Electric Vehicle Infrastructure

Regional Station Siting Analysis

Puget Sound Regional Council
July 2010
Purpose of Analysis

- Goals
  - Regional coordination
  - Inform $20+M siting decisions with data and analysis
  - Provide broad, long-range perspective to individual station siting decisions

- Partners
  - Seattle, Bellevue, King County, Clean Cities Coalition
  - ECOtality, State, ChargeNW

- PSRC
  - Data development, analysis, mapping
Regional EVi Siting Analysis

Summary of Analysis

• Part 1. Origin-destination (O-D) analysis of likely EV market
  – Identify origin zones based on owner demographic assumptions
  – Determine auto travel patterns from origin zones
  – Compare to regional travel patterns from all zones

• Part 2. Major regional destinations
  – Work and non-work destinations
  – Trip distances
  – Dwell times

• Part 3. Supplemental siting factors
Regional EVi Siting Analysis

Key Findings

• Hybrid ownership strongest correlation with Nissan early registrants

• Travel patterns from origin zones different than regional travel
  – More concentrated in core of region

• Typical tour easily accommodated on single battery charge
  – EV owners will likely be more concerned about non-typical travel
  – Importance of “safety-net” charging sites
  – Public charging will largely involve “topping off” the battery

• Regional Destinations database and Household Travel Survey are useful for understanding non-work destinations and dwell time averages
Part 1. O-D Analysis: Origin Zones

- Likely EV market
  - Nissan Leaf registrants – “early hand raisers”

- Determine origin zones
  - Hybrid vehicle ownership
  - Ratio of local-to-regional median household income
  - % SF households (i.e. predominantly SF areas)
  - % households with 2+ vehicles
O-D Analysis: Origin Zones

(Examples)
O-D Analysis: Origin Zones

• Findings
  – Hybrid ownership strongest correlation with Nissan Leaf registrants
  – Origin zones selected based on hybrid data (in private ownership)
    • TAZs with high percent of hybrid vehicles
    • TAZs with high percent of hhld's with hybrid vehicles
  – Approach validated by other studies and utility planning efforts
O-D Analysis: Destinations

- Identify travel patterns and characteristics of origin zone residents
  - Work and non-work auto trips
  - Trip counts
  - Trip distances

- Compare against regional travel patterns and characteristics across all zones
O-D Analysis: Work Trips
(Examples)

From Origin Zones

From All Zones
O-D Analysis: Non-Work Trips
(Examples)

From Origin Zones

From All Zones
Findings

- Travel patterns and characteristics of origin zone residents show clear differences from region as a whole.
- Typical destinations are concentrated in:
  - Seattle, East King County, SW Snohomish County, North Kitsap County, Bainbridge Island, Vashon Island, Key Peninsula
- Work trips are longer than non-work trips.
- Non-work trips occur across a broader geographic area than work trips.
• Travel tour: Series of linked trips from home to a primary destination and back home
• Regional statistics:
  – Tour type
    – Work tours comprise 37% of all tours
  – Average tour distance
    – Less than 20 miles
    – Average distance of work tours (27.9 miles) is greater than non-work tours (12.8 miles)
  – Average tour time
    – 4.6 hours
    – Average tour time of work tours (8.2 hours) and school tours (7.0 hours) is greater than other tour types
Travel Data Analysis

• Findings:
  – Assuming full charge at beginning of tour:
    • Typical auto tour (work and non-work) can be easily accommodated on a single battery charge
    • EV owners will likely be more concerned about non-typical travel
      – Importance of “safety-net” charging sites
    • Public charging will largely involve “topping off” the battery
      – Suggests Level 2 chargers may serve a purpose at sites where typical dwell time is 2+ hours
Part 2. Major Regional Destinations

- Regional Destinations
  - Work destinations
    - Derived from PSRC covered employment database
  - Non-work destinations – primary focus
    - Derived from PSRC’s 2006 Household Travel Survey
      - 2-day travel diaries collected on a rolling basis during Spring 2006
    - Supplemented with other sources:
      - Rand McNally Thomas Guides
      - Kitsap County Street Atlas
## Non-Work Destinations

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<tr>
<th>Destination Type</th>
<th># of Destinations</th>
<th>Non-Work Auto Trips</th>
<th>Average Duration (minutes)</th>
<th>Average Distance (miles)</th>
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Note: Data are for auto trips to non-work destinations. Trip duration is based on driver (and not vehicle) duration at each destination.

Source: PSRC 2006 Household Travel Survey Database
Major Regional Destinations
(Examples)

Work

Non-Work
Non-Work Destinations

• Findings
  – High volume destinations:
    – SeaTac Airport, University of WA and other colleges, malls, stadiums, civic attractions, parks, military bases, fitness gyms
  – Destinations with high percentage of trips >20 miles:
    – Airports, museum, stadiums, entertainment venues
  – Destinations with high average dwell times:
    – Entertainment venues, golf clubs, stadiums
Part 3. Supplemental Factors

• Supplemental siting factors
  – Priority planning districts
    – Regionally designed growth centers and manufacturing-industrial centers
    – Other subregional centers
  – Major transportation facilities
  – Park and rides, parking lots
  – Geographic equity
    – Household density
    – Employment density
  – Socioeconomic equity
    – Median household income
Maps for Siting Summit (Examples)
Regional EVi Siting Summit

- Initial meeting in June 2010
- Push pins on maps to represent preliminary station sites
- More detailed local & on-the-ground analysis needed
For more information

• PSRC Website
  – www.psrc.org … search on electric vehicle infrastructure

• Contacts
  – Ivan Miller, Growth Management Planning
    (206) 464-7549, imiller@psrc.org
  
  – Carol Naito, Data Systems & Analysis
    (206) 464-7535, cnaito@psrc.org