Relevance of ROI calculation

• Value Proposition for Employers
  – How are Lifecycle/Scope 3 GHG emissions affected?
  – What are my (employer) direct costs?
  – What is the Return on Investment (ROI)?
  – What are possible ancillary benefits?

• How does Workplace Charging compare to:
  – Transit Subsidies
  – Vanpool Subsidies
  – Bike Purchase Subsidies
  – Other Commuting Options?
Scope 1, Scope 3 Emissions—Transportation is Hard

• Direct and Indirect GHG emissions can be classified into “scopes”
  – Scope 1 emissions are direct emissions from sources owned or controlled by the entity
  – Scope 2 emissions are indirect emissions that result from the generation of purchased energy
  – **Scope 3** emissions include indirect GHG emissions from sources not owned or directly controlled by the entity but related to the entity’s activities.

• Ties to greener energy as part of a complete strategy
Transportation is Important—petroleum/security

- Transportation is responsible for 2/3 of U.S. petroleum usage
- On-Road vehicles responsible for 80% of transportation petroleum usage
- >240M Vehicles on the road

- Economic security, energy security, and environmental stewardship
- Changing energy landscape
  - Natural gas
  - Electrification
  - Fuel Economy Standards

The Cost of Oil is Not Just Monetary
ROI calculation background: EVSE assumptions

- 4 units
- 2.1 drivers per unit; 7 kWh per day per driver
- Conventional vehicle emissions: 440 g CO2e/mi
- EV Emissions (U.S. Average Grid Mix): ~1.4 lb CO2e/kWh (~223 g CO2e/mi)
- 10-year lifetime; 240 days of use per year
- Yearly network costs: $250
- Yearly maintenance costs: 2.5% of total
- $0.1032/kWh (Average Commercial Electricity Cost in 2013)
Breakdown of L2 Costs

<table>
<thead>
<tr>
<th>Unit</th>
<th>2 units</th>
<th>4 units</th>
<th>6 units</th>
<th>8 units</th>
<th>10 or more units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-unit installation discount</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
</tr>
</tbody>
</table>

- **Materials**
- **EVSE**
- **Installation**
- **Total**
WPC GHG ROI—Preliminary Estimates

- Bike Purchase Subsidy
- Vanpool Subsidy
- Transit Subsidy
- L1 EVSE
- L2 EVSE

GHG Abatement Cost ($/metric ton CO2e)
Changes assumption: 1 use per day (down from 2.1)
Utilization factors—ROI implications and anecdotes

![Graph showing hours in use per day vs. price to charge (\$/kWh). There are curves for 1.5x, 2x, and 2.5x the home-charging price-to-consumer, with payback periods at 5, 10, 20, and 25 years. Retail electricity is 11\$/kWh.](image)

- 1.5x the home-charging price-to-consumer
- 2x the home-charging price-to-consumer
- 2.5x the home-charging price-to-consumer

6 months

Price to charge (\$/kWh)

<table>
<thead>
<tr>
<th>Hours in use per day</th>
<th>24</th>
<th>20</th>
<th>16</th>
<th>12</th>
<th>8</th>
<th>4</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5x</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Retail electricity: 11\$/kWh
### Other Factors to Consider?

<table>
<thead>
<tr>
<th></th>
<th>Possible Pros</th>
<th>Possible Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parking</strong></td>
<td></td>
<td>Does not displace a parking spot or disincentivize single-occupancy driving.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Administration</strong></td>
<td>If unmetered, low administrative costs</td>
<td>Could raise questions of tax status.</td>
</tr>
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<td></td>
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<td></td>
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<tr>
<td><strong>Flexibility</strong></td>
<td>PEVs are options for commuters who can’t or prefer not to use bicycling, transit, or other modes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Employee Satisfaction</strong></td>
<td>May be a strong incentive to attract or retain employees who have or support PEVs</td>
<td>May lead to concerns of fairness from employees without PEVs.</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td><strong>Demand Charges</strong></td>
<td>In future, could be part of demand response</td>
<td>If unmanaged, large numbers could affect peak demand.</td>
</tr>
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<tr>
<td><strong>Systematic</strong></td>
<td>Supports a transition to more electric drivetrain vehicles</td>
<td>Does not reduce (or could increase) congestion.</td>
</tr>
</tbody>
</table>

**PEVs** = Plug-In Electric Vehicles
Additional VTO Analytical Capabilities

Models and Tools:

- VISION, NEAT
- ADOPT, LV Choice, MA³T, ParaChoice, StoCo, TRUCK
- GREET
- Autonomie, FASTSim, HTEB
- TEDB, Market Report,xEV data, TREND

Integrated Analysis

- Macro-econ. Accounting
- Market Penetration
- Emissions and Environmental Modeling
- Vehicle Modeling and Simulation
- Technology and Market Data
Questions?
What other topics can Analysis address to inform the WPC?
Other Questions?

For questions about this presentation, please contact:

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ROI calculation background: assumptions

Vanpools
- 8.3 persons/van
- 100 mile daily commute
- 16 mpg per van
- up to $400 per vanpool

Transit subsidy
- $30/month (min to qualify for “Best Workplaces for Commuters”)
- up to $130/month (max for federal employees)

Bike purchase subsidy
- $200-$500 per participant
- Lifetime of 4 years
- Cost of lockers, showers, bike racks, infrastructure costs (bike lanes) etc. not included
1.5x the home-charging price-to-consumer
2x the home-charging price-to-consumer
2.5x the home-charging price-to-consumer

Payback period for public charger installation:
- 1 year
- 2 years
- 5 years
- 10 years
- 20 years

Retail electricity: 11¢/kWh

Price to charge ($/kWh):
- 0.10 ($2.75 / 30-min)
- 0.15 ($3.75 / 30-min)
- 0.20 ($5.00 / 30-min)
- 0.25 ($6.25 / 30-min)
- 0.30 ($7.50 / 30-min)

Hours in use per day:
- 0
- 4
- 8
- 12
- 16
- 20
- 24