Supporting EV Adoption via en-route Charging Stations in Delaware

Kathy Harris
Jean Brodeur
Willett Kempton
V2G Research Team
The University of Delaware
Large multi-year EV research program

- UD research since 1997, running EVs since 2007
- Currently ~$800K/year, ~15 researchers
- Driving EVs, registered PJM power provider from EVs, design and install EVSEs, surveys of drivers
- All above informs the Charging Station program
Introduction

- **En-route recharge biggest boost for EV sales**
  - Extend travel cheaply
  - Reduce range anxiety
- **Only 9 charging stations in Delaware**
  - Most are not accessible to all electric vehicles
  - Low power, slow recharge
  - Only one at each location
  - Not located to extend trips

Source: Alternative Fuels Data Center
The Big Question:

Where in Delaware can charging stations most encourage EV travel?

Need to locate well to support en-route recharge
Step 1: Determine Parameters

- **Nissan Leaf used as baseline**
  - Lowest range on market (Average of 73 miles/charge)
  - But can’t count on 73 miles, lowered by:
    - Air-conditioning/Heating
    - Cold battery

- **50 miles used as a “worst-case scenario”**
Step 2: Determine Long Routes in DE

- Wilmington - Rehoboth Beach
- Wilmington - Bethany Beach
- Laurel, DE - Wilmington
- Hockessin - Rehoboth Beach
- Hockessin - Bethany Beach
Step 3: Analyze Routes

- 50 mile radii circles were drawn around each major city
  - Ensures “worst-case scenario” is met.

- Circles were clipped to fit major roads

- The routes were overlaid
  - This created a “Critical Recharge Zone” (CRZ) for the state.

- The CRZ for the State
  - South Dover
Step 4: Site and facilities

- Pick a location with these attributes:
  - Easy on/Easy off access from through route
  - Something to do during charge (food, recreation, shop)
  - Site owner agrees to host charging station
  - Agrees to continue availability after 2 year initial period
  - Commercial entities may be asked to pay for station/install

- Charging station
  - Durable, outdoor equipment
  - No cost to user for initial 2 year period, to encourage use
  - Max power for standard J1772 charger (16-18 kW)
  - A few IEC chargers (low cost, high power), 52 kW
  - Two stations per location
  - High power charging station adds little cost, allows for and encourages faster recharge EV models
Step 4: Site and facilities

• Signage and communication
  ▫ Signs on road and leading to station
  ▫ Sign gives connector type and kW rating
  ▫ Enter in data bases, such as US DOE, Recargo
  ▫ Other information/education possible

• Possible synergistic programs
  ▫ Charging at popular destinations
    • Beaches
    • Shopping
  ▫ Work with neighboring states for I95, state 301, state 202 and other throughways (see following)
Does this work on a Regional Level?
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- By placing charging stations at origin/destinations
  - Can create a regional network for EV’s.

- Traveling from Philly (top photo)
  - A charging station in Newark would allow travelers to make it to Dover.

- From Baltimore and D.C.
  - Charging station placed after Chesapeake Bay Bridge and in Southwestern DE would allow travel to beaches and Dover.
Does this work on a Regional Level?

- From Philly- Baltimore:
  - Another charging station needed
  - I-95 rest stop
    - Chesapeake House
    - Havre de Grace
Example: I-95 Welcome Center

- The Delaware Welcome Center in Newark
  - Allows for in-route charging
  - Travel to Dover (and therefore beaches)
  - Travel to Maryland (and therefore Baltimore and D.C)
- Draft parking lot designs and signage have been created for this location
Parking Lot Design
Signage- On the Highway

ELECTRIC VEHICLE CHARGING

16 kW
52 kW
60 kW
Signage- In the Parking Lot

Electric Vehicle Charging

All Electric Vehicles

Tesla Vehicles

EXCEPT FOR ELECTRIC VEHICLE CHARGING

ELECTRIC VEHICLES park here for charging and waiting to charge

16 kW

J1772 Connector
Signage- Rules and Etiquette

Charging Rules and Etiquette

• Green spaces are for charging or waiting to charge your electric vehicle only.

• When your battery is full, please move to free up the charger.

• If you see that another car is fully charged, you may unplug and begin charging.

• Be considerate of other cars waiting! Charge your battery only the amount you need to get to your destination today. Let waiting vehicles have a turn.

Installed by DNREC, DelDot and the University of Delaware
Questions or Comments?