OVERVIEW OF THE CALIFORNIA BIOMASS POWER INDUSTRY

NORCAL SAF/UC EXTENSION WEBINAR

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Presentation Overview

- Introduction
- Biomass Power Rules of Thumb
- Abbreviated History of Biomass Power in CA
- Current status of the sector
- Conversion Technologies
  - Combustion
  - Gasification
- Recent Trends
- Community-Scale Project Example
- Key Issues for the Future of the Industry

What is Biomass?

- **Biomass** – any solid, nonhazardous, cellulosic material derived from: forest-related resources, solid wood wastes, agricultural wastes, and plants grown exclusively as a fuel.*

*based on the definition of biomass per the Federal Energy Act of 2005.

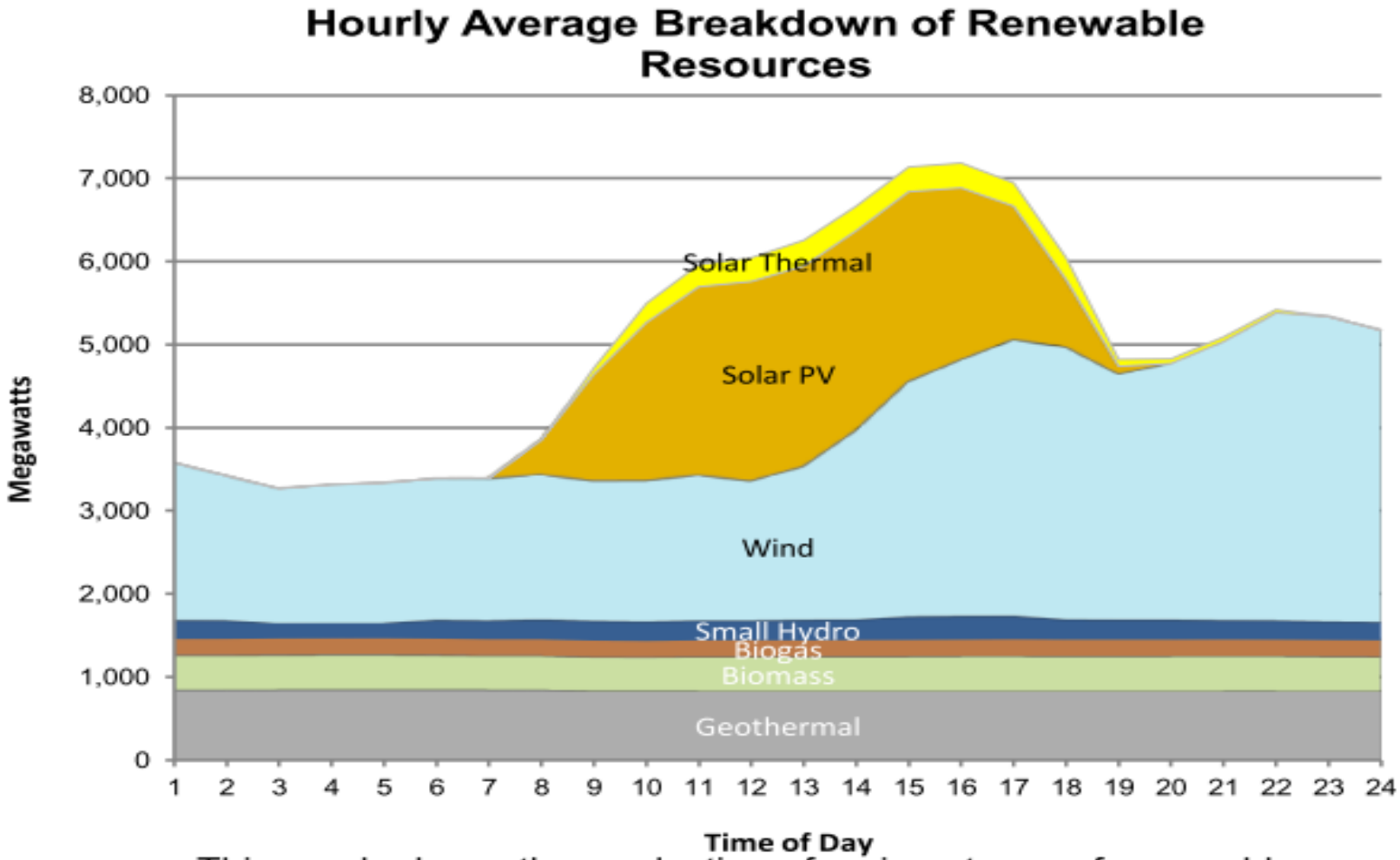
Biomass Power – Some Rules of Thumb

- 1 MW (1,000 kW) is enough power for 750 to 1,000 homes.
- Biomass fuel is purchased primarily on a Bone Dry Ton basis.
- Typical amount of biomass recovered during forest fuels treatment is 10-14BDT/ acre.
- Typical "burn rate" for a biopower facility is 1 BDT/MWh.
- 10 MW biopower plant consumes 10 BDT/hr.
- Biopower facilities are designed to operate 24/7 and deliver baseload power. Power utilities purchase the power using long-term Power Purchase Agreements. (PPA)

Abbreviated History of the California Biomass Power Sector

- Forest products sector was an early adopter.
- Public Utilities Regulatory Policy Act (Federal).
  - Market response – 50+ new biopower plants (approx. 800 MW of generation capacity).
- Power contract buyouts.
- CA Renewable Portfolio Standard – 33% renewable by 2020.
- Currently 26 operating plants (approx. 550 MW of capacity).
- Latest State Policy - Senate Bill 1122.

Biomass – A Base-Load Energy Source

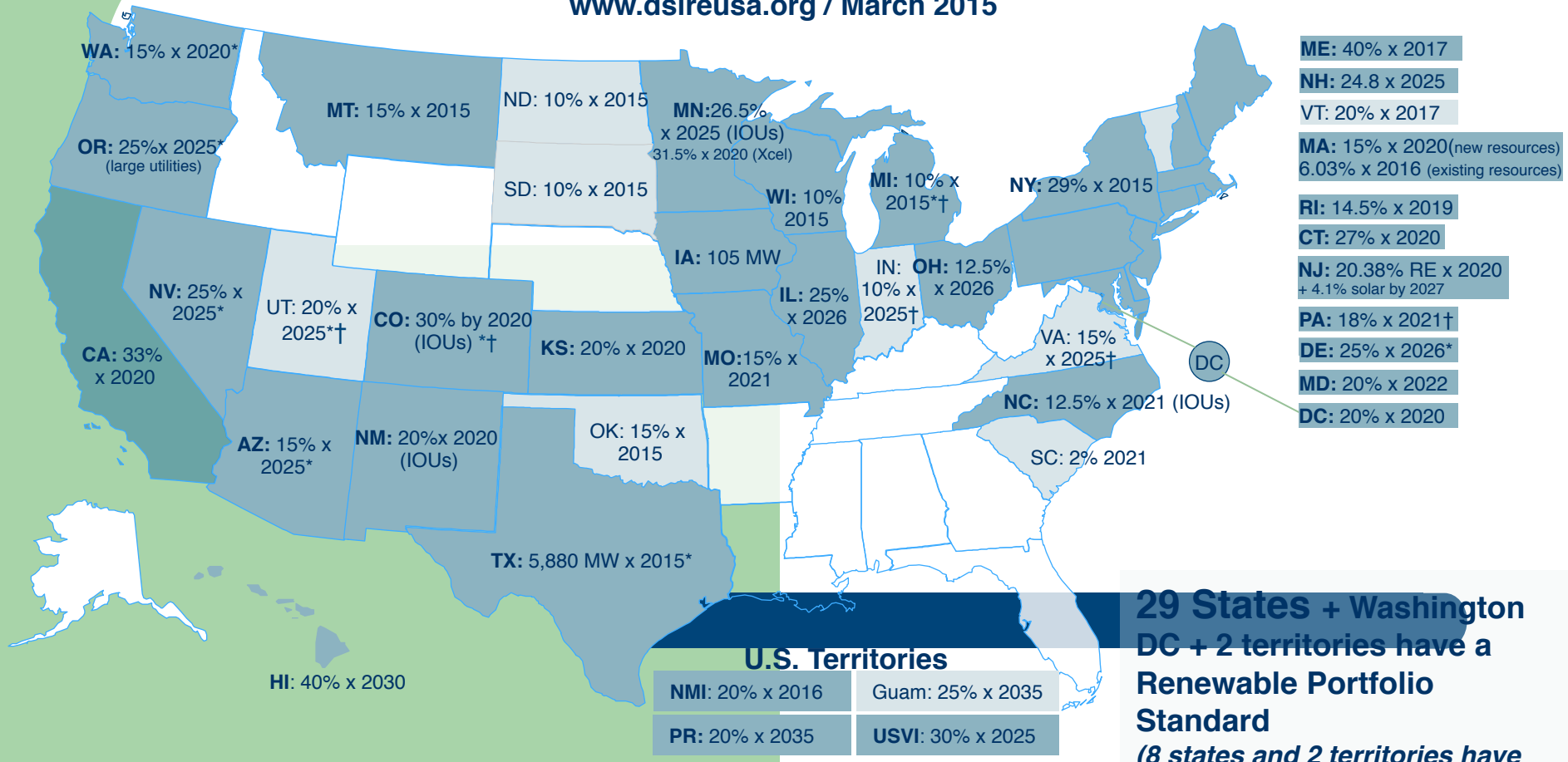


This graph shows the production of various types of renewable generation across the day.

Source; HTTP://content.caiso.com
September 17, 2013

Renewable Portfolio Standard Policies

www.dsireusa.org / March 2015



ME: 40% x 2017
NH: 24.8 x 2025
VT: 20% x 2017
MA: 15% x 2020(new resources) 6.03% x 2016 (existing resources)
RI: 14.5% x 2019
CT: 27% x 2020
NJ: 20.38% RE x 2020 + 4.1% solar by 2027
PA: 18% x 2021†
DE: 25% x 2026*
MD: 20% x 2022
DC: 20% x 2020

U.S. Territories

NMI: 20% x 2016	Guam: 25% x 2035
PR: 20% x 2035	**USVI**: 30% x 2025

29 States + Washington DC + 2 territories have a Renewable Portfolio Standard
(8 states and 2 territories have renewable portfolio goals)

Renewable portfolio standard
Renewable portfolio goal

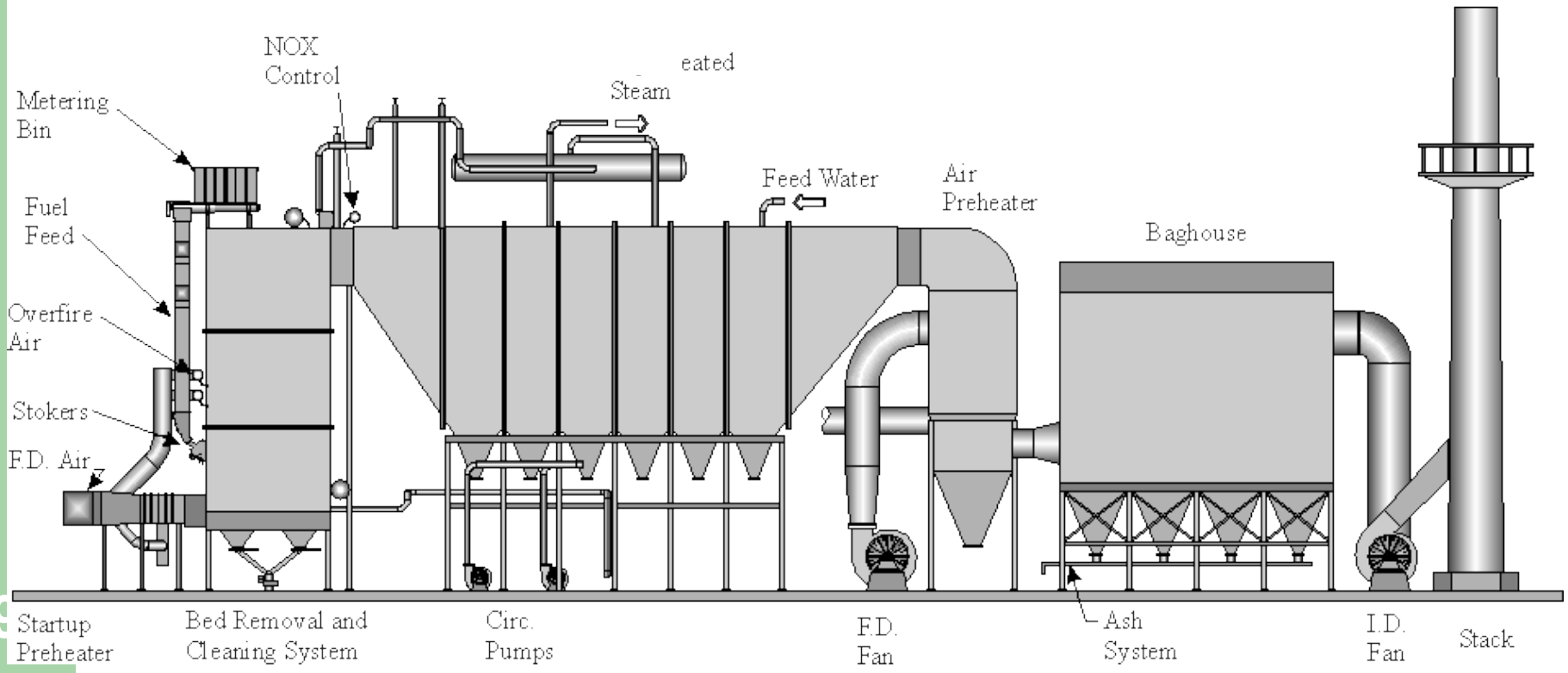
* Extra credit for solar or customer-sited renewables
† Includes non-renewable alternative resources

Current Operating Facilities

- 26 biomass plants in commercial service – about 550 MW capacity.
- Utilize a blend of urban, ag and forest feedstocks. Urban is the low price leader.
- Power Purchase Agreements for many of these facilities term out by 2020.
- 10 idle plants.
- Most recent entry is DTE Stockton 45 MW (converted coal).
- 1 plant in construction phase – SPI Anderson 31 MW

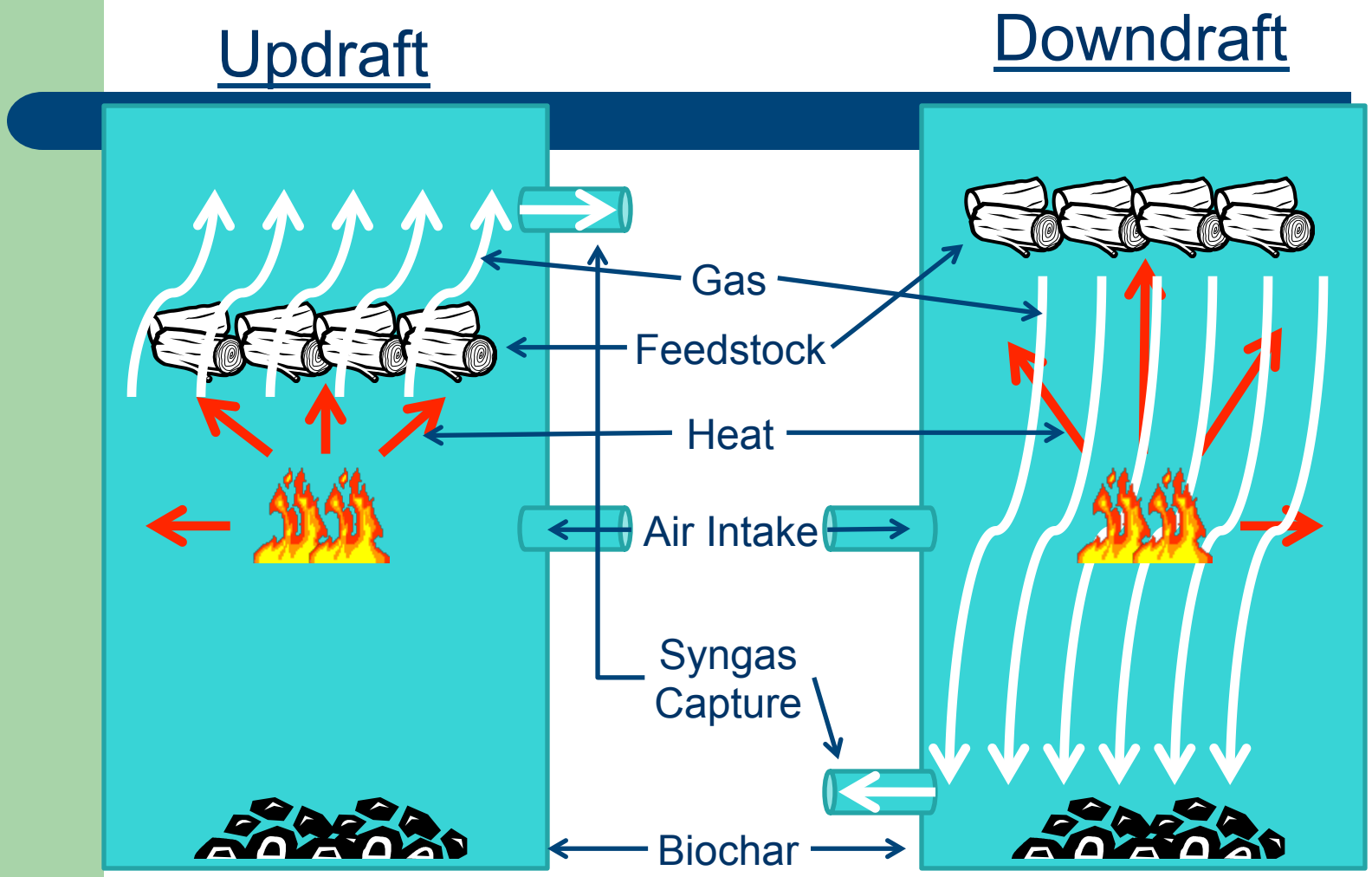
Combustion Technology

Typical EPI Energy System



Burney Forest Power 31 MW CHP at Burney, CA

Gasification



Community Power Corp BioMax 50 kWh CHP at
Dixon Ridge Walnut Farm, Winters, CA

Phoenix Energy 500 kWh Gasification Unit at Merced, CA

SB 1122 Bioenergy Market Adjusting Tariff (BioMAT)

- Signed into law Sept 2012.
- Bioenergy specific carve out for 250 MW of small-scale (3 MW or less) distributed generation.
  - Urban sourced – 110 MW
  - Dairy and other Ag sourced – 90 MW
  - Forest sourced – 50 MW
- Designed to address waste diversion and air emissions reduction goals of the CA Energy Commission, CalRecycle and the State's Bioenergy Action Plan.
- Administered by the CA Public Utilities Commission.
- Initial BioMAT auction likely to take place summer 2015.

Community-Scale Biopower Facility Example – North Fork Community Power

- 1 MW project being considered at North Fork, California.
- New plant construction cost = $5 to $6 million.
- Will consume about 23 BDT/day (about 1BDT/MWh burn rate).
- Biomass transported approx. 30 - 40 miles.
- Delivered biomass fuel cost at $45 to $60 per BDT.
- Average electrical energy production cost

  ~ $0.14 - $0.17/kWh

The Future of Commercial Scale Biomass Power Plants in California Depends on …

- Relative price of natural gas and power.
- Environmental issues
  - Air Emissions – particulate, black carbon, etc.
  - Carbon accounting
- KEY - Monetization of societal and ratepayer benefits
  - e.g., AB 590

Advantages of Biomass Power Generation

- Provides baseload renewable energy (24/7).
- Has numerous benefits:
  - Supports hazardous fuels reduction, healthy forests and watersheds
  - Provides employment (4.9 jobs/MW)
  - Greenhouse gas reduction displacing fossil fuels
  - Reduces waste material destined for landfills
  - Net improvement in air quality/reduction of GHG emissions

Not All Biomass Users Agree

Additional Resources

- CA Biomass Energy Alliance

http://www.calbiomass.org/

- Bioenergy Association of California

http://www.bioenergyca.org/

- UC Division of Ag and Natural Resources

http://ucanr.edu/sites/WoodyBiomass/

- CA Biomass Collaborative

http://biomass.ucdavis.edu/about/

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