

# FNSB Energy Initiatives

Ben Loeffler

Energy Management Engineer



# FNSB Energy Initiatives

- Energy Project Finance Seminar – March 2, 2017
- Energy Management Engineer
- C-PACE
- Comprehensive Economic Development Strategy (CEDS)
  - **“COMMUNITY PRIORITY #1: Lower and stabilize FNSB energy costs by expanding the energy portfolio with a focus on local resources.”**
    - Natural Gas
    - Geothermal
    - Waste Heat
    - UAF Research



# Energy Management Engineer

- Understand and Track FNSB Utility Costs
  - Utility Bill Database and Trending
  - Building Benchmarking and Operations
- Reduce FNSB Utility Costs
  - Energy Efficiency Projects
  - Advise Capital Improvement Projects
  - Support Borough Energy Initiatives
- Joint Collaboration with ACEP
  - Coordinate Energy Projects
  - Pursue Funding Opportunities



# Energy Efficiency Projects

- Lighting
  - Electricity is ~65% of Borough utility cost
  - 30-60% reduction with LED lighting and controls
- Solar PV not economical yet for Borough installations
- Heating
  - Envelope
  - Controls and retro-commissioning
  - Heat pumps, natural gas if oil prices rise



# Commercial Property Assessed Clean Energy (C-PACE)

- Leverage Borough tax collecting powers to give commercial properties access to lower lending rates for energy projects.
- Tie energy upgrade to property rather than owner.
- Voluntary program.
- Payments should be smaller than savings.
- Enable projects and work not appealing under traditional financing.

# ACEP Collaboration



**ACEP**  
Alaska Center for Energy and Power

- Alaska Center for Energy and Power
  - Applied energy research program
  - Mission: “Develop and disseminate practical, cost-effective, and innovative energy solutions for Alaska and beyond”
  - Vision: “Alaska leading the way in innovative production, distribution, and management of energy”

# ACEP Collaboration

## Biomass Pilot Project

- Joint effort to fund and implement a novel Biomass Energy project
  - Reduce FNSB energy costs
  - Evaluate new technology in Alaska
  - Open commercial markets throughout Interior and Southeast Alaska



# ACEP Collaboration

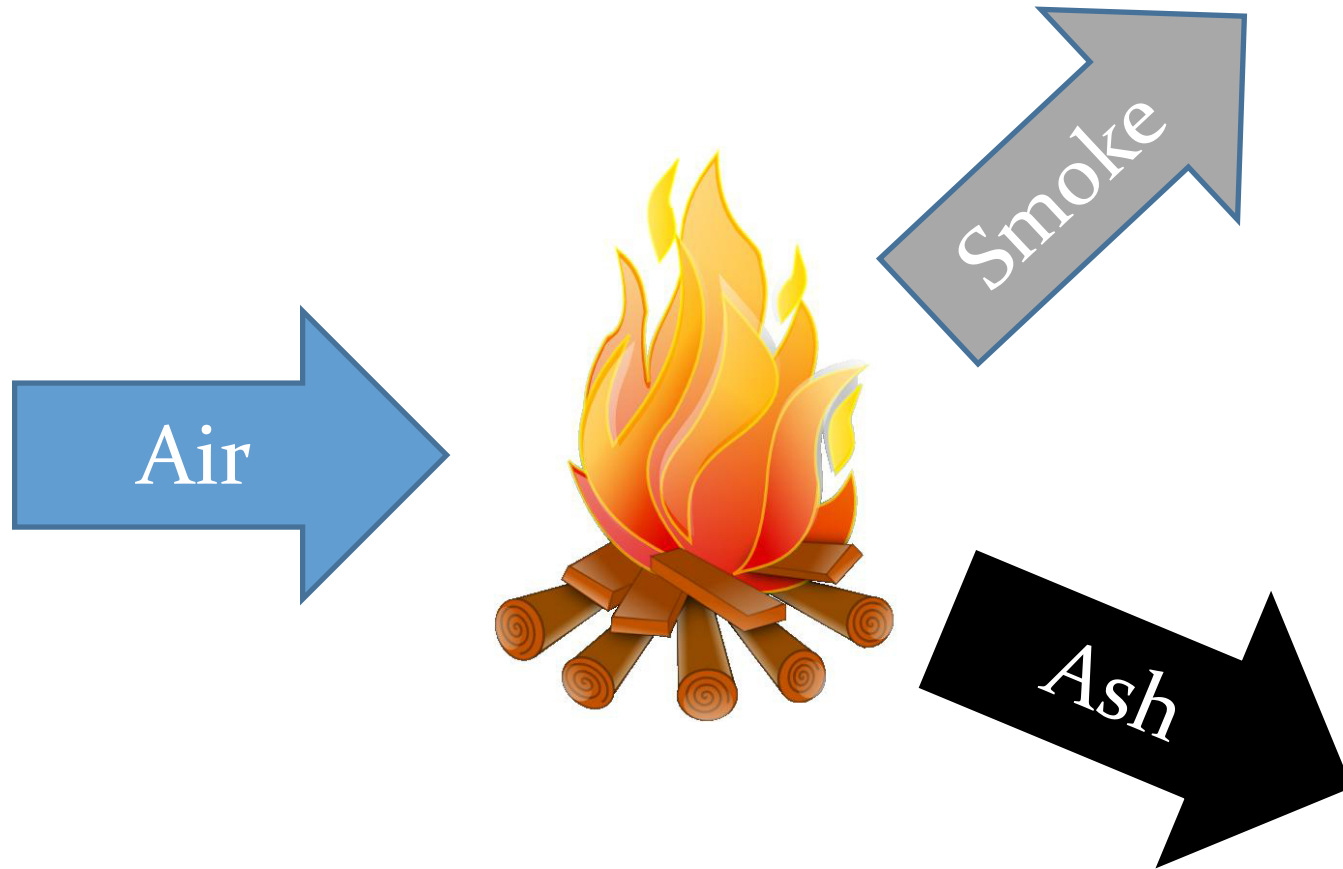
## Biomass Pilot Project

- System of interest:
  - Volter 40
    - 40kW Electric
    - 340,000 BTU/hr Thermal
  - Small-scale, packaged unit suited for both railbelt and rural installations
- Technical Introduction to Gasification and CHP
  - Wood Chip Gasification
  - Combined Heat and Power

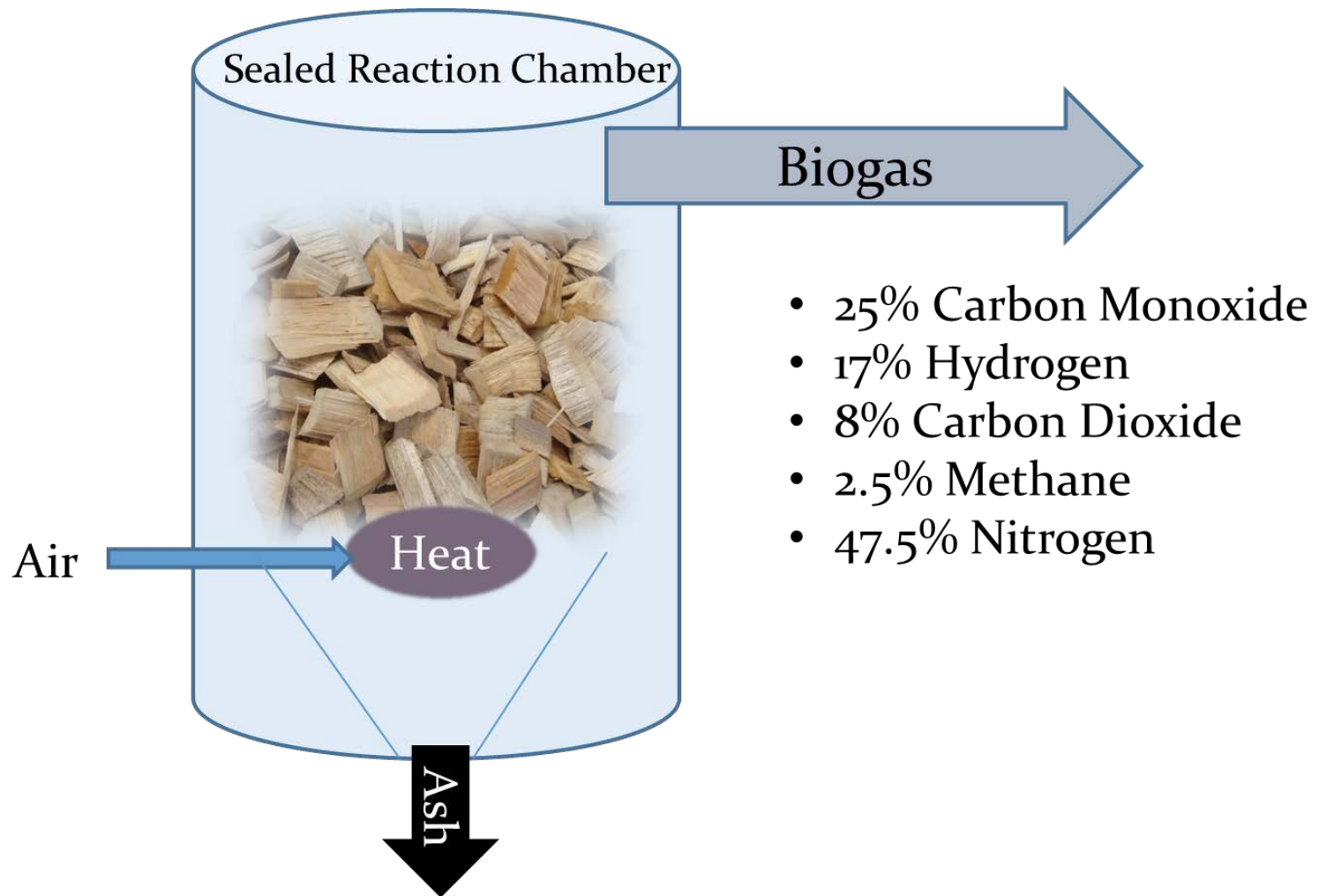




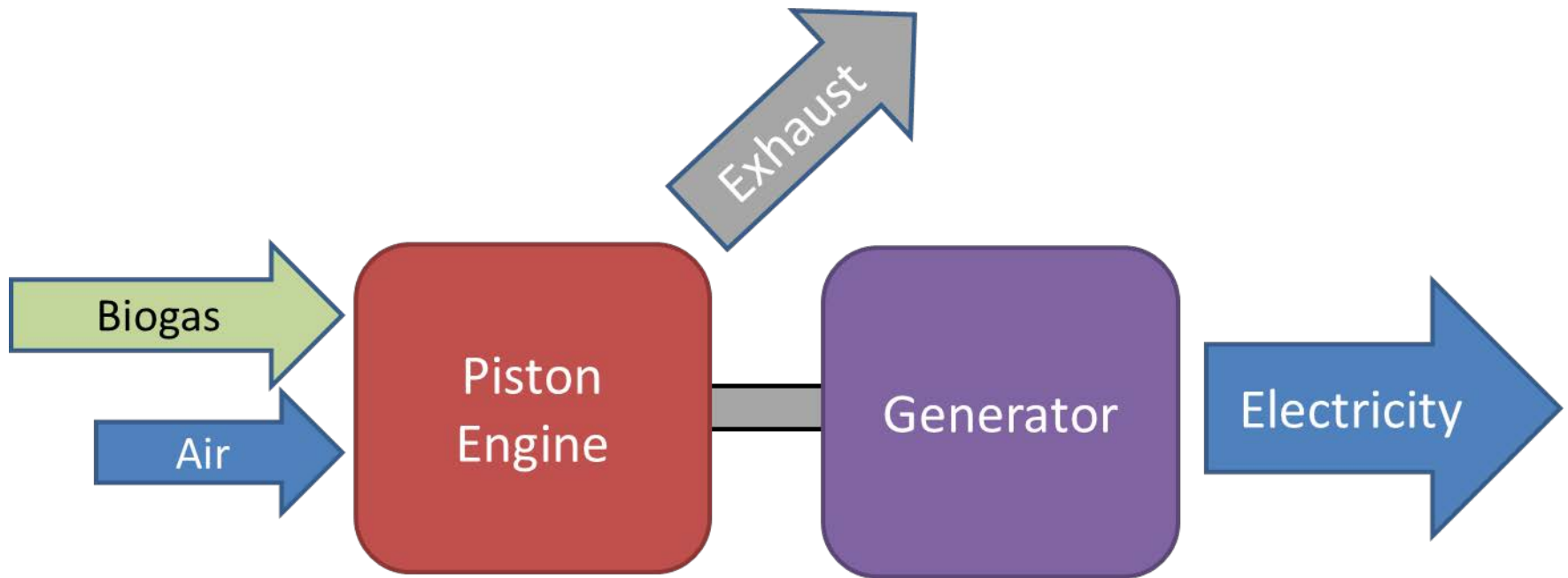
# Traditional Open Combustion of Wood



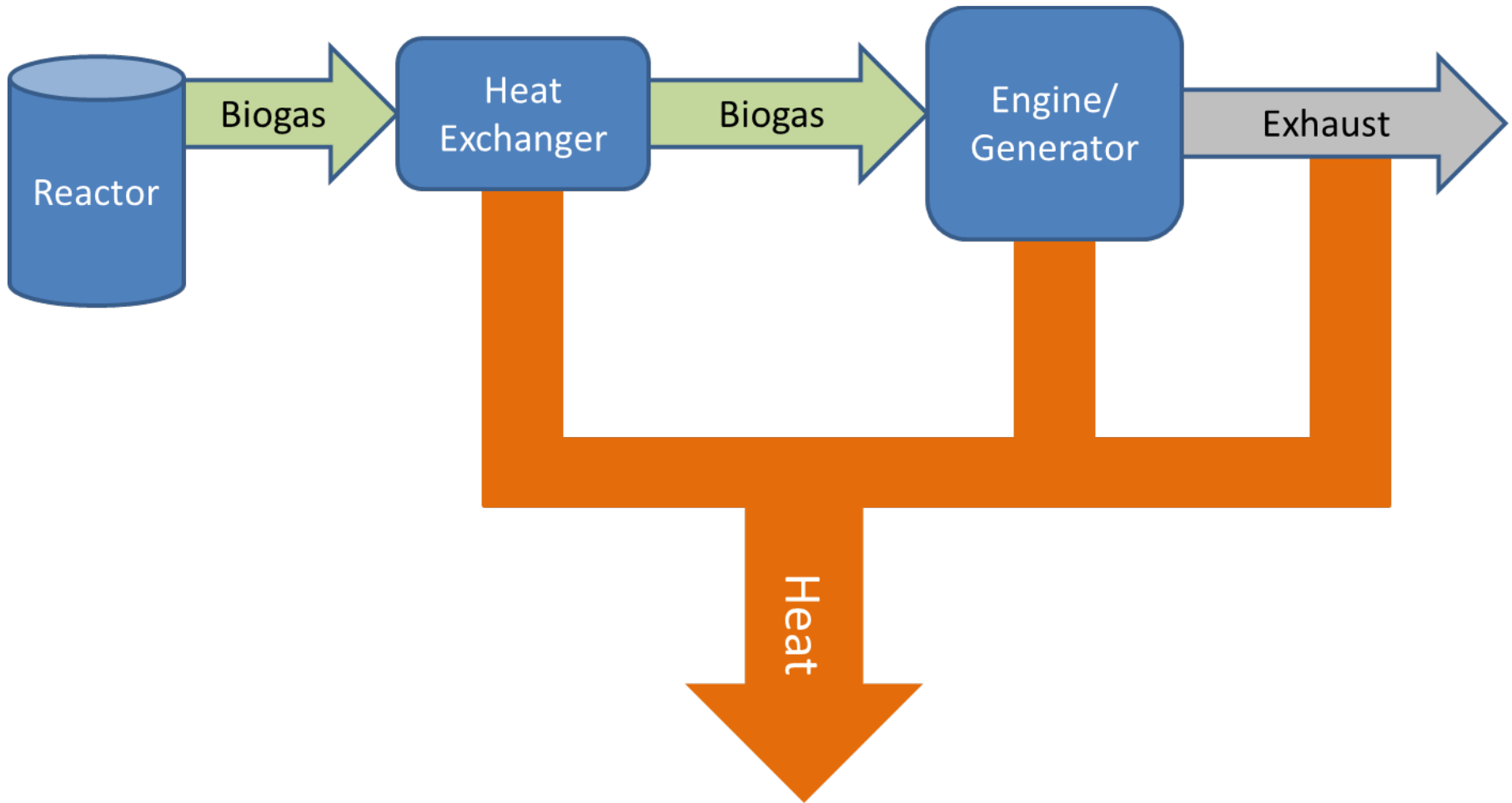
# Wood Gasification



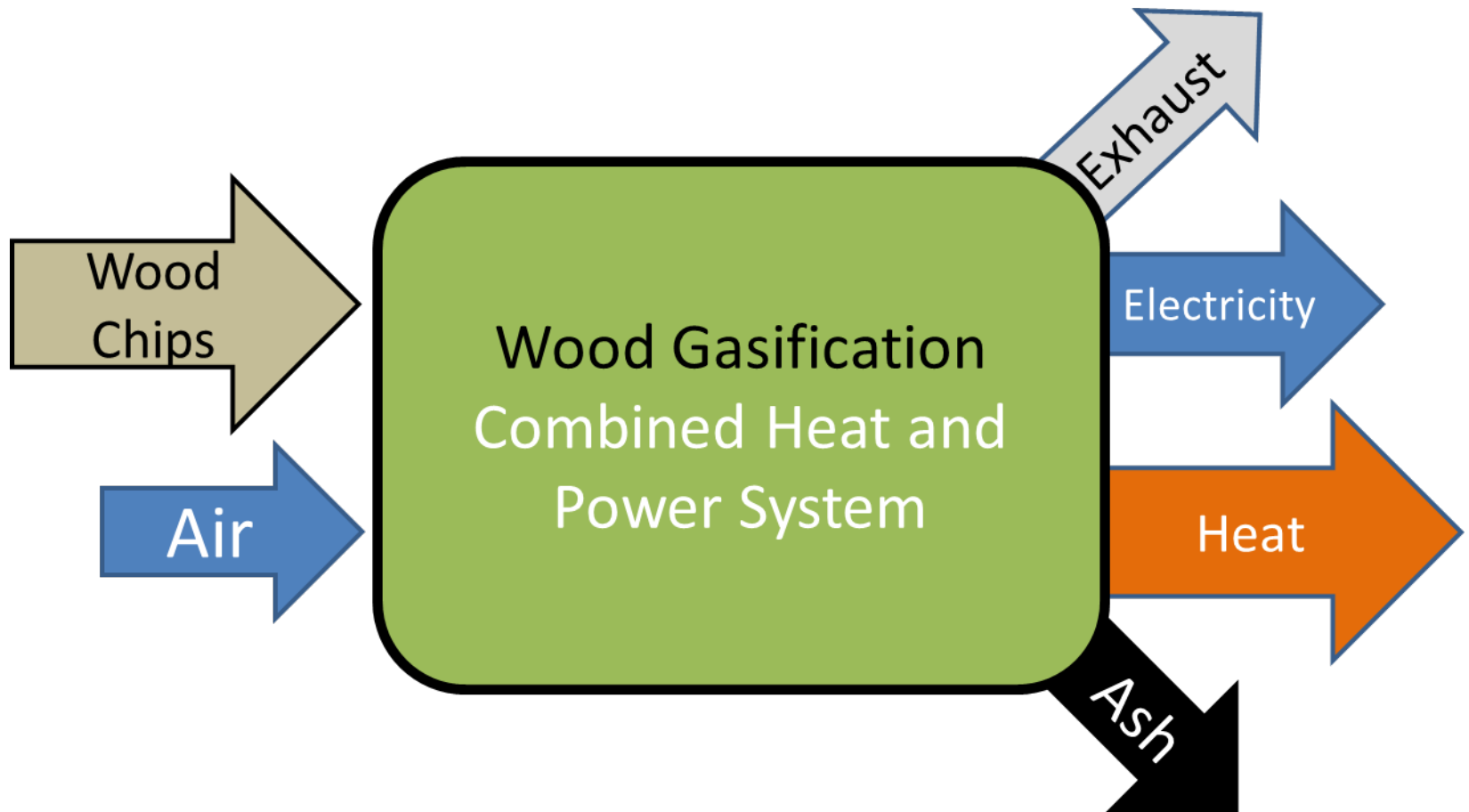
# Wood Gas Combustion



# Combined Heat and Power



# Overall Operation



# Emissions – PM 2.5

- Pounds PM 2.5 per ton wood consumed
  - Hydronic Heater – **64 lb/ton**
  - EPA Certified Wood Stove – **8.76 lb/ton**
  - Pellet Stove – **3 lb/ton**
- **Wood Gasification CHP - 0.01 lb/ton**

# Economics - Railbelt

- **\$37,500 energy savings per year**
  - Production - **\$87,500** per year @ 80% utilization
    - 40kW = 280,000 kWh = **\$50,000** per year
      - (\$0.18 per kWh)
    - 340,000 BTU/hr = 2,380 MMBTU = **\$37,500** per year
      - (\$2.05 per gal #1 Oil)
  - Costs - **\$50,000** per year
    - 300 tons wood = **\$30,000** per year
      - (\$100 per dry ton)
    - **\$20,000** Operations and Maintenance

# Economics - Rural

- **\$146,000 energy savings per year**
  - Production - **\$206,000** per year @ 80% utilization
    - 40kW = 280,000 kWh = **\$126,000** per year
      - (\$0.45 per kWh)
    - 340,000 BTU/hr = 2,380 MMBTU = **\$90,000** per year
      - (\$5 per gal #1 Oil)
  - Costs - **\$60,000** per year
    - 300 tons wood = **\$30,000** per year
      - (\$100 per dry ton)
    - **\$30,000** Operations and Maintenance



# Economic Impact - FNSB

- Reduced utility costs at appropriate installations
- Sales and service
  - Distributorships
  - Maintenance Technicians
- Wood fuel production
  - Downed trees harvest
  - Fire mitigation
  - \$7-10 million annual sales possible

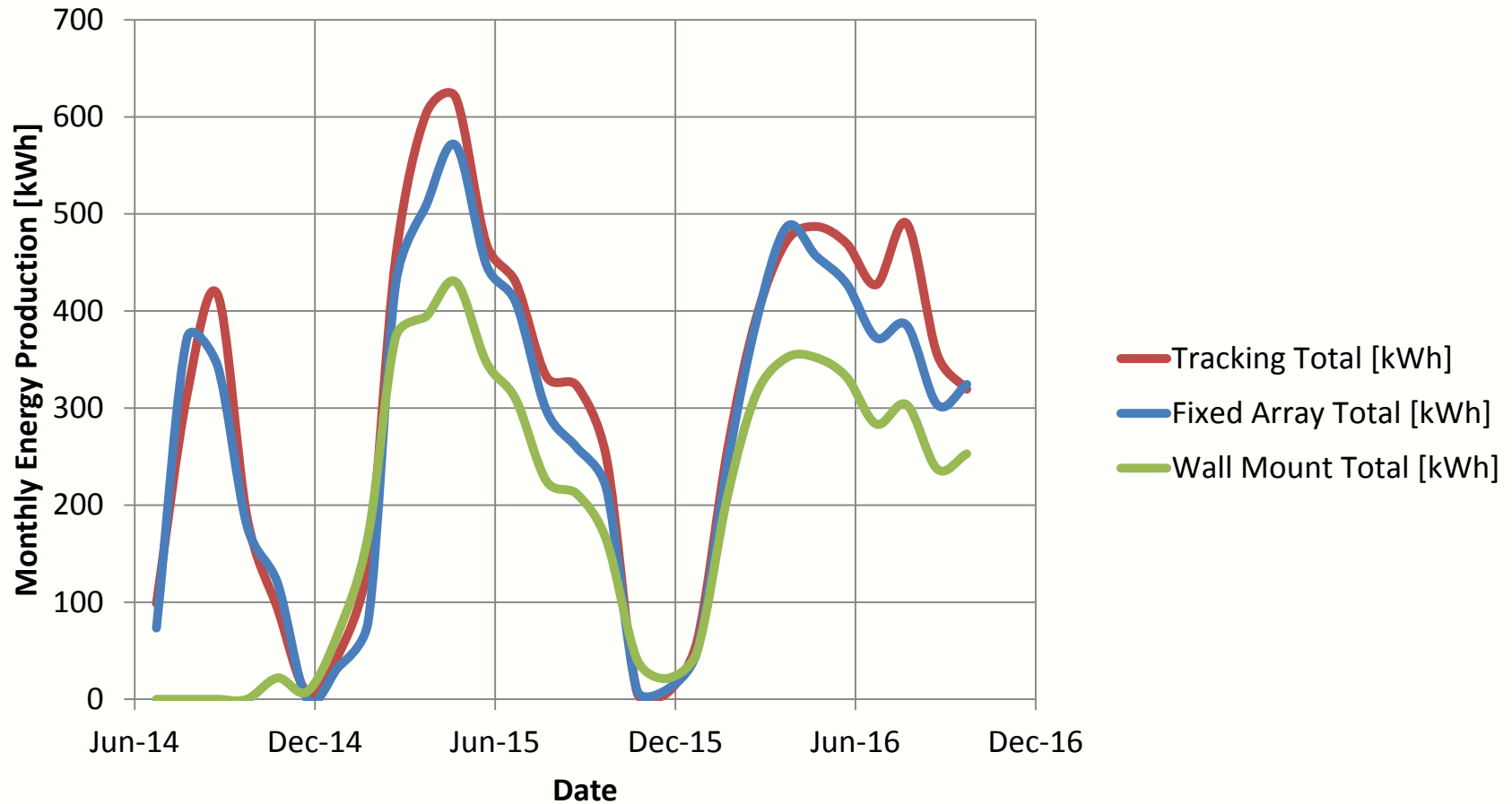


# Questions



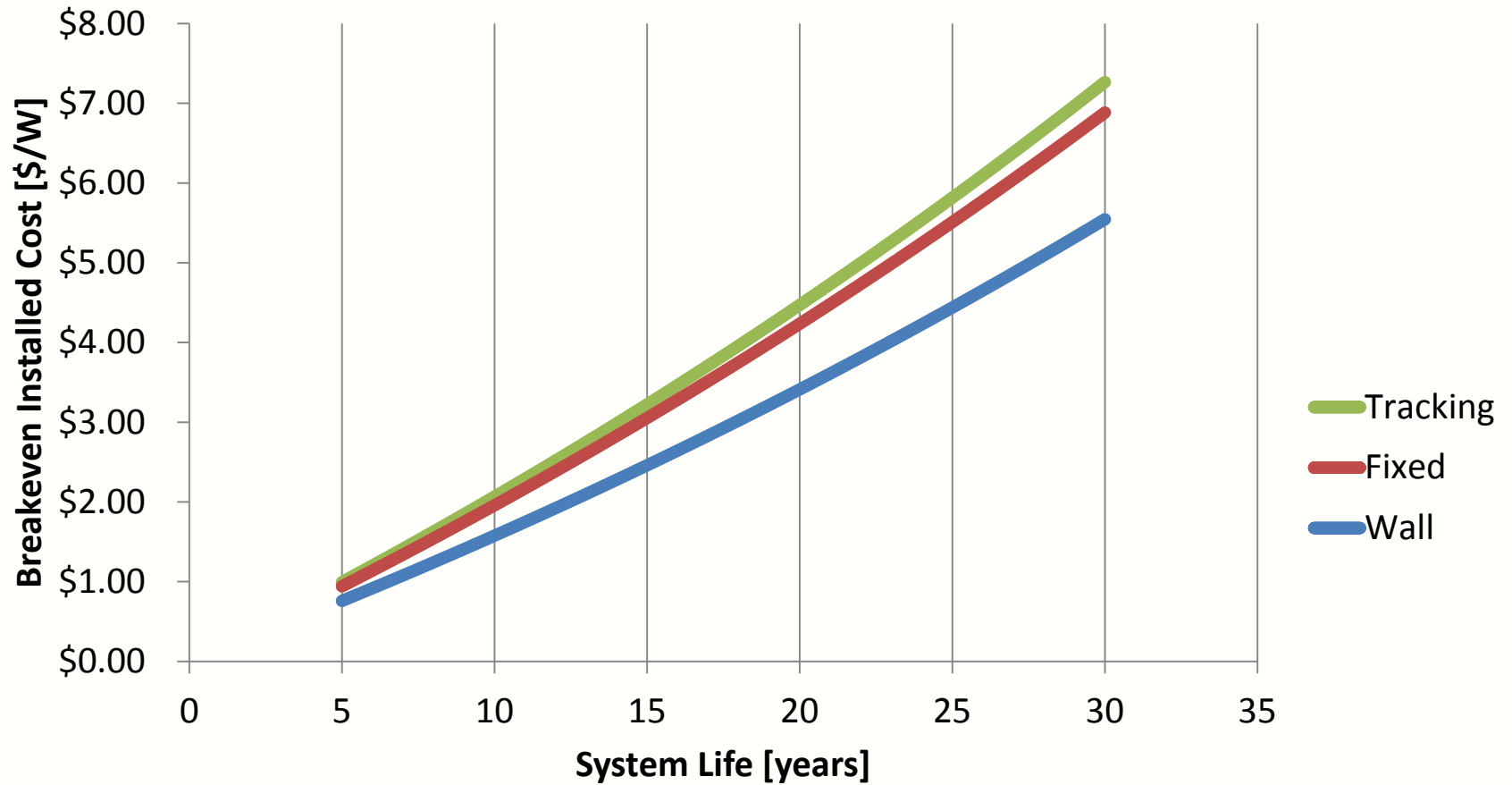
# Energy Efficiency Upgrades

## Solar Photovoltaic – North Pole Library



# Energy Efficiency Upgrades

## Solar Photovoltaic Breakeven Costs



Electricity Cost Escalation: 2%

Panel Performance Degradation: -0.5%

# Energy Efficiency Upgrades

## Heat Pump Breakeven Performance

