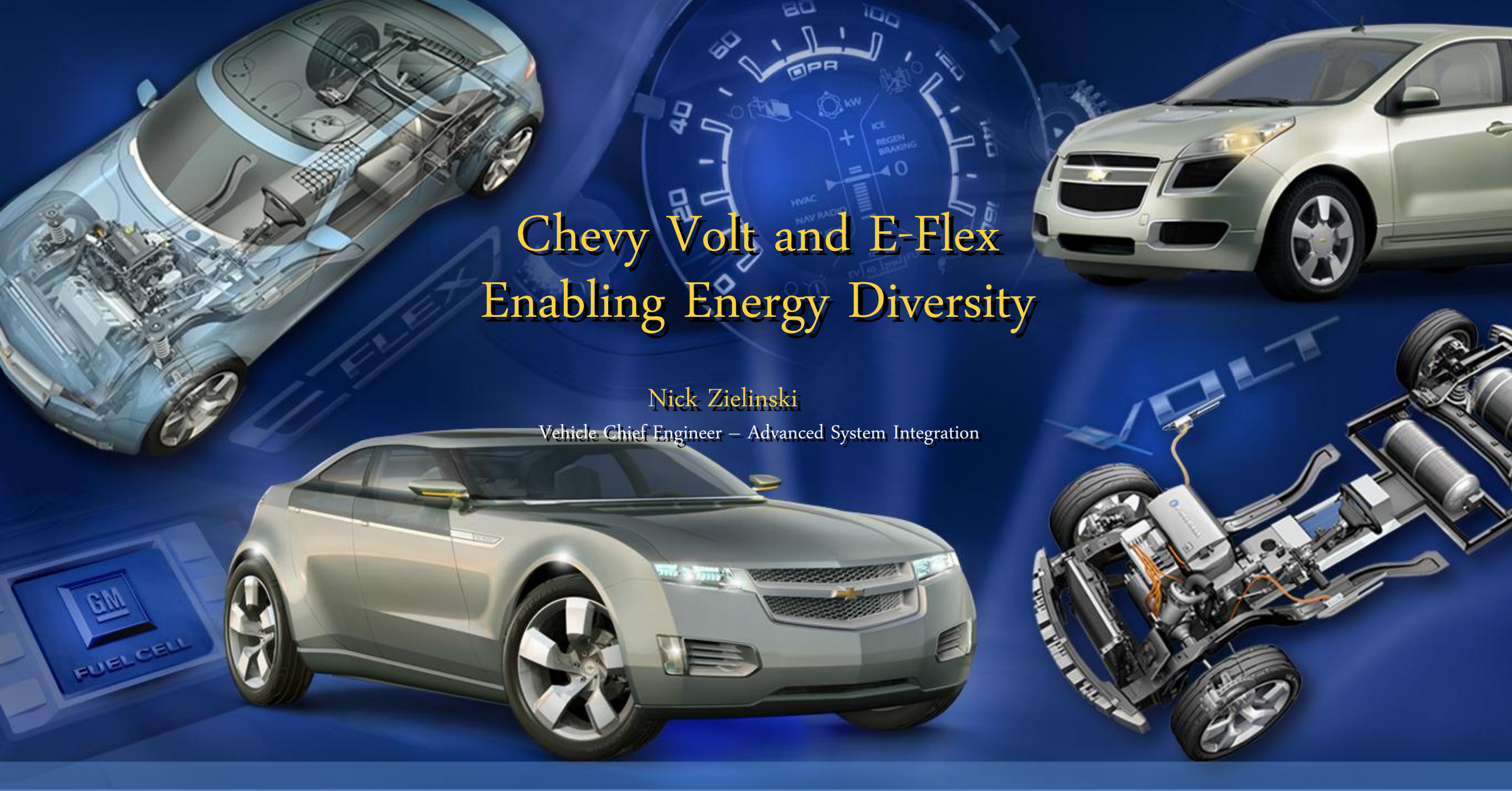
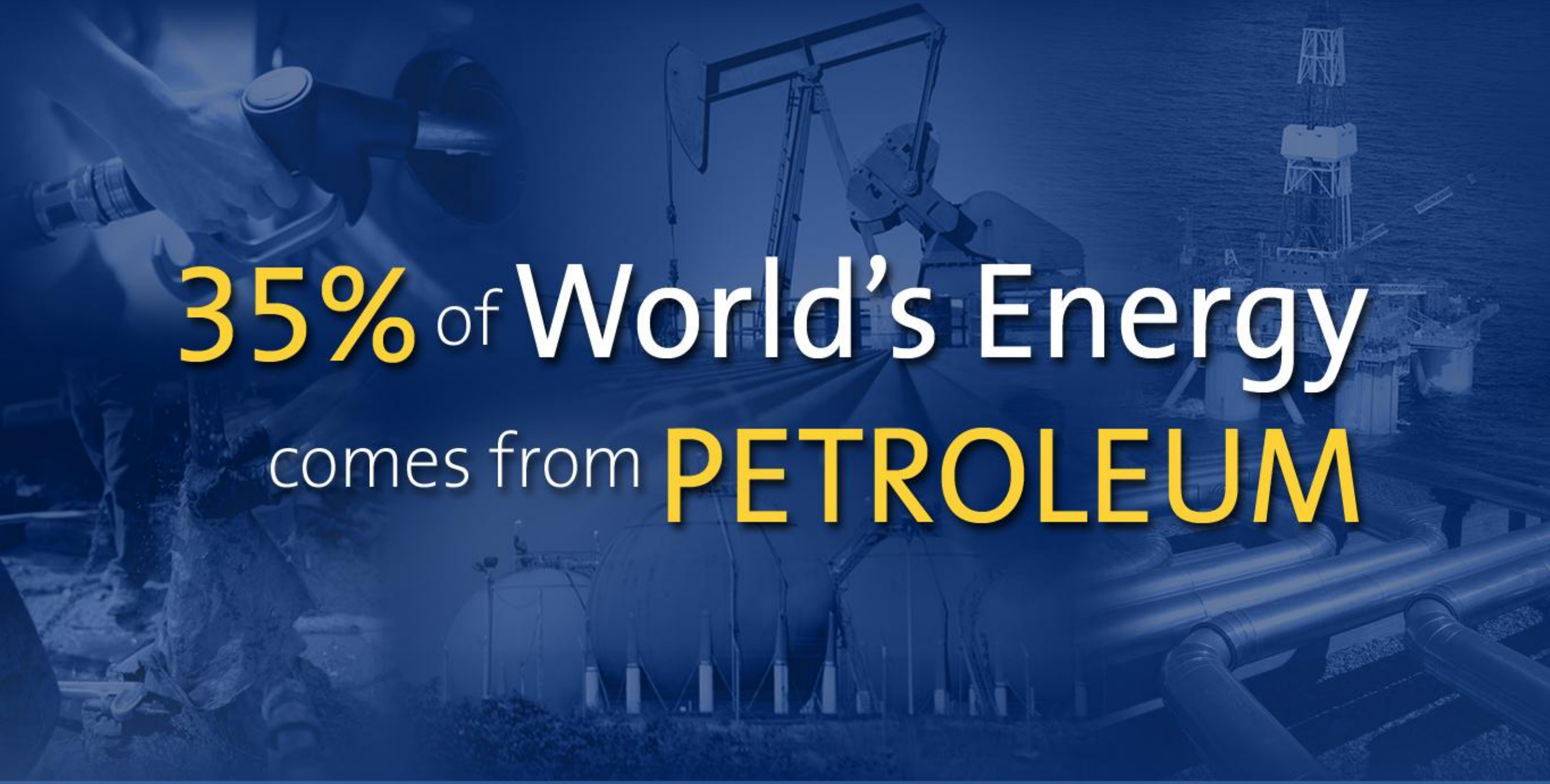

Chevy Volt and E-Flex
Enabling Energy Diversity
Nick Zielinski
Vehicle Chief Engineer – Advanced System Integration
GM
FUELCELL
VOLT
Cascadia TransTechEnergy Series - May 7, 2007

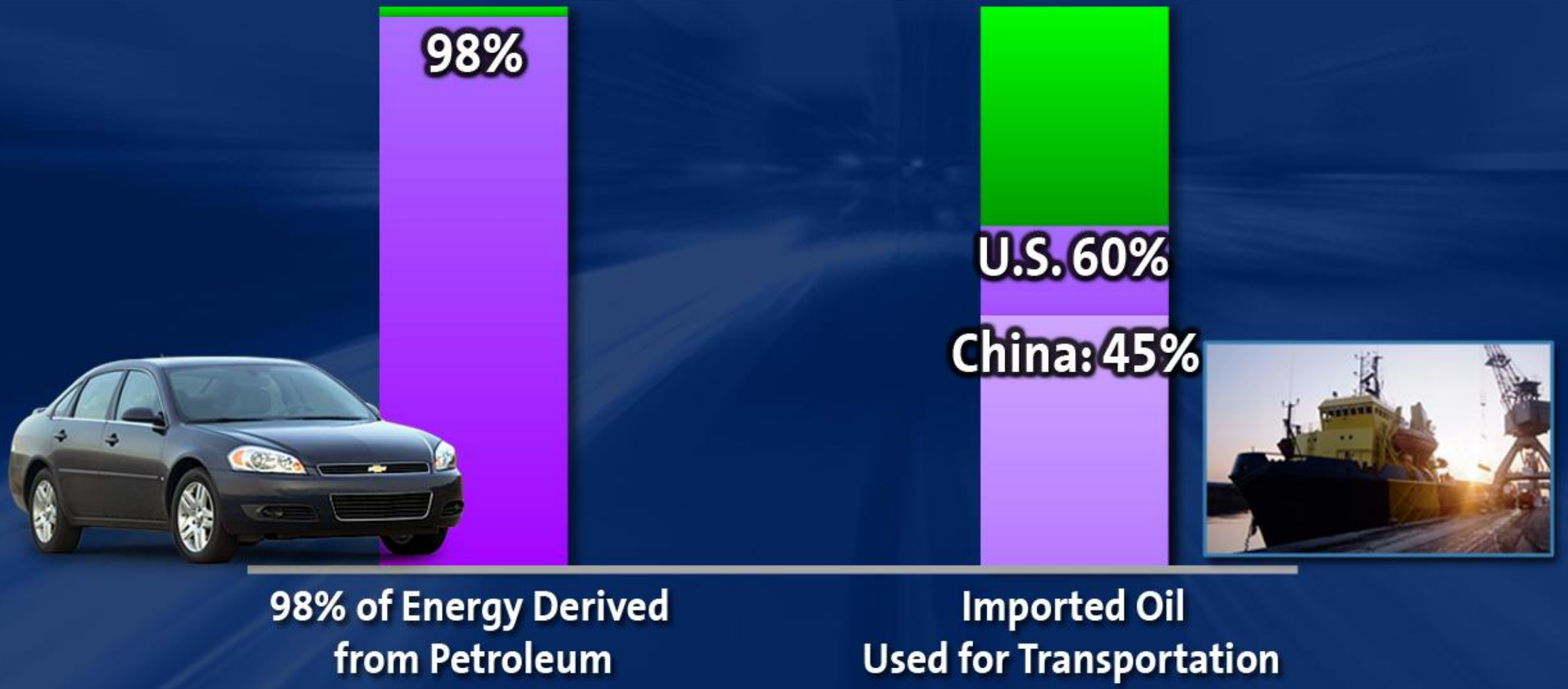

35% of World's Energy
comes from PETROLEUM

We'll Need

70% More Energy

in 2030 Than in 2004

Petroleum Dependence



GM Strategy: Energy DIVERSITY to Displace Petroleum

The GM U.S. "FlexFuel Club"

16 models for 2007 MY - Over 2 Million on the Road

Chevy Silverado

Chevy Impala

GMC Sierra

livegreen goyellow .com

Chevy Monte Carlo

GMC Yukon & Yukon XL

Chevy Uplander

GMC Savana

Chevy Avalanche , Suburban & Tahoe

GM's Hybrid Portfolio

HYBRID

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Two Mode Hybrid

Light Hybrid

Hybrid

Two-Mode Hybrid

GM/Allison Hybrid Bus

Chevy Silverado/GMC Sierra

Saturn VUE

Saturn Aura

Chevy Malibu

Tahoe/Yukon

Escalade

Silverado/Sierra

Recently Announced – Saturn VUE
Plug - In Two-Mode Hybrid

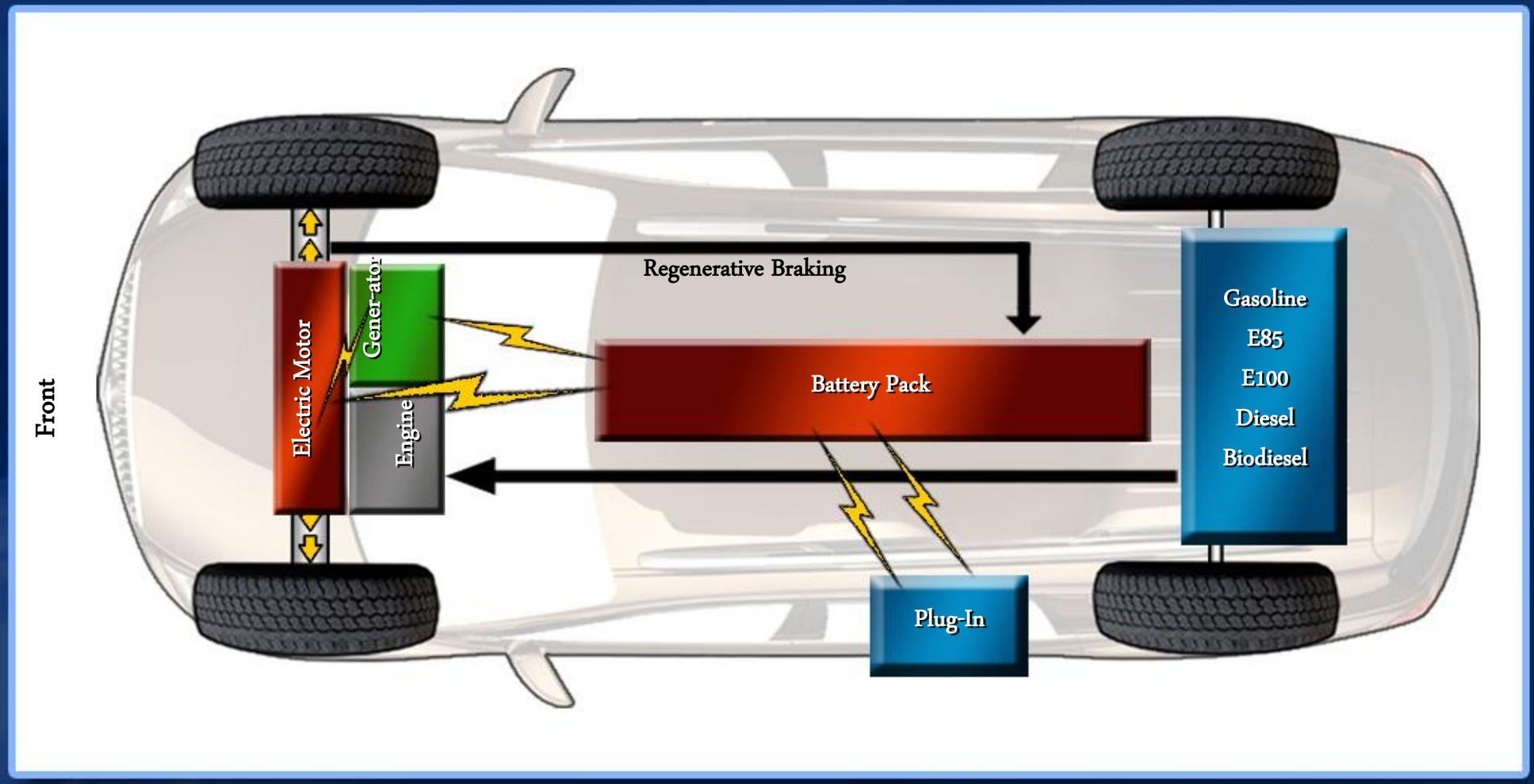
Electrically Driven Vehicles

- Purely electrically driven
  - Not a hybrid
  - Not mechanically driven
- Set stage for diverse energy sources and simpler vehicles

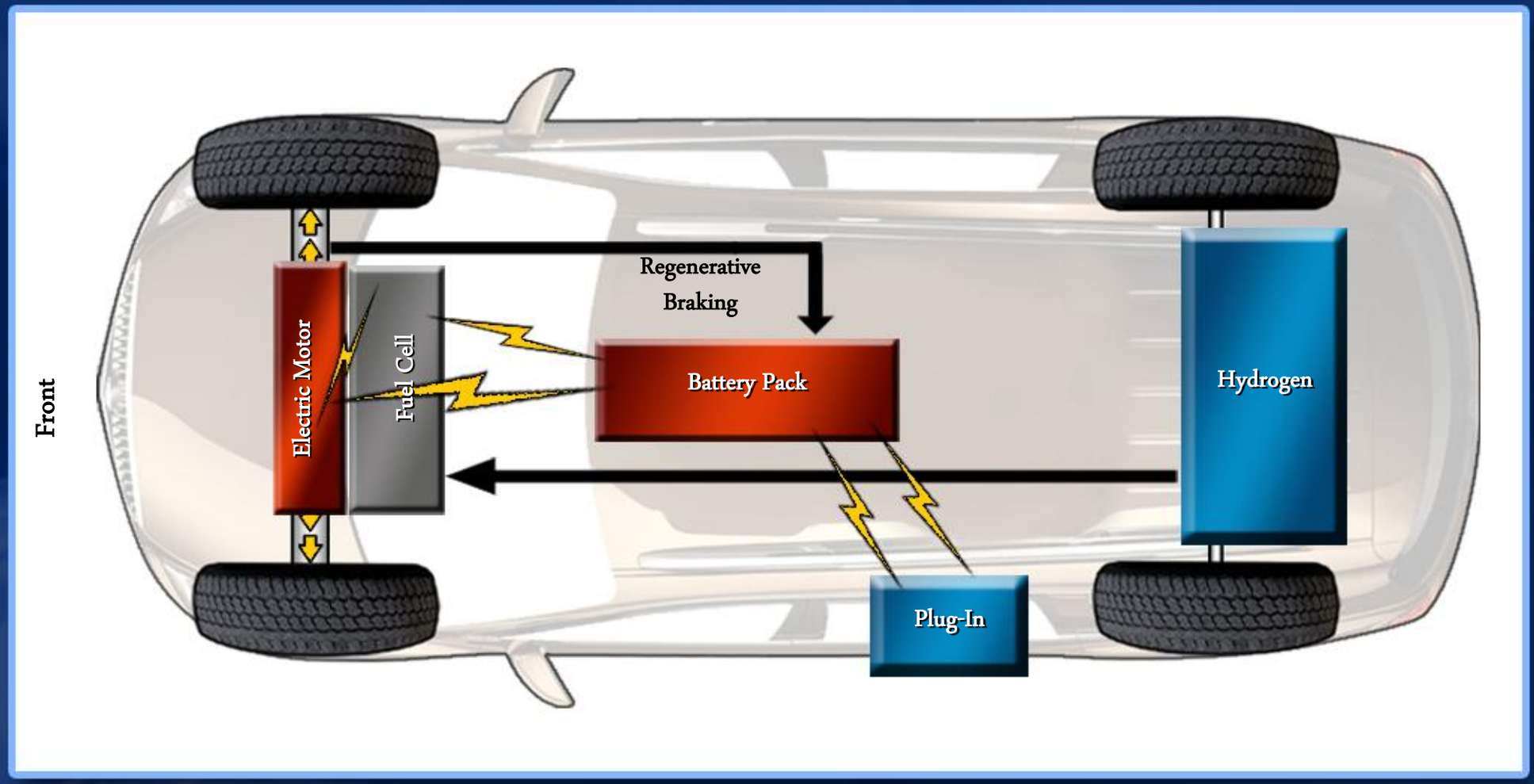
GM E-Flex

- Flexible electric drive system enabling variety of electrically driven vehicles
  - Common electrical drive components
  - Create and store electricity on board
    - Engine-generator
    - Hydrogen fuel cell
    - Advanced battery
    - Plug-in capable
- Electricity and hydrogen can be generated from a wide range of energy sources

E-Flex System: Engine-Generator

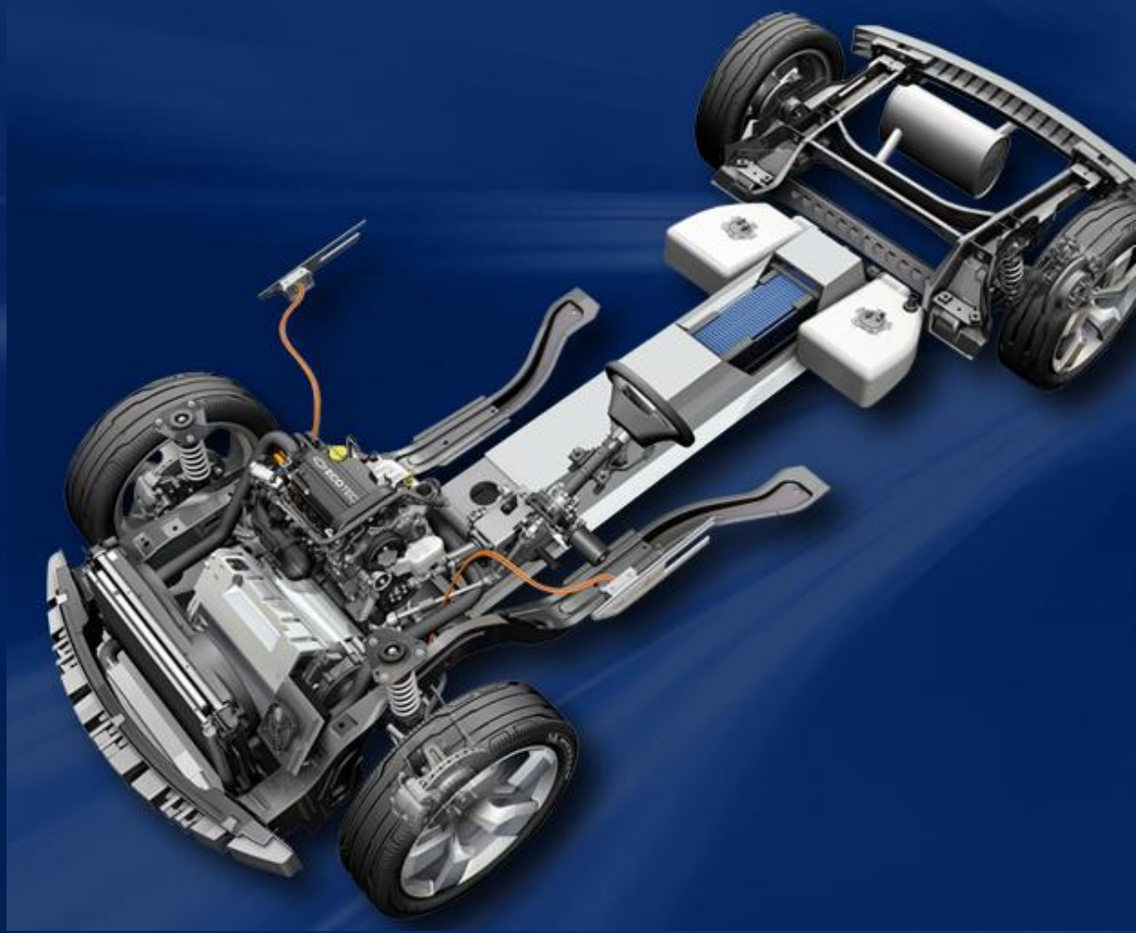


E-Flex System: Fuel Cell



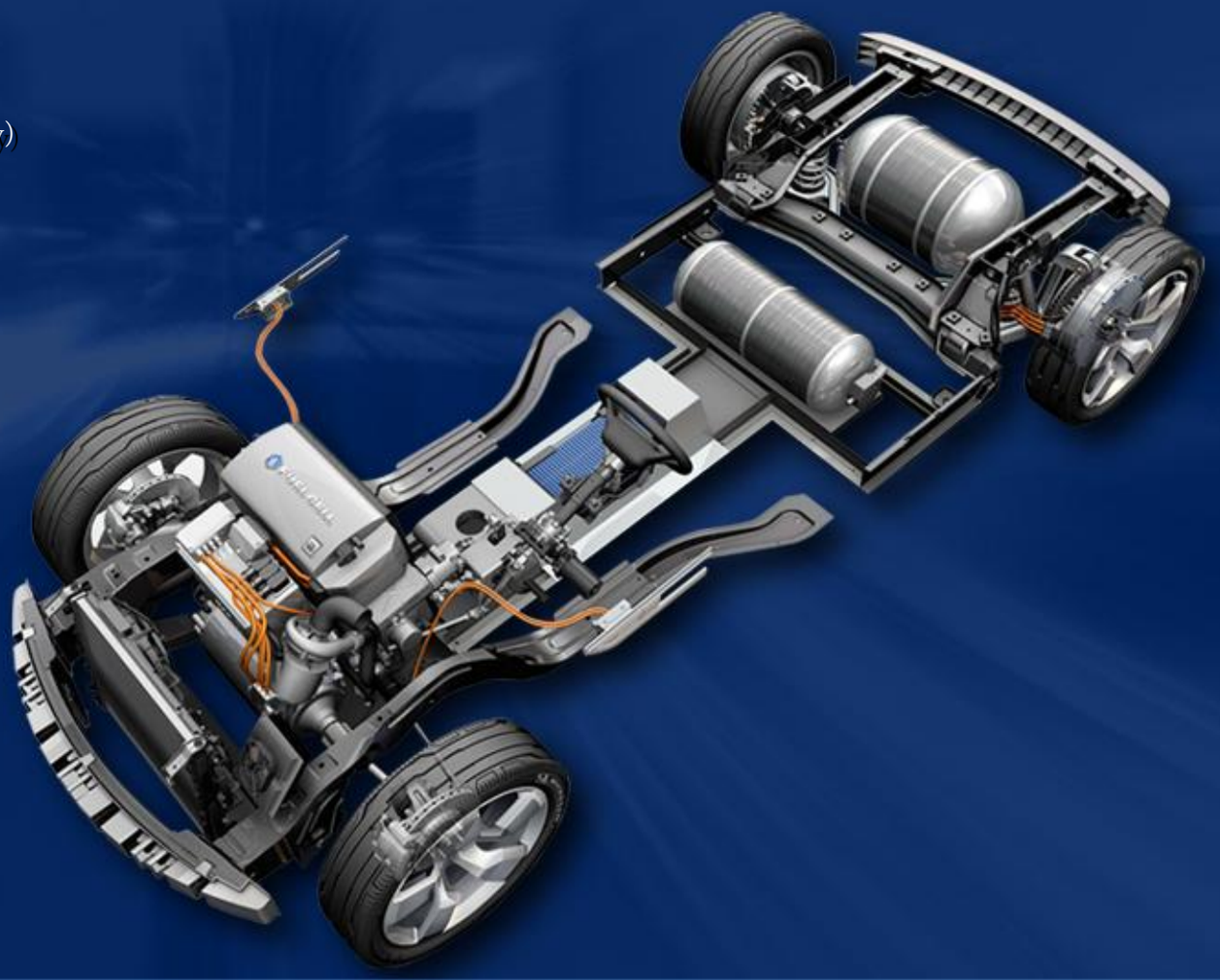
E-Flex EV - ICE Range Extender Variant

- Global compact vehicle structure
- Front electric drive motor
  - 120 kW (161 hp)
  - mechanical power
- Lithium-ion battery pack
  - 136 kW peak power
  - 16 kWh total energy stored
  - Plug-in charging (110 volt)
- Generator
  - 53 kW peak power
- ICE
  - 3cylinder
  - 1 litre
  - Turbocharged
- Fuel
  - 12 gallons
  - 640 miles driving range (40 miles on battery only and 600 miles charge sustaining – EPA City Schedule)
- Low rolling resistance tires
  - 21x6.5 in wheels
  - 195/55R21 tires



E-Flex Fuel Cell-Electric Variant

- Global compact vehicle structure
- Front electric drive motor
  - 70 kW (94 hp) mechanical power
- Lithium-ion battery pack
  - 50 kW peak power
  - 8 kWh total energy stored
  - Plug-in charging (110 volt)
- Fuel cell system
  - Generation 5
  - 80 kW power
- Hydrogen storage
  - 4 kg
  - 300-mile range (H_2 + battery)
- Wheel motors
  - 25 kW (33.5 hp) each
- Low rolling resistance tires
  - 21x6.5 in wheels
  - 195/55R21 tires



E-Flex Status

- Engineering development for range-extended and fuel cell E-Flex variants under way

- These propulsion systems being co-developed with production intent


VOLT
E FLEX