Alternatively Fueled Vehicles
Presentation Overview

• Introduction

• Electric Vehicles (EVs)
  – Available & Upcoming EVs
  – Electricity as a fuel
  – Infrastructure
Introduction

PSEG’s Alternative Fuel Vehicle (AFV) Readiness Team was established in 2010 to examine the potential business opportunities surrounding both electric vehicles (EV) and natural gas vehicles (NGV). Some of the areas the team has reviewed and supported over the years includes:

- EV technology assessment and market adoption projections
- Distribution systems impacts
- Vehicle Technology Testing & Analysis
- EV Charging and NGV Fueling Infrastructure Business Cases
- Public Education and Outreach
- Employee EV Ride n Drive Program
- Working with State officials on developing plans to promote AFV adoption
- Provide technical guidance and input for the NJ Energy Master Plan
- Participate in Nationwide AFV Research Efforts (EPRI, EEI)
- Memberships with NJ Organizations (NJ Clean Cities)
EV’s, something old that’s new again….

Circa 1914, Mrs. Edison’s EV and Home Charging Station….
In 1914, Detroit was the first American city to use EV Taxi’s.

Detroit’s first electric taxi accumulated more than 46,000 miles in its first two years of operation.
Electric Vehicles: so what’s the difference?

A Plug-in Hybrid Electric Vehicle (PHEV) is a hybrid vehicle that obtains energy from two sources; 1) hydrocarbon-based fuel and 2) electric energy obtained by plugging the vehicle in to the electrical grid and stored in an onboard battery. PHEVs can be charged at either 120 or 240 volts.

The all-battery electric vehicle (BEV) obtains all of its energy from electricity with no gasoline engine back-up. BEVs will mainly be charged at 240 volts.

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**PHEV**

**Chevrolet Volt**
40-mile EV range
16kWh Li-Ion

**BEV**

**Nissan Leaf**
100- mile range
24kWh Li-Ion
Electricity makes a great fuel...

EV owners also will be motivated both environmentally and economically to maximize electric usage for their vehicles....
EV sales have been steadily increasing.

The fleet of plug-in electric vehicles in the United States is the largest in the world.

Source: EPRI; Sales through March 2013
Leading the way in EV sales…

<table>
<thead>
<tr>
<th>OEM</th>
<th>Model</th>
<th>TYPE</th>
<th>Electric Range (Miles)</th>
<th>Price (US Dollars)*</th>
<th>Total Sales to date (Dec. 2010-March 2013)</th>
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<tr>
<td>Nissan</td>
<td>Leaf</td>
<td>BEV</td>
<td>73</td>
<td>$32,200</td>
<td>23,051</td>
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<tr>
<td>General Motors</td>
<td>Volt</td>
<td>PHEV</td>
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<td>Toyota</td>
<td>Prius</td>
<td>PHEV</td>
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<td>$32,000</td>
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<tr>
<td>Tesla</td>
<td>Model S</td>
<td>BEV</td>
<td>160 - 300</td>
<td>$57,000-105,000</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total Production</strong></td>
<td></td>
<td>81,256</td>
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</table>

*Before Federal and State Tax Incentives

Since 2008 more than 90,000 highway-capable plug-in electric cars have been sold in the country through March 2013
Now that EV’s are here in NJ, how many and when?

By 2020, New Jersey may expect to have between 14,000 and 142,000 EV’s on the road. The medium case forecasts 70,000 by 2020.

Source: EPRI, Nov 2012
Electric Vehicle Supply Equipment

Electric Vehicle Supply Equipment (EVSE) refers to equipment involved in delivering energy from an electric circuit to the EV. This equipment includes wires, conductors, connectors, attachment plugs, power outlets, meters, monitors and software.
Charging will occur under three voltage levels ...

Level 1 Charging Cord set
120V AC

Level 2 Charging
208/240V AC

DC Fast Charging
500V DC (three phase)

Level 2 Charging will be the most widespread technology deployed in the next few years....
2020 Electric Load Demand Factors

**EV Weekday Load Factor Scenarios**

- Managed Charging
- Unmanaged Charging

**Assumptions**

- EPRI’s Medium penetration scenario
- 100% of PHEV and BEVs are charged at home; as much as possible 80% of these will stagger their charges across lowest priced hours
- 80% of PHEVs are used by work commuters; most of commuting PHEVs need a full charge, most commuting BEVs only need half a charge.

Staggered charging during off-peak hours would minimize system impacts.
An EPRI GIS analysis study shows the potential for public EV charging station locations...

“Range Anxiety”

Source: The Economist
PEV Charging Locations Topology

For most PEV owners the primary charge will occur at the home residence; the second highest incidence of charging is expected to occur at or near the place of work; and finally we believe that some PEV owners will want to “top-up” on electricity at a destination.
… Key Takeaways for EV’s

• All of the major auto manufactures in the world are either selling or leasing EV’s right now in NJ.

• Incentives will help in the short term to move the technology along.

• Electricity makes a great fuel and is a less expensive way to operate a vehicle over conventional fossil fuels (gasoline, diesel).

• The majority of EV charging will occur at home or work.

• Placement of public charging infrastructure must be thoroughly planned out and placed in the right locations.

• EV’s are reliable, easy to operate, clean running, and fun to drive.
Contact Information

Robert Gibbs – PSE&G; AFV Program Manager
• Robert.Gibbs@pseg.com
• 973-430-7985

Wayne Wittman – PSEG Services Corp; AFV Technology Advisor
• Wayne.Wittman@pseg.com
• 973-430-6648

Kimberly Scarborough – PSEG Services Corp; Air Policy Manager
• Kimberly.Scarborough@pseg.com
• 973-430-7030
Any Final Questions???????

and Thank You!