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

No Carbon Price
User-Selected Price
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

No Carbon Price
User-Selected Price
Sanders-Boxer w/ 2x p.a. %

CO2 Emissions with Carbon Tax and without

Million Tonnes CO2 (U.S.)

17% difference in 10th year

No Carbon Price
User-Selected Price
U.S. CO2 Emissions in Carbon Tax's 10th Year, by Sector

- **Electricity**: 1,085 tonnes (963 with tax, 1,052 with tax)
- **Personal Ground Travel**: 220 tonnes (183 with tax, 388 without tax)
- **Freight**: 97 tonnes (31 with tax, 183 without tax)
- **Aviation**: 162 tonnes (667 with tax, 212 without tax)
- **"Other" Petroleum**: 212 tonnes (431 with tax, 667 without tax)
- **"Other" Methane**: 431 tonnes (212 with tax, 667 without tax)

CO2 Reductions from No-tax Trajectory
CO2 Emissions with Carbon Tax

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

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

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

**Compound Growth to 2023**

<table>
<thead>
<tr>
<th>Metric</th>
<th>No Tax</th>
<th>Larson</th>
<th>Impact</th>
</tr>
</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>
</tr>
<tr>
<td>2012¢/kWh</td>
<td>-0.4%</td>
<td>2.6%</td>
<td>3.0%</td>
</tr>
<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>
</tr>
</tbody>
</table>

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

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)

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

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

- Carbon Tax Revenue
- Per-HH Dividend

$ per year (revenue line is in billions)

2014 2016 2018 2020 2022 2024 2026 2028 2030 2032 2034 2036

$0 $2,000 $4,000 $6,000 $8,000 $10,000