STATUS UPDATE OF CALIFORNIA’S BIOENERGY SECTOR

Forest Vegetation Management Conference

January 14, 2020

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TSS Consultants
PRESENTATION OVERVIEW

- Brief history and overview of California’s biomass power sector
- Governor’s 2015 proclamation and its implications
- Current status
- BioRAM I
- BioRAM II
- Community Choice Energy
- SB 1122
- Additional Resources
- Value Add Options
- Questions
ABBREVIATED HISTORY OF THE CALIFORNIA BIOMASS POWER SECTOR

- Forest products sector was an early adopter.
  - Market response – 60+ new biopower plants (approx. 900+ MW of generation capacity).
- Power contract buyouts.
- CA Renewable Portfolio Standard – 60% renewable by 2030 and 100% carbon free by 2045.
- Senate Bill 1122.
- Gov’s Proclamation results in SB 859 and BioRAM PPA contracts. (Bioenergy Renewable Auction Mechanism)
- SB 901
- Currently 22 operating plants (approx. 560 MW of capacity).
22 biomass plants in commercial service – about 560 MW capacity.

Utilize a blend of urban, ag and forest feedstocks. Urban feedstock is the low price leader, then ag, with forest biomass as the highest priced.

15 idle plants with about 260 MW capacity.

Most recent entry is ARP Loyalton at 20 MW.
RESPONSE TO GOVERNOR’S EMERGENCY PROCLAMATION

CA Legislature Response:
- Senate Bill 859 is signed by the Governor in Sept 2016.

CA PUC and Utility response:
- Directed investor owned utilities (PG&E, SCE, SDG+E) and publicly owned utilities (SMUD, LADWP, IID, MID, etc.) to procure power from facilities that source forest biomass using the Renewable Auction Mechanism.
- BioRAM only applies to IOU’s and POU’s with at least 100,000 customers.
- Target allocation is at least 180 MW.
- Applies only to biomass power plants on line before June 1, 2013.
- Power Purchase Agreements for BioRAM facilities (six) term out by 2027 & 2028.
Power Purchase Agreements are a minimum of five years duration targeting 180 MW (minimum).

BioRAM I fuel Requirements:
- At least 80% from HHZ.

BioRAM II fuel Requirements:
- 80% from “sustainable” forest management with at least 60% from HHZ.

Fuel tracking protocols require plants to report quarterly to the IOU’s.

If BioRAM plants do not meet minimum fuel sourcing requirements then the energy price drops to $89.23/MWh (down from about $120/MWh).

SB 901 allows BioRAM plants to request a five year PPA extension (if not located in a federal severe nonattainment airshed).
<table>
<thead>
<tr>
<th>FACILITY</th>
<th>SCALE (Net MW)</th>
<th>ANNUAL FEEDSTOCK USAGE (BDT/YEAR)</th>
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</thead>
<tbody>
<tr>
<td><strong>BIORAM I FACILITIES</strong></td>
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<tr>
<td>Pacific Ultrapower Chinese Station</td>
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<td>Rio Bravo Fresno Biomass</td>
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<tr>
<td>Pacific Ultrapower Chinese Station</td>
<td>Dennis Serpa</td>
<td><a href="mailto:dserpa@chinesestation.net">dserpa@chinesestation.net</a></td>
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<td><a href="mailto:alanj123@aol.com">alanj123@aol.com</a></td>
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<td>Honey Lake Power</td>
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<td><a href="mailto:skozlowski@greenleaf-power.com">skozlowski@greenleaf-power.com</a></td>
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<td>American Renewable Power Loyalton</td>
<td>Jim Turner</td>
<td><a href="mailto:jim.turner@amerpower.com">jim.turner@amerpower.com</a></td>
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COMMUNITY CHOICE ENERGY

- Also known as Community Choice Aggregation (CCA). Currently authorized in CA, OH, MASS, NJ, NY and RI.
- Allows communities to procure power on behalf of residents – both residential and commercial. Power is still delivered using existing infrastructure provided by the existing utility provider.
- Currently 19 CCA’s in CA. Marin County was the first to adopt this business model (2010). 11 communities are now considering CCA.
- Most CCA’s focus on procuring power (primarily renewable) from a variety of sources.
- Some procure biomass power (Redwood Coast Energy Authority).
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, CA Air Resources Board and the State’s Bioenergy Action Plan.

Administered by the CA Public Utilities Commission.

BioMAT Category 3 auction currently underway.
At least 80% sourced as byproducts of “Sustainable Forest Management”
  - Sustainable Forest Management as designated by CPUC
  - Verified by third party

Other 20% of feedstock:
  - Byproducts of agricultural operations
  - Clean urban wood waste

Annual Reporting to the CPUC
  - Volume by feedstock type
Phoenix Energy 500 kWh Gasification Unit at Merced, CA
COMMUNITY-SCALE BIOPOWER FACILITY EXAMPLE – NORTH FORK COMMUNITY POWER

- 2 MW project being considered at North Fork, California.
- New plant construction cost around $15 million.
- Will consume about 46 BDT/day (approx. 1BDT/MWh burn rate).
- Biomass transported approx. 30 - 40 miles (one way).
- Achieved financial close on 12/31/19.
- EQTEC is strategic partner and will supply gasifier technology.
- Commercial operations should commence Q2 2021.
- Energy price with BioMAT PPA: $199/MWh
<table>
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<tr>
<th>Facility</th>
<th>Scale (MW)</th>
<th>Annual Feedstock Usage (BDT/Year)</th>
<th>Location</th>
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<td>CHIPS Value-Added Product Yard</td>
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<td>Burney Hat Creek Bioenergy</td>
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<td>Nevada County Bioenergy</td>
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<td>Mariposa Biomass Project</td>
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<td><strong>Totals</strong></td>
<td><strong>22</strong></td>
<td><strong>176,000</strong></td>
<td></td>
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</tbody>
</table>
OTHER VALUE-ADDED USES

- District heating and power
  - Quincy
  - Bridgeport
- Transportation Fuels
  - Red Rock Biofuels
- Fuel pellets
  - RCRC initiative
- Animal bedding
  - American Wood Fiber
- Landscape cover
- Soil amendment
  - Mulch
  - Biochar
- Firewood
- Post and poles
California CCA
https://leanenergyus.org/new/california/
Statewide Wood Energy Team
http://ucanr.edu/sites/swet/
Placer Co Air Pollution Control District
http://www.placer.ca.gov/departments/air/apcdbiomass
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/
QUESTIONS or HECKLING REMARKS?

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