



Biomass co-firing at Texas coal plants

TEXAS HAS HUGE POTENTIAL FOR REDUCING COAL EMISSIONS

Coal Power in Texas and opportunities for reducing emissions

There are 20 operating coal-fired power plants in Texas, with over 21 GW of capacity. Most of these coal plants were constructed in the 1970s and 80s, a younger coal fleet than much of the rest of the country. Some plants are also in the process of decommissioning, upgrading or repowering, or installing new emissions control equipment to meet new EPA regulations. Many coal plants are facing new constraints on air and mercury emissions and, in the coming years, carbon dioxide. It is possible that biomass conversions or biomass co-firing can play an important role in allowing existing coal plants to meet an expanding array of regulations

opportunities to reduce emissions, like carbon capture and storage, repowering to use natural gas, or simply shutting down. Biomass co-firing should be investigated as an important additional opportunity to reduce emissions. If sourced from sustainable wastes and residues, biomass can be a net-zero emissions fuel. EPA is still finalizing how they will account for the emissions from biomass, but indications from the most recent version of their Biogenic Emissions Framework and a letter from senior management indicates that states will be encouraged to account for sustainable wastes and residues, and possibly other biomass types, as net-zero emissions.

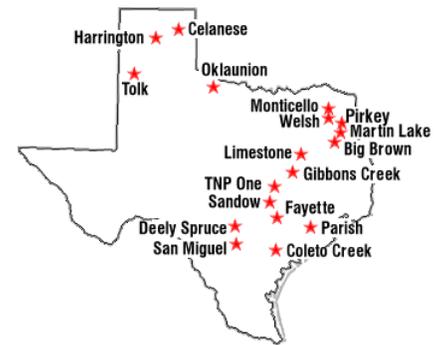
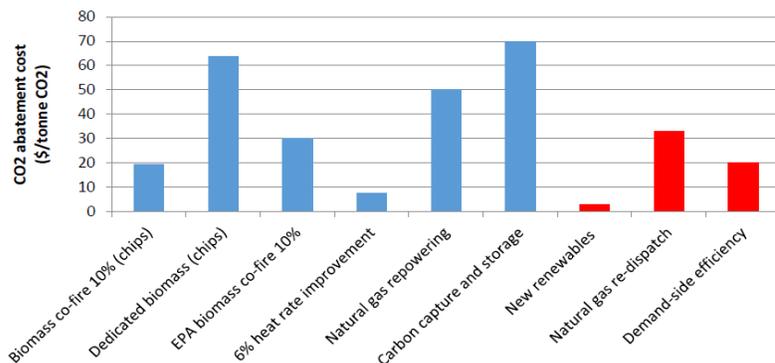


Figure 1. (above) Locations of Texas coal plants.
Figure 2. (below) CO₂ reduction options inside (blue) and outside (red) the fence line for coal plants.

CO₂ regulations and options for power plants

The U.S. EPA is proposing that Texas reduce CO₂ emissions from the power sector by 33% from 2012 levels, an aggressive target compared to many other states. These new regulations are likely to significantly impact the coal sector. Coal plants are expected to increase efficiency where possible, but in order to meet these strict emissions levels, coal plants may need to find additional



Biomass co-firing potential in Texas

An assessment of sustainable biomass availability in Texas indicates there is significant potential for offsetting coal use in the power sector, even when accounting for competing markets like biofuels, heating, and bioproducts. The Earth Partners has identified that biomass could offset up to 10% of annual coal use in the power sector in Texas using feedstocks from within the state alone. There are already several biomass power plants in Texas, an approach that could be further scaled cost-effectively. Many states have indicated that scenarios for meeting emissions reductions requirements could include biomass co-firing, and that coal plants could be at risk of shutting down without large-scale, cost-effective efforts within the fenceline. Many states have even advocated for limiting CO₂ reduction requirements to within the fenceline options. The average abatement cost of 10% biomass co-firing is estimated to be \$30 per ton of CO₂, but the actual cost should be assessed for

each coal plant based on cost of delivered biomass, current coal costs, specific offtake terms, in addition to any other upgrades the coal plant is undertaking. Given the low energy density of subbituminous and lignite coal, the predominant types used in Texas, biomass may be even more cost-effective, depending on local markets.

Using invasive brush for power

Over 100 million acres of natural grassland, pasture, and rangeland in Texas over the past century have become densely covered with invasive juniper brush, mesquite, and other species. Texas has allocated over \$100 million state dollars to brush removal alone over the past decade, treating 350,000 acres per year, with landowners devoting similar resources to clearing land, in an effort to promote healthier rangeland, improved soil quality, and natural vegetation communities. Removed brush is usually burned on site or left to rot, and almost none of it is utilized. There is significant opportunity to recover this low-cost feedstock and utilize it for power, particularly when co-firing with coal. Analysis indicates invasive brush alone could offset up to 5% of Texas coal use, while supporting sustainable rangeland management and reducing taxpayer and landowner burden.



Figure 3. Invasive brush, an important biomass source in Texas

The Earth Partners is completing a program in New Mexico and Texas to screen brush-infested rangeland, develop restoration and harvest practices, bring 100,000s of acres under long-term contract for brush removal, and develop owned and -operated bioenergy facilities. The Earth Partners estimates that, with current economics, under this privately-financed program up to 150,000 acres could be treated annually over the next 10 years to deliver 1.5 million tons of biomass each year. By supporting brush removal, emissions reduction programs can support win-win opportunities for the environment, landowners, and the power sector.



The Earth Partners would like to work with interested coal facilities and utilities to assess the cost of biomass co-firing under emerging regulations and identify promising opportunities. The Earth Partners and its partner companies bring extensive experience in biomass sourcing, logistics, and processing, all in ways that are guaranteed to meet regulations around emissions reductions and sustainability.

The Earth Partners LP is a company that develops, owns, and operates land restoration and bioenergy projects. Specializing in best-in-class land management and stewardship, its activities include management of pine forests, natural forest ecosystems, invasive brush removal, and native prairie grass restoration.

About The Earth Partners

The Earth Partners has an experienced, multi-disciplinary team to support its portfolio of biomass supply projects in Texas, New Mexico, Louisiana, and South Dakota.

Conservation Biomass is an energy source that can be recovered in an ecologically sustainable way and that can have tangible benefits for the land.

Responsible brush removal from historical grasslands in the Southwest can:

- Improve plant diversity and wildlife habitat
- Reduce soil erosion
- Have the potential to improve soil carbon
- Improve water quality and retention
- Reduce wildfire risks
- Improve forage production

The Earth Partners has overcome previous challenges to scaling this approach by working in close partnership with landowners and undertaking a two-step land restoration and biomass recovery process that creates significant local value and can supply large, reliable amounts of sustainable biomass. To date, The Earth Partners has enrolled over 700,000 acres in Texas and New Mexico in brush management programs.

For more information on how to work with us to identify biomass co-firing strategies, visit our website: www.theearthpartners.com or contact info@teplp.com