Repowering Transportation

A cross-functional team responsible for creating, communicating and implementing the Company’s clean transportation strategy.
Clean Transportation Strategy

1. Enable the market
   
   **Support our customers** who choose to repower their transportation.

2. Get the rules right
   
   **Engage stakeholders** to develop policy and regulations that support the market without harming non-participants and supports a fair regulatory compact.

3. Manage grid impacts
   
   Provide **reliable** and **safe** energy to fuel vehicles at a **reasonable cost** to our customers, while managing system costs.
Supporting Our Decisions

- **Electric vehicle projections**
  - Gradual adoption of electric vehicles provides time to plan

- **End-to-end process development**
  - Vehicle shopping through charging plan

- **Utility notification - tracking PEV sales**
  - OEMs, dealerships, permitting, customer

- **System design practices**
  - Distribution monitoring/planning

- **Program/rate design for load management**
  - Demand response, Time of Use rates
Enabling the Market

- **Drive Electric Minnesota**
  - Transit Connect
  - Public Charging Stations

- **Event Participation**
  - GE Vehicle Innovation Center
  - National Plug-in Day

- **Customer Efforts**
  - Xcelenergy.com [EV page](#)
  - The “Windsource for EVs” initiative

- **NSP Fleet (2012)**
  - One Chevy Volt
  - One all-electric Ford Transit Connect van
  - Two hybrid bucket trucks
Electric Energy and Demand

Annual Energy

- Household: 7,580 kWh
- Chevy Volt: 1,890 kWh
- Nissan Leaf: 2,920 kWh

Peak Demand

- Average Household: 3.5 kW
- Microwave Oven: 1.6 kW
- Central AC: 2-5 kW
- Level 1 120V/12A Charger: 1.4 kW
- Level 2 240V/15A Charger: 3.6 kW
- 240V/32A Charger: 7.7 kW

Source: EPRI

* Tesla Model S Optional 20kW charging
The existing generation infrastructure can fuel 84% of light duty vehicles
  - Pacific Northwest National Laboratory

The existing transmission infrastructure will support vehicle deployment

Most likely near-term impact on the distribution system
  - One EV charging at Level 2 can equal a home’s demand
  - Ownership “clustering”
  - Transformer overload
  - Thermal loading impacting transformer life
Impact Study

Objective: To determine how Plug-in Electric Vehicle (PEV) and Plug-in Hybrid Electric Vehicle (PHEV) chargers will increase peak distribution transformer loading in the NSP-MN Metro service territory.

- First 16 Volts in Minnesota
  - 5 of 16 transformers prompt further investigation
  - Metered transformer and service
- 3 recommended to be addressed
  - Level 2 charging presented summer peak risk
Charging Challenge

- **Uncontrolled charging coincides with system peak (blue)**

- **Rate Design – TOD/TOU creates new system peak (purple)**

- **Demand response technologies enable managed charging (Green)**

Source: EPRI
Questions?