

# Implications of Longer Term Policy

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# International Council on Clean Transportation

- Goal of the ICCT is to dramatically reduce conventional pollutant and greenhouse gas emissions from all transportation sources in order to improve air quality and human health, and mitigate climate change.
- Promotes best practices and comprehensive solutions to:
  - Improve vehicle emissions and efficiency
  - Increase fuel quality and sustainability of alternative fuels
  - Reduce pollution from the in-use fleet, and
  - Curtail emissions from international goods movement.
- The Council is made up of leading regulators and experts from around the world.



# Future Trends

- Increasing competition for scarce oil resources
- Policies to reduce VMT
- Increase mobility
- Increased efficiency of gasoline and diesel
- Decarbonise fuels
- Low and zero emissions
- ‘One size’ may not fit all

# Decarbonise Fuels

- LCFS
  - Status and future prospects
  - Can it deliver the desired outcome?
- Prospects for natural gas
- Biofuels
- Electricity

# Future Technology & Fuel Options

- Biofuel use in vehicles
- Hybrids
- Plug-in Hybrids
- Battery Electric Vehicles
- Fuel Cell Electric Vehicles
- Hydrogen Combustion Engines
- Other e.g., Hydraulic, Compressed Air

# Increasing Introduction of Electric Drive

	LDV	HDV
HYBRIDS	✓	✓
PHEV	✓	?
BEV	✓	
FCEV - HYBRID	✓	✓

# Best Options for Clean Power Plants

- Efficient combined-cycle natural gas fired power plants
- Efficient Combined-heat and power
- Carbon capture and sequestration for coal plants?

# Supplying “Green” Electrons

- Various renewable resources are available:
  - Solar
  - Wind
  - Hydroelectric
  - Geothermal
  - Wave and tidal power
- Nuclear (?)

# Advanced Vehicle Simulations

Urban Air  
Pollution

Greenhouse Gas  
Pollution

Oil Import  
Costs

Objectives:

- Compare the societal costs of advanced vehicle/fuel options over the 21<sup>st</sup> century
- Estimate cost of a distributed hydrogen infrastructure

# Defining Success for the Transportation Sector:

- Greenhouse Gas Pollution
  - 80% below 1990 levels
- Oil Energy Independence
  - Meet all non-transportation petroleum needs with domestic oil production (in a crisis)
- Urban Air Pollution
  - Near-zero

# What is best for society?

- Hybrid electric vehicles?
- Plug-in hybrids?
- Biofuels?
- Fuel cell vehicles?

*.....or all of the above!*

# Conclusions

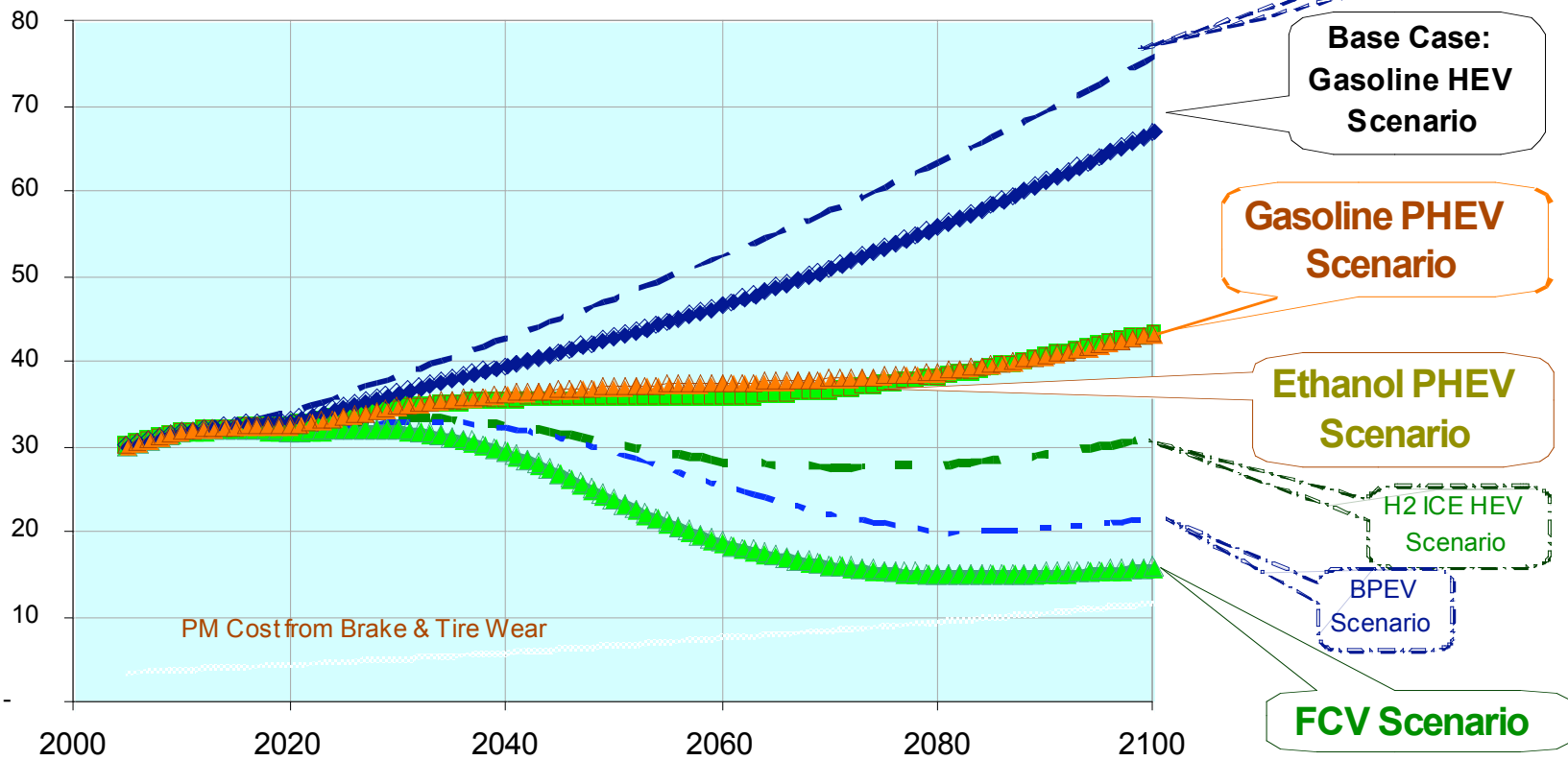
- Hydrogen-powered fuel cell vehicles are the only option that can simultaneously:
  - **Reduce GHG's to 80% below 1990 levels**
  - **Achieve petroleum energy independence\***
  - **Nearly eliminate urban air pollution\*\***

\*Hydrogen ICE Vehicles and battery EVs could also achieve petroleum energy independence

\*\* With the exception of particulates from brake & tire wear

# Urban Air Pollution Costs

**US Urban Air Pollution Costs**  
(\$Billions/year)



Story Simultaneous.XLS; Tab Graphs; CO102\_5/25/2008

# Thank You

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