



Environmental Impacts of Technology

The Production of Electricity *Power from Biomass*



Image Source: National Agroforestry Center, Canada

Power from Biomass

How does it work?

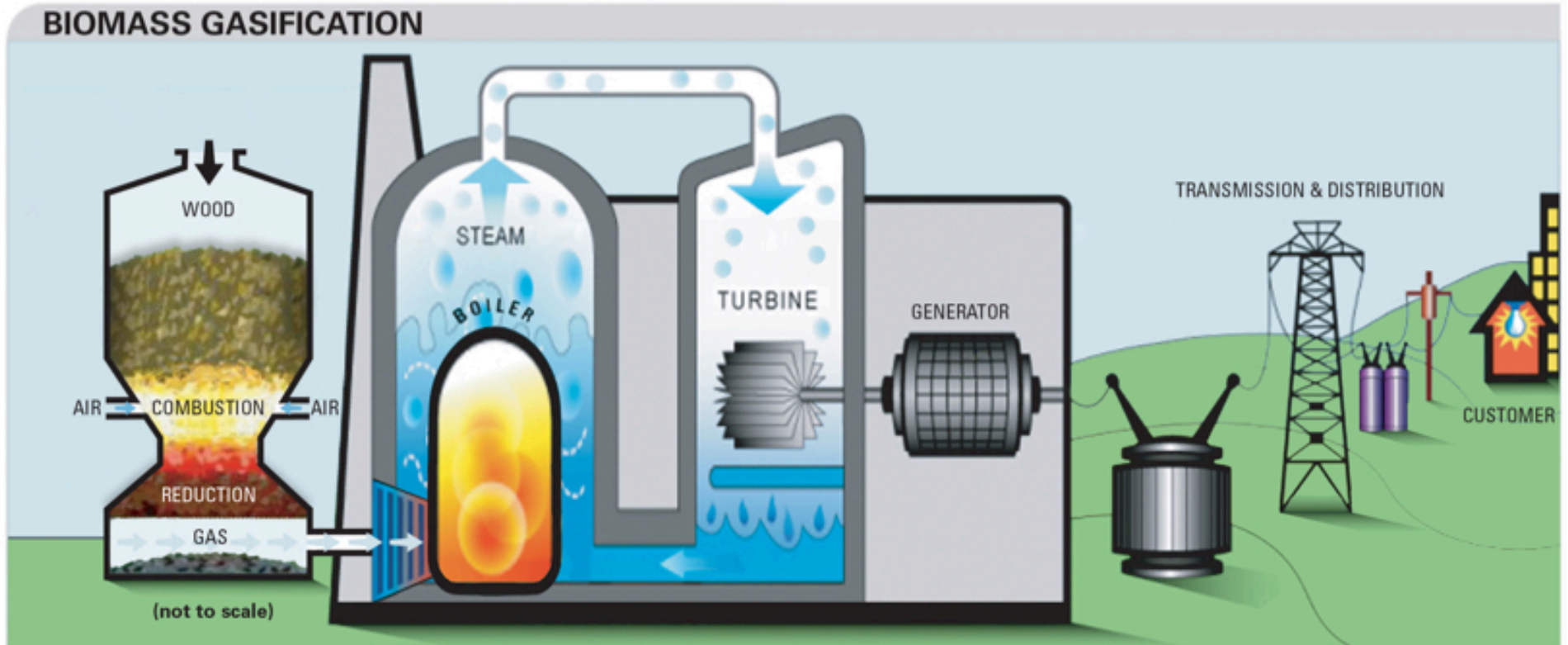
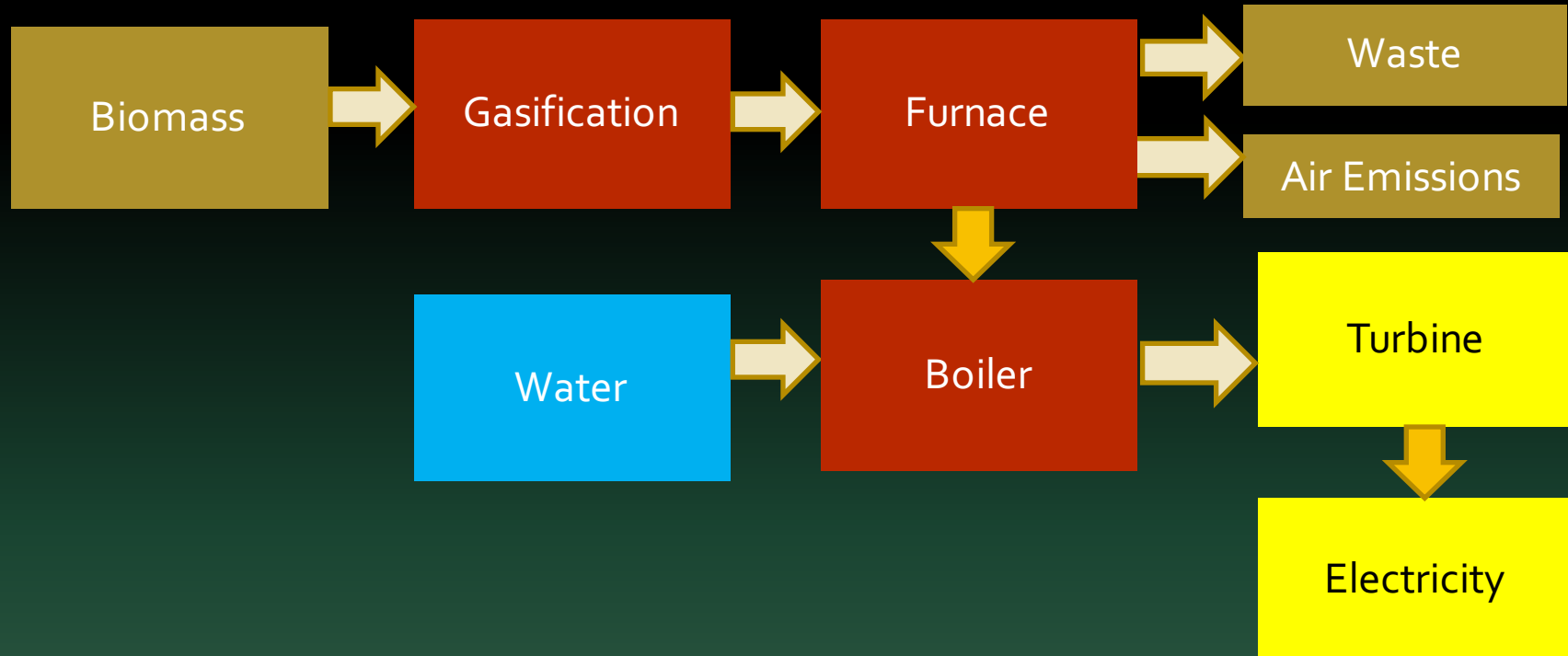


Image source: <http://biomassbess.weebly.com/scientist.html>

Power from Biomass

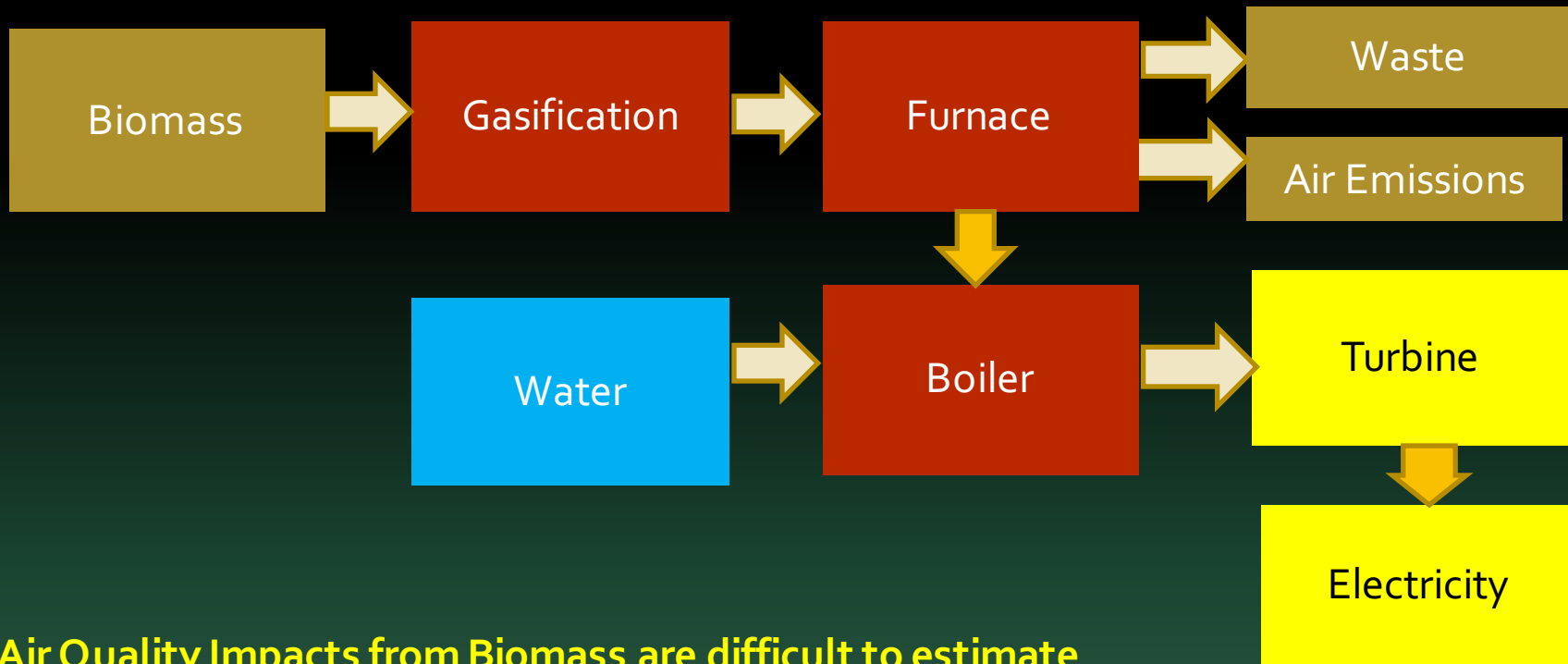
How does it work?



1. Wood or other forest and agricultural products are reacted at high temperatures without combustion to produce a synthetic gas.
2. The synthetic gas is burned to produce heat .
3. The heat converts water to steam in a boiler.
4. Steam turns the blades of a turbine.
5. The rotating turbine produces electricity.

Power from Biomass

How does it impact the environment?

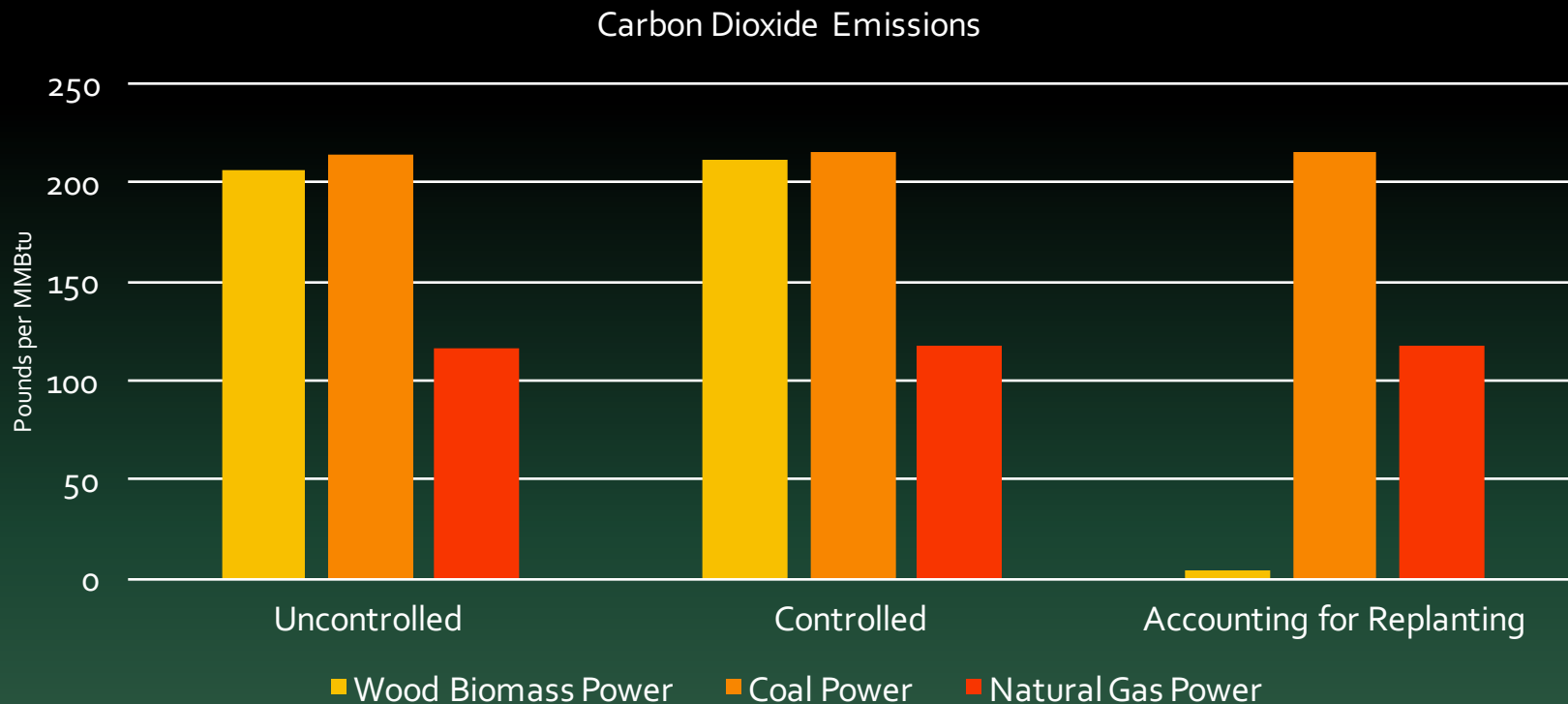


Air Quality Impacts from Biomass are difficult to estimate

- On the one hand, biomass power plants can emit more nitrous oxides, carbon monoxide, and particulate matter than many coal burning plants.
- On the other hand, when compared to the alternative fate for biomass, burning biomass for electricity produces a net gain. For example, open burning of wood and agricultural products produces much more carbon monoxide, nitrous oxides, particulate matter, and total hydrocarbons than using that same biomass to produce electricity.

Power from Biomass

How does it impact the environment?

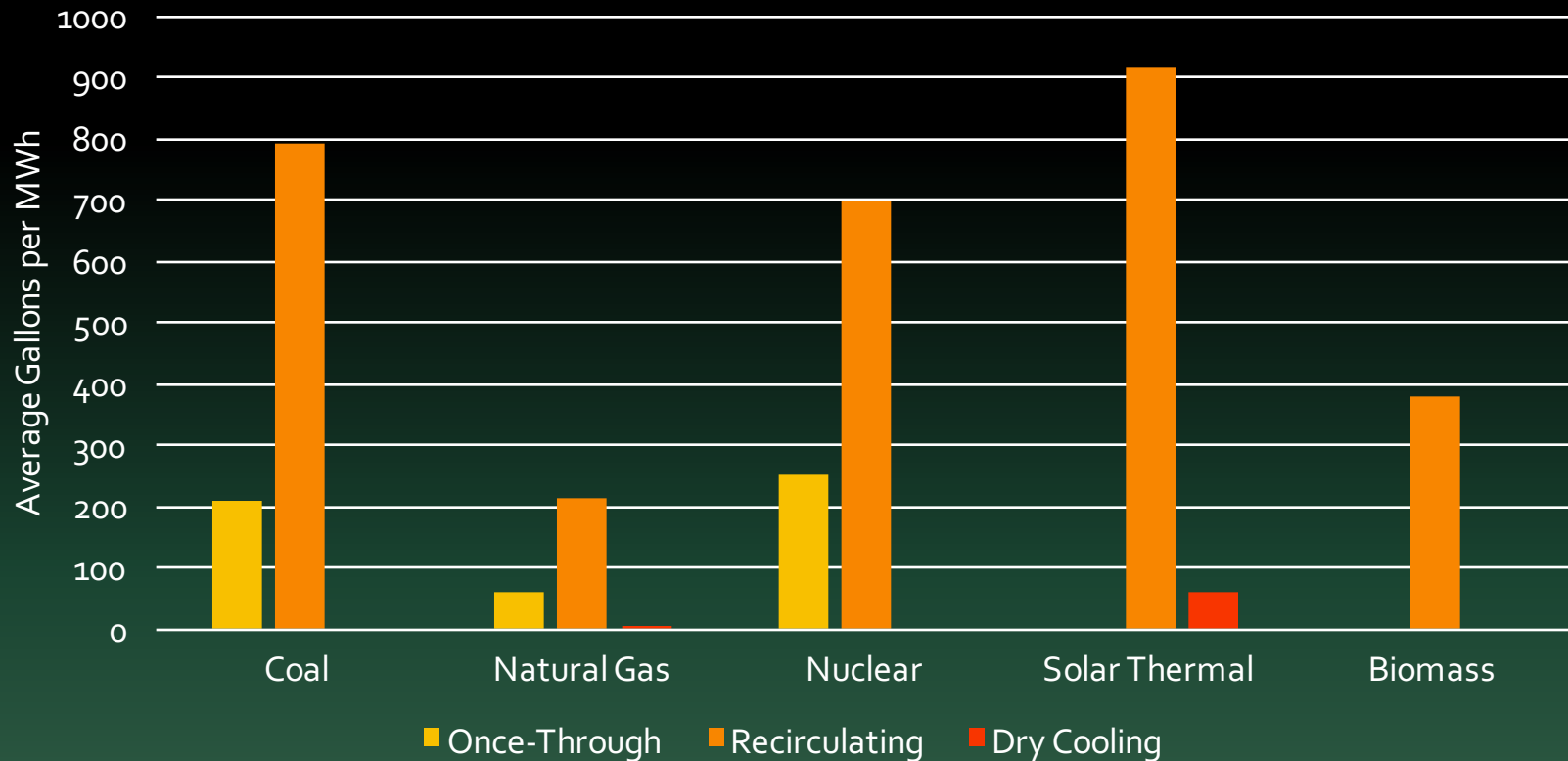


As is the case with air pollution generated by using biomass for electricity, Greenhouse Gas Emissions are also complicated and depend on:

- Whether carbon neutral carbon dioxide is considered (i.e. the carbon dioxide that is absorbed by replacement forest or agricultural product).
- Whether burning and emissions in a power plant are controlled or uncontrolled.

Power from Biomass

How does it impact the environment?



Like other thermoelectric plants (e.g. coal, natural gas), biomass power plants withdraw water from local water supplies to heat into steam and drive turbines to produce electricity. Depending on the type of plant, the amount of water actually consumed (and not returned to the local water supplies) in this process varies with the approach used to circulate and cool water in the plant.

Power from Biomass

How does it impact the environment?



Image Source: Brian Stansberry

Other Impacts

- Land Usage: Biomass plants typically have a footprint of 10-100 acres, similar to other thermoelectric plants (e.g. coal, natural gas).
- Waste Ash: Burning wood and agricultural products typically produces no toxic waste, although burning municipal solid waste (garbage) can produce toxic ash.

Power from Biomass

Why does the U.S. use biomass for electricity?

Biomass accounts for only 2% of total electricity in the United States and the most popular biomass products for electricity are lumber, agricultural or wood wastes. Burning biomass reduces landfill volume but has mixed environmental impacts.

Biomass
Power
Plants in the
U.S.

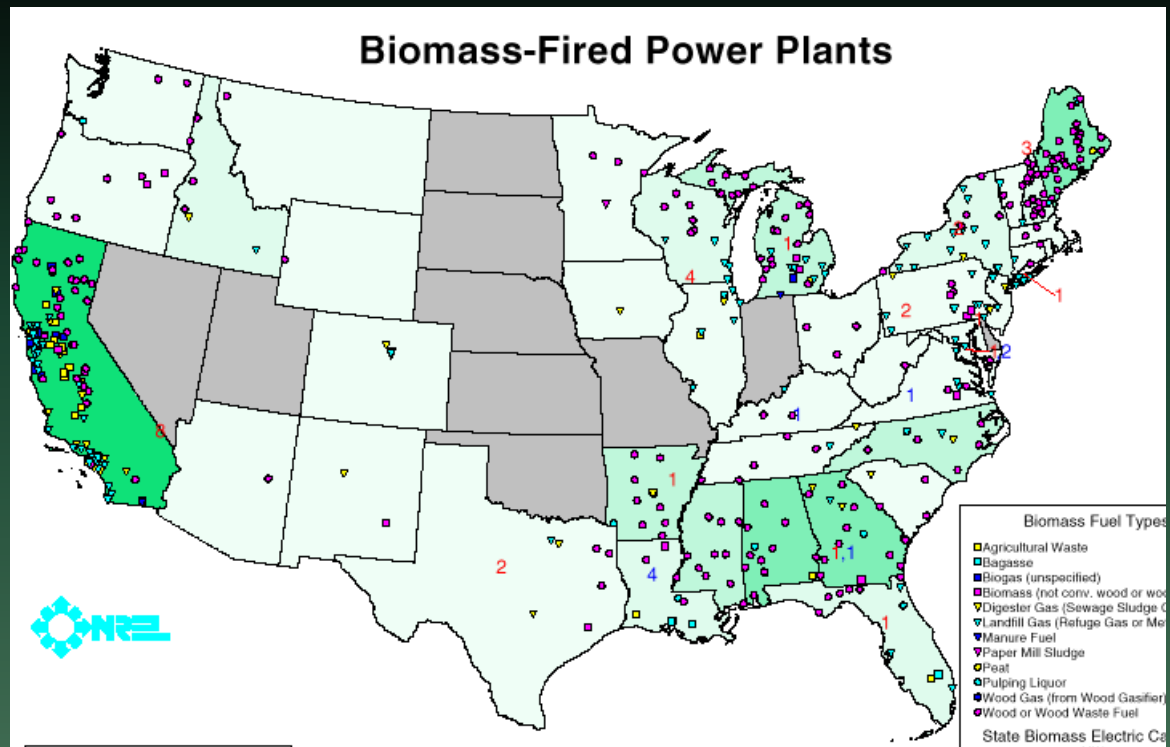
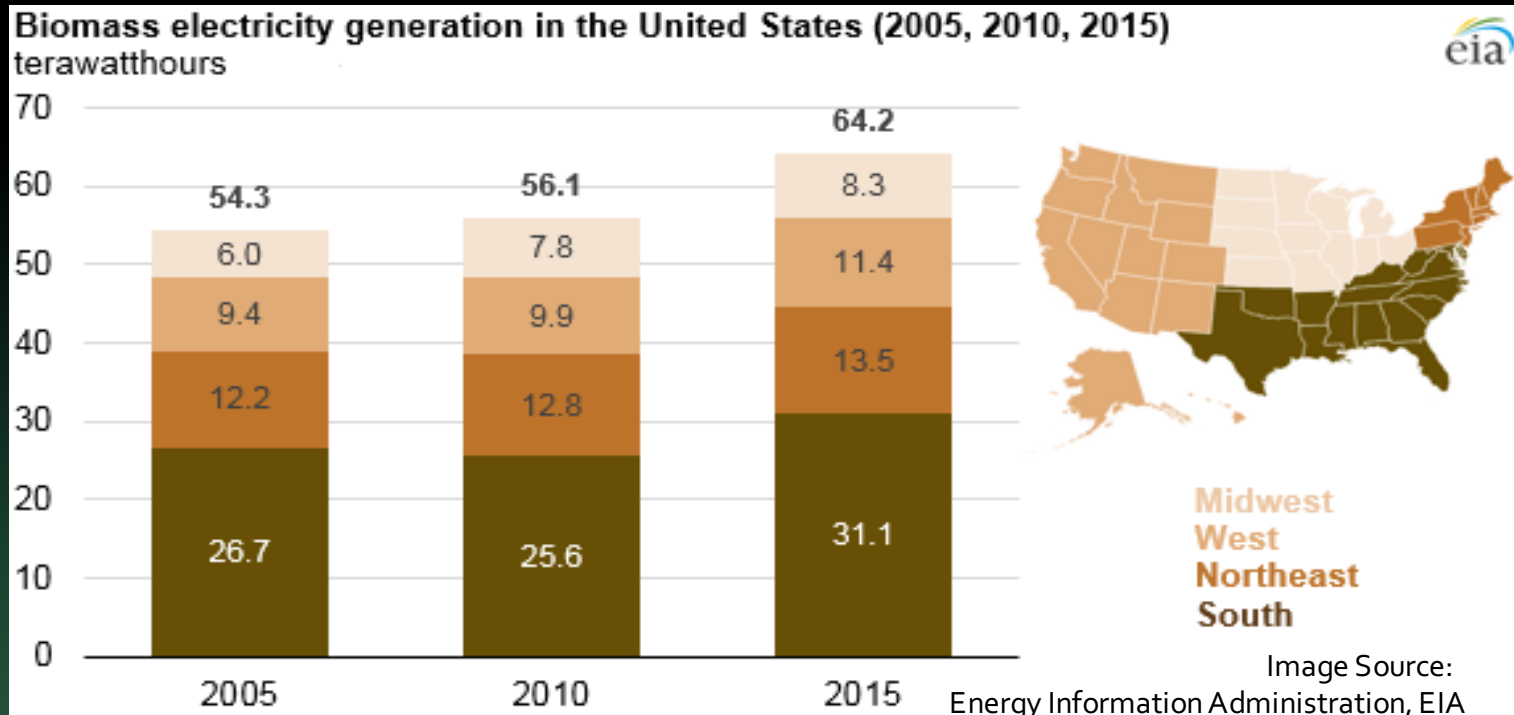


Image Source: NREL

Power from Biomass

What's next for the U.S.?



Biomass for electricity continues to increase over time, with the American Southeast leading the way. However, this form of renewable energy production is not growing as quickly as other forms of renewable energy like wind energy, which is less controversial in terms of net air quality and greenhouse gas impact.



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Additional Impacts

<http://comingalongside.org/Technology/>

<http://labs.ee.washington.edu/community/EnvironmentallImpacts/>