

Plug-In Electric Vehicles: Driving Change through Clean Energy Policies

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Deep Reductions in Transportation Emissions Will Be Needed to Achieve Climate Stabilization

World GHG Transport Emissions

IPCC Climate Stabilization Scenarios

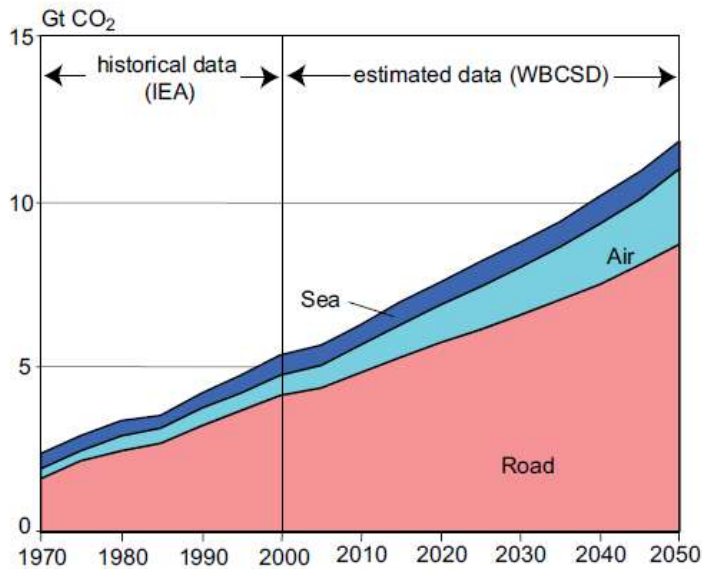
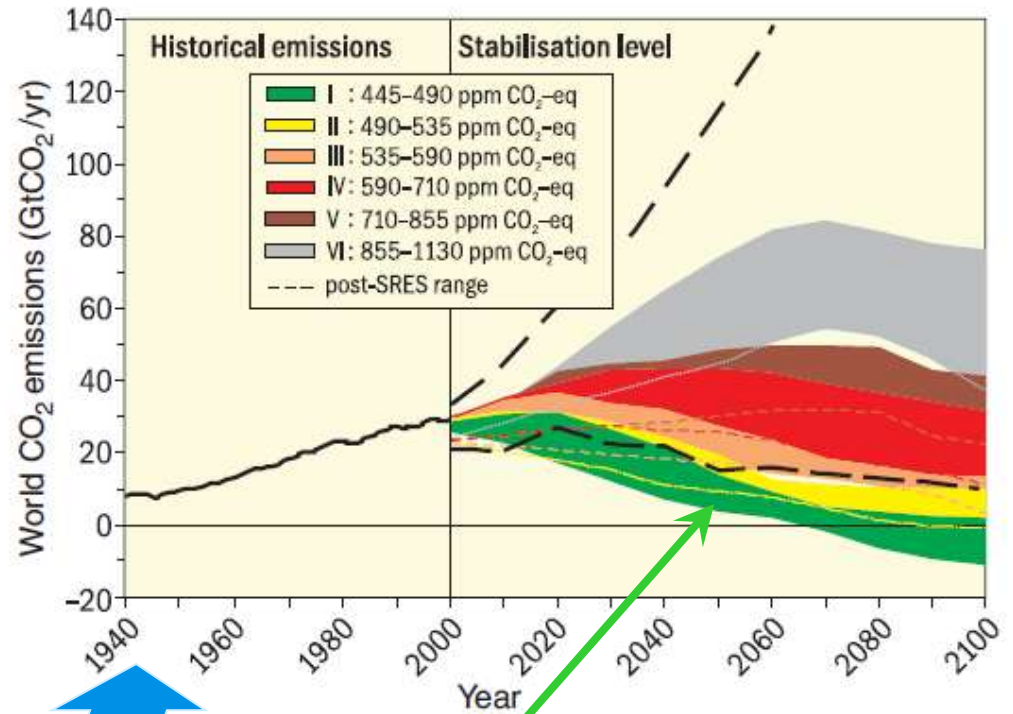


Figure 5.4: Historical and projected CO₂ emission from transport by modes, 1970–2050

Source: IEA, 2005; WBCSD, 2004b.

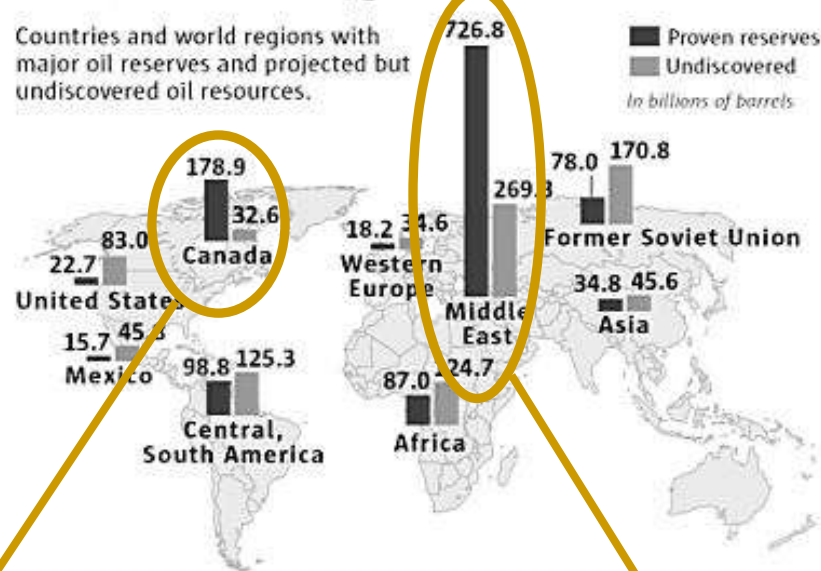


Green avoids the most severe consequences of climate change

Cleaner Transportation is Critical for Energy Security

Oil sources, present and future

Countries and world regions with major oil reserves and projected but undiscovered oil resources.



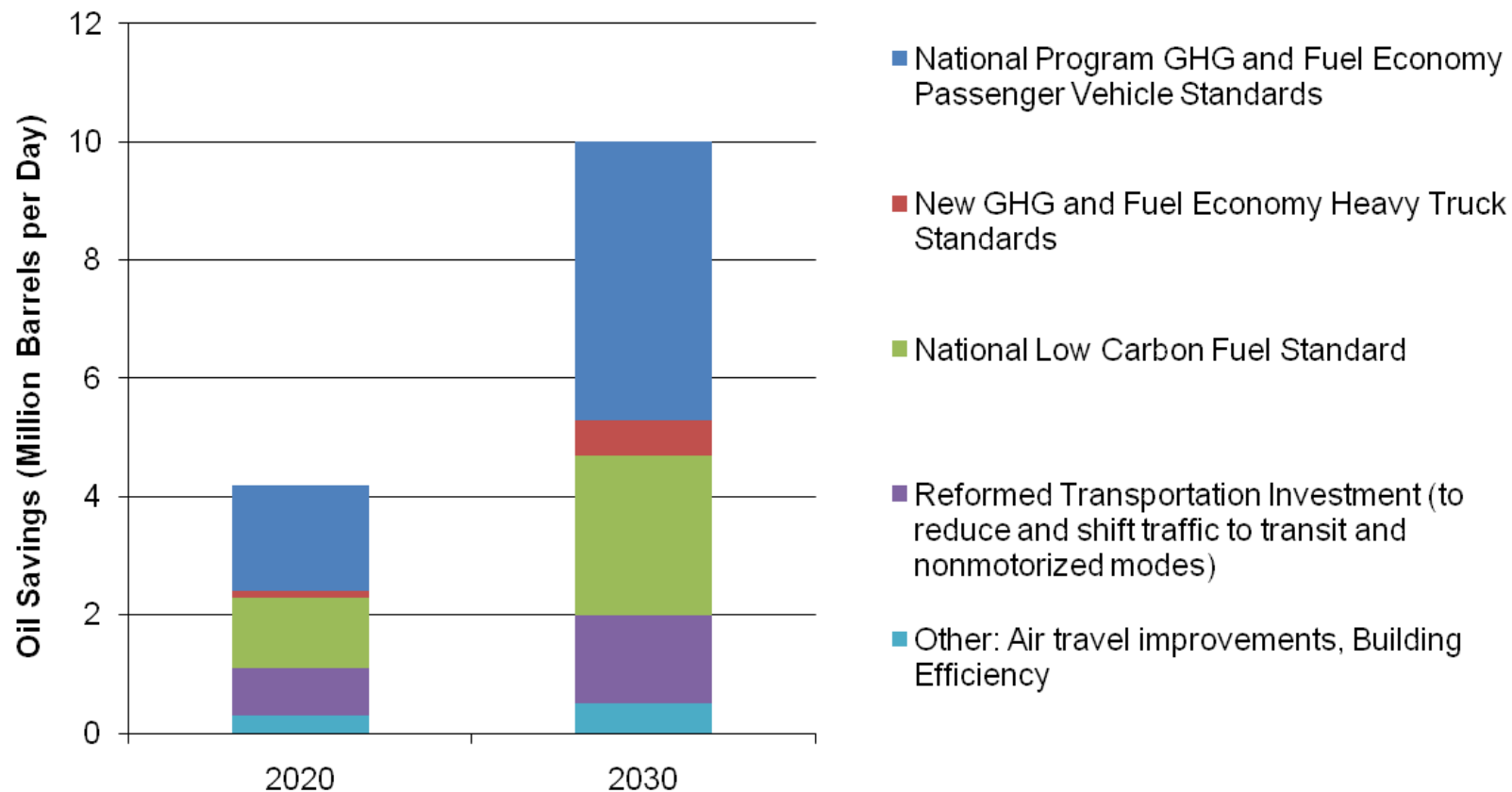
Source: Energy Information Administration

KNIGHT RIDDER NEWSPAPERS

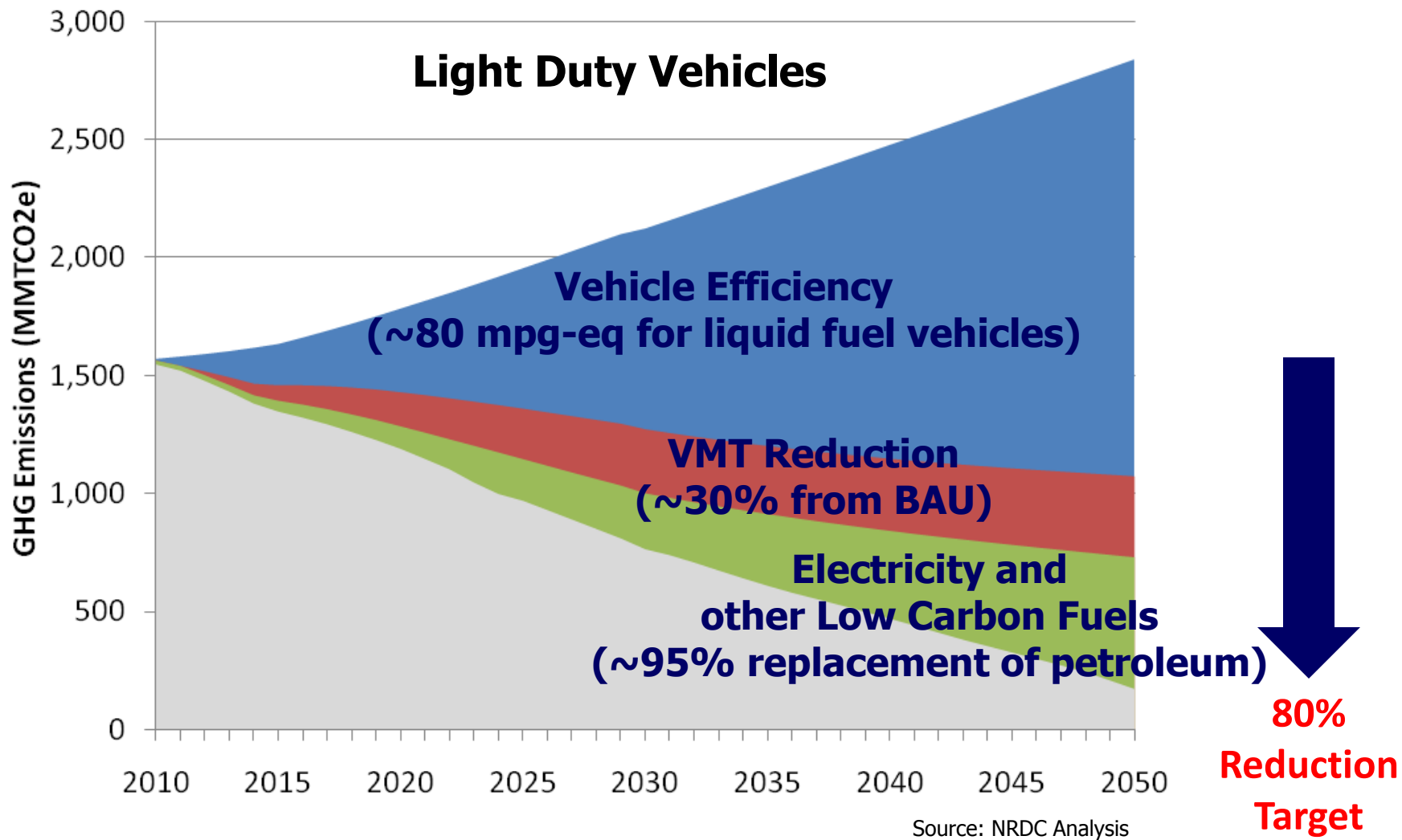


Clean Energy Saves Oil

In 10 years, U.S. can save more oil (4.2 mbd) than imported from the Middle East and Venezuela (3.6 mbd).



Electric Vehicles: An Essential Component of a Comprehensive GHG and Security Strategy



Study Demonstrates Environmental Benefits of Plug-in Vehicles



Environmental Assessment of Plug-in Hybrid Vehicles

Volume 1: Nationwide Greenhouse Gas Emissions

Volume 2: United States Air Quality Analysis Based on AEO-2006 Assumptions for 2030

Joint report available at: www.epri-reports.org

Electric Drive will Significantly Reduce GHG Emissions and Oil Consumption

EPRI-NRDC Study Results:

GHG Emission Reductions (MMT CO_2e)		Electric Sector CO_2 Intensity [2050 Annual Emissions Change from 2010]		
		High [+25%]	Medium [-41%]	Low [-85%]
PHEV Fleet Penetration [2050 % New Vehicles]	Low [20%]	163	177	193
	Medium [62%]	394	468	478
	High [80%]	474	517	612

All regions experience GHG reductions

Middle case (468 MMT) equivalent to taking 82 million cars off the road and saving 3.7 million barrels of oil per day

Max benefit case (612 MMT) provides additional 31% savings



How can plug-in vehicles encourage renewables in the grid?

Flexible demand of plug-ins can be aligned with renewables generation

- ⌘ Requires intelligent charging but not V2G

If plug-ins can be a flexible supply, then renewables can be a larger portion of the generation mix

- ⌘ Potentially allows wind to displace coal or older natural gas
- ⌘ Value of storage comes from handling long-duration (multi-hour) variability of renewables
 - Denmark can support high wind penetration (~20%) because inter-connected Norway & Sweden hydro systems can be adjusted for long time periods, effectively acting as storage for the wind
- ⌘ V2G required but challenges are significant
 - Grid and vehicle management
 - Deep battery cycling, driving up costs



Guiding Principles for Electric Transportation Programs

1. Reduce barriers for consumers to “fuel switch” through plug-in electric vehicles.
2. Ensure the environmental benefits of plug-in electric vehicles are maximized.
3. Minimize electricity grid impacts and maximize potential grid benefits.
4. Ensure cost-effective service for utility customers.

More details in Environmental Coalition filing to CA PUC, Proceeding R0908009, <http://docs.cpuc.ca.gov/PUBLISHED/proceedings/R0908009.htm>

1. Reduce barriers for consumers to “fuel switch” through plug-in electric vehicles.

Foster coordination between utilities, automakers and permitting authorities to:

- ⌘ Streamline permitting processes for charging equipment so consumers can operate vehicles ASAP after purchase

- ⌘ Install and/or upgrade infrastructure at consumer locations to allow utilities to manage load in efficient and environmentally preferred manner
 - Update building codes

- ⌘ Reduce battery costs
 - Explore stationary batteries as first and second use
 - Explore battery leasing arrangements

- ⌘ Develop voluntary pilot programs to understand charging behavior, vehicle use patterns, local grid impacts and effectiveness of TOU rate structures

2. Ensure the environmental benefits of plug-in electric vehicles are maximized.

Encourage development of utility programs that provide:

- ⌘ Incentives for renewable power charging (solar, for example)
- ⌘ Timely information on the net energy, cost, and emission savings
- ⌘ Information on benefits of TOU rates and load management services
- ⌘ Incentives to purchase most energy efficient types of plug-in vehicles (kWh per mile)
- ⌘ Incentives for utilities to maximize the integration of intermittent, renewable resources with plug-in vehicles, including maximizing the potential for demand response and vehicle-to-home or vehicle-to-grid applications. Utilities can partner with automakers that are currently developing communication technologies for the vehicle and grid.

3. Minimize electricity grid impacts and maximize potential grid benefits.

Develop policies that encourage utilities and third party providers to deploy devices and policies that support load management

- ⌘ Avoid charging during peak demand periods
 - Requires understanding of consumer needs
- ⌘ Align electric vehicle demand with renewable generation

Continue to explore V2G for frequency regulation and storage services

4. Ensure cost-effective service for utility customers.

As plug-in demand increases, utility costs to meet load will increase. Utilities and plug-in vehicle owners can help minimize costs by investing in active load management.

- ≡ Energy efficiency programs are key

- ≡ Plug-in demand could lower generation costs by better utilization of existing, low-cost baseload capacity
 - Leads to faster cost recovery of assets and increased plant efficiencies

Federal Policies to Encourage Electric Transportation

New Vehicle GHG Emissions and Fuel Economy Standards

- ⌘ On-going, future increases beyond 35 mpg (MY2016)

Federal Clean Energy and Climate bills

- ⌘ H.R. 2454, American Clean Energy and Security Act (“Waxman-Markey”)
- ⌘ S. 1733, Clean Energy Jobs and American Power Act (“Kerry-Boxer”)
- ⌘ Specifically encourage or require development of utility programs for electric vehicle integration with the grid

Low Carbon Fuel Standards (LCFS)



Federal Climate Bills Can Retool the U.S. Auto Industry Making It More Competitive in the Future

Estimated Allowance Allocation Value for 2012-2025

Legislation	H.R. 2454	S. 1733
Advanced Combustion Vehicle Manufacturing Retooling	\$24 billion	\$14 billion
Plug-in Vehicle Manufacturing	\$2 billion	\$5 billion
Advanced Combustion and Plug-in Vehicle Deployment	\$2 billion	\$5 billion
Total	\$28 billion	\$24 billion

Funding estimates assume CO2 allowance prices from 2012 to 2019 as predicted by CBO's analysis of H.R. 2454. Beyond 2019, prices are assumed to rise 5 percent per year.

A LCFS Will Generate Investment in the Fuels Market for Activities that Reduce GHGs

Performance-based, technology-neutral approach as opposed to specific volume mandates

Guarantees specific reductions in emissions intensity and necessarily reduces petroleum use

Inclusive of all transportation fuels including electricity, natural gas, hydrogen
→ RFS leaves non-biofuels out

Provides certainty and value for fuel producers of low-carbon fuel production.
Provides long-term direction to investors and fuel producers.

Ensures full carbon accounting and requires fuel producers to account for high carbon liability

With proper safeguards, the LCFS can prevent unintended consequences (e.g. indirect land use change, extraterritorial emissions, losses of ecosystem services)

Conclusion

Plug-in vehicles are essential part of a clean energy strategy to cut global warming pollution and wean us off oil.

- ⌘ Over the next few decades, both the electric power and transportation sectors must make very large reductions in emissions to avoid dangerous consequences of climate change. Key to reaching this goal is the coordination of the auto and electric power industries.

Utility commissions and utilities and automakers should work with other stakeholders and authorities to encourage drivers to switch to electricity and maximize the benefits of the electrification.

Key federal policies to promote the electrification of transportation include

- ⌘ Continued advancement in GHG standards and CAFE,
- ⌘ Economy-wide cap on global warming emissions and
- ⌘ Low carbon fuel standard.