

As nations focus on controlling carbon, global demand for and production of coal-based electricity continues to increase. Building towards a sustainable generation future ultimately means balancing carbon objectives, energy demand and electricity affordability.

Text Kristen Brewitt

Co-firing biomass

An emerging future in a carbon constrained world

In the United States, the Obama Administration and Congress's historic focus on energy and climate change have introduced significant regulatory uncertainty in generation planning and operations. Biomass co-firing technology can provide a path to addressing climate change while mitigating costs to the nation's coal-generation base and the customers served.

“Co-firing makes use of existing power generation assets with relatively low modification costs, while providing a means to mitigate the cost of carbon.”
– Kevin Sullivan

Hot topic

While the technology has been demonstrated in many boiler types, the US has been slow to adopt biomass co-firing due to its limited full-scale commercial use, a lack of incentives, and a general reluctance in introducing new fuels into boilers. However, power generation and co-generation from biomass, waste, and recovered fuels is now quickly becoming a hot topic for the power sector as a result of new environmental policies and regulations.

Biomass co-firing is gaining increasing attention from both utilities and regulatory stakeholders. It offers renewable energy generation with low capital costs and takes advantage of the high electrical efficiencies of today's coal power plants. By replacing up to 20 percent of the coal fuel with biomass, a substantial volume of carbon dioxide emissions may be avoided.

Relatively low costs

Co-firing may indeed make sense, from cost and environmental perspectives, for many coal-based electricity producers. “Co-firing makes use of existing power generation assets with relatively low modification costs, while providing a means to mitigate the cost of carbon,” says KEMA's Kevin Sullivan. “In low cost co-firing applications, plant operators mix biomass feedstock with coal without modifying the boilers. The capital costs are mainly those required to receive and handle the biomass fuel. High cost co-firing applications – which enable higher levels of co-firing – can require significant modifications to boiler systems due to upgrades in fuel handling equipment and burners. Many national governments provide tax and financial incentives to encourage electric producers to adopt co-firing.”

Actively engaged

Many electricity producers opt to conduct trials first, to prove the viability, reliability, sustainability and cost-effectiveness of bio-firing in their plants. We have been actively engaged in supporting biomass co-firing initiatives already underway in Europe and the Netherlands for over a decade. Full scale commercial co-firing of at least ten percent biomass - based on

heat input – is a daily practice there, with a wide variety of bio-fuels and co-firing configurations.

Project feasibility study

In North America, we have performed extensive feasibility studies on co-firing for six large utilities. Most recently, we supervised a fuel supply study, and provided a detailed techno-economic assessment and conceptual design for a coal-fired plant owned and operated by American Electric Power (AEP), a US public utility holding company. AEP plant operators wanted to co-fire between five and ten percent biomass (by heat input) with the following conditions: a separate injection of biomass, the ability to operate at 100 percent coal, no unit de-rating, no severe adverse operating conditions, no degradation of ash quality, no increased emissions, compliance with regulation and legislation, broad initial fuel scope, and competitive economics – a favorable internal rate of return.

KEMA's fuel supply study found that a significant amount of appropriate woody biomass – mostly wood chips from saw mills – was available to the AEP generation unit, and a fuel scenario based upon a mix of sawdust and wood chips was selected for the study. The technical assessment examined several cases to assess boiler performance using thermodynamic modeling. Using proprietary Cofiring Control Model software, we provided immediate quantitative insight in the risks associated with firing a mix of fossil and/or biomass fuels in existing coal-fired power plants.

Finally, KEMA's economic assessment found that firing up to 10 percent (e/e) biomass is technically feasible. There was enough clean biomass available, a suitable area for the pre-processing unit, no unit de-rating, and no undue degradation of combustion properties. The most important economic parameters were biomass and coal prices, specific capital outlay costs, and the carbon dioxide price.

Implementation and certification

As co-firing biomass becomes a recognized option in the US electric generation market, we are currently expanding on its feasibility work in the US to the actual implementation of co-firing installations based upon the results from these studies. We also are helping clients develop long-term strategies to ensure that they are prepared for likely upcoming regional or national carbon dioxide reduction regulations.

In Europe, we are currently helping to implement a new certification process for sustainably produced biomass for energy generation purposes. The biomass certification is based on the chain of custody – from producer to processor to end user (see page 9). <<

More information:

contact@kema.com

T +1 78127 35 700 230

www.kema.com/biomass-energy

