OUTLINE

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

• **Technical Consulting:** Feasibility studies, conceptual design, and financial modelling

• **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
Self Sufficiency with Modern Wood Energy

BIOMASS ENERGY BASICS
WHY WOODY BIOMASS?

“Energy Resilience”

1. Demand Conservation
2. Renewable Energy Generation

The San Juan Islands community is committed to increasing locally generated renewable energy.
WHY WOODY BIOMASS?
WHAT IS WOODY BIOMASS?

- Cordwood
- Pellets
- Clean Chips
- Hog Fuel
- C&D Waste
- Yard Debris
## BIOMASS ENERGY TECHNOLOGIES

<table>
<thead>
<tr>
<th>Technology</th>
<th>Fuel Type</th>
<th>Installed Capacity</th>
<th>Fuel Demand (tons/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pellet/clean chip boiler</td>
<td>Pellets and/or clean chips</td>
<td>&lt; 3 MMBtu/hr</td>
<td>&lt;50 – 1,000</td>
</tr>
<tr>
<td>Hog fuel wood chip boiler</td>
<td>Hog fuel wood chips</td>
<td>1.5 – 30 MMBtu/hr</td>
<td>500 - 20,000</td>
</tr>
<tr>
<td>Gasification CHP</td>
<td>Pellets and/or wood chips</td>
<td>65kW – 5MW</td>
<td>200 – 10,000</td>
</tr>
<tr>
<td>Combustion CHP</td>
<td>Hog fuel wood chips</td>
<td>5 – 100MW+</td>
<td>10,000 – 850,000+</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 energy costs, supports local jobs
• **Sustainable**: supports sustainable forest management, low carbon fuel, locally abundant
Development of emissions of Austrian Biomass Boilers, measured by the federal agency for agricultural engineering Wieselburg (BLT)
Development of emissions of Austrian Biomass Boilers, measured by the federal agency for agricultural engineering Wieselburg (BLT)
Particulate Emissions (lbs/mmBtu)

- Open Pile Burning: > 4.5
- EPA Certified Woodstove: Very Low Emissions Possible
- Pellet Stove: 20-50x cleaner than EPA-certified woodstoves
- Wood Chip Boiler
- Wood Pellet Boiler
- Oil Furnace
- Biomass CHP (w/ Particle Filter)
- Gas Furnace
ECONOMICAL

Energy Cost $/mmBTU (2018)

- Electricity (retail): $29.30
- Electricity (heat pump): $9.77
- Heating oil (retail): $22.99
- Propane (retail): $23.15
- Wood pellets (bulk): $14.71
- Natural gas (retail): $10.00
- Forest Biomass (50%mc): $4.84
- Mill Residuals (20%mc): $1.73
SUSTAINABLE, LOW CARBON

- Carbon impacts depend on source of feedstock, forest management practices, fuel being displaced, efficiency of technology
- Diverting the **byproduct** of material that would otherwise be **burned** in piles into a **highly efficient** energy system is among best use of modern wood energy
  - Quick carbon debt payback
  - Immediate reduction in particulate emissions
Cordwood & Pellet Stoves

Photo: Vermont Castings, http://stcroixstoves.com
Light Commercial & Institutional Cordwood Boiler

Photo: ISOBC.org
Residential & Light Commercial Pellet Boilers

Photo: Windhager
Containerized Pellet/Clean Chip Chip Boiler
Containerized Pellet/Clean Chip Chip Boiler
Hog Fuel District Heating
Hog Fuel Industrial Process Heat
Gasification Power & Biochar Production
Gasification Power & Biochar Production

Image: Syncraft
Wood Processing
6" CONNECTION TO BOILER PLANT

1,400,000 BTU/HR BIOMASS
2,227,000 BTU/HR PROPANE

FUTURE ANNUAL FUEL STORAGE 5000 FT²
FUTURE VALUE ADDED PROCESSING FACILITY 6000 FT²

2000 GAL OIL TANK
80kW STAND BY GENERATOR

REJECTS AUGER

WALL NEAR TRANSFORMERS MUST BE NON-COMBUSTABLE OR METAL SKINNED
TRANSFORMER PAD FOR BOILER PLANT AND FUTURE WOOD PROCESSING FACILITY
Self Sufficiency with Modern Wood Energy

WHAT MAKES A Viable PROJECT
PROJECT ELEMENTS

- Size of Energy Demand
- Existing Energy System
- Current Fuel Type
- Funding & Incentives
- Supply
- Project Champion
CURRENT FUEL TYPE

• 2017 OPALCO fuel mix:
  – Hydro: 89.4%
  – Nuclear: 8.9%
  – Coal: 0.7%
  – Natural Gas: 0.9%
  – Biomass & Waste: 0.1%
• Propane
SIZE OF ENERGY 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 ENERGY SYSTEM
FUNDING AND INCENTIVES

WASHINGTON STATE DEPARTMENT OF Natural Resources

Department of Commerce
Innovation is in our nature.

USDA Rural Development
Committed to the future of rural communities.

Forest Service Department of Agriculture

CRAFT
Lending to people, Investing for resilience

UMPQUA BANK

meyer MEMORIAL TRUST
SUPPLY
Self Sufficiency with Modern Wood Energy

PROJECT EXAMPLES
Photo: Karen Peterson, University of AK Cooperative Extension Service
Northport School District
Containerized Pellet Boiler in Northport, Washington
Versatile Wood Products
Manufacturing Residuals Boiler in Portland, Oregon

Photo: Dan Bihn
Ketchikan International Airport
Pellet Boiler in Ketchikan, Alaska
Yakima Specialties, Inc.

Hog fuel steam district energy system in Yakima, WA
Plumas Health & Human Services Center
Organic Rankine Cycle CHP in Quincy, CA
Waste Water Treatment Plant
Gasification CHP in the Austrian Alps
Self Sufficiency with Modern Wood Energy

BIOMASS IN THE SAN JUANS
STRATEGIES FOR NEXT STEPS

Wisewood Energy Project Development Process

- Initial Project Interest
- Objective Setting
- Data Collection & Site Visit
- Energy Modeling
- Preliminary Site Assessment
- Preliminary Financial Model
- Site Selection
- Preliminary Permit Assessment
- Conceptual Design
- Preliminary Design
- Financial Model
- Detailed Design & Engineering
- Construction Documentation
- System Construction

Uncertainty vs. Investment
INITIAL PROJECT INTEREST

Key Questions

What is your local underutilized wood source?
Where are your largest energy loads?
Where is new construction happening?

Who are your local entrepreneurs?
Who are your project champions?

What funding sources might exist?
District heating for Friday Harbor or Eastsound?
Gasification CHP with biochar production a light industrial warehouse cluster?
San Juan Islands Energy Plan
Empowering Our Island Community for a Resilient Future

GOAL #3 – INCREASE LOCAL RENEWABLE ENERGY GENERATION

OBJECTIVE 3.A – INCREASE RENEWABLE ENERGY PORTFOLIO 5 PERCENT ANNUALLY

ACTION 3.A.5 – BIOMASS CONVERSION FEASIBILITY STUDY

Action: Conduct a feasibility study to evaluate the costs and benefits of gasification and incineration technology.
...AND DON’T FORGET TO THINK BIG!
THANK YOU!

Technology in Service of Community and Environment