OREGON MILITARY DEPARTMENT
JOINT FORCE HEADQUARTERS, OREGON NATIONAL GUARD
OFFICE OF THE ADJUTANT GENERAL
1776 MILITIA WAY
P.O. BOX 14350
SALEM, OREGON 97309-5047

April 5, 2013

The Honorable Richard Devlin, Co-Chair
The Honorable Peter Buckley Co-Chair
Joint Committee on Ways and Means
900 Court Street NE
H-178 State Capitol
Salem, OR 97301-4048

Dear Co-Chairpersons:

Nature of the Emergency/Request

The Oregon Military Department (OMD) requests Legislative approval to apply for a federal 2013 Woody Biomass Utilization Grant in the amount of $250,000 from the USDA Forest Service. This request is similar to the one approved by the September 2012 Emergency Board.

Agency Action

Background

In August 2012 OMD was awarded a 2012 USDA Forest Service Hazardous Fuels Woody Biomass Utilization Grant, or "Woody Bug" (WBUG) as it is commonly known in the industry. The grant provided $250,000 for engineering design of biomass pellet heating systems at five OMD sites: Biak Training Center; Central Oregon Unit Training & Equipment Site (Redmond COUTES); Bend Oregon Youth Challenge Program (OYCP); Burns Armory, and the Umatilla Training Center (UTC).

OMD submitted capital funding requests to the National Guard Bureau (NGB), and received Sustainment, Repair, and Modernization (SRM) funding for two 100% federally funded sites: Biak Training Center ($433,237) and Redmond COUTES ($549,432). AGI Construction is preparing an exemption request and RFQ-RFP for a design-build contract to install biomass pellet boilers at these two sites, and to procure design-only services for the Bend OYCP and Burns Armory sites. These projects will expend $171,393 of the 2012 WBUG design funds, leaving a remaining balance of $78,607 designated for the UTC. FY 2014 Energy Conservation Investment Program (ECIP) construction funding requests for Bend OYCP and Burns Armory are pending NGB approval.

The original WBUG grant was submitted in early April 2012, and since that time the Land Use Plan (LUP) for UTC has been completed, and the Base Realignment and Closure (BRAC) process for transfer of the former Army Depot to OMD is moving forward. Based on a comprehensive review of the entire UTC site energy needs, and the proposed redevelopment plan described in the LUP, installation of biomass pellet boilers at individual buildings is not the optimal solution. OMD believes that installation of a central biomass district heating plant using wood chip fuel with an underground distribution piping system providing heating hot water to individual buildings will result in greater fuel cost savings, increased efficiencies, reduced first costs, and a reduction in total operations and maintenance (O&M) expenses.

The benefits of a biomass district heating plant include the following:

- Reduced Operating Costs - $199,630 annual savings switching from propane to biomass fuel
- Energy Efficiency – 5,703 MMBtu annual savings with new high efficiency boilers
- Renewable Energy - 14,259 MMBtu of fossil fuel replaced with local, renewable biomass
- Economic Development - $2.8 M capital construction creates jobs in local economy
- Economic Development - $85,556 annual purchases of locally produced biomass fuel
- Environmental - Improved forest health, reduced fire danger and greenhouse gas emissions

The proposed project is located near Hermiston in northeast Oregon. The project would utilize forest material fuel from the Malheur National Forests and surrounding private forest lands. These forests contain varied habitats of mountain hemlock, lodgepole pine, mixed conifers including true fir, spruce, and Douglas-fir, and contain large areas of ponderosa pine.

Timeline

The grant application submittals are due April 08, 2013. Grant award notifications are typically announced in July with grant agreements signed and executed in August.

Due to timing issues associated with the application period for this grant the Military Department contacted the United States Forest Service (USFS) on Thursday April 4th to seek an extension to the application period in order to obtain legislative approval to officially apply for the grant. The USFS has agreed to allow the Military Department to submit an unsigned, undated, unofficial placeholder application by the April 8th submission deadline. Submitting this unofficial application provides the legislature an opportunity to make a recommendation on the request to apply for the Woody Biomass Utilization Grant. Should the legislature choose to not allow the Military Department to apply for the grant the placeholder application will be removed by the USFS and the Military Department will not be eligible to receive a grant award. The Military Department has until April 22nd to submit its formal signed and dated application to the USFS.

The grant funds will be used to contract with an engineering design consultant to design the biomass district heating system for the Umatilla Training Center. National Guard Bureau has expressed strong interest in funding these types of capital projects, which could occur in FY2014 or FY2015 depending on funding availability. The district heating system could potentially be up and running by the fall of 2015.

The grant requires a 20% non-federal match of $62,500. The Military Department is proposing to utilize Armory Other Funds Rental Revenue to cover the 20% matching requirements.

Action Requested

Approve OMD to apply for a federal 2013 woody biomass utilization grant from the US Forest Service. The Military Department does not need additional Federal Funds or Other Funds limitation in order to meet the expenditure needs of this grant.

Legislation Affected

None.

Thank you for your consideration of this request.

Sincerely,

for Raymond F. Rees
Major General
The Adjutant General

Notices

Federal Register

Vol. 78, No. 33

Tuesday, February 19, 2013

This section of the FEDERAL REGISTER contains documents other than rules or proposed rules that are applicable to the public. Notices of hearings and investigations, committee meetings, agency decisions and rulings, delegations of authority, filing of petitions and applications and agency statements of organization and functions are examples of documents appearing in this section.

DEPARTMENT OF AGRICULTURE

Forest Service

Request for Proposals: 2013 Hazardous Fuels Woody Biomass Utilization Grant Program

AGENCY: U.S. Forest Service, USDA.

ACTION: Request for Proposals.

SUMMARY: The Department of Agriculture (USDA), Forest Service, State and Private Forestry (S&PF), Technology Marketing Unit, located at the Forest Products Laboratory, requests proposals for wood energy projects that require engineering services. These projects will use woody biomass, such as material removed from forest restoration activities, wildfire hazardous fuel treatments, insect and disease mitigation, forest management due to catastrophic weather events, and/or thinning overstocked stands. The woody biomass shall be used in a bioenergy facility that uses commercially proven technologies to produce thermal, electrical or liquid/gaseous bioenergy. The funds from the Hazardous Fuels Woody Biomass Utilization Grant program (WBU) must be used to further the planning of such facilities by funding the engineering services necessary for final design and cost analysis. Examples of projects might include engineering design of a woody biomass boiler for steam at a sawmill, hospital or school; non-pressurized hot water system for various applications; and biomass power generation facility. To join in support of the public interest and general welfare, to protect communities and critical infrastructure, the applicants applying to this program seek assistance to complete the necessary engineering design work required to secure public and/or private funding for construction for developing local enterprises to better utilize woody biomass. An example of public funding is the USDA Rural Development grants and loan programs that might help fund construction of such facilities. The lack of a professional engineering design often limits the ability of an applicant or business to secure Federal, State or private funding.

DATES: Monday, April 8, 2013, Application Deadline.

ADDRESSES: All applications must be sent to the respective Forest Service Regional Office listed below for initial review. These offices will be the point of contact for final awards.

Forest Service Region 1, (MT, ND, Northern ID & Northwestern SD), ATT: Angela Farr, USDA Forest Service, Northern Region (R1), Federal Building, 200 East Broadway, Missoula, MT 59807, *afarr@fs.fed.us,* (406) 329–3521.	Forest Service Region 2, (CO, KS, NE, SD, & WY), ATT: Sherry Hazelhurst, USDA Forest Service, Rocky Mountain Region (R2), 740 Simms St. Golden, CO 80401–4702, *shazelhurst@fs.fed.us,* (303) 275–5750.
Forest Service Region 3, (AZ & NM), ATT: Dennis Dwyer, USDA Forest Service, Southwestern Region (R3), 333 Broadway Blvd. SE., Albuquerque, NM 87102, *ddwyer@fs.fed.us,* (505) 842–3480.	Forest Service Region 4, (Southern ID, NV, UT, & Western WY), ATT: Scott Bell, USDA Forest Service, Intermountain Region (R4), Federal Building, 324 25th St., Ogden, UT 84401, *sbell@fs.fed.us,* (801) 625–5259.
Forest Service Region 5, (CA, HI, Guam and Trust Territories of the Pacific Islands), ATT: Larry Swan, USDA Forest Service, Pacific Southwest Region (R5), 1323 Club Drive, Vallejo, CA 95492–1110, *lswan01@fs.fed.us,* (707) 562–8917.	Forest Service Region 6, (OR & WA), ATT: Ron Saranich, USDA Forest Service, Pacific Northwest Region (R6), 333 SW 1st Ave., Portland, OR 97204, *rsaranich@fs.fed.us,* (503) 808–2346.
Forest Service Region 8, (AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA, Virgin Islands & Puerto Rico), ATT: Dan Len, USDA Forest Service, Southern Region (R8), 1720 Peachtree Rd. NW., Atlanta, GA 30309, *dlen@fs.fed.us,* (404) 347–4034.	Forest Service Region 9, (CT, DL, IL, IN, IA, ME, MD, MA, MI, MN, MO, NH, NJ, NY, OH, PA, RI, VT, WV, WI), ATT: Lew McCreery, Northeastern Area—S&PF, 180 Canfield St., Morgantown, WV 26505, *lmccreery@fs.fed.us,* (304) 285–1538.
Forest Service Region 10, (Alaska), ATT: Daniel Parrent, USDA Forest Service, Alaska Region (R10), 161 East 1st Avenue, Door 8, Anchorage, AK 99501, *djparrent@fs.fed.us,* (907) 743–9467.	

Detailed information regarding what to include in the application, definitions of terms, eligibility, and necessary prerequisites for consideration is available at *www.fpl.fs.fed.us/tmu* and at *www.grants.gov.* Paper copies of the information are also available by contacting the Forest Service, S&PF Technology Marketing Unit, One Gifford Pinchot Drive, Madison, Wisconsin 53726–2398, 608–231–9504.

FOR FURTHER INFORMATION CONTACT: For questions regarding the grant application or administrative regulations, contact your appropriate Forest Service Regional Biomass Coordinator as listed in the addresses above or contact the Technology Marketing Unit, Madison, WI, (608) 231–9504, *dtucker@fs.fed.us.mailto:* Individuals who use telecommunication devices for the deaf (TDD) may call the Federal Relay Service (FRS) at 1–800–877–8339 twenty-four hours a day, every day of the year, including holidays.

SUPPLEMENTARY INFORMATION: To address the goals of Public Law 110–234, *Food, Conservation, and Energy Act of 2008, Rural Revitalization Technologies (7 U.S.C. 6601),* and the anticipated *Department of the Interior, Environment and Related Agencies Appropriation Act of 2013,* the Agency is requesting proposals to address the nationwide challenge of using low-value woody biomass material to create renewable energy and protect communities and critical infrastructure from wildfires.

Goals of the grant program are to:

• Promote projects that target and help remove economic and market barriers to using woody biomass for renewable energy.

• Assist projects that produce renewable energy from woody biomass while protecting the public interest.

• Reduce the public's cost for forest restoration by increasing the value of biomass and other forest products generated from hazardous fuels reduction and forest health activities on forested lands.

• Create incentives and/or encourage business investment that uses woody biomass from our nation's forestlands for renewable energy projects.

Grant Requirements

1. Eligibility Information

a. Eligible Applicants. Eligible applicants are businesses, companies, corporations, state, local and tribal governments, school districts, communities, non-profit organizations, or special purpose districts (*e.g.*, public utilities districts, fire districts, conservation districts, or ports). Only one application per business or organization shall be accepted.

b. Cost Sharing (Matching Requirement). Applicants shall demonstrate at least a 20% match of the *total project cost.* This match shall be from non-federal sources, which can include cash or in-kind contributions.

c. DUNS Number. All applicants shall include a Dun and Bradstreet, Data Universal Numbering System (DUNS) number in their application. For this requirement, the applicant is the entity that meets the eligibility criteria and has the legal authority to apply for and receive a WBU grant. For assistance in obtaining a DUNS number at no cost, call the DUNS number request line (1–866–705–5711) or register on-line at *http://fedgov.dnb.com/webform.*

d. System for Award Management (SAM). The applicant should be aware that prospective awardees shall be registered in the SAM database prior to award, during performance, and through final payment of any grant resulting from this solicitation. Further information can be found at *www.sam.gov.* For assistance, contact the SAM Assistance Center (1–866–606–8220).

2. Award Information

Total funding anticipated for awards is about $3.0 million for the 2013 WBU program. Individual grants cannot exceed $250,000. The Federal government's obligation under this program is contingent upon the availability of 2013 appropriated funds. No legal liability on the part of the Government shall be incurred until appropriated funds are available and committed in writing through a grant award letter issued by the grant officer to the applicant. Grants can be for two years from the date of award. Written annual financial performance reports and semi-annual project performance reports are required and shall be submitted to the appropriate grant officer. A grant awarded under this program will generate an IRS Form 1099 Miscellaneous Income that will be filed with the Internal Revenue Service (IRS) and provided to the awardee. However, the USDA expresses no opinion on the taxability, if any, of the grant funds awarded. Awardees are expected to follow all Occupational Safety and Health Administration (OSHA) requirements regarding safe working practices and all applicable Federal, State and local regulations pertinent to the proposed project.

3. Application Prerequisites

This grant program requires that projects have had considerable advance work completed prior to submitting a grant application. Only applicants that have already completed and submitted with their applications: (a) A Comprehensive Feasibility Assessment of the project by qualified and credible parties, (b) a Woody Biomass Resource Supply Assessment and, (c) past three years of financial statements (balance sheets, income statements and cash flow analysis) shall be considered. Corporate annual reports will not be accepted as evidence of due diligence for a business. In addition, for-profit applicants, as well as non-profit organizations should have a Dun and Bradstreet rating that falls within the following categories:

(1) Financial stress rating should be 1, 2 or 3;

(2) Credit score should be 1, 2 or 3; and

(3) Paydex score should be between 60 and 100 (0 being the lowest and 100 the highest).

For state, local and tribal governments and other governmental entities (school districts), appropriate sector ratings from Moody's should be in the range from Aaa to A. Entities with Municipal Bond rating Baa to Ba will be considered with reservations. Entities with Municipal Bond Ratings between B and C (including B, Caa, Ca, and C) will not qualify. The two assessments and three years of financial statements shall be included with the submission. The Dun and Bradstreet and Moody's financial ratings will be obtained by the Technology Marketing Unit for the review process as evidence of the financial capability of the applicant. Applicants will not be charged for the Dun and Bradstreet or Moody's reports. All financial information is kept confidential.

a. The Comprehensive Feasibility Assessment shall address, at minimum, the following items:

• Economic feasibility analysis of site, labor force wages and availability, utilities, access and transportation systems, raw material feedstock needs, and overall economic impact, including job creation and retention, displayed by employment associated with operating the facility itself and supplying the facility (jobs created and jobs retained on a full-time equivalent basis). Also required in the economic analysis is a market feasibility study, including analysis of the market(s) for the power, heat, fuel, or other energy product produced, market area, marketing plans for projected output, if needed, extent of competition for the particular target market(s), extent of competition for supply and delivered costs and general characterization of supply availability (more detailed information is provided in the Woody Biomass Resource Supply Assessment section).

• Technical feasibility analysis shall include an assessment of the recommended renewable energy technology, what other technologies were considered, why the recommended renewable energy technology was chosen, assessment of site suitability given the recommended renewable energy technology, actions and costs necessary to mitigate environmental impacts sufficient to meet regulatory requirements, developmental costs, capital investment costs, operational costs, projected income, estimated accuracy of these costs and income projections, realistic sensitivity analysis with clear and explicit assumptions, and identification of project constraints or limitations.

• Financial feasibility analysis shall include projected income and cash flow for at least 36 months, description of cost accounting system, availability of short-term credit for operational phase, and *pro forma* financial statement with clear and explicit assumptions.

• List of personnel and teams undertaking project development, implementation and operations, including a clear description of how continuity between project phases will be maintained. Describe the qualification of each team member including education and management experience with the same or similar projects, and how recently this experience occurred.

b. The Woody Biomass Resource Supply Assessment shall provide a description of the available woody biomass resource supply. At a minimum the assessment should address the following items:

- Feedstock location and procurement area relative to the project site;
- Types of biomass fuel available and realistic pricing information based on fuel specifications required by the technology chosen, including explicit break-out of forest-sourced, agricultural-sourced and urban-sourced biomass.
- Volume potentially available by ownership, fuel type and source of biomass supply, considering recovery rates and other factors, such as Federal, State and local policy and management practices;
- Volume realistically and economically available by ownership, fuel type and source of biomass supply, considering recovery rates and other factors, such as Federal, State and local policy and management practices;
- Detailed risk assessment of future biomass fuel supply including, but not limited to, impacts of potential Federal, State and local policy changes, availability of additional fuel types, increased competition for biomass resource supply and changes in transportation costs;
- Summary of total fuel realistically and economically available compared to projected annual fuel use (i.e., a ratio usually exceeding 2.0:1); and
- Minimum five-year biomass fuel pricing forecast for material or blend of material meeting fuel specifications delivered to project site (required for financial *pro forma*).

c. Financial Statements: All applicants shall submit the last three years of historical financial statements (balance sheets, income statements, and cash flow analysis).

4. Application Evaluation

Applications are evaluated against criteria discussed in Section 5. All applications shall be screened to ensure compliance with the administrative requirements as set forth in this Request for Proposals (RFP). Applicants not following the directions for submission shall be disqualified without appeal. Directions can be found at *www.fpl.fs.fed.us/tmu* under 2013 Woody Biomass Utilization Grant Program. The appropriate Forest Service region shall provide a preliminary review based on grant administrative requirements and regional priorities of environmental, social, and economic impacts. Each region may submit up to seven proposals for the nationwide competition. The nationwide competition will consist of a technical and financial review of the proposed project by Federal experts from different federal agencies, experienced in energy systems, financing projects, and/or forestry. Panel reviewers will independently evaluate each proposed project for technical and financial merit and assign a score using the criteria listed in Section 5. Technical and financial merits, along with the regional priorities, will be submitted to the Forest Service national leadership for final selection and announcement.

5. Evaluation Criteria and Point System

If a reviewer determines that a proposal meets basic requirements for a criterion, half the number of available points will be awarded. More points can be earned if the reviewer determines that a proposal exceeds the basic criteria and fewer if a proposal falls short of the basic criteria. A maximum of 225 total points can be earned by a proposal.

Criteria:

a. Required Comprehensive Feasibility Assessment is thorough and complete, conducted by a qualified and experienced professional team; and project is economically viable using relevant and accepted financial metrics. Total Points 30

b. Required Woody Biomass Resource Supply Assessment conforms to professional standards for size and complexity of proposed facility, is suitable for appropriate lender or public financing review; and projected biomass quantity and sourcing arrangements from forested land management activities are clearly identified on an annual basis. Total Points 30

c. Number of projected jobs created and/or retained (direct or indirect) when project goes in service is reasonable and substantiated. Total Points 15

d. Amount and type of fossil fuel offset in therms/year and increased system fuel use efficiency (in percentage) once project is operational. Annualized fuel use efficiency for average annual system conditions is calculated as follows: Fuel Use efficiency = (Net BTUs used by processes + BTUs of electricity produced by generator) divided by (BTUs of inputted fuel to boiler (HHV)). Project provides impact in geographic area appropriate for size of projected facility and is reasonable and substantiated. (Note: 1 therm = 100,000 BTUs). Examples of typical energy efficiencies include: 1) Electricity only = 25%; 2) electricity plus low pressure steam for dry kilns = 45%; and 3) boiler processes that use backpressure turbine ahead of process = 65%. All calculations shall be shown. (See *www.fpl.fs.fed.us/tmu* under Woody Biomass Grant program for Btu content of wood at various moisture contents.) Total Points 30

e. Documentation of collaborations and qualifications necessary for the development and operation of the proposed facility, including roles and directly relevant qualifications of Development, Engineering, Management, Construction, and Operations Teams or similar, are adequate and appropriate for project. Total Points 30

f. Proposed engineering design components reflect accepted professional standards for type and complexity of proposed facility and are complete. Total Points 20

g. Financial plan and sources of funding are described in detail for all phases of the project, including, but not limited to, development, construction and operations. Total Points 30

h. Detailed description of federal, state and local environmental, health and safety regulatory and permitting requirements, and realistic projected timeline for completion are provided. Total Points 30

i. Description of outreach efforts to maximize dissemination of project results and pass on lessons learned. Total Points 10

6. Application Information

a. Application Submission. Applications shall be time stamped showing the time of sending by United States Postal Service or other commercial delivery company no later than midnight Monday, April 8, 2013. No exceptions. If submitted through *grants.gov,* the date submitted shall be by midnight Monday, April 8, 2013. One paper copy and an electronic version shall be submitted to the Regional Biomass Coordinator of your Forest Service region, as listed previously in the **ADDRESSES** section even if submitted through *grants.gov.* Your Forest Service region is generally determined by the state in which the bioenergy facility is located. However, in a few instances, two Forest Service regions may exist in one state. Forest Service regions can be located at *http://www.fs.fed.us/maps/products/guide-national-forests09.pdf.* The electronic version submitted to the Regional Biomass Coordinator should be a single pdf file on a USB flash drive or compact disc (CD). No emails shall be accepted.

Applications may also be submitted electronically through *www.grants.gov.*

b. Application Format and Content. Each submittal should be in PDF format. The application template form FPL–1500–4 is in word format and is recommended to be used. After completing the template, the document should be saved as a PDF format either using Adobe Acrobat or Word software. The template form FPL–1500–4 along with directions for completing can be found at the *www.fpl.fs.fed.us/tmu.* Paper copy shall be single sided on 8.5- by 11-inch plain white paper only (no colored paper, over-sized paper, or special covers). Do not staple. All forms and application template can be found at *www.fpl.fs.fed.us/tmu* 2013 Hazardous Fuels Woody Biomass Utilization Grant Program.

Outline of form FPL–1500–4 and mandatory appendices

(1) Project Summary Sheet

(2) Title Page

(3) Project Narrative

The project narrative shall provide a clear description of the work to be performed, impact on removing woody biomass and creating renewal energy (e.g., tons of biomass removed that would have otherwise been burned, cost savings to landowners, source of biomass removed from forested areas, broken-out by ownership), and how jobs will be created and/or retained, and sustained. Application narrative should address the 15 discussion areas listed on the form FPL–1500–4.

(4) Budget Summary Justification in Support of SF 424A.

(5) Qualifications and Summary Portfolio of Engineering Services

For the engineering systems, the project usually consists of a system designer, project manager, equipment supplier, project engineer, construction contractor or system installer and a system operator and maintainer. One individual or entity may serve more than one role. The project team must have demonstrated expertise in similar bioenergy systems development, engineering, installation, and maintenance. Authoritative evidence that project team service providers have the necessary professional credentials or relevant experience to perform the required services must be provided. Authoritative evidence that vendors of proprietary components can provide necessary equipment and spare parts for the system to operate over its design life must also be provided. A list of the same or similar projects designed, installed and currently operating with references shall be provided along with appropriate contacts.

(6) Community Benefit Statement.

Provide a one page narrative on the social, environmental and economic impacts and the importance of the project to the community. Include substantiated facts and benefits, such as local employment rate, per capita income and fossil fuel impacts with and without the project. Include letters of support from community leaders demonstrating on-going community collaboration, where appropriate, in the appendix. Forest Service regions shall use this information to help evaluate regional impacts, particularly impact of job creation and retention as appropriate at the geographic scale for the region and how this grant award provides for the overall general welfare of the region.

(7) Appendices.

The following information shall be included in the appendices and scanned into a single PDF file:

a. Comprehensive Feasibility Assessment.

b. Woody Biomass Resource Supply Assessment.

c. Quotes for Professional Engineering Services considered (minimum of two quotes): Rationale for selection of engineering firm, if already selected.

d. Letters of Support from Partners, Individuals, or Organizations: Letters of support shall be included in an appendix and are intended to display the degree of collaboration occurring between the different entities engaged in the project. These letters shall include partner commitments of cash or in-kind services from all those listed in the SF 424 and SF 424A. Each letter of support is limited to one page in length.

e. Federal Funds: List all other Federal funds received for this project within the last three years. List agency, program name, and dollar amount.

f. Miscellaneous, such as schematics.

g. Last three years of financial statements (balance sheets, income statements, cash flow analysis).

h. Administrative Forms: SF 424, SF 424A, SF 424B and AD 1047, 1048, 1049 and certificate regarding lobbying activities are standard forms that shall be included in the application. These forms can be accessed at *www.fpl.fs.fed.us/tmu* under 2013 Woody Biomass Grant Program.

Dated: November 2, 2012.

Victoria Christiansen,

Acting Associate Deputy Chief.

[FR Doc. 2013–03768 Filed 2–15–13; 8:45 am]

BILLING CODE 3410–11–P

COMMISSION ON CIVIL RIGHTS

Agenda and Notice of Public Meeting of the South Carolina Advisory Committee

Notice is hereby given, pursuant to the provisions of the rules and regulations of the U.S. Commission on Civil Rights (Commission) and the Federal Advisory Committee Act (FACA) that a meeting of the South Carolina Advisory Committee (Committee) will convene on Tuesday, March 5, 2013, at 10:30 a.m. and adjourn at approximately 11:30 a.m. The meeting will be held at the Aiken County Public Library, 314 Chesterfield Street SW., Aiken, South Carolina, 29801. The purpose of the meeting is for the Committee to receive ethics training and orientation and plan future activities.

Members of the public are entitled to submit written comments; the comments must be received in the regional office by April 5, 2013. Written comments may be mailed to the Southern Regional Office, U.S. Commission on Civil Rights, 61 Forsyth St. SW., Suite 16T126, Atlanta, GA 30303. They may also be faxed to the Commission at (404) 562–7005, or emailed to the Commission at *pminari@usccr.gov.* Persons who desire additional information may contact the Southern Regional Office at (404) 562–7000.

Hearing-impaired persons who will attend the meeting and require the services of a sign language interpreter should contact the Southern Regional Office at least ten (10) working days before the scheduled date of the meeting.

Records generated from this meeting may be inspected and reproduced at the Southern Regional Office, as they become available, both before and after the meeting. Persons interested in the work of this Committee are directed to the Commission's Web site, *http://www.usccr.gov,* or may contact the Southern Regional Office at the above email or street address.

The meeting will be conducted pursuant to the rules and regulations of the Commission and FACA.

Dated in Washington, DC, February 13, 2013.

David Mussatt,

Acting Chief, Regional Programs Coordination Unit.

[FR Doc. 2013–03715 Filed 2–15–13; 8:45 am]

BILLING CODE 6335–01–P

PROJECT SUMMARY

2013 Hazardous Fuels Woody Biomass Utilization Grant Application

(Include this 18-page form at the front of your single PDF file.)

Project Coordinator's Name	Project Coordinator's Email Address and FAX Number	Name of Organization/Business and Mailing Address	Project Coordinator's Office Phone and Cell Phone	Congressional District and County	FS Region	Amount Requested	Non-Federal Matched Funds	Project Duration
Craig Volz	craig.d.volz.ctr@mail.mil (503) 584-3584	Oregon Military Department P.O. Box 14350 Salem, OR 97309-5047	(503) 584-3864 (503) 851-4744	OR-002 Umatilla County	6	$250,000	$62,500	36 months

Regional Biomass Coordinator: Ron Saranich

Project Title:
Umatilla Training Center - Biomass District Heating Plant
(Optional - Combined Cooling, Heat and Power Plant)

Project Description:
Design and construct a biomass district combined heat and power system to serve approximately 40 buildings with a total of 297,714 square feet of conditioned space . The biomass central plant will be fueled by wood chips sourced from forest residues, and will have a capacity of 5.0 MW (thermal) and 1.0 MW (electric). The prime mover for the combined heat and power (CHP) plant will be an organic rankine cycle (ORC) turbo-generator. Two biomass thermal oil boilers rated at 1.8 MW (thermal) and 3.2 MW (thermal) will provide the required heat input, and a new chiller (either centrifugal or adsorption) will provide cooling to the district chilled water piping distribution system. A cooling tower will provide heat rejection capacity for the chiller.

Collaborative Partners (Letters of support should be included in the application.):
1) Blue Mountain Lumber; 2) Confederated Tribes of the Umatilla Indian Reservation; 3) Ecotrust Forest Management; 4) Oregon Business Development Dept; 5) Oregon Dept of Energy; 6) Oregon Dept of Forestry; 7) Umatilla Army Depot Reuse Authority; 8) Umatilla County Board of Commissioners; 9) Umatilla County Economic Development Dept; 10) Wallowa Resources.

Project Objectives:

1) Energy Security & Disaster Response

2) Net Zero Energy - Energy Conservation and Renewable Biomass Thermal & Generation

3) Lowest Total Cost of Ownership (TCO)

4) Pilot installation proof of concept for other DoD, Federal GSA and commercial buildings in the small-medium scale CHP market sector (< 5 MW) .

TITLE PAGE

United States Department of Agriculture, Forest Service
2013 Hazardous Fuels Woody Biomass Utilization Grant Application

Federal Register Number: 2013-03768
Proposal Title: Umatilla Training Center - District Biomass Combined Heat & Power Plant
Point of Contact: Craig Volz
Business/Organization Name: Oregon Military Department
Address: 1776 Militia Way SE P.O. Box 14350 Salem, OR 97309-5047
Office Telephone Number: (503) 584-3864
Cell Phone Number: (503) 851-4744
Fax Number: (503) 584-3584
Email: craig.d.volz.ctr@mail.mil
Website Address: www.oregon.gov/omd
Duns Number: 809580343
Tax Identification Number: 93-6001775
Date of Submission: 08 APRIL 2013

Executive Summary:

1) Benefits: Offset 258,910 gallons per year of propane use with 100% renewable woody biomass, and generate 1,247 MWh per year of renewable electricity.

2) Strategic Impact & Technology Transfer potential: Cost effective pilot implementation of medium-scale biomass CHP representing 53% of total CHP market potential (< 5 MWe)

3) Fuels Reduction: Utilize up to 2,004 tons per year of biomass wood chips sourced from forest residuals

4) Job Creation & Economic Development: $10.2 M project will generate 177 jobs

1. List and describe the key issues associated with forest conditions economically accessible to the proposed project, such as insects, disease, hazardous fuels, and catastrophic weather events and the impact of not conducting forest management. Also, describe how residue is currently being disposed of from forest management activities to meet state, federal and/or local forest and fire priorities. List the activities you are engaged in currently.

Key Findings
The supply assessment found that northeastern Oregon and southeastern Washington contain active timber harvest operations that generate significant quantities of commercial timber, pulp, and forest biomass.
Data from timber harvest reports combined with telephone interviews with industrial forestland owners completed by the author in 2012 with industrial forestland managers revealed large quantities of forest biomass available within the fuel supply area.
Potentially Available
• The fuel supply area contains over 120,000 bone-dry tons of forest biomass that is potentially recoverable from commercial timber harvest operations on industrial, non-industrial, and federal forestlands.

Realistically Available
• The fuel supply area contains several industrial forestland owners and wood fuel providers that could supply the proposed project. The four existing wood fuel/wood chip businesses interviewed noted that they could provide the quantity of wood fuel required by the Oregon Military Department. The fuel supply area contains over 108,000 acres of private industrial forestland and 1.3 million acres of US Forest Service land within 75 miles of the project site. Given the quantities required, the project owners could source the feedstock from industrial, federal, or private non-industrial forest lands or dedicated energy crops.

Existing and Competing Uses
• The fuel supply area contains an active market in timber, pulp, and some forest biomass. The pulp and paper market consumes the largest amount of non-saw log material. Demand for pulp grade chips has fluctuated over time. Demand for forest biomass in the fuel supply area appears to be low.

2. Describe the proposed woody biomass bioenergy facility operations completely. Include size, amount of energy that will be produced, established and potential markets for the energy produced; type and amount of woody biomass that will be used on an annual basis for facility (include moisture content specifications/targets); and amount of fossil fuel offset/or fossil fuel carbon emission offsets in therms/year. Also describe increased system fuel use efficiency (in percentage) once project is operational. Annualized fuel use efficiency for average annual system conditions is calculated as follows: Fuel Use Efficiency = (Net BTUs used by processes + BTUs of electricity produced by generator) divided by (BTUs of inputted fuel to boiler (HHV)). Project provides impact in geographic area appropriate for size of projected facility and is reasonable and substantiated. (Note: 1 therm = 100, BTUs). Examples of typical energy efficiencies include: 1) electricity only = 25%; 2) electricity plus low pressure steam for dry kilns = 45%; and 3) boiler processes that use backpressure turbine ahead of process = 65%. All calculations shall be shown.

For more details see attached Feasibility Assessment

MAJOR EQUIPMENT & THERMAL-ELECTRIC OUTPUT
Schmid AG Biomass Boiler # 1 = 3.2 MW thermal
Schmid AG Biomass Boiler # 2 = 1.8 MW thermal
Turboden ORC Turbo-generator = 1.0 MW electric (1,247 MWh per year output)

FUEL CONSUMPTION & SPECIFICATIONS
Biomass wood chips, 30% to 60% moisture content, approx. 2-inch minus hog fuel

FOSSIL FUEL OFFSET
258,910 gallons of propane = 23,739 MMBTU per year of fossil fuel replacement

FUEL USAGE EFFICIENCY
Input = 28,297 MMBTU from biomass
Output = 26,638 MMBTU total = 22,638 MMBTU thermal + 4,256 MMBTU electric
FUE = 26,638 / 28,297 = 95.0%

3. List and briefly summarize the professional studies that have been done to date for this project, such as pre-feasibility assessment, environmental analysis, site analysis, economic feasibility, and community support.

A. Feasibility Assessment for Biomass Heating Systems (30 March 2012)
Evaluation of the technical and economic feasibility of biomass pellet boiler installations for 7 buildings located at 5 sites in Central and Northeastern Oregon.

B. Oregon Army National Guard Biomass Energy Case Study (31 January 2013)
Case study summarizing the benefits of biomass pellet boiler heating system installations for 7 buildings located at 5 sites in Central and Northeastern Oregon.

C. Biomass Feedstock Resource Assessment (Spring 2013)
Case study summarizing the benefits of biomass pellet boiler heating system installations for 7 buildings located at 5 sites in Central and Northeastern Oregon.

D. Feasibility Assessment for Biomass Combined Cooling, Heat and Power (05 April 2013)
Evaluation of the technical and economic feasibility of a district biomass combined cooling, heat and power plant (CCHP) for the Umatilla Training Center.

E. Oregon Wood Energy Cluster Pilot: Biomass District Heating Feasibility Study (30 August 2013)
Detailed analysis and schematic design development for a biomass district heating only system at the Umatilla Training Center. The study will kick off in April 2013 and conclude by August 2013.

4. List and describe the technology alternatives evaluated in the previously completed comprehensive feasibility study for this project. Include pros and cons of each alternative technology examined, and explain why the particular preferred technology was chosen. H. Highlight the project merits ecologically, economically, and socially.

1) Individual biomass pellet boilers - 79.3% efficiency, High annual fuel and O&M costs
2) Biomass wood chip district heating - 75.2% efficiency, lower annual fuel and O&M costs
3) Biomass CHP with ORC turbo-generator - 88.4% efficiency, low annual fuel and O&M costs, 778 MWh per yr
4) Biomass CHP with ORC & electric chiller - 90.5% efficiency, lowest fuel and O&M costs, 778 MWh per yr
5) Biomass CHP with ORC & adsorption chiller - 95.0% efficiency, low fuel and O&M costs, 1,247 MWh per yr

OPTION 4 or 5 is recommended based on overall efficiency, economics, woody biomass utilization, and renewable electricity generation

5. Describe the fuel requirements (amount, moisture content, and other raw material characteristics, such as particle geometry and size) and summarize results of the previously completed biomass feedstock assessment report, including infrastructure that will deliver feedstock.

Fuel classification is for industrial wood chips per the European Standard (EN 14961-4) For Wood Chips and Hog Fuel.

Origin & Source: A2 and B1 (forest sourced woody biomass)
Particle Size: P45B
Moisture: M35
Ash: A1.5 to A3.0
Bulk Density: BD 150 kg/m3 (pg. 9)
Higher Heating Value: 9,616 Btu/lb (for oven dry) per Forest Products Lab Report FPL-29
Lower Heating Value: minimum 4,405 Btu/lb (50% MC)

6. Summarize the economic feasibility of the proposed project. List key assumptions used, such as sale price of energy to customers, capitalization costs, operating and maintenance costs, feedstock costs, costs to meet permitting requirements, and any other revenue and costs that may be material to evaluating the economic feasibility of the project. (Projects that provide detailed information on the economic feasibility of the proposed facility fare better in the evaluation.

ASSUMPTIONS

1. Biomass wood chips @ $80 per ton
2. Propane @ $1.96 per gallon
3. Electricity @ $0.045 per kWh
4. All electricity generated will be used on site

Net payback after incentives, tax credits, and New Market Tax Credit financing ranges from 6.6 years to 8.0 years and the Biomass CHP project cost ranges from $8.9 M to $10.2 M.

For more information see Feasibility Assessment for detailed Life Cycle Cost Analysis

7. Briefly describe the layout and configuration of the proposed system. Include size of all processing equipment, such as boilers or steam turbines. Include a flowchart, naming all steps and processes, and associated equipment or machinery. Attach schematics in Appendix.

SEE ATTACHED FEASBILITY ASSESSMENT FOR DETAILS

8. List and describe required permits and all other regulatory obligations that must be met for facility to be approved, including a timeline that also shows retrofit or new build construction activities and commissioning date. Please be realistic and include discussion about where challenges or obstacles may be expected and how this might affect the projected timeline.

Remediation of brownfield portion of site is underway as part of Base Realignment and Closure (BRAC) transfer process.

Areas of proposed construction will be prioritized for clean up. Remediation delays may impact construction activities.

Other than county building permits, there are no other special environmental or regulatory requirements.

9. Describe how the proposed project will be financed. Include what funds have been raised, sources, and a general idea of terms and conditions. Include how much remains to be raised, what sources are being accessed, potential terms and conditions, and any other pertinent information about the status of funding committed for capitalization and initial operations. Detailed information on the economic feasibility of the proposed facility is an essential criterion.

TWO FUNDING OPTIONS

1) Capital funding request to National Guard Bureau for FY2014 or FY2015

2) New Market Tax Credit finance FY 2014 (preliminary letter of support, and project intake form in Appendix)

10. Outline the key categories for the proposed design, costing, and permitting analysis that will be funded by the grant. Include outputs anticipated and a timeline for accomplishment, such as start and end dates and key tasks. (Note: If a grant is awarded, invoices submitted for reimbursement must correspond to the cost categories and activities described in this process.)

Engineering design cost estimate = $312,500 (approximatel 3.5% of constructio cost)

Deliverables Include:

30% Schematic Design Documents

60% Design Documents

95% Design Drawings & Specification

100% Issue for Bid / Construction Documents

Design Duration = 30 weeks

11. Describe how the proposed project will retain, create, or expand job opportunities both during the design phase and when the system is operational. Be as accurate and specific as possible about job retention and creation projections. Specifically address local job situation.

Design and construction trade job creation = 177 jobs

Long-term plant operations and fuel supply jobs= 6 jobs

12. Identify key individuals responsible for project, their roles and qualifications.

Craig Volz, P.E. - Tetra Tech Resource Efficiency Manager for ORARNG
Responsible for program management and oversight. 31 years of engineering experience, including industrial, defense, high-tech, and energy efficiency. Registered OR mechanical engineer.

Ron Kirkedorfer - Northline Energy LLC, President
Responsible for engineering design calculations documents, drawings and specifications. Registered OR mechanical engineer responsible for multiple biomass boiler design projects and feasibility studies.

Jim Willeford - Oregon Military Department, Construction Branch Chief
Responsible for procurement, contracts, and construction project management. 26 years of professional construction project management and contracting experience.

LTC Ken Safe, P.E. - Oregon Military Department, Construction & Facility Management Officer
Responsible for fiscal and technical program oversight. 21 years of professional engineering experience. Registered OR structural engineer.

Joe O' Carroll - Imperative Energy Ltd, Managing Director
Responsible for biomass technical consulting, constructability & operability reviews, and Design / Build general contracting consulting. Over 6 years of specialized biomass consulting experience in finance, project development and construction.

13. Discuss long-term benefits and impacts of the proposed project. Describe outreach efforts to maximize dissemination of project results and pass on lessons learned.

Project offsets 712,185 MMBTU of fossil fuel use over 30 year service life, and generates 37,419 MWh of renewable electricity.

Woody Biomass utilization of up to 96,359 tons over the project life span.

14. Estimate effects on natural resources, such as projected reduction in green house gases, water pollution as well as improvements to forest conditions and wildlife habitat. Describe proposed adoption of technologies that exceed current environmental standards or permitting requirements.

Reduction in hazardous fuels, and green house gas emissions.

Multi-clone separators will be provided to filter boiler flue gas particulates, although not currently required by EPA or DEQ.

Space will be reserved in the boiler plant for addition of electrostatic precipitators to accommodate potentially more stringent air quality requirements in the future.

15. Describe what will be monitored and evaluated and how this will be reported, as well as procedures for ensuring all requirements of this grant program are met. List responsible individuals.

Design project scope, schedule and budget will be documented with quarterly progress reports. Responsible individuals include Jim Willeford - Construction Branch Chief, Moya McKeehan - Contracts Specialist, and Craig Volz - Resource Efficiency Manager.

Budget Summary Justification in Support of SF 424A

Biomass Combined Cooling, Heat & Power Plant

Scope of Design:
Using Owner supplied documentation and data and working the preliminary load data from Tetra Tech, provide design for a biomass thermal oil heat generation system including two thermal oil biomass heating systems, including ORC generator, cooling equipment and engineering, site assessment, civil , structural, mechanical, electrical, distributed energy and biomass thermal hot water system as specified by Owner, as follows:

Design Components:
- Site assessment.
- Load analysis verification and definition.
- Civil site plan.
- Structural building design to include all biomass, fuel handling, thermal oil, ORC, and cooling equipment.
- Biomass thermal oil plan general equipment arrangement including material storage, transfer and thermal plant.
- Integration of the ORC and Cooling Equipment
- Increase and adjust the central utility plant building configuration as required.
- Mechanical and electrical plan.
- District energy heat distribution plan and engineering.
- On-site assessment and 3 progress design meetings in Oregon.

Limits of the scope of work
- Site work limited to direct building and distributed heating.
- Direct thermal interface with heat load (Buildings).

Excluded Design Elements
- Site drainage.
- Utilities beyond distributed thermal energy main line (no connection engineering to buildings).
- Environmental and air permitting requirements (by Owner's Environmental Engineer).
- Military design requirements if any (by Owner).
- Fuel procurement or specifications (by Owner).

Design Fee Budget $312,500
Anticipate Design Duration 30 weeks

2013 Hazardous Fuels Woody Biomass Utilization Grant Application
Portfolio of Engineering Services

(2 page limit)

Qualifications and Summary Portfolio of Engineering Services

SEE APPENDIX FOR DETAILED NGINEERING STATEMENTS OF QUALIFICATION

Northline Energy- C Corporation
111 Sunset Avenue, Edmonds WA 98020
PO Box 1863, Edmonds WA 98020
Phone 425-672-0197
Fax 425-407-5250
President Ron Kirkendorfer
State of Registration Washington
Year of Incorporation 1994

Overview:
Northline Energy has specialized in biomass combustion since 1994 with projects completed in the USA, Canada and abroad markets including industrial solid fuel markets and municipally prepared fuel markets including pellet and chip applications. Our experience includes industrial and commercial construction structural and underground utilities work providing a unique combination of skills that allow us to provide components and turn-key projects that are cost effective

Application:
Northline Energy applies the following approaches depending on project requirements
- Appliance units sales through qualified distribution
- Negotiated design build
- Design, build, operate and maintain plant in partnership with the owner and associated companies, suited to project requirements and application

Staffing:
Project Management, after sales technical, sales engineering are staffed in house.
Project Development and construction coordination are staffed based upon project requirements and project scope of work.
Specialized project engineering subject to local requirements are staffed based upon project requirements.

Company Approach:
Northline Energy Inc. is a corporation based in the State of Washington which has specialized in biomass combustion since 1994. Regional office in Turner, Maine including assembly and warehousing and increased manufacturing. Northline Energy's recent area of focus has been in regional development of municipally heating systems within the public heating sector.

Current concentration on district heating energy systems utilizing European partners and extensive experience in district heating systems applications are integrated into 2012 and 2013 market development. Partnership collaboration has proven to increase de-centralized knowledge based decreasing the costs of projects and increasing the efficiency of the overall systems.

Project experience includes design and engineering services, equipment retrofits, new turn-key installations and project management. Our historical project experience ranges from large 25+ mw high pressure steam systems as far away as Russia and China, industrial boiler installations in a large number of US states and Canadian Provinces. As such, we are adept at remote site management and location.
Recently completed Projects
- Northern Maine Community College 900 Kw hot water thermal heating system
- Millinocket Regional Hospital 700 Kw low pressure steam
- Mechanic Falls Town Hall, Mechanic Falls, ME 150 Kw hot water heating system
- Poland High School, Poland ME 700 Kw turnkey chip hot water heating system
- Phillips Middle School, Philips ME 350 Kw hot water heating system
- U Maine center for Aquatic Research, Franklin ME 250 Kw containerized heating system
- Fayette Middle School, Fayette ME 150 Kw school heating system

Vendor Supply:
Exclusive supplier and distributor for Schmid Energy Systems for USA and Canada
Exclusive supplier Hamont combustion systems

Fabrication:
Development of biomass combustion systems private labelled under Northline Energy.

Strategic Alliance:
Imperative Energy, Ireland

2013 Hazardous Fuels Woody Biomass Utilization Grant Application
Community Benefit Statement
(1 page limit)

Community Benefit Statement

Proposed biomass energy plant will have expansion capability to serve adjoining industrial development tracts owned by Umatilla County and Morrow County. Goal is to work with Counties and Oregon Business Development Department to attract industrial and biomass fuel processing tenants with energy intensive thermal process loads to locate in adjoining industrial parks. Biomass energy plant will provide renewable thermal and electric energy to the industrial biomass park.

Short-term job creation during construction, and long-term jobs for operators and fuel suppliers. Potential as catalyst for bioenergy development on adjacent industrial property could generate long-term economic benefits for the surrounding communities, as well as help develop Oregon's biomass industry.

2013 Hazardous Fuels Woody Biomass Utilization Grant Application Appendices

(Include these documents in your single PDF file)

1. Comprehensive Feasibility Assessment
2. Woody Biomass Resource Supply Assessment
3. Quotes for Professional Engineering Services Considered (minimum of 2)
4. Letters of Support from Partners, Individuals, or Organizations
5. List of Federal Funds Received
6. Miscellaneous, such as appendices and schematics
7. Last 3 Years of IRS Tax Returns
8. Administrative Forms

Form No.	Title
SF-424	Application for Federal Assistance (CFDA Number is 10.674) form and instructions
SF-424A	Budget Information – Non-Construction Programs form and instructions
SF-424B	Assurances—Non-Construction Programs
AD-1047	Certification Regarding Debarment, Suspension, and Other Responsibility Matters – Primary Covered Transactions
AD-1048	Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – Lower Tier Covered Transactions
AD-1049	Certification Regarding Drug-Free Workplace Requirements Alternative I – For Grantees Other Than Individuals (if applicable)
Certificate Regarding Lobbying Activities	Certificate Regarding Lobbying Activities

Biomass District Heating / Combined Heat and Power (CHP) Feasibility Assessment

ORNG Umatilla Training Center
Oregon National Guard

Prepared for:	Oregon Military Department 1776 Militia Way SE PO Box 14350 Salem, OR 97309-5047
Prepared by:	Tetra Tech EM Inc.
Reference:	WBUG 2013-03768
Date:	05 APRIL 2013

TABLE OF CONTENTS

1 – EXECUTIVE SUMMARY

Feasibility Assessment

A biomass district heating system, or optionally a biomass combined heat and power system, are both very attractive from a technical, operational and financial perspective. Project costs range from $4.7 M for a biomass district heating system to $10.2M for a biomass combined cooling, heat, and power plant. The simple paybacks range from 12.4 years to 26.1 years for systems with a 30 year service life. The net payback period after energy incentives, tax credits and loan incentives to between 6.6 years to 8.1 years.

Resource Supply Assessment

There is more than sufficient biomass supply within a close radius of the site, at prices that are attractive compared to the current fuel costs.

Job Creation

The proposed biomass district heating project would generate 82 direct construction and manufacturing jobs. The biomass combined cooling, heat and power project would generate up to 177 jobs.

Fossil Fuel Offset

The project replaces 258,910 gallons of propane annually (23,739 MMBTU) with 2,004 tons of biomass wood chips sourced from forest residuals.

Project Team

The Oregon Army National Guard project team consists of experienced procurement, construction, and operations professionals familiar with large design-build projects. The ORARNG core team is aided by energy consultants and design and construction professionals with broad experience with biomass in commercial and industrial applications.

Preliminary Equipment Selection

All equipment selected is commercially available, proven technology, selected for high energy efficiency, low operating costs, and the least total cost of ownership based on Life Cycle Cost Analysis. The specific manufacturers are leaders in their respective fields, with many years of experience and successful installations.

Financial Plan

The project financial plan is sound, and based on reasonable assumptions for fuel and capital equipment costs and leverages available incentive programs. In addition to submitting a capital funding request for the proposed project, the ORARNG will also evaluate a third-party Design-Build-Operate-Maintain (DBOM) model. This may allow the project to be executed on an accelerated time frame, with lower development and operation risks for ORARNG. An additional benefit of the DBOM structure is it allows the third-party developer to monetize the Federal Investment Tax Credit and accelerated depreciation (MACRS) which brings additional financial benefits to the project.

Environmental Permits

The scale of this project falls below the requirements for EPA or DEQ air and solid waste permits. The biomass boilers will implement multi-clone cyclone separators to reduce particulate emissions, which exceeds the current environmental requirements.

2 – SITE ASSESSMENT

Background

The Oregon National Guard (ORNG) was awarded a 2012 Hazardous Fuels Woody Biomass Utilization Grant for engineering design of biomass heating systems at five sites: Biak Training Center and Central Oregon Unit Training and Equipment Site (COUTES) located in Redmond; Youth Challenge Program (YCP) in Bend; Burns Armory; and the Umatilla Training Center located in Hermiston.

Capital funding requests were submitted and approved for FY13 biomass projects at Biak and COUTES, and the AGI-Construction branch is preparing an exemption request and a two-step RFQ/RFP solicitation to be issued in March 2013 for a design-build contract to install the biomass pellet boiler heating systems. Capital funding requests for FY14 biomass heating system installations at Bend YCP and Burns Armory have been submitted and are pending approval.

The Umatilla Training Center (UTC) biomass heating concept for the 2012 WDBG grant was based on replacing existing propane-fired boilers at three buildings with high historical energy use, with new biomass pellet boilers. As more of the UTC site has been transferred from the US Army to ORNG under the Base Realignment and Closure (BRAC) process, and the UTC Land Use Plan (LUP) was completed in June 2012, it is apparent that a significant opportunity exists to develop a biomass district heating network to provide enhanced efficiency, economies of scale and flexibility in comparison to individual biomass boiler installations on a building-by-building basis.

Table 1 – Heat Load Forecasts

Condition | Phase	Building Area ft^2	Heat Load MMBtu / year	Biomass tons / year
WBUG (April 2012)	94,821	4,250	247
Biomass CHP	297,714	21,234	2,004
Biomass CCHP	297,714	49,081	3,212

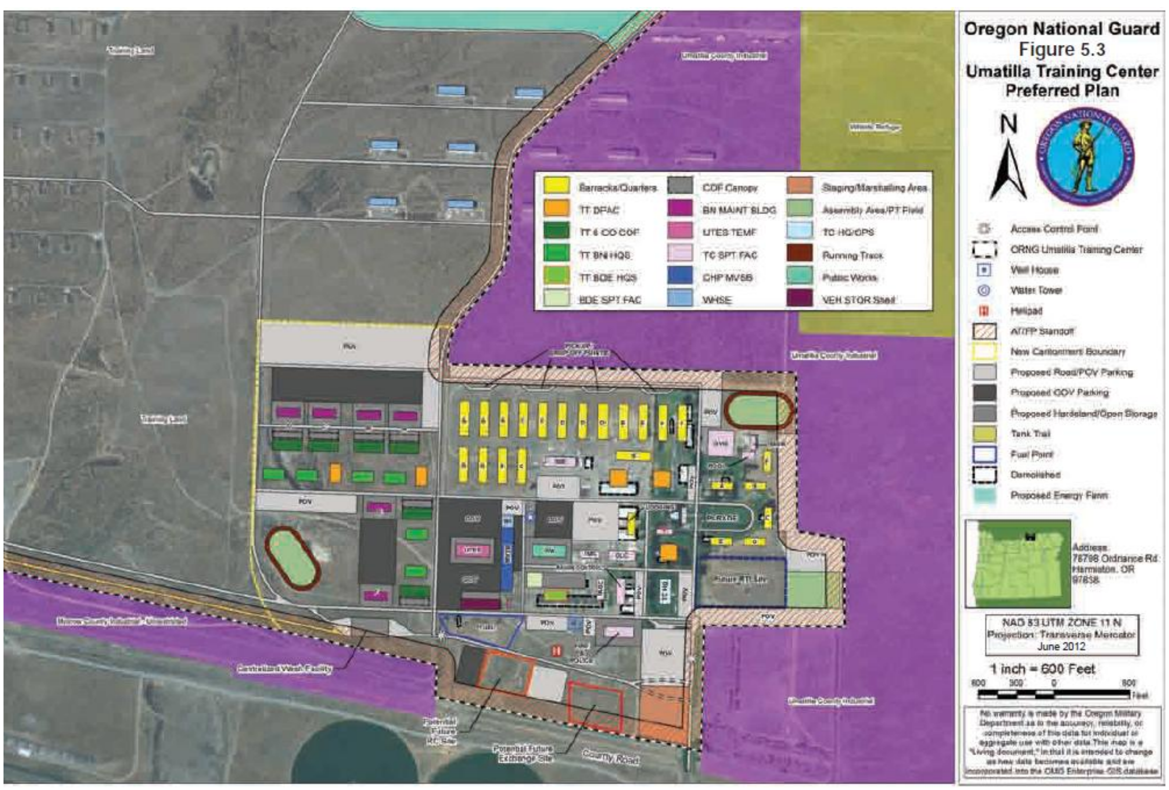
Objective

The proposed Biomass District Heating system for the UTC will provide the foundation of a highly energy efficient, and cost effective installation of renewable thermal biomass. The project design will develop strategy and tactics for a phased development of a biomass heating network that is flexible and scalable to meet short term needs, with the capability to expand in a modular approach to meet future needs and to generate renewable electricity.

The existing UTC building stock, heating systems, and steam piping infrastructure are aging and most of the WWII vintage buildings will be replaced with new buildings to be constructed over a 5 to 25 year redevelopment program. Renovations and upgrades of existing buildings are planned in the short term to support relocation of the Regional Training Institute (RTI) which provides the initial opportunity for development of the first phase of a biomass district heating system serving a cluster of buildings. The Feasibility Study will address the technical, economic, and logistical issues in developing a biomass district heating system with specific implementation recommendations for planning, design, and procurement activities.

- **Short-range** (FY12-FY17) - Reuse and renovate existing buildings to support RTI relocation and training center operations.
- **Mid-range** (FY18-FY23) - Construct new training support facilities and new RTI Campus.
- **Long-range** (FY24-FY37) – Construct new facilities to support Brigade Combat Team (BCT-L) and Maneuver Training Center (MTC-L) operations.

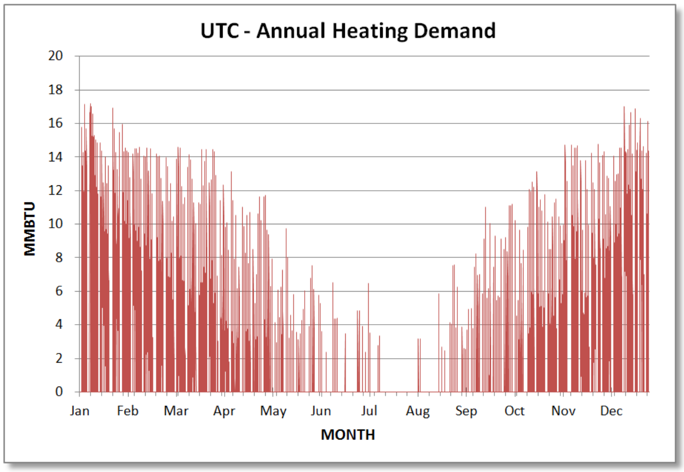
Figure 1 – Existing UTC Cantonment Area

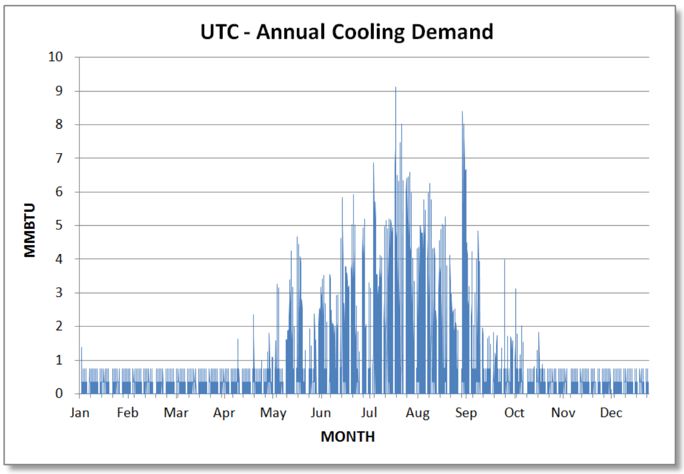


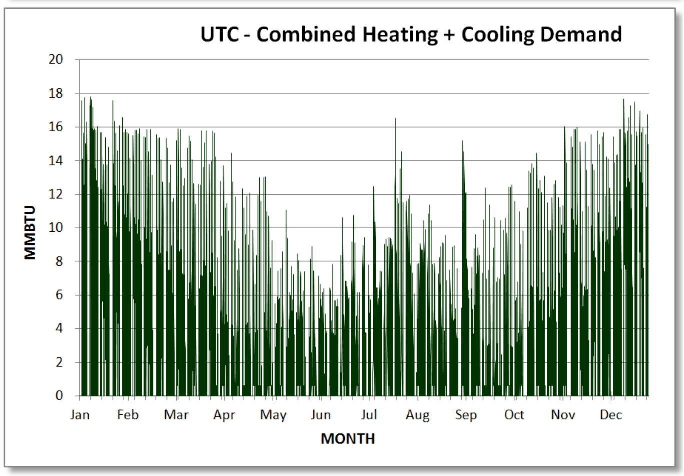
2 – SITE ASSESSMENT

Preliminary Analysis of Cooling, Heating, and Electrical Loads

Besides increased overall system efficiencies achieved by trigeneration, the ability to serve cooling loads using biomass as the heat source to drive an adsorption chiller helps to provide a more stable thermal load throughout the year. This yields more renewable electricity generation and higher part load turbogenerator efficiencies which shortens the payback for the capital investment. The combined heating and cooling load profile in the graph below is more balanced than the heating only profile, which helps maintain renewable electrical production output during the summer months.







3 – TECHNICAL FEASIBILITY

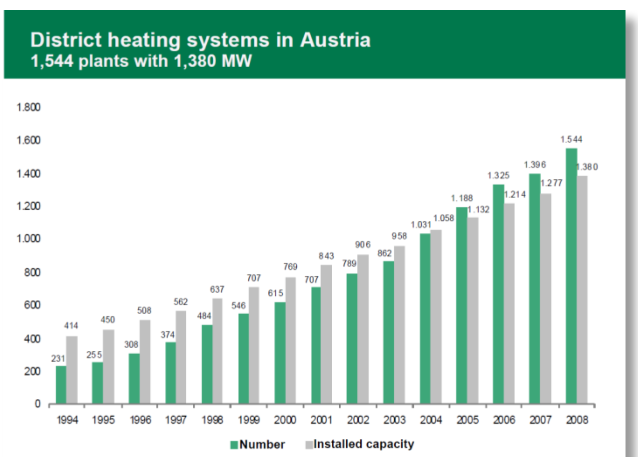
Biomass Pellet Boilers

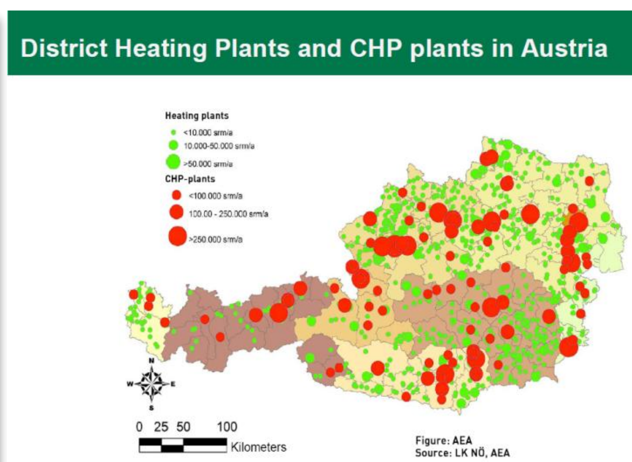
Installation of individual pellet boilers with fuel silos for each building, or serving clusters of adjacent buildings, is technically feasible, but delivers sub-optimal performance from an operational and economic perspective. Managing pellet deliveries for multiple fuel silos, and providing preventive maintenance services for large numbers of individual boilers is time consuming and expensive. Each boiler must be sized to meet the building peak heating demand, but there is no ability to share unused excess capacity with nearby buildings. As a result, the total installed boiler capacity will be unnecessarily high, and overall seasonal efficiencies will be low with many oversized boilers operating inefficiently at part load most of the year. The inevitable outcomes are high capital first costs, high annual energy costs, and high operational costs to maintain many small systems. Another disadvantage is wood pellets cost $160 per ton, significantly more than wood chips at $80 per ton.

Biomass District Heating

Given the site's favorable characteristics, relatively high heat demand, and proximity to woody biomass feedstock sources, a central district heating approach offers potential economies of scale that merit further consideration.

Biomass district heating plants have been common in Europe for decades, and their commercial technology is mature, robust and widely available. A few biomass district heating systems have been developed in North America, but market penetration lags far behind the European Union (EU). The chart below shows the development of district heating systems in Austria over a 15 year period. The map shows the distribution and size of district heating and combined heat and power (CHP) plants.

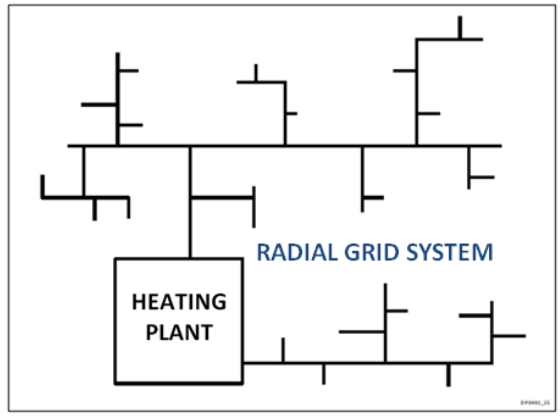




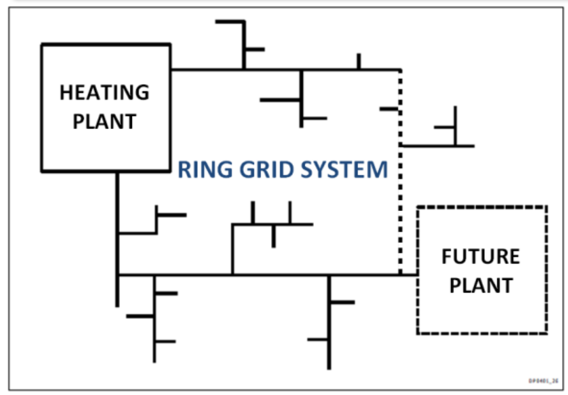
Source: Cross Border Bioenergy Consortium, www.crossborderbioenergy.eu

3 – TECHNICAL FEASIBILITY

Piping Distribution Network



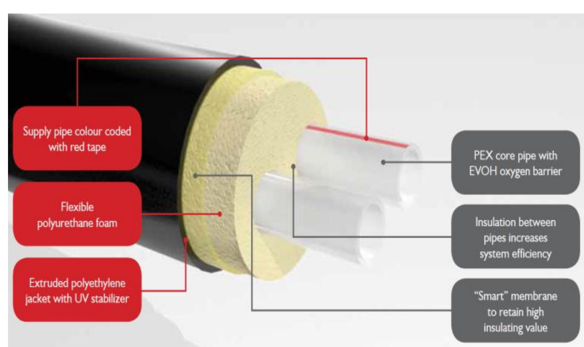
The Cantonment area of the site is compact with a high heat density. The most appropriate distribution method would be to utilize a radial grid system. This system offers the benefits of simplicity, lower first cost, and low heat losses. Drawbacks may include additional costs if the system must be expanded, and possible interruption of service in the event of a failure as the entire line must be shut down for repairs.



In the event of future site expansion requiring extension of the piping network and addition of a second heating plant, the radial grid system could be converted to a ring grid system to accommodate the increased heating demand and provide additional redundancy in the event of a line failure. The drawbacks of the ring grid system are higher capital costs and greater heat losses due to increased line lengths.

Figure 9. Sizes of the pipes for the central heating system.

The figure on the right depicts the district heating network for the Fort Bliss Brigade Combat Training Complex which utilizes a radial grid distribution system. This is illustrative of the type of distribution system recommended for the Umatilla Training Center. The proposed radial grid system will comprise 4,000 linear feet of distribution piping with a heat density of 4.3 kBtu per foot (1.54 MWh per meter).

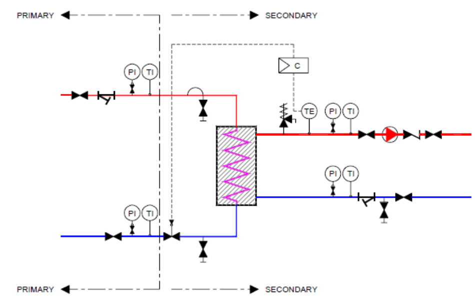


A flexible, pre-insulated system with dual carrier pipes will be used. The piping has a polyethylene (LDPE) jacket with polyurethane (PUR) closed cell foam insulation for low heat loss. Carrier pipes are cross-linked polyethylene (PEX) able to withstand 203°F temperature and 87 psig pressure. Pipe is supplied in coil lengths of 100 meters, and is suitable for direct burial.

3 – TECHNICAL FEASIBILITY

Energy Transfer Stations

Energy transfer stations are located at each building connection to the district heating system and consist of a heat exchanger and a thermal Btu-meter to measure the energy content of heating and chilling water delivered to the building secondary loop from the primary district loop.



Part II Figure 11.7: Schematic representation of an indirect connection

Fuel Specifications

Fuel classification is for industrial wood chips per the European Standard (EN 14961-4) For Wood Chips and Hog Fuel. Requirement for wood chips is comparable to clean hog fuel 2" minus with bark (few needles) as a reasonable starting point with preferred properties listed below. Assume that ponderosa and lodgepole pine are the predominant species.

Property class Analysis method	**Unit**	**A**		**B**	
		1	**2**	**1**	**2**
Origin and source		1.1.1 Whole trees without roots [a] 1.1.3 Stemwood 1.2.1 Chemically untreated wood residues 1.1.4.3 Logging residues, stored broadleaf	1.1.1 Whole trees without roots [a] 1.1.3 Stemwood 1.2.1 Chemically untreated wood residues 1.1.4.3 Logging residues, stored broadleaf	1.1 Forest, plantation and other virgin wood [b] 1.2.1 Chemically untreated wood residues	1.2. By-products and residues from wood processing industry 1.3.Used wood

Origin & Source: A2 and B1 (forest sourced woody biomass)

Particle Size: P45B

Moisture: M35

Ash: A1.5 to A3.0

Bulk Density: BD 150 kg/m3 (pg. 9)

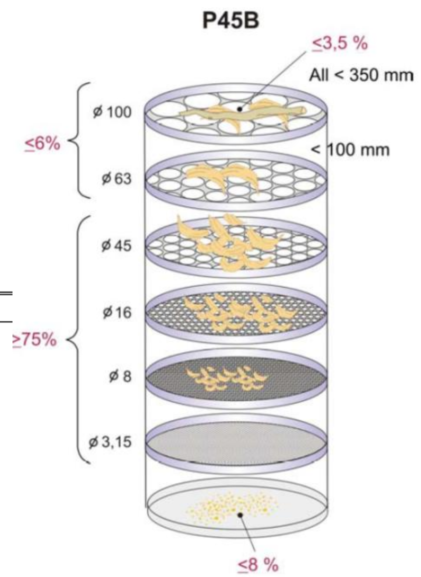
Higher Heating Value: 9,616 Btu/lb (for oven dry) per Forest Products Lab Report FPL-29

Lower Heating Value: minimum 4,405 Btu/lb (50% MC)

3 – TECHNICAL FEASIBILITY

Origin: According to 6.1 and Table 1.			Woody biomass (1)
Traded Form			Wood chips
Dimensions (mm) prEN 15149-1, prEN15149-2			
	Main fraction (minimum 75 w-%), mm [a]	Fines fraction, w-% (< 3,15 mm)	Coarse fraction, (w-%), max. length of particle, mm
P16A [c]	3,15 ≤ P ≤ 16 mm	≤ 12 %	≤ 3 % > 16 mm and all < 31,5 mm
P16B [c]	3,15 ≤ P ≤ 16 mm	≤ 12 %	≤ 3 % > 45 mm and all < 120 mm
P45A [c]	8 ≤ P ≤ 45 mm	≤ 8 % [b]	≤ 6 % > 63 mm and maximum 3,5 % > 100 mm, all < 120 mm
P45B [c]	8 ≤ P ≤ 45 mm [b]	≤ 8 % [b]	≤ 6 % > 63 mm and maximum 3,5 % > 100 mm, all < 350 mm
P63 [c]	8 ≤ P ≤ 63 mm [b]	≤ 6 % [b]	≤ 6 % > 100 mm, all < 350 mm
P100 [c]	16 ≤ P ≤ 100 mm [b]	≤ 4 % [b]	≤ 6 % > 200 mm, all < 350 mm

Moisture, M (w-% as received) prEN14774-1, prEN 14774-2	
M10	≤ 10 %
M15	≤ 15 %
M20	≤ 20 %
M25	≤ 25 %
M30	≤ 30 %
M35	≤ 35 %
M40	≤ 40 %
M45	≤ 45 %
M50	≤ 50 %
M55	≤ 55 %
M55+	> 55 % (maximum value to be stated)
Ash, A (w-% of dry basis), EN 14775	
A0.5	≤ 0,5 %
A0.7	≤ 0,7 %
A1.0	≤ 1,0 %
A1.5	≤ 1,5 %
A2.0	≤ 2,0 %
A3.0	≤ 3,0 %
A5.0	≤ 5,0 %
A7.0	≤ 7,0 %
A10.0	≤ 10,0 %
A10.0+	> 10,0 % (maximum value to be stated)



Informative	**Net calorific value, Q** (MJ/kg or kWh/kg as received) or **energy density, E** (MJ/ m^3 loose or kWh/m^3 loose) EN 14918		
	Minimum value to be stated		
	Bulk density (BD) as received (kg/m^3) EN 15103		
	BD150	≥ 150	Recommended to be stated if traded by volume basis
	BD200	≥ 200	
	BD250	≥ 250	
	BD300	≥ 300	
	BD350	≥ 350	
	BD400	≥ 400	
	BD450	≥ 450	
	BD450+	> 450 (minimum value to be stated)	
	Ash melting behaviour (°C) prEN 15370		Deformation temperature, DT should be stated

[a] The numerical values (P-class) for dimension refer to the particle sizes (at least 75 w-%) passing through the mentioned round hole sieve size (prEN 15149-1). The cross sectional area of the oversized particles shall be P16 < 1 cm², for P45 < 5 cm², for P63 < 10 cm² and P100 < 18 cm².

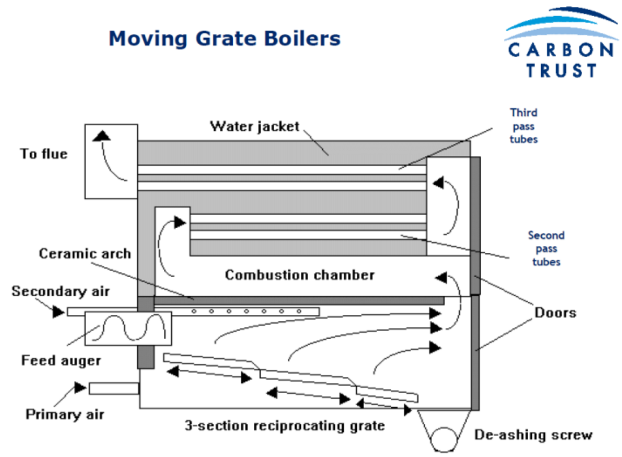
[b] For logging residue chips, which include thin particles like needles, leaves and branches, the main fraction for P45B is 3,15 ≤ P ≤ 45 mm, for P63 is 3,15 ≤ P ≤ 63 mm and for P100 is 3,15 ≤ P ≤ 100 mm and amount of fines (< 3,15 mm) may be maximum 25 w-%.

[c] Property classes P16A, P16B and P45A are for non-industrial and property class P45B, P63 and P100 for industrial appliances. In industrial classes P45B, P63 and P100 the amount of fines may be stated from the following F04, F06, F08.

3 – TECHNICAL FEASIBILITY

Biomass Boiler Plant

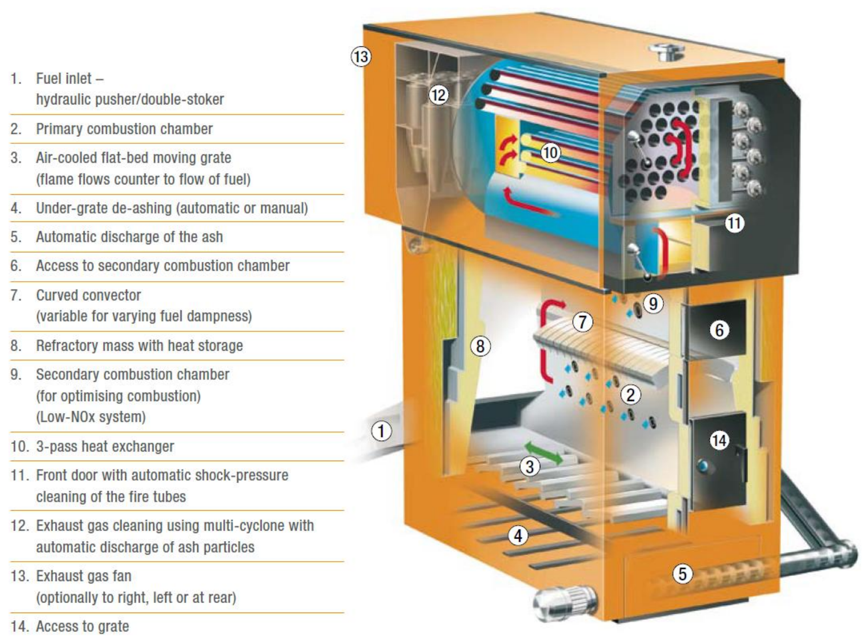
Selection of the optimal type and configuration of the biomass boiler is dependent on the fuel specification, system size, and project economics. An air-cooled, moving grate biomass boiler is recommended for the district heating system. Moving grate boilers are the most versatile in terms of fuel flexibility, but the large combustion space and additional equipment (hydraulic drive) make them more expensive than other types. Moving grate boilers are popular in Northern Europe and Scandinavia where unseasoned softwood is used for fuel. They are more common in the higher output ranges (300kW to 1MW +).



In a moving grate boiler, fuel is delivered onto a series of inclined or flat fire-bars which move so the fuel travels slowly down the grate towards the far end of the combustion chamber. The fuel is dried and combusts as it moves down the grate (primary air is supplied from under the grate). Gases are emitted, and the char burns out. The sequenced combustion is the great strength of this design. By controlling grate speed, fuel feed and air supply, it is possible to burn a wide range of fuels with varying moisture content. The addition of a ceramic arch over the grate reflects heat back to promote drying and subsequent ignition. This allows combustion of wet fuels (up to 60% moisture content). Moving grate boilers can burn pellets or wood chips, although wood chips are more common because of the capacity of the plants to burn wet fuel and the lower fuel cost offsets the higher first cost of the boiler plant.

Pellets are usually burned in less expensive plane grate (underfed) boilers. With the moving grate design, the wood chips do not require drying or special storage conditions. Green chips and lower-grade fuel with a high proportion of leaves and bark can be placed directly into the fuel silo for direct and efficient combustion.

A flue gas economizer captures waste heat from exhaust gases and increases the efficiency by 3% to 7%.



3 – TECHNICAL FEASIBILITY

Moving Grate Boilers Advantages

CARBON TRUST

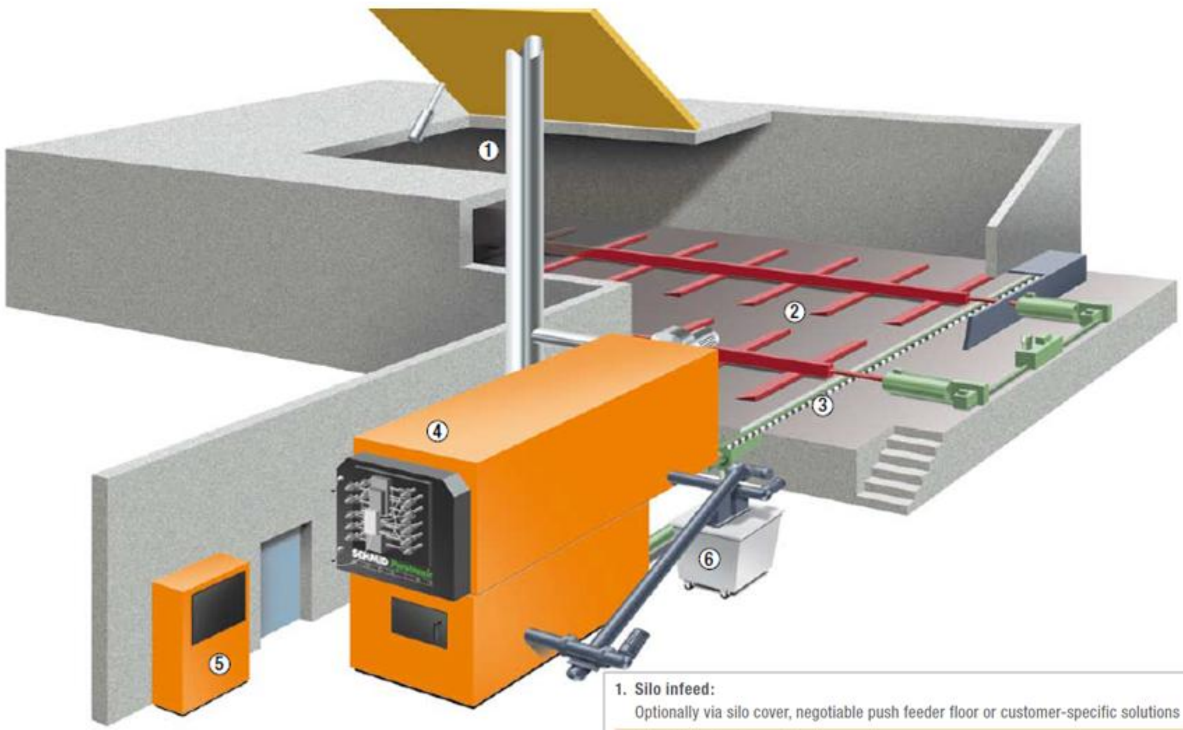
- Wide tolerance of fuel type and particle size
- Can accept fuels with MC up to 55%
- Moving grate design avoids clinkering and blockages
- Ceramic linings can be modified to cater for wetter or drier fuel
- Can burn all biomass fuel types
- Overall the best design for a wood boiler

Moving Grate Boilers Disadvantages

CARBON TRUST

- Slow response to load swings because of high fuel loading on grate
- Slumber mode heat output can be up to 30% when burning wet fuel
- Long warm-up and cool-down times because of significant thermal linings
- The most complex, and expensive, of the boiler types

The disadvantages of the moving grate boiler can be overcome by careful attention to boiler sizing and thermal storage capacity to maintain stable high output operation, avoid load swings, and provide thermal storage buffer capacity for warm-up periods. Lower wood chip costs offset the higher first cost.



Proposed Biomass Boiler Layout

At a glance

- >> Moving grate furnace (UTSR)
- >> Operating medium: Water, steam, thermal oil
- >> Grate cooling: Air/water
- >> Operating range: 100-6000 kW
- >> Capacity control: Modulating
- >> Moisture content of fuel w: 30-60%
- >> Fuel types: Shavings, wood-chips, bark, residual wood and special fuels

1. **Silo infeed:** Optionally via silo cover, negotiable push feeder floor or customer-specific solutions
2. **Silo / Silo discharge:** Fuel silo with push feeder floor discharge (hydraulic drive) or alternative discharge variants
3. **Fuel feed:** Depending on the nature of the material, by feed screw, double screw, scraper chain conveyor or pusher systems
4. **Moving grate furnace UTSR – Pyrotronic Modular:** Compact firing system with moving grate. Low-NOx and low-particle firing technology for low NOx and dust values. Multi-cyclone for exhaust gas cleaning integrated as standard.
5. **Pyrotronic Perfekt PPV controller:** Optimised control and monitoring system with five control circuits. The interaction of these control circuits optimises the furnace values, thereby guaranteeing a high degree of efficiency with low emissions.
6. **Automatic de-ashing:** Removal of the ash from the furnace space and dust particles from the multi-cyclone either centrally or separately – depending on system size – into ash containers.

3 – TECHNICAL FEASIBILITY

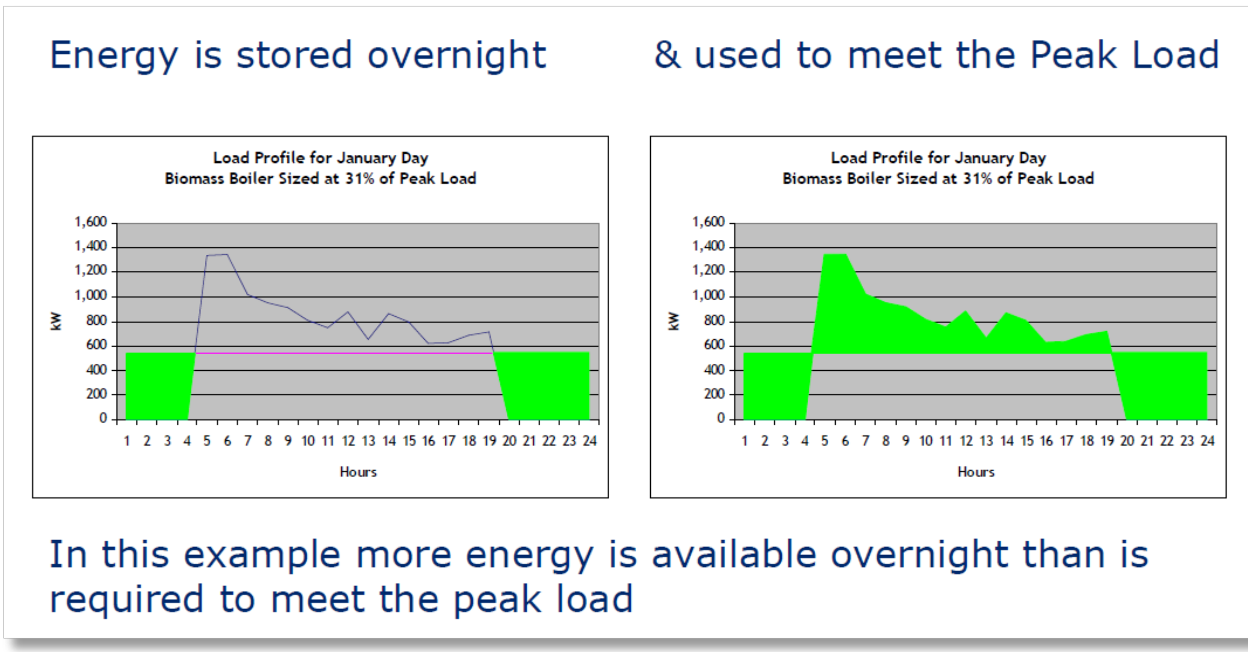
Biomass Heating System Components

Component	Description
Fuel transfer system	Not part of the main plant itself but the means whereby fuel is transferred from where it is stored to the plant.
Fuel feed system	The system for transferring fuel into the plant at the required rate. Typical methods include screw augers or actuating 'ram stokers'.
Combustion grate	The main point at which combustion starts, several different configurations (see section 2.2.3) are available.
Refractory material	Also known as 'fire bricks' – not always present but designed to reflect heat back onto the grate so as to drive off moisture from the fuel and maintain optimum combustion temperature.
Air feed/control system	As discussed above, biomass typically needs two or three sources of air for good combustion to take place (see also, control system below).
Heat exchangers	Where a plant is providing hot water as the heating medium (as opposed to direct hot air) this is the means of transferring the heat in the hot combustion gases to the medium (water) – e.g. via 'fire tubes' with a 'water jacket'.
Ash extraction system	Most automatic systems use an auger to transfer the ash into an external receptacle which can be emptied manually.
Control system	Most systems have some means of controlling output via the fuel feed rate and air levels. It is common for larger systems to use flue gas oxygen and temperature sensors (lambda control similar to those used in car engines) to monitor combustion conditions and operate air fans/fuel feed rates to achieve the optimum.
Exhaust gas treatment system	Some form of exhaust gas treatment system is usually required to minimise emissions of such things as particulate matter and fly ash from the plant's combustion chamber. Different levels of emissions abatement equipment are available from relatively simple, single-stage cyclones to multiple stages involving bag filters and other devices. Equipment manufacturers should be able to provide details on what equipment is fitted as standard on their plant and what additional, optional abatement equipment is available should local air quality requirements necessitate it.
Flue gas fan(s)	Some plants need a flue gas fan or induced draft fan to draw the flue gases from the combustion chamber and through the plant heat exchanger. The flue gas fan discharges to the chimney.
Flue (chimney)	The chimney stack has two functions: it draws the flue gases through the plant and disperses the gases to atmosphere at a safe level.
Ignition system	Plants may be ignited automatically using a hot air gun (smaller systems) or electrically ignited gas pilot (larger systems).
Expansion tank	Not part of the main plant itself but a key component of a system to allow the natural expansion of the water in a heating system as it gets hot – in sealed systems the 'expansion vessel' (a small pressurised container) accommodates the extra volume.
Fire protection system	Not part of the main plant itself but a key requirement to prevent fire from the combustion chamber moving back into the fuel store. Can be a water 'dousing' approach or some form of automatic shut-off gate(s) on the feed mechanism systems offering varying levels of fire protection.

3 – TECHNICAL FEASIBILITY

Thermal Storage

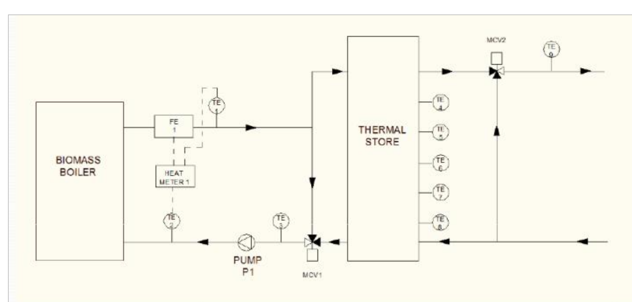
Thermal storage capacity is an important element in optimizing the overall efficiency of the district heating system. Thermal storage allows a smaller biomass boiler to supply the majority of the annual heating demand. Using a smaller boiler improves part load efficiencies and significantly increases the overall seasonal efficiency of the system. With thermal storage the smaller boiler runs at peak output and efficiency for longer periods to charge the thermal storage for later use when the peak demand exceeds the maximum boiler output.



Heating plant sizing is based on the optimal combination of boiler and thermal storage capacity. With properly sized thermal storage a biomass boiler rated as low as 25% to 30% of the peak load is able to supply 95% or more of the annual heating demand. It is possible to meet 100% of the annual heating demand with a boiler rated as low as 40% of the peak load. The optimal combination of boiler size and thermal storage is determined by the heating demand load profile and the economic tradeoff between decreasing boiler costs and increasing storage costs.

Thermal Storage Schematic

The schematic on the right shows a typical piping circuit with the biomass boiler, circulation pump, thermal storage, control valves, and Btu-meter.

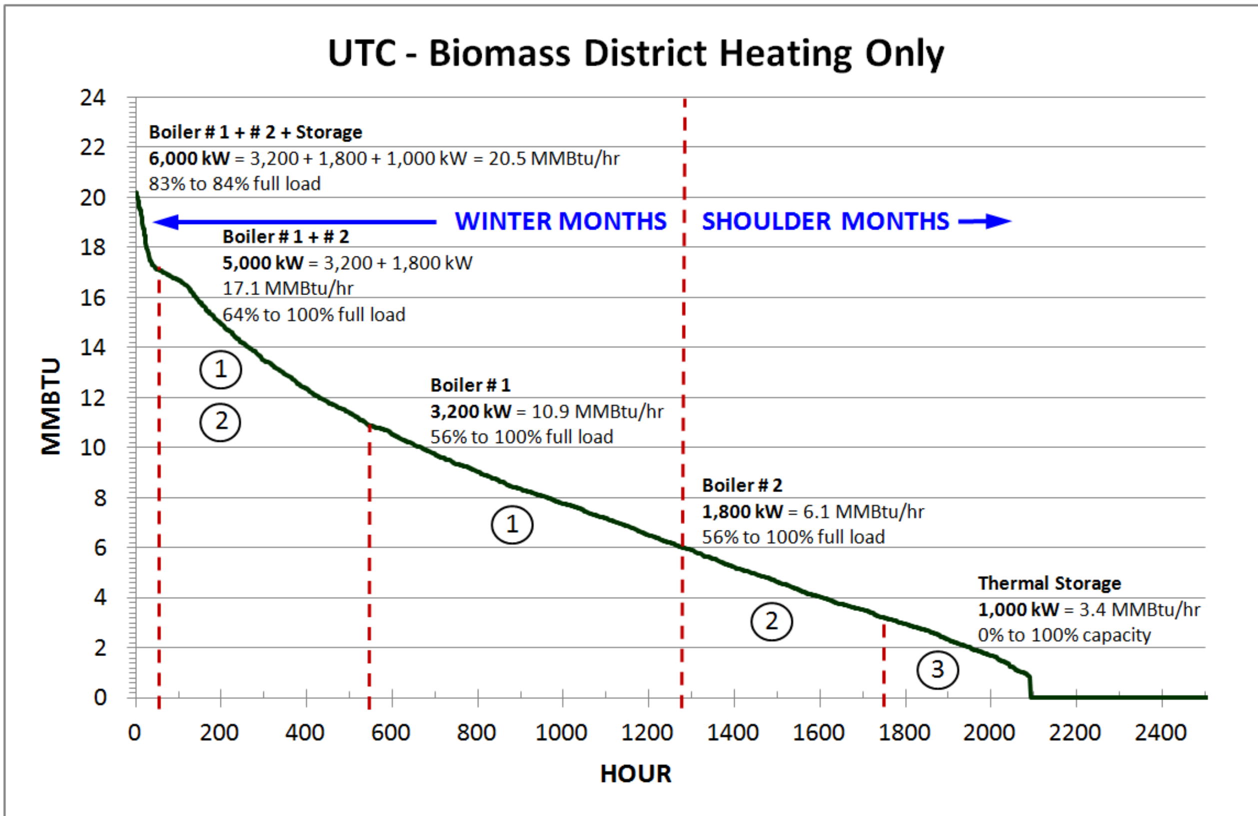


Biomass Boiler and 4 Port Thermal Store

3 – TECHNICAL FEASIBILITY

Preliminary Boiler Sizing

The curve below shows the annual hourly heating load profile. The preliminary sizing selection allows two biomass boilers to operate between 100% to a minimum of 56% of their rated full load capacity in order to maintain high part load operating efficiencies. During periods of low demand (Zone 3) the thermal storage discharges to supply the heating load for short durations. During moderate demand (Zone 2) the standby biomass boiler # 2 supplies the heating load. During high demand conditions (Zone 1) the main biomass boiler # 1 meets the heating load. During very high demand (Zone 1 + 2) both boilers # 1 and # 2 operate in tandem to supply the heating load. During extreme demand (< 60 hours per year) the peak demand exceeds the combined capacity of both boilers, and the thermal storage discharges for several hours to cover the shortfall.



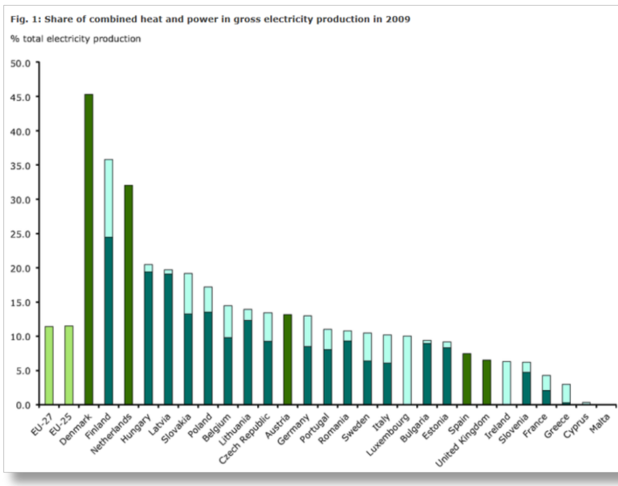
Preliminary Boiler Selection

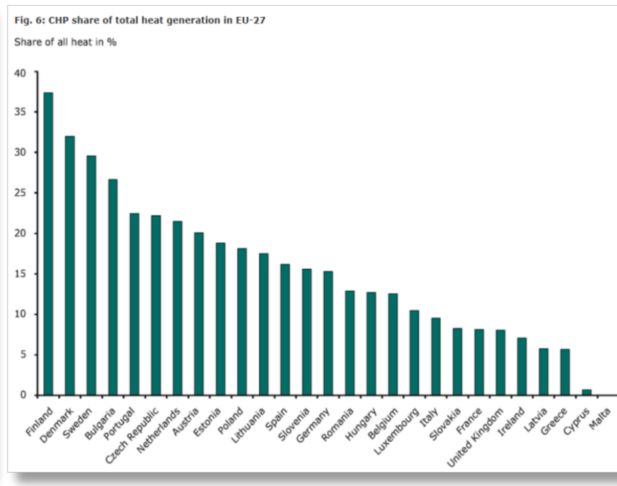
ID	DESCRIPTION	MODEL NO.	CAPACITY kW		COMBUSTION EFFICIENCY
			MAX (100%)	MIN (30%)	
B-1	Schmid AG Biomass Boiler	UTSR-3200	3,200	960	80% – 85%
B-2	Schmid AG Biomass Boiler	UTSR-1800	1,800	540	80% – 85%
T-3	Thermal Storage Tank	10,000 gallon	1,000	0	N/A

3 – TECHNICAL FEASIBILITY

Biomass Combined Heat & Power

EU countries with the highest market penetration of CHP electricity include Denmark (45.3%), Finland (35.8%), and the Netherlands (32.5%). Countries with the highest percentage of CHP heat generation include Finland (37%), Denmark (32%), and Sweden (30%). The high levels of CHP production in Northern countries reflects the cold climate, which provides ample opportunities for utilization of the heat, through district heating as well as the electricity produced by CHP. Renewable fuels such as biomass accounted for 11.0% of the fuel input to CHP plants in 2009.





Source: European Environment Agency, www.eea.europa.eu

While the US lags behind Europe in deployment of CHP and District Energy solutions there is growing awareness of the need to catch up with efforts underway to promote cleaner, more efficient and resilient energy infrastructure. USDOE Clean Energy Application Centers are promoting CHP and District Energy to improve fuel efficiency, energy security, electric grid reliability, and reduce emissions.

"While the traditional method of producing separate heat and power has a typical combined efficiency of 45%, CHP systems often have total efficiencies of 80%".

White House Executive Order (August 30, 2012) set a goal of deploying 40 GW of new, cost effective CHP by the end of 2020. A 2012 Pike Research report titled "Combined Heat and Power for Commercial Buildings" estimates that CHP capacity will more than double in the next ten years, and the installation market will grow from $2.2 billion in 2012 to $11.2 billion by 2022.

	WGA Cogeneration Technical Potential, MW			
	< 1MW	1-5 MW	5-20 MW	>20 MW
Commercial	6,823	3,935	3,122	531
Industrial	2,717	6,230	5,778	7,736
Total	9,540	10,165	8,900	8,267

53% of CHP potential ≤ 5 MW_e

Table 3: Much of the Additional CHP Technical Potential is in Applications of 5 MW or Less[xvi]

A strategic, untapped market segment lies in the small-scale CHP arena (< 5 MW_e) which accounts for over 50% of the total market potential. Typical steam turbine generators are not cost effective for these applications. Organic Rankine Cycle (ORC) turbo-generators are a cost effective option for these small systems that dominate the commercial building and light industrial markets.

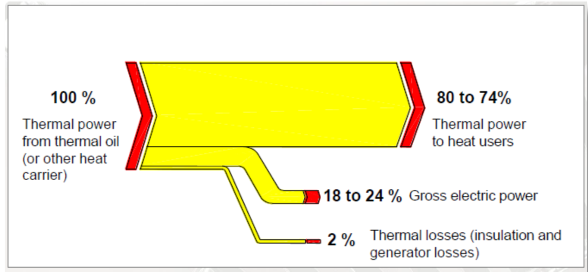
Source: Combined Heat & Power White Paper, Western Governors Association, www.chpcenternw.org

3 – TECHNICAL FEASIBILITY

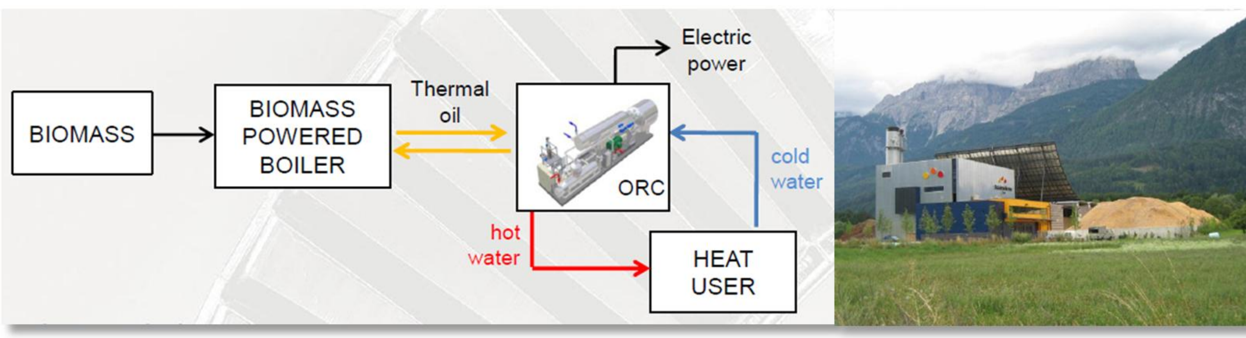
CHP Prime Mover

Organic Rankine Cycle (ORC) turbo-generators offer a number of advantages in comparison to steam turbines or gas-fired micro-turbines in small-scale applications under 5 $MW_{electric}$. The technical advantages include high cycle efficiency, very high turbine efficiency, low speed and stress on turbine, direct drive of electric generator without gear reduction losses, and use of a high molecular weight refrigerant which eliminates turbine blade erosion problems. Besides the technical advantages the ORC turbo-generators benefit from important operational advantages which include: simple start-stop operation, automatic and continuous operation and can run unattended, low sound levels, high availability (> 98% uptime), high efficiency at part load, low O&M requirements (3-5 hours per week), and long system life.

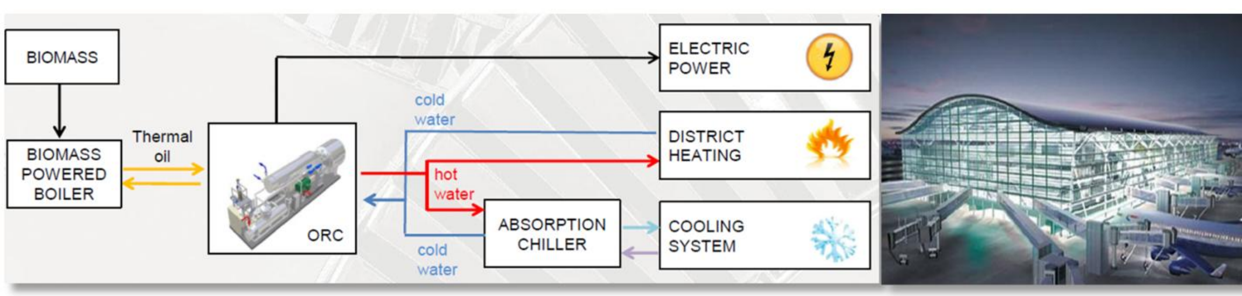
ORC applications in CHP can reliably produce heat and electrical power from biomass fuels efficiently and offer user friendly operation. The typical heat to power ratio is 3:1, with electric efficiencies approaching 20% and overall system efficiencies approaching 95%.



Typical ORC biomass applications include power generation in district heating networks, or in a combined cooling, heat and power plant as shown in the schematics below.



ORC Plant in a District Heating Network



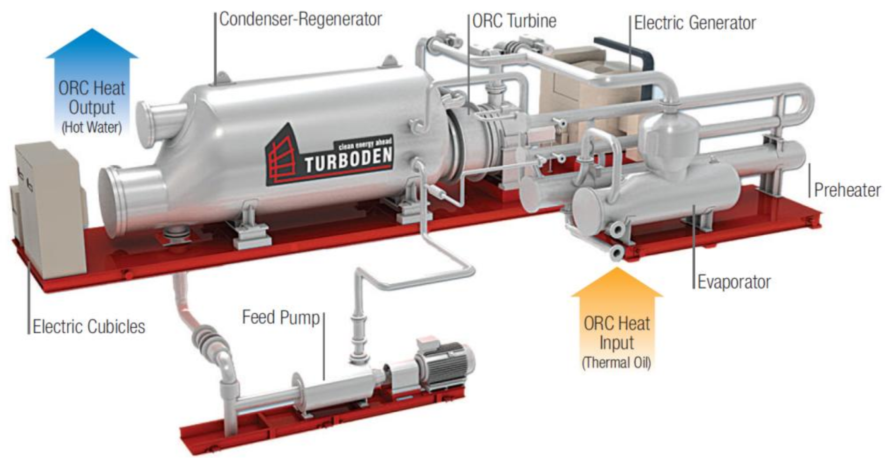
ORC Plant in a Combined Cooling, Heat & Power (CCHP) System

Other ORC applications include industrial heat recovery, geothermal, and solar thermal power plants. Some industry specific examples include sawmill timber drying, MDF and particle board production, drying in biomass pellet production, greenhouses, refrigeration, wine production, and district heating.

3 – TECHNICAL FEASIBILITY

Proven Commercial Technology

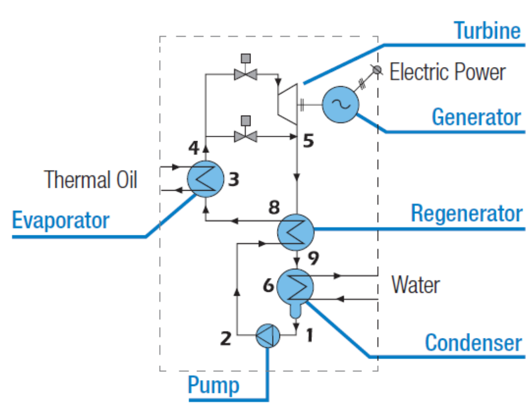
Turboden, an Italian subsidiary of Pratt & Whitney Power Systems, pioneered ORC technology with their first solar ORC installation in 1984, and first biomass ORC turbo-generator in 1987. Since then they have installed a total of 250 ORC plants in 28 countries worldwide, with 217 specifically for biomass CHP applications. The majority of the ORC biomass CHP installations have been in Germany, Italy, Austria, and Latvia. In 2012 Turboden completed a 2 MWe biomass ORC plant for Nechako Green Energy Ltd, a biomass pellet manufacturer located in Vanderhoof, British Columbia. Turboden recently announced another new biomass CHP project in North America. It is for a 12 MWe biomass heat recovery ORC power plant at West Fraser's Chetwynd Forest Industries in British Columbia, which is expected to be operational in 2014. The ORC units are factory tested and shipped pre-assembled on skid mounted units for ease of installation and start-up. The main components are identified in the rendering below.



ORC Main Components

Principle of Operation

ORC technology operates in a manner similar to a steam turbine, but instead of using water vapor the ORC unit vaporizes a high-molecular-mass organic fluid (silicone based refrigerant) which results in high electric conversion efficiencies. Key ORC advantages include: slower turbine rotational speeds, lower pressures, and no erosion of metallic parts and turbine blades. The biomass boiler heats a medium-to-high-temperature thermal oil (300°C) which is circulated through the ORC unit to preheat and vaporize the organic working fluid in the evaporator (8, 3, 4). The organic fluid vapor spins the turbine (4, 5) which is directly coupled to the electric generator, providing clean, reliable and renewable electric power. Exhaust vapor flows through the regenerator (5-9) where it heats the organic liquid (2, 8) and is then condensed in the condenser and cooled by the cooling circuit (9, 6, 1). The organic working fluid is then pumped (1, 2) back to the regenerator and evaporator, completing the closed-cycle operation.



3 – TECHNICAL FEASIBILITY

Preliminary ORC Selection

		TD 10 CHP	TD 14 CHP	TD 18 CHP	TD 22 CHP	TD 30 CHP
Input – Thermal Oil						
Nominal temperature "HT" loop (in/out)	°C	300/240	300/240	300/240	300/240	300/240
Overall thermal power input	kW	5140	6715	9790	12020	16800
Nominal temperature "HT" loop (in/out)	°F	572/464	572/464	572/464	572/464	572/464
Overall thermal power input	MMBtu/hr	17.54	22.91	33.40	41.01	57.32
Output – Hot Water						
Hot water temperature (in/out)	°C	60/80	60/80	60/90	60/90	69/94
Thermal power to hot water circuit	kW	4081	5313	7834	9601	13610
Hot water temperature (in/out)	°F	140/176	140/176	140/194	140/194	156/201
Thermal power to hot water circuit	MMBtu/hr	13.92	18.13	26.73	32.76	46.44
Performance						
Gross active electric power	kW	1016	1339	1863	2304	3083
Gross electric efficiency**		19.8%	19.9%	19.0%	19.2%	18.4%
Captive power consumption		48	58	79	97	179
Net active electric power**	kW	968	1281	1784	2207	2904
Net electric efficiency		18.8%	19.1%	18.2%	18.4%	17.3%
Electric generator*		50Hz, 400V	50Hz, 400V	50Hz, 660V	50Hz, 660V	50Hz, 6kV
		60Hz, 480V	60Hz, 480V	60Hz, 4160V	60Hz, 4160V	60Hz, 4160V

Annual Energy Production

Biomass Combined Heat & Power = 778,253 kWh per year

Biomass Combined Cooling, Heat & Power = 1,247,384 kWh per year

BIOMASS OPTION	THERMAL		ELECTRIC	
	Heating MMBTU	Cooling MMBTU	Power MMBTU	Power MWh
CHP	14,125	0	2,656	778
CCHP	14,125	8,513	4,256	1,247

Fuel Use Efficiency:

Input = 28,297 MMBTU from biomass

Output = 22,638 MMBTU $_{\text{thermal}}$ + 4,256 MMBTU $_{\text{electric}}$

Output = 26,894 MMBTU $_{\text{TOTAL}}$

FUE = $\frac{\text{Output 26,826 MMBTU}}{\text{Input 28,297 MMBTU}}$ = 95.0%

3 – TECHNICAL FEASIBILITY

Adsorption Chillers

Capturing and reusing waste heat is a significant conservation and green house gas reduction opportunity. Heat recovery recycles energy that is otherwise wasted. EPA estimates that waste heat recovery could substitute approximately 9% of the total US energy usage.

Adsorption chillers offer a unique approach to achieving air conditioning and process cooling by using hot water rather than electricity like conventional chillers. The hot water may come from any number of sources including waste heat from industrial processes, prime heat from solar thermal installations, from the exhaust or water jacket heat of an internal combustion engine, turbine, or from a biomass boiler. The heat extracted from the chilled water and the heat consumed from the hot water is directed into a cooling tower system used to dissipate this energy.

Very little electric power is consumed to operate the adsorption chiller, roughly about the same amount of electricity as a handful of incandescent light bulbs. The minimal electric power consumption is used for the internal process computer, a PLC, (programmable logic controller) and intermittent operation of a fractional horsepower vacuum pump. A summary of the benefits of adsorption chillers compared to a conventional electric centrifugal chiller is shown below.

Adsorption versus mechanical chiller comparison

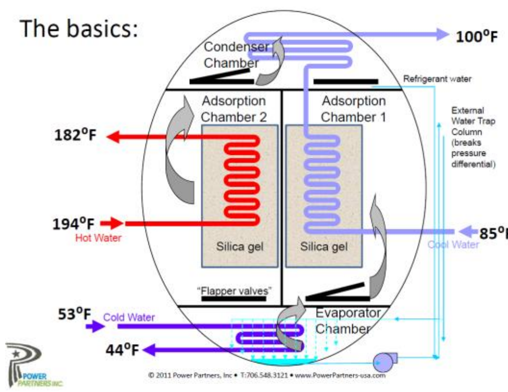
Attribute	Adsorption Chiller	Mechanical Chiller
Sound Pressure Level	Very low <50 db (A)	Loud > 80db (A)
Operating Cost	~$320/year[3]	$100,000 or greater for continuous operation
Maintenance	Replace vacuum pump oil as needed (recommended every 5 years) Annual cleaning of condenser tubes Approximately $5,000/year (or less depending on labor costs)	Seasonal maintenance required ~ $10,000 per year or greater Annual oil analysis Replace oil every 5 years Periodic teardown and rebuild required Annual cleaning of condenser tubes Replacement of bearings every 15 years
Chemistry	Municipal water and silica gel	HFC and HCFC refrigerant with synthetic oils
Energy Requirements	Hot water- 122°F to 205 °F	Electricity – 208/230,480 or 4,160 volts
Cooling water requirements	85°F to 50°F. Lower temperatures increase capacity of the system	85°F to 65°F minimum temperature -- unstable at low temperatures
End-of-life	No special disposal requirements	Certified technician required to reclaim all refrigerant at risk of $25,000 fine (and 5 years imprisonment) for release to the atmosphere

3 – TECHNICAL FEASIBILITY

Adsorption Chiller Principle of Operation

The principle of adsorption works on the interaction of gases and solids. With adsorption chilling, the molecular interaction between the solid and the gas allow the gas to be adsorbed into the solid. The adsorption chamber of the chiller is filled with solid material, silica gel, eliminating the need for moving parts and eliminating noise associated with moving parts. The silica gel creates an extremely low humidity that causes the water refrigerant to evaporate at a low temperature.

As the water evaporates it cools the chilled water. The adsorption chiller has four chambers; an evaporator, a condenser and two adsorption chambers. All four chambers are operated at nearly full vacuum.



The chiller cycles adsorption chambers 1 and 2 between the processes of adsorbing and desorbing. In the figure to the right, the water vapor flashes off the surface of the tubes in the evaporator, creating the chilling effect captured in the output of chilled water. The water vapor enters Chamber 1 through the open ports in the bottom of the chamber and is adsorbed into the silica gel in Chamber 1. Cool water is circulated in this chamber to remove the heat deposited in Chamber 1 by the adsorption process.

Hot water enters Chamber 2 to regenerate, or desorb, the silica gel while Chamber 1 is in the adsorption process. The water vapor is driven from the silica gel by the hot water. The refrigerant water vapor rises to the condenser where it is condensed to a liquid state. The condenser water is recycled in a closed-loop to the bottom of the machine where it is immediately available for re-use. As the machine cycles, the pressure in Chamber 1 is slightly lower than in the evaporator chamber. A portion of the water refrigerant evaporates and moves to Chamber 1. Simultaneously, the pressure in Chamber 2 elevates slightly as the water vapor is driven from the silica gel. The water vapor is then pushed to the condenser chamber where it is condensed back to the liquid state and returns to the evaporator chamber.

When the silica gel in Chamber 1 is saturated with water and the silica gel in Chamber 2 is dry, the machine's process reverses. The first step is the opening of a valve between the two chambers, allowing the pressure to equalize. Then, cool water is sent through Chamber 2 to transfer any residual heat to Chamber 1, which begins the heating process. The reversal is completed and the adsorption in Chamber 2 begins while Chamber 1 is dried by the desorption heating.

The adsorption chiller is capable of operating within a wide range of temperatures. The machine self-regulates and balances the performance of the system by the control programs, shifting to the program best suited for the system conditions. For optimal performance, the hot water temperature should be 194°F and the cooling water between 75°F to 95°F. The output chilled water temperature ranges from 45°F to 55°F.

3 – TECHNICAL FEASIBILITY

Preliminary Chiller Selection

POWER PARTNERS INC.

ECO-MAX adsorption chillers ...for global cooling

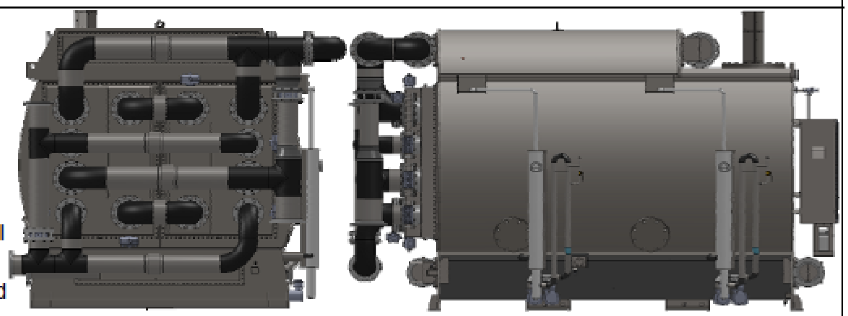
Technical Support:
(706) 548-3121 x 505
eco-maxchillers.com

SUBMITTAL DATA: AD3-F **F FRAME ADSORPTION CHILLER**

Job Name:	Location:	Date:	
Purchaser:	Engineer:		
Submitted to:	Approval:	Date:	
Submitted by:	Schedule No.:		

GENERAL FEATURES:

- ►Ultra low electricity consumption
- ►Zero ozone depletion potential
- ►No dangerous chemicals
- ►Very few moving parts
- ►Ease of maintenance
- ►Advanced microprocessor control
- ►Designed for outdoor installation
- ►Wide temperature ranges allowed



MODEL	F-330	F-300	F-250	F-200
Rated Capacity (Tons)	335	305	254	203
Chilled Water:				
Inlet Temperature (°F)	55	55	55	55
Outlet Temperature (°F)	45	45	45	45
Flow Rate (gpm)	804	732	610	487
Pressure Drop (ft. H_20)	29	26	20	15
Condenser Water:				
Inlet Temperature (°F)	85	85	85	85
Outlet Temperature (°F)	95	95	95	95
Flow Rate (gpm)	2422	2205	1836	1468
Pressure Drop (ft. H_20)	42	37	29	22
Hot Water:				
Inlet Temperature (°F)	195	195	195	195
Outlet Temperature (°F)	183	183	183	183
Flow Rate (gpm)	1340	1220	1016	812
Pressure Drop (ft. H_20)	20	18	14	10

*Rated for maximum capacity mode. Higher efficiencies are available at reduced capacities.

*All data is preliminary and subject to change without notice.

Electrical

Voltage:.................................. 208/230-3-60
Frequency:.............................. 60 Hz
Operating kW Consumption:...... 1.3 kW
Maximum kW Consumption....... 2.4 kW

Air Supply

Air Pressure:........................... 71 psi
Air Consumption:......................0.34 cfm

Unit Dimensions*

Width.................................... 144"
Length.................................... 210"
Height.....................................138"
*with cabinets mounted on the rear

Weight

Empty:......................................47,000 lbs
Operating:................................ 53,000 lbs

Refrigerant type:...................... Tap Water (H_20)

Operating Range

Chilled Water...........................38 °F to 68 °F
Hot Water.................................125 °F to 200 °F
Condenser Water......................50 °F to 102 °F
Maximum Pressure.................. 70 psig
*Maximum pressure 70 psig for hot, chilled, & condenser water

Comparison of Annual Fuel Use and Efficiencies

	HEATING OPTIONS	FUEL COSTS				ANNUAL ENERGY USE MMBTU				PROPANE	BIOMASS	ELECTRIC	COGEN	OVERALL
		TYPE	UNIT	COST	$/MMBTU	HEATING	COOLING	COGEN	TOTAL	GALLONS	TONS	kWh	kWh	EFFICIENCY
A	Existing Propane Boilers	Propane	Gallon	$ 1.96	$ 21.42	23,739	2,421	0	**26,160**	258,910	0	709,417	0	57.7%
B	Biomass Pellet Boilers	Wood Pellets	Ton	$ 160.00	$ 9.30	16,618	2,421	0	**19,038**	0	966	709,417	0	79.3%
C	Biomass District Heating Only	Wood Chips	Ton	$ 80.00	$ 7.27	17,656	2,421	0	**20,077**	0	2,004	709,417	0	75.2%
D	Biomass District Combined Heat & Power	Wood Chips	Ton	$ 80.00	$ 7.27	17,656	2,421	(2,656)	**17,421**	0	2,004	709,417	(778,253)	88.4%
E	Biomass District Combined Cooling [1], Heat & Power	Wood Chips	Ton	$ 80.00	$ 7.27	17,656	1,573	(2,656)	**16,574**	0	2,004	461,121	(778,253)	90.5%
F	Biomass District Combined Cooling [2], Heat & Power	Wood Chips	Ton	$ 80.00	$ 7.27	17,656	10,641	(4,256)	**24,042**	0	3,212	0	(1,247,284)	95.0%

NOTES:

[1] Electric Centrifugal Chiller

[2] Heat Driven Adsorption Chiller

REVIEW OF OPTIONS & RECOMMENDATION

A – Business As Usual: Highest annual fuel & operating costs, lowest overall efficiency. Existing boilers are beyond their useful life and **NEED REPLACEMENT**.

B – Biomass Pellet Boilers: Improved energy efficiency, but higher annual fuel and operating costs. **NOT RECOMMENDED**.

C – Biomass District Heating Only: Improved energy efficiency, with lower annual fuel and operating costs. **VIABLE OPTION**.

D - Biomass CHP: High energy efficiency, with lower annual fuel and operating costs, and renewable power generation. **BETTER OPTION**.

E – Biomass CHP + Electric Chiller: High energy efficiency, with lowest annual fuel and operating costs, and renewable power generation. **BETTER OPTION**.

F – Biomass CHP + Adsorption Chiller: Highest energy efficiency, low annual fuel and operating costs, maximum renewable power generation. **BETTER OPTION**.

4 – ECONOMIC ANALYSIS

Financial Incentives

The overall project economics are heavily influenced by available renewable energy incentives. See a brief summary of each relevant incentive program below.

Oregon Department of Energy – Renewable Thermal Incentive

Biomass Thermal projects = 35% of eligible project cost

Oregon Department of Energy – Biomass CHP Incentive

Biomass CHP projects = 35% of eligible project cost

Federal Investment Tax Credit – Biomass CHP

Biomass CHP projects = 10% of eligible project costs (30% credit if construction start by 12/31/13)

MACRS – Modified Accelerated Depreciation Schedule

New Market Tax Credit Loan

Subsidized low interest loan = 20% to 25% grant of total project cost

Summary of Economic Analysis

	HEATING OPTIONS	ANNUAL ENERGY COSTS				CAPEX COST	ANNUAL SAVINGS	SIMPLE PAYBACK	NET PAYBACK
		HEATING	COOLING	ELECTRIC	TOTAL				
A	Existing Propane Boilers	$ 508,539	$ 31,924	$ -	**$ 540,463**	$ 4,000,000	$ -	N/A	N/A
B	Biomass Pellet Boilers	$ 154,583	$ 31,924	$ -	**$ 186,507**	$ 11,871,600	$ 353,956	33.5	22.1
C	Biomass District Heating Only	$ 128,409	$ 31,924	$ -	**$ 160,333**	$ 4,707,747	$ 380,130	12.4	8.1
D	Biomass District Combined Heat & Power	$ 128,409	$ 31,924	$ (34,463)	**$ 125,870**	$ 8,926,402	$ 414,592	21.5	6.6
E	Biomass District Combined Cooling [1], Heat & Power	$ 128,409	$ 20,750	$ (34,463)	**$ 114,697**	$ 9,903,254	$ 425,766	23.3	7.2
F	Biomass District Combined Cooling [2], Heat & Power	$ 128,409	$ 77,391	$ (55,232)	**$ 150,568**	$ 10,165,379	$ 389,895	26.1	8.0

NOTES:

[1] Electric Centrifugal Chiller

[2] Heat Driven Adsorption Chiller

Recommendation

The best solution based on both energy and economic considerations, is some form of Biomass District CHP. Further evaluation is recommended to determine the optimal approach, and whether or not to include district cooling as part of the design. For further financial details refer to the attached Life Cycle Cost Analyses for each option and the associated Capital Expenditure (CAPEX) Budgets.

4 – ECONOMIC ANALYSIS

Life Cycle Cost Analysis – Option C: Biomass District Heating

ARNG LIFE CYCLE COST ANALYSIS (LCCA) SUMMARY

LOCATION: Umatilla Training Ce REGION NO: 4 PROJECT NO.: TBD
PROJECT TITI OPTION C - Biomass District Heat FY: 2014
ANALYSIS DATE 04/05/13 ECONOMIC LIFE: 30 YEARS
PREPARED B Craig Volz CHECKED BY: Larry Hamburg

#1 INVESTMENT COSTS:

A. CONSTRUCTION COSTS	$ 4,326,104		
B. SIOH	$ 372,045		*(Supervision + Inspection + Overhead)*
C. DESIGN COST	$ 216,305		
D. TOTAL COST (1A+1B+1C)		$ 4,914,454	
E. SALVAGE VALUE OF EXISTING EQUIPMENT		$ -	
F. PUBLIC UTILITY COMPANY REBATE		$ 3,483,711	
G. TOTAL INVESTMENT (1D-1E-1F)		$ 1,430,743	

#2 ENERGY & DEMAND SAVINGS (+) / COSTS (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTOR: 09/01/11 REGION #

NOTE: IN THIS ANALYSIS, MM = 1,000,000

ENERGY SOURCE	COST $/MMBTU (#1)	SAVINGS MMBTU/YR (#2)	ANNUAL $ SAVINGS (#3) (#1 X #2)	FEMP UPV DISCOUNT FACTOR (#4)	PRESENT VALUE SAVINGS (#5) (#3 X
A. ELEC. (Site)					
B. DIST. OIL					
C. RESID. OIL					
D. NAT. GAS					
E. PPG/LPG	$ 21.42	23,739.5	$ 508,538	22.97	$ 11,681,120
F. BIOMASS	$ 9.08	(17,655.2)	$ (160,320)	18.39	$ (2,948,285)
G. WATER					
H. DEMAND SAVINGS					
I. TOTAL		6,084.2	$ 348,218		$ 8,732,835

#3 NON-ENERGY SAVINGS (+) / COSTS (-)

A. ANNUAL RECURRING OM & R (+/-)	$ 4,000		
1 DOE UPV DISCOUNT FACTOR		19.60	
2 DISCOUNTED SAVINGS/COST (3A X 3A1)			$ 78,400

B. NON-RECURRING SAVINGS (+) OR COSTS (-)

ITEM	SVGS (+) COST (-) (#1)	YEAR OF OCCUR. (#2)	DOE SPV FACTOR (#3)	DISCOUNTED SAVINGS/COSTS [+ / -] (#4)
a.				
b.				
c.				
d. **TOTAL**				

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (3A2 + 3Bd4) $ 78,400

#4 FIRST YEAR DOLLAR SAVINGS (2I3 + 3A + 3Bd1/YRS ECON LIFE)	$ 352,218
#5 SIMPLE PAYBACK IN YEARS (1G/#4)	4.1
#6 TOTAL NET DISCOUNTED SAVINGS (2I5 + 3C)	$ 8,811,235
#7 SAVINGS TO INVESTMENT RATIO (SIR) # 6/(1G)]	6.16

4 – ECONOMIC ANALYSIS

CAPEX Budget – Option C: Biomass District Heating

A	B	C	D	E	F
ITEM NO.	DESCRIPTION	EQUIPMENT & MATERIAL	LABOR	TOTAL	BASIS OF DESIGN
1.0	**CENTRAL UTILITY BUILDING (CUB)**				
1.1	Site work	$ 20,000	$ 60,000	$ **80,000**	
1.2	Concrete	$ 50,000	$ 75,000	$ **125,000**	
1.3	Pre-engineered metal building	$ 153,125	$ 21,875	$ **175,000**	Area = 7,700 SF (70 x 110)
1.4	Overhead crane system	$ 50,000	$ 4,000	$ **54,000**	5 ton capacity
1.5	Mechanical	$ 89,100	$ 75,900	$ **165,000**	
1.6	Electrical	$ 72,900	$ 62,100	$ **135,000**	
1.7	**SUBTOTAL - CUB**	**$ 435,125**	**$ 298,875**	**$ 734,000**	
2.0	**DISTRICT PIPING**				
2.1	Trenching, bedding & backfill	$ 35,000	$ 105,000	$ **140,000**	4,000 LF
2.2	Heating water supply & return piping	$ 145,800	$ 124,200	$ **270,000**	4,000 LF
2.3	Building energy transfer stations	$ 80,000	$ 20,000	$ **100,000**	40 ea HW
2.4	**SUBTOTAL - DISTRICT PIPING**	**$ 260,800**	**$ 249,200**	**$ 510,000**	
3.0	**HEATING PLANT**				
3.1	Fuel storage and conveyor system	$ 517,000	$ 180,950	$ **697,950**	
3.2	Biomass boiler # 1 (3,200 kW hot water)	$ 1,120,000	$ 112,500	$ **1,232,500**	Schmid AG model UTSR-1800
3.3	Biomass boiler # 2 (1,800 kW hot water)	$ 630,000	$ 71,250	$ **701,250**	Schmid AG model UTSR-3201
3.4	Heating water circulation pump skid	$ 42,000	$ 5,250	$ **47,250**	xxx gpm, variable speed drive
3.5	Thermal storage tank	$ 100,000	$ 18,000	$ **118,000**	10,000 gallon
3.6	**SUBTOTAL - HEATING PLANT**	**$ 2,409,000**	**$ 387,950**	**$ 2,796,950**	
4.0	**PROJECT TOTAL**				
4.1	Subtotals	$ 3,104,925	$ 936,025	$ **4,040,950**	
4.2	Permits	$ -	$ 60,655	$ **60,655**	
4.3	General Conditions	$ 363,686	$ -	$ **363,686**	
4.4	Contractor OH&P	$ 242,457	$ -	$ **242,457**	
4.5	**GRAND TOTAL**	**$ 3,711,068**	**$ 996,680**	**$ 4,707,747**	

4 – ECONOMIC ANALYSIS

Life Cycle Cost Analysis – Option D: Biomass CHP

ARNG LIFE CYCLE COST ANALYSIS (LCCA) SUMMARY

LOCATION: Umatilla Training Ce	REGION NO: 4	PROJECT NO.: TBD	
PROJECT TITI OPTION D - Biomass CHP		FY: 2014	
ANALYSIS DATE 04/05/13	ECONOMIC LIFE: 30 YEARS		
PREPARED B Craig Volz	CHECKED BY: Larry Hamburg		

#1 INVESTMENT COSTS:

A. CONSTRUCTION COSTS	$ 8,211,510		
B. SIOH	$ 706,190		*(Supervision + Inspection + Overhead)*
C. DESIGN COST	$ 287,403		
D. TOTAL COST (1A+1B+1C)		$ 9,205,103	
E. SALVAGE VALUE OF EXISTING EQUIPMENT		$ -	
F. PUBLIC UTILITY COMPANY REBATE		$ 3,085,172	
G. TOTAL INVESTMENT (1D-1E-1F)		$ 6,119,931	

#2 ENERGY & DEMAND SAVINGS (+) / COSTS (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTOR: 09/01/11 REGION #

NOTE: IN THIS ANALYSIS, MM = 1,000,000

ENERGY SOURCE	COST $/MMBTU (#1)	SAVINGS MMBTU/YR (#2)	ANNUAL $ SAVINGS (#3) (#1 X #2)	FEMP UPV DISCOUNT FACTOR (#4)	PRESENT VALUE SAVINGS (#5) (#3 X
A. ELEC. (Site)	$ 13.19	2,655.4	$ 35,021	18.39	$ 644,043
B. DIST. OIL					
C. RESID. OIL					
D. NAT. GAS					
E. PPG/LPG	$ 21.42	23,739.5	$ 508,538	22.97	$ 11,681,120
F. BIOMASS	$ 9.08	(17,655.2)	$ (160,320)	18.39	$ (2,948,285)
G. WATER					
H. DEMAND SAVINGS					
I. TOTAL		8,739.6	$ 383,239		$ 9,376,878

#3 NON-ENERGY SAVINGS (+) / COSTS (-)

A. ANNUAL RECURRING OM & R (+/-)	$ 4,000		
1 DOE UPV DISCOUNT FACTOR		19.60	
2 DISCOUNTED SAVINGS/COST (3A X 3A1)			$ 78,400

B. NON-RECURRING SAVINGS (+) OR COSTS (-)

ITEM	SVGS (+) COST (-) (#1)	YEAR OF OCCUR. (#2)	DOE SPV FACTOR (#3)	DISCOUNTED SAVINGS/COSTS [+ / -] (#4)
a.				
b.				
c.				
d. **TOTAL**				

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (3A2 + 3Bd4)	$ 78,400
#4 FIRST YEAR DOLLAR SAVINGS (2I3 + 3A + 3Bd1/YRS ECON LIFE)	$ 387,239
#5 SIMPLE PAYBACK IN YEARS (1G/#4)	15.8
#6 TOTAL NET DISCOUNTED SAVINGS (2I5 + 3C)	$ 9,455,278
#7 SAVINGS TO INVESTMENT RATIO (SIR) # 6/(1G)]	1.54

CAPEX Budget – Option D: Biomass CHP

A	B	C	D	E	F
ITEM NO.	DESCRIPTION	EQUIPMENT	LABOR & MATERIAL	TOTAL	BASIS OF DESIGN
1.0	CENTRAL UTILITY BUILDING (CUB)				
1.1	Site work	$ 20,000	$ 60,000	$ 80,000	
1.2	Concrete	$ 50,000	$ 75,000	$ 125,000	
1.3	Pre-engineered metal building	$ 153,125	$ 21,875	$ 175,000	Area = 7,700 SF (70 x 110)
1.4	Overhead crane system	$ 50,000	$ 4,000	$ 54,000	5 ton capacity
1.5	Mechanical	$ 89,100	$ 75,900	$ 165,000	
1.6	Electrical	$ 72,900	$ 62,100	$ 135,000	
1.7	SUBTOTAL - CUB	$ 435,125	$ 298,875	$ 734,000	
2.0	DISTRICT PIPING				
2.1	Trenching, bedding & backfill	$ 35,000	$ 105,000	$ 140,000	4,000 LF
2.2	Heating water supply & return piping	$ 145,800	$ 124,200	$ 270,000	4,000 LF
2.3	Building energy transfer stations	$ 80,000	$ 20,000	$ 100,000	40 ea HW
2.4	SUBTOTAL - DISTRICT PIPING	$ 260,800	$ 249,200	$ 510,000	
3.0	HEATING PLANT				
3.1	Fuel storage and conveyor system	$ 517,000	$ 180,950	$ 697,950	
3.2	Biomass boiler # 1 (3,200 kW thermal oil)	$ 1,879,966	$ 150,000	$ 2,029,966	Schmid AG model UTSR-1800
3.3	Biomass boiler # 2 (1,800 kW thermal oil)	$ 1,057,481	$ 95,000	$ 1,152,481	Schmid AG model UTSR-3201
3.5	Heating water circulation pump skid	$ 42,000	$ 5,250	$ 47,250	xxx gpm, variable speed drive
3.6	Thermal storage tank	$ 100,000	$ 18,000	$ 118,000	10,000 gallon
3.7	SUBTOTAL - HEATING PLANT	$ 3,596,448	$ 449,200	$ 4,045,648	
4.0	ORC TURBO-GENERATOR				
4.1	ORC turbo-generator	$ 1,927,650	$ -	$ 1,927,650	Turboden model TD-10-CHP
4.2	Uninterruptible power supply	$ 12,500	$ 6,750	$ 19,250	APC model SURT8000XLT-1TF3
4.3	Export shipping, customs, duty, taxes	$ 110,000	$ -	$ 110,000	
4.4	Rigging	$ 3,000	$ 16,250	$ 19,250	
4.5	Mechanical hook-up	$ 33,250	$ 17,500	$ 50,750	
4.6	Electrical interconnection	$ 53,200	$ 28,000	$ 81,200	
4.7	Controls & monitoring	$ 39,900	$ 21,000	$ 60,900	
4.8	Insulation	$ 57,000	$ 30,000	$ 87,000	
4.9	Start-up & system commissioning	$ 4,000	$ 12,500	$ 16,500	
4.10	SUBTOTAL	$ 2,240,500	$ 132,000	$ 2,372,500	
5.0	PROJECT TOTAL				
5.1	Subtotals	$ 6,532,873	$ 1,129,275	$ 7,662,148	
5.2	Permits	$ -	$ 114,932	$ 114,932	
5.3	General Conditions	$ 651,283	$ -	$ 651,283	
5.4	Contractor OH&P	$ 498,040	$ -	$ 498,040	
5.5	GRAND TOTAL	$ 7,682,195	$ 1,244,207	$ 8,926,402	

4 – ECONOMIC ANALYSIS

Life Cycle Cost Analysis – Option E: Biomass CCHP Electric Chiller

ARNG LIFE CYCLE COST ANALYSIS (LCCA) SUMMARY

LOCATION:	Umatilla Training Ce	REGION NO:	4	PROJECT NO.:	TBD
PROJECT TITI	OPTION E - Biomass CHP Centrifugal Chiller			FY:	2014
ANALYSIS DATE	04/05/13	ECONOMIC LIFE:	30 YEARS		
PREPARED B	Craig Volz	CHECKED BY:	Larry Hamburg		

#1 INVESTMENT COSTS:

A. CONSTRUCTION COSTS	$ 9,110,129		
B. SIOH	$ 783,471		*(Supervision + Inspection + Overhead)*
C. DESIGN COST	$ 318,855		
D. TOTAL COST (1A+1B+1C)		$ 10,212,455	
E. SALVAGE VALUE OF EXISTING EQUIPMENT		$ -	
F. PUBLIC UTILITY COMPANY REBATE		$ 3,395,436	
G. TOTAL INVESTMENT (1D-1E-1F)		$ 6,817,019	

#2 ENERGY & DEMAND SAVINGS (+) / COSTS (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTOR: 09/01/11 REGION #

NOTE: IN THIS ANALYSIS, MM = 1,000,000

ENERGY SOURCE	COST $/MMBTU (#1)	SAVINGS MMBTU/YR (#2)	ANNUAL $ SAVINGS (#3) (#1 X #2)	FEMP UPV DISCOUNT FACTOR (#4)	PRESENT VALUE SAVINGS (#5) (#3 X
A. ELEC. (Site)	$ 13.19	3,503.4	$ 46,205	18.39	$ 849,718
B. DIST. OIL					
C. RESID. OIL					
D. NAT. GAS					
E. PPG/LPG	$ 21.42	23,739.5	$ 508,538	22.97	$ 11,681,120
F. BIOMASS	$ 9.08	(17,655.2)	$ (160,320)	18.39	$ (2,948,285)
G. WATER					
H. DEMAND SAVINGS					
I. TOTAL		9,587.6	$ 394,424		$ 9,582,553

#3 NON-ENERGY SAVINGS (+) / COSTS (-)

A. ANNUAL RECURRING OM & R (+/-)	$ 4,000		
1 DOE UPV DISCOUNT FACTOR		19.60	
2 DISCOUNTED SAVINGS/COST (3A X 3A1)			$ 78,400

B. NON-RECURRING SAVINGS (+) OR COSTS (-)

ITEM	SVGS (+) COST (-) (#1)	YEAR OF OCCUR. (#2)	DOE SPV FACTOR (#3)	DISCOUNTED SAVINGS/COSTS [+ / -] (#4)
a.				
b.				
c.				
d. **TOTAL**				

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (3A2 + 3Bd4)	$ 78,400
#4 FIRST YEAR DOLLAR SAVINGS (2I3 + 3A + 3Bd1/YRS ECON LIFE)	$ 398,424
#5 SIMPLE PAYBACK IN YEARS (1G/#4)	17.1
#6 TOTAL NET DISCOUNTED SAVINGS (2I5 + 3C)	$ 9,660,953
#7 SAVINGS TO INVESTMENT RATIO (SIR) # 6/(1G)]	1.42

CAPEX Budget – Option E: Biomass CCHP Electric Chiller

A	B	C	D	E	F
ITEM NO.	**DESCRIPTION**	**EQUIPMENT**	**LABOR & MATERIAL**	**TOTAL**	**BASIS OF DESIGN**
1.0	**CENTRAL UTILITY BUILDING (CUB)**				
1.1	Site work	$ 20,000	$ 60,000	**$ 80,000**	
1.2	Concrete	$ 50,000	$ 75,000	**$ 125,000**	
1.3	Pre-engineered metal building	$ 153,125	$ 21,875	**$ 175,000**	Area = 7,700 SF (70 x 110)
1.4	Overhead crane system	$ 50,000	$ 4,000	**$ 54,000**	5 ton capacity
1.5	Mechanical	$ 89,100	$ 75,900	**$ 165,000**	
1.6	Electrical	$ 72,900	$ 62,100	**$ 135,000**	
1.7	**SUBTOTAL - CUB**	**$ 435,125**	**$ 298,875**	**$ 734,000**	
2.0	**DISTRICT PIPING**				
2.1	Trenching, bedding & backfill	$ 35,000	$ 105,000	**$ 140,000**	4,000 LF
2.2	Heating water supply & return piping	$ 145,800	$ 124,200	**$ 270,000**	4,000 LF
2.3	Chilled water supply & return piping	$ 109,350	$ 93,150	**$ 202,500**	3,000 LF
2.4	Building energy transfer stations	$ 140,000	$ 35,000	**$ 175,000**	40 ea HW + 30 ea CW
2.5	**SUBTOTAL - DISTRICT PIPING**	**$ 430,150**	**$ 357,350**	**$ 787,500**	
3.0	**HEATING PLANT**				
3.1	Fuel storage and conveyor system	$ 517,000	$ 180,950	**$ 697,950**	
3.2	Biomass boiler # 1 (3,200 kW thermal oil	$ 1,879,966	$ 150,000	**$ 2,029,966**	Schmid AG model UTSR-1800
3.3	Biomass boiler # 2 (1,800 kW thermal oil	$ 1,057,481	$ 95,000	**$ 1,152,481**	Schmid AG model UTSR-3201
3.5	Heating water circulation pump skid	$ 42,000	$ 5,250	**$ 47,250**	xxx gpm, variable speed drive
3.6	Thermal storage tank	$ 100,000	$ 18,000	**$ 118,000**	10,000 gallon
3.7	**SUBTOTAL - HEATING PLANT**	**$ 3,596,448**	**$ 449,200**	**$ 4,045,648**	
4.0	**ORC TURBO-GENERATOR**				
4.1	ORC turbo-generator	$ 1,927,650	$ -	**$ 1,927,650**	Turboden model TD-10-CHP
4.2	Uninterruptible power supply	$ 12,500	$ 6,750	**$ 19,250**	APC model SURT8000XLT-1TF3
4.3	Export shipping, customs, duty, taxes	$ 110,000	$ -	**$ 110,000**	
4.4	Rigging	$ 3,000	$ 16,250	**$ 19,250**	
4.5	Mechanical hook-up	$ 33,250	$ 17,500	**$ 50,750**	
4.6	Electrical interconnection	$ 53,200	$ 28,000	**$ 81,200**	
4.7	Controls & monitoring	$ 39,900	$ 21,000	**$ 60,900**	
4.8	Insulation	$ 57,000	$ 30,000	**$ 87,000**	
4.9	Start-up & system commissioning	$ 4,000	$ 12,500	**$ 16,500**	
4.10	**SUBTOTAL**	**$ 2,240,500**	**$ 132,000**	**$ 2,372,500**	
5.0	**CHILLER PLANT**				
5.1	Centrifugal Chiller	$ 300,000	$ 50,000	**$ 350,000**	Carrier
5.2	Shipping	$ 15,000	$ -	**$ 15,000**	
5.3	Rigging	$ 750	$ 3,900	**$ 4,650**	
5.4	Chilled water circulation pump skid	$ 45,000	$ 5,600	**$ 50,600**	xxx gpm, variable speed drive
5.5	Cooling Tower	$ 95,050	$ 40,000	**$ 135,050**	Marley model NC8409TAN1
5.6	Condenser water pump skid	$ 2,200	$ 3,500	**$ 5,700**	62 gpm, variable speed drive
5.7	**SUBTOTAL - CHILLER PLANT**	**$ 458,000**	**$ 103,000**	**$ 561,000**	
6.0	**PROJECT TOTAL**				
6.1	Subtotals	$ 7,160,223	$ 1,340,425	**$ 8,500,648**	
6.2	Permits	$ -	$ 127,510	**$ 127,510**	
6.3	General Conditions	$ 722,555	$ -	**$ 722,555**	
6.4	Contractor OH&P	$ 552,542	$ -	**$ 552,542**	
6.5	**GRAND TOTAL**	**$ 8,435,320**	**$ 1,467,935**	**$ 9,903,254**	

4 – ECONOMIC ANALYSIS

Life Cycle Cost Analysis – Option F: Biomass CCHP Adsorption Chiller

ARNG LIFE CYCLE COST ANALYSIS (LCCA) SUMMARY

LOCATION: Umatilla Training Ce	**REGION NO:** 4	**PROJECT NO.:** TBD	
PROJECT TITI OPTION D - Biomass CHP Adsorption Chiller		**FY:** 2014	
ANALYSIS DATE 04/05/13	**ECONOMIC LIFE:** 30 YEARS		
PREPARED B Craig Volz	**CHECKED BY:** Larry Hamburg		

#1 INVESTMENT COSTS:

A. CONSTRUCTION COSTS	$ 9,342,341		
B. SIOH	$ 803,441		*(Supervision + Inspection + Overhead)*
C. DESIGN COST	$ 326,982		
D. TOTAL COST (1A+1B+1C)		$ 10,472,764	
E. SALVAGE VALUE OF EXISTING EQUIPMENT		$ -	
F. PUBLIC UTILITY COMPANY REBATE		$ 3,475,611	
G. TOTAL INVESTMENT (1D-1E-1F)		$ 6,997,153	

#2 ENERGY & DEMAND SAVINGS (+) / COSTS (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTOR: 09/01/11 REGION #

NOTE: IN THIS ANALYSIS, MM = 1,000,000

ENERGY SOURCE	COST $/MMBTU (#1)	SAVINGS MMBTU/YR (#2)	ANNUAL $ SAVINGS (#3) (#1 X #2)	FEMP UPV DISCOUNT FACTOR (#4)	PRESENT VALUE SAVINGS (#5) (#3 X
A. ELEC. (Site)	$ 13.19	4,255.7	$ 56,128	18.39	$ 1,032,190
B. DIST. OIL					
C. RESID. OIL					
D. NAT. GAS					
E. PPG/LPG	$ 21.42	23,739.5	$ 508,538	22.97	$ 11,681,120
F. BIOMASS	$ 9.08	(28,297.7)	$ (256,960)	18.39	$ (4,725,494)
G. WATER					
H. DEMAND SAVINGS					
I. TOTAL		-302.5	$ 307,706		$ 7,987,815

#3 NON-ENERGY SAVINGS (+) / COSTS (-)

A. ANNUAL RECURRING OM & R (+/-)	$ 5,000		
1 DOE UPV DISCOUNT FACTOR		19.60	
2 DISCOUNTED SAVINGS/COST (3A X 3A1)			$ 98,000

B. NON-RECURRING SAVINGS (+) OR COSTS (-)

ITEM	SVGS (+) COST (-) (#1)	YEAR OF OCCUR. (#2)	DOE SPV FACTOR (#3)	DISCOUNTED SAVINGS/COSTS [+/-] (#4)
a.				
b.				
c.				
d. **TOTAL**				

C. TOTAL NON-ENERGY DISCOUNTED SAVINGS (3A2 + 3Bd4) $ 98,000

#4 FIRST YEAR DOLLAR SAVINGS (2I3 + 3A + 3Bd1/YRS ECON LIFE)	$ 312,706
#5 SIMPLE PAYBACK IN YEARS (1G/#4)	22.4
#6 TOTAL NET DISCOUNTED SAVINGS (2I5 + 3C)	$ 8,085,815
#7 SAVINGS TO INVESTMENT RATIO (SIR) # 6/(1G)]	1.16

4 – ECONOMIC ANALYSIS

CAPEX Budget – Option F: Biomass CCHP Adsorption Chiller

A	B	C	D	E	F
ITEM NO.	DESCRIPTION	EQUIPMENT	LABOR & MATERIAL	TOTAL	BASIS OF DESIGN
1.0	**CENTRAL UTILITY BUILDING (CUB)**				
1.1	Site work	$ 20,000	$ 60,000	**$ 80,000**	
1.2	Concrete	$ 50,000	$ 75,000	**$ 125,000**	
1.3	Pre-engineered metal building	$ 153,125	$ 21,875	**$ 175,000**	Area = 7,700 SF (70 x 110)
1.4	Overhead crane system	$ 50,000	$ 4,000	**$ 54,000**	5 ton capacity
1.5	Mechanical	$ 89,100	$ 75,900	**$ 165,000**	
1.6	Electrical	$ 72,900	$ 62,100	**$ 135,000**	
1.7	**SUBTOTAL - CUB**	**$ 435,125**	**$ 298,875**	**$ 734,000**	
2.0	**DISTRICT PIPING**				
2.1	Trenching, bedding & backfill	$ 35,000	$ 105,000	**$ 140,000**	4,000 LF
2.2	Heating water supply & return piping	$ 145,800	$ 124,200	**$ 270,000**	4,000 LF
2.3	Chilled water supply & return piping	$ 109,350	$ 93,150	**$ 202,500**	3,000 LF
2.4	Building energy transfer stations	$ 140,000	$ 35,000	**$ 175,000**	40 ea HW + 30 ea CW
2.5	**SUBTOTAL - DISTRICT PIPING**	**$ 430,150**	**$ 357,350**	**$ 787,500**	
3.0	**HEATING PLANT**				
3.1	Fuel storage and conveyor system	$ 517,000	$ 180,950	**$ 697,950**	
3.2	Biomass boiler # 1 (3,200 kW thermal oil	$ 1,879,966	$ 150,000	**$ 2,029,966**	Schmid AG model UTSR-1800
3.3	Biomass boiler # 2 (1,800 kW thermal oil	$ 1,057,481	$ 95,000	**$ 1,152,481**	Schmid AG model UTSR-3201
3.5	Heating water circulation pump skid	$ 42,000	$ 5,250	**$ 47,250**	xxx gpm, variable speed drive
3.6	Thermal storage tank	$ 100,000	$ 18,000	**$ 118,000**	10,000 gallon
3.7	**SUBTOTAL - HEATING PLANT**	**$ 3,596,448**	**$ 449,200**	**$ 4,045,648**	
4.0	**ORC TURBO-GENERATOR**				
4.1	ORC turbo-generator	$ 1,927,650	$ -	**$ 1,927,650**	Turboden model TD-10-CHP
4.2	Uninterruptible power supply	$ 12,500	$ 6,750	**$ 19,250**	APC model SURT8000XLT-1TF3
4.3	Export shipping, customs, duty, taxes	$ 110,000	$ -	**$ 110,000**	
4.4	Rigging	$ 3,000	$ 16,250	**$ 19,250**	
4.5	Mechanical hook-up	$ 33,250	$ 17,500	**$ 50,750**	
4.6	Electrical interconnection	$ 53,200	$ 28,000	**$ 81,200**	
4.7	Controls & monitoring	$ 39,900	$ 21,000	**$ 60,900**	
4.8	Insulation	$ 57,000	$ 30,000	**$ 87,000**	
4.9	Start-up & system commissioning	$ 4,000	$ 12,500	**$ 16,500**	
4.10	**SUBTOTAL**	**$ 2,240,500**	**$ 132,000**	**$ 2,372,500**	
5.0	**CHILLER PLANT**				
5.1	Adsorption Chiller	$ 525,000	$ 50,000	**$ 575,000**	Eco-Max F-330
5.2	Shipping	$ 15,000	$ -	**$ 15,000**	
5.3	Rigging	$ 750	$ 3,900	**$ 4,650**	
5.4	Chilled water circulation pump skid	$ 45,000	$ 5,600	**$ 50,600**	xxx gpm, variable speed drive
5.5	Cooling Tower	$ 95,050	$ 40,000	**$ 135,050**	Marley model NC8409TAN1
5.6	Condenser water pump skid	$ 2,200	$ 3,500	**$ 5,700**	62 gpm, variable speed drive
5.7	**SUBTOTAL - CHILLER PLANT**	**$ 683,000**	**$ 103,000**	**$ 786,000**	
6.0	**PROJECT TOTAL**				
6.1	Subtotals	$ 7,385,223	$ 1,340,425	**$ 8,725,648**	
6.2	Permits	$ -	$ 130,885	**$ 130,885**	
6.3	General Conditions	$ 741,680	$ -	**$ 741,680**	
6.4	Contractor OH&P	$ 567,167	$ -	**$ 567,167**	
6.5	**GRAND TOTAL**	**$ 8,694,070**	**$ 1,471,310**	**$ 10,165,379**	

5 – PROJECT PLAN

Project Team: Includes a motivated, disciplined, highly capable project Owner with access to a deep talent pool of independent renewable energy experts. An experienced renewable energy consultant will guide preparation of the feasibility study in collaboration with specialized vendors that possess industry leading research & development, design, manufacturing, service support, and remote monitoring capabilities.

Oregon Military Department (OMD)

OMD has the Net Zero Energy vision, focused leadership, skilled team resources, and commitment to execute the vision. As project Owner and grant applicant, OMD staff contribute strong competencies in planning, environmental, construction, procurement, operations, and fiscal management to successfully execute this project.

Through the US Army Net Zero Energy program, OMD has access to unparalleled technical resources and works closely with the National Renewable Energy Laboratory, Oregon Institute of Technology's Oregon Renewable Energy Center, the US Army Corps of Engineers Engineer Research & Development Center, and the Office of the Assistant Secretary of the Army to achieve breakthrough results.

Tetra Tech

As a renewable energy consultant, Tetra Tech applies their considerable expertise and experience to assist OMD in developing innovative approaches for the proposed biomass energy project. Tetra Tech also provides sustainable energy, sustainability services, and energy management services. See relevant project references below, and attached Statement of Qualifications for further details.

Tetra Tech Biomass References:

Project	Client	Contact	Address	Telephone
Feasibility Study – WWTP Biogas Utilization & Optimization (2012)	Oregon Dept of Energy	Mr. Matt Krumenauer Senior Policy Analyst	625 Marion Street NE Salem, OR 97301-3737	(503) 378-6043
Feasibility Study - Tillamook County Community Bioenergy Project (2010-2011)	Oregon DEQ NW Region, North Coast Regional Solutions	Ms. Jennifer Purcell	4301 Third Street Tillamook, OR 97141	(971) 212-5745
Feasibility Study - Clearwater County Biomass CHP (2011)	Clearwater County Board of Commissioners	Mr. Don Ebert Mr. Stan Leach Mr. John Allen	150 Michigan Avenue Orofino, ID 83544	(208) 476-3615

Northline Energy

Is a project management and general construction services firm specializing in design-build biomass projects with a successful track record in the forest products, industrial, and commercial markets.

Imperative Energy

Is a design-build-operate-maintain (DBOM) third-party biomass project developer with access to market capital, and design, construction, and operation expertise.

Schmid AG

Is a leading European manufacturer of biomass combustion and fuel handling systems with decades of experience and hundreds of successful biomass installations.

Turboden

Turboden is a division of Pratt and Whitney Power Systems located in Brescia, Italy. They pioneered ORC technology and have hundreds of successful biomass CHP and trigeneration installations worldwide.

5 – PROJECT PLAN

Power Partners

Power Partners, Inc. manufactures and markets energy-efficient, environmentally friendly ECO-MAX adsorption chillers that utilize waste heat to provide cooling. PPI also offers trigeneration packages that combine cogeneration with adsorption chillers enabling simultaneous production of power, heat and cooling from a single heat source for high overall system efficiency, and capital and energy cost savings.

Using water -- the greenest refrigerant there is -- ECO-MAX adsorption chillers are more reliable than absorption chillers because they do not contain lithium Water is adsorbed onto a bed of silica gel and regenerated under low pressure to produce chilled water.

PPI is one of seven winners of the SJF Institute's 2011 Green Jobs Award, which honors private businesses that contribute to both the economy and the environment. Power Partners also received the Excellence in Sustainability award at the 2011 Manufacturing Innovations Conference, a national event sponsored by the National Institute of Standards' Manufacturing Extension Partnership (MEP).

Procurement Options

ORARNG will explore parallel paths for project delivery.

1) Capital Request and execute a Design-Build construction contract
2) Issue an RFQ – RFP for qualified Design-Build-Operate-Maintain (DBOM) Third Party Developers

7 – REFERENCES

1. *District Heating and Cooling Connection Handbook*, International Energy Agency, IEA District Heating and Cooling,

2. *Community Energy: Planning, Development and Delivery*; International District Energy Association, Michael King, (2012 U.S. edition)

3. *District Heating Manual for London*; Greater London Authority, ARUP February 2013. http://www.londonheatmap.org.uk/Content/DHManual.aspx

4. *Combined Heat and Power: Enabling Resilient Energy Infrastructure for Critical Facilities*; ICF International for Oak Ridge National Laboratory, March 2013. http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_critical_facilities.pdf

5. *CHP: Enabling Resilient Energy Infrastructure*; USDOE Energy Efficiency and Renewable Energy webinar, April 3, 2013. http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_enabling_resilient_energy_infrastructure.pdf

6. *Evaluation of European District Heating Systems for Application to Army Installations in the United States*; US Army Corps of Engineers, Engineer Research & Development Center – Construction Engineering Research Lab, July 2006.

7. *Towards a Net Zero Building Cluster Energy Systems Analysis for a Brigade Combat Team Complex*; ASME 2010 4th International Conference on Energy Sustainability; US Army Corps of Engineers, Engineer Research & Development Center – Construction Engineering Research Lab ,May 2010.

8. *Principles & Fundamentals of Biomass Boiler System Design*; The Carbon Trust, David Palmer, March 17, 2010, www.carbontrust.co.uk

9. *Biomass Boiler System Sizing Tool User Manual*; Version 6.4, The Carbon Trust, October 3, 2012, www.carbontrust.co.uk

10. *Biomass System Design*; Graham P. Smith CEng, MInstMC, MCIBSE, Birling Consulting Ltd, www.birlingconsulting.co.uk

11. *Biomass Heating: A Practical Guide for Potential Users*; The Carbon Trust, January 2009, www.carbontrust.co.uk

8 – APPENDICES

A. Engineering Quotes and Qualifications

B. Equipment Data Sheets (Schmid, Turboden, Power Partners)

C. Fuel Specifications

Oregon Military Department Biomass Feedstock Resource Assessment

Completed by:

Marcus Kauffman
Biomass Resource Specialist
Oregon Department of Forestry
1758 NE Airport Rd
Roseburg, OR 97470
541-440-3412 ext 141
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Completed for:

Oregon Military Department

Spring 2013

Introduction

The Oregon Department of Forestry (ODF) prepared this report at the request of the Oregon Military Department. The report forms part of the supporting documentation required with a submission to the USDA Forest Service's Woody Biomass Utilization Grant program. The grant application requires that the applicant provide a biomass feedstock resource assessment.

This document describes the availability and price of woody biomass in the fuel supply area (FSA) of the Umatilla Training Center Tri-Generation project. Understanding that woody biomass is primarily a residual of commercial timber harvest, the report describes trends in commercial timber harvest as a means of placing woody biomass in the larger wood supply context. It also briefly describes the risks the project proponents may face in procuring adequate quantities of woody biomass over the life of the proposed project.

Purpose

This report aims to identify 7,000 bone dry tons (BDT) of woody biomass residuals from commercial logging, thinning, and forest restoration projects that could be delivered to the project site located at the Umatilla Training Center in Hermiston, Oregon.

Specifically, the proposed district energy system will be designed to burn 2" minus high quality wood chips sourced from forestry residuals. The report identifies land ownerships that could provide the required volume of biomass feedstock. In addition, report describes a range of expected prices for a quality fuel chip. Lastly, the document identifies several biomass providers who expressed interest in providing the quantity of biomass required by the proposed facility.

Methods

The data to complete this assessment came from several sources. The Oregon Department of Forestry (ODF) maintains historical records on timber harvest levels across all ownerships, including federally managed forests. The report relies on ODF timber harvest volume data to describe volumes of commercial timber in Oregon at the county level. The report also draws on county-level timber harvest data reported by the Washington Department of Natural Resources. Staff at the USDA Forest Service Regional Office and Umatilla National Forest provided information about biomass availability from the Umatilla National Forest.

Telephone interviews conducted with private industrial forestland company representatives provided data about annual harvest levels and the quantities of woody biomass that would be available from their lands. Lastly, three woody biomass fuel providers in northeast Oregon confirmed the price and availability of equipment and rolling stock for biomass removal, processing, and transportation in northeast Oregon.

Feedstock Supply Area (FSA)

The proposed facility would be located on the campus of Oregon National Guard's Umatilla Training Center located in Hermiston, Oregon. The facility would draw forestry residuals from as far away as 75miles. The fuel supply area for the project includes four Oregon counties (Morrow, Umatilla, Union, and Wallowa) and three Washington counties (Benton, Franklin, and Walla Walla).

Key Findings/Executive Summary

The supply assessment found that northeastern Oregon and southeastern Washington contain active timber harvest operations that generate significant quantities of commercial timber, pulp, and forest biomass.

Data from timber harvest reports combined with telephone interviews with industrial forestland owners completed by the author in 2012 with industrial forestland managers revealed large quantities of forest biomass available within the fuel supply area.

Potentially Available

- The fuel supply area contains over 120,000 bone-dry tons of forest biomass that is potentially recoverable from commercial timber harvest operations on industrial, non-industrial, and federal forestlands.

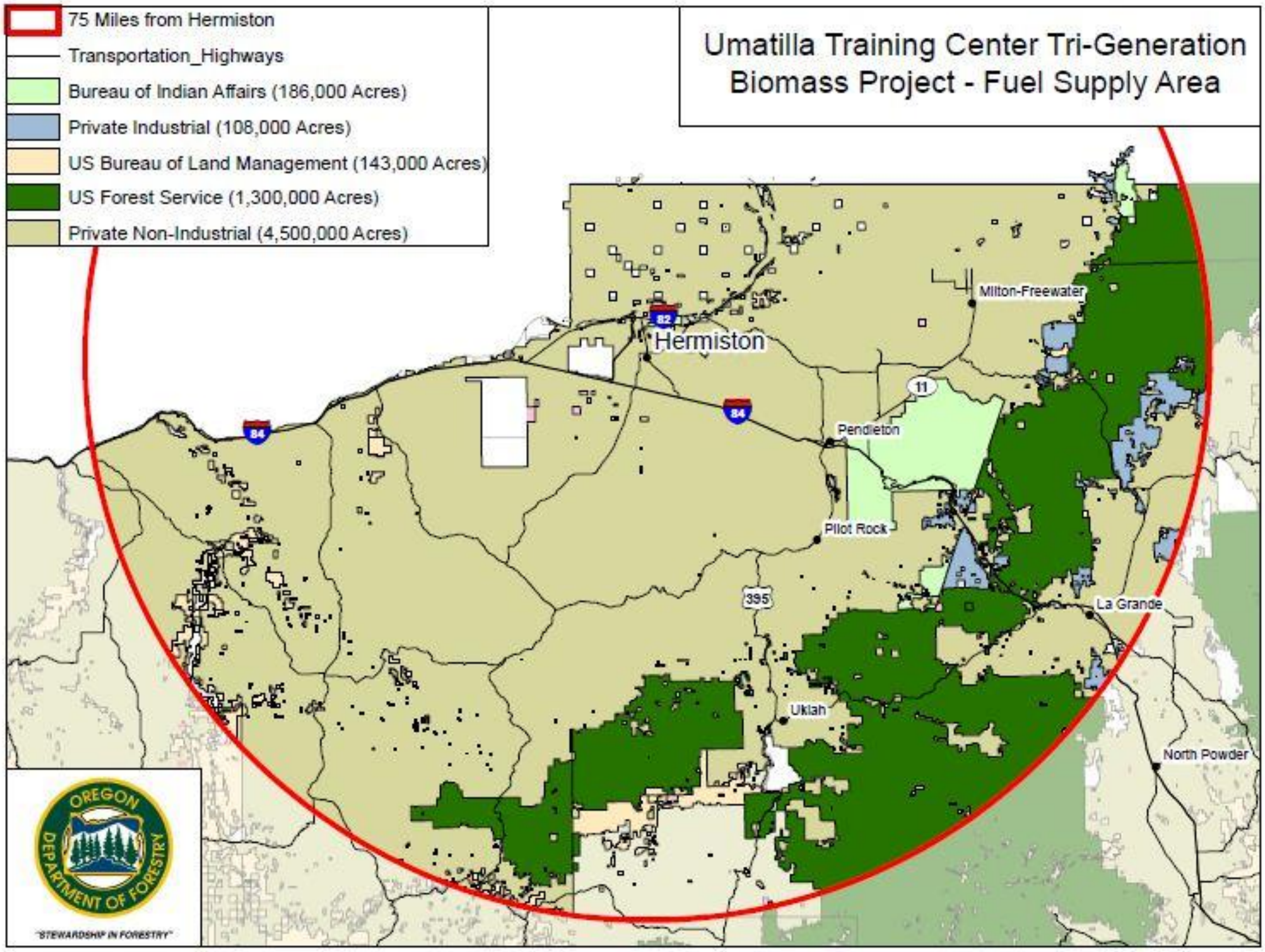
Realistically Available

- The fuel supply area contains several industrial forestland owners and wood fuel providers that could supply the proposed project. The four existing wood fuel/wood chip businesses interviewed noted that they could provide the quantity of wood fuel required by the Oregon Military Department. The fuel supply area contains over 108,000 acres of private industrial forestland and 1.3 million acres of US Forest Service land within 75 miles of the project site. Given the quantities required, the project owners could source the feedstock from industrial, federal, or private non-industrial forest lands or dedicated energy crops.

Existing and Competing Uses

- The fuel supply area contains an active market in timber, pulp, and some forest biomass. The pulp and paper market consumes the largest amount of non-saw log material. Demand for pulp grade chips has fluctuated over time. Demand for forest biomass in the fuel supply area appears to be low.

Map 1 depicts the Oregon portion of the fuel supply area. Although it is not shown on the map, the fuel supply area also includes a portion of southeastern Washington.



Source: Oregon Department of Forestry, Enterprise Data, accessed April 2, 2013.

Supply Needs for Proposed Facility
The proposed facility would be designed as district energy systems that would provide space heat, process heat, and electricity to the Umatilla Training Center campus. The Oregon National Guard biomass energy system would require approximately 7,000 BDT/year of biomass feedstock per year at full build out. The system would utilize 2" minus quality wood fuel at approximately 30 percent moisture content with minimal fines and contaminants.

Types of Biomass Fuel Available and Pricing

Forest-sourced biomass
The project site is located on the Columbia Plateau in a largely agricultural community. Despite the large agricultural base surrounding Hermiston, the community is flanked with actively managed forests. The fuel supply area contains over 1.5 million acres of forestland including over 108,000 acres of industrial forestland with ongoing forestry operations. The Umatilla National Forest also manages 1.3 million acres of forest lands in the fuel supply area. Forestry operations in the area include regeneration harvests (on private land), commercial thinning, pre-commercial thinning, fuels reduction, and forest restoration activities. These operations produce logging slash and small diameter material that is sold as hog fuel and pulp wood. Forest-sourced biomass fuels in the FSA include:

- Tops, limbs, cull logs, and other non-merchantable material. Tops, limbs, and culls are usually piled at landings and later chipped and hauled.
- Pulp wood: round wood of various species is generally sorted at the landing and hauled in whole log form to chipping operations.

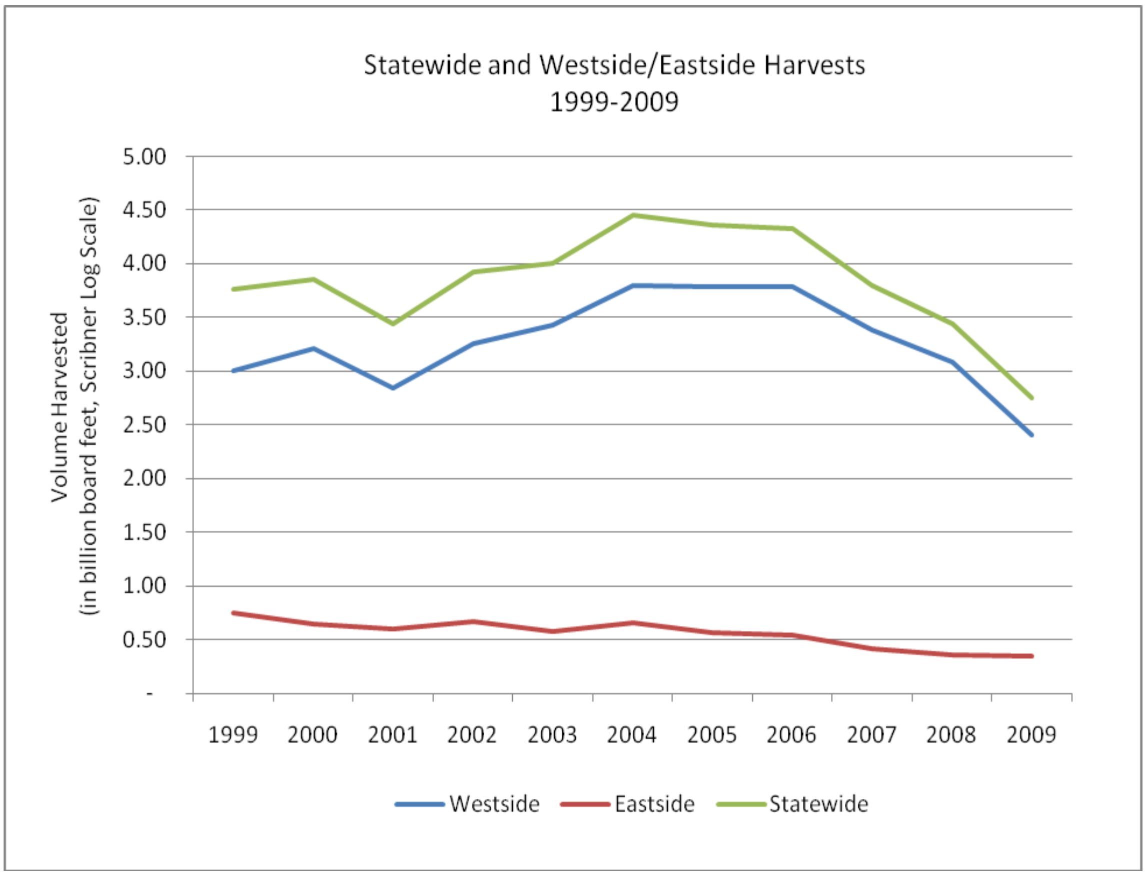
Potentially Available Volume

Timber supply in Oregon
The potential supply of forest-sourced biomass is dependent on commercial timber operations and, to a lesser extent, forest restoration and fuel reduction activities in the fuel supply area. Commercial timber operations on public and private land can supply limbs, tops, and cull logs at a relatively low price as the sawlog component pays for the road building and extraction. Whole tree harvesting is a common timber harvest method in the FSA and results in tops, limbs, and cull material being generated at landings.

Given the interdependence of commercial timber removal and forest biomass availability, supply analyses often rely on historic timber harvest data to assess the quantity of forest biomass available.

In the past five years, the commercial timber harvest across Oregon dropped significantly. The struggling economy, lack of housing demand and low lumber prices led to historically low harvest volumes. Harvest levels in Oregon declined from a high of 4.5 billion board feet in 2005 to a low of 2.75 billion board feet in 2009. In spite of its troubles, observers noted that the forest products industry remained intact. Oregon Department of Forestry economist Gary Lettman noted in August 2010 that, "There have been numerous recent temporary mill shutdowns, but few mills are being permanently shuttered."[1]

Table 1: Oregon Timber Harvest by Region 1999-2009



Source: Oregon Department of Forestry, http://www.oregon.gov/ODF/STATE_FORESTS/FRP/annual_reports.shtml

[1] Oregon Department of Forestry: Press release, "Oregon timber harvest in 2009 hits historic low." http://www.oregon.gov/ODF/newsroom/newsreleases/2010/NR1042.shtml

For the last two decades industrial forestland owners have produced the majority of region's timber volume. In the last few years, private industrial land accounted for more than eighty percent of the harvested timber base. In 2010, industrial forestland provided 75 percent of the 3.17 billion board feet harvested. Despite the large acreage of federal forests, the Forest Service and Bureau of Land Management combined to produce only 15 percent of Oregon's total harvest volume. Over the last two decades the share of timber volume provided by state owned forests has climbed from 1 percent in 1991 to a historic high of 9 percent in 2009.[2]

Table 2
Timber Harvest Volume in Morrow, Umatilla, Union, and Wallowa Counties
2007-2011, in thousand board feet

2007	Industry	NIPV	Tribal	USFS	Total
MORROW	2,220	1,864	-	359	4,443
UMATILLA	4,863	3,717	420	3,253	12,270
UNION	35,953	16,260	-	10,444	62,657
WALLOWA	47,506	1,272	-	4,593	53,639
Total	90,542	23,113	420	18,649	133,009

2008	Industry	NIPV	Tribal	USFS	Total
MORROW	183	1,006	-	295	1,484
UMATILLA	4,003	4,952	1,988	1,558	12,501
UNION	49,430	3,773	-	5,855	59,058
WALLOWA	42,816	1,640	-	1,871	46,327
Total	96,432	11,371	1,988	9,579	119,370

2009	Industry	NIPV	Tribal	USFS	Total
MORROW	17,239	1,377	-	2,296	20,912
UMATILLA	9,994	1,091	420	758	12,263
UNION	27,491	1,853	-	12,893	49,075
WALLOWA	39,891	937	-	195	41,023
Total	94,615	5,258	420	16,142	123,273

2010	Industry	NIPV	Tribal	USFS	Total
MORROW	31,901	1,518	-	4,216	37,635
UMATILLA	7,462	1,987	420	1,713	11,582
UNION	32,559	1,604	-	8,320	42,483
WALLOWA	48,346	2,444	-	1,987	52,777
Total	120,268	7,553	420	16,236	144,477

[2] Oregon Annual Timber Harvest Reports, Oregon Department of Forestry, http://www.oregon.gov/ODF/STATE_FORESTS/FRP/annual_reports.shtml,

2011	Industry	NIPV	Tribal	USFS	Total
MORROW	37,440	805	-	5,065	44,947
UMATILLA	5,241	2,409	320	1,189	9,159
UNION	25,046	6,092	100	7,044	41,083
WALLOWA	52,675	2,334	-	2,576	57,585
Total	120,402	11,640	420	15,874	152,774

Table 2 confirms that, similar to the state as a whole, private industrial landowners in the region produced the majority of the region's commercial timber volume. Most importantly, it highlights the fact the proposed facility would be located in a region with significant commercial timber harvests.

Volume of Forest-Sourced Biomass

As noted earlier, commercial timber harvest activity is the main indicator of biomass availability and can be used as a means to quantify recoverable forest biomass. The recoverable biomass from commercial timber operations consists of tops, limbs, damaged or broken pieces, and non-merchantable trees. The industry standard for biomass recovery states that .9 bone-dry tons (BDT) is recoverable per thousand board feet. However, given the vagaries of markets, terrain, logging practices, and available equipment it is not reasonable to assume that biomass can be recovered from all lands. For example, steep and narrow forest roads may prevent large chip vans from accessing the sites. Additionally, some logging systems, such as ground-based harvesting, process cut trees in the woods as opposed to the landing. To account for these and other factors, this analysis assumes that only 50 percent of harvested lands are suitable for biomass recovery.

The formula to display recoverable forest biomass from fuel supply area is expressed below:

> *five-year average harvest volume in northeast Oregon (mbf commercial timber harvest) x .5 (suitable lands) x .9 (recovery rate)=* ***bone dry tons per year of recoverable forest biomass***

The five-year (2007-2011) average of timber harvest from four Oregon counties (Morrow, Umatilla, Union, and Wallowa) was 134,581 MBF. Assuming biomass harvest is suitable on 50 percent of that volume reduces the amount to 67,290 MBF. Applying a biomass recovery rate of .9 BDT/MBF on 67,290 MBF would result in **60,561 BDT/year** of available forest biomass in the four-county at the current rates of commercial timber harvest. This estimate assumes a business-as-usual approach.

In addition to the forest biomass available in Oregon, forestlands in Yakima and Benton counties in Washington could also provide forest biomass. According to information provided by the Washington Department of Natural resources, Yakima and Benton counties could provide **65,031 BDT** of forest residual biomass at approximately $50/BDT.[3]

Data from these sources indicate that the seven counties surrounding Hermiston, Ore. show over 120,000 BDT of biomass material being produced. This figure does not account for existing and planned uses.

Realistically Available Volume

Forest-Sourced Biomass from the Umatilla National Forest

The Umatilla National Forest lies directly south and east of the proposed project site. The national forest has an active timber sales program and sells woody biomass material, mostly pulp logs and chips. According to contracting staff, the forest has sold approximately 42,000 to 48,000 BDT per year of biomass material to local and regional pulp chipping operations.[4] The forest sells pulp material for approximately $45/BDT delivered to local chipping facilities.

Table 3 below shows the expected quantities of timber by district and fiscal year for the Umatilla National Forest.

Table 3
Umatilla National Forest
Timber Sale Volume Estimate by District FY 2013-2017, in thousand board feet

FY 2013		FY 2014		FY 2015		FY 2016		FY 2017	
District	MBF	District	MBF	District	MBF	District	MBF	District	MBF
Heppner	3.0	Heppner	7.3	Heppner	7.6	Heppner	3.9	Heppner	1.2
Pomeroy	14.8	Pomeroy	10.7	Pomeroy	10.3	Pomeroy	7.1	Pomeroy	7.6
NFJD	1.3	NFJD	1.0	NFJD	4.1	NFJD	5.0	NFJD	0.6
Walla2	8.0	Walla2	7.0	Walla2	10.6	Walla2	9.7	Walla2	8.7
Add-on	0.8	Add-on	1.5	Add-on	2.0	Add-on	2.0	Add-on	1.0
Total	27.9	Total	27.5	Total	34.6	Total	27.7	Total	19.1

Source: Bill Aney, USDA Forest Service Blue Mountain Restoration Coordinator, via email.

[3] Washington Forest Biomass Supply Assessment, March 13, 2012. http://wabiomass.cfr.washington.edu/ calculated using "average statewide harvest" from 2010 through 2015.
[4] Source: Dan Kinney, Contracting Officer, Umatilla National Forest, email communication.

It should be noted that the Umatilla National Forest does not expect timber sale volume to drop significantly in FY 2017. The quantity of expected timber is underreported due to lack of available information on future planned projects.

The information provided by the Umatilla National Forest suggests that the timber management operations from the forest could supply the entirety of the project's expected feedstock needs at full build out.

Risk Assessment

Forest biomass is a low value product and can be negatively affected by market and policy changes far beyond the control of forestlands owners and managers. For example, the cycles of the domestic housing market have a dramatic impact on the availability of biomass material as demand for structural lumber and panel products from regional manufacturers dictates commercial timber harvest levels, which are the biggest source of forest biomass. Similarly, the global demand for forestry residuals also presents risks as these markets rise and fall over time. The cyclical nature of these markets is well understood, and these risks can be accounted for in the financial projections for the proposed project.

The risks for federal forests include the market risks noted above as well as significant legal and policy risks. Federal forest management in northeast Oregon has a litigious past but recent history is more hopeful. Specifically, several national forests in the region have established functional collaborative groups that are building common ground and creating opportunities for landscape-scale forest health treatments on public land. The Umatilla Forest Collaborative Group can be viewed as a vehicle to reduce planning risk and foster a more continuous program of work on the forest.

The risk of rising fossil fuel prices has the ability to impact the price of forest-sourced woody biomass. Transportation accounts for approximately one-third of the cost of forest biomass and the risk of rising fuel costs present an uncertainty. Data from the Energy Information Administration (EIA) indicates that diesel fuel prices are likely to rise by 2% by 2030, which is less than the rate of inflation. [5]

New competition for forest-sourced biomass also presents a risk. Increased demand for forest-sourced biomass from newly developed facilities could drive prices upward and decrease availability of low-cost material. Fortunately for this proposed project, the

[5] Source: http://205.254.135.24/forecasts/steo/
Energy Information Administration, Short-term Energy Outlook, accessed March 2012.

project developers have not announced any new large-scale biomass utilization projects in the region.

Finally, the project could face risk from the escalation for pulp and paper chip prices. The high quality fuel chip specified by the Oregon Military Department is similar to a pulp chip and would be created from similar feedstock. The pulp chip market is notoriously volatile. Given the small volume of material required by the proposed project is reasonable to assume that this risk could be mitigated with sound contract management.

Total Fuel Economically Available

According to ODF's analysis, the fuel supply area contains over 120,000 BDT of forest-sourced biomass within the seven-county area surrounding the community of Hermiston. Although the region experiences strong demand for pulp quality chips and logs, demand for forest residual biomass is weak. The fuel supply area does not contain any large users of forest biomass, although forest biomass from the area is occasionally utilized by outside entities. Interviews with chip and biomass contractors indicated that the quantities of biomass required by the proposed project could be easily procured without causing disruption or price escalation.

Fuel Pricing Forecast

Delivered Wood Fuel Volume and Price

Interviews with biomass fuel providers in northeast Oregon suggest that the price for high quality wood fuel delivered to the project site would range from $75-$110 BDT delivered. The price range for the specified fuel falls just below the average price for pulp quality wood chips, $100--$120/BDT.

The author interviewed several wood fuel contractors, chipping operators, and industrial land managers to determine prices. Representatives interviewed included:

- Integrated Biomass Resources Inc.
- T2 Inc.
- Greenwood Resources
- Blue Mountain Lumber
- Quicksilver Contracting

Existing Contractor Capacity

Telephone interviews confirmed that several existing forest and chipping contractors have the capacity to process and transport a quality wood fuel chip that would meet the project specifications. Existing wood fuel contractors that operate in or near the fuel supply area include:

- Integrated Biomass Resources
- T2 Inc.
- Quicksilver Contracting
- Lee Smith Logging
- Iron Triangle Inc.

The price for forest-based biomass is not expected to increase beyond standard rate of inflation (3%). As noted above, biomass to energy projects face risk in the form of diesel fuel volatility. However, this risk is minimal as the Energy Information Administration predicts only a 2% price increase in diesel fuel over the next 20 years.[6]

Existing and Competing Uses

Various facilities and operations in northeast Oregon and southwest Washington utilize the same or similar feedstock as is required by the proposed biomass energy facility. These competing sources of demand include:

- Pulp and paper operations
- Combined heat and power facilities
- Densified fuel plants
- Commercial fire wood operations
- Mobile chipping and grinding operations

While it is beyond the scope of this assessment to identify wood fuel demand at each facility, it is apparent that the project lies within an active market area for timber, residuals, and forest biomass. This review, albeit cursory, found no planned or future projects that would consume large quantities of forest biomass.

[6] http://www.eia.gov/forecasts/aeo/tables_ref.cfm, Energy Information Administration, 2012.