



# Summary of Legislation and Regulations Included in the Annual Energy Outlook 2023

March 2023

The U.S. Energy Information Administration (EIA), the statistical and analytical agency within the U.S. Department of Energy (DOE), prepared this report. By law, our data, analyses, and forecasts are independent of approval by any other officer or employee of the U.S. Government. The views in this report do not represent those of DOE or any other federal agencies.

The version of the National Energy Modeling System (NEMS) used for our *Annual Energy Outlook 2023* (AEO2023) generally represents current legislation, environmental regulations, and international protocols, including recent government regulations as of mid-November 2022. The potential effects of proposed federal and state legislation, regulations, or standards are not reflected in NEMS. In addition, NEMS does not reflect sections of legislation that have been enacted but have not been funded or lack implementation regulations. A list of the federal and selected state legislation and regulations included in AEO2023, including how we incorporated them, is provided in each module's documentation. This document provides an overview of all the relevant regulations and includes summary tables that represent both new and existing legislation and regulations represented in NEMS.

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## New Laws and Regulations Reflected in the Reference case

### Federal

The Inflation Reduction Act (IRA) was passed on August 16, 2022, and we incorporated several of its provisions related to the energy sector in AEO2023, such as:

- The extension and modification of clean energy tax credits
- Tax credits for zero-emission vehicles
- New production tax credit for existing nuclear power plant
- A separate clean fuel production tax credit

More details on which IRA provisions we included within the Reference case and core side cases are the AEO2023 [narrative](#) and the *Issues in Focus: Inflation Reduction Act Cases in the AEO2023*, which explores the differences in how certain provisions are ultimately implemented.

The U.S. Department of Transportation's National Highway Traffic Safety Administration (NHTSA) issued Corporate Average Fuel Economy Standards for Model Years 2024–2026 Passenger Cars and Light Trucks, effective July 1, 2022, to amend and replace the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule. SAFE set Corporate Average Fuel Economy (CAFE) standards for light-duty vehicles in model years 2021–2026. The updated standards increase 8% in stringency each year for model year 2024 to 2025 and 10% in model year 2026.

### State

In 2022, Illinois, North Carolina, Nebraska, and Rhode Island enacted new legislation for their respective clean energy standards (CES) programs. In addition, AEO2023 includes, for the first time, CES state-level executive branch targets for Colorado, Connecticut, Louisiana, Massachusetts, Michigan, New Jersey, and Wisconsin.

## Summary: Existing and New Federal and State Legislation and Regulations in the Annual Energy Outlook 2023

### Residential sector

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
A.	National Appliance Energy Conservation Act of 1987 (NAECA1987)	Requires the Secretary of Energy to set minimum efficiency standards for various appliance categories with periodic updates	Applies to new appliance purchases in the residential sector	Public Law 100-12
	a. Room air conditioners	In 2014, set standards for room air conditioners	New room air conditioners	Federal Register Notice of Final Rulemaking
	b. Central air conditioners and heat pumps	In 2015 and 2023, set standards for central air conditioners and heat pumps	New central (or <i>other</i> ) air conditioners	Federal Register Notice of Final Rulemaking
	c. Water heaters	In 2015, set standards for water heaters	New water heaters	Federal Register Notice of Final Rulemaking
	d. Refrigerators and freezers	In 2014, set standards for refrigerators and freezers	New refrigerators and freezers	Federal Register Notice of Final Rulemaking

<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basis</b>
e. Dishwashers	In 2010, set standards for dishwashers; superseded by a consensus agreement effective in 2013	New dishwashers	Federal Register Notice of Final Rulemaking
f. Fluorescent lamp ballasts	In 2014, set standards for fluorescent lamp ballasts	New fluorescent lamp ballasts	Federal Register Notice of Final Rulemaking
g. Clothes washers	In 2015, set standards for clothes washers	New clothes washers	Federal Register Notice of Final Rulemaking
h. Furnaces	In 2013, set standards for furnaces	New furnaces	Federal Register Notice of Final Rulemaking
i. Clothes dryers	In 2015, set standards for clothes dryers	New clothes dryers	Federal Register Notice of Final Rulemaking
j. Boilers	In 2021, set standards for boilers	New boilers	Federal Register Notice of Final Rulemaking
<b>B. Energy Policy Act of 1992 (EPACT1992)</b>			Public Law 102-486
a. Building codes	For the International Energy Conservation Code (IECC) 2006, specifies whole house efficiency minimums	All states adopt the IECC 2006 code by 2017	Trend of states' adoption of codes, allowing for lead times for enforcement and builder compliance
b. Various lighting types	In 2012, set standards for various lighting types	New various lighting types	Federal Register Notice of Final Rulemaking
<b>C. Energy Policy Act of 2005 (EPACT2005)</b>			Public Law 109-58
a. Torchiere lamp standard	In 2006, set standards for torchiere lamps	New torchiere bulbs	Federal Register Notice of Final Rulemaking
b. Compact fluorescent lamp standard	In 2006, set standards for compact fluorescent lamps	New compact fluorescent bulbs	Federal Register Notice of Final Rulemaking
c. Ceiling fan and light kit standard	In 2019, set standards for ceiling fans and in 2020 for ceiling fan light kits	Miscellaneous and lighting electricity consumption for new ceiling fans and ceiling fan light kits drops by the required amount	Overall savings determined by number of ceiling fan shipments and estimated kilowatt-hour (kWh) savings per unit
d. Dehumidifier standard	In 2019, set standards for dehumidifiers	Dehumidifier electricity consumption drops by the required amount	Overall savings determined by number of dehumidifier shipments and estimated kWh savings per unit
e. Energy-efficient equipment tax credit	Provides tax credits to purchasers of certain energy-efficient equipment in 2006 and 2007	Cost of applicable equipment drops by the required amount	Federal Register Notice of Final Rulemaking
f. New home tax credit	Provides \$1,000 or \$2,000 tax credit to builders if they construct homes that are 30% or 50%, respectively, more efficient than code in 2006 and 2007	Shell package cost for these homes drops by the required amount	Cost reductions to consumers are assumed to be 100% of the builder's tax credit
g. Energy-efficient appliance tax credit	Provides tax credits to producers of energy-efficient refrigerators, dishwashers, and clothes washers for each unit they produce that meets	Cost savings passed on to the consumer, reducing the price of the appliance by the required amount	Cost reductions to consumers are assumed to be 100% of the producer's tax credit

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	certain efficiency specifications		
D. Energy Independence and Security Act of 2007 (EISA2007)			Public Law 110-140
a. General service incandescent lamp standard	From 2012 to 2014, required less wattage for bulbs; a 2020 backstop standard that would have effectively eliminated incandescent bulbs was removed in December 2019, reinstated in 2022, and is effective in 2023	Wattage for new bulbs is reduced by 28% in 2013	Federal Register Notice of Final Rulemaking
b. External power supply standard	In 2016, set standards for external power supplies	Electricity consumption by external power supplies is reduced by the required amount	Overall savings on compact fluorescent bulbs determined by number of shipments and estimated kWh savings per unit
c. Manufactured housing code	In 2011, set standard for manufactured homes to meet latest IECC	All manufactured homes shipped after 2011 are required to meet the 2006 IECC	Federal Register Notice of Final Rulemaking
d. Miscellaneous refrigeration products	In 2019, set minimum efficiency standards for wine coolers	Other electricity consumption is reduced by the required amount	Federal Register Notice of Final Rulemaking
E. Energy Improvement and Extension Act of 2008 (EIEA2008)			Public Law 110-343
a. Energy-efficient equipment tax credit	Offers purchasers of certain energy-efficient equipment tax credits through 2016	Cost of applicable equipment is reduced by the required amount	Federal Register Notice of Final Rulemaking
b. Energy-efficient appliance tax credit	Offers producers of energy-efficient refrigerators, clothes washers, and dishwashers tax credits for each unit they produce that meets certain efficiency specifications, subject to an annual cap	Cost savings passed on to the consumer, reducing the price of the appliance by the required amount	Cost reductions to consumer are assumed to be 100% of the producer's tax credit
F. American Recovery and Reinvestment Act of 2009 (ARRA2009)			Public Law 111-5
a. Energy-efficient equipment tax credit	Increases cap of energy-efficient equipment specified under Section E(a) of ARRA2009 to \$1,500; removes cap for solar photovoltaic (PV), wind, and ground-source (geothermal) heat pumps	Cost of applicable equipment is reduced by the required amount	Federal Register Notice of Final Rulemaking
b. Weatherization and State Energy Programs	Increases funding for weatherization and other programs to improve the energy efficiency of existing housing stock	Annual funding amount is applied to retrofit existing housing; base savings for heating and cooling based on \$2,600 per-home investment as specified in	Federal Register Notice of Final Rulemaking

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
		weatherization program evaluation	
G.	Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010		Public Law 111-312
	a. Energy-efficient equipment tax credit	Tax credits for some energy-efficient equipment are extended, generally to EISA2007 amounts	Reduces the cost of applicable equipment by specified amount
I.	Consolidated Appropriations Act of 2016 (H.R. 2029)		Public Law 114-113
	a. Residential solar investment tax credit (ITC)	Extends the EPACT2005 30% ITC for solar property through 2019, decreasing to 26% in 2020, to 22% in 2021, and expiring after 2021	Tax credit is incorporated into cash flow for solar generation systems; investment cost for solar water heaters is reduced by the required percentage
J.	Bipartisan Budget Act (BBA) of 2018 (H.R. 1892)		Public Law 115-123
	a. Residential energy efficiency and non-solar renewable energy tax credits	Retroactively extends existing federal 25C tax credits for home energy efficiency upgrades and equipment through 2017. It also extends the 25D credit for non-solar technology tax credits with the same ramp down as solar through 2021	Cost of applicable equipment is reduced by the required amount; tax credit is incorporated into cash flow for non-solar generation systems based on updated timeline
K.	Taxpayer Certainty and Disaster Tax Relief Act of 2019 (H.R. 3301)	Retroactively extended existing federal 25C tax credits for home energy efficiency upgrades and equipment through 2020	Cost of applicable equipment is reduced by the required amount
L.	Energy Policy and Conservation Act of 1975 (EPCA1975)		Public Law 94-163
	a. Dedicated-purpose pool pumps	Expanded EPCA1975 coverage of pump efficiency to pool pumps, effective 2021	Other electricity consumption is reduced by the required amount
M.	Consolidated Appropriations Act, 2021	Extends the ramp down of ITCs for distributed generation equipment by an additional two years	26% ITC extended through 2022; phases out to 22% in 2023 and no tax credit after 2023
N.	Inflation Reduction Act (IRA)		Public Law 117-169
	a. Section 13301 Extension, increase, and modifications of nonbusiness energy property credit	Extends tax credits under IRS Section 25C for home energy efficiency improvements and modifies the tax credit for	We assume the cost of applicable major end-use equipment is reduced by the required amount through 2032



Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
b. Section 13302 Residential clean energy credit	qualified energy efficiency improvements. Extends the credit under IRS Section 25D for the cost of qualified residential clean energy expenditures and projects	We assume the ITC for solar PV, fuel cells, wind, ground-source heat pumps, and solar water heaters is increased to 30% and extended through 2032; phases out to 26% in 2033, 22% in 2034; and no tax credit after 2034	
c. Section 13304 Extension, increase, and modifications of new energy efficient home credit	Extends Section 45L credits for new energy-efficient homes, and increases the credit amount if qualified projects meet prevailing wage and apprenticeship requirements	We assume a \$500–\$2,500 tax credit for new housing units meeting or exceeding ENERGY STAR specifications, and an extension of this credit through 2032	

**Commercial sector**

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basis</b>
A.	National Appliance Energy Conservation Act of 1987 (NAECA1987)	Requires the Secretary of Energy to set minimum efficiency standards for various appliance categories with periodic updates	Appliance categories represented in the commercial sector are included	Public Law 100-12
	a. Room air conditioners	In 2014, set standards for room air conditioners	Room air conditioner efficiency, including metric, is changed from 9.8 Energy Efficiency Ratio (EER) to 10.9 Combined Energy Efficiency Ratio (CEER) in 2014	Federal Register Notice of Final Rulemaking
	b. Other residential-size air conditioners (<5.4 tons)	In 2015, set standards for central air conditioners; will be updated in 2023	Central air-conditioning and heat pump efficiency is set to 10 Seasonal Energy Efficiency Ratios (SEER) before 2006, 13 SEER in 2006, 14 SEER in 2015, and 14.4 SEER in 2023	Federal Register Notice of Final Rulemaking
	c. Fluorescent lamp ballasts	In 2014, set standards for fluorescent lamp ballasts	Purchases are limited to electronic ballasts by setting a 0.90 power factor and a minimum efficacy factor for F40 and F96 lamps based on lamp size and wattage	Federal Register Notice of Final Rulemaking
B.	Energy Policy Act of 1992 (EPACT1992)			Public Law 102-486
	a. Building codes	Directs U.S. Department of Energy (DOE) to participate in development of model energy codes and help states adopt and implement more efficient energy codes	Incorporated into commercial building shell assumptions. Efficiency of new shell is represented relative to existing shell in shell efficiency indexes. Shell efficiency is assumed to improve 6.9% for existing buildings and 15.0% for new construction by 2040	Based on Science Applications International Corporation commercial shell indexes for 2003, developed for EIA in 2008 and 2011
	b. Window labeling	Helps consumers determine which windows are more energy efficient	Incorporated into commercial building shell assumptions. Efficiency of new shell is represented relative to existing shell in shell efficiency indexes. Shell efficiency is assumed to improve 6.9% for existing buildings and 15.0% for new construction by 2040	Based on Science Applications International Corporation commercial shell indexes for 2003, developed for EIA in 2008 and 2011
	c. Commercial furnaces and boilers	In 2023, sets standards for furnaces	Natural gas-fired furnace and boiler thermal efficiency is set to 80%; oil	Federal Register Notice of Final Rulemaking

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
		furnace thermal efficiency is set to 81%; oil boiler thermal efficiency is set to 83%	
d. Commercial air conditioners and heat pumps	Sets standards for air conditioners and heat pumps	Not modeled; superseded by EPACT2005 standards	Federal Register Notice of Final Rulemaking
e. Commercial water heaters	In 2003, set standards for water heaters	Natural gas and oil thermal efficiency is set to 78%, increasing to 80% thermal efficiency for gas units in 2003	Federal Register Notice of Final Rulemaking
f. Lamps	In 2012, set standards for various lighting types	Incandescent efficacy is set to 16.9 lumens per watt and fluorescent efficacy to 75 lumens per watt for 4-foot lamps and 80 lumens per watt for 8-foot systems	Federal Register Notice of Final Rulemaking for fluorescent requirements; incandescent requirements superseded by EISA2007
g. Electric motors	Specifies minimum efficiency levels for a variety of motor types and sizes	End-use services are modeled at equipment level (motors contained in new equipment must meet the standards)	Federal Register Notice of Final Rulemaking
h. Federal energy management	Requires federal agencies to reduce energy consumption by 20% by 2000 relative to 1985	Federal share of the commercial sector uses the 10-year Treasury note rate as a discount rate in equipment purchase decisions	Superseded by Executive Order 13123, EPACT2005, and EISA2007
i. Business investment tax credit (ITC) for solar energy property	Provides a permanent 10% ITC for solar property	Tax credit is incorporated into cash flow for solar generation systems; investment cost is reduced for solar water heaters by 10%	Federal Register Notice of Final Rulemaking; rates and schedule superseded by the IRA extension and expansion of the ITC (Public Law 117-169)
C. Executive Order 13123: Greening the Government Through Efficient Energy Management	Requires federal agencies to reduce energy consumption 30% by 2005 and 35% by 2010 relative to 1985 through cost-effective life-cycle energy measures	Federal share of the commercial sector uses the 10-year Treasury note rate as a discount rate in equipment purchase decisions	Superseded by EPACT2005 and EISA2007
D. Energy Policy Act of 2005 (EPACT2005)			Public Law 109-58
a. Commercial package air conditioners and heat pumps	In 2018, set minimum efficiency levels, updated in 2023	Air-cooled air conditioners and heat pumps are set in technology menu (with assumed capacity of 90,000 British thermal units [Btu]) to an integrated energy efficiency ratio (IEER) of 12.4 and a heating coefficient of	Federal Register Notice of Final Rulemaking

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
		performance (COP) of 3.3 in 2018 and 14.4 IEER and a heating COP of 3.4 in 2023	
c. Lamp ballasts	In 2008, banned manufacture or import of mercury vapor lamp ballasts; in 2009 and 2010, set minimum efficacy level for T12 energy saver ballasts, based on application	Mercury vapor lighting system is removed from technology choice menu; minimum efficacy of T12 ballasts is set at specified standard levels	Federal Register Notice of Final Rulemaking
d. Compact fluorescent lamps	In 2006, set standards for medium base lamps to ENERGY STAR specifications	Efficacy level of compact fluorescent lamps is set at required level	Federal Register Notice of Final Rulemaking
e. Illuminated exit signs and traffic signals	In 2006, set standards to ENERGY STAR specifications	Miscellaneous electricity consumption is reduced by the required amount	Number of shipments, share of shipments that currently meet standard, and estimated kilowatt-hour (kWh) savings per unit determine overall savings
f. Distribution transformers	In 2007, set standards as National Electrical Manufacturers Association Class I Efficiency levels; updated in 2016	The estimation of the share of miscellaneous electricity consumption attributable to transformer losses includes the effects of the standard	Federal Register Notice of Final Rulemaking
g. Pre-rinse spray valves	In 2019, set maximum flow rate to 1.28 gallons per minute	Energy use for water heating is reduced by the required amount	Number of shipments, share of shipments that currently meet standard, and estimated kWh savings per unit determine overall savings
h. Federal energy management	Requires federal agencies to reduce energy consumption by 20% by 2015 relative to 2003 through cost-effective life-cycle energy measures	Federal share of the commercial sector uses the 10-year Treasury note rate as a discount rate for equipment purchase decisions as opposed to adding risk premiums to the 10-year Treasury note rate	Superseded by EISA2007
i. Business ITC credit for fuel cells and microturbines	Provides a 30% ITC for fuel cells and a 10% ITC for microturbines installed in 2006 through 2016	Tax credit is incorporated into cash flow for fuel cells and microturbines	Extended through 2008 by Public Law 109-432 and through 2016 by the Energy Improvement and Extension Act of 2008 (EIEA2008); Extended by subsequent legislation, most recently extended through 2024 by the

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
			IRA (Public Law 117-169)
j. Business solar ITC	Provides a 30% investment tax credit for solar property installed in 2006 through 2016	Tax credit is incorporated into cash flow for solar generation systems; investment cost for solar water heaters is reduced by 30%	Extended through 2008 by Public Law 109-432, through 2016 by EIEA2008, and through 2019 and then phased down to 10% by Public Law 114-113; expanded to 30% starting in 2022 by the IRA (Public Law 117-169)
k. Vending machines	In 2019, set standards to ENERGY STAR specifications	Vending machines that do not meet standards are removed from technology choice menu	Federal Register Notice of Final Rulemaking
E. Energy Independence and Security Act of 2007 (EISA2007)			
a. Commercial walk-in coolers and walk-in freezers	Requires use of specific energy efficiency measures in equipment manufactured in or after 2009; updated in 2017	Walk-in refrigerator and freezer systems that do not meet standards are removed from technology choice menu	Federal Register Notice of Final Rulemaking
b. Incandescent and halogen lamps	Sets maximum allowable wattage based on lumen output from 2012 to 2014. A 2020 backstop standard that would have effectively eliminated incandescent bulbs was removed in December 2019, <a href="#">reinstated</a> in 2022, and is effective in 2023	Incandescent and halogen general service lighting systems that do not meet standards are removed from technology choice menu in 2012	Federal Register Notice of Final Rulemaking
c. Metal halide lamp ballasts	Sets minimum efficiency levels for metal halide lamp ballasts starting in 2009; updated in 2017	Metal halide lighting systems that do not meet standards are removed from technology choice menu; minimum system efficiency includes specified standard levels for ballasts based on type	Federal Register Notice of Final Rulemaking
d. Federal use of energy-efficient lighting	Requires use of energy-efficient lighting fixtures and bulbs in federal buildings to the maximum extent possible starting in 2009	All existing and new federal floorspace uses 10-year Treasury note rate for lighting purchase decisions in 2009	Federal Register Notice of Final Rulemaking
e. Federal energy management	Requires federal agencies to reduce energy consumption per square foot by 30% by 2015 relative to 2003 through cost-effective life-cycle energy measures	Federal share of the commercial sector uses the 10-year Treasury note rate as a discount rate in equipment purchase decisions (as opposed to adding risk premiums to the 10-year Treasury note rate to develop discount	Federal Register Notice of Final Rulemaking

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis	
F.	Energy Improvement and Extension Act of 2008 (EIEA2008)	rates for other commercial decisions)	Public Law 110-343	
a.	Business solar ITC	Extends EPACT2005's 30% ITC for solar property through 2016	Tax credit is incorporated into cash flow for solar generation systems; investment cost is reduced for solar water heaters by 30%	Federal Register Notice of Final Rulemaking; rates and schedule superseded by the IRA extension and expansion of the ITC (Public Law 117-169)
b.	Business ITC for fuel cells and microturbines	Extends EPACT2005's 30% ITC for fuel cells and 10% ITC for microturbines through 2016	Tax credit is incorporated into cash flow for fuel cells and microturbines	Federal Register Notice of Final Rulemaking
c.	Business ITC for combined-heat-and-power (CHP) systems	Provides a 10% ITC for CHP systems installed in 2009 through 2016	Tax credit is incorporated into cash flow for CHP systems	Federal Register Notice of Final Rulemaking; rates and schedule superseded by the IRA extension and expansion of the ITC (Public Law 117-169)
d.	Business ITC for small wind turbines	Provides a 30% ITC for wind turbines installed in 2009 through 2016	Tax credit is incorporated into cash flow for wind turbines	Federal Register Notice of Final Rulemaking; rates and schedule superseded by the IRA extension and expansion of the ITC (Public Law 117-169)
e.	Business ITC for geothermal heat pumps	Provides a 10% ITC for geothermal heat pump systems installed in 2009 through 2016	Investment cost for geothermal heat pump systems is reduced by 10%	Federal Register Notice of Final Rulemaking; rates and schedule superseded by the IRA extension and expansion of the ITC (Public Law 117-169)
G.	American Recovery and Reinvestment Act of 2009 (ARRA2009)			Public Law 111-5
a.	Business ITC for small wind turbines	Removes the cap on the EIEA2008 30% ITC for wind turbines through 2016	Tax credit is incorporated into cash flow for wind turbines	Federal Register Notice of Final Rulemaking; rates and schedule superseded by the IRA extension and expansion of the ITC (Public Law 117-169)
b.	Stimulus funding to federal agencies	Provides funding for efficiency improvement in federal buildings and facilities	All existing and new federal floorspace uses the 10-year Treasury note rate for purchase decisions in years in which stimulus funding is available to account for new, replacement, and retrofit projects; some funding is assumed to be	Federal Register Notice of Final Rulemaking

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
		used for solar PV, small wind turbine, and fuel cell installations	
c. State Energy Program funding and energy efficiency and conservation block grants	Provides grants for state and local governments for energy efficiency and renewable energy purposes (State Energy Program funding conditioned on enactment of new building codes)	All public commercial sector buildings use the 10-year Treasury note rate for purchase decisions in years in which stimulus funding is available. New building shell efficiency is 10% better than 2003 by 2018 for improved building codes. Some funding is assumed to be used for solar PV and small wind turbine installations	Federal Register Notice of Final Rulemaking
d. Funding for smart grid projects	Provides funding for smart grid demonstration projects	Consumers are assumed to become more responsive to electricity price changes resulting in higher price elasticity of demand for certain end uses	Federal Register Notice of Final Rulemaking
I. Consolidated Appropriations Act of 2016 (H.R. 2029)			Public Law 114-113
a. Business solar ITC	Extends EPACT2005's 30% ITC for solar property through 2019, decreasing to 26% in 2020, 22% in 2021, and then remaining at 10% in 2022 and subsequent years	Tax credits are incorporated into the cash flow for solar generation systems; investment cost for solar water heaters is reduced by the required percentage	Federal Register Notice of Final Rulemaking; rates and schedule superseded by the IRA extension and expansion of the ITC (Public Law 117-169)
J. California Global Warming Solutions Act of 2006: emissions limit (SB-32)			
a. Limits California greenhouse gas (GHG)	Limits the statewide GHG emissions level to the 1990 level to be achieved by 2020	Additional subsidies are applied for energy-efficient technologies in the Pacific Census Division; all increase in efficiency is attributed to California	Apply assumptions of SB-350 as it sets a goal of doubling energy efficiency savings targets by 2030
K. Tax Cuts and Jobs Act (TCJA) of 2017 (H.R. 1)			Public Law 115-97
a. 100% expensing for qualified renewable energy property	Introduces 100% expensing for qualified property, including geothermal heat pumps, solar PV, and solar thermal water heating placed in service by 2022. Qualified property placed in service from 2023 to 2026 receives 50% bonus depreciation	100% expensing and 50% bonus depreciation for geothermal heat pumps and solar thermal water heating are incorporated, reducing the investment cost	TCJA2017, Section 13201 (26 USC 168)

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basis</b>
L.	Bipartisan Budget Act (BBA) of 2018 (H.R. 1892)			Public Law 115-123
	a. Commercial ITC for distributed and renewable technologies	Extends ITC provisions for several technologies not covered by the 2016 Consolidated Appropriations Act, including geothermal heat pumps, qualified fuel cell and microturbine equipment, combined heat and power, and qualified small wind beginning construction before January 1, 2022	The tax credits are incorporated into cash flow for applicable distributed generation systems; investment costs for geothermal heat pumps are reduced	BBA2018, Section 40411 (26 USC 48); rates and schedule superseded by the IRA extension and expansion of the ITC (Public Law 117-169)
M	Consolidated Appropriations Act, 2021	Extends the phaseout of ITCs for distributed generation equipment by an additional two years	26% ITC extended through 2022; phases down to 22% in 2023 and 10% for subsequent years	Public Law 116-260; rates and schedule superseded by the IRA extension and expansion of the ITC (Public Law 117-169)
N.	Inflation Reduction Act (IRA)			<a href="#">Public Law 117-169</a>
	a. Section 13102 extension and modification of energy tax credit	These provisions include extensions of the Internal Revenue Service Code Section 48 ITC for certain energy properties	Tax credits are incorporated into the cash flow for commercial solar and wind generation systems, increasing to 30% in 2022 and available thereafter. Fuel cells and microturbines are eligible for a 30% and a 10% credit, respectively, through 2024. Investment costs for solar water heaters and ground-source heat pumps are reduced by the required percentage.	<a href="#">Public Law 117-169</a>
	b. Section 13702 Clean electricity investment credit	This provision creates a new ITC for eligible clean energy technologies.	See section 13102 description for commercial solar and wind. We do not assume reductions in the ITC rate due to GHG targets being met.	<a href="#">Public Law 117-169</a>
	c. Section 13703 cost recovery for qualified facilities, qualified property, and energy storage technology	The provision updates the definition of a <i>five-year property</i> to include property qualifying for the clean energy investment tax credit, and any energy storage technology for modified accelerated cost recovery (MACRS).	For AEO2023, we recalculated the MACRS depreciation for geothermal technologies and solar water heater installed costs that are subject to the updated ITC. The portion of costs offset by the ITC cannot be depreciated. We do not explicitly model	<a href="#">Public Law 117-169</a>



Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
		energy storage in the commercial sector.	

**Industrial sector**

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
A.	Clean Air Act Amendments of 1990 (CAAA1990)		
a.	Process emissions	Numerous process emissions requirements for specified industries and activities	Requirements not yet modeled, because process emissions currently only modeled for the cement and lime industries.
b.	Emissions related to hazardous and toxic substances	Numerous emissions requirements for hazardous and toxic substances	Not modeled because they are not directly related to energy projections
c.	Industrial sulfur dioxide (SO <sub>2</sub> ) emissions	Sets annual limit for industrial SO <sub>2</sub> emissions at 5.6 million tons. If limit is reached, specific regulations could be implemented	Industrial SO <sub>2</sub> emissions are not projected to reach the limit
d.	Industrial boiler hazardous air pollutants	Requires industrial boilers and process heaters to conduct periodic tune-ups or meet emissions limits on hazardous air pollutants to comply with the Maximum Achievable Control Technology (MACT) floor. Regulations finalized December 2012	Costs of compliance that are not offset by efficiency gains (non-recoverable costs) are modeled as an additional capital cost in the Macroeconomic Activity Module based on proposed regulations as of September 2012
e.	Emissions from stationary diesel engines	Requires engine manufacturers to meet the same emission standards as nonroad diesel engines. Fully effective in 2011	U.S. Environmental Protection Agency, National Emissions Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers, Major Source (40 CFR 63, Subpart DDDDD) and Area Source (40 CFR 63 Part JJJJJ)
B.	Energy Policy Act of 1992 (EPACT1992)		
a.	Boiler efficiency standards	Specifies minimum combustion efficiency for package boilers larger than 300,000 British thermal units (Btu) per hour: natural gas boilers at 80% and oil boilers at 83%	40 CFR Parts 60, 85, 89, 94, 1039, 1065, and 1068
		All package boilers are assumed to meet the efficiency standards. Although the standards do not apply to field-erected boilers, which are typically used in steam-intensive industries, we assume they meet the standards in the AEO.	Standards specified in EPACT1992, 10 CFR 431

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basis</b>
C.	California Global Warming Solutions Act of 2006 (AB-32); as amended, 2016 (SB-32)			
	a. Limits the statewide greenhouse gas (GHG) emissions level to the 1990 level to be achieved by 2020; SB-32 in 2016 requires a 40% reduction from the 1990 GHG emission level by 2030	The California Assembly Bill 32 (AB-32) sets GHG reduction goals for 2020 for California. A cap-and-trade program applies to multiple economic sectors including electric power plants, large industrial facilities, suppliers of transportation fuel, and suppliers of natural gas.	Energy prices in the West Census Region increase based on GHG cap and trade prices and assumed emissions. The Industrial Demand Module is unable to model emissions at the state level.	California Code of Regulations, California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms, Subchapter 10 Climate Change, Article 5, Sections 95802 to 96022, Title 17, (Sacramento, California: May 2014)
D.	The Energy Independence and Security Act of 2007 (EISA2007)			
	a. Motor efficiency standards	Specifies minimum efficiency levels for a variety of motor types and sizes	Purchases of motors must meet the EISA2007 standards. Motors manufactured after June 1, 2016, are required to comply with higher efficiency standards.	EISA2007, 10 CFR Part 431 as amended
E.	The Energy Improvement and Extension Act of 2008 (EIEA2008)			
	a. Combined-heat-and-power tax incentive	Provides an ITC for up to 15 megawatts (MW) of capacity in combined-heat-and-power systems of 50 MW or less through 2016	System costs are adjusted to reflect the tax credit.	EIEA2008, Title I, Sec. 103
G.	Bipartisan Budget Act of 2018 (BBA2018)			
	a. Tax credits create incentives to build combined-heat-and-power units	BBA2018 retroactively extended the CHP ITC from the Energy Improvement and Extension Act of 2008 (EIEA2008) through the end of 2021. The ITC in EIEA2008 originally spanned from 2008 through the end of 2016, but BBA2018 applied the ITC to all qualifying CHP facilities that began construction before January 1, 2022	Superseded by Consolidated Appropriations Act, 2021	U.S. Congress, "H.R.1892 - <i>Bipartisan Budget Act of 2018</i> ", Division D, Title I, Subtitle C—Extension and phase-out of energy credit, Sec. 40411, 115th Congress (2017–2018), became Public Law No: 115-123 on February 9, 2018
H.	Consolidated Appropriations Act, 2021 (CAA2021)			

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
a. Tax credits create incentives to build combined-heat-and-power units	CAA2021 extended the CHP ITC in Title 26 U.S. Code Section 48 through the end of 2023. The new Inflation Reduction Act CHP ITC structure now applies for 2023 and 2024, but we still use the flat 10% credit in 2022.	CHP tax credit incentive included in calculations of CHP economics through 2022 (originally 2023 in the law, but the 2023 rate is now superseded by the structure prescribed in the Inflation Reduction Act).	U.S. Congress, “ <a href="#">H.R.133 - Consolidated Appropriations Act, 2021</a> ”, Division EE, Title I, Subtitle C—Extension of Certain Other Provisions, Sec. 132, 116th Congress (2019–2020), became Public Law No: 116-260 on December 27, 2020
<b>I. Inflation Reduction Act, 2022 (IRA)</b>			
a. Section 13102 Extension and modification of energy tax credit	IRA extended the CHP ITC in Title 26 U.S. Code Section 48 through the end of 2024, and modified its structure in 2023 and 2024. Instead of a flat 10% credit in 2023 and 2024, it has a baseline 6% ITC credit. If a project meets prevailing wage and apprenticeship requirements set out in the bill, this percentage is instead 30%. If the project meets domestic material content requirements defined in the bill, the ITC increases by a further 10 percentage points, or by 2 percentage points if the project does not meet the material requirements. Finally, if a project is sited in an energy community as defined in the bill, the ITC is increased by 10 percentage points. If the project is not sited in an energy community, the ITC is increased by 2 percentage points.	We assume the minimum CHP tax credit of 10% in calculations of CHP economics in 2023 and 2024.	U.S. Congress, “ <a href="#">H.R.5376 – Inflation Reduction Act of 2022</a> ”, Title I, Subtitle D—Energy Security, Sec. 13102, 117th Congress (2021–2022), became <a href="#">Public Law No: 117-169</a> on August 16, 2022.

**Transportation sector**

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
A. Energy Policy Act of 1992 (EPACT1992)	Requires government, business, and fuel-provider fleets to meet minimum requirements for alternative-fuel new vehicle purchases and for the use of alternative fuels used in those vehicles	Composite mandates are created for government, electric power sector, and fuel provider fleets based on fleet vehicle stocks	Energy Policy Act of 1992, Public Law 102-486-Oct. 24, 1992
B. California’s Advanced Clean Cars program (ACCP), Zero Emission Vehicle (ZEV) Program,	The Clean Air Act allowed California to implement vehicle emission standards that exceed federal standards and includes a provision allowing	The ACCP—which includes the LEVP as amended on March 22, 2012, and the ZEV Program from July 10,	Section 177 of the Clean Air Act, 42 U.S.C. sec. 7507 (1976); California Air Resources Board, California Exhaust

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
and the Low Emission Vehicle Program (LEVP)	other states to opt into the California program. Fifteen other states have adopted this program. The ZEV program, affecting model year 2018 and later, requires a percentage of manufacturers' sales to be zero-emission vehicles. Manufacturers meet compliance by earning credits, which can be banked	2014—is incorporated. Credit compliance requirements are met for the fifteen Clean Air Act Section 177 states, through both sales and use of limited banking and traveling of these credits.	Emissions Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, August 4, 2005, as amended March 22, 2012; ZEV Standards for 2018 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, July 10, 2014
D Corporate Average Fuel Economy (CAFE) Standards for Model Years 2024–2026 Passenger Cars and Light Trucks	Amends CAFE standards for model year 2024–2026 light-duty vehicles; cars and light trucks are regulated separately	Fuel economy standards are increased in model years 2024–2026, compared with the 2020 SAFE standard, and technology options and attributes (cost, performance, weight) are updated to align with the latest associated Final Regulatory Impact Analysis (FRIA)	Corporate Average Fuel Economy Standards for Model Years 2024–2026 Passenger Cars and Light Trucks, U.S. Department of Transportation, National Highway Traffic Safety Administration; Federal Register Vol. 87, No. 84, Monday, May 2, 2022
E. Alternative-Fuel Vehicle Tax Credits	Federal tax credits are provided to increase the purchase of electric, hybrid, and alternative-fuel vehicles	The tax credits for qualified vehicles are included in the sales projections	26 USC 30B, Energy Policy Act (Public Law 109-58, 2005), Energy Independence and Security Act (Public Law 110-140, 2007), and Energy Improvement and Extension Act (Public Law 111-5, 2008)
G State electric, hybrid, and alternative-fuel vehicle tax and other incentives	More than 30 states provide incentives to purchase electric, hybrid, or alternative-fuel vehicles; the tax incentives are in the form of income reductions, tax credits, and exemptions. Other incentives include use of High Occupancy Vehicle lanes and exemptions from emissions inspections and licensing fees. The incentives offered and the mix varies by state.	State taxes and other incentives for hybrid, electric, and other alternative-fuel vehicles are not incorporated	Various state laws in place in Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Louisiana, Maryland, Massachusetts, Michigan, Missouri, Montana, Nevada, New Jersey, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, Tennessee, Texas, Utah, Virginia, Washington, and Wisconsin

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basis</b>
H	Heavy-Duty (HD) National Program; Greenhouse Gas Emissions and Fuel Consumption Standards for Heavy-Duty Vehicles	Establishes greenhouse gas (GHG) emissions and fuel consumption standards for on-road, heavy-duty trucks and their engines. Standards begin for model year 2014 vehicles and engines and are fully phased in by model year 2018 (Phase I); a second round of standards for medium- and heavy-duty vehicles begins for model year 2021 vehicles and is fully implemented by model year 2027 (Phase II); the second round adds heavy-haul tractors and trailers	HD National Program Phase I and Phase II standards are modeled, with both engine and chassis technologies; compliance is modeled among 13 heavy-duty vehicle V regulatory classifications that represent the discrete vehicle categories set forth in the rule; the standards are held constant in model years after 2027	Section 202 of the Clean Air Act Title 49 USC, Chapter 32902[k]; Energy Independence and Security Act of 2007, Title 1, Section 102; Federal Register, Vol. 76, No. 179, September 2011; Federal Register, Vol 81, No. 206, October 2016
I.	The International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI	Sets limits on emissions of sulfur oxides and nitrogen oxides from ship exhausts and prohibits deliberate emissions of ozone-depleting substances. First effective on May 19, 2005. Requirements added on January 1, 2015, set a maximum of 0.1% sulfur fuel use or exhaust scrubber use in Emission Control Areas (ECA), from a previous 1% limit. In October 2016, International Maritime Organization members agreed to the 2008 MARPOL amendments that implemented a new global limit in 2020 for sulfur emissions from ships. Under the new requirement, vessel operators must use <i>fuel oil on board</i> (which includes main and auxiliary engines and boilers) with a sulfur content of no more than 0.5% mass per mass	MARPOL Annex VI fuel sulfur mandates are reflected in domestic and international shipping fuel choices starting in 2015	MARPOL 73/78, (33 U.S.C 1901(a) (4) & (5), 1902(a)(1)&(5), and 1907 (a), as amended by the Maritime Pollution Prevention Act of 2008 (MPPA), RESOLUTION MEPC.320(74), Public Law 110-280, 122 Stat 2611)
J.	Inflation Reduction Act (IRA)			<a href="#">Public Law 117-169</a>
a.	13401 Clean vehicle credit	This provision extends the Section 30D vehicle tax credit through December 31, 2032, and updates the credit value. This provision also contains vehicle assembly requirements, battery component requirements, vehicle price limits, and income limits for vehicle buyers.	We do not explicitly model this provision, but we assume the total number of vehicles that qualify for the clean vehicle tax credit based on an analysis of official U.S. government IRA expenditure estimates from the Congressional Budget Office. <sup>a</sup>	Part 4. Sec. 13401

<sup>a</sup> U.S. Congressional Budget Office, “Summary Estimated Budgetary Effects of H.R. 5376, the Inflation Reduction Act of 2022,” August 5, 2022, [https://www.cbo.gov/system/files/2022-08/hr5376\\_IR\\_Act\\_8-3-22.pdf](https://www.cbo.gov/system/files/2022-08/hr5376_IR_Act_8-3-22.pdf).

**Electric power sector**

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basis</b>
A.	Clean Air Act Amendments of 1990 (CAAA1990)	Establishes a national limit on electricity generator emissions of sulfur dioxide (SO <sub>2</sub> ) to be achieved through a cap-and-trade program	SO <sub>2</sub> cap-and-trade program is explicitly modeled, choosing the optimal mix of options for meeting the national emissions cap	Clean Air Act Amendments of 1990, Title IV, Sections 401 through 406, Sulfur Dioxide Reduction Program, 42 U.S.C. 7651a through 7651e
		Requires the EPA to establish National Ambient Air Quality Standards (NAAQS) for criteria pollutants. Currently, two designation processes are underway: the first for the SO <sub>2</sub> NAAQS issued in 2010 and the second for the Ozone NAAQS 2015 issued in 2015. EPA designated areas for the 2010 SO <sub>2</sub> NAAQS in four rounds. The final three rounds were court-ordered deadlines, and the final round ended March 2021. States have until March 2026 to comply. For the Ozone NAAQS, the EPA Administrator extended the deadline for final designations to October 2018. Areas falling into the designation of <i>moderate</i> nonattainment had until late 2023 to comply	These standards are not explicitly represented, but the Cross State Air Pollution Rule is incorporated and was developed to help states meet their NAAQS	Clean Air Act Amendment of 1990, Title I, Sections 108 and 109, National Ambient Air Quality Standards for Ozone, 40 CFR Part 50, Federal Register, Vol. 68, No. 3, January 8, 2003. National Ambient Air Quality Standards for Particulate Matter, 40 CFR Part 50, Federal Register, Vol. 62, No. 138, July 18, 1997
		Requires EPA to develop standards for emissions for new power plants; in December 2018 EPA amended the earlier 2015 findings that carbon capture and storage (CCS) was the <i>best system of emissions reductions</i> (BSER) for GHG reductions. Instead, it now recommends efficient steam cycle technologies to reduce GHG, resulting in higher proposed CO <sub>2</sub> emission rate targets for new steam and combined-cycle technologies relative to the 2015 standard	By withdrawing the ruling, EPA has affirmed its intention that new coal plants without CCS can be built, and AEO2023 allows coal plants (using ultra-supercritical technology) without CCS to be built if economical	Review of Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 83 FR 65424, December 20, 2018
B.	Cross-State Air Pollution Rule (CSAPR)	CSAPR requires states to reduce SO <sub>2</sub> and nitrogen oxides (NO <sub>x</sub> ) emissions from power plants. CSAPR consists of four individual cap-and-trade programs, covering two	Cap-and-trade programs for SO <sub>2</sub> and NO <sub>x</sub> are modeled explicitly, allowing the model to choose the best method for	U.S. Environmental Protection Agency, <i>Cross-State Air Pollution Rule</i> , website <a href="http://epa.gov/air-transport">epa.gov/air-transport</a> . Federal Register, Vol. 70, No. 91

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	different SO <sub>2</sub> groups, an annual NO <sub>x</sub> group, and a seasonal NO <sub>x</sub> group. A total of 23 states are subject to annual limits, and 25 states are subject to seasonal limits. In September 2016, EPA finalized an update to the emission budgets and target dates for the CSAPR ozone season program. On March 15, 2021, EPA finalized an update to the CSAPR to require additional emissions reductions of nitrogen oxides from power plants in 12 states and revised the budgets for their emissions from 2022 to 2024	meeting the emission caps. Updated budgets and dates are incorporated	(May 12, 2005), 40 CFR Parts 51, 72, 73, 74, 77, 78, and 96. Federal Register 86 FR 23054 (April 30, 2021)
C. Mercury and Air Toxics Standards (MATS)	MATS sets standards to reduce air pollution from coal- and oil-fired power plants with a capacity greater than 25 MW. The rule requires plants to achieve the maximum achievable control technology for mercury, hydrogen chloride (HCl), and fine particulate matter (PM 2.5)	The Electricity Market Module (EMM) assumes that all coal-fired generating plants above 25 MW have complied by 2016. Plants are required to reduce mercury emissions by 90% relative to uncontrolled levels	U. S. Environmental Protection Agency, <a href="#">Mercury and Air Toxics Standards, website</a>
D. Energy Policy Act of 1992 (EPACT1992)	Created a class of generators referred to as exempt wholesale generators (EWG), exempt from Public Utility Holding Company Act as long as they sell wholesale power	Represents the development of EWGs or what are now referred to as independent power producers (IPPs) in all regions	Energy Policy Act of 1992, Title VII, Electricity, Subtitle A, Exempt Wholesale Generators
E. The Public Utility Holding Company Act of 1935 (PUHCA)	PUHCA is a federal statute that prevents abusive practices in the utility industry. The act grants power to the U.S. Securities and Exchange Commission (SEC) to oversee and outlaw large holding companies that might otherwise control the provision of electrical service to large regions of the country. It gives the SEC power to approve or deny mergers and acquisitions and, if necessary, force utility companies to dispose of assets or change business practices if the company's structure of activities is not deemed to be in the public interest	We assume that holding companies act competitively and do not use their regulated power businesses to cross-subsidize their unregulated businesses	Public Utility Holding Company Act of 1936

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basis</b>
F.	Federal Energy Regulatory Commission (FERC) Orders 888 and 889	FERC has issued two related rules, Orders 888 and 889, which aim to bring low-cost power to consumers through competition, ensure continued reliability in the industry, and provide for open and equitable transmission services by owners of these facilities. Specifically, Order 888 requires open access to the transmission grid currently owned and operated by utilities. The transmission owners must file nondiscriminatory tariffs that offer other suppliers the same services that the owners provide for themselves. Order 888 also allows these utilities to recover stranded costs (investments in generating assets that are unrecoverable as a result of consumers selecting another supplier). Order 889 requires utilities to implement standards of conduct and an Open Access Same-Time Information System (OASIS) through which utilities and non-utilities can receive information regarding the transmission system. As a result, utilities are expected to functionally or physically unbundle their marketing functions from their transmission functions	All generators in a given region are assumed to satisfy load requirements anywhere within the region. Similarly, transactions between regions are assumed to occur if the cost differentials between them make it economical to do so	Promoting Wholesale Competition Through Open Access, Non-Discriminatory Transmission Services by Public Utilities; Public Utilities and Transmitting Utilities, ORDER NO. 888 Issued April 24, 1996), 18 CFR Parts 35 and 385, Docket Nos. RM95-8-000 and RM94-7-001; Open Access Same-Time Information System (formerly Real-Time Information Networks) and Standards of Conduct, ORDER NO. 889, (Issued April 24, 1996), 18 CFR Part 37, Docket No. RM95-9-000



	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
G.	New Source Review (NSR)	On August 28, 2003, EPA issued a final rule defining certain power plant and industrial facility activities as routine maintenance, repair, and replacement, which are not subject to NSR. As stated by EPA, these changes provide a category of equipment replacement activities that is not subject to major NSR requirements under the routine maintenance, repair, and replacement (RMRR) exclusion. In other words, a facility's engagement in RMRR activities will not have to get preconstruction approval from the state or EPA and will not have to install best available emissions control technologies that might be required under the NSR process	We assume coal plants are able to increase their output as electricity demand increases. Their maximum capacity factor is set at 65%. We assume the capacity of existing plants does not increase	EPA, 40 CFR Parts 51 and 52, Deterioration (PSD) and Non-Replacement Provision of the Vol. 68, No. 207, page 61,248, Prevention of Significant Attainment New Source Review (NSR): Equipment Routine Maintenance, Repair and Replacement Exclusion; Final Rule, Federal Register, October 27, 2003
H.	State Clean Energy Standard (CES) Laws, Mandates, and Goals	Several jurisdictions have enacted laws requiring that a certain percentage of their generation comes from qualifying renewable sources. Among these states, some have implemented technology-specific carve-outs, requiring that a certain percentage of required generation comes from a specific energy technology source	To the extent possible, AEO2023 reflects state laws and regulations enacted as of November 2022. We also include clean energy targets set forth by state-level executive branch entities, but do not include voluntary goals. Mandatory targets from the various states are aggregated at the regional level, and achievement of nondiscretionary compliance criteria is evaluated for each region (see the Renewable Fuels Module section of the <i>Assumptions to AEO2023</i> document,)	The states with CES or other requirements providing quantified projections are detailed in Table 1

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
I.	Regional and State Air Emissions Regulations	<p>The Northeast Regional Greenhouse Gas Initiative (RGGI) applies to fossil-fueled power plants over 25 MW in 11 states in New England and the mid-Atlantic region of the United States. New Jersey withdrew in 2011, but it rejoined in 2019. Virginia joined on January 1, 2021. The rule caps CO<sub>2</sub> emissions and requires that states account for CO<sub>2</sub> emitted with allowances purchased at auction. In February 2013, program officials announced a tightening of the cap beginning in 2014. In December 2017, an Updated Model Rule was released, specifying a cap through 2030, modifications to the Cost Containment Reserves, and the creation of an Emissions Containment Reserve</p>	<p>The impact of RGGI is included in the EMM, making adjustments when needed to estimate the emissions caps at the regional level used in NEMS. AEO2023 incorporates the latest model rule specifications, including adding Virginia to the program beginning in 2021</p>	<p>Regional Greenhouse Gas Initiative Model rule, <a href="http://www.rggi.org">www.rggi.org</a></p>
		<p>The California Assembly Bill 32 (AB32) sets GHG reduction goals for 2020 for California. A cap-and-trade program aims to enforce the caps. The cap-and-trade program applies to multiple economic sectors including electric power plants, large industrial facilities, suppliers of transportation fuel, and suppliers of natural gas. Emissions resulting from electricity generated outside California but consumed in the state are also subject to the cap</p>	<p>The EMM models the cap-and-trade program explicitly for CO<sub>2</sub> for California through an emission constraint that accounts for emissions from the other sectors. Limited banking and borrowing of allowances as well as an allowance reserve and offsets are incorporated as specified in the bill</p>	<p>California Code of Regulations, Subchapter 10 Climate Change, Article 5, Sections 95800 to 96023, Title 17, <i>California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms</i>, (Sacramento, CA: July 2011)</p>
		<p>The California Senate Bill 32 (SB32) sets GHG reduction goals for 2030 for California, at 40% lower than 1990 levels, requiring additional declines from the AB32 goals. The California Assembly Bill 398 (AB398), passed in July 2017, provided more clarification on how the new targets will be achieved</p>	<p>AEO2023 assumes the cap-and-trade program developed for AB32 will continue, and it sets new annual targets through 2030 to achieve the SB32/AB398 goals. After 2030, the target remains flat</p>	<p>California Senate Bill 32, California Global Warming Solutions Act of 2006: emissions limit (September 8, 2016); California Assembly Bill 398, California Global Warming Solutions Act of 2006: market-based compliance mechanisms, fire prevention fees, sales and use tax manufacturing exemption (July 25, 2017)</p>

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basis</b>
J.	American Recovery and Reinvestment Act of 2009 (ARRA2009)	ARRA2009 provides \$4.5 billion for smart grid demonstration projects. These projects generally include a wide array of measurement, communications, and control equipment employed throughout the transmission and distribution system that will enable real-time monitoring of the production, flow, and use of power from generator to consumer	In the EMM, we assume that line losses would fall slightly and customers would be more responsive to price signals	American Recovery and Reinvestment Act of 2009, Title IV, Energy and Water Development, Section 405
		ARRA2009 provides \$800 million to fund projects under the Clean Coal Power Initiative program focusing on the capture and sequestration of greenhouse gases	AEO2023 does not assume any new coal with sequestration plants will come online directly from this initiative because most of the selected demonstration projects have since had their funding withdrawn or suspended	American Recovery and Reinvestment Act of 2009, Title IV, “Energy and Water Development”
K.	New York (NY) Clean Energy Standard	The Clean Energy Standard creates two mechanisms to achieve New York’s goal to reduce carbon emissions through greater use of renewable and other zero emission generation. A renewable energy standard requires 50% of New York electricity sales to come from renewable energy sources by 2030. The zero emission credit (ZEC) program requires load-serving entities to purchase ZECs based on their share of state sales. Certain existing nuclear units are eligible to receive the ZECs if their profitability is determined at risk because of low market prices	In the EMM, the renewable standard is modeled explicitly as for other state RPS programs. For states with programs designed specifically to provide support to existing nuclear generating plants (as is the NY Clean Energy Standard), the supporting subsidy is modeled by requiring the existing eligible units to remain operable during the program and by calculating any payment needed to keep them profitable. The calculated payment is passed through to retail prices	State of New York Public Service Commission, Order Adopting a Clean Energy Standard, August 1, 2016
L.	Illinois Future Energy Jobs Bill and Climate and Equitable Jobs Act	The Future Energy Jobs Bill revised the state’s RPS program and created a zero emission credit program for existing nuclear units. The Illinois Power Agency had to purchase ZECs to cover 16% of utility electricity sales in 2014.	In the EMM, the renewable standard is modeled explicitly in the same manner as other state RPS programs. For states with programs designed specifically to	State of Illinois, Future Energy Jobs Bill, Public Act 099-0906, June 1, 2017 and <a href="#">Climate and Equitable Jobs Act, SB2408</a> , September 15, 2021

Legislation	Brief description	<i>Annual Energy Outlook (AEO) handling</i>	Basis
	Existing nuclear units serving Illinois are eligible to receive the ZECs. The Clinton and Quad Cities nuclear plants were selected to receive payments under the original ZEC program. In September 2021, the Illinois Climate and Equitable Jobs Act was passed and includes carbon mitigation credits available to additional nuclear power plants, which led to the reversal of plans to shut down the Byron and Dresden plants	provide support to existing nuclear generating plants (as is the Illinois Future Energy Jobs Bill and Climate and Equitable Jobs Act), the supporting subsidy is modeled by requiring the existing eligible units to remain operable during the program and by calculating any payment needed to keep them profitable. The calculated payment is passed through to retail prices	
M. New Jersey Zero Emission Certificate program for nuclear power plants	New Jersey Senate Bill S2313 establishes a zero emission certificate (ZEC) program for existing nuclear power plants; a maximum of \$300 million is available annually over 10 years to nuclear plants that demonstrate they make a significant contribution to New Jersey air quality and that they are at risk of closure within 3 years	For states with programs designed specifically to provide support to existing nuclear generating plants (as is the New Jersey Zero Emission Certificate program), the supporting subsidy is modeled by requiring the existing eligible units to remain operable during the program and by calculating any payment needed to keep them profitable, subject to the cap. The calculated payment is passed through to retail prices	State of New Jersey, Senate Bill No. 2313, May 23, 2018
N. Creates Ohio Clean Air Program, House Bill Number 6, 133 <sup>rd</sup> General Assembly and House Bill 128, 134 <sup>th</sup> General Assembly	Ohio House Bill 6 provided payments for qualified nuclear resources, but these provisions were repealed through the later HB128. HB6 also provides support to several coal plants owned and operated by the Ohio Valley Electric Corporation	AEO2023 no longer models the state specific nuclear subsidy because that portion of HB6 was repealed; coal plant support continues to be modeled	State of Ohio, House Bill No. 6, July 23, 2019, House Bill No. 128, June 30, 2021
O. Connecticut Senate Bill No. 1501	Connecticut passed Senate Bill No. 1501 in June 2017, permitting nuclear power to compete in zero-emissions state energy auctions and solicitations, as required under Public Act 17-3. In December	As the Connecticut legislation creates a general clean energy auction, rather than specific support for existing nuclear generating plants, the	Connecticut General Assembly, Senate Bill No. 1501, June 2017

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	<p>2018, Connecticut’s Department of Energy and Environmental Protection selected a 10-year proposal from the Millstone nuclear plant for about half of its 2.1 gigawatt output. Between 2022 and 2029, Millstone will receive higher prices based on environmental, economic, and grid benefits. The Seabrook nuclear power plant, in New Hampshire, was also selected, and its contract begins in 2022</p>	<p>standard modeling approach used to model other state programs is not applied to Connecticut. In the AEO2023 core cases, nuclear plants in New England tend to be economical and are not projected to retire through at least 2030</p>	
<p>P. Infrastructure Investment and Jobs Act 2021</p>	<p>The civil nuclear credit program supports nuclear power plants in competitive electricity markets that may shut down due to economic viability. The Secretary of Energy will determine specific unit eligibility and credit level, under a \$6 billion total budget, allocated in fiscal years (FY) 2022–2026</p>	<p>The EMM models this program by expanding the earlier state ZEC logic to all competitive states that are not already receiving state payments, but for these additional states, the costs are not passed through to electricity prices</p>	<p>Infrastructure, Investment and Jobs Act, <a href="#">HR3684</a>, November 15, 2021, Section 40323</p>
<p>Q. EPA Coal Combustion Residual (CCR) rule</p>	<p>Defines clay-lined impoundments as <i>lined</i> and allows unlined surface implements to continue to receive coal ash unless they leak. By April 11, 2021, unlined surface impoundments and units that failed the aquifer location restriction must cease receiving waste and initiate closure or retrofit</p>	<p>Not explicitly modeled in NEMS but may affect individual coal plant retirement decisions</p>	<p>EPA issued a rule on August 28, 2020, to update 2015 Coal Combustion Residual (CCR) regulations</p>
<p>R. EPA’s Effluent Limitation Guidelines (ELG)</p>	<p>Proposed and published November 22, 2019, to:</p> <ul style="list-style-type: none"> <li>• Extend compliance deadlines for up to two years</li> <li>• Expand technology options for achieving compliance</li> <li>• Provide flexibility in managing ELG systems under a voluntary incentives program that allows facilities until 2028 to implement new limits if they adopt additional measures to achieve stricter limitations on specific pollutants</li> <li>• Impose less-stringent requirements for high-</li> </ul>	<p>Not explicitly modeled in NEMS but may affect individual power plant retirement decisions</p>	<p>ELG compliance is reflected in survey Form EIA-860 filings as each plant takes action to comply</p>

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
S. Inflation Reduction Act of 2022	flow facilities, low-utilization units, and facilities retiring by 2028	AEO2023 includes the revised tax credit values assuming the prevailing wage and apprenticeship requirements are satisfied for all technologies in the electric power sector. Solar PV, both standalone and hybrid, is assumed to claim the PTC. Battery storage is assumed to take the ITC.	<a href="#">Public Law 117-169</a>
	Sections 13101 and 13102 modified and extended PTC and ITC values available for eligible electricity generating technologies. They also eliminated the phaseout of PTC for onshore wind. These provisions offered solar photovoltaic (PV) the option to claim either the ITC or PTC and allowed battery storage to receive the ITC. Furthermore, they modified the tax credit phaseout for certain technologies	AEO2023 includes the new tax credit values assuming the prevailing wage and apprenticeship requirements are satisfied for all technologies in the electric power sector. The domestic content bonus is assumed for onshore and offshore wind, and both nuclear technologies. Geothermal, hydroelectric, and offshore wind technologies take the ITC, although biomass, onshore wind, and nuclear technologies take the PTC.	
	Section 13701 and 13702 created new PTC and ITC for qualified domestically produced electricity from zero-emission resources	AEO2023 explicitly models the credits based on a base rate of 0.3 cents/kWh that is reduced when average revenues exceed 2.5 cents/kWh. The facilities are assumed to meet prevailing wage and apprenticeship requirements to receive a bonus factor of five.	
	Section 13105 created a PTC for existing nuclear generation for facilities online before 2022. Qualifying generation will get a credit in 2024 through 2032	The tax credit is extended and modified according to the values	

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	capture credit under IRS section 45Q	indicated in the IRA, assuming prevailing wage and apprenticeship requirements are met. The required start date for qualifying CO <sub>2</sub> capture and storage projects is extended to all plants that begin construction before January 1, 2033. The tax credit for CO <sub>2</sub> used for EOR or stored in saline aquifers is set to \$60 per metric ton (mt) and \$85 per mt, respectively, from 2023 to 2026. After 2026, credits rise with inflation.	

### Oil and natural gas supply

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
A.	The Outer Continental Shelf Deep Water Royalty Relief Act (DWRRA)	Requires that all tracts offered by November 28, 2000, in deep water in certain areas of the Gulf of Mexico must be offered under the new bidding system permitted by the DWRRA. The Secretary of the Interior must offer such tracts with a specific minimum royalty suspension volume based on water depth	Incorporates royalty rates based on water depth	43 USC SS 1331-1356 (2002)
B.	Energy Policy and Conservation Act Amendments of 2000	Requires the U.S. Geological Survey (USGS) to inventory oil and natural gas resources beneath federal lands	To date, the USGS has completed its Rocky Mountain oil and natural gas resource inventory. The results of this inventory have been incorporated in the technically recoverable oil and natural gas resource volumes used for the Rocky Mountain region	Scientific Inventory of Onshore Federal Lands: Oil and Gas Resources and Reserves and the Extent and Nature of Restrictions or Impediments to Their Development: The Paradox/San Juan, Uinta/Piceance, Greater Green River, and Powder River Basins and the Montana Thrust Belt; Prepared by the U.S. Departments of Interior, Agriculture, and Energy, January 2003

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basis</b>
C.	Tax Cuts and Jobs Act of 2017	Sets federal corporate tax rate at 21% and establishes a program for the leasing and developing of crude oil and natural gas from the coastal plain (1002 Area) of the Arctic National Wildlife Refuge (ANWR)	Federal tax rate is set to 21%. Oil fields in the 1002 Area of ANWR are available for exploration and development if economical	Public Law 115-97
D.	Colorado setback requirements between new wells and most buildings	The Colorado Oil and Gas Conservation Commission (COGCC) approved revisions to oil and natural gas permitting rules in Colorado. Of note is the provision that increased the drilling setback from homes and businesses from 500 feet to 2,000 feet. The new setback requirement applies to new permit applications and still-pending applications submitted under the previous rules	Modeled by reducing the acreage that can be drilled in Colorado	Senate Bill 19-181 directed the COGCC to regulate drilling in a way that protects public health and the environment
E.	Inflation Reduction Act (IRA)			Public Law 117-169
F.	a. Section 13104 Extension and modification of credit for carbon oxide sequestration	This provision extends the carbon oxide capture credit under IRS section 45Q	The tax credit is extended and modified according to the values indicated in the IRA, assuming prevailing wage and apprenticeship requirements are met. The required start date for qualifying CO <sub>2</sub> capture and storage projects is extended to all plants that begin construction before January 1, 2033. The tax credit for CO <sub>2</sub> used for enhanced oil recovery (EOR) or stored in saline aquifers is set to \$60 per metric ton (mt) and \$85 per mt, respectively, from 2023 to 2026. After 2026, credits rise with inflation.	
	b. Section 50261 Offshore oil and gas royalty rate	This provision increases the minimum royalty rate for new offshore fossil fuel leases	We assume the updates to the minimum royalty rates	
	c. Section 50262 Mineral Leasing Act modernization	This provision updates the onshore oil and natural gas royalty rates	We assume the updates to the onshore oil and natural gas production royalty rates	
	d. Section 50264 Lease sales under the 2017–	This provision requires the completion of the 2017–2022	We assume the 2017–2022 Outer Continental	



Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
2022 Outer Continental Shelf leasing program	Outer Continental Shelf leasing program	Shelf Leasing Program is completed	

### Natural gas market

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
A.	Federal Motor Fuels Excise Taxes for Compressed Natural Gas and Liquefied Natural Gas in Vehicles. Liquefied natural gas tax changed as of January 1, 2016, under the Surface Transportation and Veterans Health Care Choice Improvement Act of 2015 (H.R. 3236)	Taxes are levied on each gasoline-gallon equivalent of compressed natural gas and each diesel-gallon equivalent of liquefied natural gas used in road vehicles and ships	Current federal motor fuels excise taxes on natural gas fuel for road vehicles and ships are included in retail prices and are assumed to be extended indefinitely in nominal dollars	26 USC 4041
B.	State Motor Fuels Taxes for Compressed Natural Gas and Liquefied Natural Gas in Vehicles	Taxes are levied on each gallon, gasoline-gallon equivalent, or diesel-gallon equivalent of natural gas for road vehicles	Current state motor fuels excise taxes on natural gas fuel for road vehicles are included in retail prices and are assumed to be extended indefinitely in nominal rates	Determined by review of existing state laws

### Liquid fuels market

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basics
A.	Ultra-low sulfur diesel (ULSD) regulations under the Clean Air Act Amendment of 1990	Since mid-2012, all diesel for domestic use (highway, nonroad, locomotive, marine) must be at or below 15 parts per million (ppm) of sulfur	Reflected in diesel specifications	40 CFR Parts 69, 80, 86, 89, 94, 1039, 1048, 1065, and 1068
B.	Mobile Source Air Toxics (MSAT) Controls Under the Clean Air Act Amendment of 1990	Establishes a list of 21 substances emitted from motor vehicles that are known to cause serious human health effects, particularly benzene, formaldehyde, 1,3 butadiene, acetaldehyde, diesel exhaust organic gases, and diesel particulate matter; establishes anti-backsliding and anti-dumping rules for gasoline	Modeled by updating gasoline specifications to most current EPA gasoline survey data (2005), which represents anti-backsliding requirements	40 CFR Parts 60 and 86
C.	Low Sulfur Gasoline Regulations Under the Clean Air Act Amendment of 1990	Gasoline must contain an average of 30 ppm sulfur or less by 2006; small refiners may be permitted to delay compliance until 2008	Reflected in gasoline specifications	40 CFR Parts 80, 85, and 86

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basics</b>
D.	Tier 3 Vehicle Emission and Fuel Standards Program	Gasoline must contain an average of 10 ppm sulfur or less by January 1, 2017; small refiners may be permitted a three-year delay	Reflected in gasoline specifications beginning in 2017	40 CFR Parts 79, 80, 85, et al., <a href="#">final rule</a>
E.	Methyl Tertiary Butyl Ether (MTBE) Bans in 25 states	25 states ban the use of MTBE in gasoline by 2007	Ethanol assumed to be the oxygenate of choice for all motor gasoline blends	State laws in Arizona, California, Colorado, Connecticut, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Rhode Island, South Dakota, Vermont, Washington, and Wisconsin
F.	Regional Clean Fuel Formulations	States with air quality problems can specify alternative gasoline or diesel formulations with EPA's permission. California has long had authority to set its own fuel standards	Reflected in Petroleum Administration for Defense District (PADD)-level gasoline and diesel specifications	State implementation plans required by the Clean Air Act Amendments of 1990, as approved by EPA
G.	Federal Motor Fuels Excise Taxes	Taxes are levied on each gallon of transportation fuels to fund infrastructure and general revenue. These taxes are set to expire at various times in the future but are expected to be renewed, as they have been in the past	Gasoline, diesel, and ethanol blend tax rates are included in end-use prices and are assumed to be extended indefinitely at current nominal rates	26 USC 4041 Extended by American Jobs Creation Act of 2004
H.	State Motor Fuel Taxes	Taxes are levied on each gallon of transportation fuels. The assumption that state taxes will increase at the rate of inflation supports an implied need for additional highway revenues as driving increases	Gasoline and diesel rates are included in end-use prices and are assumed to be extended indefinitely in real terms (to keep pace with inflation)	Determined by review of existing state laws performed semi-annually by EIA's Office of Energy Statistics
I.	Diesel Excise Taxes	Phases out the 4.3 cents excise tax on railroads between 2005 and 2007	Modeled by phasing out	American Jobs Creation Act of 2004, Section 241
J.	Energy Policy Act of 2005 (EPACT2005)			
	a. Biodiesel mixture tax credit (BTC)	Petroleum product blenders may claim tax credits for blending biodiesel or renewable diesel into diesel fuel or heating oil. Qualified producers or blenders are eligible for an income tax credit of \$1.00 per gallon. The	The tax credits are applied against the production costs of the products into which they are blended. Biodiesel and renewable diesel are assumed to be blended into highway diesel,	26 USC 40, 26 USC 6426, and 26 USC40A; Tax credits extended through December 31, 2016, by Public Law 114-113)

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basics
	current BTC was signed into law in December 2019, was retroactively applied to 2018 and 2019, and expired at the end of 2022	nonroad diesel, or heating oil	
b. Renewable Fuel Standard (RFS)	This section has largely been redefined by EISA2007 (see item K); however, EPA rulemaking completed for this law was assumed to contain guiding principles of the rules and administration of EISA2007		Energy Policy Act of 2005, Section 1501
c. Elimination of oxygen content requirement in reformulated gasoline	Removes the 2% oxygen requirement for reformulated gasoline (RFG) nationwide	Oxygenate waiver already an option of the model. MTBE was phased out in 2006 as a result of the petroleum industry's decision to discontinue use	Energy Policy Act of 2005, Section 1504
d. Coal gasification provisions	Investment tax credit program for qualifying advanced clean coal projects including coal-to-liquids (CTL) projects	Two CTL units are available to build with lower capital costs, reflecting the provision's funding	Energy Policy Act of 2005, Section 1307
K. Energy Independence and Security Act of 2007 (EISA2007)			
a. Renewable Fuel Standard (RFS)	Requires the use of 36 billion gallons of ethanol per year by 2022. Corn ethanol is limited to 15 billion gallons. Any other biofuel may be used to fulfill the balance of the requirement, but the balance must include 16 billion gallons per year of cellulosic biofuel by 2022 and 1 billion gallons per year of biodiesel by 2012. EPA is authorized to reduce volume targets specified in the statute in some circumstances.	The RFS is included; however, we assume the schedule for cellulosic biofuel is adjusted downward, consistent with waiver provisions contained in the law	40 CFR Part 80 Subpart M; 40 CFR Part 1090; <a href="#">RFS Program: RFS Annual Rules</a>
L. State Heating Oil Mandates	A number of northeastern states passed legislation that reduces the maximum sulfur content of heating oil to between 15 ppm and 50 ppm in different phases through 2016	All state regulations included as legislated. 2013 EIA heating oil consumption data are used to calculate respective state census division shares for new consumption of low sulfur diesel as heating oil	Vermont Energy Act of 2011, Maine State Legislature HP1160, New Jersey State Department of Environmental Protection, Amendment N.J.A.C. 7:27-9.2, New York State Senate Bill 51145C
M. California Low Carbon Fuel Standard (LCFS)	California passed legislation that aims to reduce the	The LCFS is included as legislated for gasoline and	California Air Resources Board (CARB), <a href="#">Final</a>

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basics
	carbon intensity (CI) of motor gasoline and diesel fuels sold in California by 10% between 2012 and 2020 through the increased sale of alternative <i>low-carbon</i> fuels. In 2018, the LCFS was extended through 2030 with an additional 10% planned reduction in carbon intensity, for a total 20% reduction relative to the 2010 baseline	diesel fuel sold in California and for other regulated fuels	<a href="#">Regulation Order: Subarticle 7. Low Carbon Fuel Standard</a>
Oregon Clean Fuels Program (CFP)	Oregon passed legislation that aims to reduce the carbon intensity (CI) of motor gasoline and diesel fuels sold in Oregon by 10% by 2025 from the 2015 baseline, followed by a 20% reduction by 2030 and 37% by 2035	The CFP is included as legislated for gasoline and diesel fuel sold in Oregon and for other regulated fuels. The update to the CFP extending legislation to 2030 and 2035 is not included in AEO2023	Oregon Department of Environmental Quality (DEQ), <a href="#">Permanent Administrative Order DEQ 199-2018, Chapter 340</a>
N. California Assembly Bill 32 (AB32)	The California AB32, the Global Warming Solutions Act of 2006, authorized the California Air Resources Board to set GHG reduction goals for 2020 for California. A cap-and-trade program was designed to enforce the caps. The cap-and-trade program applies to multiple economic sectors including electric power plants, large industrial facilities, and suppliers of natural gas. Emissions resulting from electricity generated outside California but consumed in the state are also subject to the cap	The AB32 cap-and-trade was more fully implemented in AEO2013, in which industrial facilities, refineries, fuel providers, and non-CO <sub>2</sub> GHG emissions were added to the representation already in the electrical power sector of NEMS. In addition, limited banking and borrowing, as well as an allowance reserve and offset purchases, were modeled, providing some compliance flexibility and cost containment	California Code of Regulations, Subchapter 10 Climate Change, Article 5, Sections 95800 to 96023, Title 17, California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms, (Sacramento, CA: July 2011)
O. EPA Waiver	EPA approved two waivers for the use of ethanol motor gasoline blends of up to 15% in 2001 vehicles and newer	These two waivers were included and modeled based on forecast vehicle fleets and potential infrastructure and liability setbacks	EPA-HQ-OAR-2009-0211; FRL-9215-5, EPA-HQ-OAR-2009-0211; FRL-9258-6
P. U.S. Department of Commerce, Bureau of Industry and Security (BIS): clarification on the export of crude oil under the Export Administration Regulations (EAR)	The definition of crude oil excludes hydrocarbon mixtures that have been processed through a crude oil distillation tower	Processed American Petroleum Institute (API) 50+ crude oil is assumed to be processed condensate and is allowed to be exported	Crude oil was defined in Section 754.2 of the EAR on December 30, 2014, and was subsequently moved to <a href="#">Section 772.1</a> on May 12, 2016; see page 13
Q. U.S. Congress, H.R. 1314—Bipartisan Budget Act of 2015, Title IV – Strategic Petroleum	Sec. 401-404 requires a test drawdown, actual drawdown, and sale of crude oil from the	Explicitly represents the crude oil withdrawals from the SPR as specified by the act	<a href="#">H.R.1314—Bipartisan Budget Act of 2015</a>

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basics</b>
	Reserve, Sec. 401-404, 114th Congress (2015–2016)	Strategic Petroleum Reserve (SPR) during FY 2018–FY 2025		
R.	U.S. Congress, H.R. 22—FAST Act, Sec. 32204, Strategic Petroleum Reserve drawdown and sale, 114th Congress (2015–2016)	Sec. 32204 requires drawdown and sale of crude oil from the SPR during a specified timeframe	Explicitly represents the crude oil withdrawals from the SPR as specified by the act	<a href="#">H.R.22—Fixing America’s Surface Transportation Act</a>
S.	U.S. Congress, H.R. 2029—Consolidated Appropriations Act, 2016, Division O—Other matters, Title I—Oil Exports, Safety Valve, and Maritime Security, 114th Congress (2015–2016)	Title 1, Sec. 101 ends the ban on U.S. crude oil exports; however, under extenuating circumstances, the President may restrict U.S. crude oil exports for no more than one year	Any crude oil produced in the United States is allowed to be exported	<a href="#">H.R.2029—Consolidated Appropriations Act, 2016</a>
T.	U.S. Congress, H.R.34 – 21st Century Cures Act, Sec. 5010, Strategic Petroleum Reserve drawdown, 114th Congress (Dec. 4, 2015)	Sec. 5010 requires drawdown and sale of crude oil from the SPR during FY 2017–FY 2019 (Public Law 114-255)	Explicitly represents the crude oil withdrawals from the SPR as specified by the act	<a href="#">H.R.34—21st Century Cures Act, Dec. 4, 2015</a>
U.	U.S. Congress, H.R.1 – An act to provide for reconciliation pursuant to titles II and V of the concurrent resolution on the budget for fiscal year 2018, Sec. 2003, Strategic Petroleum Reserve drawdown and sale, 115th Congress (Dec. 22, 2017)	Sec. 20003 requires drawdown and sale of crude oil from the SPR during FY 2026–FY 2027 (Public Law 115-97)	Explicitly represents the crude oil withdrawals from the SPR as specified by the act	<a href="#">H.R.1—Sec. 20003, Public Law 115-97, Dec. 22, 2017</a>
V.	U.S. Congress, H.R.1892 - Bipartisan Budget Act (BBA) of 2018, Sec. 30204, Strategic Petroleum Reserve drawdown, 115th Congress (Feb. 8, 2018)	Sec. 30204 requires drawdown and sale of crude oil from the SPR during FY 2022–FY 2027 (Public Law 115-123)	Explicitly represents the crude oil withdrawals from the SPR as specified by the act	<a href="#">H.R.1892—Bipartisan Budget Act of 2018, Feb. 8, 2018</a>
W.	U.S. Congress, H.R.1625 – Consolidated Appropriations Act, 2018, Sec. 501, Strategic Petroleum Reserve drawdown, 115th Congress (March 23, 2018)	Sec. 501 requires drawdown and sale of crude oil from the SPR during FY 2020–FY 2021 (Public Law 115-123)	Explicitly represents the crude oil withdrawals from the SPR as specified by the act	<a href="#">H.R.1625—Consolidated Appropriations Act, 2018, March 23, 2018</a>

	<b>Legislation</b>	<b>Brief description</b>	<b>Annual Energy Outlook (AEO) handling</b>	<b>Basics</b>
X.	U.S. Congress, S.2800 – America’s Water Infrastructure Act of 2018, Sec. 3009, Strategic Petroleum Reserve drawdown, 115th Congress (Oct. 23, 2018)	Sec. 3009 requires drawdown and sale of crude oil from the SPR during FY 2028 (Public Law 115-270)	Explicitly represents the crude oil withdrawals from the SPR as specified by the act	<a href="#">S.2800—America’s Water Infrastructure Act of 2018, Oct. 23, 2018</a>
Y.	U.S. Congress, H.R.3684 – Infrastructure Investment and Jobs Act, Sec. 90002, Strategic Petroleum Reserve drawdown and sale, 117th Congress (Nov. 15, 2021)	Sec. 90002 requires drawdown and sale of crude oil from the SPR during FY 2028–FY 2031 (Public Law 117-58)	Explicitly represents the crude oil withdrawals from the SPR as specified by the act	<a href="#">H.R.3684—Infrastructure Investment and Jobs Act, Nov. 15, 2021</a>
Z.	Inflation Reduction Act (IRA)			<a href="#">Public Law 117-169</a>
	Section 13201 Extension of incentives for biodiesel, renewable diesel, and alternative fuels	This provision extends the biodiesel and renewable diesel credit and an alternative fuel credit.	We implemented a simplified version of this credit that extends the existing biomass-based diesel credit through 2027.	
	Section 13202 Extension of second generation biofuel incentives	This provision extends a tax credit for second-generation biofuel production.	We implemented a simplified version of this credit that extends the credit through 2027.	
	Section 13203 Sustainable aviation fuel credit	This provision creates a sustainable aviation fuel credit equal to \$1.25 per gallon.	We implemented a simplified version of this credit that extends the credit through 2027	
	Section 13704 Clean fuel production tax credit	This provision creates a new tax credit for clean fuels, including a credit for sustainable aviation fuel, produced after December 1, 2024, and sold before December 31, 2027.	We implemented a simplified version of this credit for certain qualified fuels.	

Data source: U.S. Energy Information Administration, Office of Energy Analysis

## Appendix: Existing Clean Energy and Energy Efficiency Policies in the Reference Case

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AEO2023 reflects a number of state-level policies that affect its projections of the electricity generation mix.

AEO2023 Reference case divides state regulations into two general categories: state clean energy standards and state energy efficiency programs.

### Clean energy standards

To the extent possible, the AEO2023 reflects state laws and regulations enacted as of November 2022, which establish minimum requirements for clean energy generation or capacity for load-serving entities operating in the state. These requirements represent known clean energy standards (CES). We include net-zero greenhouse gas emissions standards and carbon neutrality goals among the clean energy targets if they are enacted in legislation or set forth by state-level executive branch entities, but we do not include zero-emission credit policies within this group. The AEO2023 projections do not include laws and regulations with voluntary goals, but it does include clean energy targets set forth by state-level executive branch entities.

The AEO2023 Reference case assumes that states will meet their CES targets, yet it also assumes that states will not necessarily meet targets for interim years. We estimate CES compliance constraints in most regions; however, because NEMS is not a state-level model, each state generally represents only a portion of one of the NEMS electricity regions. In general, we have confirmed the requirements for each state through original legislative or regulatory documentation.

Most states are meeting or exceeding their interim required levels of renewable generation, based on qualified generation or purchases of renewable energy credits.<sup>1</sup> A number of factors helped make CES compliance attainable for generators, including:

- New CES-qualified generation capacity timed to take advantage of federal incentives
- Lower cost of wind, solar, and other renewable technologies
- State and local policies that either reduce costs (for example, equipment rebates) or increase revenue streams (for example, net metering) associated with CES-eligible technologies
- Credit trading among compliant entities within a state and across state boundaries

As states continue adopting 100% targets, they use terms such as carbon-free, carbon-neutral, or clean energy to define their policies. However, each state has defined these terms in its own way, and in some cases, they include non-renewable sources to count toward the policy target. When referring to these policies collectively, we call them carbon-neutral policies.

The CES requirements for each state, as modeled for the AEO2023, are in Table 1. These modeled requirements may differ from the written legislation. For example, policies designed to create an economy-wide carbon-neutral or zero-carbon state are modeled as a 100% clean energy standard

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<sup>1</sup> G. Barbose, *U.S. Renewables Portfolio Standards: 2021 Annual Status Report* (Berkeley, CA: Lawrence Berkeley National Laboratory, February 2021).

due to limitations that our National Energy Modeling System (NEMS) has to model state-level carbon emissions.

**Table 1. Aggregate clean energy standards requirements as modeled for AEO2023**

State	Target	Qualifying renewables	Qualifying other (thermal, efficiency, nonrenewable, distributed generation, etc.)
Arizona (AZ)	15% by 2025	Solar, wind, biomass, hydro, land fill gas (LFG), and anaerobic digestion built after January 1, 1997	Direct use of solar heat, ground-source heat pumps, renewable-fueled CHP, and fuel cells using renewable fuels
California (CA)	60% electricity generation by 2030, 100% carbon-free by 2045	Geothermal electric, solar thermal electric, solar photovoltaics, wind (all), biomass, municipal solid waste (MSW), LFG, tidal, wave, ocean thermal, wind (small), hydroelectric (small), and anaerobic digestion	Energy storage and fuel cells using renewable energy  Nuclear and hydroelectric (large) qualify after 2030 toward the 100% carbon-free by 2045 target
Colorado (CO) legislation	30% by 2020 for investor-owned utilities, 20% by 2020 for large electric cooperatives, 10% by 2020 for other cooperatives and municipal utilities serving more than 40,000 customers	Solar, wind, biomass, hydro, and geothermal	Recycled energy, coal-mine methane, <a href="#">pyrolysis</a> gas produced from MSW, and fuel cells
Colorado (CO) Executive Order <sup>a</sup>	100% carbon-free generation by 2050	Geothermal electric, solar thermal electric, solar photovoltaics, wind, biomass, MSW, LFG hydroelectric, and anaerobic digestion	Energy storage and fuel cells using renewable energy, nuclear
Connecticut (CT) legislation	48% by 2030 (44% renewables, 4% efficiency and CHP)	Solar, wind, biomass, hydro (with exceptions), geothermal, LFG/MSW, anaerobic digestion, and marine	CHP and fuel cells
Connecticut (CT) Executive Order <sup>b</sup>	100% carbon-free generation by 2050	Geothermal electric, solar thermal electric, solar photovoltaics, wind, biomass, MSW, LFG hydroelectric, and anaerobic digestion	
District of Columbia (DC)	100% by 2040	Solar, wind, biomass, hydro, geothermal, LFG/MSW, and marine	Direct use of solar and cofiring
Delaware (DE)	40% by 2035	Solar, wind, biomass, hydro, geothermal, LFG, anaerobic digestion, and marine	Fuel cells
Hawaii (HI)	100% by 2045	Geothermal electric, solar thermal electric, solar photovoltaics, wind (all), biomass, hydroelectric, hydrogen, geothermal heat pumps, MSW, CHP, landfill gas, tidal, wave, ocean thermal, wind (small), anaerobic digestion, and fuel cells using renewable fuels	Solar water heat, solar space heat, and solar thermal process heat



State	Target	Qualifying renewables	Qualifying other (thermal, efficiency, nonrenewable, distributed generation, etc.)
Illinois (IL)	50% renewable by 2040	Solar, solar thermal, wind, biomass, hydro, anaerobic digestion, LFG, and biodiesel	None
Iowa (IA)	105 megawatts (MW) of eligible renewable resources	Solar, wind, some types of biomass and waste, and small hydro	None
Louisiana (LA) Executive Order <sup>c</sup>	100% carbon-free generation by 2050	Geothermal electric, solar thermal electric, solar photovoltaics, wind, biomass, MSW, LFG hydroelectric, and anaerobic digestion	Energy storage and fuel cells using renewable energy, nuclear
Massachusetts (MA) legislation	35% by 2030 (and an additional 1% per year thereafter)	Solar, solar thermal, wind, hydro, some biomass technologies, LFG/MSW, geothermal electric, anaerobic digestion, and marine	Fuel cells
Massachusetts (MA) Executive Order <sup>d</sup>	100% carbon-free generation by 2050	Geothermal electric, solar thermal electric, solar photovoltaics, wind, biomass, MSW, LFG, anaerobic digestion, and marine	Energy storage and fuel cells using renewable energy, nuclear
Maryland (MD)	60% by 2040	Solar, wind, biomass, geothermal, LFG/MSW, anaerobic digestion, and marine	Solar water heating, ground-source heat pumps, and fuel cells
Maine (ME)	100% by 2050	Solar, wind, biomass, hydro, geothermal, LFG/MSW, and marine	CHP and fuel cells
Michigan (MI) legislation	15% by 2021, with specific new capacity goals for utilities that serve more than one million customers	Solar, wind, hydro, biomass, LFG/MSW, geothermal electric, anaerobic digestion, and marine	CHP, coal with carbon capture and sequestration, and energy efficiency measures for up to 10% of a utility's sales obligation
Michigan (MI) Executive Order <sup>e</sup>	100% carbon-free generation by 2050	Geothermal electric, solar thermal electric, solar photovoltaics, wind, biomass, MSW, LFG hydroelectric, and anaerobic digestion	Energy storage and fuel cells using renewable energy, nuclear
Minnesota (MN)	31.5% by 2020 (Xcel), 26.5% by 2025 (other investor-owned utilities), or 25% by 2025 (other utilities)	Solar, wind, hydro, biomass, LFG/MSW, and anaerobic digestion	Cofiring and hydrogen
Missouri (MO)	15% by 2021	Solar, wind, hydro, biomass, LFG/MSW, anaerobic digestion, and ethanol	Fuel cells
Montana (MT)	15% by 2015	Solar, wind, hydro, geothermal, biomass, and LFG	Compressed air energy storage
Nebraska (NE)	100% carbon-free generation by 2050	Geothermal electric, solar thermal electric, solar photovoltaics, wind (all), biomass, MSW, LFG, wind, hydroelectric, and anaerobic digestion	Direct use of solar heat, CHP, hydrogen, and nuclear
North Carolina (NC)	100% carbon-free by 2050, with interim target of 70% by 2030	Geothermal electric, solar thermal electric, solar photovoltaics, wind (all), biomass, MSW, LFG, tidal, wave, ocean thermal, wind (small), hydroelectric (small), and anaerobic digestion	Direct use of solar heat, CHP, hydrogen, demand reduction, and nuclear

State	Target	Qualifying renewables	Qualifying other (thermal, efficiency, nonrenewable, distributed generation, etc.)
New Hampshire (NH)	24.8% by 2025	Solar, wind, small hydro, marine, and LFG	Fuel cells, CHP, microturbines, direct use of solar heat, and ground-source heat pumps
New Jersey (NJ) legislation	50% by 2030 with the solar portion reaching 5.1% in 2021 before gradually decreasing to 1.1% by 2033	Solar, wind, hydro, geothermal, LFG/MSW, and marine	None
New Jersey (NJ) Executive Order <sup>f</sup>	100% carbon-free generation by 2050	Geothermal electric, solar thermal electric, solar photovoltaics, wind, biomass, MSW, LFG hydroelectric, and anaerobic digestion	Energy storage and fuel cells using renewable energy, nuclear
New Mexico (NM)	80% renewable generation by 2040, 100% carbon-free by 2045	Solar, wind, hydro, geothermal, and LFG (carbon-free includes nuclear)	Zero-emission technology, not including nuclear
Nevada (NV)	50% renewable generation by 2030, 100% carbon-free by 2050	Solar, wind, hydro, geothermal, biomass, and LFG/MSW (carbon-free includes nuclear)	Waste tires, direct use of solar and geothermal heat, and efficiency measures (which can account for one-quarter of the target in any given year)
New York (NY)	70% renewable generation by 2030, 100% carbon-free by 2040	Solar, wind, hydro, geothermal, biomass, LFG, anaerobic digestion, certain biofuels, and marine (carbon-free includes nuclear)	Direct use of solar heat, CHP, and fuel cells
Ohio (OH)	8.5% renewable energy resources by 2026	Solar, wind, hydro, biomass, geothermal, and LFG/MSW	CHP, fuel cells, anaerobic digestion, and microturbines
Oregon (OR)	80% clean energy by 2030, 90% clean energy by 2035, 100% clean energy by 2050 for investor-owned utilities 50% renewable energy by 2040 for all other utilities	Solar, wind, hydro, biomass, geothermal, LFG/MSW, anaerobic digestion, and marine	Hydrogen. Any technology with zero CO <sub>2</sub> emissions
Pennsylvania (PA)	18% by 2020	Solar, wind, hydro, biomass, geothermal, and LFG/MSW	CHP, certain advanced coal technologies, certain energy efficiency technologies, fuel cells, direct use of solar heat, and ground-source heat pumps
Rhode Island (RI)	100% renewable by 2033	Solar, wind, hydro, biomass, geothermal, anaerobic digestion, LFG, biodiesel, and marine	Fuel cells
Texas (TX)	5,880 MW by 2015	Solar, wind, hydro, biomass, geothermal, LFG, and marine	Direct use of solar heat and ground-source heat pumps
Virginia (VA)	100% carbon-free by 2045	Solar, wind, hydro, geothermal, biomass, LFG, anaerobic digestion, certain biofuels, and marine (carbon-free includes nuclear)	None
Vermont (VT)	75% by 2032	Geothermal, solar, wind, biomass, hydro, LFG, marine, anaerobic	Ground-source heat pumps and CHP

State	Target	Qualifying renewables	Qualifying other (thermal, efficiency, nonrenewable, distributed generation, etc.)
		digestion, and fuel cells using renewable fuels	
Washington (WA)	100% carbon-free by 2045	Solar, wind, hydro, biomass, geothermal, LFG, anaerobic digestion, biodiesel, and marine	CHP
Wisconsin (WI) legislation	10% by 2015	Solar, wind, hydro, biomass, geothermal, LFG/MSW, small hydro, anaerobic digestion, and marine	CHP, pyrolysis, synthetic gas, direct use of solar or biomass heat, ground-source heat pumps, and fuel cells
Wisconsin (WI) Executive Order <sup>8</sup>	100% carbon-free generation by 2050	Geothermal electric, solar thermal electric, solar photovoltaics, wind, biomass, MSW, LFG hydroelectric, and anaerobic digestion	Energy storage and fuel cells using renewable energy, nuclear

Data source: U.S. Energy Information Administration

Note: LFG=landfill gas, CHP=combined heat and power, MSW=municipal solid waste

Note: For executive orders and carbon-neutral policies where the technologies are not defined within the legislation, we assume a suite of technologies that qualify that may not align with those technologies that were intended to qualify.

<sup>a</sup> Colorado Office of the Governor, “Executive Order D 2019 16,” signed December 16, 2019, [https://drive.google.com/file/d/1P86lNArYhY\\_PL2Zwm0tK1ROolbFJoahs/view](https://drive.google.com/file/d/1P86lNArYhY_PL2Zwm0tK1ROolbFJoahs/view).

<sup>b</sup> Connecticut Office of the Governor, “Executive Order No. 3,” signed September 2019, <https://portal.ct.gov/-/media/Office-of-the-Governor/Executive-Orders/Lamont-Executive-Orders/Executive-Order-No-3.pdf>.

<sup>c</sup> Louisiana Office of the Governor, “Executive Order JBE 2020-18,” signed August 19, 2020, <https://gov.louisiana.gov/assets/ExecutiveOrders/2020/JBE-2020-18-Climate-Initiatives-Task-Force.pdf>.

<sup>d</sup> Massachusetts Office of the Governor, “Executive Order No. 594,” signed April 21, 2021, <https://www.mass.gov/executive-orders/no-594-leading-by-example-decarbonizing-and-minimizing-environmental-impacts-of-state-government>.

<sup>e</sup> Michigan Office of the Governor, “Executive Directive 2020-10,” signed September 23, 2020, <https://www.michigan.gov/whitmer/news/state-orders-and-directives/2020/09/23/executive-directive-2020-10>.

<sup>f</sup> New Jersey Office of the Governor, “Executive Order No. 28,” signed January 27, 2020, <https://www.nj.gov/governor/news/news/562020/approved/20200127a.shtml#:~:text=The%20Energy%20Master%20Plan%20defines,or%20exceed%20the%20GWRA%20mandates>.

<sup>8</sup> Wisconsin Office of the Governor, “Executive Order #38,” signed August 16, 2019, <https://evers.wi.gov/Documents/EO%20038%20Clean%20Energy.pdf>.

One factor that could result in states missing their CES goals is slow or no growth in electricity demand. To date, slowing demand has not affected these marginal sources, but the situation could change if demand is flat for an extended period.

Further, although states have more qualifying generation in aggregate than they need to meet the targets, states with technology-specific goals could still have shortages related to certain technologies. In addition, the projected pattern of aggregate surplus does not necessarily imply that the projected generation would be the same without state CES policies. These policies may increase investment in states where it would not otherwise occur or increase the amount of projected generation from zero-carbon sources, and in other states, zero-carbon generation growth could exceed state targets or even increase without target requirements. The results do suggest that state CES programs will not be the sole motivation for future growth in zero-carbon generation.

Currently, 30 states and the District of Columbia have enforceable CES or similar laws (Table 1).<sup>2</sup> Under such standards, each state determines its own levels of zero-carbon generation, eligible technologies,<sup>3</sup> and noncompliance penalties. Many states have modified their existing programs in recent years, building on their own implementation experience and changing market conditions.

### State energy efficiency resource standards and goals

AEO2023 does not explicitly include state energy efficiency resource standards (EERS). EERS are mandatory, long-term reduction targets spanning at least three years that:

- Are sufficiently funded to allow covered entities to meet their targets
- Use financial incentives or non-performance penalties
- Usually increase over time

Nevertheless, these standards do inform modeling of utility and state energy efficiency incentives. Of the 32 states plus the District of Columbia with mandatory or voluntary efficiency goals, 26 meet the definition of an EERS. Efficiency policies for utilities complement efficiency gained from structural changes, federal appliance standards, and enhanced building codes. The extent of the change in demand varies by region and sector.

State legislatures and public utility commissions (PUC) each create energy efficiency (EE) policies (Table 2). Savings targets are set as reductions from a single base year or as:

- An average of previous years
- A cumulative reduction during a compliance period
- A percentage of projected electricity sales

As with the CES, we confirmed EERS requirements for each state through original legislative or regulatory documentation and used the Database of State Incentives for Renewables & Efficiency (DSIRE) (and have historically used Advanced Energy United’s [PowerSuite](#) tools) to support those efforts.

**Table 2. Characteristics of state efficiency requirements or goals (as of November 2022)**

State or city	Type <sup>a</sup>	Targeted electricity savings (requirements and goals) <sup>b</sup>	Percentage of sales covered <sup>c</sup>	Current savings period (range)		2021 incremental savings including annual (MWh) <sup>d</sup>	Percentage of retail sales <sup>e</sup>
Arizona	Elec	1.1% average annual electric savings target	56%	2020	2025	1,067,867	1.31%
Arkansas	E&G	1.2% average annual electric savings	50%	2020	2025	379,485	0.78%

<sup>2</sup> Summaries of state CES policies may vary from source to source. The policies vary significantly from state to state, with no universal definition. Our previous discussions of state RPS policies have included a policy in West Virginia that allowed several types of fossil-fueled generators to be built instead of renewable generators to meet the portfolio requirement. That policy is not included as an RPS in the AEO2023.

<sup>3</sup> Eligible technologies and even the definitions of technologies or fuel categories vary by state. For example, one state’s definition of renewables may include hydropower, but another’s may not. Table 1 provides more detail on how the technology or fuel category is defined by each state.

State or city	Type <sup>a</sup>	Targeted electricity savings (requirements and goals) <sup>b</sup>	Percentage of sales covered <sup>c</sup>	Current savings period (range)		2021 incremental savings including annual (MWh) <sup>d</sup>	Percentage of retail sales <sup>e</sup>
California	E&G	Doubling energy efficiency savings by 2030, average annual electric savings of 1.5%	73%	2015	2030	3,034,469	0.94%
Colorado	E&G	5% of 2018 sales by 2028, plus peak reductions	56%	2019	2028	654,990	1.16%
Connecticut	E&G	0.70% average annual electric savings	93%	2020	2025	313,837	0.77%
District of Columbia	E&G	Cumulative energy savings targets across electricity, natural gas and fuel oil; minimum reductions of 1.1 trillion British thermal units in year 1, increasing thereafter	100%	2022	2026	99,630	0.58%
Hawaii	Elec	About 1.4% annual incremental savings between 2009 and 2030	100%	2009	2030	102,682	1.15%
Illinois	E&G	Varies by investor-owned utility (IOU); cumulative electricity savings of 16% and 21.5% natural gas savings; Average 2.08% annual electricity savings in 2022–25, 2.05% in 2026–30, and 1.5% natural gas savings	89%	2018	2030	2,594,268	1.19%
Iowa	E&G	Varies by IOU; average 0.89% annual incremental electricity savings and natural gas savings of at least 0.10%	75%	2019	2023	245,220	0.46%
Louisiana	Elec	Quick Start EE (energy efficiency) Pilot	81%	2014	--	128,799	0.14%
Maine	E&G	2.3% average electric savings and 0.1% natural gas savings	100%	2020	2022	174,852	1.05%
Maryland	Elec	2% of sales by 2023 in 0.2% annual increments	97%	2016	2023	866,229	0.99%
Massachusetts	E&G	19.66 trillion British thermal units (TBtu) combined electric and natural gas net annual savings	85%	2022	2024	1,202,411	1.44%
Michigan	E&G	1.0% and 0.75% of previous year's electricity and natural gas sales, respectively, with tiered performance incentives for up to 1.5% savings	100%	2008	2021	1,643,381	1.52%
Minnesota	E&G	2% of previous three-year weather-normalized average (Xcel); other IOUs 1.5%	97%	2010	--	976,803	1.47%
Mississippi	Elec	Quick Start EE program	76%	2014	--	70,115	0.15%
Missouri	Elec	9.9% cumulative annual savings by 2020, 1.9% annual sales reduction target each year thereafter	68%	2012	--	554,306	0.71%
Nevada	Elec	25% RPS, of which 10% of the requirement may be met with EE measures	88%	2020	2025	257,551	0.59%
New Hampshire	E&G	4.5% cumulative electric savings by 2023	100%	2021	2023	161,816	1.01%

State or city	Type <sup>a</sup>	Targeted electricity savings (requirements and goals) <sup>b</sup>	Percentage of sales covered <sup>c</sup>	Current savings period (range)		2021 incremental savings including annual (MWh) <sup>d</sup>	Percentage of retail sales <sup>e</sup>
New Jersey	E&G	2% annual reduction from previous three-year average	100%	2018	--	1,251,064	1.21%
New Mexico	Elec	Cumulative 8% reduction from 2005 sales by 2020; 5% reduction from 2020 sales by 2025	69%	2014	2025	188,337	0.74%
New York	E&G	185 Tbtu total energy reduction; 3% annual utility electricity savings target by 2025. Overall <a href="#">Reforming the Energy Vision</a> goal for buildings of 23% from 2012 levels by 2030	100%	2020	2025	2,288,970	1.10%
North Carolina	Elec	5% of 2021 sales from 2008 base; EE is an eligible RPS resource	100%	2009	2021	913,214	0.67%
Oregon	E&G	1.30% of sales in annual increments through 2021	61%	2020	2021	413,717	0.72%
Pennsylvania	Elec	Varies by utility; average cumulative savings of 3.7%	96%	2016	2021	658,583	0.28%
Rhode Island	E&G	Annual average incremental savings target of 2.0%	99%	2021	2023	127,732	1.20%
Texas	Elec	30% reduction in demand growth (about 0.1% annually)	74%	2013	--	1,043,980	0.24%
Utah	Elec	1% annual reduction in electricity; energy efficiency is an eligible RPS resource	80%	2009	--	331,606	1.01%
Vermont	Elec	1.7% incremental electricity sales savings (percentage of 2019 annual sales) and seasonal peak demand reductions	98%	2021	2023	74,210	1.37%
Virginia	Elec	Varies by utility; approximately 1.2% average annual savings from 2019.	87%	2021	2025	272,788	0.20%
Washington	Elec	Average annual electric savings target of 0.9%	83%	2020	2025	580,722	0.64%
Wisconsin	E&G	Lifecycle goal of 22.8 terawatt-hours (TWh) over four years (0.6%–0.7% of sales)	100%	2019	2022	710,467	1.02%

Data source: American Council for an Energy-Efficient Economy, [The 2022 State Energy Efficiency Scorecard](#) (ACEEE 2022) and U.S. Energy Information Administration Form EIA-861, [Annual Electric Power Industry Report. State Electricity Profiles](#) (November 10, 2022)

<sup>a</sup> If an EERS covers electric utilities only, it is abbreviated as *Elec*; if both electric and natural gas utilities, as *E&G*.

<sup>b</sup> Sales reductions refer to reductions in retail sales of electricity. Unless otherwise noted, they are incremental annual reductions, rather than cumulative savings. Base year indicates year (or average of previous years) against which targeted savings are measured.

<sup>c</sup> American Council for an Energy-Efficient Economy, [The 2022 State Energy Efficiency Scorecard](#) (ACEEE 2022), Appendix D, Table 13. *State energy efficiency resource standards*. The percentage of affected retail sales in an EERS depends on what entities are covered by an EERS, which differs by state. We calculate percentages for states not included in ACEEE2022 using state energy efficiency filings and our survey Form EIA-861, [Annual Electric Power Industry Report](#) (October 6, 2022).

<sup>d</sup> Incremental annual energy efficiency savings, reported in megawatt-hours (MWh), on Form EIA-861, [Annual Electric Power Industry Report](#) (October 6, 2022). These savings are defined as changes in energy use caused in the current reporting year by new participants in demand-side management (DSM) programs that operated in the previous reporting year or by participants in new DSM programs that operated for the first time in the current reporting year. Savings as a percentage of retail sales are calculated based on utility retail sales data reported on the Form EIA-861.

<sup>e</sup> Incremental annual electricity savings divided by total retail electricity sales for 2021, as reported to the U.S. Energy Information Administration on Form EIA-861, *Annual Electric Power Industry Report*. [State Electricity Profiles](#) (October 6, 2022).