

Modeling Energy-related CO2 Mitigation Pathways in the National Energy Modeling System: Workshop Overview



April 27, 2021

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EIA has a history of providing impartial and independent analysis of climate policies

SR/OIAF/2009-05

Energy Market and Economic Impacts of H.R. 2454, the American Clean Energy and Security Act of 2009

August 2009

Energy Information Administration
Office of Integrated Analysis and Forecasting
U.S. Department of Energy
Washington, DC 20585

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eia U.S. Energy Information Administration

Analysis of Impacts of a Clean Energy Standard
as requested by Chairman Bingaman

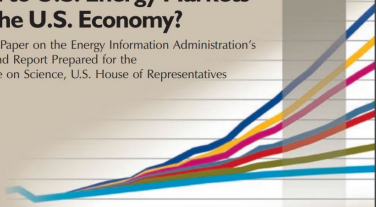
November 2011

Independent Statistics & Analysis U.S. Department of Energy

SR/OIAF/98-03 (5)

What Does the Kyoto Protocol Mean to U.S. Energy Markets and the U.S. Economy?

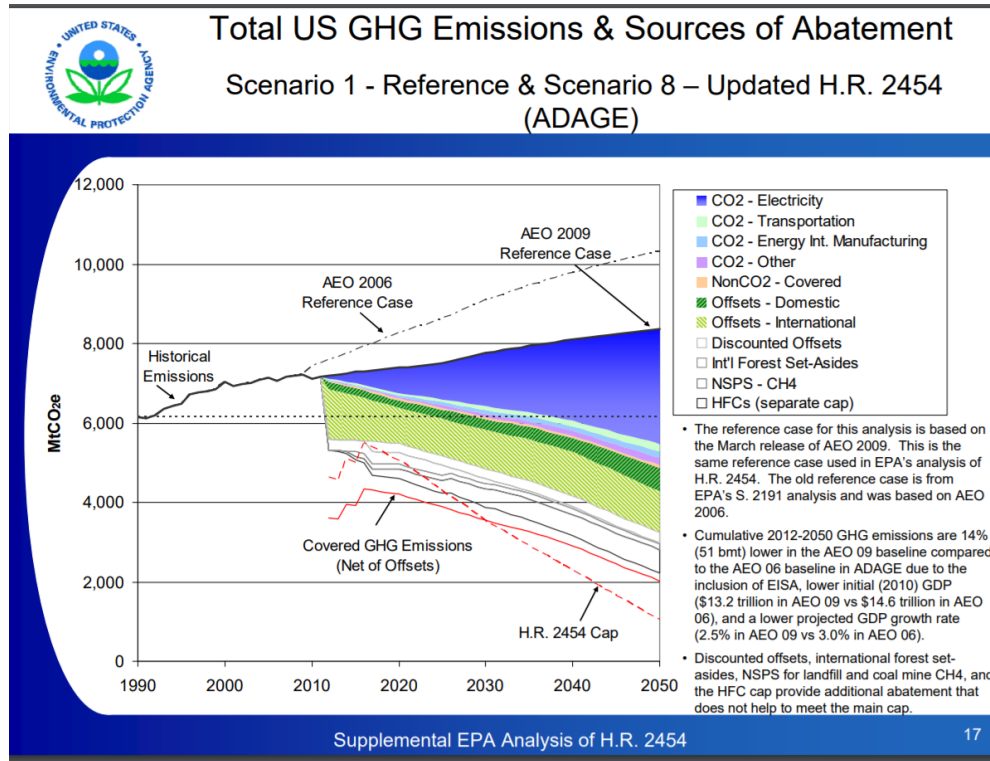
A Briefing Paper on the Energy Information Administration's Analysis and Report Prepared for the Committee on Science, U.S. House of Representatives



- Energy Prices
- Values of Carbon Emissions Credits
- Changes in Energy Mix
- Impacts on Motor Fuel and Electricity
- Market Penetration by New Technologies
- Improvements in Efficiency
- Changes in Potential vs Actual Growth of the Economy
- A Range of Cases, Based on Means of Compliance

Prepared for the Committee on Science, U.S. House of Representatives
October 1998

Climate discussions used to center around ~80% reductions from 2005 levels (including offsets)



Source: EPA

Climate policy discussions have turned to net-zero scenarios (including land sink)

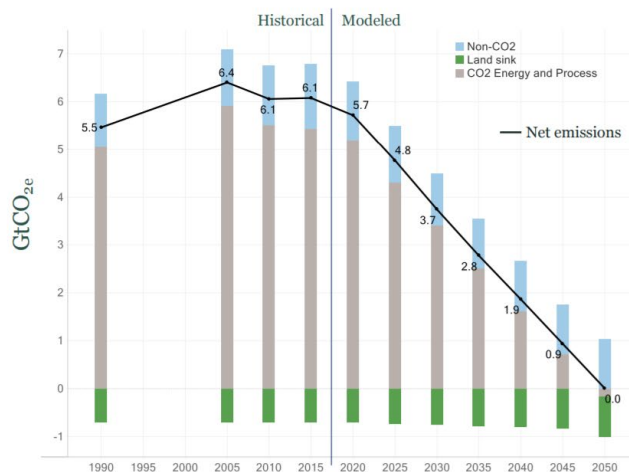
Net-zero emissions by 2050 sets decarbonization target for energy and industrial process emissions



Gt CO _{2e}			
Year	Non-CO ₂ *	Land sink**	Energy & Industrial system
1990	1.1	-0.7	5.06
2005	1.19	-0.7	5.92
2010	1.24	-0.7	5.52
2015	1.35	-0.7	5.43
2020	1.22	-0.7	5.2
2025	1.19	-0.73	4.3
2030	1.09	-0.75	3.41
2035	1.04	-0.78	2.51
2040	1.05	-0.8	1.62
2045	1.04	-0.83	0.72
2050	1.02	-0.85	-0.17

* United States Mid-Century Strategy for Deep Decarbonization benchmark scenario (U.S. Whitehouse, 2016)

** Natural plus enhanced land sink.



The demand for EIA's analysis remains strong



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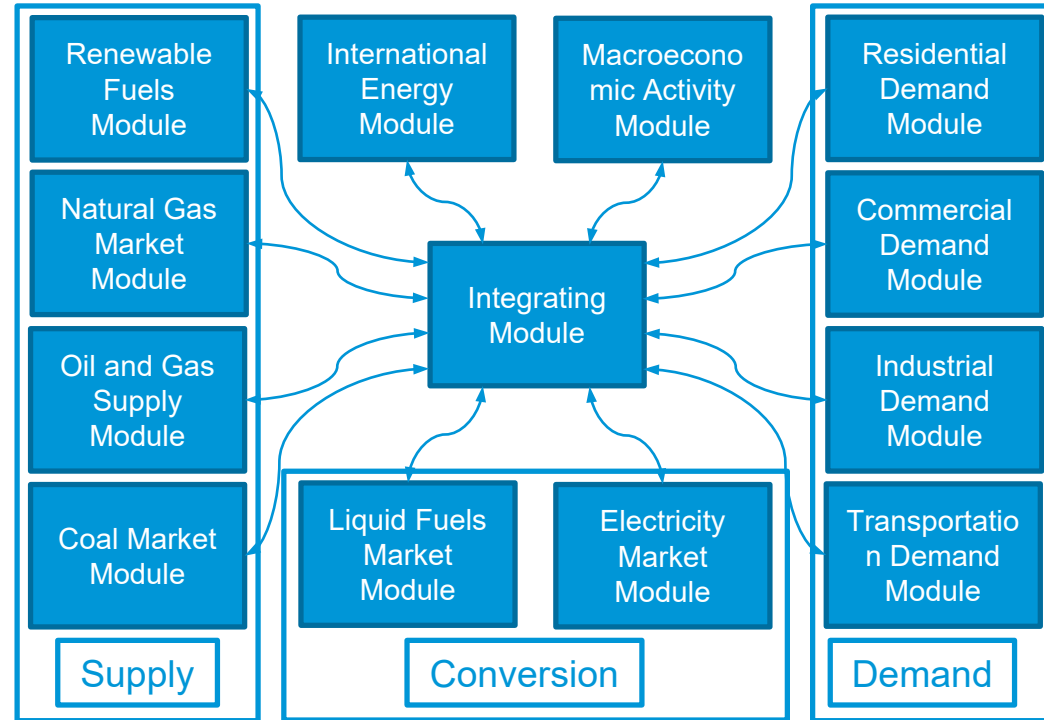
Source: Princeton Net-Zero America

Congress is interested in EIA's capabilities: the Appropriations Committees directed the following request to EIA

The Department is directed to provide to the Committees on Appropriations of both Houses of Congress not later than 180 days after enactment of this Act a report outlining resources necessary to further develop National Energy Modeling System capabilities to be able to simulate deep decarbonization scenarios, including economy-wide net-zero emissions policies.

NEMS is a modular, partial equilibrium model of the U.S. energy system with macroeconomic feedback

- NEMS is a large, regional, modularly designed, technology-rich, energy-economy model that solves for annual equilibrium in U.S. energy markets
- Consists of 12 energy related modules:
 - 4 domestic supply modules
 - 4 demand modules
 - Electricity market module
 - Liquid fuels market module
 - Macroeconomic module
 - International energy module
- Each module represents the operational and planning activities of the appropriate economic agent in that area

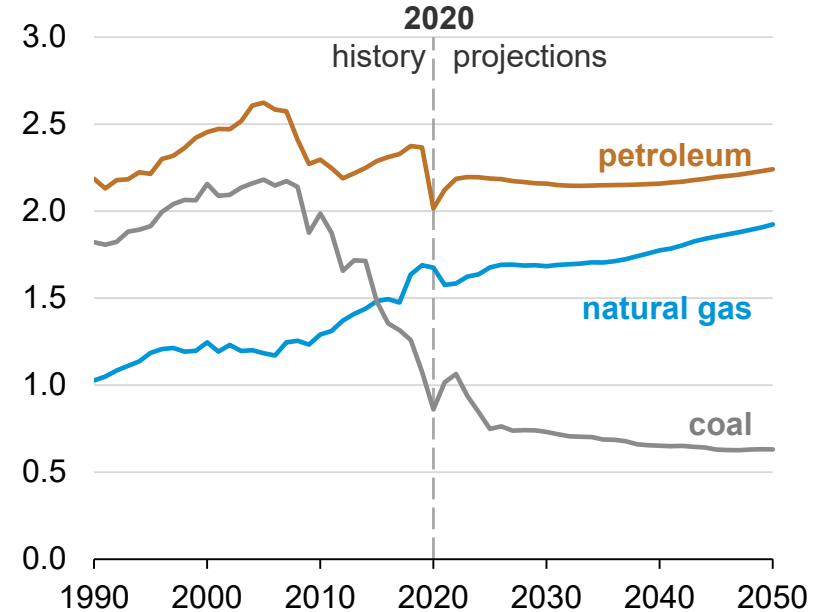


NEMS reports CO₂ emissions from the U.S. energy system

	Carbon Dioxide			Non-CO ₂ Gases		
	End-use energy consumption	Non-energy (e.g., process emissions from cement)	LULUCF (Land Use, Land-Use Change and Forestry)	Methane	Nitrous Oxide	Other GHGs
United States	NEMS					
Rest of the world						

U.S. energy-related carbon dioxide emissions by fuel
AEO2021 Reference case

billion metric tons



Deep decarbonization

Many pathways to deep decarbonization:

- Capture and storage of CO₂, including from industrial sources
- Electrification
- Biofuels and biomass
- Hydrogen economy
- Direct air capture
- More?

Likely a combination of all of them....

Challenge

How do we model potential policies and new technologies
in NEMS?

Goals of the workshop

What are the policies being considered in the context of deep decarbonization?

- Both near- and longer-term policies, across all sectors

What technologies should be represented in NEMS in order to be able to model deep decarbonization scenarios?

- Want choices to be made endogenously in the model in response to policy changes and not have a single pathway imposed exogenously

What insights can you tell us that will help us model these policies and technologies?

Outline

Two sessions: policies and technologies

Each session will begin with an overview of what is currently in NEMS, followed by two outside speakers to discuss their work in the area

Hoping for lots of discussion

Will also have an additional opportunity for discussion of cross-cutting issues at the end

Ground Rules

All comments made in the workshop are not for attribution

This is not being recorded

Notes will be taken

Webex Logistics

Click button to raise hand, and I can unmute you

Presentations should be relatively short, so please save questions for discussion period

Can also put questions in the chat window

Thank you!