The Electrification Acid-Test
California – Germany Experience

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Remarks drawn from


And various blogs
California Deep Carbon Reduction Playbook

1. Reduce electric sector carbon to zero
2. Electrify other sectors (transportation, home heating, scooters, etc.)
3. Watch while rest of world follows our lead
Composition of California GHG Emissions Covered by Emissions Cap

Start of cap and trade market

UCDAVIS
ENERGY ECONOMICS PROGRAM

Building the Evidence Base for Accelerated Climate Action
Challenges with the electrification scenario

• Policy tools deployed for decarbonizing electricity range from mildly to extremely inefficient.
  – Should expect marginal cost of additional reductions increase sharply as we approach zero.

• Electricity pricing levels and structures discourages usage and switching
  – And contribute to higher cost

• Limited understanding of best ways to encourage adoption of electrified goods and services.
  – Outside of price advantage
  – Track record on appliance replacement not good.
  – Some programs promoting adoption paid by electric rates
Hourly Utility Scale Solar Output on CAISO System

Average Hourly Solar Generation

Average Hourly Solar Generation (MWh)

Hour

Comparing California Germany Experience
- December 2018
Hour of day average price impacts: of an incremental GWh of Solar
Average Renewable Costs are Declining: but so are Benefits
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### Charges

**08/11/2007 - 09/11/2007**

#### Electric Charges

<table>
<thead>
<tr>
<th>Component</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Quantity</td>
<td>262,400,000 Kwh</td>
<td></td>
<td>$114.37</td>
</tr>
<tr>
<td>Baseline Usage</td>
<td>262,400,000 Kwh</td>
<td>@ $0.11430</td>
<td></td>
</tr>
<tr>
<td>101-130% of Baseline</td>
<td>78,720,000 Kwh</td>
<td>@ $0.12989</td>
<td></td>
</tr>
<tr>
<td>131-200% of Baseline</td>
<td>183,680,000 Kwh</td>
<td>@ $0.22722</td>
<td></td>
</tr>
<tr>
<td>201-300% of Baseline</td>
<td>102,200,000 Kwh</td>
<td>@ $0.31719</td>
<td></td>
</tr>
</tbody>
</table>

**Net Charges**

The net charges shown above include the following component(s). Please see definitions on Page 2 of the bill.

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Generation</td>
<td>$55.78</td>
</tr>
<tr>
<td>Transmission</td>
<td>5.55</td>
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<tr>
<td>Distribution</td>
<td>38.78</td>
</tr>
<tr>
<td>Public Purpose Programs</td>
<td>4.99</td>
</tr>
<tr>
<td>Nuclear Decommissioning</td>
<td>0.17</td>
</tr>
<tr>
<td>Trust Transfer Amount (TTA)</td>
<td>3.96</td>
</tr>
<tr>
<td>DWR Bond Charge</td>
<td>2.94</td>
</tr>
<tr>
<td>Ongoing CTC</td>
<td>0.09</td>
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<tr>
<td>Energy Cost Recovery Amount</td>
<td>2.11</td>
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</table>

#### Taxes and Other

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Commission Tax</td>
<td>$0.14</td>
</tr>
<tr>
<td>Utility Users' Tax (7.500%)</td>
<td>8.58</td>
</tr>
</tbody>
</table>

**TOTAL CHARGES**

$123.09
Composition of PG&E Rates

Growing gap Between procurement Cost and energy price ("value")
Retail Electricity Price Minus Average Social Marginal Cost (SMC)
Rooftop Solar going where $P >> SMC$

Price-Avg Social MC

Net Metered Res PV Capacity
Total Res Customers
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Summary

• Policy design is focused on sequential, siloed, solutions.
  – Reduce carbon in electricity, reduce carbon in fuels, reduce

• Puts us in circumstances where cost of abatement can be wildly misaligned across sectors.

• As we increasingly rely upon switching between sectors/fuels, this misalignment can become a major barrier to achieving goals.
Thank You!

Questions and Comments?