Washington State’s
West Coast Electric Highway
DC Fast Charging Network

EVS27
November 19, 2013
Barcelona, Spain

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Washington State Department of Transportation
Washington’s Electric Highways:

- **EV charging network:** 12 public DC fast-charging locations in critical recharge zones outside of The EV project to make DC fast charging available every 35 to 50 miles.

- **Charging equipment:** Both AeroVironment DC fast charger (CHAdeMO) and Level 2 EVSE (J1772) at each location.

- **Locations:** Private retail locations such as shopping malls, restaurants, and fueling stations. Plus, two “gateway” safety rest areas along I-5.

- **Funding:** $1.6 million grant through the Washington State Department of Commerce, State Energy Program, with U.S. Department of Energy Recovery Act funds.

- **Completed:** November, 2012.
Project Function vs. Purpose

**Project Purpose:** Support broad consumer adoption of EVs – *commercialization*.

**Main Problem:** Concerns about EV range limits are a significant factor in consumers’ purchasing decision.

**Strategy:** Provide a basic network of DC Fast Chargers to increase both the *perceived* and *actual* utility of a battery-electric vehicle.

**West Coast Electric Highway:** Create and promote both the *functional* and *emotional benefits* of having a “safety net” of EV charging opportunities.

**Success Indicators:**
- Longer-distance/interregional trips made in EVs
- How often DC Fast-Charge stations are used
- *Number of EVs sold in the state of Washington*
Success Indicator #1: Longer-distance / Interregional Trips
### Success Indicator #2: Actual Station Usage

**Use of the DC Fast Charge Stations Continues to Grow:**

<table>
<thead>
<tr>
<th># of Sessions</th>
<th>Population</th>
<th>2012 Avg./Mo</th>
<th>2013 Avg./Mo</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellingham</td>
<td>81,000</td>
<td>54</td>
<td>118.2</td>
<td>46%</td>
</tr>
<tr>
<td>Burlington</td>
<td>8,400</td>
<td>84.4</td>
<td>125.2</td>
<td>67%</td>
</tr>
<tr>
<td>Tumwater/Olympia</td>
<td>47,000</td>
<td>86.1</td>
<td>113.6</td>
<td>76%</td>
</tr>
<tr>
<td>Centralia</td>
<td>16,400</td>
<td>57</td>
<td>74.2</td>
<td>77%</td>
</tr>
<tr>
<td>Castle Rock</td>
<td>2,100</td>
<td>19.9</td>
<td>51.1</td>
<td>39%</td>
</tr>
<tr>
<td>Ridgefield</td>
<td>4,800</td>
<td>37.1</td>
<td>33.9</td>
<td>-9%</td>
</tr>
</tbody>
</table>

| Total I-5 Locations | 67.7       | 103.2        | 66%          |
Success Indicator #3: EV sales in Washington

5,000+ newly-registered EVs through July, 2013

WHERE THEY ARE
Markets with the largest share of U.S. market share for non-plug-in electric vehicles, January - July 2013

San Francisco 19.5%
Salt Lake City 9.1%
Los Angeles 12.4%
Seattle 8.0%
New York 4.0%

Map of Washington state showing EV sales by county.
New Challenges & Emerging Infrastructure Issues

- When – and how -- will the basic EV charging network be completed?
- What can be done to backfill the Seattle metro area with promised DC Fast-chargers?
- How will EVs with SAE’s new Combo plug be supported?
- What is the business model to fund these network improvements?
- And many, many other issues.
Extending the Basic Network to Connect Mid-sized Cities and Regions
Public DC Fast Charger Average Cost: $109,500 - $122,000 USD

- Electric utility upgrades & grid interconnection: to $25k (20%)
- Construction and equipment installation: $26k (21%)
- Level 2 Charger: $2.5k (2%)
- Commercial-grade DC Fast-Charger, networking & safety equipment: $58k (47%)
- Lease & property transaction costs: $6k (5%)
- Host site identification & screening: $5k (4%)
Public Charging 2.0 - What is the Business Model?

100% Social Investment

- 314 million US taxpayers
- 6.9 million state taxpayers
- 2.9 million electric ratepayers

100% Private Investment

- Service territory electric ratepayers
- 100,000 US EV owners
- 5,300 state EV owners
- Charge station users
Even under most optimistic scenarios, no business case for per-use financing approach

Waypoint charging demand is insufficient to be self-financing over 10 years, even assuming aggressive 30% compounded annual growth

<table>
<thead>
<tr>
<th>Forecast</th>
<th>Mo. Sessions (Use)</th>
<th>Years to reach capacity</th>
<th>10-Year Total Sessions</th>
<th>10-Year Revenue ($9 fee) less electricity cost</th>
<th>Expansion Locations</th>
<th>10-Year Total Revenue (not Net)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>15</td>
<td>10+</td>
<td>7,668</td>
<td>$49,842</td>
<td>13</td>
<td>647,946</td>
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<tr>
<td>Moderate</td>
<td>40</td>
<td>8</td>
<td>17,088</td>
<td>$111,072</td>
<td>4</td>
<td>444,288</td>
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<tr>
<td>Higher</td>
<td>100</td>
<td>5</td>
<td>24,708</td>
<td>$160,602</td>
<td>1</td>
<td>160,602</td>
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<tr>
<td>Total Revenue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>$1,252,836</td>
</tr>
</tbody>
</table>

Estimated capital cost to install 18 stations to expand Washington’s network: $2,196,000  (18 x $122k per station)

Funding shortfall: $943,164 (or 43%)
Strong Business Case for Public Network Expansion Funded by State EV Owners

$30 annual fee paid by battery-electric vehicles = $4.7 million over 10 years

35,578 BEVs (10-year total) x $30 paid annually (156,944 renewals) = $4.7 million

Potential Financing Providers:
- Public Sector
- Automakers
- EV Service Providers

Proposed limited-duration: 10 years or until BEVs reach 0.5% of state’s passenger vehicle fleet
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