

Energy Diversity & Emerging Technologies for the Automobile Industry

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APEC Women Leaders Network
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Year 2020
1.1 billion vehicles
Circle the earth 125 times



12th APEC Women Leaders Network (WLN) Meeting

Port Douglas, Australia

25-27 June 2007



Critical Need for More Diverse, More Secure, and Cleaner Energy Pathways



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In GM's view, we must:

- Increase the fuel efficiency of conventional propulsion vehicles
- Develop alternative sources of propulsion that will displace traditional petroleum-based fuels
- Emphasize energy diversity (alternative sources of energy)



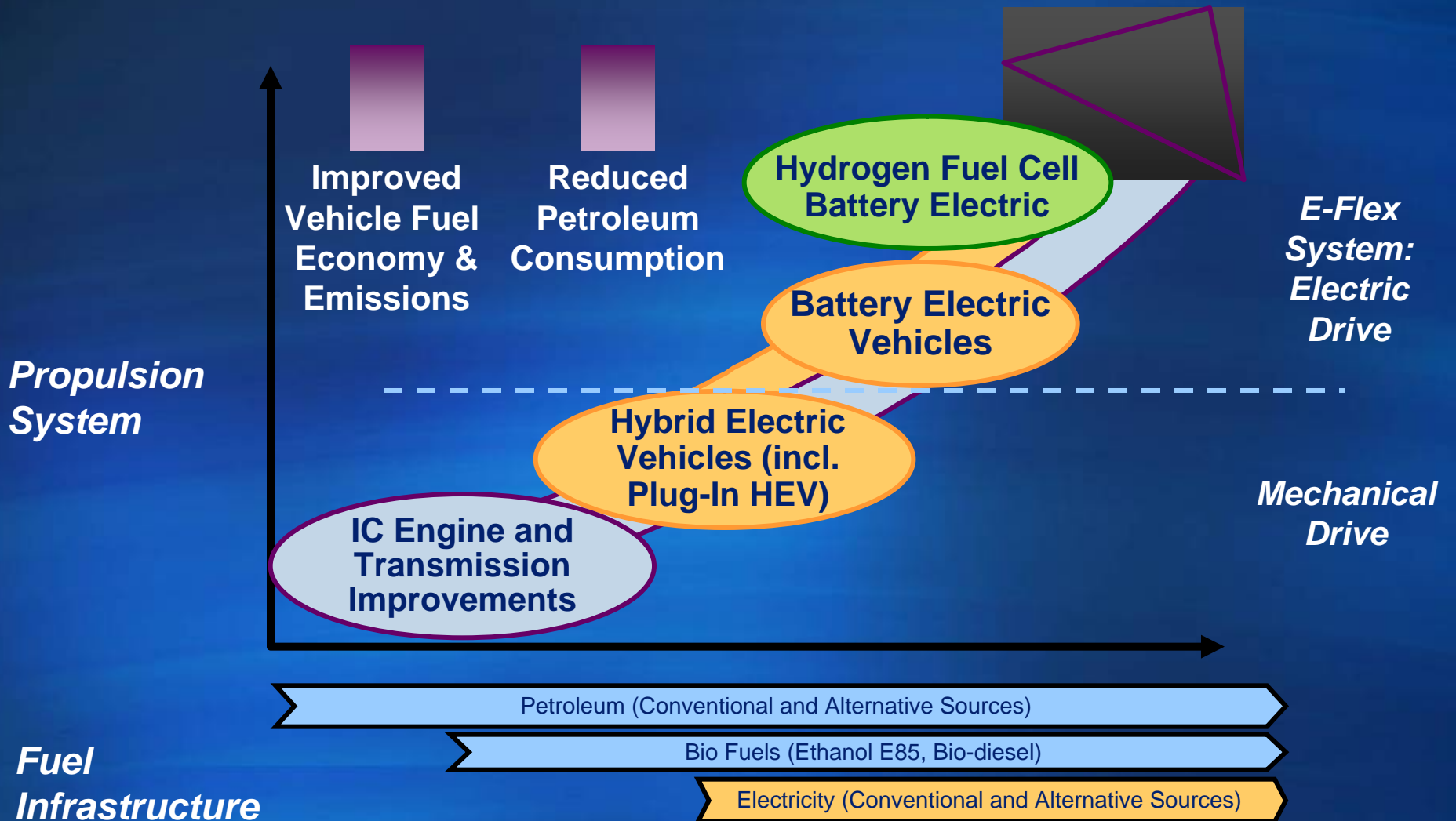
Global Customer Demands, Regulatory Requirements and Societal Objectives

- Customer Demands
 - Styling
 - Power
 - Range
 - Convenience
 - Quality / reliability / durability
- Regulatory Requirements
 - Criteria emissions
 - Fuel efficiency
 - Safety
- Societal Objectives
 - CO₂ emissions
 - Energy security
 - Economic growth

A sustainable personal transportation industry cannot meet all of these goals through use of internal combustion engines and petroleum-based fuels alone.



Advanced Propulsion Technology Strategy



GM's Energy Diversity Plan

- Not one thing, but several key initiatives

1. Fuel Efficient Vehicles

- 23 cars and trucks over 30 MPG
- Active fuel management
- Advanced diesels around the world



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2. Alternative Fuels / Biofuels

- E85
- BioDiesels
- LPG



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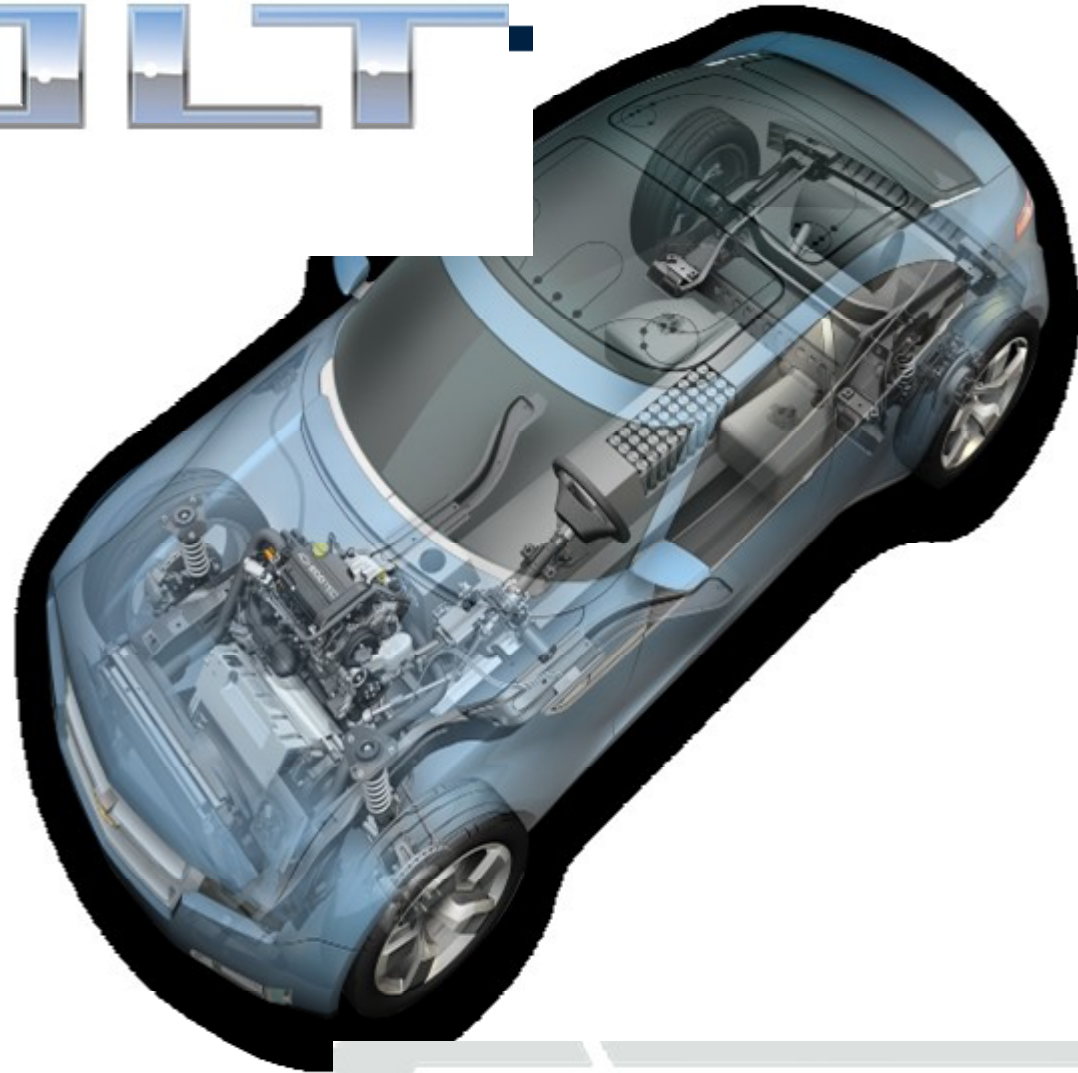
- E85 (FlexPower in Brazil)
- BioDiesels (Saab & Hummer)
- LPG

3. Electric Vehicles

- **12 hybrid cars & trucks**
- **550 city buses**
- **Chevrolet Volt E-Flex**



VOLT



E-FLEX



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GM's E-Flex System

- A family of electric vehicle propulsion systems
 - Common drive train components
 - Electrically driven
 - Electrical energy stored in:
 - Battery
 - Hydrogen (fuel cell)
 - Able to create electricity on board
 - Plug-in capable



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4. Hydrogen

- **Autonomy, Hy-wire, Sequel**

- **Equinox**



Hydrogen Fuel Cells and the Hydrogen Economy



Chevrolet Sequel (2006)

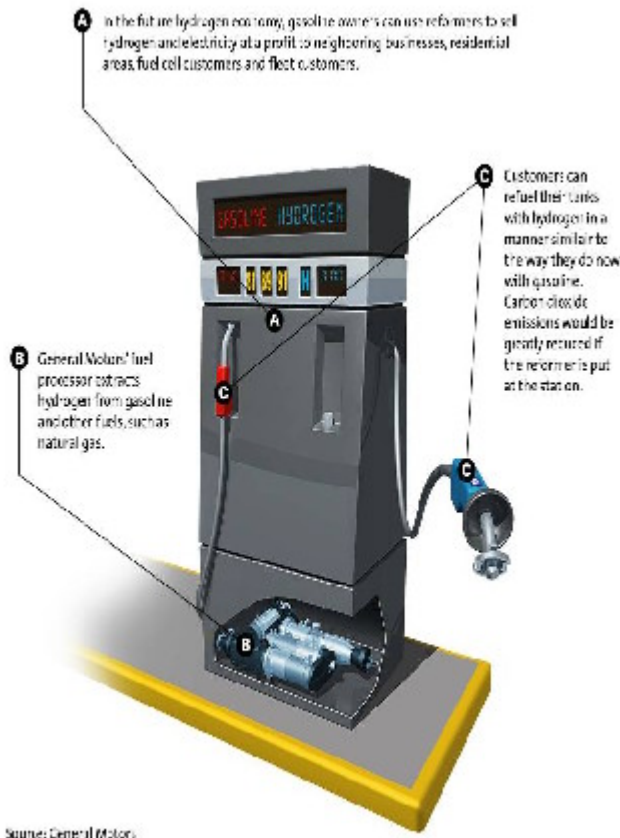


Chevrolet Equinox Fuel Cell (2006)

100 vehicles in "Project Driveaway"



Hydrogen Infrastructure



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Conclusion

- No single solution to the complex challenge of supplying long-term sustainable mobility.
- GM is taking a multi-path approach to finding solutions to address the issues of energy security, climate change and emissions and customer requirements.
- Governments have a significant role in supporting alternative strategies

