DOE OFFICE OF INDIAN ENERGY

Introduction to Biomass for Commercial-Scale Applications

Presented by the National Renewable Energy Laboratory

U.S. DEPARTMENT OF ENERGY | Office of Indian Energy

Biomass Presenters

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Presentation Outline

- Intro to Bioenergy and Project Considerations
- Feedstocks
- Technology Overview
- Approximate costs of bio-energy

Introduction to Biomass Energy

- Biomass can be used for renewable energy generation
- Considered carbon-neutral in the near-term
- It's a base-load (dispatchable) source of power and heat
- Intermediate products include pellets and torrefied biomass

Source: NREL/PIX 16161

Intro to Biomass, continued

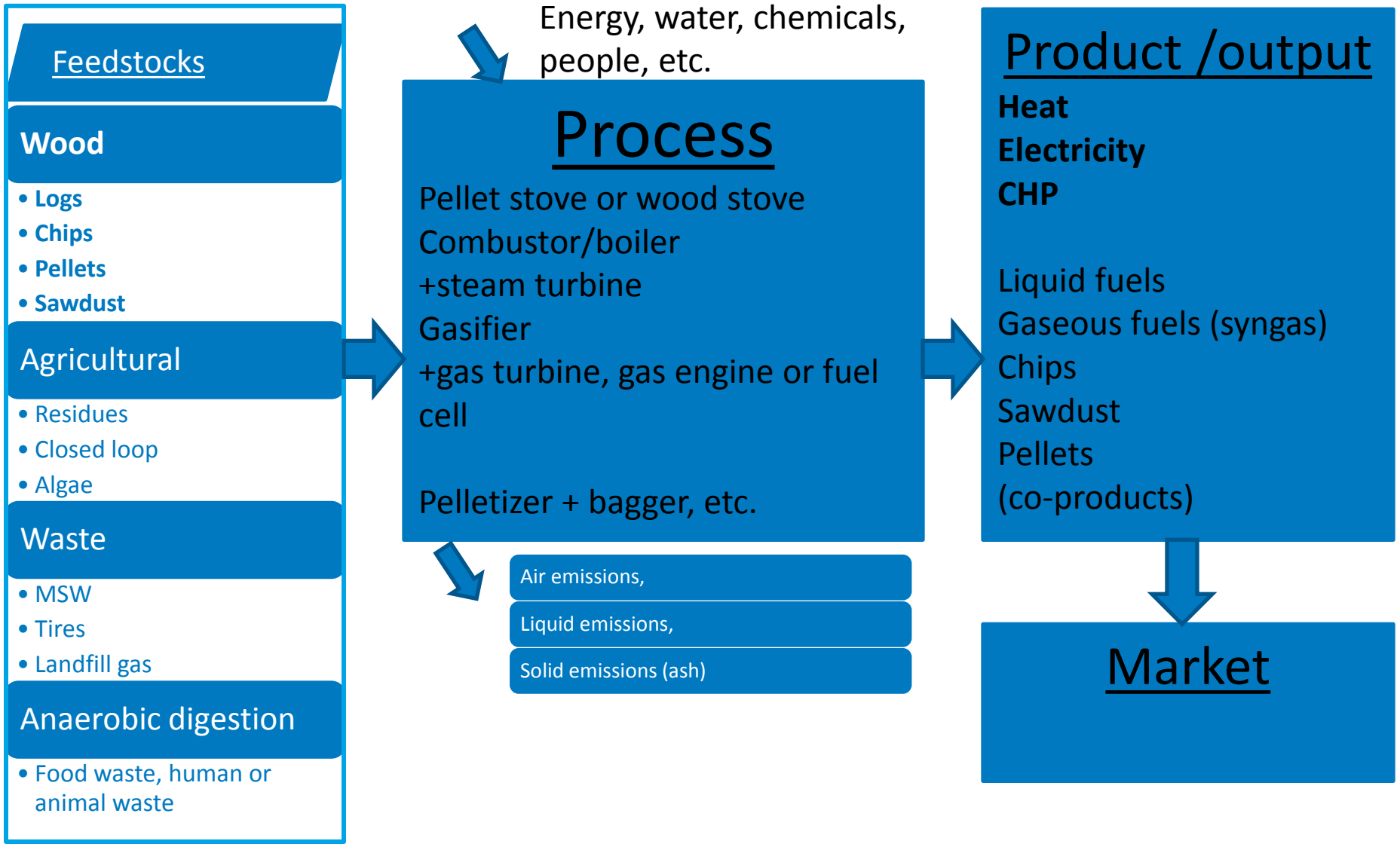
- Reliability and cost of biomass supply is critical
- Commercial, proven technologies
- New, highly-efficient technologies making headway in U.S. and around the world

Biomass Heat Exchanger
NREL/PIX 03447

Commercial Scale

- Commercial scale biomass electric power plants range in size from about 10 megawatts (MW) to 100 MW
- Fuel form factors include:
  - Whole-tree
  - Chips
  - Pellets
  - Bales (agricultural residues)
- Waste-to-energy
  - MSW-mass burn
  - MSW-RDF
  - Landfill gas
  - Anaerobic digestion
- Combined heat and power (CHP) is best!
  - Most efficient
  - Best economics
  - Requires a steam load (host)

Bioenergy Project Considerations



Biomass Resources in the United States

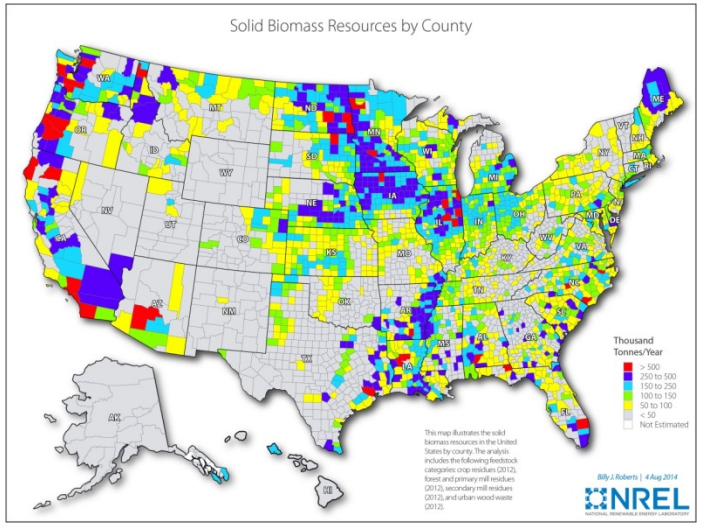
Crop residues
- Harvesting residues
- Processing residues

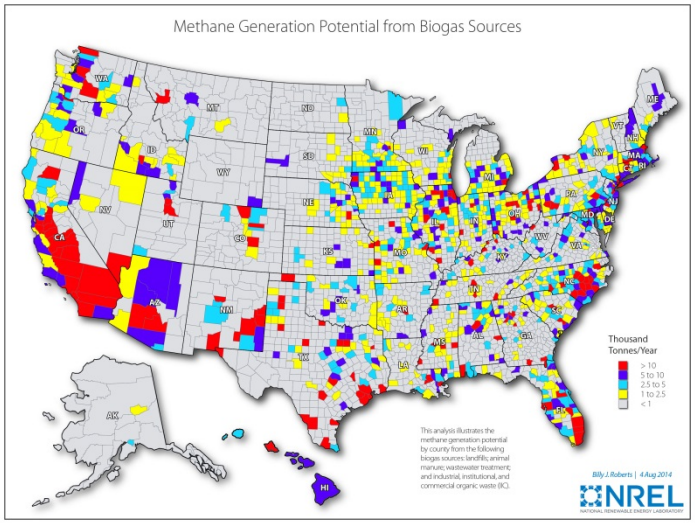
Wood residues
- Forest residues
- Primary mill residues
- Secondary mill residues
- Urban wood waste

Lipid-based feedstock
- Vegetable oils
- Animal fats
- Greases
- Algae

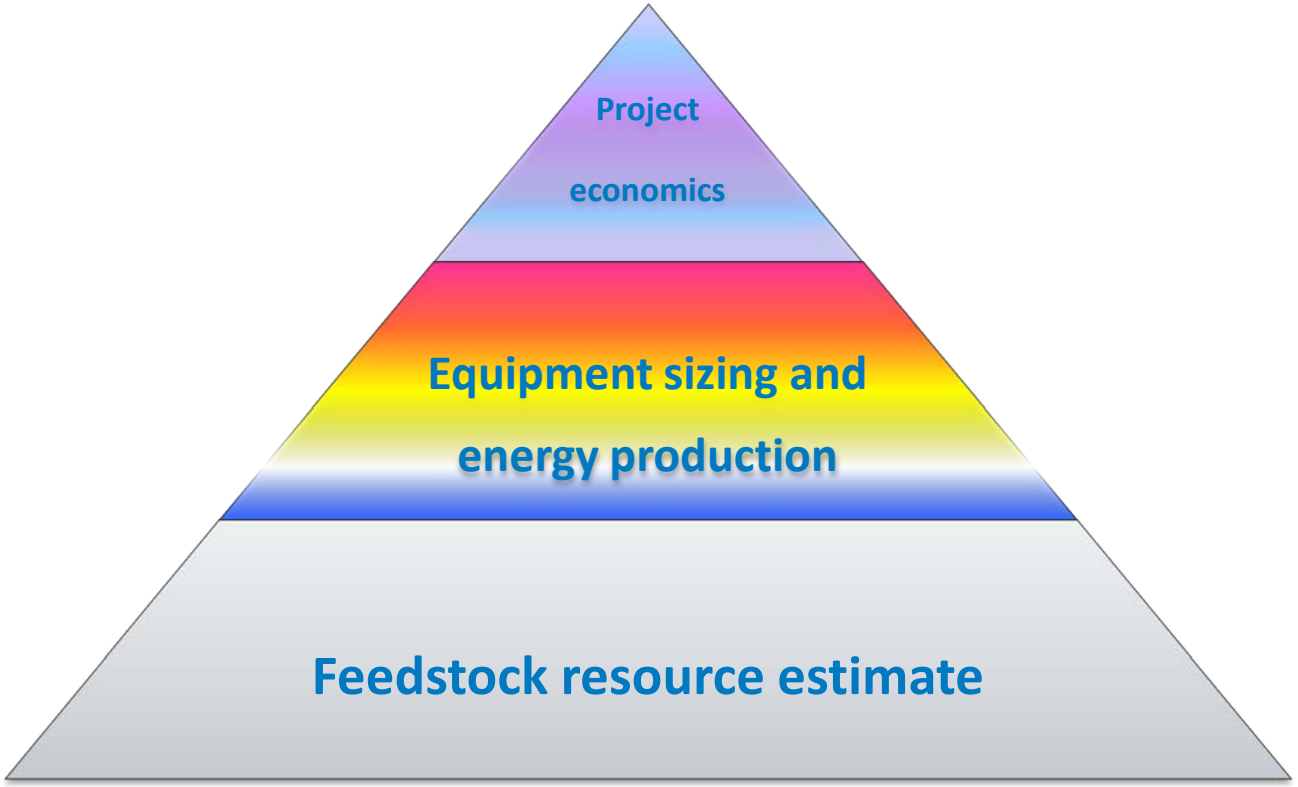
Biogas/Biomethane
- Landfills
- Animal manure
- Wastewater treatment
- Industrial, institutional, and commercial organic waste (e.g. food waste).

More information available at
http://www.nrel.gov/gis/biomass.html



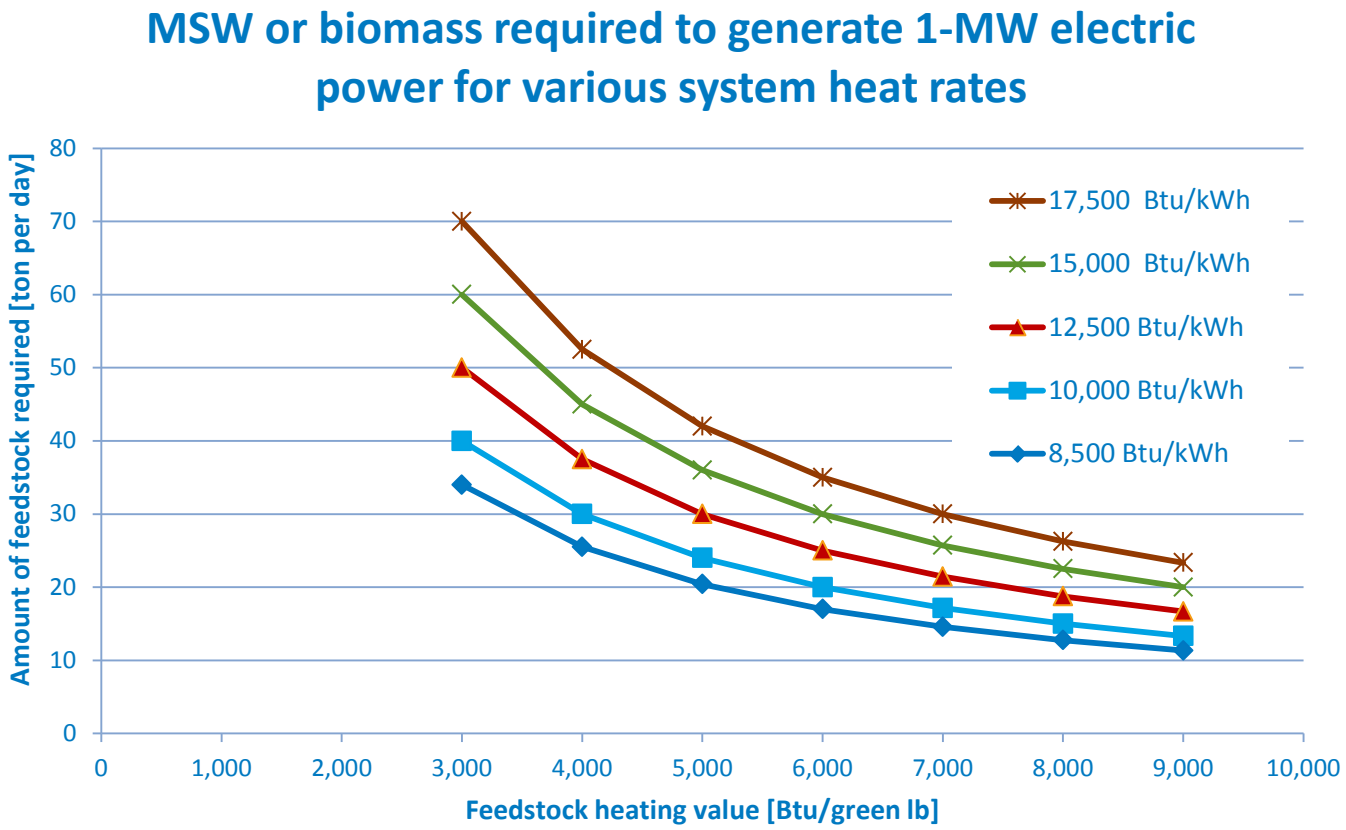


Bioenergy Pyramid



An accurate feedstock resource determination is the basis for estimating the performance and economics of a biomass project.

Capacity Sizing Chart



Tons per day at various heat rates and energy contents to generate 1 MW gross (electric only)

Biomass Costs - Electric

- Installed costs $1,700 - $5,500/kilowatt (kW)
- Larger systems have better economics than small systems
- LCOE = $0.08 - $0.20/kilowatt-hour (kWh)
- A typical biopower scale for a tribal or community application would probably be about 10 MW, and cost ~$40 M
- LCOE could be $0.10 - 0.12/kWh
  - This strongly depends on feedstock cost