The Decarbonization Revenue Calculator

A Spreadsheet by Charles Komanoff
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U.S. Economy Divided into Six Sectors

U.S. CO2 Emissions, 2012

- Electricity: 39%
- Personal Ground Travel: 23%
- Goods Movement: 15%
- Aviation: 10%
- Other Petroleum: 9%
- Other Methane: 4%
Modeler’s Inputs

• Tax Start Year

• Initial Rate ($/ton CO2) — economy-wide
  • Annual Increment by Constant Amount?
  • How Much?

• Annual Increment by Constant Percent?
  • How Much?

• Are Tax Increments in Real or Nominal $?

• Surtax on Petroleum Products?
  • Which?
  • How large?
Elasticities Drive Sectoral Demand and Carbon Content

• Demand Side Price-Elasticities
  (Negative) 0.4 – 0.7

• Demand Side: Income-Elasticities
  (Positive) 0.5 – 1.0

• Supply Side: Degree to which $100/ton CO2 tax will reduce per-unit emissions
  Electricity: ongoing decline magnified 3-4X
  Personal Ground Travel: 10% reduction

• User May Vary
Results

- CO2: by Sector and Overall
- Revenue: Nationally and by Household (with and without deficit reduction)
- Oil: by Sector and Overall
Larson Carbon Tax
(Rep. John B. Larson, D-CT)
“AESTFA” • 2009

• **Initial Year**: $15/ton CO2
• **Subsequent Yrs**: $10-15/ton
  (we model as $12.50/ton increments)
Larson Carbon Tax

CO2 Emissions with Carbon Tax and without

33% difference in 10th year
Sanders-Boxer Carbon Tax

(Senators Bernie Sanders, D-VT & Barbara Boxer, D-CA)

- **Initial Year**: $20/ton CO2
- **Subsequent Yrs**: Rise 5.6%/annum
- Analyzed by CBO (2011)
Sanders-Boxer Carbon Tax

CO2 Emissions with Carbon Tax and without

11% difference in 10th year
CO2 Emissions with Carbon Tax and without

- **No Carbon Price**
- **User-Selected Price**

17% difference in 10th year
U.S. CO2 Emissions in Carbon Tax's 10th Year, by Sector

- Electricity: 1,085 tonnes (963 CO2 Reductions, 1,052 CO2 Emissions)
- Personal Ground Travel: 220 tonnes (97 CO2 Reductions, 388 CO2 Emissions)
- Freight: 31 tonnes (183 CO2 Reductions, 667 CO2 Emissions)
- Aviation: 667 tonnes (162 CO2 Reductions, 31 CO2 Emissions)
- "Other" Petroleum: 212 tonnes (431 CO2 Reductions, 183 CO2 Emissions)
- "Other" Methane: 1,052 tonnes (963 CO2 Reductions, 183 CO2 Emissions)

Carbon Tax Center, May 2013.
## Electricity Sector: Demand Side

### Compound Growth to 2023

<table>
<thead>
<tr>
<th></th>
<th>No Tax</th>
<th>Larson</th>
<th>Impact</th>
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</thead>
<tbody>
<tr>
<td>TWh</td>
<td>1.5%</td>
<td>-0.6%</td>
<td>-2.1%</td>
</tr>
<tr>
<td>¢/kWh</td>
<td>1.3%</td>
<td>4.4%</td>
<td>3.0%</td>
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<tr>
<td>2012¢/kWh</td>
<td>-0.4%</td>
<td>2.6%</td>
<td>3.0%</td>
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<tr>
<td>Bills</td>
<td>2.9%</td>
<td>3.8%</td>
<td>0.9%</td>
</tr>
<tr>
<td>2012$ Bills</td>
<td>1.1%</td>
<td>2.0%</td>
<td>0.9%</td>
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</table>

Conclusion: Impact on bills is slight (easily covered by dividends or tax swaps).

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### 10th-Yr Larson Tax Impact, Electricity Sector

- **Reductions from Decarbonization**: 724,000 tonnes CO2
- **Reductions from Conservation**: 361,000 tonnes CO2
- **CO2 Emissions with Carbon Tax**: 963,000 tonnes CO2

Carbon Tax Center, May 2013.
Growth in Renewables to Meet Larson “Targets” for 2023

Compound Growth Rates 2012-2023

No Tax
Wind: 8% • Solar: 28%

Tax #1
Wind: 20% • Solar: 40%

Tax #2
Wind: 11% • Solar: 50%
Carbon Tax Revenues (Larson Bill)

Dividend line reflects deductions (if any) for deficit reduction or other purposes.

Revenue line is all carbon-tax revenues, in billions (nominal $).