# Forest Thermal Energy 101

A Primer on Creating Heat from Forest Biomass and Other Materials in Colorado

Photo courtesy of Scott Golden, Boulder County Parks and Open Space

# Discussion Topics

1. What is Forest Energy?
2. Forest Thermal Energy in CO
3. Thermal vs. Electric
4. Pros and Cons
5. Challenges
6. Colorado's Renewable Energy Std.
7. Other Incentives

# 1. What is Forest Energy?

Defined, **Forest Energy** is produced when forest biomass and other residual materials are converted into energy.

Raw materials for making forest energy can be harvested from the forests or recovered during the course of wood product manufacturing.

# 1. What is Forest Energy?

Forest energy can be take several forms:

1. Electrical (Power) Generation
2. Thermal (Heat) Generation
3. Liquid Fuel Generation

Some processes can produce these forms in combination (e.g., CHP, biochemical plants, etc.).

# 1. What is Forest Energy?

**Forest thermal energy** is the conversion of wood or wood with other materials to produce heat.

Forest thermal energy sources include traditional products like firewood, wood chips, charcoal, etc.

Other sources include products such as wood pellets and blended “fire logs,” etc.

# 2. Forest Thermal Energy in Colorado

Colorado consumes modest quantities of forest thermal energy, though totals are hard to determine.

Ex. In 2000, Colorado consumed an estimated 30,000 cords of firewood, with some (33%) imported.

(A cord is a volume measuring 8 feet x 4 feet x 4 feet. For firewood, a cord includes gaps between logs.)

# 2. Forest Thermal Energy in Colorado

In the early 1980s, however, Colorado consumed roughly 1.1 million cords of firewood *annually*.

In 1999, Colorado imported 1.2 million fire logs. (Laid end-to-end, these would stretch from Denver to GJ.)

In 1999, wood pellet consumption state-wide was estimated to be up to 60,000 tons.

# 3. Thermal vs. Electric

Consumption rates for producing electric can vary as do the sizes of installations.

A good, general rule is that every 1 MWe (megawatt of electricity) will require 1 dry ton of forest biomass per hour.

One MW will power between 750 and 1,000* homes.

# 3. Thermal vs. Electric

Thermal installations are even more varied, ranging from fireplaces to large-scale installations.

An average-sized home in Colorado will consume about 2 cords of firewood per year.

Larger district heating plants will consume more.

# 3. Thermal vs. Electric

| Location: | Boulder County Parks & Open Space | Boulder County Jail |
|---|---|---|
| **Size:** | 95,000 sq ft | 109,208 sq ft |
| **Need:** | Heat | Heat and hot water |
| **Payback:** | 12 years | Shorter (due to heat and hot water use) |

# 3. Thermal vs. Electric

## Gypsum Biomass CHP Plant

Scale: 11.5 MW Power Plant
(10 MW to be sold, rest on-site)

Use: Power for roughly 10,000 homes

# 3. Thermal vs. Electric

| Location: | Boulder County Facilities | Gypsum Biomass Power Plant |
|---|---|---|
| Acres/Yr: | 100 to 200 | About 1,500 |
| Tons/Yr: | 1,500 to 1,600 | About 70,000 |

(Cost savings for the Boulder County facilities are roughly $40,000 per year over natural gas costs.)

# 4. Forest Thermal Energy: Pros

Positive attributes for forest thermal energy include:

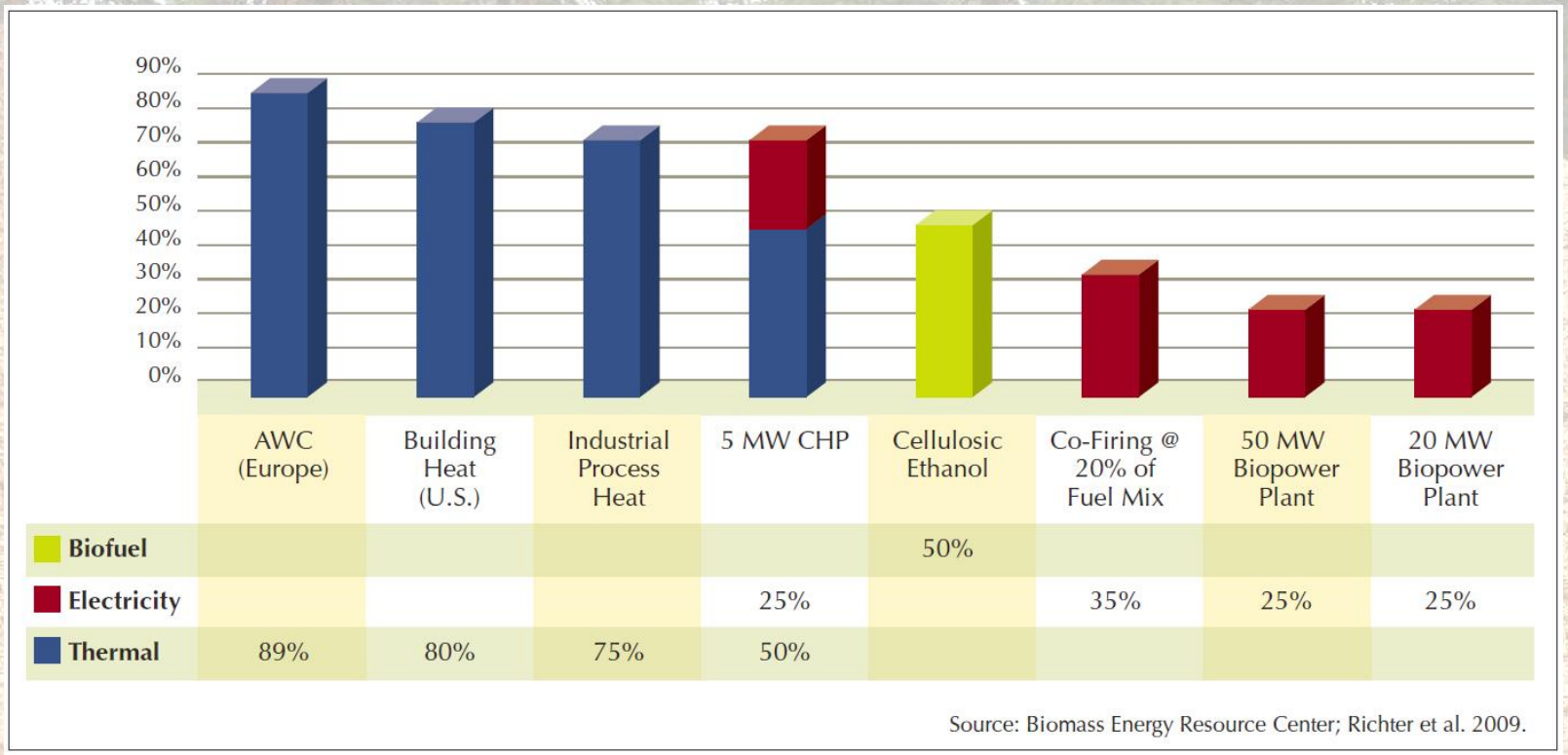
- Technology is highly efficient.
- Can offset our demand for fossil fuels.
- Residues can be used as soil amendments.

# 4. Forest Thermal Energy: Pros

Positive attributes for forest thermal energy include:

- Emissions are cleaner than wildfire smoke.
- Forest biomass is the only renewable energy source that can hurt us when we don't use it.

## 4. Forest Thermal Energy: Pros




| | AWC (Europe) | Building Heat (U.S.) | Industrial Process Heat | 5 MW CHP | Cellulosic Ethanol | Co-Firing @ 20% of Fuel Mix | 50 MW Biopower Plant | 20 MW Biopower Plant |
|---|---|---|---|---|---|---|---|---|
| Biofuel | | | | | 50% | | | |
| Electricity | | | | 25% | | 35% | 25% | 25% |
| Thermal | 89% | 80% | 75% | 50% | | | | |

Source: Biomass Energy Resource Center; Richter et al. 2009.

# 4. Forest Thermal Energy: Cons

Negative attributes for forest thermal energy include:

- Removals can be prohibitively expensive.
- Fuel supply requires on-site space (i.e. storage).

# 4. Forest Thermal Energy: Cons

Negative attributes for forest thermal energy include:

- Lower-value use (vs. animal bedding, solid-sawn products, etc.)
- Due to nature of technology, forest thermal is not as easy to use as natural gas / propane.

# 5. Challenges

Some challenges to forest thermal energy include:

- Persistent (record) low prices for natural gas
- Lack of parity (e.g. fossil fuel subsidies, production tax credit imbalance, etc.)

# 5. Challenges

Some challenges to forest thermal energy include:

- Lack of public understanding / support for industry
- Wood used for energy can't be used for other products (e.g., BCAP)

# 6. Colorado's Renewable Energy Std.

Requires utilities to produce a percentage of electricity from renewables by a given date, including distributed generation carve-outs.

Forest biomass is included in Colorado's RES (RPS) but only for electricity.

Includes credit multipliers, too. (e.g., solar = 300%)

# 7. Other Incentives

Incentives are available in several forms, including:

- Tax-Based (Sales, Production, Property Taxes, etc.)
- Cost-Share Programs, Grants and Rebates

# 7. Other Incentives

Incentives are available in several forms, including:

- Financing (Bonds, Loans, Contracting, etc.)
- Policy (Renewable Thermal Standard, Energy Codes / Planning, Purchase Agreements, etc.)

# 7. Other Incentives

Some possible strategies include:

- Foster greater public-private partnerships
- Education / Outreach (point-of-purchase displays, branding [e.g., Colorado Forest Products], etc.)
- Greater public inclusion (wood stove exchanges, firewood for WUI)

# Thank you!

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