



# SUPPORT MECHANISMS FOR COFIRING BIOMASS WITH COAL

Coal still plays an important role in power generation. In 2017, global coal power generation increased by over 250 TWh and accounted for about 40% of the additional power generation worldwide. In the same year, global energy-related CO<sub>2</sub> emissions increased by 1.4%, reaching an all-time high of 32.5 Gt. This sends an important message to the energy sector that more action is needed to reduce further CO<sub>2</sub> emissions from energy generation. It has been generally accepted that cofiring biomass with coal can offer a relatively quick, cost-effective way to partially decarbonise power generation in the short-to-medium term, while using existing infrastructure. Cofiring biomass in modern, large coal-fired power plants can achieve a higher efficiency than 100% biomass-fired power plants. The incremental investment for cofiring is significantly lower than the cost of dedicated biomass power. Cofiring also helps to extend the life of coal-fired power plants during the transition to low carbon generation. A disadvantage is that most biomass, apart from waste-derived fuels, has a higher price per tonne at the power plant gate than the equivalent coal. Other drawbacks of cofiring include biomass transportation and handling, fuel conversion, loss of boiler efficiency, slagging, fouling, corrosion, and ash utilisation. These drawbacks and the extra costs mean that the coal power sector will only convert to cofiring with governmental support in the form of policies or finance.

Western Europe, with more than 20 years' experience, has been the world leader in deploying cofiring biomass with coal. Some countries, such as Denmark, the Netherlands, and the UK, where intensive cofiring activity has taken place, have developed a wide range of support mechanisms. Others, such as Finland, France, Germany, and Italy, do not have support schemes for cofiring but have some cofiring activity. Many Western European countries plan to phase out coal within the next decade which means that cofiring will decline too, either closed with the coal-fired power plants or replaced by 100% biomass conversion. However, cofiring has fulfilled an important transitional role in decarbonisation and extending the lives of some coal-fired power plants.

Eastern European countries including the Czech Republic, Poland, Kosovo, Serbia, Greece and Bulgaria still use lignite to generate electricity. For lignite-fired power plant, the addition of biomass improves the heating value of the fuel mixture and can improve combustion conditions in the furnace. Supporting policies are needed to enable cofiring biomass with lignite. Under the 7th Framework Programme, the EU supports the study of cofiring agricultural biomass in lignite power plants in Eastern Europe. Much of Eastern Europe has no plans to stop burning coal and a handful of new coal-fired power plants are under construction in the Balkans, Greece and Poland. Thus, cofiring still has potential there.

Cofiring biomass in Asia is expanding fast. Many countries, such as China, India, Japan, Malaysia, South Korea, and Vietnam are actively cofiring. China is starting to cofire to reduce local air pollution resulting from the dispersed burning of agricultural and forestry wastes and sludge as well as to decarbonise its coal fleet. It has planned 89 pilot demonstration projects, one of which started operation in September 2018 (see Figure below). However, China still does not have an adequate supportive mechanism in place to ensure a smooth deployment of cofiring. Cofiring is expanding rapidly in Japan and South Korea due to strong supportive policies. But some management and technical issues have been raised and biomass

sustainability is the main concern for these two countries. The Japanese Feed-in Tariff (FIT) scheme does not offer an additional incentive for combined heat and power (CHP) plants to use the heat and does not support existing plants. However, some older Japanese coal-fired power plants are still adopting cofiring technology as a means of achieving the 44.3% electricity efficiency standard required by March 2031. In South Korea, cofiring is supported by the 2012 Renewable Portfolio Standard and more than 90% of the wood pellets used are imported as domestic production cannot meet the demand. The South Korean government reduced the renewable energy credit weightings for biomass cofiring in May 2018. This may have a negative impact, as without sufficient subsidies, biomass cofiring might become too expensive for the utilities.

North America has large forestry resources and is the main exporter of wood pellets. Its coal-fired fleet is old. However, cofiring biomass with coal is barely active due to a lack of supportive policies. Only Ontario Power Generation cofired biomass in the 2000s encouraged by a provincial FIT scheme before deciding to phase out coal completely. As major coal users, neither Australia nor South Africa is active in cofiring because of a lack of support mechanisms. Australia has great potential to grow biomass and may have substantial resources of agricultural and forestry wastes. South Africa's domestic biomass resources are more limited due to water scarcity and prioritising food production, so it is less well-placed to develop bioenergy. Cofiring is new to Turkey.

Cofiring biomass with coal to reduce CO<sub>2</sub> emissions can play a transitional role in the move towards a low carbon power sector. Although cofiring is a relatively cheap technical route to partially decarbonise a coal fleet, subsidies are needed to make high ratio cofiring financially viable. Supportive policies, both regulatory and economic, are vital instruments for the deployment of biomass cofiring. It is clear that cofiring is moving from west to east. Europe has rich experience in introducing policies to support and control the development of cofiring as well as tackling the technical challenges cofiring brings. Countries with less cofiring experience could learn from them. International cooperation would be helpful to enable the transfer of technologies and knowledge sharing.



**China's first biomass cofiring pilot project at Xiangyang coal-fired power station (Courtesy of China Hefei Debo Bioenergy Ltd)**

The IEA Clean Coal Centre is organised under the auspices of the International Energy Agency (IEA) but is functionally and legally autonomous. Views, findings and publications of the IEA Clean Coal Centre do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.

Each executive summary is based on a detailed study which is available separately from [www.iea-coal.org](http://www.iea-coal.org). This is a summary of the report: Support mechanisms for cofiring biomass with coal by Xing Zhang, CCC/294, ISBN 978-92-9029-617-1, 60 pp, June 2019.