Biomass Cofiring: A Renewable Alternative for Utilities

Biomass Cofiring

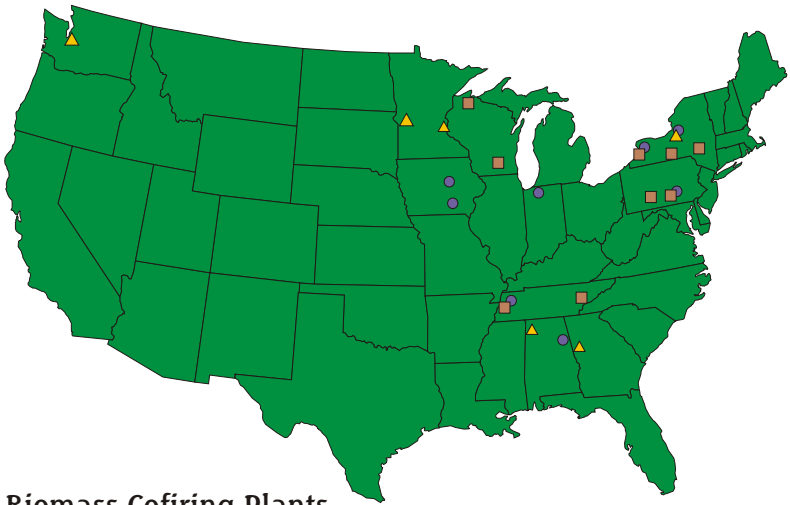
Cofiring refers to the practice of introducing biomass as a partial substitute fuel in high-efficiency coal boilers. This is the nearest term low-cost option for the efficient conversion of biomass to electricity. Cofiring has been practiced, tested, and evaluated for a variety of boiler technologies. After "tuning" the boiler's combustion output, there is little or no loss in total efficiency, implying that the biomass combustion efficiency to electricity would be close to the 33%-37% range. Since large-scale coal power boilers represent 310 GW of generating capacity, there is a substantial opportunity for power generation using biomass cofiring. Extensive demonstrations and trials have shown that effective substitutions of biomass energy can be made up to about 15% of the total energy input with little more than burner and feed intake system modifications to existing stations. In addition to CO_2 emission benefits, biomass in general contains significantly less sulfur than coal, so there is an So_2 benefit as well. Early test results also suggest that there is a NO_x reduction potential of up to 30% with woody biomass.

The Dunkirk Power Station will use hybrid willow grown by New York farmers to generate renewable electricity

Economic Requirements

The economics of cofiring are highly site-specific and depend on power plant type and the availability of low-cost biomass fuels. A typical cofiring installation includes modification to the fuel-handling and storage system to accommodate biomass. Costs can increase significantly if facilities for wood drying or size reduction are required, or if a separate feed to the boiler is required. For pulverized-coal boilers, retrofit costs range from $150 to $300 per kilowatt (kW) of biomass generation. The lowest cost opportunities are with cyclone boilers, for which costs may be as low as $50 per kW.

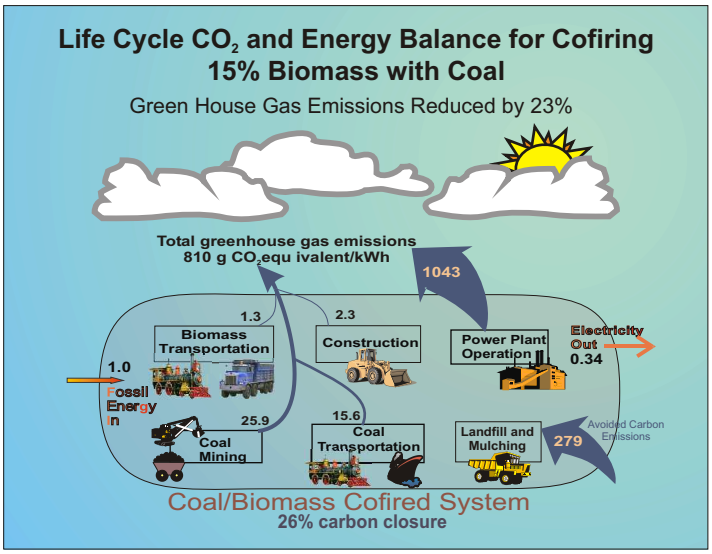
The more important cost factor, however, is fuel supply. Costs for biomass fuels depend on a number of factors such as climate, proximity to population centers, and the presence of industries that handle and dispose of wood. Usually the cost of biomass fuels must be equal to or less than the cost of coal (per MBtu) for cofiring to be economically successful. Some utilities reduce fuel costs by cofiring with biomass; the Tennessee Valley Authority, for example, estimates that it will save $1.5 million per year in fuel costs by using cofiring at its Colbert plant.



Biomass Cofiring Plants
- In Commercial Operation
- Demonstrations Conducted
- Tests Planned

Technical Challenges

Several technical questions having to do with fuel feed, boiler chemistry, and ash deposition and disposal have been defined and are approaching resolution. Losses in boiler efficiency due to cofiring are small and are usually due to higher moisture content in the biomass fuels. A consensus is emerging that cofiring is feasible at the majority of coal-fired power plants. However, many power companies sell fly ash for use in making cement; currently the standard set by the American Society for Testing and Materials requires that only "coal ash" be used in the mixture. Until this standard is changed, cofiring biomass may hinder plant managers from selling ash for use in cement. Several utilities are working with the U.S. Department of Energy to resolve this issue.



Customers Support Clean Energy

Biomass cofiring may represent an opportunity for both consumers and power companies. In recent polls, consumers have indicated their willingness to support green pricing and renewable energy programs. Some consumers are paying a premium for renewable energy (typically 10% or less of their entire bill). For power generators, biomass may represent the most plentiful and economic supply of locally available renewable energy.

Cofiring may also represent an opportunity for power companies to provide new services to important customers. This opportunity provides industries, such as construction or transportation, with a way to discard large quantities of wood. Cofiring can also provide industries such as forestry, wood products, pulp and paper, agriculture, and food processing with a way to dispose of large quantities of residues. In these locations , the cost of biomass fuels can be relatively low. Thus, cofiring can provide a service to industrial customers and renewable energy for environmentally conscious customers at the same time.

Over the last decade, electric utilities across the country have implemented biomass cofiring in demonstrations and in commercial operations. Today, five power plants are cofiring coal with wood residue products and a sixth plant recently shut down after 10 years of operation. Five additional plants are planning tests some time in the next year. As a result of this experience, information is now available on the technical and economic performance of cofiring biomass with coal.

Planned Cofiring Demonstrations

Utility	Plant	Boiler Type	Features
Alliant Energy	Ottumwa Station	PC	Dedicated switchgrass on CRP Land
AES Corp.	Greenidge	PC	Dedicated willow crop
NRG Energy	Dunkirk	PC	Dedicated willow crop
Southern Company	Gadsden	PC	Co-pulverized switchgrass
GPU	Seward	PC	Increase capacity; minimize NOx
NIPSCO	Bailey	Cyclone	Tri-firing; gasifier cofiring with NG
TVA	Allen	Cyclone	Gasifier cofiring

Biomass Power for Rural Development DOE (OPT & FETC)/EPRI Cofiring Initiative

For More Information. Visit the BioPower Web site at: http://www.eren.doe.gov/biopower

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