

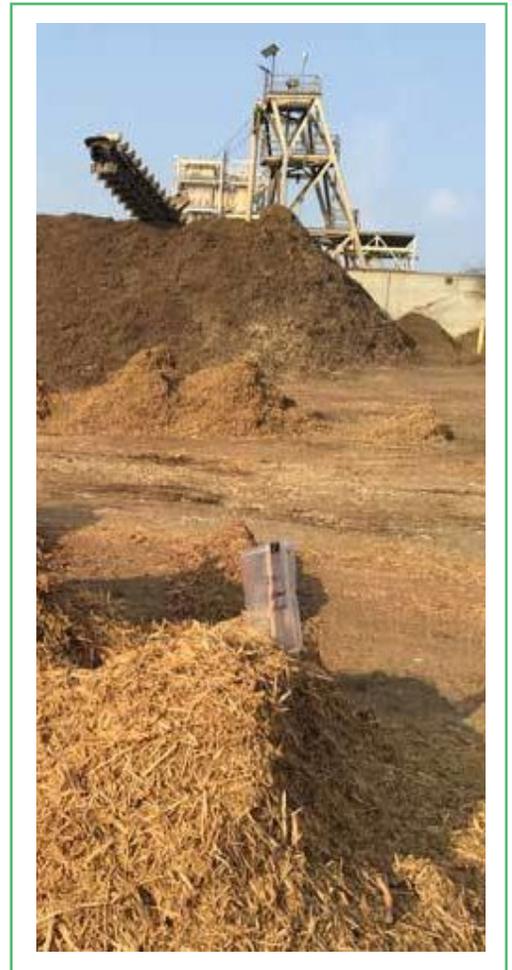


Wood Pathway: Bioenergy

With the immediate need to address catastrophic wildfire threat and Public Safety Power Shutoffs (PSPS), generating on-demand, renewable energy while simultaneously reducing the wildfire risk of the region is a solution many policy makers and startups are beginning to recognize. Because bioenergy is considered a renewable resource under California's Renewable Portfolio Standard (RPS), the Energy Commission (CEC) and Public Utility Commission (CPUC) have repeatedly supported programs that encourage more electricity to be generated from non-merchantable woody biomass.

Bioenergy can employ a number of different conversion processes to generate electricity. Old, pollutant-heavy combustion technology is being phased out in favor of cleaner, more efficient technology like pyrolysis and gasification. State funds and leaders highly incentivize these two pathways while a new swell of support throughout the world is realizing the technology readiness of hydrogen conversion which offers a carbon neutral conversion process.

There are about 23 of facilities throughout the state that generate a total of 585.35 MW of baseload power. Through the BioMAT program overseen by CPUC, the Investor-Owned Utilities (IOUs) like PG&E must procure 50 MW of energy from sustainable forest management through small-scale community driven bioenergy facilities. Currently, PG&E still has over 36 MW to procure, leaving a huge opportunity for Sonoma.



What is forest-based “Woody Biomass”?

The term woody biomass includes all trees and woody plants in forests, woodlands, or rangelands. This biomass includes limbs, tops, needles, leaves, and other woody parts. From a commercial perspective, woody biomass usually refers to material that has had a low economic value and cannot be sold as sawtimber or pulpwood. As wood processing technologies and markets change, however, different sizes and qualities of material are considered as biomass. The term woody biomass refers to vegetation removed from forests, usually logging slash, small diameter stems, tops, limbs, or trees that otherwise cannot be sold as higher-value products such as saw timber.

A bioenergy facility receives these materials in the form of wood chips to be processed through their combustion systems. For more information on the technical specifications of a bioenergy system please look for the “Wood Pathway: Biofuels” handout produced for the Sonoma County BioBiz Competition.

Emissions Comparison: Pile Burning and Bioenergy

In 2011, a seminal report was released that illustrates how converting biomass into energy from a conventional boiler is less carbon intensive than the alternative fate of open pile burning or from the emissions emitted in the event of a wildfire. Pyrolysis and gasification offer considerable improvements in the emissions profile. There are several policies, incentive programs and coalitions to expand biomass to energy facilities throughout the state due to the expected amount of vegetation removal required over the next several decades.

Figure 1: taken from Springsteen (2011)

Operation	Air Emissions (t)						
	NO _x	PM	NMOC	CO	CO ₂	CH ₄	CO ₂ e ^a
Baseline, open pile burning							
Open pile burning	17.37	37.65	28.96	362	10,618	17.37	10,983
Displaced power from grid	0.47	0.28	0.06	1	2,733		2,733
Total	17.84	37.93	29.02	363	13,352	17.37	13,717
Biomass project							
Boiler	6.58	0.98	0.22	9	11,178	0.55	11,189
Process and transport							
Grinding	0.43	0.52	0.02	1	73	0.04	74
Loading	0.31	0.01	0.01	0	19	0.03	19
Chip van transport	0.91	0.02	0.03	2	118	0.05	119
Total	8.23	1.53	0.28	12	11,388	0.70	11,402
Emissions reductions	9.62	36.39	28.74	350	1,965	16.7	2,315
Percent reduction	54%	96%	99%	97%	15%	96%	17%

Notes: ^aCO₂e determined as CO₂ + 21 × CH₄.

Low-Cost Modular Systems

While large stationary Bioenergy projects can be quite expensive, modular small bioenergy technologies offer a lower cost to process and handle excess biomass. The equipment is designed to be delivered to a project site and produce a small limited amount of kilo-watts (kW) for more remote regions and businesses. There are several available technologies offered by a growing list of companies to accommodate forest health projects. Additionally, these modular systems have various co-products (like biochar, bio-oil, or solid fuel) which can offer alternate sources of revenue.



Modular biomass handling system to produce biochar is an example of projects happening in the Sonoma region. There are similar technologies to convert biomass to energy. Source: Sonoma Biochar Initiative

1. Springsteen B, T Christofk, T Mason, C Clavin (2011) Emission reductions from woody biomass waste for energy as an alternative to open burning. Journal of the Air and Waste Management Association 61:63-68
2. Carreras-Sospedra M, MacKinnon M, Dabdup D (2015) Assessment of Emissions and Energy Impacts of Biomass and Biogas Use in California. California Air Resources Board. Agreement #11-307