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NNRG Workshop Series: Solving Woody Biomass in the Forest of the San Juan Islands
June 24, 2017
OUTLINE

• About Wisewood Energy
• Biomass energy basics
• Biomass energy technologies
• What makes a viable project
• Project examples
• Biomass in the San Juans
ABOUT WISEWOOD ENERGY

• **Technical Consulting:** Feasibility studies, financial modelling, and project management

• **Design/Build:** Biomass energy installations including complete system engineering, procurement and construction (EPC)

• **Project Development:** Thermal energy supply from investor and community-owned thermal energy generation assets

• **Territory:** OR, WA, AK, CA, ID, MT, CO
Our Mission

We outfit communities and businesses with state-of-the-art biomass energy systems that strengthen local economies, lower heating costs and promote environmental stewardship.

Technology in Service of Community and Environment
WHAT IS WOODY BIOMASS?

Construction waste: untreated wood that has been used in commerce prior to its energetic utilization

Ag fuels: straw, grasses, corn stover, purpose-grown feedstocks
# BIOMASS HEATING TECHNOLOGIES

<table>
<thead>
<tr>
<th>Technology</th>
<th>Pellet/clean chip boiler</th>
<th>Wood chip boiler</th>
<th>District heating</th>
<th>CHP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel</td>
<td>Pellets and/or clean chips</td>
<td>Hog fuel wood chips</td>
<td>Hog fuel wood chips</td>
<td>Hog fuel wood chips</td>
</tr>
<tr>
<td>Typical Installed Capacity</td>
<td>&lt; 3 MMBtu</td>
<td>1.5 – 10 MMBtu</td>
<td>2 – 30 MMBtu</td>
<td>&gt;3-300 MMBtu</td>
</tr>
<tr>
<td>User</td>
<td>Single-family homes, light commercial, institutional</td>
<td>Commercial, institutional, and light industrial</td>
<td>Commercial, institutional, municipal, industrial</td>
<td>Industrial and district heating</td>
</tr>
</tbody>
</table>
MODERN BIOMASS HEAT & COMBINED HEAT AND POWER (CHP)

- **Efficient**: high conversion efficiency (>85%)
- **Clean**: low particulate, NOx and CO emissions
- **Economical**: lowers costs, supports local jobs
- **Sustainable**: supports sustainable forest management, low carbon fuel, locally abundant
EFFICIENT
Development of emissions of Austrian Biomass Boilers, measured by the federal agency for agricultural engineering Wieselburg (BLT)
Particulate Emissions (lbs/mmBtu)

- **Clean**: > 4.5
- **20-50x cleaner than EPA-certified woodstoves**
- **Very Low Emissions Possible**

- **Open Pile Burning**: More than 20-50x cleaner than EPA-certified woodstoves.
- **EPA Certified Woodstove**: Very low emissions possible.
- **Pellet Stove**: Lower emissions compared to EPA-certified woodstoves.
- **Wood Chip Boiler**: Even lower emissions.
- **Wood Pellet Boiler**: Very low emissions possible.
- **Oil Furnace**: Minimal emissions.
- **Biomass CHP (w/ Particle Filter)**: Very low emissions possible.
- **Gas Furnace**: Minimal emissions.
ECONOMICAL

Energy Cost $/mmBTU (2016)

Gas is cheap, but most rural locations still depend on propane, oil, and electricity.

Rich in forest resources!
SUSTAINABLE
Fossil Fuel Model

Community Institutions

$200K

Oil Heat Inc.

$185K

$15K

Local Economy

- Services
- Maintenance
- Taxes

Global Economy

We
COMMUNITY ENERGY MODEL

Community Institutions $200K

Biomass Community Energy $140K

Local Economy $60K

Regional/National Economy $140K

Ongoing
- Services
- Taxes
- Site lease
- Fuel purchase
- Fuel transport
- Maintenance

Construction
- Concrete
- Building
- Plumbing
- Electrical
Wood Stoves

Photo: Vermont Castings, http://stcroixstoves.com
Residential Heating
Upper Austria
Residential Cordwood Boiler
Residential and Light Commercial Pellet Boilers

Photo: Windhager
Containerized Pellet/Clean Chip Boiler
Gasification Power Production

Image: Andrew Haden
Wood Pellet Production
WHAT MAKES A VIABLE PROJECT

Modern Wood Energy for the Front Range
PROJECT ELEMENTS

Size of Heat Demand

Existing Heating System

Current Fuel Type

Funding & Incentives

Supply

Project Champion
CURRENT FUEL TYPE
SIZE OF HEAT DEMAND

• Larger demand = larger cost savings
• Cold climates = higher heat demand
• Good candidates:
  – Process heating for industry: breweries, food processing, manufacturing
  – Resorts and hotels: 24/7, swimming pools, etc.
  – Healthcare: 24/7, lots of fresh air requirements
  – Schools, community centers, municipal buildings
EXISTING HEATING SYSTEM
FUNDING AND INCENTIVES
PROJECT CHAMPION
BIOMASS-HEATED GREENHOUSES
A HANDBOOK FOR ALASKAN SCHOOLS AND COMMUNITY ORGANIZATIONS
Pierce Community Center
Containerized Pellet Boiler in Pierce, Idaho
Versatile Wood Products
Manufacturing Residuals Boiler in Portland, Oregon

Photo: Dan Bihn
Ketchikan International Airport
Pellet Boiler in Ketchikan, Alaska
ABOUT HCE

- **Technology:** Boiler can efficiently and cleanly utilize hog fuel biomass (4”minus, 55% MC)
- **District Heating:** Heating multiple buildings on one common loop
- **Third Party Development Model:** Developer financed construction and assures successful operations
- **Local Ownership:** Community will own the system for long-term operations
Yakima Specialties, Inc.
Hog fuel steam district energy system in Yakima, WA
Plumas Health & Human Services Center - Small-Scale CHP in Quincy, CA

Photo: Nichols, Melburg, and Rosetto
Small-scale combined heat-and-power for the Lopez Island Pool and the Lopez Middle/High School?
District heating for Friday Harbor or Eastsound?
KEY QUESTIONS

• What is your local underutilized wood source?
• Where are your largest heat loads?
• Where is new construction happening?
• Who are your local entrepreneurs?
• Who are your project champions?