Alex Keros
Manager, Vehicle, Fuels & Advanced Technology Policy
HEVs, PHEVs and BEVs have delivered functionality and emotional appeal to meet early customer needs.
February 2015 Announcement:

• Confirmed production of next-gen electric vehicle based on Bolt at Michigan’s Orion Assembly Plant

January 2015 Announcement:

• Long-range all-electric vehicle
• Designed to start around $30,000
• Designed for daily driving needs with more than 200 miles range
• Designed for 50 states, global markets
• Hi-Tech Infusion: smartphone as key fob, ride-sharing management, automatic park-and-retrieval.

January 2015 Announcement:

• All-new exterior, interior
• All-new propulsion system.
• MSRP: $33,995; As low as $24,995 in CA

Lighter, Faster, Further!

• EV range = 50 miles
• Twin-motor drive – 5% more efficient and 100 pounds lighter
• 19% stronger 0-30 mph
• Battery capacity increase to 18.4 kWh
• New 1.5L range extender, with combined fuel efficiency of 41 mpg (est.)
• Five-passenger seating
• Regen on Demand
• Location-based charging

February 2015 Announcement:

• Confirmed production of next-gen electric vehicle based on Bolt at Michigan’s Orion Assembly Plant
Growing & Understanding the Market | Collaboration

Private-Public Forums: Leadership, Resources, Execution

Activities (Examples):
- DOE EV Readiness Planning
- Letters of Support (e.g. NGOs, Infrastructure)
- ZEV Action Plan(s)
- Permit Guidebooks
- Go-Fast Teams (e.g. GO-Biz Green Team)

Stakeholders (Examples):
- City Officials
- Mayor’s Offices
- Permitting Officials
- Fleet Managers
- State Officials
- Governor’s Offices
- Energy Offices
- Environmental Offices
- Public Utility Commissions
- National Labs
- INL, NREL
- Clean Cities
- NGOs
- Consumer Advocacy
- Environmental
- Clean Transportation
- Community Groups
- Codes & Standards
- Universities

New forums: Public Utilities Commissions
Engaged Partners and Stakeholders have played critical roles in EV market growth.
Engaged Partners and Stakeholders have played critical roles in EV market growth.
Cold climate (BEV range penalty) reduced BEV shares while incentives (mostly states in air quality nonattainment) helped.

PHEV/EREV fare better in cold climates – incentives and stakeholder engagement always move the needle.
**Infrastructure | Deployment Strategies**

Tools are in place:
- Workplaces, Public Guidance
- Case Studies
- Decision Guides
- Survey Tools
- Siting, Designing, Permitting
- Cluster Analysis
- Electric Highway Considerations

(re)Consideration Scale:
- Regional infrastructure deployments
  - CA vs NE (different patterns)
  - Role of connectors
  - Integrated cities / density
  - Managing growth at workplaces
- Re-imagining Scale
  - New paradigms may be necessary
  - CA utility proposal 60,000 locations in 5 years. (Current: ~7,000)
- Educating & Outreach
  - Not enough to have the tools.

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501 GM WORKPLACE CHARGING STATIONS
Including 25 Assembly Plants

(19% Solar; 2 ADA friendly; 400 add'l private; 66% 240V and 33% 120V)

Also: Chevrolet and Cadillac dealers have installed approximately 5,900 charge stations at their locations for owner use – 17 of these dealerships use solar charging canopies.
DOE’s Workplace Charging Challenge Partners

Goal is tenfold increase in partnering companies in 5 years!

Currently 175 Partners

Employees of companies with workplace charging are **20x more likely** to purchase an EV, than companies with no workplace charging (DOE)

Source: DOE’s Energy Efficiency and Renewable Energy (EERE); eere.energy.gov
Automakers are working with infrastructure providers to establish sustainable infrastructure business models that ensure focused on customer needs.
Why should a utility have a role in installing infrastructure?

OUC installed 5x 40kW DC fast-charge stations in Orlando, FL

- Siting wisely is key
- Focused on locations with easy access to transformer
- Installation cost was $4k-$9k per site (well below other nationally reported efforts)

... to expertly manage station siting and installation to keep costs low

Equipment Costs* ($25,000)

Installation Costs** ($4,000 to $9,000)

Total Installed Cost ($29,000 to $34,000)

*Units provided through Donor
**Data based on the installation of 5 stations in Orlando, FL
## OUC’s DC Fast-Charger Installation Cost Breakdown by Site

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<th>Location</th>
<th>Installation ($)</th>
<th>Step Down Required?</th>
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<tr>
<td>Rosen Shingle Creek</td>
<td>$8,780</td>
<td>YES</td>
</tr>
<tr>
<td>UCF Medical School</td>
<td>$8,040</td>
<td>YES</td>
</tr>
<tr>
<td>Chamber of Commerce</td>
<td>$4,046</td>
<td>NO</td>
</tr>
<tr>
<td>OUC Gardenia</td>
<td>$8,928</td>
<td>YES</td>
</tr>
<tr>
<td>OUC Reliable Plaza</td>
<td>$6,939</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>$7,347</strong></td>
<td></td>
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Good correlation between states with PEV sales and those states with strong stakeholder engagement efforts.
How does a state benefit economically from PEV incentives?

1. **Electricity is cheaper than gasoline**
   - PEV owners spend less on fuel costs and thus can spend more on other locally/state-produced goods and services

2. **Federal tax credits**
   - PEV purchasers qualify for the federal $7,500 EV income tax credit, which increases cash inflows to the state’s households

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**Washington**

- State GDP increases $25mil over 5 years ($68mil through 2030)
- EV drivers save $29mil in fuel costs over five years ($145mil through 2030)

**Oregon**

- State GDP increases $38mil over 5 years ($83mil through 2030)
- EV drivers save $32mil in fuel costs over five years ($153mil through 2030)

**Georgia**

- State GDP increases $107mil over 5 years ($252mil through 2030)
- EV drivers save $95mil in fuel costs over 5 years ($453mil through 2030)

**Ohio**

- State GDP increases $107mil over 5 years ($252mil through 2030)
- EV drivers save $95mil in fuel costs over 5 years ($453mil through 2030)

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**California**

- Net benefit of a PEV is approximately $5,000 over the life of the vehicle

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**Economic analysis performed by AECOM, with Quercus**

*Economic studies commissioned by Securing America’s Future Energy (SAFE) and the Electrification Coalition, and prepared under the direction of Keybridge’s Robert F. Wescott, Ph.D., former economic advisor to President Clinton; uses the REMI, Inc. economic model.

Reframe our thinking:

At launch: Cost of incentives, impact on grid, etc.
Today: Benefits (ROI (market/household), grid) to communities
What will it take to Grow the PEV Market?

• Drive Consumer Demand!
  – Keep a Laser-like Focus on the Vehicles

• Build Awareness
  – National Awareness Campaign
  – Ride and Drives → Butts-in-Seats

• Workplace charging
  – Provides daily charging for those without convenient home charging
  – Doubles the potential for daily electric miles driven
  – Provides a visible showcase of PEVs to potential new car buyers (employees, execs, fleet managers)

• Continue to grow state/regional task forces to align policies (incl. incentives), education and awareness efforts

(re)Consider Scale of complementary market development efforts
Thank You.

2016 Chevrolet Volt

Chevrolet Bolt Concept
Backup
Volt is being used as expected:
- Volt Customers are primarily driving electrically

No compromises
- No range anxiety, use full extent of battery range
- May be used on all trips, regardless of length
- May be the household’s only vehicle
Chevrolet Volt | Impact to Date: GM

Analysis

Presentation at SAE (Feb 2015) / World Congress (Apr 2015):
667 million miles of Volt customer driving has been analyzed

Sample Size
• Data collected from Oct. 2013 through Sept. 2014
• MY11–14 retail vehicles sold in US and Canada with active OnStar accounts

Results
• **Volt drivers traveled 74% of their total miles all-electrically**
  ➢ Projected to increase to 80% for Second Generation Volt drivers
• Volt initial engine starts were reduced by 70% relative to conventional vehicles
  ➢ Projected to increase to 77% for the Second Generation Volt
• Daytime charging by Volt drivers contributed to increasing daily all-electric range beyond the EPA label values
• **Significantly less real-world production of smog forming emissions from E-REVvs. a conventional vehicle or PHEV equivalent**
  ➢ Not yet accounted for in the EPA label smog score rating
Home vs. Work vs. Public Charging
DOE’s EV Project Data

• EV drivers Overall:
  Study Period 1/1/2012 – 12/31/2013
  o 84% of all charging events are at home
  o 16% not at home

• When workplace charging is available to an EV driver:
  (96 Volts with access to workplace charging Jan ‘13 – Dec ‘13)
  o 57% of charging events are at home
  o 39% at work
  o 4% at other locations (e.g. public)

  (707 Leafs with access to workplace charging Jan ’12 – Dec ’13)
  o 65% of charging events are at home
  o 32% at work
  o 3% at other locations (e.g. public)

Residential and workplace charging provide the vast majority of all charging.

Source: John Smart, INL, EV Project; Link to all reports = http://avt.inel.gov/librarybydate.shtml
Well-to-Wheels TOTAL ENERGY

- Well-to-Wheels energy analysis accounts for the total energy used across 3 phases from feedstock extraction thru fuel use in a vehicle:
  1. Feedstock extraction and delivery
  2. Fuel conversion and distribution
  3. Fuel use in the vehicle

- 6 fuel pathways compared

- Though more energy is used to produce electricity, the battery (and hydrogen fuel cell) vehicle pathways use less overall energy due to the efficiency of the fuel use on the vehicle.

Probably the single most important step a home owner/car owner can take to reduce overall “energy” use.
The Grid is Getting Cleaner... Since 2000: significant reductions in Coal (52% to 39%); and increases in Natural Gas (16% to 27%) and non-Hydro Renewables (2% to 7%)
What is Required of Utilities and Utility Regulators

A growing PEV market benefits everyone
- Individual benefits: fuel savings, quiet and exciting ride & handling
- Society benefits: energy security, environment (local air, climate), and grid reliability
- Utility benefits: a smart load that drives new revenue to keep rates low

Utilities need to be active participants in growing the PEV market
- This is a “learning” transition and requires hands-on experience to shape next steps
- The PEV market will not escape “niche” unless utilities (and regulators) get involved

Active role in home, workplace and DC fast-charging
- PEVs are already very smart and will do most charging at home – utilities will want to ensure good load balancing across the service territory (off-peak EV rates, smart charging)
- Workplace charging is key to growing PEV awareness and corporate relationships are key to utilities - a utility will want to ensure healthy corporate engagement
- A basic network of DC fast-chargers will grow BEV adoption among fence-sitters

Active role in PEV outreach and education
- Utilities are trusted 3rd parties and operate at a local level – key for building awareness

Longer term – pilot projects
- Utilities need to probe the role of PEVs in ancillary services, V2H, V2G, and battery secondary use to address growing issues in renewables, intermittency, storage, outage
THANK YOU