

SEPTEMBER 2014

# Can bioenergy replace coal?

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Europe wants 27 percent of its energy to come from renewable sources by 2030. Bioenergy has the potential to help the continent reach that goal, but it requires an industry comeback.

**Like all renewable energy** in the European Union, bioenergy has struggled against low-priced coal imports, low carbon dioxide prices in the emissions-trading system, and an economic and regulatory backlash against renewable-energy policies, including substantial cuts in government support. But don't count out biomass-based energy just yet. Although today it fails to compete on cost with other renewables such as wind and solar, we believe bioenergy not only has the potential to significantly improve but could even become cost competitive with coal.

Our recent article, "Bioenergy in Europe: A new beginning—or the end of the road?," finds that bioenergy still offers one of the most capital-efficient transitions from coal to renewables, as well as a scalable opportunity for European utilities to take part in the second wave of renewable-energy-source growth. With carbon capture and storage still far from happening, bioenergy offers a way for big utilities to comply with renewable targets while using their existing assets.

How can that happen? We believe the levelized cost of bioenergy—its cost per kilowatt-hour—has the potential to be reduced by almost half by 2025, making bio-based electricity close to competitive with coal depending on the type of plant (exhibit). While there's no denying this would require significant effort, it doesn't require technological breakthroughs but rather simply making better use of the opportunities already at hand.

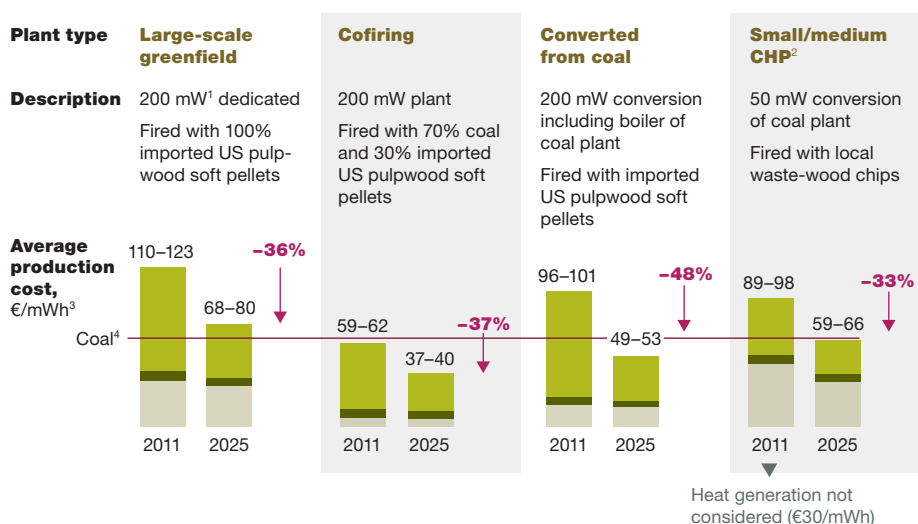
For instance, boiler efficiency in biomass plants today is often as low as 30 percent. Increasing steam parameters such as pressure, temperature, and energy efficiency would reduce the volume of feedstock required and lower costs. Further gains could be made by standardizing plant designs, adopting boiler and plant modularization, and applying design to value. And fuel costs could be lowered by driving greater efficiency in the biomass supply chain, whether by applying lean techniques to remove stumbling blocks, moving to long-term contracts, or improving fuel-treatment technology.

There's an opportunity to revive Europe's bioenergy industry and for the sector to step up as a fast and capital-efficient replacement for coal. But it requires a renewed sense of urgency among

**Exhibit**

Depending on the type of plant, biomass could make levelized-cost-of-energy improvements of up to 48 percent by 2025, making it close to competitive with coal.

■ Fuel ■ Operations/maintenance ■ Capital expenditure



<sup>1</sup>Megawatts.

<sup>2</sup>Combined heat and power.

<sup>3</sup>Megawatt-hour.

<sup>4</sup>Estimated cost of coal (€64/mWh, with carbon dioxide at €20/ton), which remains stable throughout 2025.

industry participants to deliver improvements in both cost and performance, as well as government action to create EU-wide sustainability criteria. Without these, there may be no place for bioenergy in the continent's future energy mix. □

This article is an extract from “Bioenergy in Europe: A new beginning—or the end of the road?,” which appears in the latest issue of *McKinsey on Sustainability & Resource Productivity*. Download the full issue on McKinsey's Sustainability and Resource Productivity site, on [mckinsey.com](http://mckinsey.com).

*The authors would like to acknowledge the contribution of Anja Bühner-Blaschke to this article.*

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