

Biomass Electricity



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Agenda

- 1. Introduction
- 2. Conversion Process
- 3. Environmental Impact
- 4. Benefits for the US
- 5. The Future of Biomass Electricity

What Is Biomass?

“The term ‘biomass’ means any plant derived organic matter available on a renewable basis, including dedicated energy crops and trees, agricultural food and feed crops, agricultural crop wastes and residues, wood wastes and residues, aquatic plants, animal wastes, municipal wastes, and other waste materials.”

- US DoE



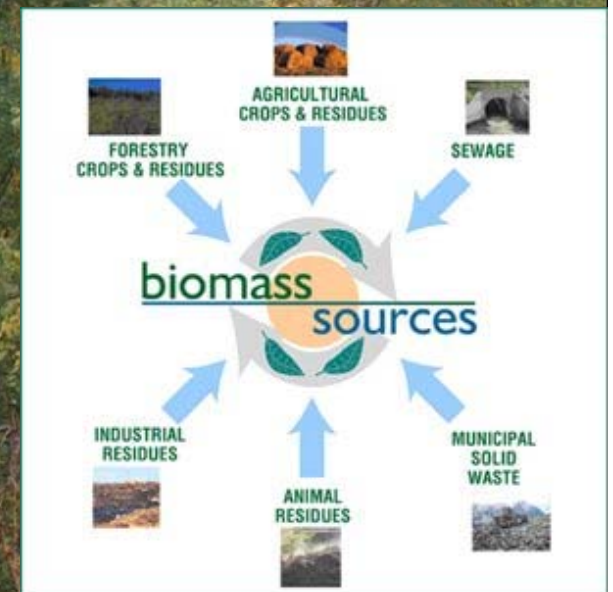
Corn



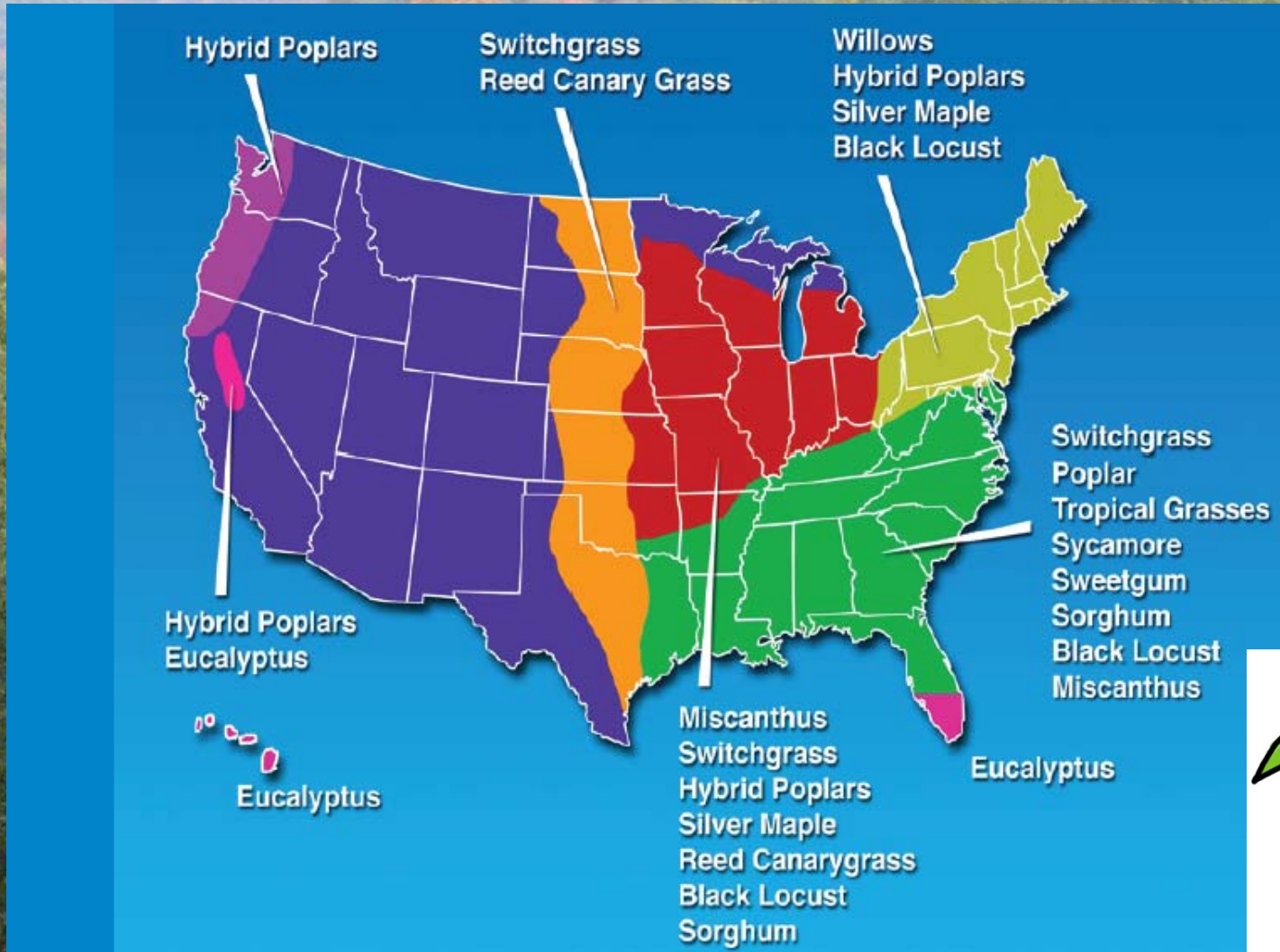
Eucalyptus



Willow



Cellulosic Biomass Sources by Region



Herbaceous and wood crop possibilities as suggested by the Department of Energy in 2006.

How is Biomass Used?

“Bioenergy technologies use renewable biomass resources to produce an array of energy related products including electricity, liquid, solid, and gaseous fuels, heat, chemicals, and other materials. Bioenergy ranks second (to hydropower) in renewable U.S. primary energy production and accounts for three percent of the primary energy production in the United States.” – US DOE



Biomass Electricity Generation



The Conversion Process

- Thermal Conversion
 - Combustion → Torrefaction → Pyrolysis → Gasification
- Chemical Conversion
 - A variety of different conversion processes used
- Biochemical Conversion
 - Enzymatic reactions and natural processes

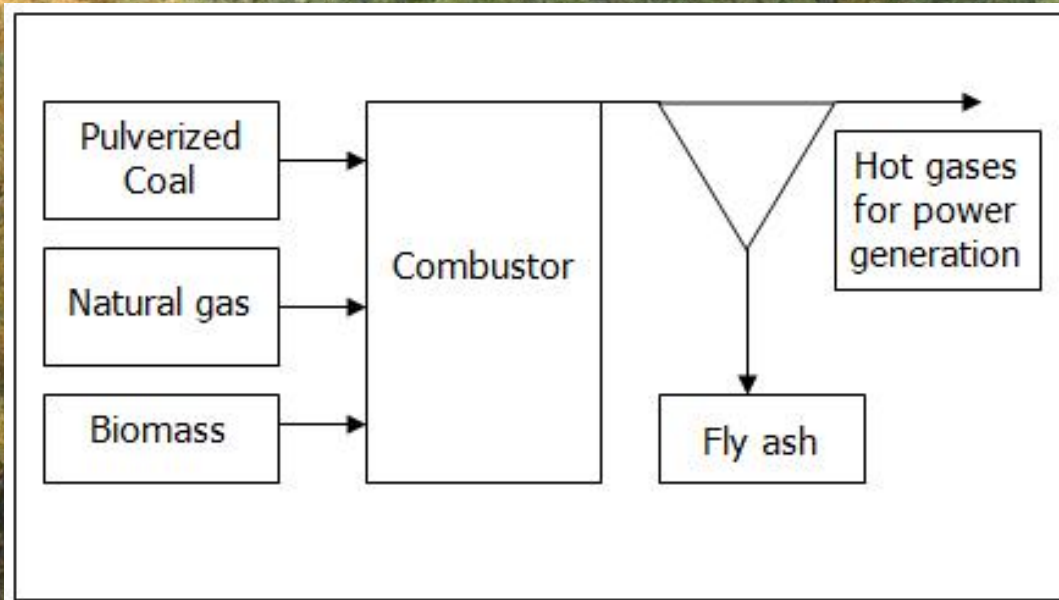
Biomass Cofiring

- Simultaneous combustion of a biomass fuel and a base fuel to produce energy.
- Great potential as a “bridge-technology:” provides low-cost, low-risk method of cutting GHG emissions and reducing overall fossil fuel use.
- Direct & indirect cofiring methods



Biomass Cofiring: Process

- Biomass feedstock is collected, processed & prepared. Coal & biomass mixture is fed into a modified coal-fired power plant in a blended delivery system.

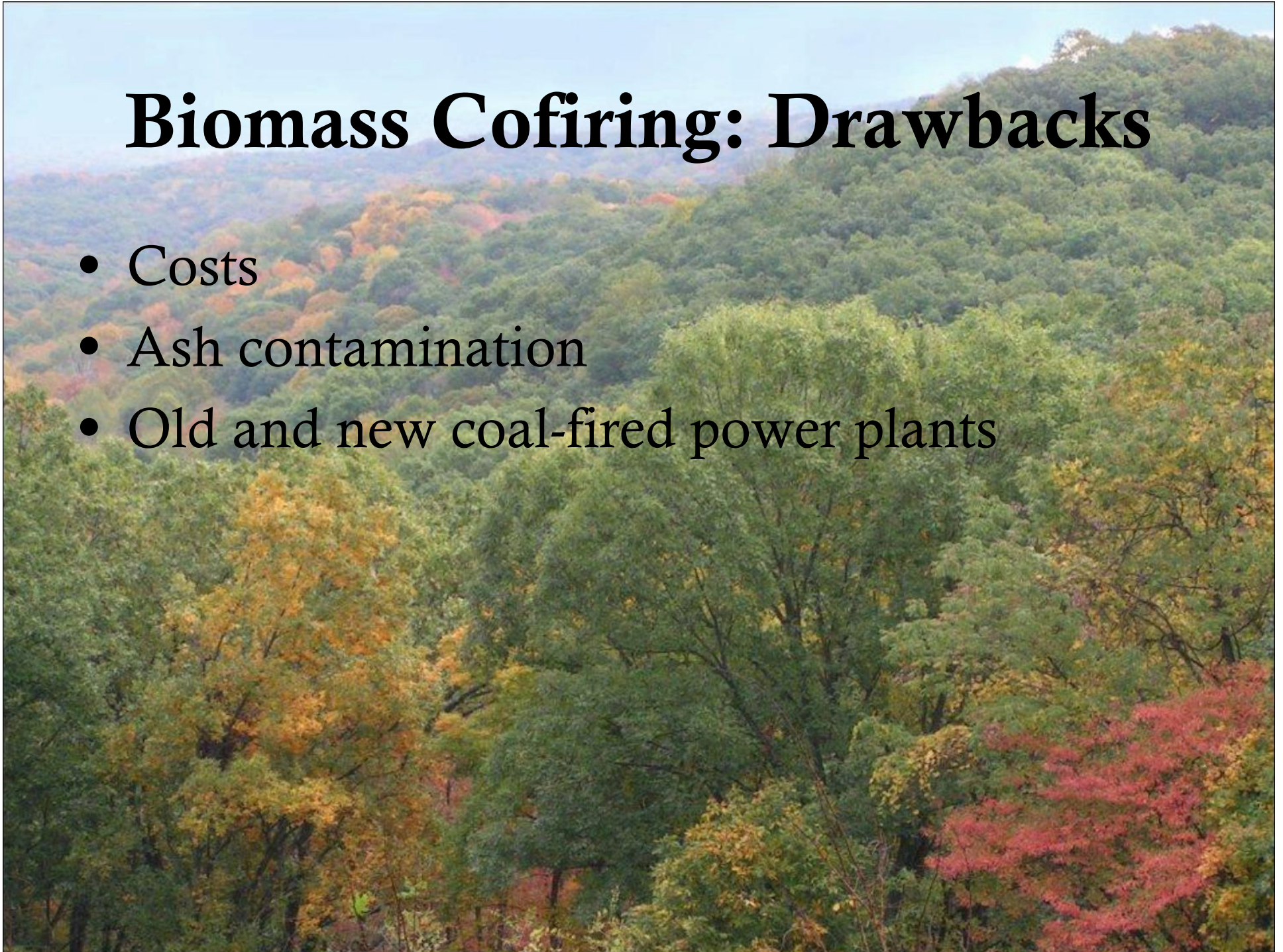


Biomass Cofiring: Benefits

- The energy production that comes from biomass has no net carbon emissions from the energy generation
- Renewable
- Reduces the emission of greenhouse gasses and air pollutants
- Complements sustainable land management
- Makes economic sense

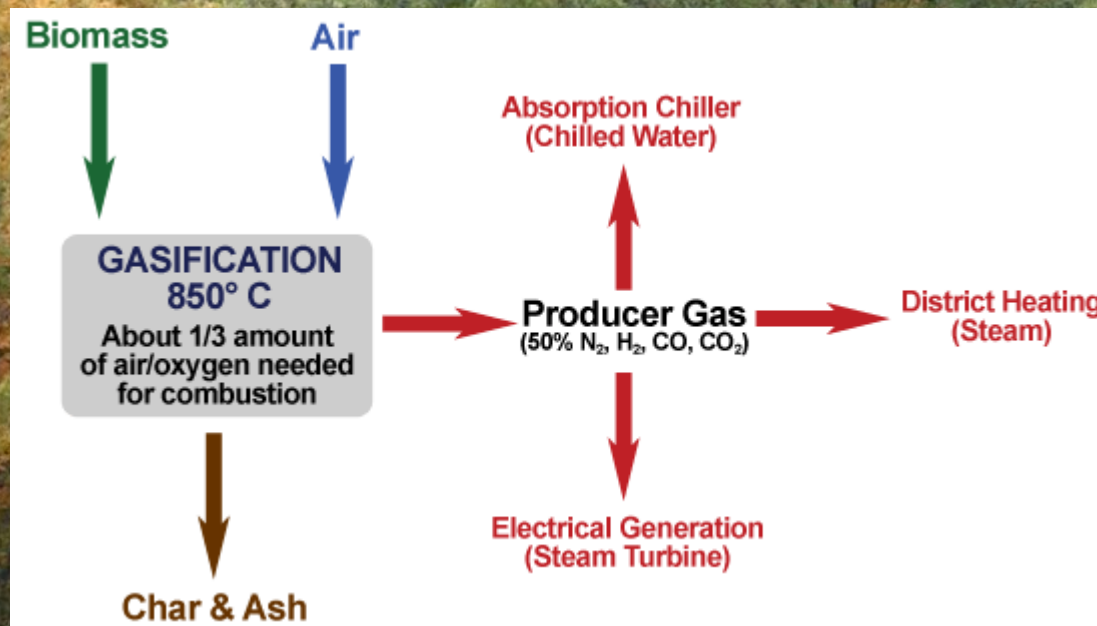
Biomass Cofiring: Drawbacks

- Costs
- Ash contamination
- Old and new coal-fired power plants



Gasification

- Process where biomass is converted into methane gas at high temperatures to fuel steam generators, combustion turbines, combined cycle technologies or fuel cells.



Gasification: Benefits

- Renewable production – the process does not emit any greenhouse gasses
- Efficient – the high-temperatures allow for a higher maximum efficiency than direct combustion
- Cleaner production – the high-temperature process refines out corrosive elements
- Variety – extracted gases can be used in a variety of power plant configurations

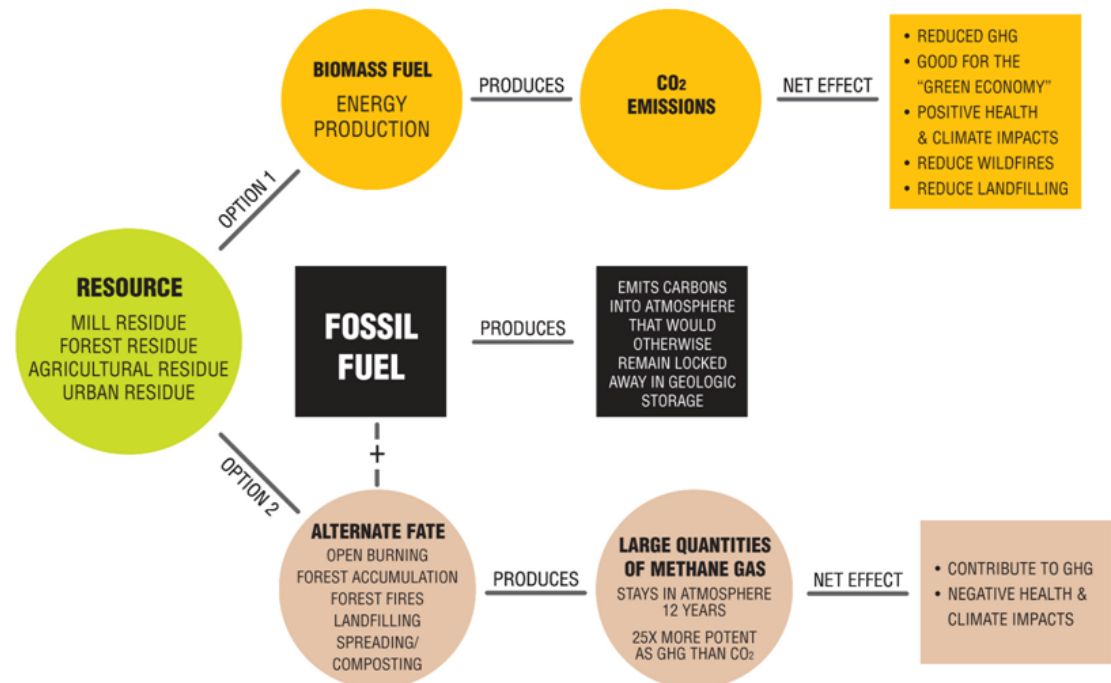
Gasification: Drawbacks

- Sustainable? – the power consumed in the process may outweigh any power produced and even emit CO₂
- Carbon Neutral? – carbon neutrality depends on what is used and how the gasification process is carried out.

Environmental Impact: Global Benefits

- Reduces Greenhouse Gas Emissions
- Carbon Neutral Energy Generation
- Provides Waste Disposal Alternatives
- Improves the Health of Forests
- Clean, renewable alternative to fossil fuel plants

BIOMASS' NET NEGATIVE GHG IMPACT



Environmental Impact: Problems with Biomass

- Still emitting CO₂ into the atmosphere
- Reduced carbon storage capacity
- May encourage the production of more co-firing power plants
- Takes away from land for food crop production

Benefits for the United States

- Environmental benefits
- Growing clean energy source reduces dependence on foreign oil
- Keeping the country healthy
- Creates jobs and clean energy

The Future of Biomass Electricity

- Extending Tax Credits For Biomass For An Additional 5 Years
- Making Tax Credits For Biomass The Same As Other Renewables
- A National Renewable Electricity Standard (RES) Will Mandate the Deployment of Biomass And Other Renewables Technologies
- American Renewable Energy Act of 2009