Group 1 – California

Jose Pacheco
Tianlu Gao
Lauren Bridger
Elizabeth Devore
Overview

- Present Status
- Rules and Standards
- Issues and Recommendations
- Achieving Goals
- Conclusions
Present Status

JOSE PACHECO, UNIVERSITY OF TEXAS - DALLAS
California is…

- among the top states in the nation in net electricity generation from renewable resources.
- one of the nation's leading producers of electricity from conventional hydroelectric power.
- a leader in net electricity generation from several other renewable energy sources, including:
  - Solar
  - Geothermal
  - Wind
  - Biomass
Solar Thermal

- In 2014, California became the first state in the nation to get more than 5% of its utility-scale electricity generation from its solar resource.

- The world's largest solar thermal plant, located in California's Mojave Desert, began delivering electricity to the grid in early 2014.

- The Ivanpah Solar Power Facility has a capacity of ~400MW.
Geothermal

- Substantial geothermal resources are found in California's coastal mountain ranges and in the volcanic areas of northern California.

- With more than 2,700 MW of installed capacity, California is the top producer of electricity from geothermal energy in the nation.
Consumption

California Energy Consumption by End-Use Sector, 2013

- Residential: 37.8%
- Commercial: 24.4%
- Industrial: 18.5%
- Transportation: 19.3%

Source: Energy Information Administration, State Energy Data System

California Energy Consumption Estimates, 2013

- Coal
- Natural Gas
- Motor Gasoline excl. Ethanol
- Distillate Fuel Oil
- Jet Fuel
- LPG
- Residual Fuel
- Other Petroleum
- Nuclear Electric Power
- Hydroelectric Power
- Biomass
- Other Renewables
- Net Interstate Flow of Electricity

Source: Energy Information Administration, State Energy Data System

http://www.eia.gov/state/?sid=CA
# Prices

<table>
<thead>
<tr>
<th>Service</th>
<th>California</th>
<th>U.S. Average</th>
<th>Period</th>
<th>Find More</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Petroleum</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic Crude Oil First Purchase</td>
<td>$25.75 /barrel</td>
<td>$25.51 /barrel</td>
<td>Feb-16</td>
<td></td>
</tr>
<tr>
<td>Natural Gas</td>
<td>California</td>
<td>U.S. Average</td>
<td>Period</td>
<td>Find More</td>
</tr>
<tr>
<td>City Gate</td>
<td>$2.65 /thousand cu ft</td>
<td>$3.46 /thousand cu ft</td>
<td>Feb-16</td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>$11.52 /thousand cu ft</td>
<td>$8.39 /thousand cu ft</td>
<td>Feb-16</td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td>California</td>
<td>U.S. Average</td>
<td>Period</td>
<td>Find More</td>
</tr>
<tr>
<td>Average Sales Price</td>
<td>--</td>
<td>$34.83 /short ton</td>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>Delivered to Electric Power Sector</td>
<td>--</td>
<td>$2.10 /million Btu</td>
<td>Feb-16</td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>17.69 cents/kWh</td>
<td>12.15 cents/kWh</td>
<td>Feb-16</td>
<td>find more</td>
</tr>
<tr>
<td>Commercial</td>
<td>13.81 cents/kWh</td>
<td>10.15 cents/kWh</td>
<td>Feb-16</td>
<td>find more</td>
</tr>
<tr>
<td>Industrial</td>
<td>10.41 cents/kWh</td>
<td>6.38 cents/kWh</td>
<td>Feb-16</td>
<td>find more</td>
</tr>
</tbody>
</table>

[http://www.eia.gov/state/print.cfm?sid=CA](http://www.eia.gov/state/print.cfm?sid=CA)
## Environment

### Special Programs
- California

### Clean Cities Coalitions
- Antelope Valley, Central Coast, Coachella Valley, East Bay (Oakland),
- Long Beach, Los Angeles, Sacramento, San Diego, San Francisco, San Joaquin Valley, Silicon Valley (San Jose), Southern California, Western Riverside County

### Alternative Fuels

<table>
<thead>
<tr>
<th>Description</th>
<th>California</th>
<th>Share of U.S.</th>
<th>Period</th>
<th>Find More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Fueled Vehicles in Use (selected fleets)</td>
<td>39,745 vehicles</td>
<td>11.5%</td>
<td>2014</td>
<td>find more</td>
</tr>
</tbody>
</table>

### Ethanol Plant Operating

<table>
<thead>
<tr>
<th>Description</th>
<th>California</th>
<th>Share of U.S.</th>
<th>Period</th>
<th>Find More</th>
</tr>
</thead>
<tbody>
<tr>
<td>218 million gai/year Capacity</td>
<td>1.4%</td>
<td>2016</td>
<td></td>
<td>find more</td>
</tr>
</tbody>
</table>

### Ethanol Consumption

<table>
<thead>
<tr>
<th>Description</th>
<th>California</th>
<th>Share of U.S.</th>
<th>Period</th>
<th>Find More</th>
</tr>
</thead>
<tbody>
<tr>
<td>36.329 thousand barrels</td>
<td>11.3%</td>
<td>2014</td>
<td></td>
<td>find more</td>
</tr>
</tbody>
</table>

### Total Emissions

<table>
<thead>
<tr>
<th>Description</th>
<th>California</th>
<th>Share of U.S.</th>
<th>Period</th>
<th>Find More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide</td>
<td>353.0 million metric tons</td>
<td>6.7%</td>
<td>2013</td>
<td>find more</td>
</tr>
</tbody>
</table>

### Electric Power Industry Emissions

<table>
<thead>
<tr>
<th>Description</th>
<th>California</th>
<th>Share of U.S.</th>
<th>Period</th>
<th>Find More</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide</td>
<td>57,223 thousand metric tons</td>
<td>2.5%</td>
<td>2014</td>
<td>find more</td>
</tr>
<tr>
<td>Sulfur Dioxide</td>
<td>3 thousand metric tons</td>
<td>0.1%</td>
<td>2014</td>
<td></td>
</tr>
<tr>
<td>Nitrogen Dioxide</td>
<td>89 thousand metric tons</td>
<td>4.1%</td>
<td>2014</td>
<td></td>
</tr>
</tbody>
</table>
Rules and Standards

TIANLU GAO, UNIVERSITY OF DENVER
Renewable Portfolio Standard

- RPS is a regulation that requires the increased production of energy from renewable energy sources, such as solar, wind, geothermal, small hydro, and biomass.

- The California RPS was created in 2002 under Senate Bill 1078 and further accelerated in 2006 under Senate Bill 107 -
  - The bills stipulate that California electricity corporations must expand their renewable portfolio by 1% each year until reaching 20% in 2010.

http://www.energy.ca.gov/tour/geysers/Geysers_3.jpg

RPS – CA

- 2010: 20%
- 2020: 33%
- 2024: 40%
- 2027: 45%
- 2030: 50%
Other Notable Information

- In addition to the Renewable Portfolio Standard RPS and an energy efficiency standard, California policies promote stricter appliance efficiency standards and higher energy efficiency standards for public buildings.

- The state also requires net metering and power source disclosure from utilities.
Issues and Recommendations

LAUREN BRIDGER, UNIVERSITY OF ARKANSAS
Transmission

- Development and funding of additional transmission infrastructure.
- Overcrowded interconnection queue.
- Interconnection delays.
- Curtailment of generation resources.
Permitting

- Environmental concerns
  - Large desert farms
    - Bighorn sheep and desert tortoises need open space
    - Ivanpah solar-thermal, killed thousands of birds
  - Genesis plant built on Native American tribal ground, 3000 artifacts dug up
Permitting cont’d

- CA Land Conservation Act
- Property tax relief for 10 years of farmland designation
Unpredictable Resources

- Ivanpah solar-thermal system
- Talk of shutting down because generation is lower than expected
Achieving Goals

ELIZABETH DEVORE, AUBURN UNIVERSITY
Utilities

Utilities informed to adopt the new targets of an average of:

- 20% of retail sales from procurement of renewables from January 1, 2011 – December 31, 2013.
- 25% of retail sales from renewables by December 31, 2016.
- 33% of retail sales from renewables by the end of 2020.

RPS applies to publicly owned electric utilities (POUs), as well as retail sellers of electricity.
Incentives

- Rebates available by many POUs.
- All utilities except LADWP have net metering.

<table>
<thead>
<tr>
<th>Utility</th>
<th>Residential Rebates</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burbank Water and Power</td>
<td>$0.64/watt AC</td>
<td>Min sys size: 1 kW, max sys size: 30 kW</td>
</tr>
<tr>
<td>Riverside Public Utilities</td>
<td>$0.50/watt AC</td>
<td>System size must abide by net metering rules</td>
</tr>
<tr>
<td>Roseville Electric</td>
<td>$0.24/watt AC</td>
<td>Systems less than 10 kW</td>
</tr>
<tr>
<td>Silicon Valley Power</td>
<td>$1.50/watt AC</td>
<td>Max incentive $15,000</td>
</tr>
</tbody>
</table>

http://programs.dsireusa.org/system/program?state=US
Viability of Goals

- Electricity generation, 2013:
- Non-hydro renewable generation, 2013:

http://www.eia.gov/todayinenergy/detail.cfm?id=15751
Conclusions

- Setting trends in the US
- Ambitious RPS
- No issues that will set them back
- They’ll meet their goals
QUESTIONS

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