



Pollution Prevention Benefits of Biomass Power



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PRESENTS

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What is Biomass Power?

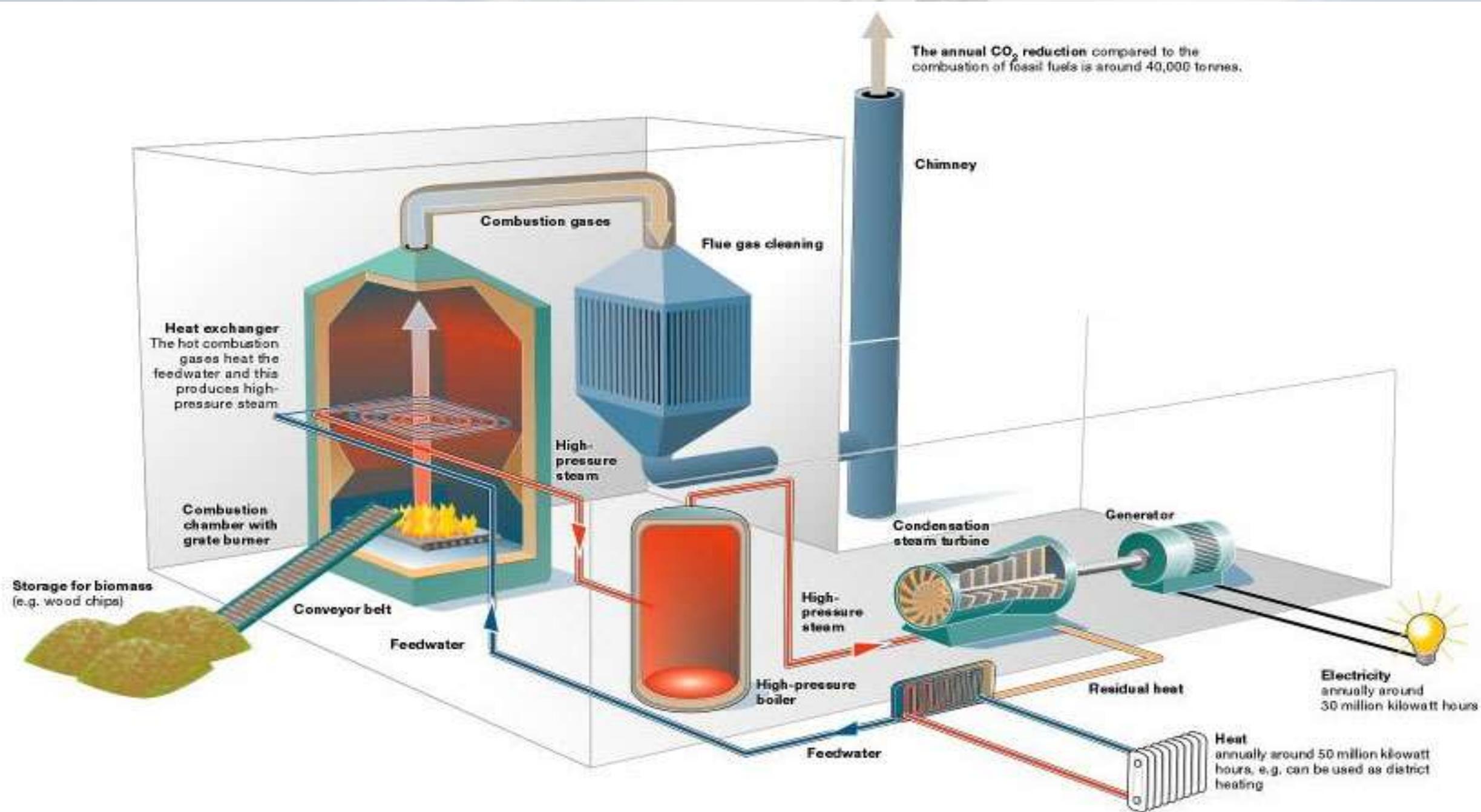
- Biomass power is carbon neutral electricity generated from the reuse of renewable organic used wood, wood byproducts, and wood residues that would otherwise be dumped in landfills, openly burned, or left as fuel for forest fires.
- The original impetus for starting the California biomass industry in the late 1970s was an effort to improve air quality in the state by ending the disposal of sawmill residues by combustion in smoky teepee burners.
- In the pre-1970s world, the majority of the fuel currently used by the state's biomass industry was disposed of by open burning.
- In today's world, if the biomass industry suddenly ceased operations, the majority of the fuel would probably have to be disposed of by landfill burial.

What is Biomass Power?

- Biomass fuel comes from three distinct sources:
 - Agricultural byproducts like orchard and vineyard removals and prunings, nut shells, rice hulls, fruit pits, etc.
 - Central Valley
 - Imperial Valley
 - Forest residues and byproducts like saw mill residues, bark and branches from log harvesting operations, and small trees and undergrowth cleared from forests for fire suppression, watershed cleanup, and growth enhancement.
 - Shasta
 - Sierra Nevada
 - Urban wood like construction wood scraps, discarded pallets, clean wood waste from wood products factories, and residues from tree trimmers and land clearers.

What is Biomass Power?

- Biomass material is processed, chipped, and transported to the nearest biomass power generating facility.
 - Unlike other renewable energy technologies, biomass power plants pay to collect, process, and transport their fuel.
- Instead of burning non-renewable fuels such as coal, petroleum, and natural gas, California's biomass power plants efficiently combust wood residues and byproducts in modern boilers under tightly controlled environmental regulations to produce affordable, reliable, renewable electricity.
- Biomass power contributes to air pollution reduction efforts through the avoidance of open-burning and landfill diversion, both of which also produce harmful climate change gases.





Benefits of Biomass Power

- The California Biomass Power industry provides several benefits to the State:
 - Economic Benefits
 - California's biomass power industry supports living wage jobs and growing the green economy, employing about 750 direct jobs at the power plants, and another 1,500 dedicated indirect jobs in the fuel supply infrastructure. Most of these jobs are in rural areas of the State.
 - Biomass power plants, on average, contribute between \$8 and \$14 million annually to their local communities in payroll, purchases, and property tax revenues.
 - Transmission Benefits
 - Biomass power generation provides benefits to the electricity grid that result from the fact that it is a reliable, schedulable, baseload generation option, delivering electricity with 95% availability and 90% reliability.
 - Environmental Benefits
 - Managing waste
 - Protecting forest health
 - Improving air quality
 - Reducing greenhouse gas emissions

Benefits of Biomass Power

- **Managing waste**
 - Landfill disposal of low value wood leads to a variety of adverse environmental impacts, including leachates that threaten groundwater quality, delayed stabilization of the fill, and emissions of odors, volatile organic compounds (VOCs), and greenhouse gases (methane).
 - Some 20% of the material traditionally sent to landfills in California is recoverable and usable low value wood.
 - Biomass power generation diverts about 3.5 million tons of that low value wood that would otherwise be disposed of in landfills.

Benefits of Biomass Power

- Protecting forest health
 - Leaving overgrowth material in the state's ecologically-stressed forests leaves the forests at high risk of massively destructive wildfires, impedes the functioning of watersheds, diminishes wildlife habitat, and has other negative effects on the forests.
 - Biomass energy production promotes healthy forests by lowering the cost of performing forestry treatments designed to reduce fire risks and accomplish other forestry goals. The value of the residues as fuel is not enough to pay the entire cost of the forest treatment, but it can bring the net cost down enough to make the difference as to whether or not a needed treatment is performed. It is no coincidence that some of the healthiest tracts of National Forest in California are located close to biomass power plants.

Benefits of Biomass Power

- Improving Air Quality

- Forest Biomass and Air Pollutants

- California biomass power plants' divert about 3.5 million tons of forestry residues annually.
 - Although bioenergy facilities release emissions that impact air quality, the facilities dramatically reduce the emissions that would be produced by open burning and wildfires.
 - Bioenergy emissions include all emissions associated with collection and transportation of the biomass materials, and all handling machinery emissions at the power plant, plus the boiler emissions.

Criteria Pollutant Lb/MMBtu	Forest Burn	Power Plant
Particulate	1.3	0.015
Nitrogen Oxides	0.3	0.010
Sulfur Oxides	NA	0.025
Organic Compounds	0.8	0.005
Carbon Monoxide	12.4	0.350

Benefits of Biomass Power

- Improving Air Quality

- Agricultural Biomass and Air Pollutants

- Agricultural residues have to be disposed of in order to allow agricultural operations to proceed unimpeded.
 - Pushing the residues into piles and burning them is the cheapest disposal alternative available to farmers, but the resulting pollution is one of the greatest impediments to the achievement of air-quality standards in many of the state's major agricultural regions.
 - Bioenergy emissions include all emissions associated with collection and transportation of the biomass materials, and all handling machinery emissions at the power plant, plus the boiler emissions.

Criteria Pollutant Lb/MMBtu	Open Field Burn	Power Plant
Particulate	0.8	0.015
Nitrogen Oxides	0.4	0.010
Sulfur Oxides	NA	0.025
Organic Compounds	0.6	0.005
Carbon Monoxide	8.0	0.250

Benefits of Biomass Power

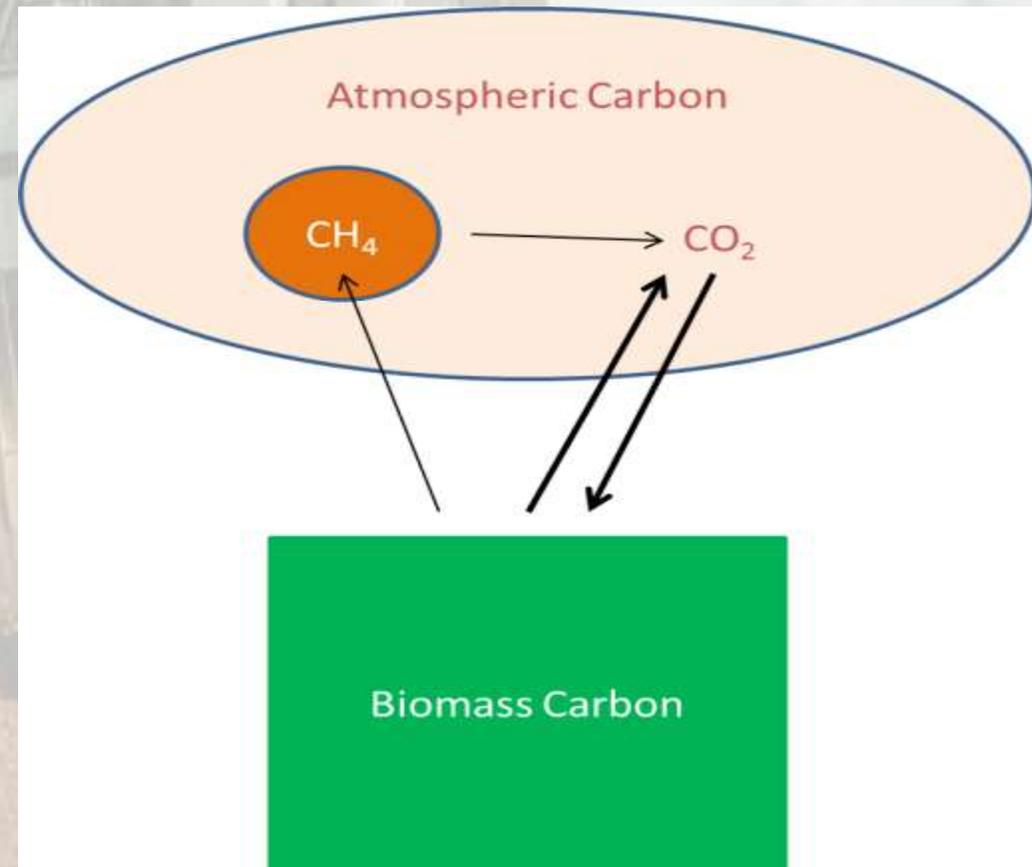
- Improving air quality
 - In addition to these overall emissions reductions, California's biomass fleet of facilities use the same general operation methodologies and employ various technologies to reduce individual plant emissions from the processing of biomass fuel. For example, NO_x emissions are controlled by combustion modifications and add-on controls such as selective catalytic and non-catalytic reduction. Typically, these control systems are successful in simultaneously attaining low NO_x and CO emission levels. Particulate matter control technologies include electrostatic precipitators, fabric filter/baghouses, wet scrubbers, and mechanical separators. No matter the specific emissions control technology, each biomass facility is operated using Best Available Control Technology (BACT)

Benefits of Biomass Power

- Improving air quality
 - Oversight of biomass plant emissions is covered by the local air pollution control districts who are also the issuing authority for plant operating permits (EPA Title V).
 - The Title V Permit requires the installation of Continuous Emissions Monitor (CEMs) for SO₂, CO, NO_x and Opacity. Continuously monitoring these critical parameters ensures consistent and efficient combustion in the boilers.
 - The Title V Permit includes fuel quality requirements, deviation notification requirements, regular quality assurance and emissions monitoring reports, and annual certification of compliance.
 - The US EPA has oversight review of Title V Permits. Both the local air district and the US EPA have permitting authority over significant changes in equipment or methods of operation, and authorization for regular inspections and compliance monitoring.

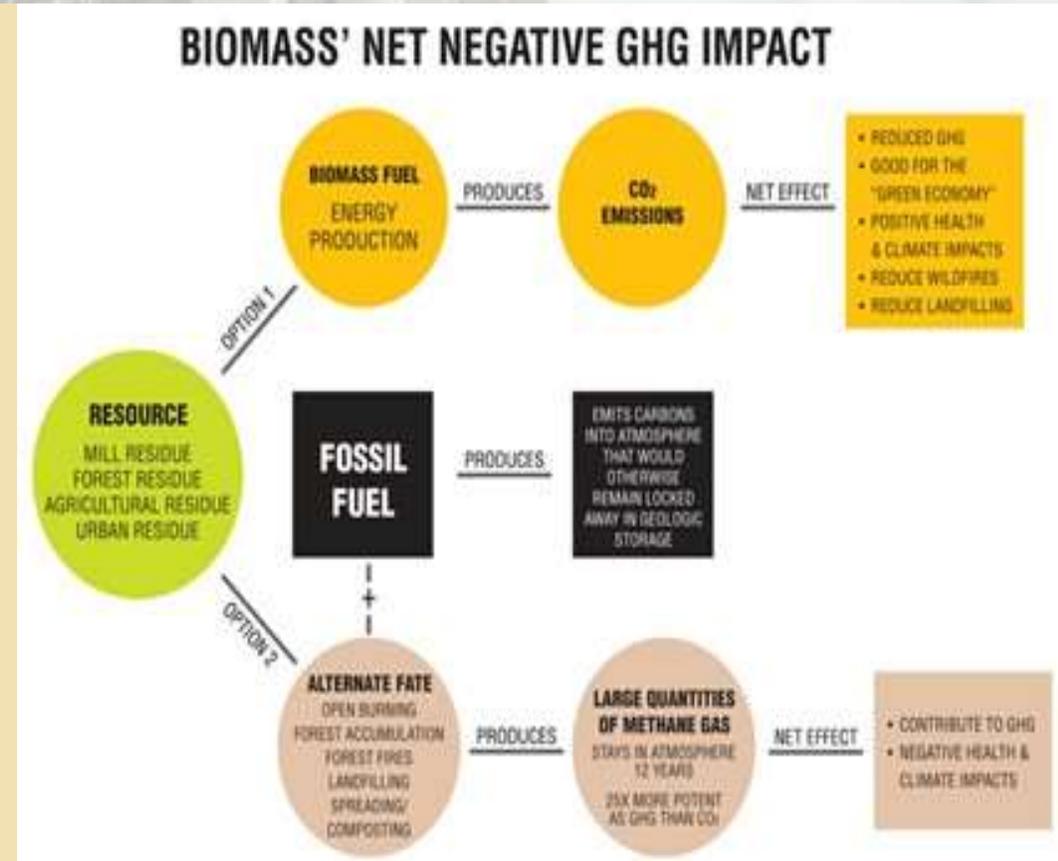
Benefits of Biomass Power

- Reducing greenhouse gas emissions
 - The amount of biomass in forests grows or declines over time, sequestering or releasing carbon to the atmosphere.
 - This balance of carbon matters, and how the biomass returns to the atmosphere also matters.
 - The figure illustrates the most active part of the global carbon cycle.



Benefits of Biomass Power

- Reducing greenhouse gas emissions
 - All renewables provide the benefit of displacing fossil fuel use.
 - Biomass energy provides an additional benefit by reducing the greenhouse gas emissions associated with conventional disposal options like landfilling, agricultural open burning, or forest fires.



Benefits of Biomass Power

- Reducing greenhouse gas emissions
 - The carbon in biomass fuels (biogenic carbon) is already part of the global carbon cycle, in which carbon circulates rapidly between the atmosphere and the biomass on earth, the great bulk of which is wood in the world's forests.
 - Carbon is returned to the atmosphere in the form of CO₂ and methane (CH₄). Methane is 25 times more potent than CO₂.
 - Biomass power plants efficiently combust the methane, emitting carbon only in the form of CO₂.

Benefits of Biomass Power

- Sources of documents, data, and figures:
 - Biomass Power Association
 - Carbon Balance and Management Journal
 - California Biomass Energy Alliance
 - California Energy Commission
 - Cal Fire
 - Environmental Protection Agency – AP 42 Air Emissions Factors
 - National Renewable Energy Laboratory
 - Washington Department of Natural Resources

