Vehicle Electrification

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PETROLEUM

96% of **transportation** energy

GM ENERGY STRATEGY

Displace **petroleum** through
energy **efficiency** and **diversity**

Gas-friendly to gas-free.

FUEL EFFICIENCY

E85 ETHANOL

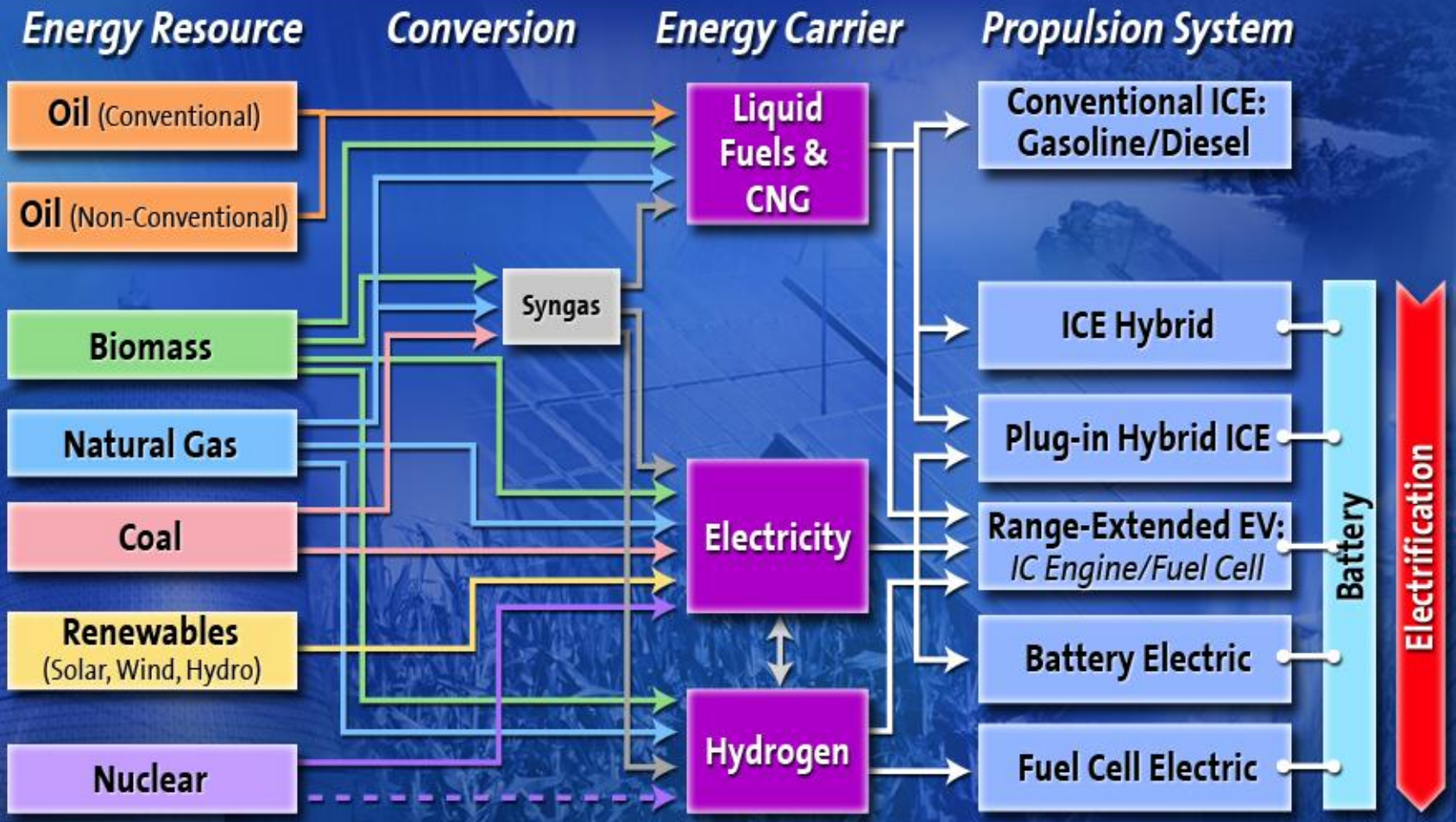
HYBRID

ELECTRIC

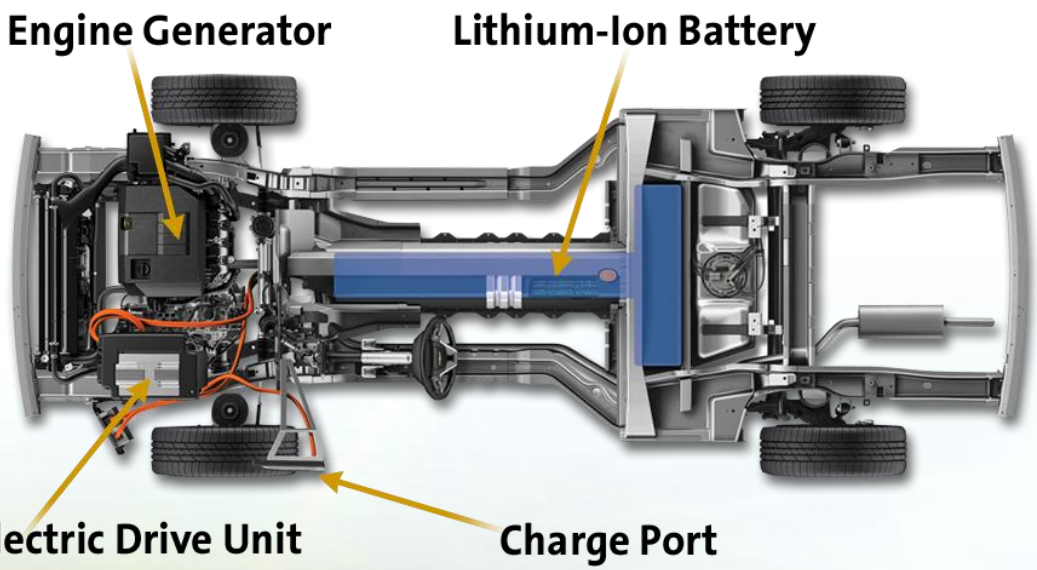
FUEL CELL

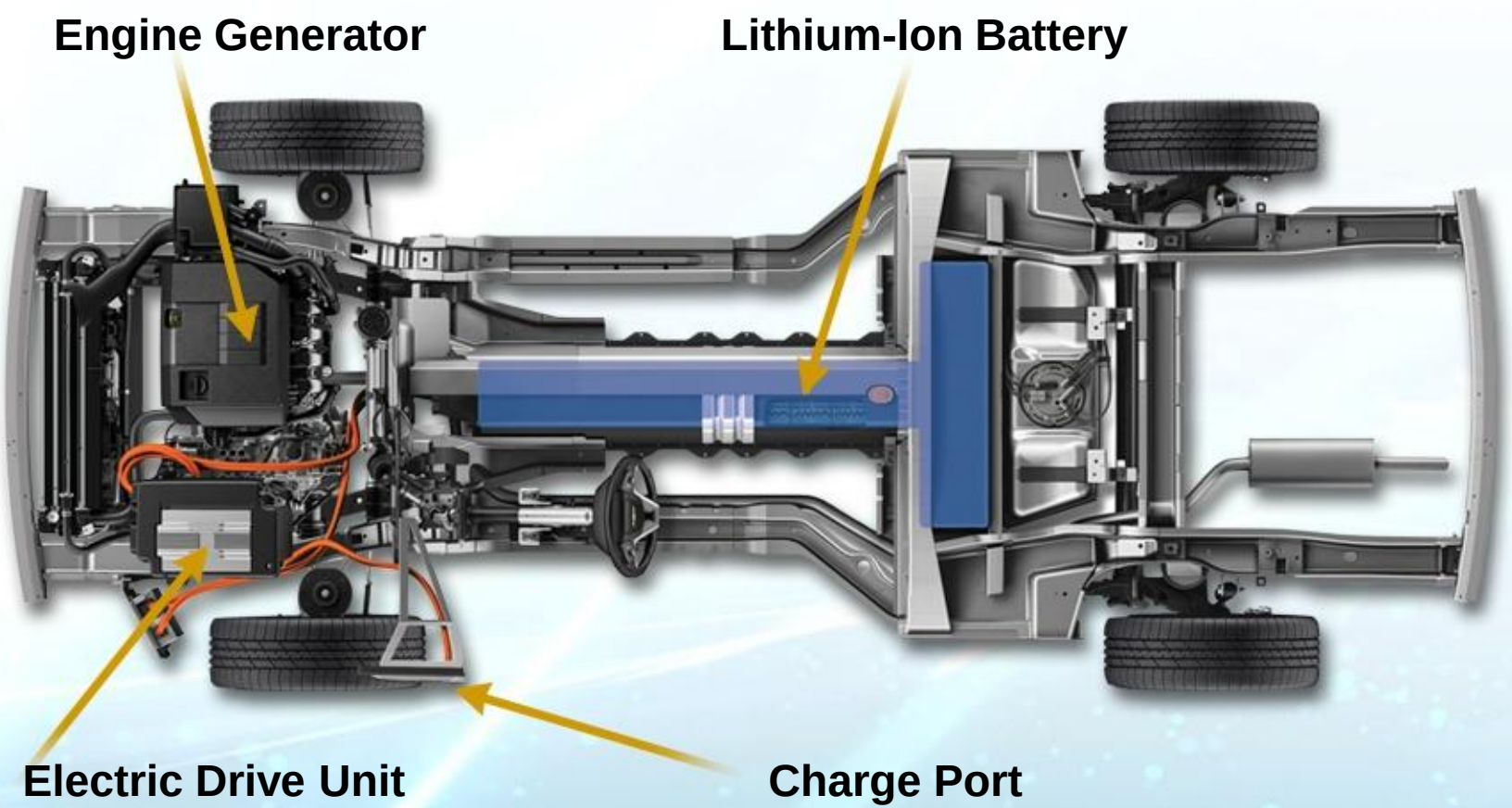
Increasing Electrification

GM Energy Strategy



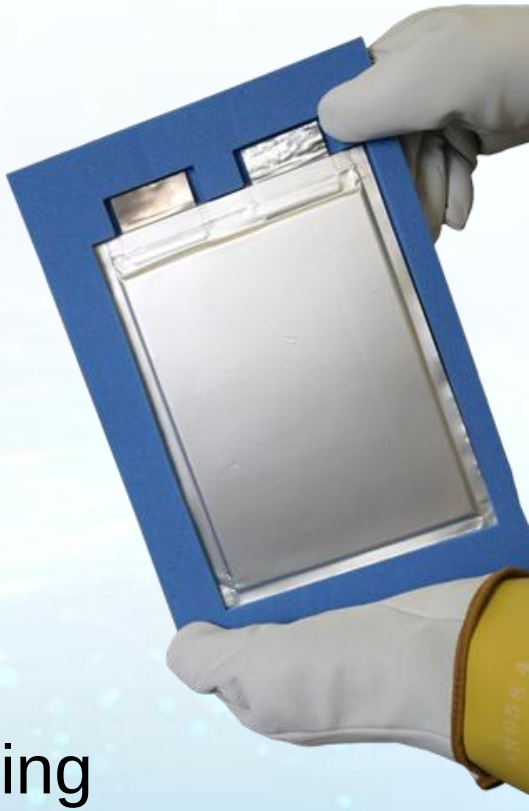
VOLT


Engine Generator
Lithium-Ion Battery
Electric Drive Unit
Charge Port

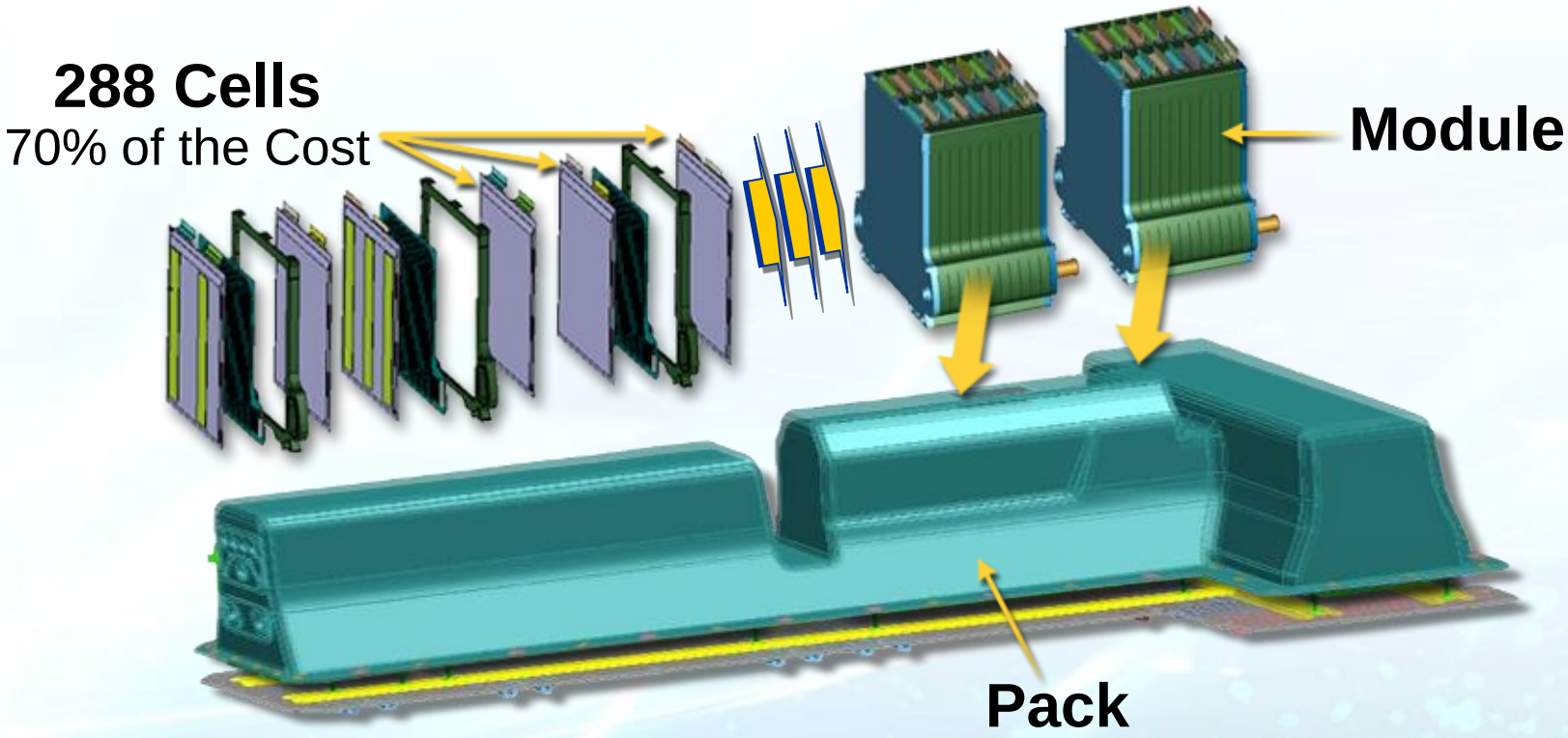

Engine Generator
Lithium-Ion Battery
Electric Drive Unit
Charge Port

Cells Are the Building Blocks of the Battery Pack

- All lithium-ion chemistries are not alike
- Characteristics required for automotive applications differ greatly from consumer electronics
- More than 200 cells
- Volt Batter will have 16 kwh of energy storage Capacity
- Thermally managed through liquid heating and cooling



VOLT Lithium-Ion Battery



VOLT

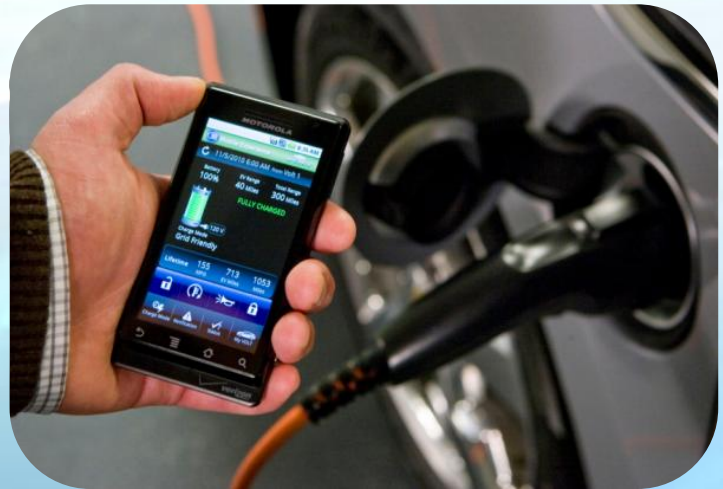
Creating a new propulsion category:

Electric Vehicle with Extended-Range

PHEV Plug-In Hybrid
Primary Fuel: Petroleum

E-REV Extended-Range Electric Vehicle
Practical Zero Emission Vehicle

EV Electric Vehicle
Limited Vehicle Range



EV1

VOLT

Overcoming RANGE Anxiety

Electric Vehicle

with EXTENDED-RANGE

64 km

BATTERY

Electric Drive

+

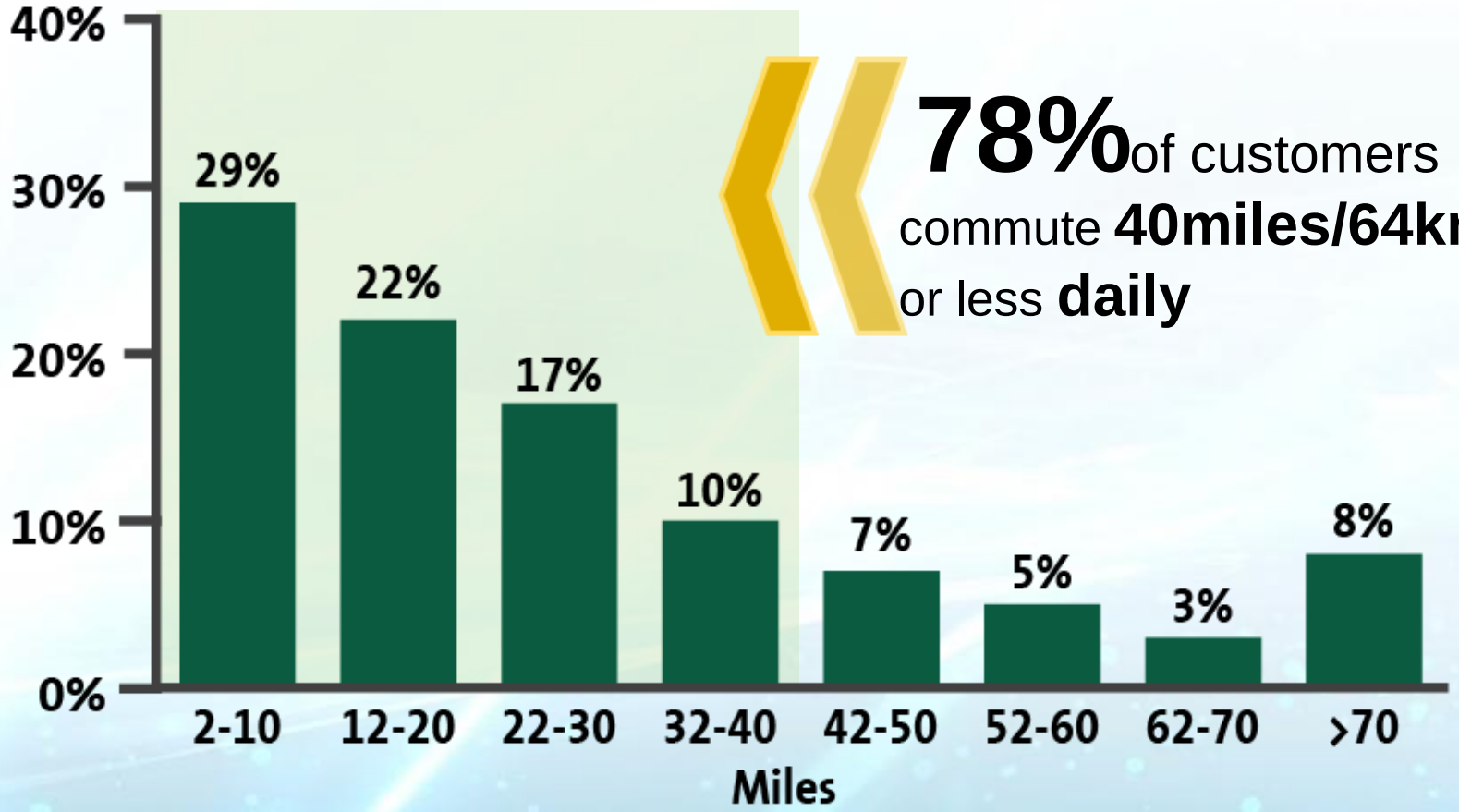
HUNDREDS of km

EXTENDED RANGE

Electric Driving

Typical Commute

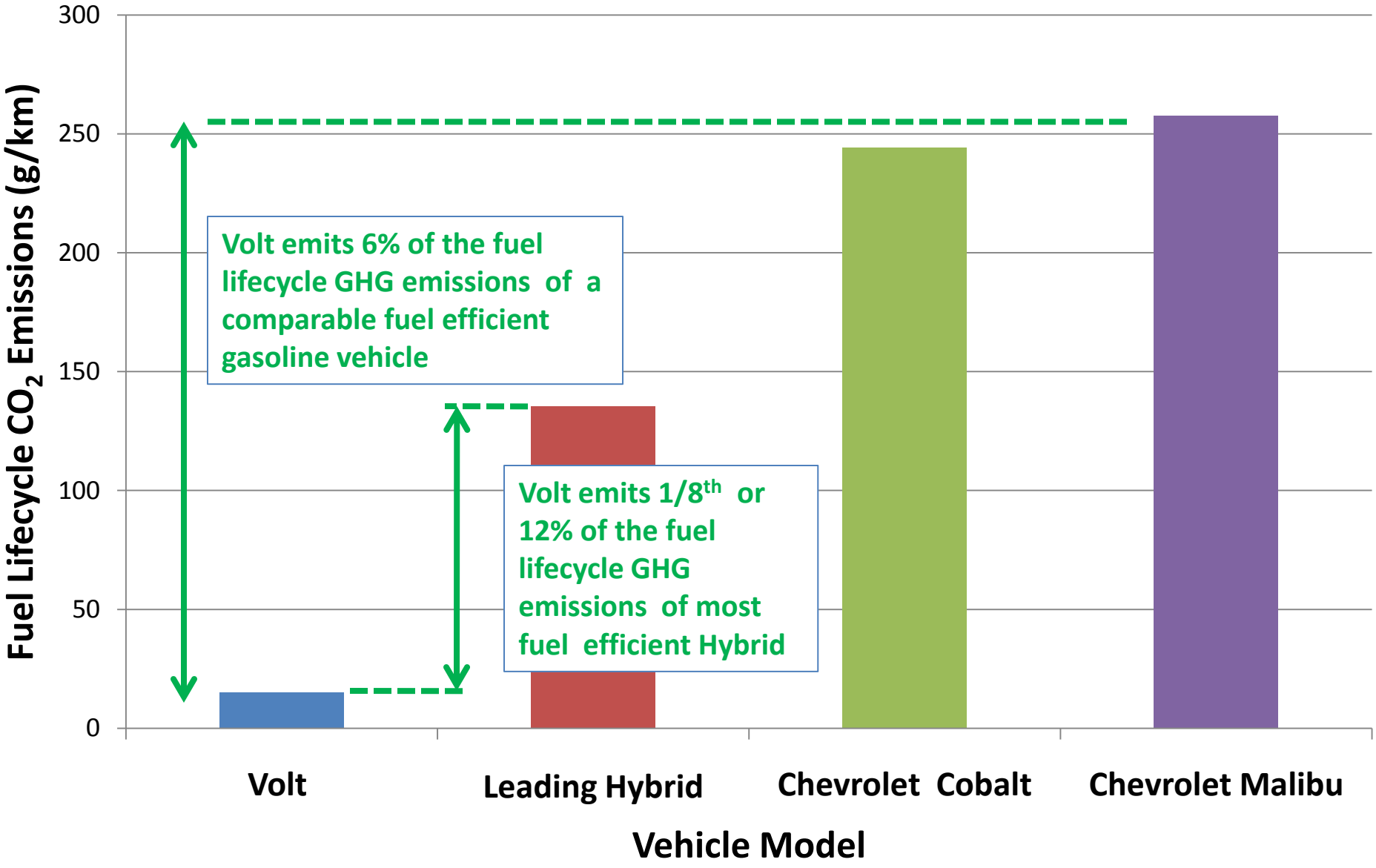
Why Target 40Miles / 64 Km?



78% of customers commute **40miles/64km** or less **daily**

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

Volt's EV CO_2 Performance based on Ontario's Electrical Mix



Operating Costs

85¢/L = 4¢ per KM

1.30$/L = 6¢ per KM

1¢ per KM off-peak
(2¢ on-peak)

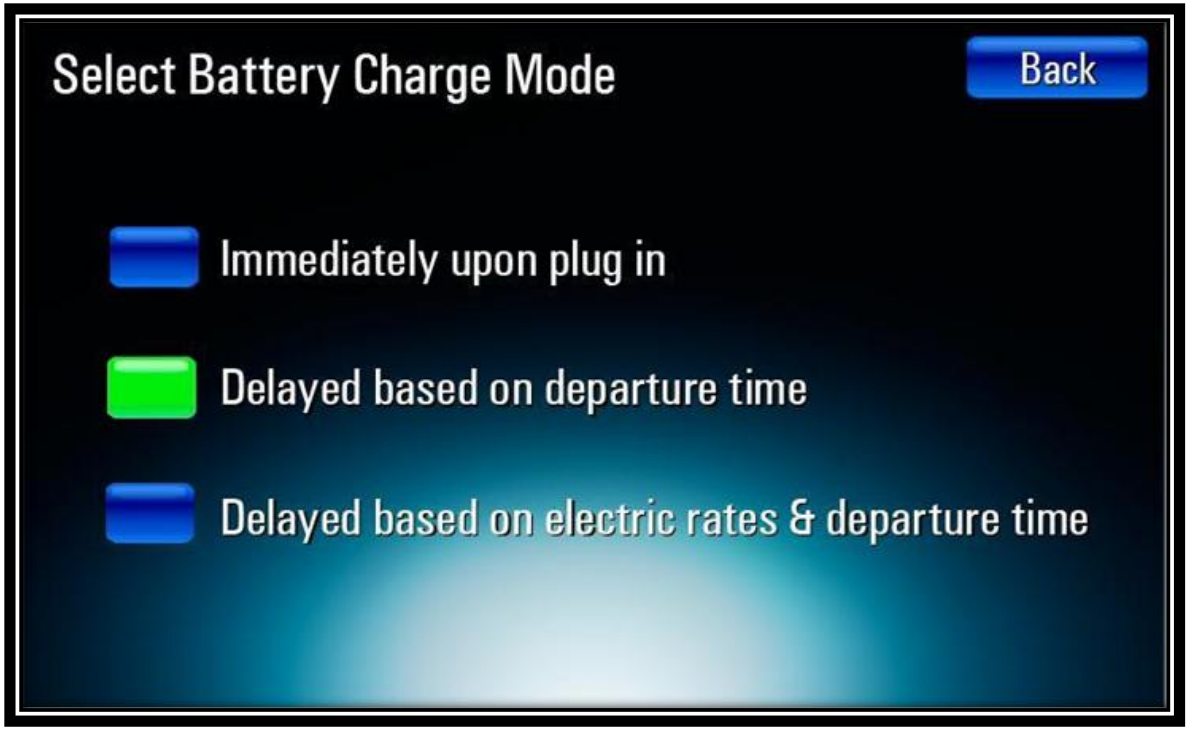
Charging Power Levels

- **120V (1.2 kW) charging**
  - Plugs into standard household outlet
  - Full charge in about 8 hours
  - No additional equipment or installation
  - Charge cord comes standard with the vehicle
- **240V (3.3 kW) charging**
  - Full charge in about 3 hours
  - Increased convenience and enables more off-peak charging
  - Will 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

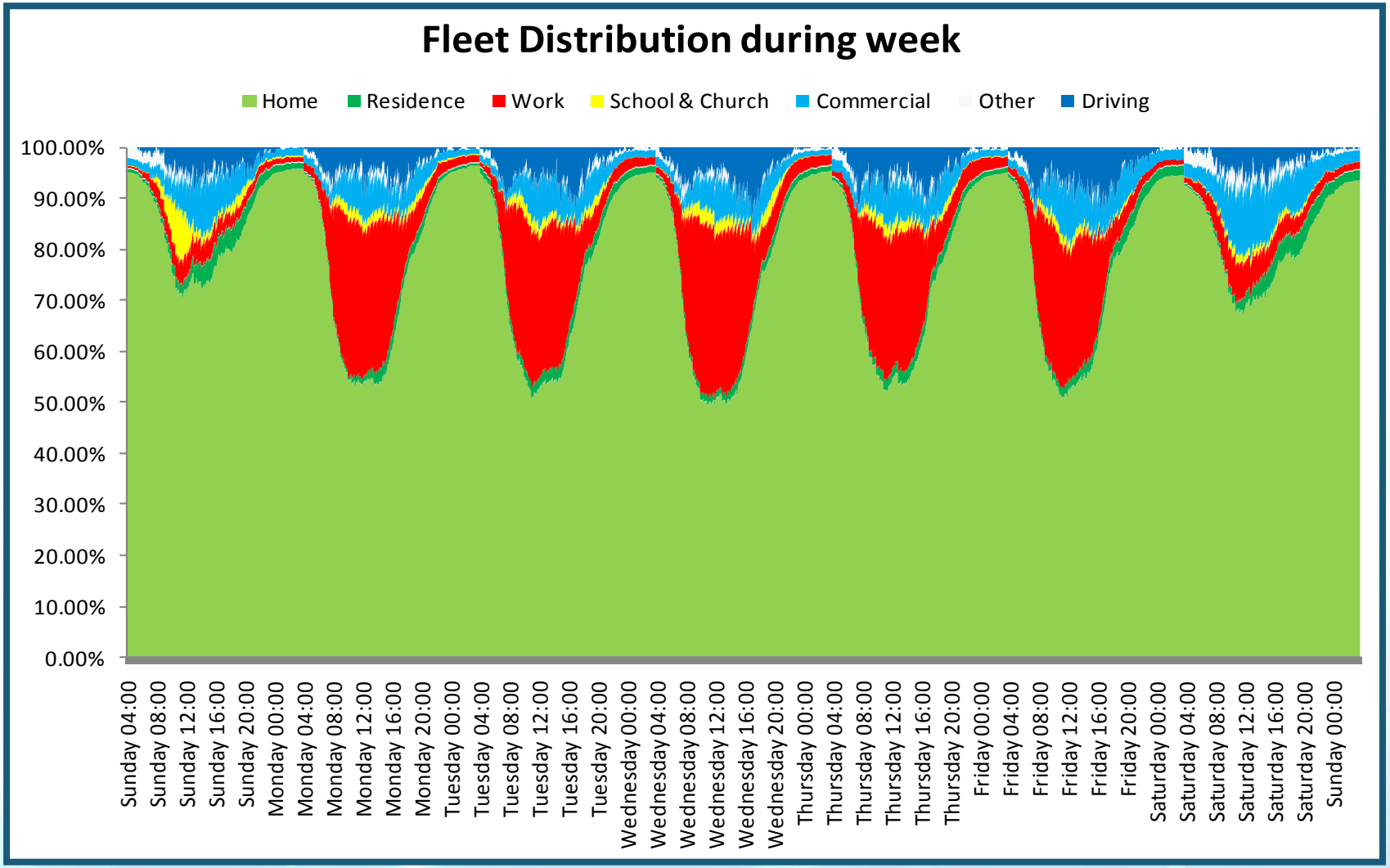
240V Charge Station

Volt Smart Charging Functionality



Volt charging options move customers away from peak charging, result in a "stagger" that prevents a new evening peak, and includes manual programmable features that anticipate the more automatic "smart grid" features to come.

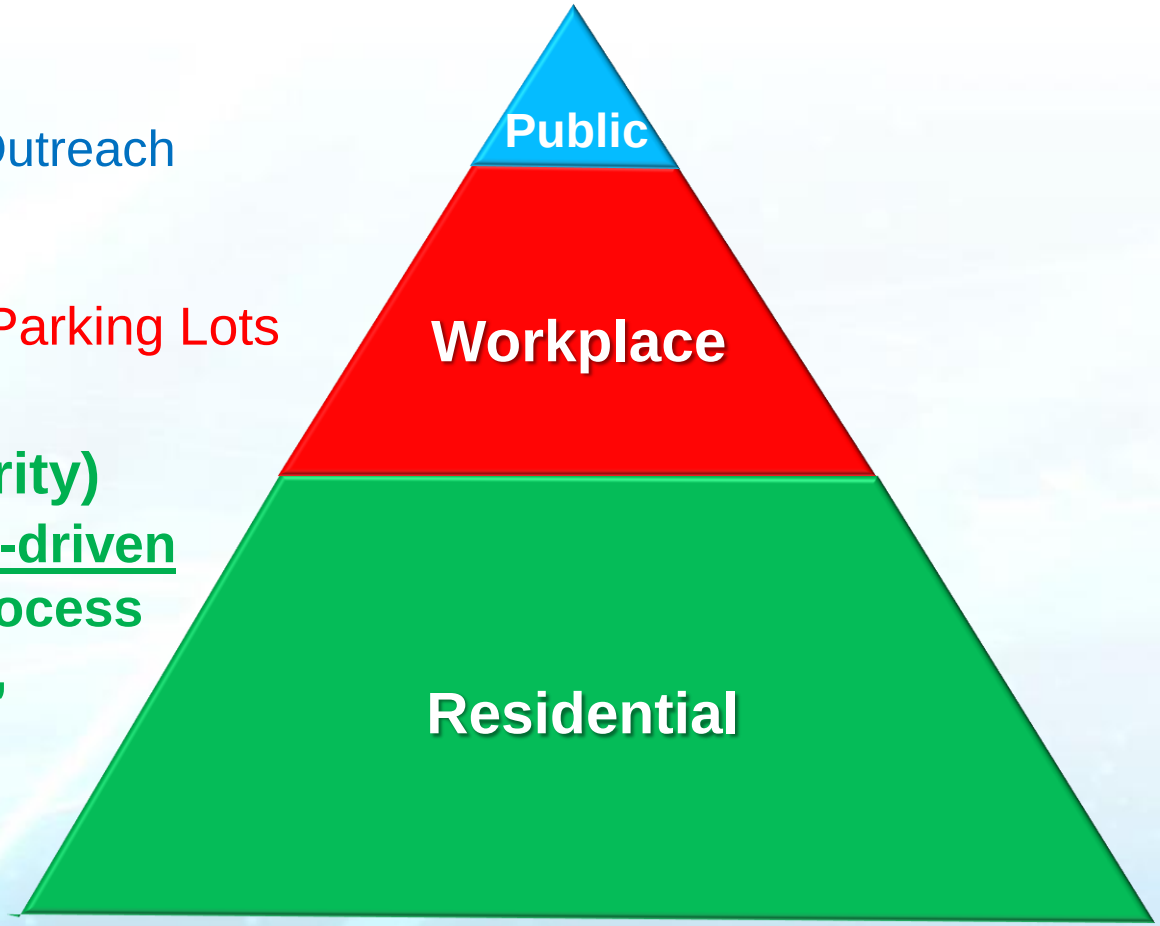
Where Are the Cars for Charging?



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

Charging Infrastructure

- Public
  - High Visibility
  - Commercial/Retail
  - Public Education and Outreach
- **Workplace**
  - Corporate, Municipal Parking Lots
- **Residential (majority)**
  - **Satisfying consumer-driven home installation process**
  - **Permits, electricians, inspections, meters, rates**



PLUG-IN 2009

GM

GM/EPRI Utility Collaboration

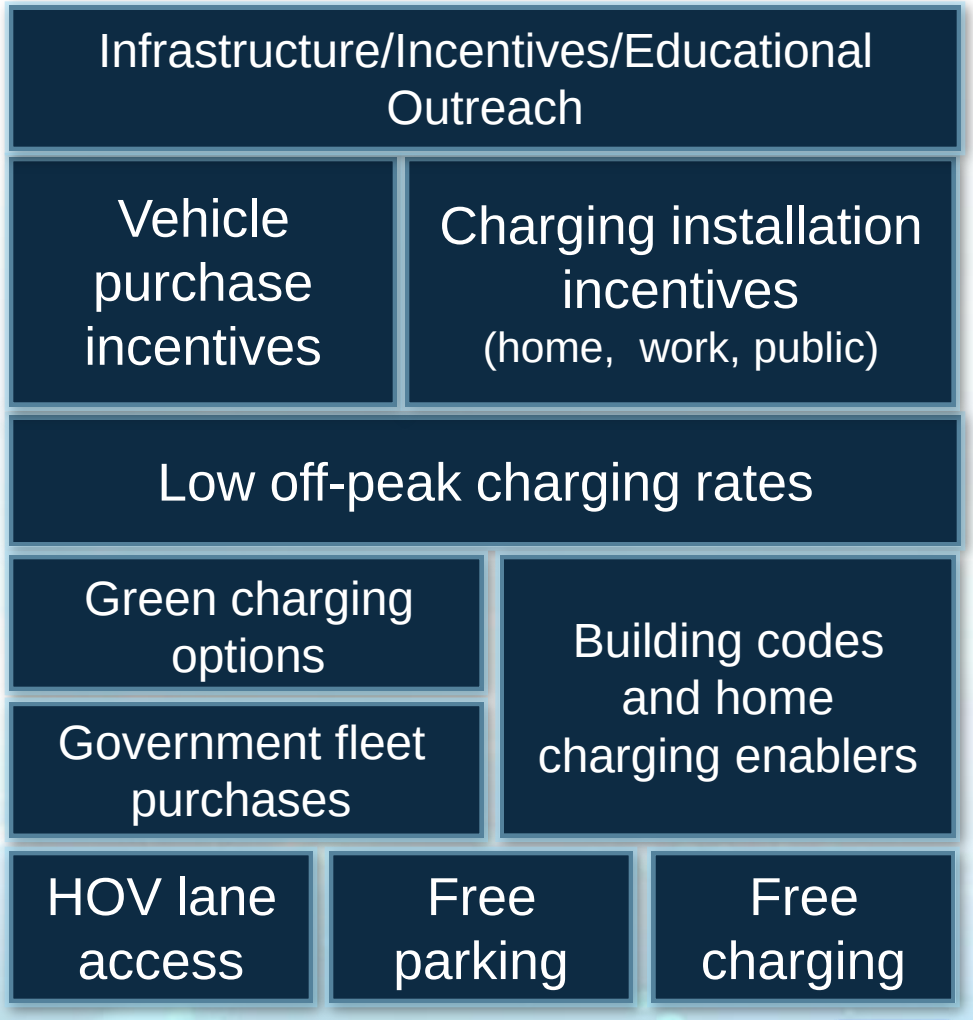
Includes more than 50 Utilities… many the industry's thought-leaders in electric transportation and grid interaction

Plug-in Ready Communities

Required Stakeholders

- Dedicated project leader
- Provinces, Fed, Cities, Municipalities
- Clean Cities Orgs
- Utilities, Generators
- Regulators/public utility commissions
- Permitting and code officials
- Major employers
- Local universities

Desired Enablers



Vehicle Electrification