Getting the Nation Plug-In Ready

By Preparing Cities for EVs

Rocky Mountain Institute

Matt Mattila

23rd Annual E Source Forum
September 19–23, 2010
Smart Garage Vision: Cheap, Clean, Secure Mobility and Electricity

**Smart Garage**: Bringing electrified vehicles, advanced net-zero buildings, and a smart renewable grid together in innovative ways to provide clean, cheap, and secure mobility and electricity.
Moving Away from Fossil Fuels Requires a New Path for Transportation

U.S. Petroleum Consumption by Sector

- Industrial: 25%
- Transportation: 67%
- Light-Duty Vehicles: 61%
- Freight Trucks: 16%
- Air: 9.8%
- Military Use: 2.4%
- Pipeline Fuel: 2.2%
- Rail: 2.0%
- Recreational Boats: 0.7%
- Lubricants: 0.5%
- Shipping: 3.0%
- Buses: 0.9%

Transportation consumes a large quantity of U.S. fossil fuels. Most of the fuel is oil for LDVs.

U.S. Primary Fossil Fuel Consumption by End Use (2010 projection):
- **Transportation**: 29%
- **Industrial**: 32%
- **Buildings**: 39%
- **Natural Gas**: 2%
- **Petroleum Lubricants**: 0.5%
- **Electricity**: 0.2%
- **Freight Rail**: 2%
- **Light Duty Vehicles**: 58%
- **Trucking**: 19%
- **Passenger Aircraft**: 7%
- **Buses**: 1%
- **Recreational Boats**: 1%
- **Shipping**: 4%
- **Freight Air**: 2%
- **Military Jet Fuel**: 2%
- **Military Distillates**: 1%

Average Automobile Efficiency:

- **Engine**: 66% fuel lost
- **Idling**: 13% fuel lost
- **Auxiliary**: 1% fuel lost
- **Drivetrain**: 6% fuel lost
- **Air Resistance**: 1/3 road load
- **Brakes**: 1/3 road load
- **Tires**: 1/3 road load
- **14% moves the vehicle**

**Only 0.5% of the gasoline moves the driver**

Energy consumption linked to weight.
Are Plug-In Vehicles Better for the Environment?

**Most GHG During Use Phase**

- Vehicle Use
- Vehicle and Battery Manufacturing
- End of Life

**Energy use by phase**

**Carbon Benefits of PHEVs**

**Large Life Cycle Emissions Benefits with Low-Carbon Electricity and PHEVs**

**EVs don’t need fossil fuel in usage phase**

Source: CM LCA Study - Samaras, RAND
Plug-in Vehicles have Come (and Gone) Before

GM EV1

1975 Electric Postal Vehicle

Ford Ranger

Thomas Edison 1913

Photos courtesy of About.com
One Million Plug-in Cars Isn’t Enough to Make a Real Impact on Fossil Fuel Dependence or GHG Reduction

Total U.S. Light Duty Vehicle Fleet

Success of the first million may determine fate of market
DOE study finds grid could power 70% of today’s vehicles

Total U.S. Light Duty Vehicle Fleet

Balance load and provide storage or increase peak power
Smart Charging and Addressing Distribution Challenges Are Key to Successful EV Integration

“If you connect about 10 percent of the homes on any given street with an electric car, the electricity system fails.”

- chief executive of Toronto Hydro (PGR City)
Project Get Ready
The full scope of Project Get Ready’s vision, from city leaders to citizen awareness and demand

- Create a prioritized menu of strategies that soothe key pain points in the transition to electrified mobility. These strategies will be for several stakeholders including policy makers, local employers, and citizens.
- Find 20 “seed” cities and help them implement the menu of strategies

<table>
<thead>
<tr>
<th>Barrier</th>
<th>How the Menu Will Overcome Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cities Want to become a “leader” in xEVs but don’t know how</td>
<td>Concise targeted menu will outline direct costs benefits to city and guide leaders in creating local coalition to implement, platform to be seen as leader</td>
</tr>
<tr>
<td>OEMs Have no quantified proof that consumers will adopt en mass</td>
<td>Will assure OEMs that supportive infrastructure and education will be in place in certain locations, give targeted, identified, and incentivized customers</td>
</tr>
<tr>
<td>Utilities Want more information about when and where the xEVs will be, and how they will charge</td>
<td>Utilities in PGR cities will know they must prepare, clear statement of potential utility benefits, platform to collaborate locally and with other affected utilities</td>
</tr>
<tr>
<td>Service Providers Know there’s a big opportunity, but need basic infrastructure installed and consumer adoption to make it happen</td>
<td>Opportunity (and incentives?) to build out physical infrastructure, transparency into target locals, opportunity for collaboration with other stakeholders</td>
</tr>
<tr>
<td>Consumer Want cheaper, greener fuel but have very little knowledge about xEVs</td>
<td>Significant package of incentives (from cash to special treatment in HOV lanes) will make owning an xEV better than owning an ICE</td>
</tr>
</tbody>
</table>
Execution: Work with Target Cities to Implement Menu

**Convening Org**
Rocky Mountain Institute (RMI)

**Role:**
- Research and draft all reports,
- Convene players regularly for open collaboration,
- Document progress and update menu,
- Create technical advising group, bring city reps on board, and
- Build coalition of cities, help implement menu.

**Technical Advisers**
OEMs, utilities, connectors, city policy experts

Provide access to research, connection to cities, platform for interdisciplinary discussion

Advise RMI, suggest strategies, share pain points

Gain insight into what cities are ready/supportive, early consumer experience, snafus

Help early cities implement menu, convene multiple cities and technical advisors, share and update menu

Share progress, best practices with RMI, feedback on research

Discuss technology needs with technical advisors, have direct relationship with key technology providers

City Reps
One dedicated leader per city/region
Cities regularly meet, evaluate progress, and work with technical advisers to execute PEV readiness plans.
Prepared Utilities Can Benefit from and Help Ease the Transition to Electric Vehicles

What are our partner utilities up to?

- Duke, Progress, and Advanced Energy are building a database of charge stations and provider information based on a nationwide RFI
- This group is also training and certifying electricians to install, permit, and provide an introduction to smart charging on charging stations
- Portland General Electric is taking the national lead on designing signage for charging stations
- SDG&E is developing and testing guidelines for charging stations in multi unit dwellings
- HECO and many others are offering a variety of TOU and EV specific rates to understand how to encourage off peak charging

What should you do to prepare?

- Provide an EV specific hotline or webpage to direct inquiries and have staff prepared to respond
- Work with local dealers and EVSE providers to understand where vehicles will be and model the impact on local transformers and infrastructure
- Consider the potential of EVs as the foot in the door to wider adoption of DR or other intelligent electricity use
- Provide EV specific rates
- Think about testing the implications of EVs in your own fleet
EV Planning: 24% have Pilot Programs and 68% have a Large Scale Plan

**EV Plan**

- Most cities consider EV as important transportation solution for the cities.
- Cities have two different primary focuses in their EV plans: Electrification of municipal fleet and establishing public charging stations.
- The target number of vehicles are blurry for most cities because market adoption of EV is very uncertain.
- Cities have comprehensive EV plans: Indianapolis, Raleigh, San Francisco, Houston, Seattle.

Look at PGR, EV Project, and leading cities for examples of good plans.
Vehicle Subsidies and Infrastructure Incentives Help Jumpstart the Local Rollout

- 66% cities provide or plan to provide infrastructure incentives
- HOV lanes, preferred parking at public parking garage, and curb parking are mainly considered infrastructure incentives.
- Some cities are providing EV rental service collaborating with local car rental companies or at airports.
- Preferable parking is at public conventions, such as museums, convention center, City Hall and universities.
- Reduced rate and free charging are considered by fewer cities as it requires agreements between cities and infrastructure providers, operators and utilities.

![Infrastructure incentives chart]

- Provide or plan to provide perks: 25
- Not considered yet: 11
- Info missing: 2
Electric Vehicle Outreach and Education Materials Exist, Don’t Reinvent the Wheel (just the drivetrain)

- EV’s performances and safety of EV as well as home charging station application and installation procedures should be primary focus of public education.
- Leaders in EV education:
  - **Indianapolis**: smart grid education and curriculum in development in community college
  - **Raleigh**: city webpage and training program for inspector
  - **Washington**: EV regulations, guidelines, and model ordinances
  - **Oregon**: Charge station site selection, installation, and maintenance

Education on two levels:
- Education on promoting EV’s benefit on consumers side; technical training and worker transit assistance on EV related personnel. Few EV leaders have developed program for technician training.
Permit Streamlining Improves Consumer Experience; Most Cities have yet to Determine Key Barriers

• Early rollouts show charge station permitting as one of the largest headaches for new EV owners
• Users also have challenges when registering the vehicle

• Cities are working to identify key bottlenecks and expedite permitting
• Several cities have implemented online or 24 hour permitting
• Federal government also working on alleviating permitting challenges

Early months of Mini’s EV test were a tangle of local red tape

It’s not as easy as plug, charge, unplug & lesson. Mini learned that at the onset of its trial.
It took Mini up to seven months to get all approvals and proper electrical hookups

Raleigh rolls out speedy permits for electric car recharging

Raleigh is preparing for the arrival of plug-in electric cars by creating streamlined permitting system for household battery recharging.

Building Codes readies Oregon for home charging of electric vehicles

Salem – To support the roll out of electric vehicles in Oregon later this year, the Oregon Department of Consumer and Business Services, Building Codes Division has made the permitting process for home charging units cheaper and easier.
For More Information:
ProjectGetReady.com
mmattila@rmi.org