

# Toward a New National Energy Policy: Assessing the Options

## POLICIES MODELED AND SUMMARY RESULTS

This two-year study by Resources for the Future and the National Energy Policy Institute provides a rigorous, comprehensive, “apples-to-apples” analysis of 35 major energy policy options for reducing oil consumption, carbon dioxide emissions, or both.

**Table 1. Policies Modeled**

<b>Reference Case</b>	The reference case is based on AEO 2009 + stimulus and also includes advancing of fuel economy standards mandating that new light-duty vehicles achieve 35.5 mpg from 2020 to 2016.
<b>Transportation/Oil Policies</b>	
<b>Gasoline Tax</b>	Raises the gasoline tax by \$1.27 per gallon in 2010 and increases it in real terms at an annual rate of 1.5 percent a year, adding \$1.73 to the cost of a gallon by 2030. The revenues from this tax, and taxes or auctioned allowances described below, are returned in lump-sum payments to individuals (they are therefore considered to be revenue neutral). We discuss the implications of alternative revenue recycling possibilities in the main report.
<b>Immediate Oil Tax</b>	Applies the above level of gasoline tax to all refined oil products used in the United States, including imported petroleum products (exported products are exempt). The tax is based on British thermal unit (Btu) equivalence. This tax is revenue neutral.
<b>Phased Oil Tax</b>	A variant of the immediate oil tax, which eventually reaches \$1.73 per gallon of gasoline equivalent on all oil products by 2030. This tax begins at 8 cents per gallon in 2010 and rises by approximately 8 cents per gallon each year out to 2030. This tax is revenue neutral.
<b>Pavley CAFE</b>	Features an increase of 3.7 percent a year in fuel economy standards for both cars and light trucks for 2017 through 2020. From 2021 to 2030, the policy further tightens standards by 2.5 percent a year, reaching an average standard of 52.2 mpg for light-duty vehicles in 2030.
<b>High Feebate*</b>	Fee assessed on vehicles that do worse than the Pavley CAFE standard in each year and rebate to those vehicles that do better. Basic rate is \$2,000 per 0.01 gallons/mile, phased in progressively between 2017 and 2021 and thereafter rising (in real terms) at 2.5 percent a year, so that it reaches \$2,969 per 0.01 gallons/mile in 2030.
<b>Very High Feebate</b>	Sets the feebate rates in each year exactly twice as large as in the high feebate case.
<b>Hybrid Subsidy</b>	Establishes a vehicle purchase subsidy of \$3,000 for each 0.01 gallon/mile saved between the hybrid electric or plug-in hybrid electric vehicle and its gasoline-equivalent vehicle, with the subsidy constant in real terms from 2010 to 2030.
<b>Pavley CAFE/Gasoline Tax</b>	Combines the Pavley CAFE policy with the Gasoline Tax.
<b>Oil Tax/Feebate/Hybrid Subsidy</b>	Combines the Phased Oil Tax, High Feebate, and Hybrid Subsidy.
<b>LNG Trucks</b>	Assumes that 10 percent of new Class 7 and 8 heavy-duty trucks bought in 2011 run on natural gas, rising to 20 percent of new trucks bought in 2012, up to 100 percent of new trucks bought in 2020 and beyond. This case is modified in one of the policy combinations to rise at half the penetration rate (rising by 5 percent per year to reach 100 percent by 2030 rather than 2020). This scenario can be viewed as a policy mandate or subsidy.
<b>CO<sub>2</sub> Pricing Policies</b>	
<b>Central Cap-and-Trade (C&amp;T)</b>	Reduces all GHGs by 17 percent below 2005 levels in 2020 and 40 percent below this base by 2030; covers all energy-related CO <sub>2</sub> and all industrial and agricultural sources of non-CO <sub>2</sub> emissions; covers all major sectors; allows 500 million tons each for domestic and international offsets per year; allows banking and borrowing of allowances with a zero bank balance in 2030; and auctions allowances, returning the revenue to households in lump-sum rebate checks.
<b>C&amp;T: Excluding Transportation</b>	Same requirements for total cumulative reductions under the cap, but excludes the transportation sector from the policy.
<b>C&amp;T: Alternative Cases for Offset Availability</b>	One case allows 1 billion tons each of domestic and international offsets per year, and another does not allow the use of any offsets in meeting the overall cap.
<b>C&amp;T: Less Stringent Cap</b>	Required cumulative reductions for all GHGs are 33 percent lower than in the central case.
<b>Carbon Tax</b>	A tax per ton of CO <sub>2</sub> emissions that mimics the time path of allowance prices under the central C&T policy.

\* We assumed that feebates were imposed at the manufacturer level. Alternatively, they could be imposed at the consumer level, though either would be equivalent within the NEMS-RFF modeling framework (as would some combination of consumer and manufacturer feebates, for which there are advocates).

# Toward a New National Energy Policy: Assessing the Options

## POLICIES MODELED AND SUMMARY RESULTS

**Table 1. Policies Modeled** (continued)

Energy Efficiency (EE) Policies	
<b>New Construction Building Codes</b>	Calls for a 30 percent reduction in energy use by new buildings upon enactment of the law, a 50 percent reduction from residential buildings by 2014 and from commercial buildings by 2015, and a 5 percent reduction at 3-year intervals thereafter up until 2029. This policy is consistent with the Building Code provisions in the Waxman-Markey (WM) bill, H.R. 2454.
<b>Complete Set of WM Energy Efficiency Policies</b>	Adds retrofit requirements; standards for outdoor lighting, portable light fixtures, and incandescent reflector lamps; and new standards and testing procedures for appliances to Building Code provisions similar to those represented by the Energy Information Administration's analysis of the WM bill.
<b>Complete Set of WM EE Policies + "High Tech" Assumptions</b>	A modification of the set of WM energy efficiency policies, which assumes accelerated technical progress (beyond that already found in the reference case) across the board. This manifests in higher efficiencies for most energy-using equipment.
<b>Residential Geothermal Heat Pumps—Subsidy</b>	Models a \$4,000 direct consumer subsidy for the purchase and installation of a geothermal heat pump (GHP) system in the residential sector.
<b>Residential Geothermal Heat Pumps—Loan</b>	Models a zero-interest \$4,000 loan for the purchase and installation of a GHP in the residential sector, paid back over a seven-year period.
Nuclear Power: Loan Guarantee	
<b>6.5 Gigawatt (GW) New Nuclear Capacity by 2020</b>	Reduces the return on equity assumed in NEMS-RFF from 17 percent (in the reference case) to 14 percent, which leads to an expansion of 6.5 GW of nuclear power by 2020.
<b>17.3 GW New Nuclear Capacity by 2020</b>	Reduces the return on equity assumed in NEMS-RFF from 17 percent (in the reference case) to 11 percent, which expands nuclear power by 17.3 GW by 2020.
Renewable Energy Technologies	
<b>Production Tax Credit</b>	Models an extension of the current production and investment tax credits for renewables (a 2.1-cent tax credit for wind, geothermal, and closed-loop biomass, and a 1.1-cent tax credit for landfill gas, other forms of biomass, and hydrokinetic energy).
<b>Renewable Portfolio Standard (RPS)</b>	Calls for 25 percent of total generation (excluding generation from hydro and municipal solid waste [MSW] plants) to come from non-hydro renewables nationwide by 2025, with interim targets leading up to this ultimate goal. Renewable Energy Credits (RECs) are used as a way to achieve these targets.
<b>Clean Energy Portfolio Standard (CEPS)</b>	Broadens the portfolio standard to include other "clean" fuels besides renewables, including incremental generation from nuclear power plants and natural gas and coal plants that have carbon capture and storage (CCS) technology.
<b>CEPS-NG</b>	Broadens the CEPS to include new natural gas capacity (without CCS) in the portfolio. New natural gas capacity receives a fraction of a clean energy credit, dependent on the CO <sub>2</sub> emissions from the technology.
<b>RINGPS</b>	Combines a 25 percent RPS with a 20 percent Incremental Natural Gas Portfolio Standard, meaning that 25 percent of total electricity generation (excluding generation from hydro and municipal solid waste plants) must come from renewables and 20 percent must come from new natural gas plants.
<b>CEPS-All</b>	Seeks to replicate the share of generation produced by technologies other than coal (with the exception of coal with CCS) obtained under the central cap-and-trade policy. The scope of CEPS-All is larger than CEPS and includes generation from new and existing noncoal generators. Unlike the CEPS and CEPS-NG policies, no cap on the price of clean energy credits, and the clean generation share target is applied to all generation, including hydro and MSW.
<b>Cap-and-Trade + RPS</b>	Combines the 25 percent RPS with the Central Cap-and-Trade Policy.
<b>Carbon Tax + RPS</b>	Combines the 25 percent RPS with the Carbon Tax policy.
Crosscutting Policy Combinations	
<b>Oil Tax + Carbon Tax</b>	Combines the Phased Oil Tax with the Carbon Tax.
<b>Oil Tax + Carbon Tax + EE Measures</b>	Combines the Phased Oil and Carbon Tax with the Building Codes and the Pavley CAFE policy.
<b>Regulatory Alternatives</b>	Combines the LNG trucks policy, the Building Codes, the Pavley CAFE policy, and CEPS-All.
<b>Blended Portfolio</b>	Combines the Phased Oil Tax, High Feebate, Hybrid Subsidy, Building Code provisions, GHP subsidy, and CEPS-All with a modified LNG Truck policy at half the original penetration rate (5 percent per year rather than 10 percent).

# Toward a New National Energy Policy: Assessing the Options

## POLICIES MODELED AND SUMMARY RESULTS

The report focuses on two key metrics—reductions in oil consumption and carbon dioxide emissions—and assesses the economic costs the policies will impose on society.

**Table 2a. Key Metrics, by Policy—Carbon Dioxide Emissions**

	Progress on Oil Target		Cumulative Reductions	PDV Welfare Cost	Cost Effectiveness: Oil	Cost Effectiveness: CO <sub>2</sub>
	Reduction from 2007 (mmbpd)		CO <sub>2</sub> Emissions (mmt CO <sub>2</sub> )	(\$2007, billions)	(\$2007/barrel)	(\$2007/ton CO <sub>2</sub> )
	in 2020	in 2030	to 2030	to 2030	a.	a.
Reference Case	2.1	2.0	—	—	—	—
	Incremental Reductions to Reference case					
Policies to Reduce Carbon Dioxide Emissions						
CARBON PRICING POLICIES						
Central Cap and Trade (C&T)	0.3	1.0	12,366	138.8	44	11
C&T: Excluding Transportation	0.2	0.7	12,948	152.8	70	12
C&T: Greater Offset Availability	0.2	0.8	8,320	64.9	27	8
Carbon Tax	0.2	1.0	12,181	138.0	46	11
C&T: No Offsets	0.6	1.3	28,745	538.9	115	19
C&T: Less Stringent Cap	0.3	1.3	6,404	43.6	14	7
ENERGY EFFICIENCY POLICIES						
Building Codes – Residential	0.0	0.1	179	15.4	b.	25
Complete Set of WM EE Policies – Residential	0.0	0.1	249	26.7	b.	34
WM EE Policies + High Tech Assumptions – Residential	0.0	0.1	847	-42.4	b.	-17
Geothermal Heat Pumps – Loan	0.0	0.1	138	-11.7	b.	-36
Geothermal Heat Pumps – Subsidy	0.1	0.1	245	-5.1	b.	-9
NUCLEAR POWER: LOAN GUARANTEE						
6.5 GW New Nuclear Capacity by 2020	0.0	0.2	958	0.7	1	0
17.3 GW New Nuclear Capacity by 2020	0.0	0.2	2,643	4.5	6	2
RENEWABLES POLICIES						
RPS	0.0	0.2	3,489	47.0	104.9	14
CEPS	0.0	0.1	2,851	37.7	93.8	13
CEPS + Natural Gas	0.0	0.0	2,652	27.8	351.6	11
RINGPS	0.0	-0.1	6,860	161.1	—	24
CEPS-All	0.1	-0.1	7,632	108.2	535.7	14
Cap-and-Trade + RPS	0.2	1.1	12,697	148.6	45.8	12
Carbon Tax + RPS	0.3	1.1	13,103	146.9	45.3	11

# Toward a New National Energy Policy: Assessing the Options

## POLICIES MODELED AND SUMMARY RESULTS

**Table 2b. Key Metrics, by Policy—Oil Consumption**

	Progress on Oil Target		Cumulative Reductions	PDV Welfare Cost	Cost Effectiveness: Oil	Cost Effectiveness: CO <sub>2</sub>
	Reduction from 2007 (mmbpd)		CO <sub>2</sub> Emissions (mmt CO <sub>2</sub> )	(\$2007, billions)	(\$2007/barrel)	(\$2007/ton CO <sub>2</sub> )
	in 2020	in 2030	to 2030	to 2030	a.	a.
Reference Case	2.1	2.0	—	—	—	—
	Incremental Reductions to Reference case					
Policies to Reduce Oil Consumption						
TRANSPORTATION POLICIES						
Phased Oil Tax	0.9	1.5	2,828	88.0	14	31
Oil Tax	1.6	1.4	4,715	200.5	19	43
Gas Tax	0.8	0.8	2,224	53.3	10	22
Pavley CAFE	0.1	0.7	722	44.6	12	31
High Feebate	0.1	0.7	637	41.9	12	35
Very High Feebate	0.2	0.9	919	116.8	23	67
Hybrid Subsidy	0.0	0.0	0	-8.2	—	—
CAFE/Gas Tax	0.8	1.4	2,919	134.2	25	46
Phased Oil Tax/Feebate/Subsidy	1.0	2.0	3,319	207.8	27	62
NATURAL GAS VEHICLES						
LNG Heavy-Duty Trucks	1.1	2.2	1,821	186.4	14	76

**Table 2c. Key Metrics, by Policy—Policy Combinations**

	Progress on Oil Target		Cumulative Reductions	PDV Welfare Cost	Cost Effectiveness: Oil	Cost Effectiveness: CO <sub>2</sub>
	Reduction from 2007 (mmbpd)		CO <sub>2</sub> Emissions (mmt CO <sub>2</sub> )	(\$2007, billions)	(\$2007/barrel)	(\$2007/ton CO <sub>2</sub> )
	in 2020	in 2030	to 2030	to 2030	a.	a.
<b>Policy Combinations</b>						
Oil Tax + Carbon Tax	1.0	2.1	15,070	241.0	c.	c.
Oil Tax + Carbon Tax + EE Measures	1.1	2.5	15,544	328.7	c.	c.
Regulatory Alternatives	1.2	2.7	10,077	375.5	c.	c.
Blended Portfolio of Policies	1.4	3.4	12,102	342.4	c.	c.
Regulatory Alternatives — no LNG Trucks	0.1	0.5	8,256	169.9	c.	c.
Blended Portfolio of Policies— no LNG Trucks	0.8	2.3	11,192	317.0	c.	c.

a. Oil and emissions reductions counted over investment lifetime or to 2050, whichever comes sooner.

b. Cost per barrel for policies in this category are not calculated because of small cumulative reductions in oil use.

c. Cost-effectiveness is not calculated for crosscutting combinations, as costs cannot be assigned to individual effectiveness measures.