2009 SUMMER SEMINAR

CREATING OUR FUTURE

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

"Plug-in Electric Vehicles are coming … is your Utility Ready?"

GM

Britta K. Gross
Director, Global Energy Systems and Infrastructure Commercialization

2009 Summer Seminar
August 3, 2009

Plug-in Hybrid Electric Vehicle (PHEV)

HYBRID

Announcements Coming Very Soon

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VOLT

Extended-Range Electric Vehicle (EREV)
Chevy Volt

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MODEL ZR2

Up to **40**

miles

Battery

ELECTRIC DRIVE

+ Hundreds

of **miles**

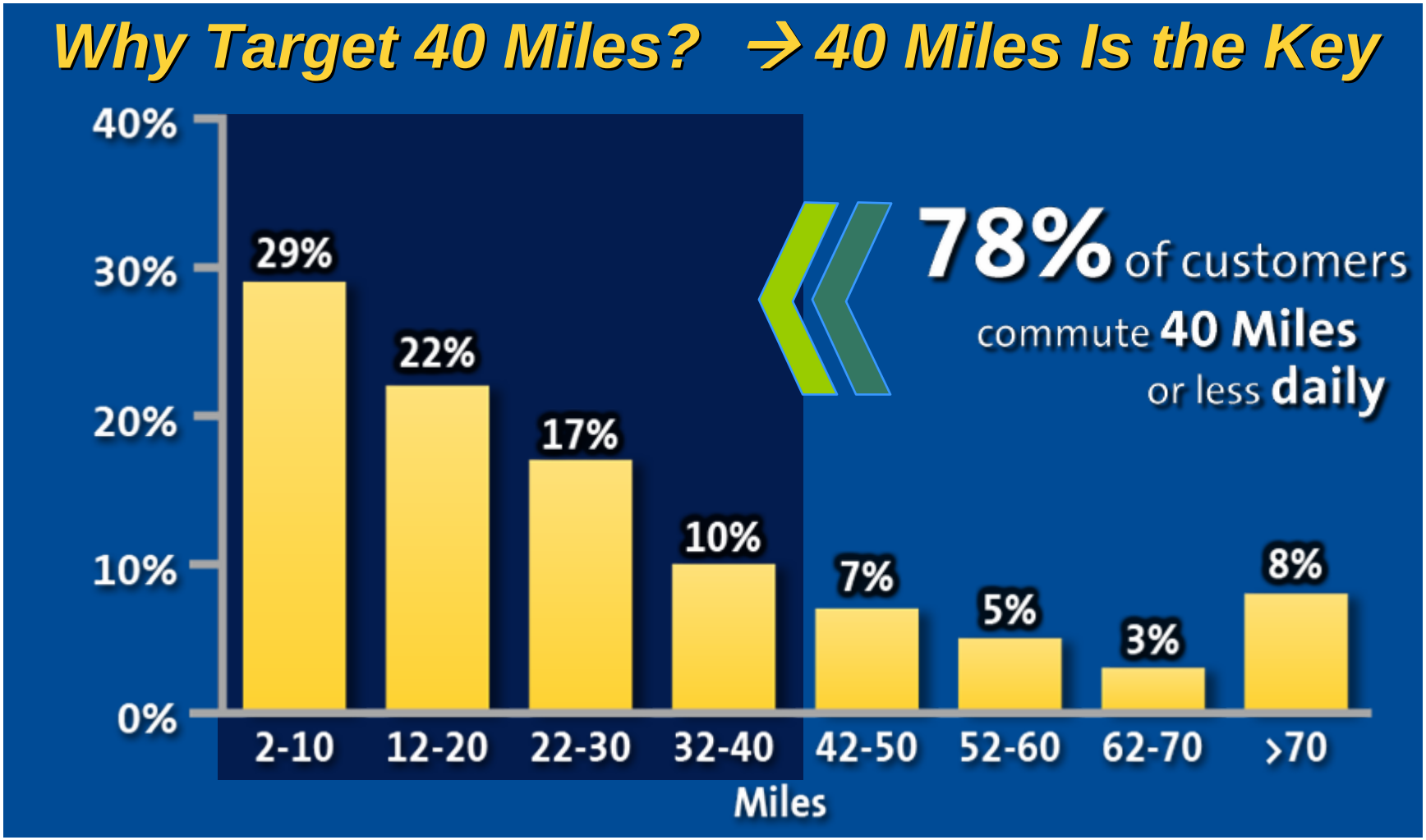
EXTENDED RANGE

Driving

(Gasoline or E85)

Typical Commute

Why Target 40 Miles? → 40 Miles Is the Key



Based on U.S. Department of Transportation 2003 Omnibus Household Survey

Charging and Infrastructure

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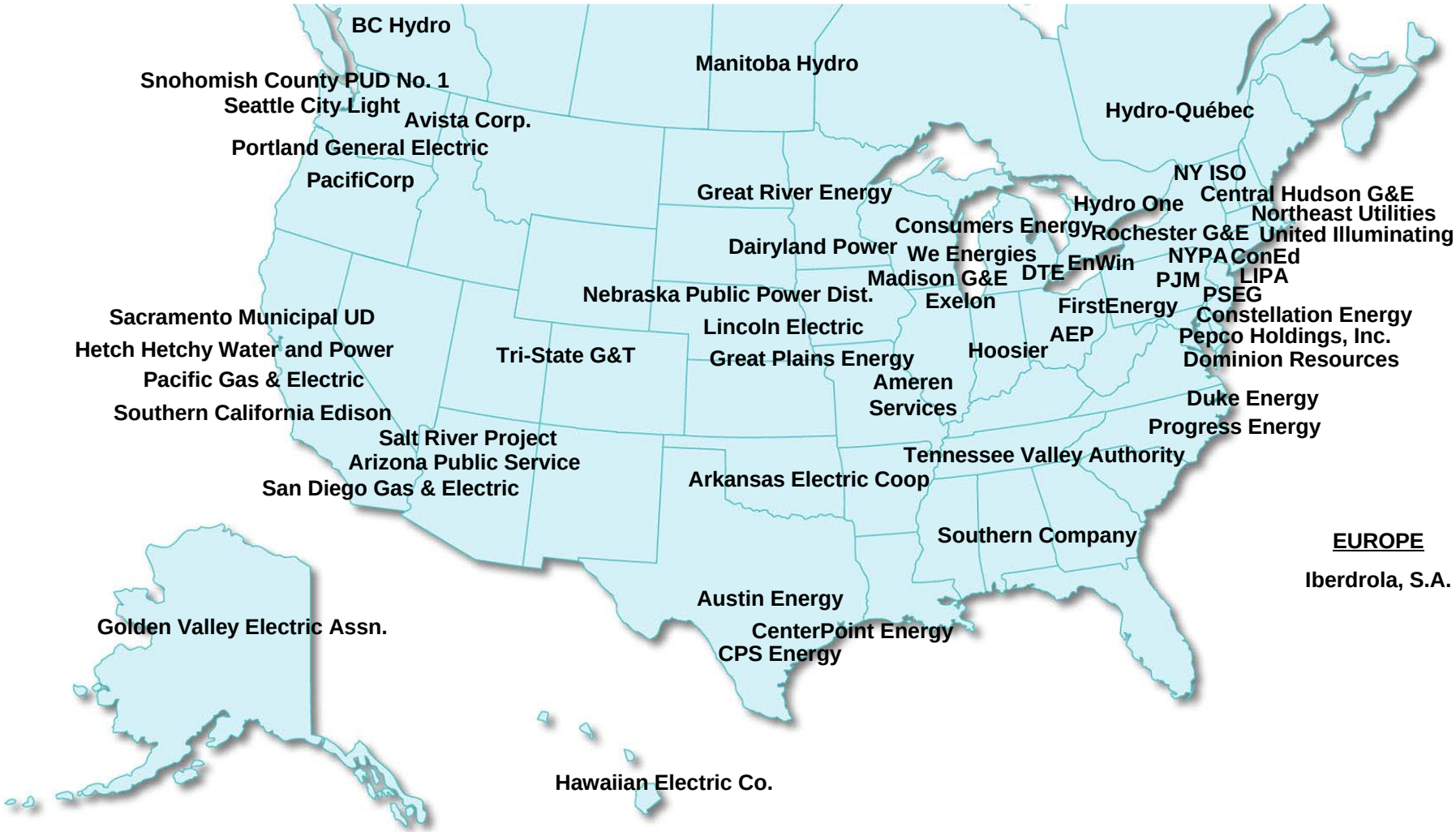
Our Goals…
(GM, EPRI and the Partnering Electric Utilities)

- Accelerate use of electricity to replace gasoline
- Create affordable, desirable vehicles that take advantage of the grid
- Provide accessible, reliable, convenient, low-cost electricity (assure that homes are ready and charging is easy – standards in place)
- Realize environmental benefits of the plug-in revolution

GM/EPRI/Utility Collaboration

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



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Six Things We Need to Get Right

- Market analysis
- Technical features
- Public education
- Customer experience
- Macro value analysis
- Public policy

Charging Power Levels

The Volt Can Be Charged at Either 120V or 240V

- 120V (1.2 kW) charging
  - The Volt plugs into a standard household outlet
  - Full charge in about 8 hours (temperature dependent)
  - May require understanding and control of other devices on the circuit
- 240V (3.3 kW) charging
  - Full charge is about 3 hours
  - This faster charging will have additional customer value
  - Will usually require a one time investment to upgrade the garage with a dedicated 240V circuit

- Charger and control logic is on-board the vehicle
- Designed for global voltages
- 120V charge cord comes with the vehicle in NA

How Does a Volt Compare?

Annual Energy Usage – Electrical Appliances

Home Heating System	3,524 kWh
Central Air Conditioning	2,796 kWh
Refrigerator/Freezer	2,610 kWh
Water Heater	2,552 kWh
VOLT	2,520 KWh
Clothes Dryer	1,079 kWh
Lighting	940 kWh

1 Computer & monitor Operating ALL day

1 CHEVY VOLT for annual energy usage

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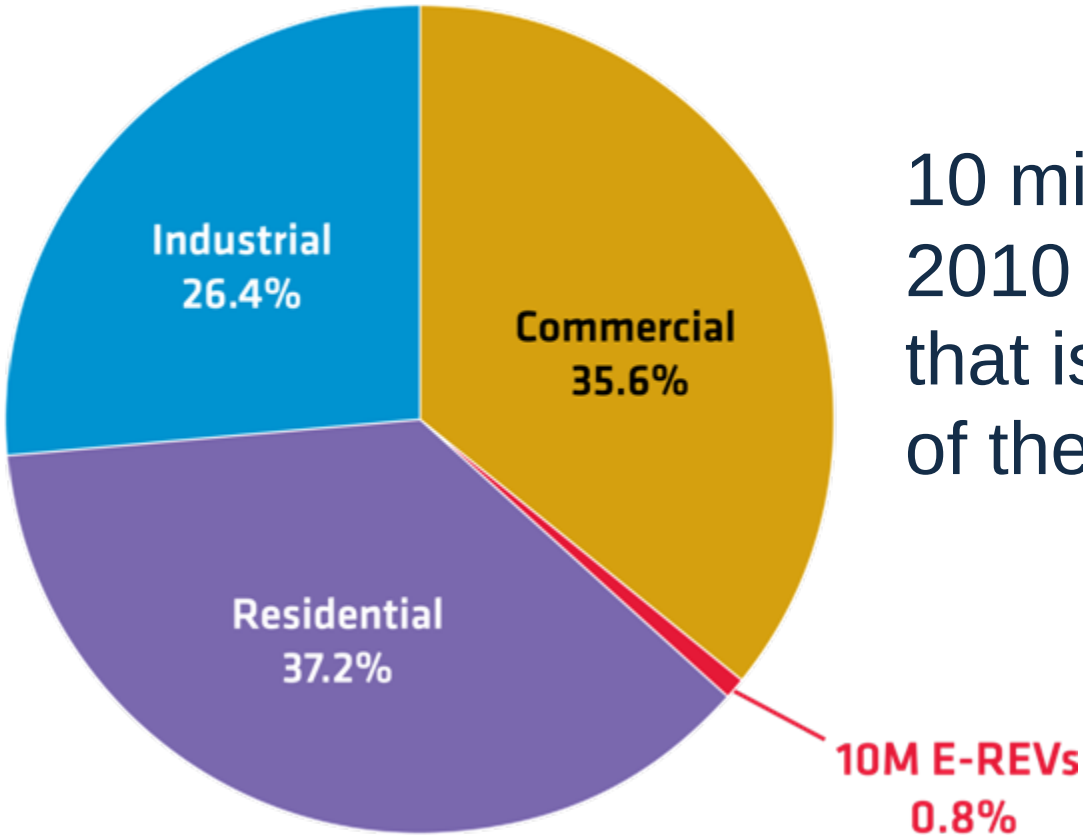
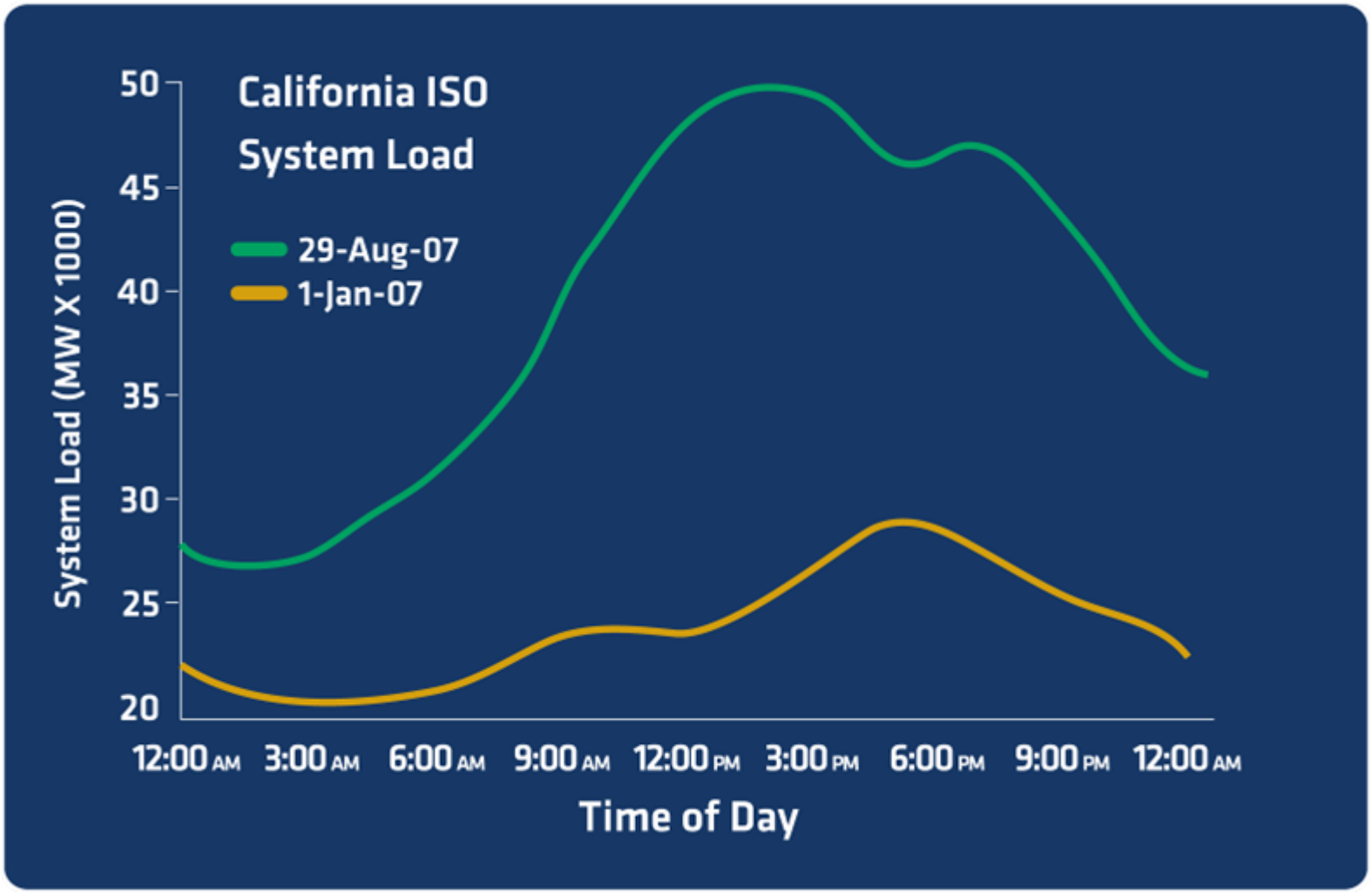
Impact on the Grid

Electricity: An important energy source with significant capacity to support transportation



10 million E-REVs in 2010 would add a load that is **less than 1%** of the total grid load

Electric Grid Design for Peak Demand
Volt Leverages Off-Peak for Charging



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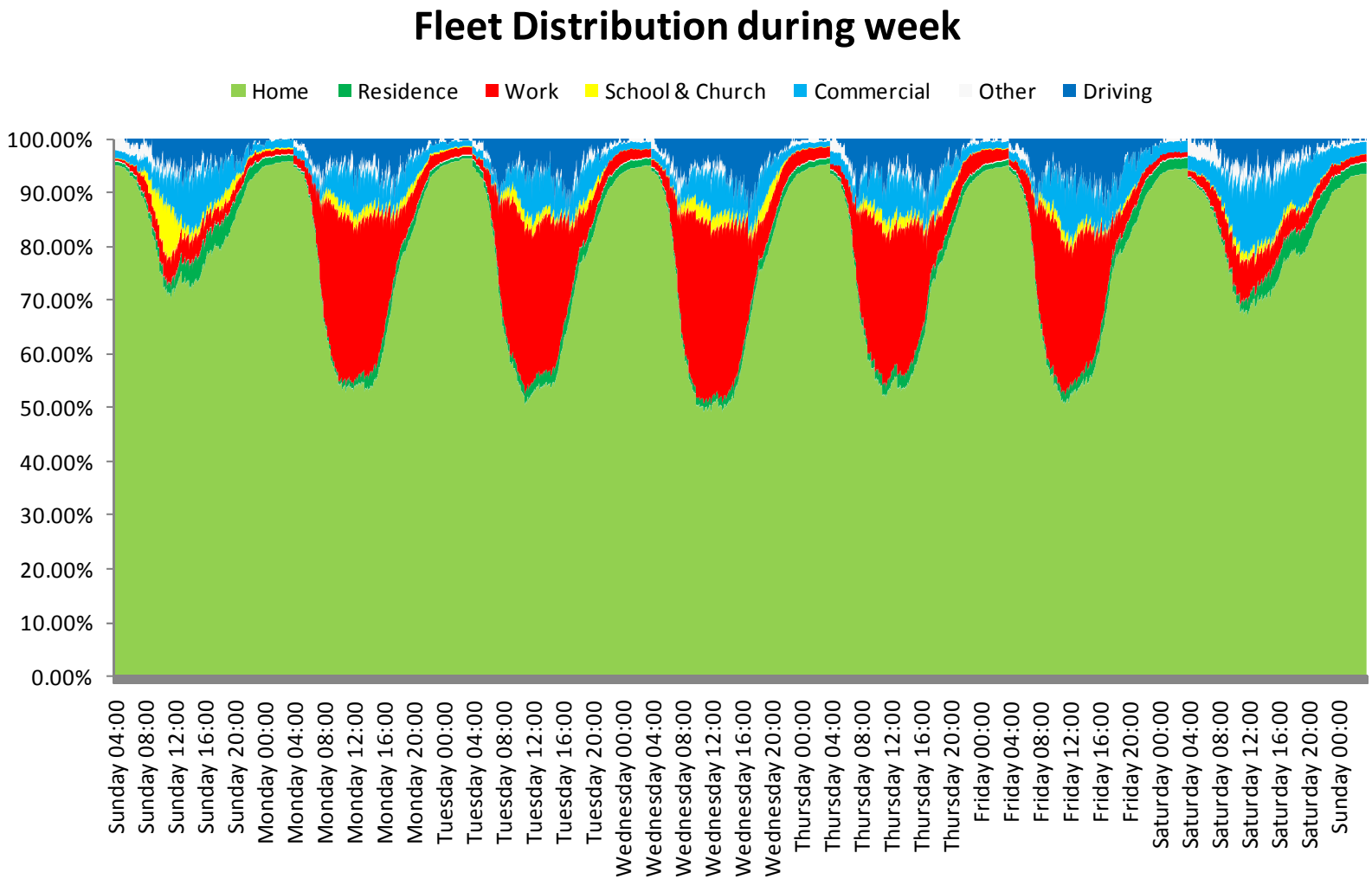
Where are the Cars?

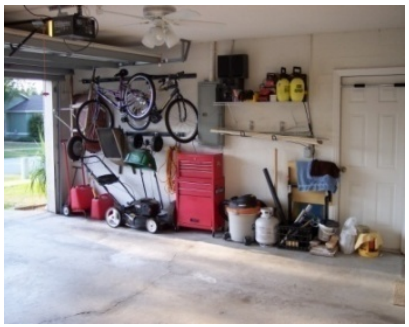


Source of Data - 2001 National Household Travel Survey ;
GM Data Analysis (Tate/Savagian) - SAE paper 2009-01-1311

Home is Still the Primary Location for Vehicle Charging, but …

- Several respondents indicated they would need to clean or rearrange their garages in order to make room for the charger. Garage is often used for more than just parking vehicles.


- Because several have washers/dryers or refrigerators in the garage, 220V lines already exist. Still, some would have trouble making room for an additional line/charger.



- Having the charger located on the right or front of the vehicle worked better for some. Several respondents were really not sure how they would make it work around the clutter in their garages.



Home (Residential) Charging Installation

Objectives:

- Establish a single point-of-contact for consumer
- Eliminate consumer confusion
  - Public dialogue on electricity rates and time-of-use (TOU) language
  - Understanding of available rate plans and best options for plugging-in their Volt
- Offer a satisfying home charging experience
  - Safe, convenient and reliable
  - Professional, courteous and comfortable service
- Deliver acceptable (low or reasonable) cost
  - Initial setup, installation cost
  - Monthly charge (electricity) cost
- Promote a long-term consumer relationship

Plug-in Ready Communities Required Stakeholders:

- Dedicated Project Leader
- State, City, County Governments
- Clean Cities Orgs/AQMD
- DOT
- Utilities (municipal and regional)
- Regulators/Public Utility Commissions
- Permitting and Code Officials
- Local Employers
- Local Universities

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Desired Enablers

Game Plan
Infrastructure / Incentives / Educational Outreach

Vehicle purchase incentives

Charging installation incentives
(home, work, public)

Low off-peak charging rates
(e.g. to encourage nighttime charging)

Green/renewable charging options

Government fleet purchases

Building codes to include home charging enablers

HOV lane access

Free parking

Free charging

Thank you