissioning of a new system provides quality assurance, identifies potential equipment problems early on and provides financial savings on utility and maintenance costs during system operations. A recent study of 224 buildings found that the energy savings from commissioning new buildings had a payback period of less than five years. Additional benefits
of commissioning include: improved indoor air quality, fewer deficiencies and increased system reliability. We strongly recommend that HDK work with an independent, third-party, commissioning agent during the design and construction of a biomass heating system. See the *Biomass and Green Building Resources* binder for more information on commissioning.
PROJECT FUNDING POSSIBILITIES

GRANTS/FINANCING OPPORTUNITIES

USDA Rural Energy for America Program (REAP)

To help agricultural producers and rural small businesses purchase and install RE systems and energy efficiency improvements.

Eligible Small Businesses are to be located in a rural area and can not exceed SBA size standards by NAICS code. [http://www.sba.gov/idc/groups/public/documents/sba_homepage/serv_sstd_tablepdf.pdf]

Eligible technologies include wind, solar, biomass, geothermal, hydrogen, small hydro and energy efficiency. The projects are limited to commercial and pre-commercial (no R&D). Residential property is not eligible for Rural Energy for America grants or loans.

Grant – The grant can cover up to 25% of eligible project costs with a minimum grant amount of $2,500 and a maximum grant amount of $500,000.

Guaranteed Loan – Guaranteed loans can be used for working capital, land acquisition and costs related to the Renewable Energy system. Loans can cover a maximum of 75% of project costs. The maximum loan amount is $25 million. Borrower equity of 15% is required for guaranteed loans less than $600,000 and 25% for guaranteed loans greater than $600,000 (some borrower equity can be covered by a REAP grant, see below).

Combination Grant/Guaranteed Loans – Combine Grant and Guaranteed Loans cannot exceed 75% of total project costs. The minimum combine funding level is $80,000 with the grant covering a minimum of $20,000. The grant amount contributes to the borrower equity percentage in the project.

USDA Business and Industry Guaranteed Loans (B&I)

The purpose of the B&I Guaranteed Loan Program is to improve, develop, or finance business, industry, and employment and improve the economic and environmental climate in rural communities. This purpose is achieved by bolstering the existing private credit structure through the guarantee of quality loans which will provide lasting community benefits. It is not intended that the guarantee authority will be used for marginal or substandard loans or for relief of lenders having such loans.

Eligible borrowers must be a cooperative organization, corporation, partnership, or other legal entity organized and operated on a profit or nonprofit basis. The borrower must be engaged in or proposing activities which improve the economic or environmental climate and/or reduce reliance on nonrenewable energy resources by encouraging the development and construction of solar energy systems and other renewable energy systems.
The maximum loan amount is $10 million. The maximum percentage of guarantee for the loan is 80% for loans of $5 million or less and 70% for loans between $5 million and $10 million. Machinery and equipment loans must be repaid in 7 years or less.

For more information on USDA grants and loans contact:
Karen McDonnell | Rural Business Cooperative Specialist
USDA Rural Development
315-4776426 | 315-477-6448 Fax
karen.mcdonnell@ny.usda.gov

**New York State Consolidated Funding**

In September of 2011, New York State, announced the creating of the NYS Consolidated Funding Application (CFA) shifting how economic development resources are allocated. The new application aligns resources behind a coordinated approach that makes it possible to access dollars for economic development projects from multiple agencies with one application. Funding through the CFA is currently available for Energy and Environmental Improvements and Low-Cost Financing. This is a strong potential funding source for HDK. Decision-makers should contact the newly formed North Country Regional Economic Development Council to find out about potential grants and loans through this program. (A copy of the application is available in the Biomass and Green Building Resources binder. To learn more about the CFA go to: [http://www.dos.ny.gov/featurestories/cfa.html](http://www.dos.ny.gov/featurestories/cfa.html).

Watertown Office
Dulles State Office Building
Watertown, NY 13601
(315) 785-7907
(315) 785-7935 Fax
nys-northcountry@empire.state.ny.us

**NYSERDA**

NYSERDA’s FlexTech Program provides New York State commercial, industrial, institutional, government, and not-for-profit sectors with objective and customized information to help customers make informed energy decisions. FlexTech’s goal is to increase productivity and economic competitiveness of participating facilities by identifying and encouraging the implementation of cost-effective energy efficiency, carbon reduction measures, peak-load curtailment, and CHP and renewable generation projects. Facilities can apply for funding for Combined Heat & Power studies that will investigate the site-specific technical and economic feasibility of installing CHP. All projects must include cost-sharing in the form of matching cash support from the applicant. For most applications, NYSERDA will contribute fifty percent (50%) of the eligible study costs, up to the lesser of either $1,000,000 or ten percent (10%) of the applicant’s annual energy costs, based on an approved Scope of Work. You can apply for the Flex Tech program with the new Consolidated
Funding Application, available in the *Biomass and Green Building Resources*. For more information on FlexTech, contact:

Clararose Voigt  
Assistant Project Manager  
Commercial & Industrial Existing Facilities and FlexTech Programs  
(212) 917-5342 Ext. 3007  
cfv@nyserda.org

**FEDERAL TAX INCENTIVES**

**Corporate Depreciation**

Under the federal *Modified Accelerated Cost-Recovery System (MACRS)*, businesses may recover investments in certain property through depreciation deductions. The MACRS establishes a set of class lives for various types of property, ranging from three to 50 years, over which the property may be depreciated.

For certain biomass property, the MACRS property class life is seven years. Eligible biomass property generally includes assets used in the conversion of biomass to heat or to a solid, liquid or gaseous fuel.

In December 2010 the provision for bonus depreciation was amended and extended yet again by The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 (H.R. 4853). Under these amendments, eligible property placed in service after September 8, 2010 and before January 1, 2012 qualifies for 100% first-year bonus depreciation. For 2012, bonus depreciation is still available, but the allowable deduction reverts from 100% to 50% of the eligible basis.

To qualify for bonus depreciation, a project must satisfy these criteria:

- the property must have a recovery period of 20 years or less under normal federal tax depreciation rules;
- the original use of the property must commence with the taxpayer claiming the deduction;
- the property generally must have been acquired during the period from 2008 - 2012; and
- the property must have been placed in service during the period from 2008 - 2012.

If the property meets these requirements, the owner is entitled to deduct a significant portion of the adjusted basis of the property during the tax year the property is first placed in service. As noted above, for property acquired and placed in service after September 8, 2010 and before January 1, 2012, the allowable first year deduction is 100% of the adjusted basis. For property placed in service from 2008 - 2012, for which the placed in service date does not fall within this window, the allowable first-year deduction is 50% of the adjusted basis. In the case of a 50% first year deduction, the remaining 50% of the adjusted basis of the property is depreciated over the ordinary MACRS depreciation schedule. The bonus depreciation rules do not override the depreciation limit applicable to projects qualifying for the federal business energy tax credit.
Before calculating depreciation for such a project, including any bonus depreciation, the adjusted basis of the project must be reduced by one-half of the amount of the energy credit for which the project qualifies.

For more information on the federal MACRS, see IRS Publication 946, IRS Form 4562: Depreciation and Amortization, and Instructions for Form 4562. The IRS web site (http://www.irs.gov/) provides a search mechanism for forms and publications.

**DISCLAIMER:** The federal tax incentives can be significant, but are less about energy savings and benefits and more about your specific tax liability. Be sure to talk with your tax advisor to fully understand the tax benefits available to you.
CARBON OFFSETS

While fossil fuels introduce carbon that has been sequestered for millions of years into the atmosphere, the carbon dioxide emitted from burning biomass comes from carbon that is already above the ground and in the carbon cycle. Biomass fuels typically come from the waste of some other industrial activity such as a logging operation or from sawmill production. The carbon from this waste would soon wind up in the atmosphere whether it was left to decompose or it was burned as slash. There are few measures HDK Wood Products could undertake that would reduce its carbon footprint more than switching their heating fuel use from fuel oil to a biomass fuel.

Figure 5: Carbon Cycle Illustration

Carbon offsets help fund projects that reduce greenhouse gases emissions. Carbon offset providers sell the greenhouse gas reductions associated with projects like wind farms or biomass projects to customers who want to offset the emissions they caused by flying, driving, or using electricity. Selling offsets is a way for some renewable energy projects to become more financially viable. Buying offsets is a way for companies and individuals to compensate for the CO2 pollution they create.

For a biomass heat-only project, a Btu-for-Btu displacement of heating fuel (based on historic purchase records) by biomass is assumed over the project’s predicted operating life. CO2 avoidance is based on the

1 Illustration taken from a handout produced by the Biomass Energy Resource Center
emissions profile (Lbs. CO₂ /Btu) of the displaced fuel. The US EPA calculates that 22.2 lbs. of CO₂ is produced from each gallon of fuel oil consumed. It is projected that HDK can offset approximately 200,000 gallons of fuel oil per year by replacing that heat using biomass. This is equivalent to about 2,200 tons of CO₂ annually. The market value of this type of offset is between $3/ton and $5/ton. These offsets can be negotiated as either a lump sum offset for up to 10 years or can be paid out as an annual payment. This could mean annual payments of 6,600 - $11,000 or a lump sum up front payment of as much as $111,000.

There are a number of companies that are interested in contributing to the construction of new sources of clean and renewable energy through carbon offsets. Information about carbon offsets is included in the Biomass and Green Building Resources Binder accompanying this report.
PERMITTING

Modern biomass boiler technology is both clean and efficient. Controls moderate both the biomass fuel and air to create either a small hot fire or a large hot fire depending on heat demand from the building. Under full load, modern woodchip boilers routinely operate at steady state efficiencies of 70% – 75%. Operating temperatures in commercial scale biomass boilers can reach up to 2,000 degrees and more, completely eliminating creosote and the need to clean stacks. The amount of ash produced from a 25 ton tractor trailer load of green hardwood chips can fit in a 25 gallon trash can, is not considered a hazardous waste and can be used as a soil amendment on lawns, gardens and playing fields.

However, as with any combustion process, there are emissions from biomass boilers. There is no question that natural gas is the cleanest fuel used for heating. However, biomass compares favorably with fuel oil and modern commercial scale biomass boilers with the appropriate pollution control devices can burn very cleanly and efficiently.

Table 3: Comparison of Boiler Emissions Fired by Woodchips and Distillate Oil

<table>
<thead>
<tr>
<th></th>
<th>Wood</th>
<th>Distillate Oil</th>
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<tr>
<td>PM&lt;sub&gt;10&lt;/sub&gt;</td>
<td>0.1000</td>
<td>0.0140</td>
</tr>
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<td>NO&lt;sub&gt;x&lt;/sub&gt;</td>
<td>0.1650</td>
<td>0.1430</td>
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<tr>
<td>CO</td>
<td>0.7300</td>
<td>0.0350</td>
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<tr>
<td>SO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>0.0082</td>
<td>0.5000</td>
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<td>TOC</td>
<td>0.0242</td>
<td>0.0039</td>
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<tr>
<td>CO&lt;sub&gt;2&lt;/sub&gt;</td>
<td>gross 220 (net 0)</td>
<td>159</td>
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The pollutant of greatest concern with biomass is particulates (PM<sub>10</sub>). Biomass boilers clearly generate more particulates than fuel oil or gas boilers. That is why it is important to install appropriate pollution control equipment. Many modern types of emission control equipment, capable of reducing particulate matter emissions from 50-99 percent, are commercially available in the US. The most common emission control equipment technologies are baghouses, cyclones, multi-cyclones, electrostatic precipitators, and wet scrubbers. Appropriate emission control equipment technologies should be identified in consultation with local air quality regulators. The emissions from a modern woodchip boiler are much less than most people think.

One of the most common misconceptions about institutional/commercial biomass energy systems comes from the experience people have with residential wood stoves and outdoor wood boilers. In general, an institutional/commercial-scale wood energy system emits only one fifteenth (seven percent) the PM$_{10}$ of the average wood stove on a Btu basis. Over the course of a year, a large, woodchip heated school in a climate like Vermont may have the same particulate emissions as four or five houses heated with wood stoves.

**Figure 6: Particulate Emissions**

![Graph showing particulate emissions from various wood combustion systems.]

**New EPA Regulations**

On February 21, 2011, the Environmental Protection Agency (EPA) issued a final rule that will reduce emissions of toxic air pollutants (including mercury, metals and organic air toxics, including dioxins) from existing and new industrial, commercial and institutional boilers. For area source boilers (those that emit less than 10 tons per year (tpy) of any single air toxic or less than 25 tpy of any combination of air toxics) the EPA is issuing regulations based on boiler design. Biomass boilers with heat input equal to or greater than 10 million Btu per hour must meet emission limits for particulate matter (PM) only. Biomass boilers with heat input less than 10 million Btu must perform a boiler tune-up every two years.

The EPA has also issued regulations based on boiler size for major source facilities (those that emit or have the potential to emit 10 or more tpy of any single air toxic or 25 tpy or more of any combination of air toxics). For large boilers, those with a heat input capacity equal to or greater than 10 mmBtu/hr, the EPA establishes numeric emission limits for mercury, dioxin, particulate matter, hydrogen chloride and carbon monoxide. In addition,

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3 Excerpted from a handout produced by the Biomass Energy Resource Center
the EPA will require monitoring to assure the boiler and pollution controls are operating properly and compliant with emission requirements. For all new biomass boilers at major source facilities with a heat capacity of less than 10 mmBtu/hr, the EPA has established a “work practice rule” instead of numeric emission limits.

Up-to-date information on EPA emission requirements is available at: www.epa.gov/airquality/combustion/

In order to install a new woodchip boiler, it is often necessary to obtain an air quality permit or an amendment to an existing permit. For a woodchip boiler, the permit would likely include requirements for pollution control equipment along with a requirement for a tall stack to help with dispersion. Costs for pollution control equipment are included in the cost estimates for the woodchip scenario analysis in this report. Other permit conditions might include testing for emissions and efficiency, keeping records of fuel consumption and test results and making periodic submittals to regulatory agencies.
CONCLUSIONS AND RECOMMENDATIONS

The analysis provided in this report indicates that HDK could save nearly $14 million in operating costs over 30 years in today’s dollars even when the cost of financing is included. The analysis shows more than $658,000 in fuel savings in the first year alone. HDK Wood Products appears to be an excellent candidate for a biomass energy system, we recommend the facility take the following steps to investigate this opportunity further:

1. Hire an engineering firm to help refine the project concept and to obtain firm local estimates on project costs. If HDK moves forward with this project, decision-makers should contact Lew McCreery, the US Forest Service Biomass Coordinator for the Northeastern Area to see what assistance can be provided. Contact Lew at (304)285-1538 or lmccreery@fs.fed.us.

2. Investigate the potential for installing a small Combined Heat and Power (CHP) biomass system that was sized to meet the heating requirements of the facility and also offset some of the electricity. While a CHP system was not analyzed in this report, HDK may want to consider further analysis if decision-makers move forward with a biomass system.

3. HDK should consider energy efficiency improvements simultaneously with boiler upgrades. The New York State Energy and Research Authority (NYSERDA) and/or the New York Power Authority (NYPA) should be engaged to develop comprehensive energy efficiency recommendations and proposals for incentives for efficiency upgrades before undertaking a major building project. This should be done regardless of whether or not the business moves ahead with a biomass project at this time. Information on energy efficiency programs and incentives are included in the Resource Binder accompanying this report.

4. Key decision makers should tour facilities that have biomass energy systems and talk with systems operators to better understand the technology. Yellow Wood can help identify sites that have comparable installations to visit if HDK decides to move forward with a project.

5. This report analyzes a biomass system using woodchips supplied by HDK. If HDK decides to move forward with a biomass heating system, an evaluation of all available wood fuel (produced through HDKs processing) should be completed to ensure that the facility is using the lowest value fuel to provide heat, allowing other by-products to be sold. If HDK identifies another, lower value, fuel source annual fuel savings will increase.
WHO WE ARE

Yellow Wood Associates
Yellow Wood Associates (Yellow Wood) is a woman-owned small business specializing in rural community economic development since 1985. Yellow Wood has experience in green infrastructure, program evaluation, business development, market research, business plans, feasibility studies, and strategic planning for rural communities. Yellow Wood provides a range of services that include measurement training, facilitation, research, and program management.

Richmond Energy Associates
Richmond Energy Associates was created in 1997 to provide consulting services to business and organizations on energy efficiency and renewable energy program design and implementation. Richmond Energy has extensive experience in wood energy systems. Jeff Forward provides analysis and project management on specific biomass projects and works with state, regional and federal agencies to develop initiatives to promote biomass utilization around the country. In addition to his own consulting business, he is also a Senior Associate with Yellow Wood.
APPENDICES

SENSITIVITY ANALYSIS

Table 4: Annual Fuel Savings When Wood and Fuel Oil Prices Vary

<table>
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<tr>
<th>Woodchip $ / Ton</th>
<th>Fuel Oil $ / Gallon</th>
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<th>3.50</th>
<th>4.00</th>
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Table 4 is a sensitivity analysis showing the annual savings from the installation of a woodchip boiler based on varying prices for wood and fuel oil. In this analysis the assumed loan interest rate of 7% and the inflation rates outlined in the assumptions are held constant. For example, if woodchips cost $25 a ton and Fuel Oil costs $3.50 a gallon, the annual fuel savings will be $654,385. ($3.05 was the average price for #2 fuel oil in Jefferson County from August 2010 – August 2011 and $3.45 is the current price for #2 fuel oil in Jefferson County (August 25, 2011)).

Table 5: 30-Year Net Present Value (NPV) when Interest and Fuel Oil Inflation Vary

<table>
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<th>Interest Rate</th>
<th>Fuel Oil Inflation Rate</th>
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<td>$7,852,850</td>
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<tr>
<td>7.0%</td>
<td>$6,703,813</td>
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*6.4% is the average rate of fuel oil inflation in New York over the past 20 years.

Table 5 is a sensitivity analysis showing the Net Present Value (NPV) of the installation of a woodchip boiler based on varying financing interest rates and fuel inflation rates. In this analysis the cost of woodchips ($23) and the General Inflation rate of 2.6% are held constant. For example, if HDK was able to borrow money at 3.0% and the fuel oil inflation rate climbs up to 8.4%, the 30-year net present value of the project would be $42,479,215.

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  - NYSERDA FlexTech CHP Program
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  - NativeEnergy (Carbon Offsetting)
  - 3Degrees (Carbon Offsetting)
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  - Decton
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  - Moss
  - Total Energy Solutions
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- Biomass Energy Resources
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  - Information on Air Pollution Control Technology for Woody Biomass Boilers
  - EPA Institutional Boilers Fact Sheet
  - Sample Woodchip Specification
  - Colby College Project Profile
  - Directory of Primary Wood-Using Industry in New York (ON ENCLOSED CD)
  - Emission Controls for Small Wood Fired Boilers (ON ENCLOSED CD)
  - Biomass Boiler and Furnace Emissions and Safety Regulations in the Northeast States (ON ENCLOSED CD)
  - Woodchip Heating Systems, A Guide for Institutional and Commercial Installations (ON ENCLOSED CD)