Biomass and Bioenergy Research in California

California Energy Commission

Public Interest Energy Research

Staff Workshop

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Bioenergy Goals for California

- Senate Bill 2: California's RPS: 20% of electricity sold must be from renewable sources in 2013, 25% in 2015, and 33% in 2020.
  - Estimated amount of renewable generation needed is 85,000 GWh/yr by 2020. [1]
- Executive Order S-06-06: Requires 20% of renewable electricity sold be generated from biomass sources.
  - Estimated amount of biomass electricity needed by 2020 is 17,000 GWh/yr
  - In 2010 there was 6,894 GWh of biomass electricity sold in California which was 17.1% of all renewable electricity, including imports, sold in California.
- Governor's Clean Energy Jobs plan: 12,000 MW of new distributed generation and 6,500 MW of new Combined Heat and Power.

Biomass Generation in California

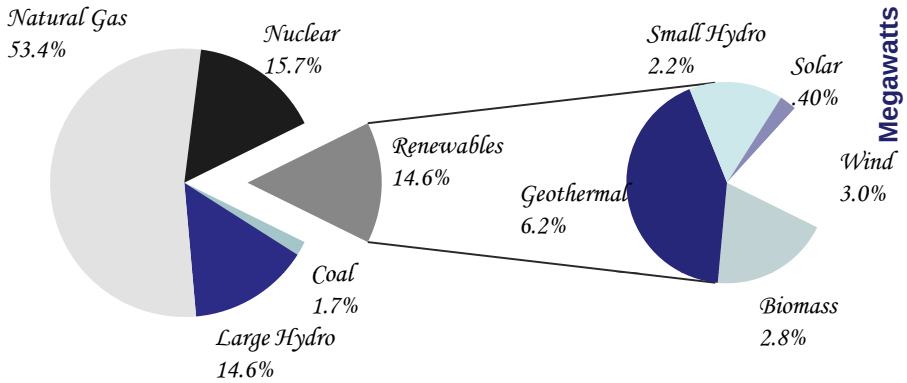


Figure 4. In-state Generation for California in 2010

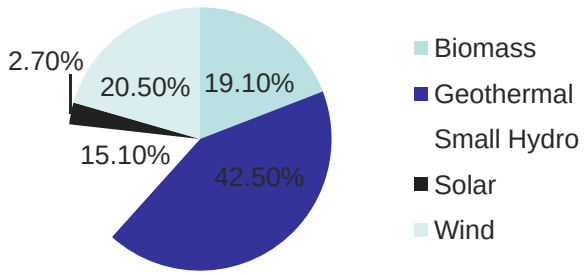


Figure 5. In-state renewable generation by source for California in 2010

Total California In-state Generation: 205, 018 GWh
In-state generation: Reported generation from units 1 MW and larger.
Sources: California Total Electric System Power
Note: Due to legislative changes required by Assembly Bill 162 (2009), the California Air Resources Board is currently undertaking the task of identifying the fuel sources associated with all imported power entering into California.

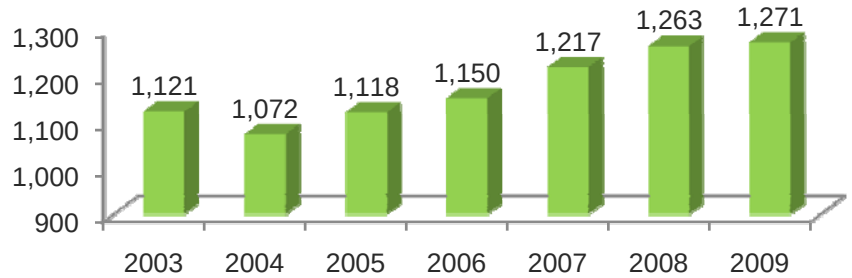


Figure 1. Biomass Capacity in California. Source: NREL, 2009 Clean Energy Databook

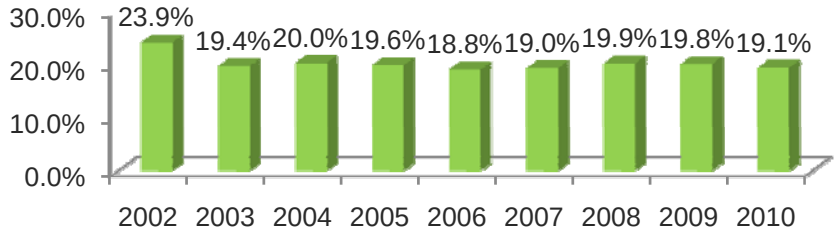


Figure 2. Percentage of Renewable Electricity Generation Made Up by Biomass. Source: California Total System Power

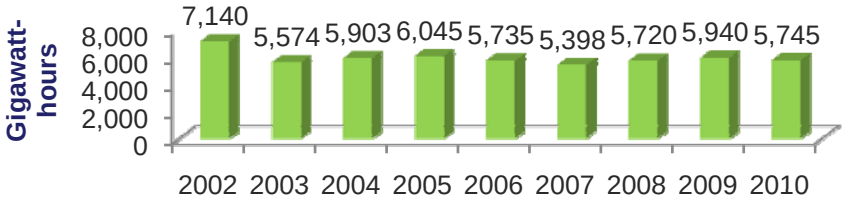
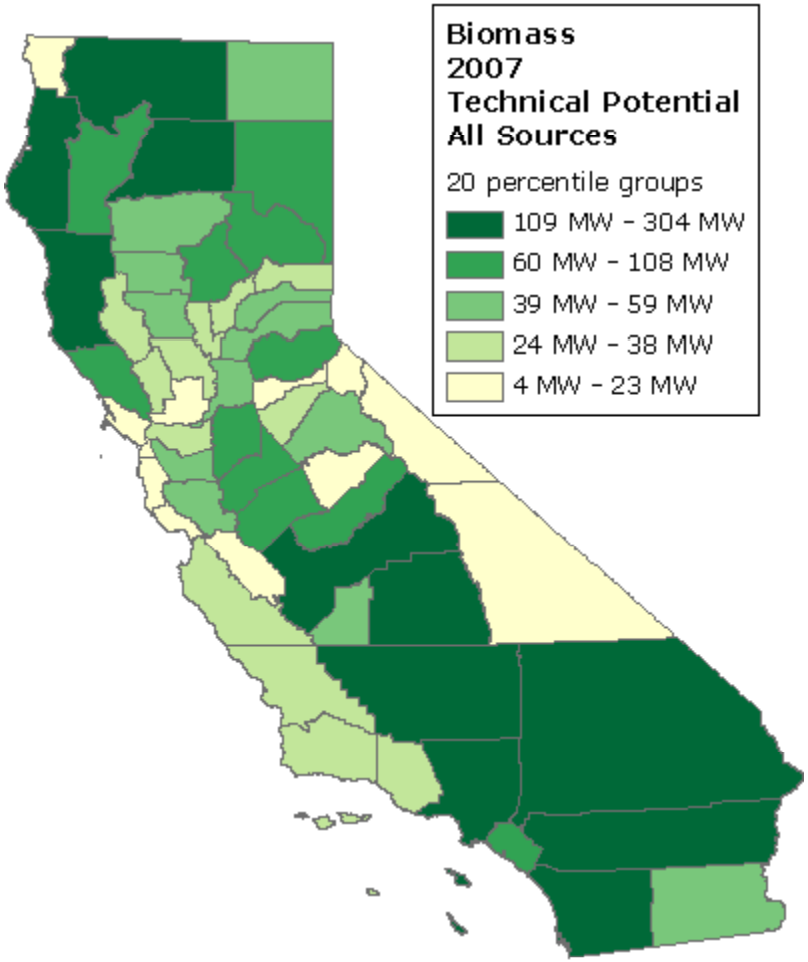


Figure 3. In-state Biomass Generation in California .Source: California System Power

Technical Potential of Biomass Resources in California



Source: California Renewable Resource Portal, Llnl

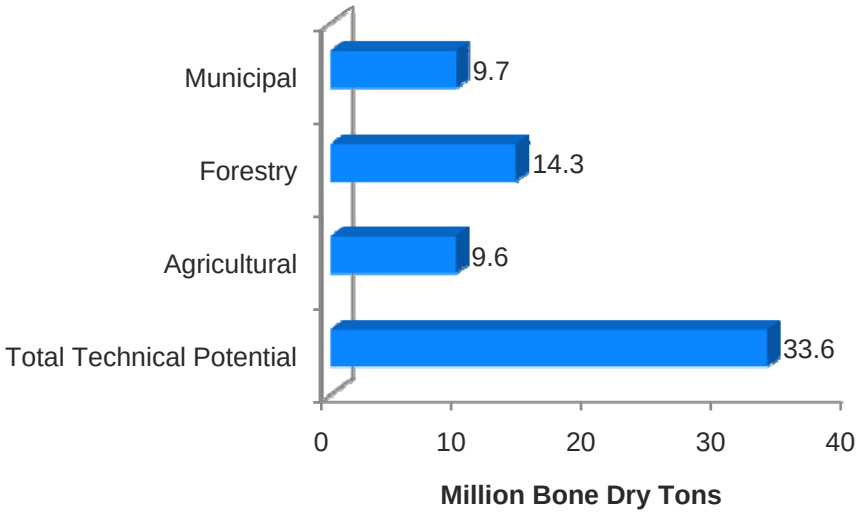


Figure 2. Technical Potential of Biomass Resources by Feedstock Source in California. Source: Table 1. Biomass Resource Assessment in California, CEC-500-2005-066-D

Barriers

- In-state generation from biomass dropped 25% between 2002 and 2010

- 144 MW of biomass capacity was idled in California in 2010
  - Reasons include
    - Feedstock access
    - Low prices for energy
    - Meeting pollution requirements

- Major barriers to the use of biomass for energy and other purposes in California:
  - Cost to collect and transport biomass feedstock remains an economic challenge.
  - A lack of policy and regulatory coordination among local and state agencies in California.
  - Grid and natural gas pipeline interconnections are challenges that have inhibited distributed biomass electricity and biogas production.
  - Small developers are at a disadvantage because they can not receive loans until they have received their permits.

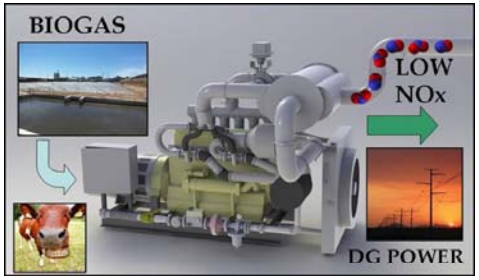
Biomass Technology Currently Funded by PIER

Technology	Active Projects	PIER Funding	Match Funding
Thermal Gasification	3	$2,499,871	$5,491,809
Biological Gasification	4	$1,699,263	$4,510,475
Direct Combustion	1	$1,195,779	$500,000
Fuel Cells	2	$2,435,575	$9,474,694
Distributed Generation	2	$2,294,322	$2,299,943
Turbines/Microturbines	1	$300,000	$0
Fuel Collection and Processing	2	$1,195,779	$1,298,454
Total	**15**	**$11,620,589**	**$23,575,375**

Future Energy Commission Objectives (2011 Bioenergy Action Plan)

- Encourage increased bioenergy production at existing facilities
  - CEC estimates 650 GWh increase per year in electricity generated if all biomass plants in California operated at 85% capacity
  - Find ways to increase the amount of sustainable feedstocks
- Promote and expedite the construction of new bioenergy facilities
  - Even with no idle plants, more facilities will be needed to reach goals.
  - Revisit restrictions on the injection of biomethane derived from landfill gas
- Fund Research and Development
  - More CEC funds for advanced biofuels and renewable energy facilities
- Promote and encourage the integration of bioenergy facilities
  - PIER grants for integrated bioenergy projects
- Remove statutory hurdles and streamline the regulatory process
  - The CEC willing to work with local governments to streamline the permitting process.
  - CalRecycle and Energy Commission plan to work together to redefine organic waste.

Successful PIER Funded Biomass Projects



- Gills Onions, located in Oxnard, to demonstrate an onsite process that converts onion peel waste products in an anaerobic digester to produce biogas for high-efficiency fuel cells.
- Community Power Corporation's BioMax 50 (Yolo/Solano County) has demonstrated a 50 kW small modular biopower system to convert a wide range of biomass residues such as nutshells, forest thinnings, and wood scraps, into clean and green power and heat.
- Makel Engineering's project is demonstrating generation of up to 200 kW of electric power using the homogenous charge compression ignition (HCCI) technology while meeting or exceeding California's emissions standards.
- University of California, Davis, demonstrates the anaerobic-phased solids (APS) digester technology, in conjunction with a clean burn engine-generator, to illustrate an environmentally sound, cost-effective distributed energy system capable of degrading high solid wastes while producing renewable energy, soil amendments, and fiber products.
- Valley Fig Growers, Inc.,(Fresno, California) anaerobic digester pretreats wastewater before disposal in the municipal sewer system to demonstrate to other food processors the quantifiable economic and environmental benefits gained by installing and operating a digester.

Discussion Questions

- How can technology help with overcoming the current barriers to deploying more biomass in California?
- How can research help the industry meet environmental regulations for anaerobic digesters?
- What R&D efforts can facilitate grid interconnection for biomass energy projects?
- How can R&D help commercialize biomass to energy systems?