

## PLUG-IN ELECTRIC VEHICLES ARE COMING... IS YOUR UTILITY READY?

**Britta Gross**

Director, Global Energy Systems and Infrastructure Commercialization



# Gas-friendly to gas-free.



**FUEL EFFICIENCY**



**BIOFUELS**



**HYBRID**



**ELECTRIC**



**FUEL CELL**

**Increasing Electrification**



# Extended-Range Electric Vehicle Chevrolet Volt





Up to **40** miles **BATTERY** Electric Drive + **HUNDREDS** of miles **EXTENDED RANGE** Driving (Gasoline or E85)



# Pre-Production Volt: Engineering Test Drive – 13 Oct 2009



# Charging and Infrastructure



# GM/EPRI Utility Collaboration

Includes more than 50 Utilities... many the industry's thought-leaders in electric transportation and grid interaction



# Six Things We Need to Get Right

- Market analysis
- Technical features
- Customer experience
- Public education
- Public policy
- Advanced features and new opportunities





# Charging Power Levels

- 120V (1.2 kW) charging
  - Plugs into standard household outlet
  - Full charge in about eight hours (temperature dependent)
  - No additional equipment or installation (?)
  - Charge cord standard with the vehicle in NA
- 240V (3.3 kW) charging
  - Full charge in about three hours
  - Efficient and enables more opportunity to drive electrically
  - Will usually require a one-time investment to upgrade garage with dedicated 240V circuit
- Charger and control logic onboard the vehicle
- Designed for global voltages



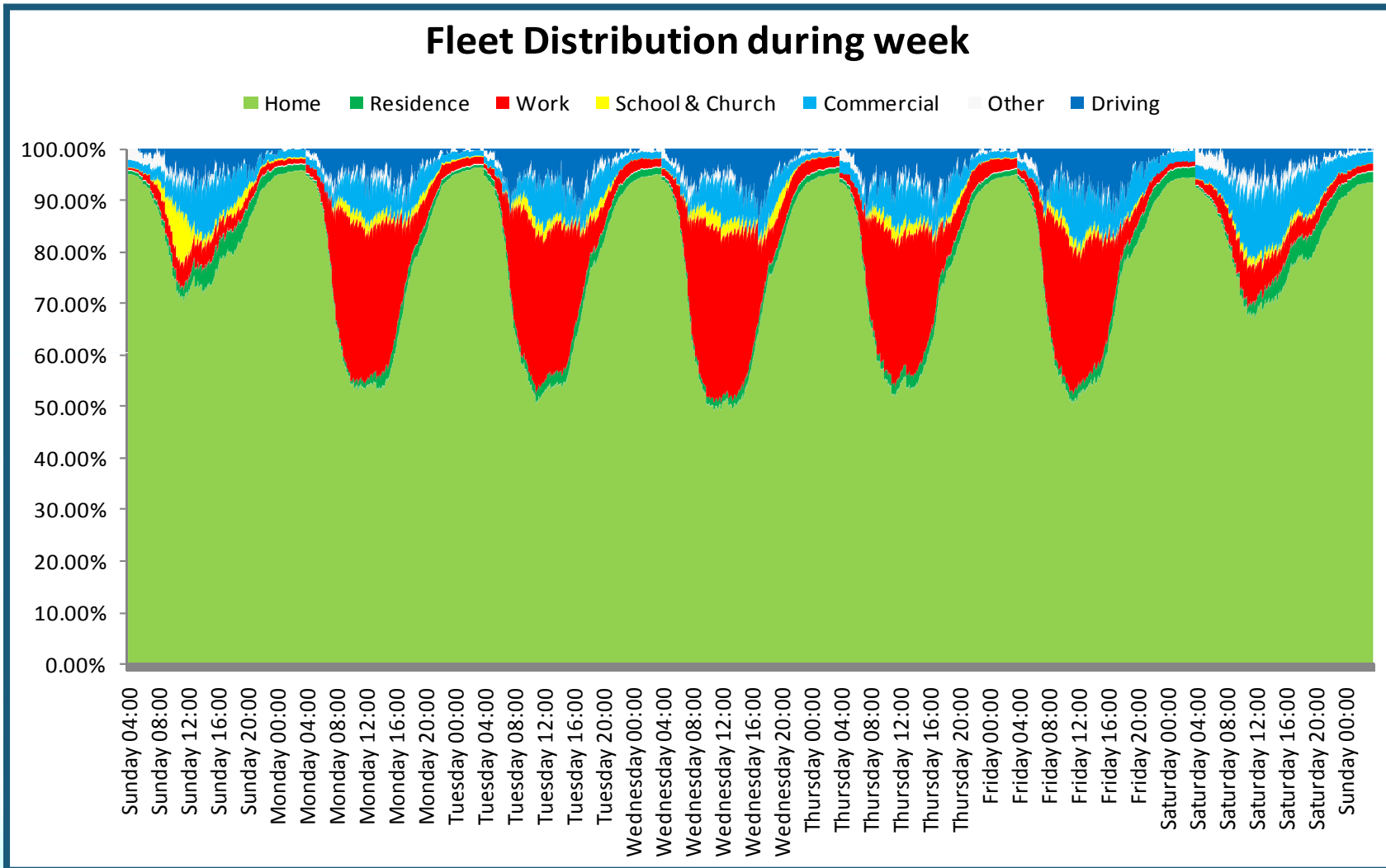
**120V Cordset**



**240V Charge Station**



# Where Are the Cars?

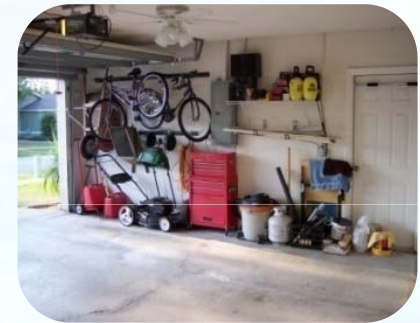


Source of Data - 2001 National Household Travel Survey ; GM Data Analysis (Tate/Savagian) - SAE paper 2009-01-1311



# Home Charging can be a real satisfier for consumers, but there is a lot of potential variability that we have to help manage...

- Garages can be filled with junk and need to be rearranged to make room for the charger
- Some garages already have washers/dryers or refrigerators that operate on 220V lines but making room for additional line a challenge
- Locating charger on right or front of vehicle works better for some. But garage clutter is still an issue



# Progress Energy Home Survey: Carolinas (2,100) and Florida (3,400)

How close is the nearest 120 V outlet?	CAR	FL
0-20 ft	61%	87%
20+ ft	39%	13%

Is 120V outlet a dedicated circuit?	CAR	FL
Yes	2%	8%
No	98%	92%

Does existing premise allow for the installation of a 120 V 15 A dedicated circuit?	CAR	FL
Yes	86%	81%
No	14%	19%

What is the estimated cost to add the required circuit? (not including EVSE, panel upgrade or meter)?	CAR	FL
\$100-\$250	40%	46%
\$250-\$500	47%	45%
\$500-\$750	12%	5%
\$750+	2%	4%

**Add'l Costs:**  
 Panel upgrade ~\$1,000  
 EVSE ~\$300-1,000  
 Meter/submeter?



# Progress Energy Home Survey: Carolinas (2,100) and Florida (3,400)

**Is there an accessible dedicated 240 V/30 A (min) outlet within 25 ft of where the vehicle is parked?**

	<b>CAR</b>	<b>FL</b>
Yes	5%	41%
No	95%	59%

**Does the existing premise allow for the installation of a 240 V/30 A dedicated circuit?**

	<b>CAR</b>	<b>FL</b>
Yes	85%	80%
No	15%	20%

**What is the estimated cost to add the required circuit?**  
(not including EVSE, panel upgrade or meter)

	<b>CAR</b>	<b>FL</b>
\$100-\$250	10%	35%
\$250-\$500	60%	52%
\$500-\$750	19%	8%
\$750+	12%	6%

**Add'l Costs:**

Panel upgrade ~\$1,000

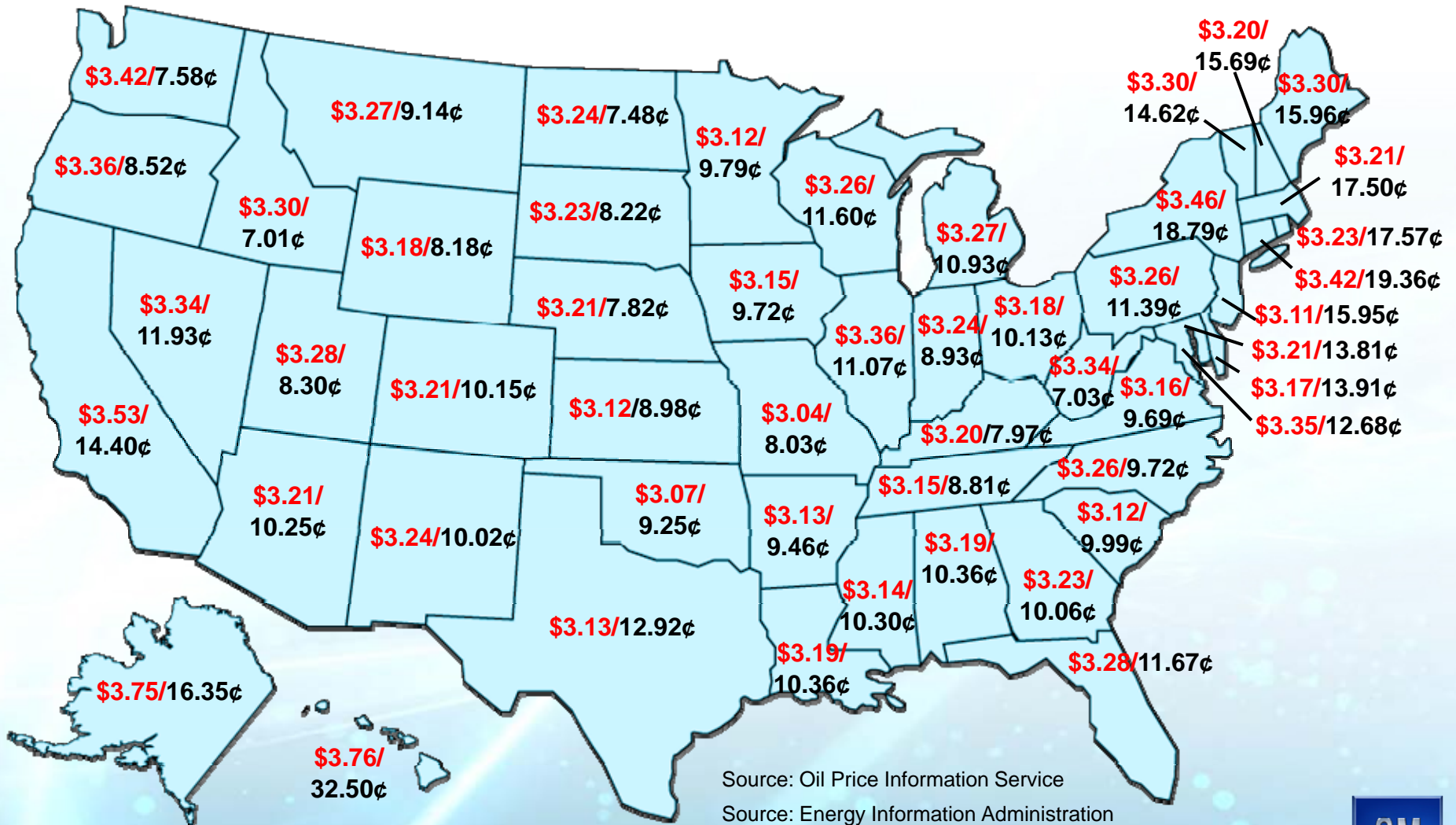
EVSE ~\$300-1,000

Meter/submeter?



# 2008 Gasoline vs. Electricity Prices

Average Gasoline Price **\$3.25/Gallon** and Electricity 11.36¢/KwHr



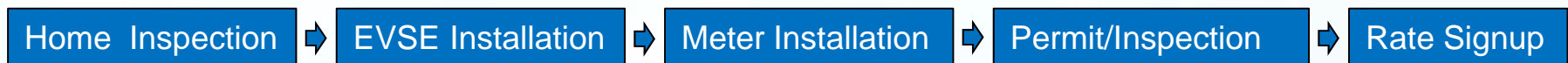
Source: Oil Price Information Service

Source: Energy Information Administration  
<http://www.eia.doe.gov/fuelectric.html>



# Top Priorities for Overall Utility Support:

- Consumer EV support (24/7 operator for EV charging questions)
- Residential infrastructure assistance
  - Fast, convenient installation process that is affordable (i.e. satisfying)



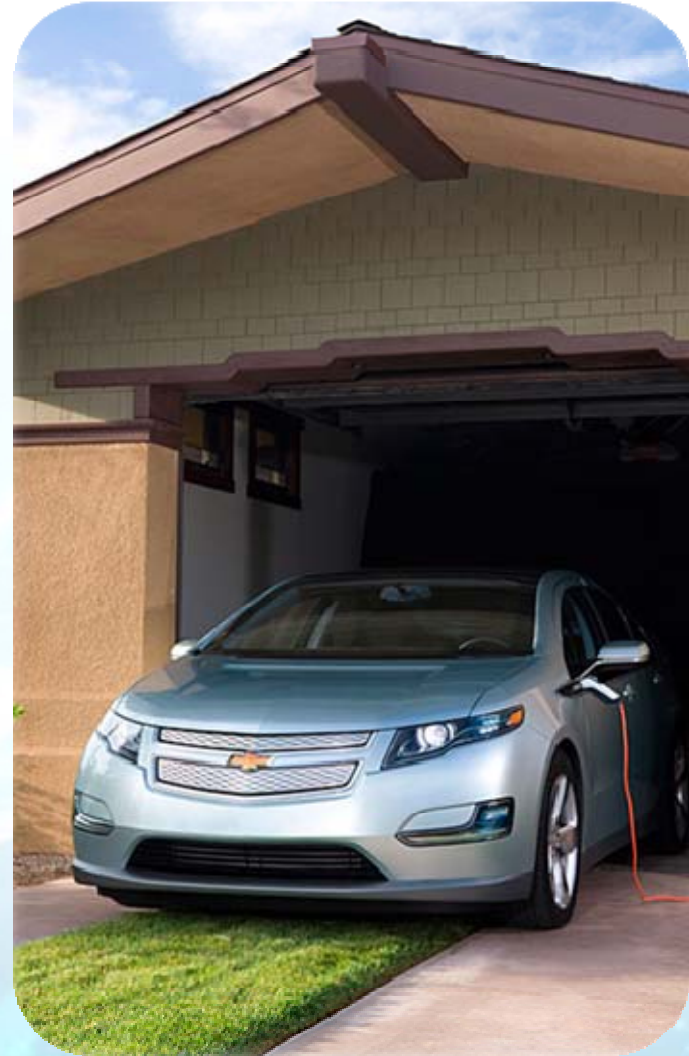
- Utility handles entire home installation process  
OR
- Coordination between Utility (meter) and 3<sup>rd</sup> party installer (EVSE)
- Outreach and leadership in readying regions for plug-in vehicles
  - Key stakeholder outreach
  - City/regional initiative to put enablers in place
  - Consumer education
- Compelling consumer EV rates and easy sign-up process
  - Inform customers of best options, preferred rates, green options
- Policy assistance (e.g. eased permitting, building codes, incentives)
- Expanded fleet purchases



# Plug-in Ready Communities

## Required Stakeholders

- Dedicated project leader
- State, city, county
- Clean Cities Orgs/AQMD
- DOT
- Utilities (municipal and regional)
- Regulators/public utility commissions
- Permitting and code officials
- Local employers
- Local universities



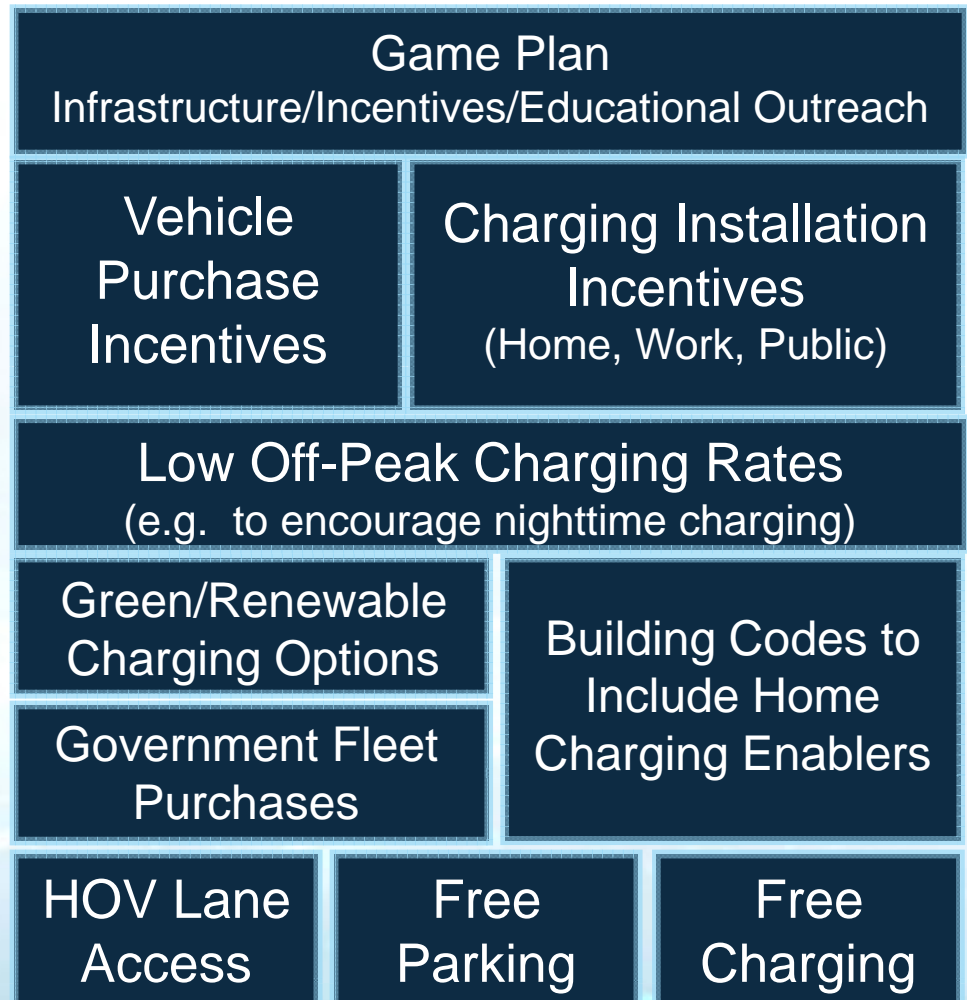


# Plug-in Ready Communities

## Required Stakeholders

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## Desired Enablers



# What's the Right Balance Between... Being Prepared and Being Positive?

## Overly Concerned

## Not Concerned Enough

Grid can't handle PEVs



Grid can handle millions of PEVs and utilities can easily keep up with PEV loads

Electricity will come from coal



Electricity is always cleaner than gasoline

Home charging/installation is fraught with problems that will dissatisfy consumers



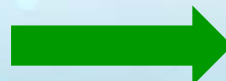
It's easy – find a normal household outlet and plug it in

There's a real infrastructure challenge and we need to install lots of public charging



Just charge it at home – as it was intended

Volt will be too expensive



Volt will fly out of dealer showrooms

