

# Policy and Planning for Transportation's Energy Transition

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*“Without question a radical transformation of the present energy system will be required over the coming decades.” (p. xiii)*

*“An effective transformation requires immediate action.” (p. xv)*

*“In all (sustainable, ed.) pathways conventional oil is essentially phased out shortly after 2050.” (p. 51)*

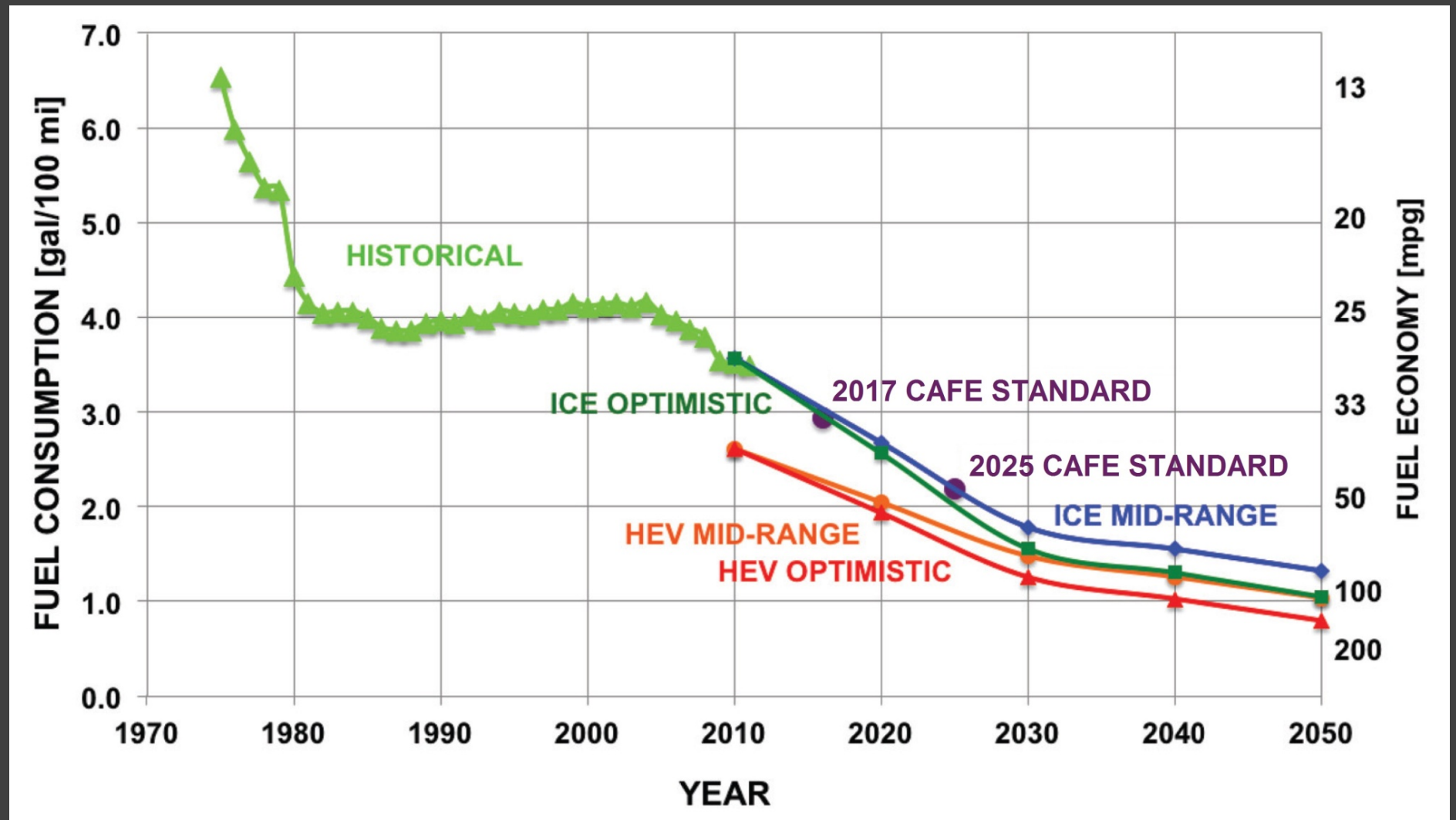
(IIASA, Global Energy Assessment, 2012)

# Global Energy Assessment

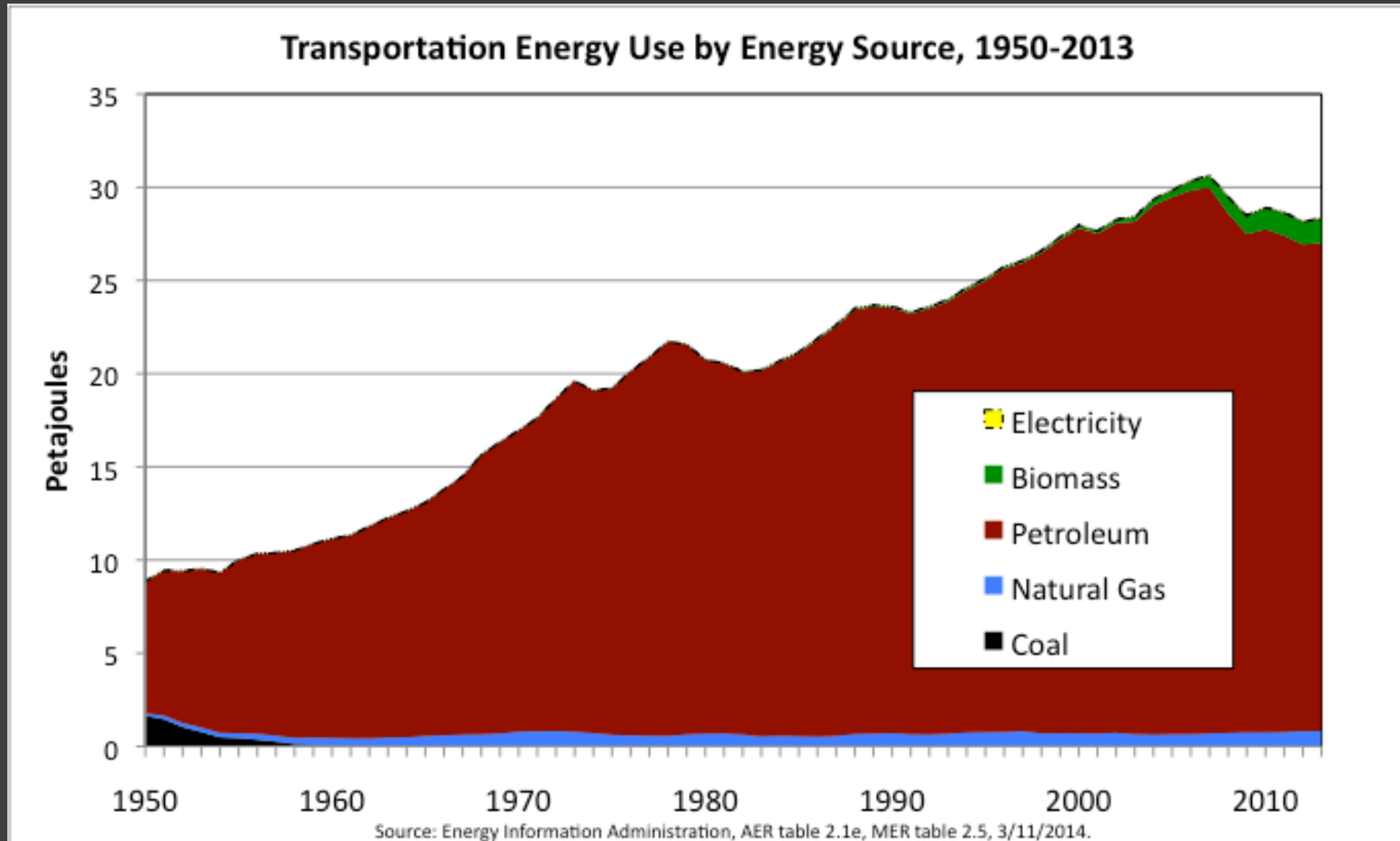
Toward a Sustainable Future



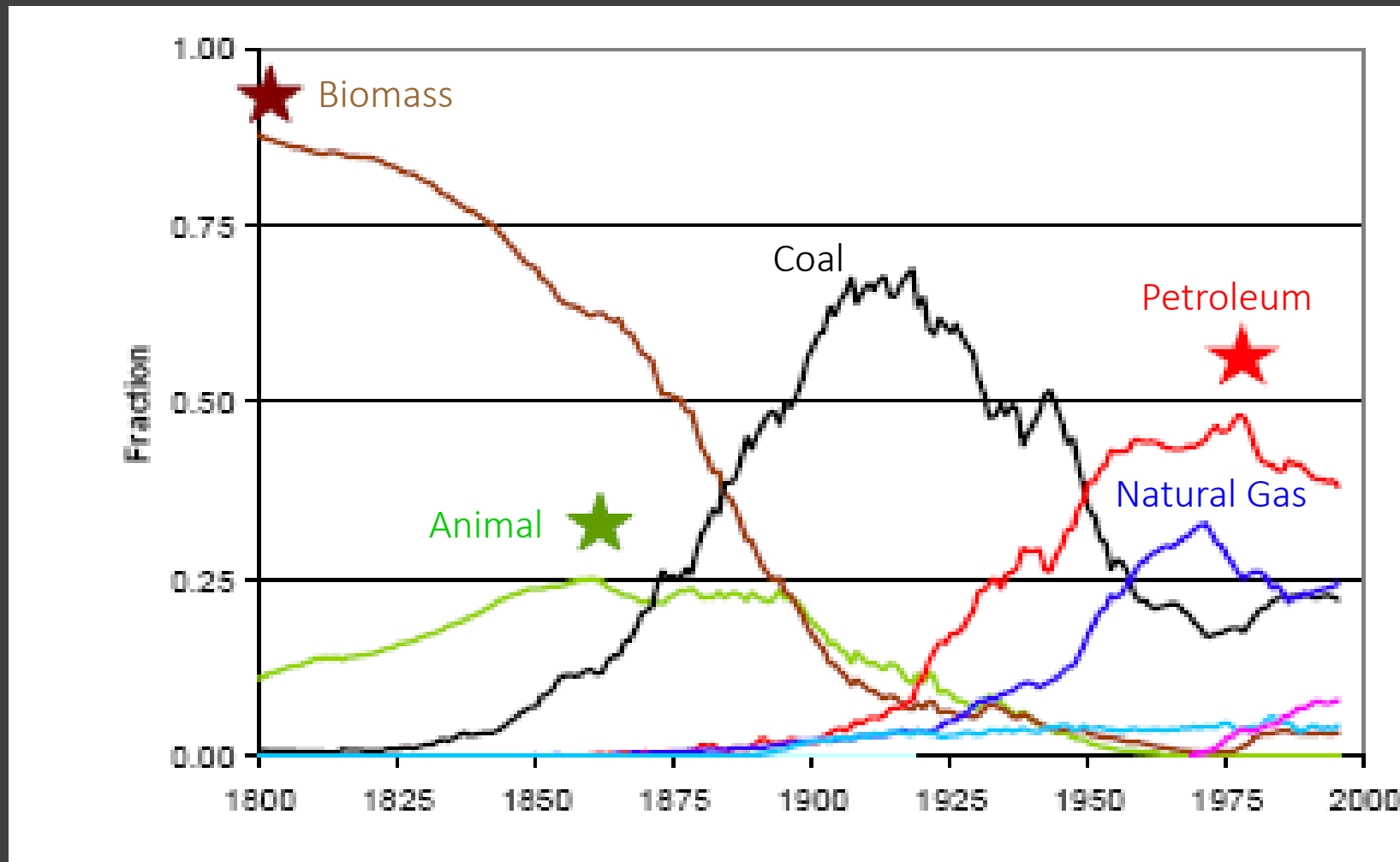
*Energy efficiency* improvements will come predominantly from technological improvements to vehicles which will be predominantly driven by fuel economy and GHG emissions standards.



The more difficult challenge is the transition to low-GHG energy.



There have been large-scale energy transitions in the past, driven primarily by technological change and market forces.



Source: A. Grubler, 2007, International Institute for Applied Systems Analysis.

Accomplishing a large scale energy transition for the *public good* requires a new public policy paradigm, new planning tools and new knowledge about transition processes.

**Deep uncertainties to 2050 and beyond**

Technological change?

Market conditions?

Behavior and preferences?

Global response?

**Strong positive feedbacks and therefore tipping points**

Network external benefits

Pecuniary externalities

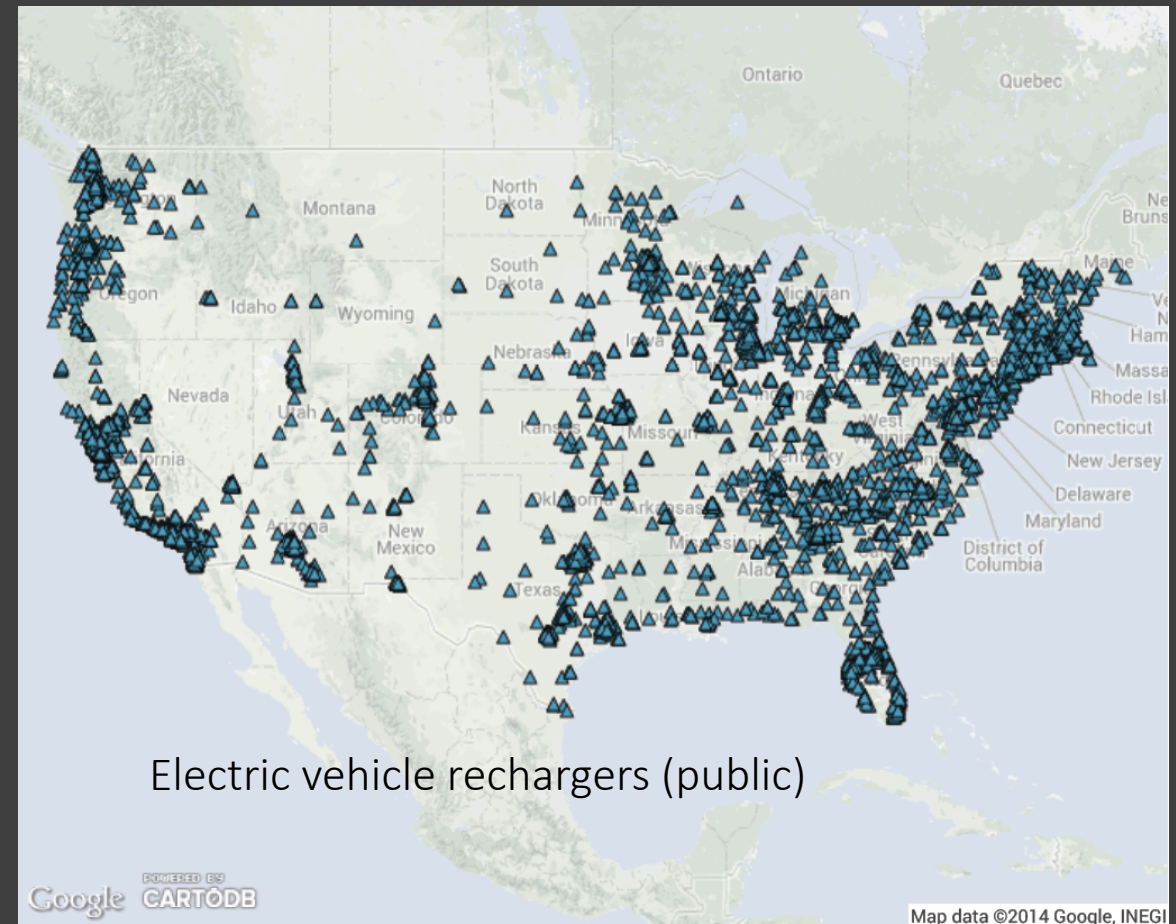
**Market realities (“imperfections”)**

Energy efficiency paradox

Market power in world oil market



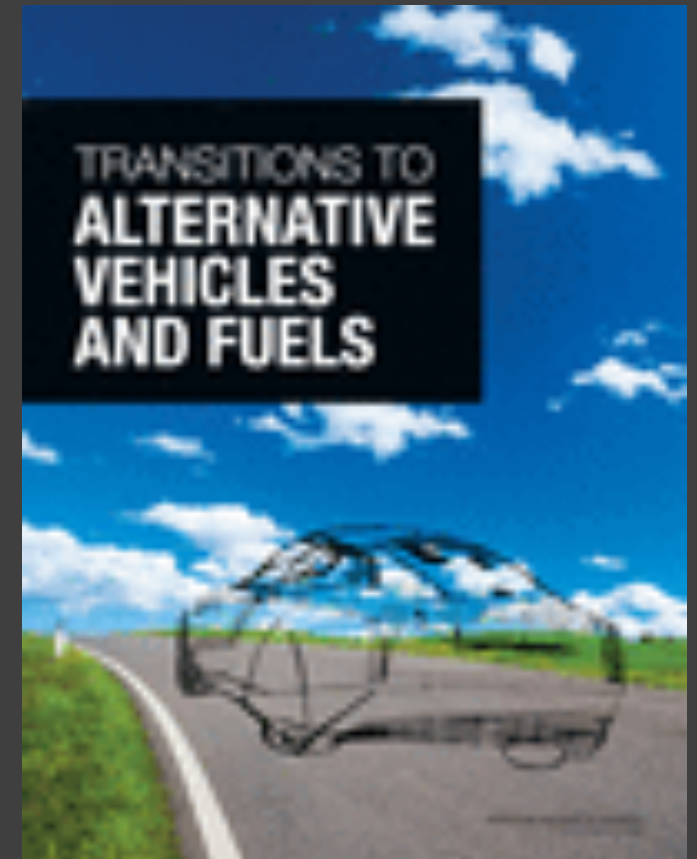
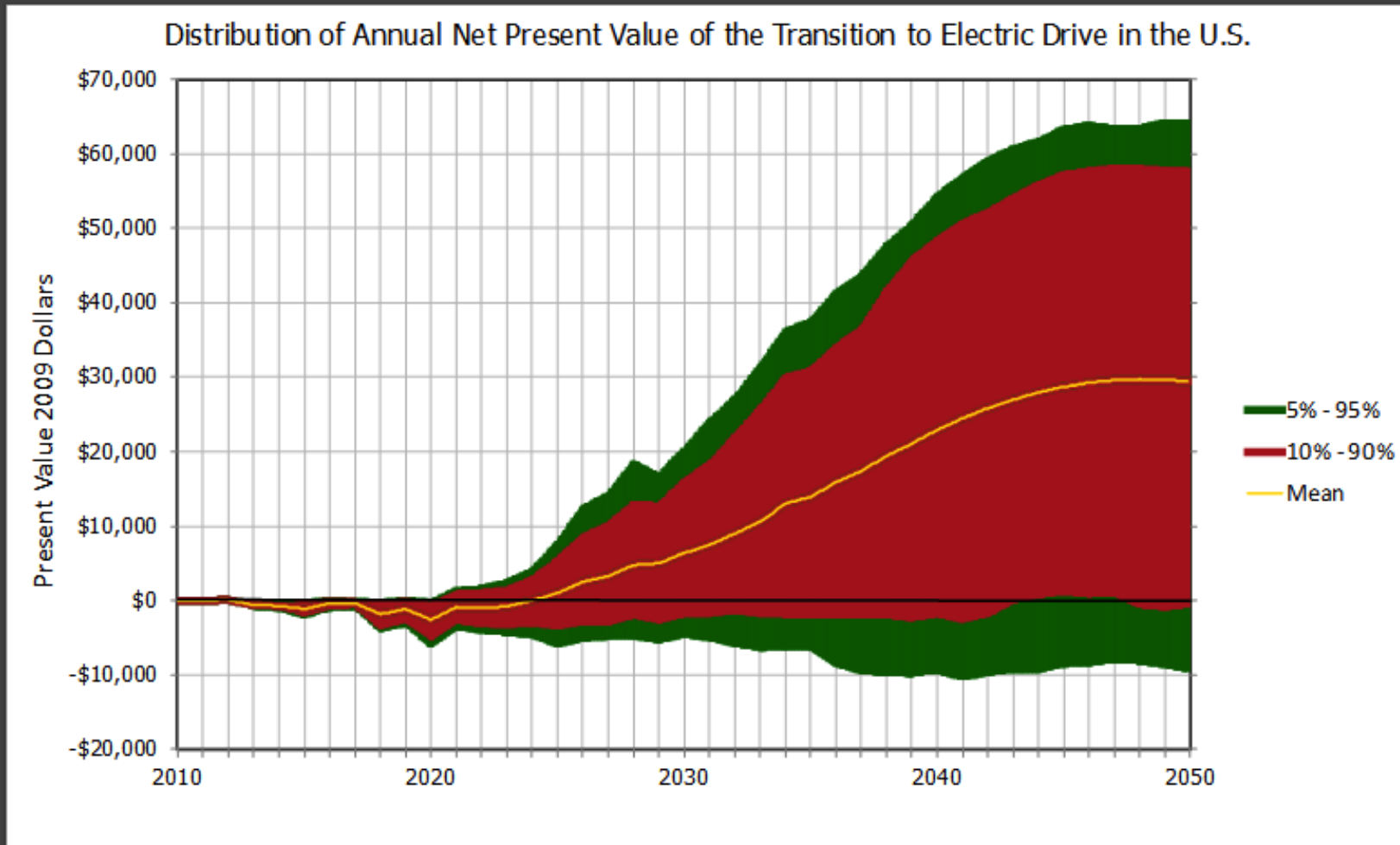
Governments and firms need planning tools to coordinate deployment of fuel infrastructure with the evolution of markets for alternative energy vehicles.



Source: U.S. Dept. of Energy, Alternative Fuels Data Center.



Energy transitions take decades. Success is uncertain. Upfront losses are not. The NRC “Transitions” study estimated net present value benefits roughly an order of magnitude greater than excess costs...



# The transition to low-GHG energy systems poses new challenges for public policy and planning.

**New policy paradigm:** (internalizing externalities is not sufficient.)

Long time constants (50 years)

Deep uncertainty

Strong positive feedbacks → tipping points

**New planning methods and tools** to coordinate massive investments in vehicles and infrastructure.

Interdependence of fuel and vehicle markets

Various levels of geographic detail

**New knowledge** to guide decisions

Innovators, majorities and risk aversion

Value of refueling availability, choice diversity, limited range + long recharging, etc.

Realistic energy market behavior

Thank you.