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Summary of Legislation and Regulations Included in the Annual Energy Outlook 2021

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The version of the National Energy Modeling System (NEMS) used for the U.S. Energy Information Administration's (EIA) *Annual Energy Outlook 2021* (AEO2021) generally represents current legislation, environmental regulations, and international protocols, including recent government actions for which implementing regulations were available as of the end of September 2020. The potential effects of proposed federal and state legislation, regulations, or standards—or of sections of legislation that have been enacted but require funds and implementation regulations that have not been provided or specified—are not reflected in NEMS. A list of the federal and selected state legislation and regulations included in AEO2021, including how they are incorporated, is provided in each module's Assumptions document. 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.

New laws and regulations reflected in the Reference case

Federal

The U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA) jointly issued *The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks* in April 2020 as an amendment to and replacement of the 2012 Corporate Average Fuel Economy (CAFE) standards for light-duty vehicles. The updated standard sets fuel economy and carbon dioxide standards, which increase 1.5% in stringency each year from model years 2021 through 2026.

State

In 2020, only Virginia enacted new legislation for renewable portfolio standards (RPS) programs.

Existing laws and regulations reflected in the Reference case

AEO2021 reflects a number of state-level policies that affect its projections of the electricity generation mix.

The AEO2021 Reference case divides state regulations into two general categories: state RPS and state energy efficiency programs.

Renewable portfolio standards

To the extent possible, AEO2021 reflects state laws and regulations signed into law as of October 1, 2020, that require levels of renewable generation or capacity for utilities operating in the state. These requirements are known as renewable portfolio standards (RPS). AEO2021 projections do not include laws and regulations with either voluntary goals or targets that can be substantially satisfied with nonrenewable resources.

The AEO2021 Reference case assumes that states will meet their ultimate RPS targets, yet assumes that states will not necessarily meet targets for interim years. RPS compliance constraints in most regions are estimated; 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, EIA has confirmed requirements for each state through original legislative or regulatory documentation, including the [Database of State Incentives for Renewables & Efficiency \(DSIRE\)](#).

Most states are meeting or exceeding their required levels of renewable generation, based on qualified generation or purchase of renewable energy credits.¹ A number of factors helped create an environment favorable for RPS compliance, including

- New RPS-qualified generation capacity timed to take advantage of federal incentives, some of which are set to phase out at the end of 2020
- Lower cost of wind, solar, and other renewable technologies

¹ G. Barbose, *U.S. Renewables Portfolio Standards: 2017 Annual Status Report* (Berkeley, CA: July 2017).

- Complementary state and local policies that either reduce costs (for example, equipment rebates) or increase revenue streams (for example, net metering) associated with RPS-eligible technologies

The RPS requirements for each state, as modeled for AEO2021, are in Table 1.

Table 1. Aggregate renewable portfolio standards requirements as modeled for AEO2021

State	Target	Qualifying renewables	Qualifying other (thermal, efficiency, nonrenewable, distributed generation, etc.)	Compliance mechanisms
Arizona (AZ)	15% by 2025	Solar, wind, biomass, hydro, landfill gas (LFG), and anaerobic digestion built after January 1, 1997	Direct use of solar heat, ground-source heat pumps, renewable-fueled combined heat and power (CHP), and fuel cells using renewable fuels	Credit trading is allowed with some bundling restrictions. Includes distributed generation requirement, starting at 5% of target in 2007, growing to 30% by 2012 and after.
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	Credit trading is allowed with some restrictions. Renewable energy credit prices capped at \$50 per megawatt-hour (MWh).
Colorado (CO)	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, pyrolysis gas produced from MSW, and fuel cells	Credit trading is allowed. Renewable distributed generation requirement applies to investor-owned utilities (3% of sales by 2020) and electric cooperatives (0.75% or 1% of sales by 2020, depending on size). Generation is eligible to earn credit multipliers if it is associated with certain projects that have specific ownership or transmission ties with small utilities, entities, or individuals.
Connecticut (CT)	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	Credit trading is allowed. Obligated providers may comply through an alternative compliance payment of \$55 per MWh. The target is composed of three class tiers that have tier-specific targets.
District of Columbia (DC)	100% by 2040	Solar, wind, biomass, hydro, geothermal, LFG/MSW, and marine	Direct use of solar and cofiring	Credit trading is allowed. The target includes a solar-specific set-aside, equivalent to 2.5% of sales by 2023. Obligated providers may also comply through a tier-specific alternative compliance payment.
Delaware (DE)	25% by 2026	Solar, wind, biomass, hydro, geothermal, LFG, anaerobic digestion, and marine	Fuel cells	Credit trading is allowed. Credit multipliers are awarded for several compliance specifications, including a 300% credit awarded for generation from in-state distributed solar and renewable-fueled fuel cells. Target increases for some suppliers can be subject to a cost threshold.
Hawaii (HI)	100% by 2045	Geothermal electric, solar thermal electric, solar photovoltaics, wind (all), biomass,	Solar water heat, solar space heat, and solar thermal process heat	Credits cannot be traded. Eligibility of several of the qualifying other displacement technologies is restricted after 2015. Utility

State	Target	Qualifying renewables	Qualifying other (thermal, efficiency, nonrenewable, distributed generation, etc.)	Compliance mechanisms
		hydroelectric, hydrogen, geothermal heat pumps, MSW, combined heat and power, landfill gas, tidal, wave, ocean thermal, wind (small), anaerobic digestion, and fuel cells using renewable fuels		companies can calculate compliance over all utility affiliates.
Illinois (IL)	25% by 2026 (3,000 megawatt [MW] solar and 1,300 MW wind)	Solar, wind, biomass, hydro, anaerobic digestion, and biodiesel	None	Credit trading is allowed. Target includes specific requirements for wind, solar, and distributed generation. The procurement process is subject to a cost cap.
Iowa (IA)	105 MW of eligible renewable resources	Solar, wind, some types of biomass and waste, and small hydro	None	Iowa's investor-owned utilities are currently in full compliance with this standard, achieved primarily through wind capacity.
Massachusetts (MA)	35% by 2030 (and an additional 1% per year thereafter)	Solar, wind, hydro, some biomass technologies, LFG/MSW, geothermal electric, anaerobic digestion, and marine	Fuel cells	Credit trading is allowed. The target for new resources includes a solar-specific goal to achieve 400 MW of in-state solar capacity, which is translated into an annual target for obligated providers. Obligated providers may comply through an alternative compliance payment (ACP), which varies in level by the requirement class. The ACP is designed to be higher than the cost of other compliance options.
Maryland (MD)	50% by 2030	Solar, wind, biomass, geothermal, LFG/MSW, anaerobic digestion, and marine	Solar water heating, ground-source heat pumps, and fuel cells	Credit trading is allowed. The target includes minimum levels of compliance from solar and offshore wind. Utilities may pay an ACP in lieu of procuring eligible sources, with a tier-specific compliance schedule.
Maine (ME)	100% by 2050	Solar, wind, biomass, hydro, geothermal, LFG/MSW, and marine	CHP and fuel cells	Credit trading is allowed. The Maine Public Utilities Commission sets an annually adjusted alternative compliance payment. Community-based generation projects are eligible to earn credit multipliers.
Michigan (MI)	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	Credit trading is allowed. Solar power receives a credit multiplier; other generation and equipment features—such as peak generation, storage, and use of equipment manufactured in-state—can earn bonus credits.
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	Credit trading is allowed. Target includes 1.5% solar standard for investor-owned utilities. Xcel's target also includes 25% of sales specifically from wind and solar (with a 1% maximum for solar). State regulators can penalize noncompliance at the estimated cost of compliance.
Missouri (MO)	15% by 2021	Solar, wind, hydro, biomass, LFG/MSW, anaerobic digestion, and ethanol	Fuel cells	Credit trading is allowed. Noncompliance payments are set at double the market rate for renewables.

State	Target	Qualifying renewables	Qualifying other (thermal, efficiency, nonrenewable, distributed generation, etc.)	Compliance mechanisms
Montana (MT)	15% by 2015	Solar, wind, hydro, geothermal, biomass, and LFG	Compressed air energy storage	Credit trading is allowed, with a price cap of \$10 per MWh. Community-based projects have specific targets.
North Carolina (NC)	12.5% by 2021 for investor-owned utilities, 10% by 2018 for municipal and cooperative utilities	Solar, wind, small hydro, biomass, geothermal, LFG, and marine	Direct use of solar heat, CHP, hydrogen, and demand reduction	Credit trading is allowed. Impacts on customer costs are capped at specified levels. Solar and certain animal waste projects have specific targets.
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	Credit trading is allowed, and utilities may pay into a fund in lieu of holding credits. The target has four separate compliance classes by technology type.
New Jersey (NJ)	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	Credit trading is allowed, and an ACP is set by state regulators. Solar and offshore wind are subject to separate requirements and have separate enforcement provisions.
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	Credit trading is allowed.
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)	Credit trading is allowed.
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	Credit trading is not allowed. Compliance is achieved through purchases by state authorities, funded by a surcharge on investor-owned utilities. Government-owned utilities may have their own similar programs.
Ohio (OH)	8.5% renewable energy resources by 2026	Solar, wind, hydro, biomass, geothermal, and LFG/MSW	CHP, fuel cells, anaerobic digestion, and microturbines	Credit trading is allowed. ACP are set by law and adjusted annually. Solar electricity generation has a separate target.
Oregon (OR)	50% by 2040	Solar, wind, hydro, biomass, geothermal, LFG/MSW, anaerobic digestion, and marine	Hydrogen	Credit trading is allowed, with an ACP and a limit on expenditures of 4% of annual revenue. Solar receives a credit multiplier.
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	Credit trading is allowed, with an ACP. Separate targets are set for solar and two different combinations of renewable, fossil fuel, and efficiency technologies.
Rhode Island (RI)	38.5% by 2035	Solar, wind, hydro, biomass, geothermal, anaerobic digestion, LFG, biodiesel, and marine	Fuel cells	Credit trading is allowed, with an ACP. A separate target exists for 90 MW of new renewable capacity.
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	Credit trading is allowed, with capacity targets converted to generation equivalents. State regulators may cap credit prices, and 500 MW must be from resources other than wind.

State	Target	Qualifying renewables	Qualifying other (thermal, efficiency, nonrenewable, distributed generation, etc.)	Compliance mechanisms
Virginia (VA)	100% carbon-free by 2045	Solar, wind, hydro, geothermal, biomass, LFG, anaerobic digestion, certain biofuels, and marine. Carbon-free includes nuclear	None	Credit trading is allowed.
Vermont (VT)	75% by 2032	Geothermal, solar, wind, biomass, hydro, LFG, marine, anaerobic digestion, and fuel cells using renewable fuels	Ground-source heat pumps and CHP	The purchase of renewable energy credits from plants whose energy is capable of delivery within New England is allowed, with an ACP of \$0.01 per kilowatthour (kWh).
Washington (WA)	100% carbon-free by 2045	Solar, wind, hydro, biomass, geothermal, LFG, anaerobic digestion, biodiesel, and marine	CHP	Credit trading is allowed, with an administrative penalty for noncompliance.
Wisconsin (WI)	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	Credit trading is allowed.

One factor that could result in states missing their RPS 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 more qualifying generation in aggregate than needed is now available 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 RPS policies, which may encourage investment in places where it would not otherwise occur or in the amounts projected, even as other parts of the country see substantial growth that is higher than state targets or in the absence of targets. The results do suggest, however, that state RPS programs will not be the sole motivation for future growth in renewable generation.

Currently, 30 states and the District of Columbia have enforceable RPS or similar laws (Table 1).² Under such standards, each state determines its own levels of renewable generation, eligible technologies,³ and noncompliance penalties. A number of modifications have been made to existing programs in recent years, building on state implementation experience and changing market conditions.

² Summaries of state RPS policies may vary from source to source. The policies vary significantly from state to state, with no universal definition. EIA's 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 AEO2021.

³ 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.

In 2020, only Virginia enacted new legislation with respect to RPS programs.

Note, as states continue adopting 100% targets, they used 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 fuels not considered renewable to count toward the policy target.

Virginia

In April 2020, Virginia enacted *The Virginia Clean Economy Act* (HB1526/SB851), establishing a renewable portfolio standard for Virginia, where previously only a voluntary renewable portfolio goal was in place. *The Virginia Clean Economy Act* set a target of 100% clean energy sales by 2050 and a 2045 target of 100% clean energy sales for the Dominion Energy Virginia utility

Maryland

In May 2019, Maryland enacted S.B. 516, which increased its RPS target to 50% of electricity sales from renewable generation by 2030 and requires a study to look at possible pathways to 100% clean energy by 2040.⁴ This policy replaces the previous target of 22.5% by 2024.

Nevada

In April 2019, Nevada enacted S.B. 358, increasing its overall RPS to 100% of electricity sales from clean energy by 2050 with an interim target of 50% renewable generation by 2030.⁵ This new standard replaced the previous policy target of 25% renewable generation by 2025.

New Mexico

In March 2019, New Mexico enacted S.B. 489, increasing its overall RPS target to 100% of electricity sales from carbon-free generation by 2045 with interim targets of 50% renewable generation by 2030 and 80% renewable generation by 2040.⁶ This new standard replaced the previous policy target of 20% renewable generation by 2020.

New York

In July 2019, New York enacted S.B. 6599, which increased its [RPS target](#) to 100% of electricity sales from clean energy generation by 2040 with an interim target of 70% renewable generation by 2030.⁷ This new target was an increase from the previous target of 50% renewable generation by 2030.

Ohio

In July 2019, Ohio enacted G.A. 133, which decreased its RPS to 8.5% of electricity sales from renewable generation by 2026. The previous target was 12.5% renewable generation by 2026.⁸

⁴ Maryland Legislature, [S.B. 516](#) (May 25, 2019)

⁵ Nevada Legislature, [S.B. 358](#) (April 22, 2019)

⁶ New Mexico Legislature, [S.B. 489](#) (March 22, 2019)

⁷ New York Legislature, [S. 6599](#) (July 16, 2019)

⁸ Ohio Legislature, [G.A. 133-HB6](#) (October 22, 2019)

Washington

In April 2019, Washington enacted S.B. 5116, which increased its RPS target to 100% of electricity sales from carbon-neutral generation by 2045. The previous target was 15% renewable generation by 2020.⁹ In addition, the policy requires a phaseout of coal-fired electricity generation by 2025.

State requirements for offshore wind Virginia

In addition to its RPS requirements, Virginia passed legislation that requires a certain amount of offshore wind to be installed by a target date. Because the requirement is framed in terms of a megawatt (MW) target rather than as a percentage of electricity sale targets, it is implemented separately from the RPS requirements. In April 2020, Virginia enacted *The Virginia Clean Economy Act* (HB1526/SB851), which authorizes the state to purchase up to 5,200 MW of offshore wind installed off the coast of Virginia by 2034.¹⁰

State requirements for diurnal storage Virginia

In addition to its RPS requirements, Virginia passed legislation that requires a certain amount of diurnal battery storage to be installed by a target date. Because these requirements are framed in terms of megawatts (MW) of capacity, or megawatthour (MWh) targets, rather than as a percentage of electricity sale targets, they are implemented separately from the RPS requirements. In April 2020, Virginia enacted *The Virginia Clean Economy Act* (HB1526/SB851), which requires utilities in the state to install collectively 2,700 MW of diurnal battery storage in Virginia by 2035.¹¹

State energy efficiency resource standards and goals

AEO2021 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 30 states with mandatory or voluntary efficiency goals, 24 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

⁹ Washington Legislature, [S.B. 5116](#) (April 22, 2019)

¹⁰ Connecticut Legislature, [H.B. 7156](#) (June, 7, 2019); Virginia Legislature, [HB1526/SB851](#) (April 11, 2020)

¹¹ Virginia Legislature, [HB1526/SB851](#) (April 11, 2020)

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

As with the RPS, EIA has confirmed EERS requirements for each state through original legislative or regulatory documentation and used DSIRE and the Advanced Energy Economy (AEE) PowerSuite tools to support those efforts.

Table 2. Characteristics of state efficiency requirements or goals (as of December 2020)

State	Type [13]	Targeted electricity savings (requirements and goals) [14]	Percentage of sales covered [12]	Current savings period (range)		2019 incremental savings including annual (MWh) [15]	Percent age of retail sales[16]
AK	E&G	1.2% saving from 2018 retail sales	50	2020	2022	300	0.01
AZ	E&G	2.6% annual saving and 22% cumulative savings by 2020; lower for co-ops	56	2016	2020	926,080	1.19
CA	E&G	Doubling energy efficiency savings by 2030	73	2015	2030	2,740,112	0.86
CO	E&G	5% of 2018 sales by 2028, plus peak reductions	56	2019	2028	726,468	1.29
CT	E&G	Average 1.1% reduction from forecast sales	93	2019	2021	430,102	1.02
DC	E&G	About 5% cumulative savings by 2021 from 2016	100	2017	2021	140,408	0.74
HI	Elec	About 1.4% annual incremental savings between 2009 and 2030	100	2009	2030	130,843	1.38

¹² American Council for an Energy-Efficient Economy, *The 2019 State Energy Efficiency Scorecard, Report U1908* (ACEEE 2019), Appendix D, pages 155–161. The percentage of affected retail sales in an EERS depends on what entities are covered by an EERS, which differs by state. EIA calculated percentages for states not included in ACEEE2019 (Louisiana, Missouri, Mississippi, and Virginia), using state EE filings and U.S. Energy Information Administration, Form EIA-861, *Annual Electric Power Industry Report* (October 6, 2020). Information on DC's targets is from a phone interview with Dan Cleverdon, Public Service Commission of the District of Columbia, January 21, 2018.

¹³ If an EERS covers electric utilities only, abbreviated as *Elec*; if both electric and natural gas utilities, as *E&G*.

¹⁴ 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.

¹⁵ Incremental annual energy efficiency savings, reported in megawatthours (MWh), on Form EIA-861, *Annual Electric Power Industry Report* (October 6, 2020). These savings are defined as changes in energy use caused in the current reporting year by new participants in 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 Form EIA-861.

¹⁶ Incremental annual electricity savings divided by total retail electricity sales for 2019, as reported to the U.S. Energy Information Administration on Form EIA-861, *Annual Electric Power Industry Report. State Electricity Profiles* (October 6, 2020).

State	Type [¹³]	Targeted electricity savings (requirements and goals) [¹⁴]	Percentage of sales covered [¹²]	Current savings period (range)		2019 incremental savings including annual (MWh) [¹⁵]	Percent age of retail sales[¹⁶]
IA	E&G	Varies by investor-owned utility (IOU); average 0.89% annual incremental savings	75	2019	2023	434,888	0.85
IL	E&G	Varies by IOU; cumulative savings of 16% or 21.5%	89	2018	2030	2,467,987	1.09
LA	Elec	Quick Start Energy Efficiency (EE) Pilot	81	2014	ongoing	104,324	0.11
MA	E&G	17.7 trillion British thermal units (Btu) from 2019 to 2021 (~2.7% of retail sales)	85	2019	2021	1,621,941	1.98
MD	Elec	2% of sales by 2023 in 0.2% annual increments	97	2016	2023	743,446	0.81
ME	E&G	2.3% average annual savings target	100	2020	2022	155,451	0.92
MI	E&G	1.0% of previous year's sales, with tiered performance incentives for up to 1.5% savings	100	2008	2021	1,393,370	1.26
MN	E&G	2% of previous three-year weather-normalized average (Xcel); other IOUs 1.5%	97	2010	no end	863,599	1.29
MO	Elec	9.9% cumulative annual savings by 2020	68	2012	2020	624,668	0.79
MS	Elec	Quick Start EE program	76	2014	ongoing	76,177	0.16
NC	Elec	5% of 2021 sales from 2008 base; EE is an eligible renewable portfolio standard (RPS) resource	100	2009	2021	1,454,102	1.07
NH	E&G	4.5% cumulative electric savings by 2023	100	2021	2023	125,009	0.77
NJ	E&G	2% annual reduction from previous three-year average	100	2018	Not applicable	558,203	0.52
NM	Elec	Cumulative 8% reduction from 2005 sales by 2020, 5% reduction from 2020 sales by 2025	69	2014	2025	142,346	0.57
NV	Elec	25% RPS, of which 10% of the requirement may be met with EE measures	88	2020	2025	205,883	0.50
NY	E&G	185 trillion Btu (TBtu) total energy reduction, 3% annual utility electricity savings target by 2025. Overall Reforming the Energy Vision goal for	100	2020	2025	2,110,512	0.97

State	Type [¹³]	Targeted electricity savings (requirements and goals) [¹⁴]	Percentage of sales covered [¹²]	Current savings period (range)		2019 incremental savings including annual (MWh) [¹⁵]	Percent age of retail sales[¹⁶]
		buildings of 23% from 2012 levels by 2030					
OH	Elec	17.5% EE target	89	2009	2020	1,755,030	0.70
OR	E&G	Average 45 MW savings from 2020	70	2020	2020	543,525	1.02
PA	Elec	Varies by utility; average cumulative savings of 3.7%	96	2016	2021	1,354,635	0.56
RI	E&G	Annual average incremental savings target of 2.0%	99	2021	2023	283,515	2.66
TX	Elec	30% reduction in demand growth (about 0.1% annually)	74	2013	no end	960,510	0.22
UT	Elec	1% annual reduction in electricity; energy efficiency is an eligible RPS resource	80	2009	no end	253,029	0.81
VA	Elec	10% by 2022 relative to 2006 sales	100	2007	2022	161,931	0.13
VT	Elec	1.7% incremental electricity sales savings (percentage of 2019 annual sales) and seasonal peak demand reductions	98	2021	2023	121,582	2.24
WA	Elec	Varies by utility; about 2% incremental for IOUs	83	2020	2021	723,162	0.77
WI	E&G	Lifecycle goal of 22.8 terawatthours (TWh) over four years (0.6%–0.7% of sales)	100	2019	2022	807,200	1.17

Appendix A: Federal and selected state legislation and regulations in the *Annual Energy Outlook 2021*

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	Appliances represented in the residential sector are included	Public Law 100-12
	a. Room air conditioners	In 2014, set standards for room air conditioners	New purchases of room air conditioners required to meet the standards	Federal Register Notice of Final Rulemaking
	b. Central air conditioners and heat pumps	In 2015, set standards for central air conditioners in 2015 with an update in 2023	New purchases of other air conditioners required to meet the standards	Federal Register Notice of Final Rulemaking
	c. Water heaters	In 2015, set standards for water heaters	New purchases of water heaters required to meet the standards	Federal Register Notice of Final Rulemaking
	d. Refrigerators and freezers	In 2014, set standards for refrigerators/freezers	New purchases of refrigerators/freezers required to meet the standards	Federal Register Notice of Final Rulemaking
	e. Dishwashers	In 2010, set standards for dishwashers; superseded by a consensus agreement effective in 2013	New purchases of dishwashers required to meet the standards	Federal Register Notice of Final Rulemaking
	f. Fluorescent lamp ballasts	In 2014, set standards for fluorescent lamp ballasts	New purchases of fluorescent lamp ballasts required to meet the standards	Federal Register Notice of Final Rulemaking
	g. Clothes washers	In 2015, set standards for clothes washers	New purchases of clothes washers required to meet the standards	Federal Register Notice of Final Rulemaking
	h. Furnaces	In 2013, set standards for furnaces	New purchases of furnaces required to meet the standards	Federal Register Notice of Final Rulemaking
	i. Clothes dryers	In 2015, set standards for clothes dryers	New purchases of clothes dryers required to meet the standards	Federal Register Notice of Final Rulemaking
	j. Boilers	In 2021, set standards for boilers	New purchases of boilers required to meet the standards	Federal Register Notice of Final Rulemaking
B.	Energy Policy Act of 1992 (EPACT1992)			Public Law 102-486
	a. Building codes	For the International Energy Conservation Code (IECC) 2006, specifies whole house efficiency minimums	All states assumed to 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 purchases of various lighting types required to meet the standards	Federal Register Notice of Final Rulemaking
C.	Energy Policy Act of 2005 (EPACT2005)			Public Law 109-58

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
a. Torchiere lamp standard	In 2006, set standards for torchiere lamps	New purchases of torchiere bulbs required to meet the standards	Federal Register Notice of Final Rulemaking
b. Compact fluorescent lamp standard	In 2006, set standards for compact fluorescent lamps	New compact fluorescent bulb purchases required to meet the standards	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 reduced by appropriate amount	Overall savings determined by number of ceiling fan shipments and estimated kilowatthour (kWh) savings per unit
d. Dehumidifier standard	In 2019, set standards for dehumidifiers	Dehumidifier electricity consumption reduced by appropriate 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 reduced by specified 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 reduced by specified 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 certain efficiency specifications	Cost savings are assumed to be passed on to the consumer, reducing the price of the appliance by the specified amount	Cost reductions to consumers are assumed to be 100% of the producer's tax credit
D.	Energy Independence and Security Act of 2007 (EISA2007)		Public Law 110-140
a. General service incandescent lamp (GSL) standard	From 2012–2014, required less wattage for bulbs; a 2020 backstop standard that would have effectively eliminated incandescent bulbs was removed in December 2019	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 appropriate 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 requirement 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

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	d. Miscellaneous refrigeration products	In 2019, set minimum efficiency standards for wine coolers	Other electricity consumption is reduced by appropriate 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	Purchasers of certain energy-efficient equipment can claim tax credits through 2016	Cost of applicable equipment is reduced by specified amount	Federal Register Notice of Final Rulemaking
	b. Energy-efficient appliance tax credit	Producers of energy-efficient refrigerators, clothes washers, and dishwashers receive tax credits for each unit they produce that meets certain efficiency specifications, subject to an annual cap	Cost savings are assumed to be passed on to the consumer, reducing the price of the appliance by the specified 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 specified 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 on \$2,600 per-home investment as specified in weatherization program evaluation	Federal Register Notice of Final Rulemaking
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
H.	Clean Power Plan (issued under Section 111(d) of the Clean Air Act); repealed			
	a. Incentives for energy efficient residential technologies	Would have allowed states to comply with emission standards by encouraging residential purchases of	Subsidies to energy efficient technologies and building shells are not currently modeled	Federal Register Notice of Final Rulemaking; repealed and replaced by the Affordable Clean

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
		energy efficient technology and building shells		Energy (ACE) rule in June 2019
I.	Consolidated Appropriations Act of 2016 (H.R. 2029)			Public Law 114-113
	a. Residential solar investment tax credit	Extends the EPACT2005 30% investment tax credit for solar property through 2019, decreasing to 26% in 2020, 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 appropriate percentage	Federal Register Notice of Final Rulemaking
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 specified amount; tax credit is incorporated into cash flow for non-solar generation systems based on updated timeline	BBA2018, Section 40401-40402 (26 USC 25)
K.	Taxpayer Certainty and Disaster Tax Relief Act of 2019 (H.R. 3301)	Passed in December 2019, this act retroactively extended existing federal 25C tax credits for home energy efficiency upgrades and equipment through 2020.	Cost of applicable equipment is reduced by specified amount	
L.	Energy Policy and Conservation Act of 1975 (EPCA1975)			Public Law 94-163
	a. Dedicated-purpose pool pumps	Expands EPCA coverage of pump efficiency to pool pumps, effective 2021	Other electricity consumption is reduced by appropriate amount	Federal Register Notice of Final Rulemaking

Commercial 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	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 with an update in 2023	Central air conditioning and heat pump efficiency is set to 10 Seasonal Energy Efficiency Ratios	Federal Register Notice of Final Rulemaking

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
		(SEER) before 2006, 13 SEER in 2006, 14 SEER in 2015, and 14.4 SEER in 2023	
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, increasing to higher efficacy factor in 2005	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% and 15.0% by 2040 for existing buildings and new construction, respectively	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% and 15.0% by 2040 for existing buildings and new construction, respectively	Based on Science Applications International Corporation commercial shell indexes for 2003 developed for EIA in 2008 and 2011
c. Commercial furnaces and boilers	Effective in 2023, sets standards for furnaces	Natural gas-fired furnace and boiler thermal efficiency is set to 80%; oil furnace thermal efficiency is set to 81%; oil boiler thermal efficiency is set to 83%	Federal Register Notice of Final Rulemaking
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 and 80	Federal Register Notice of Final Rulemaking for fluorescent requirements;

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
		lumens per watt for 4- and 8-foot lamps, respectively	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 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 for solar energy property	Provides a permanent 10% investment tax credit 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
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 with an update 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 12.4 integrated energy efficiency ratio (IEER) and heating coefficient of performance (COP) of 3.3 in 2018 and 14.4 IEER and heating COP of 3.4 in 2023	Federal Register Notice of Final Rulemaking
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 appropriate amount	Number of shipments, share of shipments that currently meet standard, and estimated kWh savings

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
			per unit determine overall savings
f. Distribution transformers	In 2007, set standards as National Electrical Manufacturers Association Class I Efficiency levels , with an update effective 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 appropriate 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 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 investment tax credit for fuel cells and microturbines	Provides a 30% investment tax credit for fuel cells and a 10% investment tax credit 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)
j. Business solar investment tax credit	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 out to 10% by Public Law 114-113
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, with an update effective 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 in 2012 to 2014. A 2020 backstop standard that would have effectively	Incandescent and halogen general service lighting systems that do not meet standards are removed	Federal Register Notice of Final Rulemaking

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	eliminated incandescent bulbs was removed in December 2019	from technology choice menu in 2012	
c. Metal halide lamp ballasts	Sets minimum efficiency levels for metal halide lamp ballasts starting in 2009, with an update effective 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 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 rates for other commercial decisions	Federal Register Notice of Final Rulemaking
F.	Energy Improvement and Extension Act of 2008 (EIEA2008)		Public Law 110-343
a. Business solar investment tax credit	Extends the EPACT2005 30% investment tax credit 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
b. Business investment tax credit for fuel cells and microturbines	Extends the EPACT2005 30% investment tax credit for fuel cells and 10% investment tax credit for microturbines through 2016	Tax credit is incorporated into cash flow for fuel cells and microturbines	Federal Register Notice of Final Rulemaking
c. Business investment tax credit for combined-heat-and-power (CHP) systems	Provides a 10% investment tax credit for CHP systems installed in 2009 through 2016	Tax credit is incorporated into cash flow for CHP systems	Federal Register Notice of Final Rulemaking
d. Business investment tax credit for small wind turbines	Provides a 30% investment tax credit for wind turbines installed in 2009 through 2016	Tax credit is incorporated into cash flow for wind turbines	Federal Register Notice of Final Rulemaking
e. Business investment tax credit for geothermal heat pumps	Provides a 10% investment tax credit 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
G.	American Recovery and Reinvestment Act of 2009 (ARRA2009)		Public Law 111-5

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
a. Business investment tax credit for small wind turbines	Removes the cap on the EIEA2008 30% investment tax credit for wind turbines through 2016	Tax credit is incorporated into cash flow for wind turbines	Federal Register Notice of Final Rulemaking
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 used for solar PV, small wind turbine, and fuel cell installations	Federal Register Notice of Final Rulemaking
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
H.	Clean Power Plan (issued under Section 111(d) of the Clean Air Act); repealed		
a. Incentives for energy efficient commercial technologies	Would have allowed states to comply with emission standards by encouraging commercial purchases of energy efficient technology and building shells	Subsidies to energy efficient technologies and building shells are not currently modeled	Federal Register Notice of Final Rulemaking; repealed and replaced by the Affordable Clean Energy (ACE) rule in June 2019
I.	Consolidated Appropriations Act of 2016 (H.R. 2029)		Public Law 114-113
a. Business solar investment tax credit	Extends the EACT2005 30% investment tax credit for solar property through 2019, decreasing to 26% in 2020, 22% in 2021, and then	Tax credits are incorporated into the cash flow for solar generation systems; investment cost for solar water heaters	Federal Register Notice of Final Rulemaking

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	remaining at 10% in 2022 and after	are reduced by appropriate percentage	
J.	California Global Warming Solutions Act of 2006: emissions limit (SB-32)		
a.	Limits California greenhouse gas	Limits the statewide greenhouse gas 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)
L.	Bipartisan Budget Act (BBA) of 2018 (H.R. 1892)		Public Law 115-123
a.	Commercial investment tax credit (ITC) for distributed and renewable technologies	Extends ITC provisions for several technologies not covered by the 2016 Consolidated Appropriations Act (see below), 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)

Industrial sector

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
A.	Energy Policy Act of 1992 (EPACT1992)		
a.	Motor efficiency standards	Specifies minimum efficiency levels for a variety of motor types and sizes	Not modeled because participation is voluntary; actual reductions will depend on future, unknown commitments
			EPACT1992, Section 342 (42 USC 6313)
b.	Boiler efficiency standards	Specifies minimum combustion efficiency for package boilers larger than 300,000 Btu/hour; natural gas boilers: 80%; oil boilers: 83%	All package boilers are assumed to meet the efficiency standards. Although the standards do not apply to field-erected boilers, which are
			Standards specified in EPACT1992, 10 CFR 431

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis	
		typically used in steam-intensive industries, EIA assumes they meet the standards in the AEO		
B.	Clean Air Act Amendments of 1990 (CAAA1990)			
a.	Process emissions	Numerous process emissions requirements for specified industries and activities	Not modeled because they are not directly related to energy projections	CAAA1990, 40 CFR 60
b.	Emissions related to hazardous/toxic substances	Numerous emissions requirements relative to hazardous and toxic substances	Not modeled because they are not directly related to energy projections	CAAA1990, 40 CFR 60
c.	Industrial sulfur dioxide (SO ₂) emissions	Sets annual limit for industrial SO ₂ emissions at 5.6 million tons. If limit is reached, specific regulations could be implemented	Industrial SO ₂ emissions are not projected to reach the limit (Source: EPA, National Air Pollutant Emissions Trends: 1990–1998, EPA-454/R-00-002, March 2000, p. 3–4.)	CAAA1990, Section 406 (42 USC 7651)
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 (MAM) based on proposed regulations as of September 2012	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)
e.	Emissions from stationary diesel engines	Requires engine manufacturers to meet the same emission standards as nonroad diesel engines. Fully effective in 2011	New stationary engines meet the standards	40 CFR Parts 60, 85, 89, 94, 1039, 1065, and 1068
C.	Energy Policy Act of 2005 (EPACT2005)			
a.	Physical energy intensity	Voluntary commitments to reduce physical energy intensity by 2.5% annually for 2007–16	Not modeled	EPACT2005, Section 106 (42 USC 15811)
b.	Mineral components of cement or concrete	Increase in mineral component of federally procured cement or concrete	Not modeled	EPACT2005, Section 108 (42 USC 6966)
c.	Tax credits for coke oven	Provides a tax credit of \$3.00 per barrel oil equivalent, limited to 4,000 barrels per day average. Applies to most producers of coal coke or coke gas	Not modeled. No impact on U.S. coke plant activity is anticipated	EPACT2005, Section 1321 (26 USC 45K)

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
D.	The Energy Independence and Security Act of 2007 (EISA2007)			
	a. Motor efficiency standards	Supersedes EPACK1992 Efficiency Standards no later than 2011	Purchases of motors must meet the EPACK1992 standards through 2010; afterwards purchases 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 investment tax credit for up to 15 megawatts of capacity in combined-heat-and-power systems of 50 megawatts or less through 2016	System costs are adjusted to reflect the tax credit	EIEA2008, Title I, Sec. 103
F.	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 (AB32) 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 Census Region 4 (West) are increased 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, <i>California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms</i> , Subchapter 10 Climate Change, Article 5, Sections 95802 to 96022, Title 17, (Sacramento, CA: May 2014)

Transportation sector

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
A.	Energy Policy Act of 1992 (EPACT1992)	Requires that government, business, and fuel-provider fleets meet minimum requirements for alternative-fuel new vehicle purchases and 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	The ACCP—which includes the Low Emission Vehicle Program as amended on March 22, 2012, and the Zero Emission Vehicle	Section 177 of the Clean Air Act, 42 U.S.C. sec. 7507 (1976) and CARB, California Exhaust Emissions

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
and the Low Emission Vehicle Program (LEVP)	allowing other states to opt in to the California program. This program has been adopted by 13 other states. The ZEV program, affecting model year 2018 and later, requires a percentage of manufacturers' sales to be zero-emission vehicles with compliance met through the use of credits, which can be banked	Program from July 10, 2014—are incorporated. Credit compliance requirements are met for California, Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont, through both sales and use of limited banking and traveling of these credits. See item C	Standards and Test Procedures for Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, August 4, 2005, as amended March 22, 2012; Zero-Emission Vehicle Standards for 2018 and Subsequent Model Year Passenger Cars, Light-Duty Trucks, and Medium-Duty Vehicles, July 10, 2014
C. Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program	Preempts state programs that regulate vehicle GHG, fuel economy, and ZEV programs based on the U.S. Environmental Protection Agency's (EPA) and the National Highway Traffic Safety Administration's statutory authority to set nationally applicable vehicle emission and fuel economy standards	The state-based ZEV mandates from item B above are set to zero after 2019. The transportation module retains the capability to model these programs	The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program, U.S. Environmental Protection Agency and U.S. Department of Transportation, National Highway Traffic Safety Administration; Federal Register Vol. 84, No. 188, Friday, September 27, 2019
D. The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks	Amends Corporate Average Fuel Economy (CAFE) standards for model year 2021 light duty vehicles and sets new fuel economy standards for model years 2022–2026; promulgated jointly with an average greenhouse emissions standard; cars and light trucks are regulated separately	Fuel economy standards are decreased in model years 2021–2025, compared with the 2012 CAFE standard, and technology options and attributes (cost, performance, weight) are updated to align with the latest associated Final Regulatory Impact Analysis (FRIA)	The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks, U.S. Environmental Protection Agency and U.S. Department of Transportation, National Highway Traffic Safety Administration; Federal Register Vol. 85, No. 84, Thursday, April 30, 2020
E. Alternative Fuel Vehicle Tax Credits	Federal tax credits are provided to encourage the purchase of electric, hybrid, and/or alternative-fuel vehicles	The tax credits for qualified plug-in electric drive motor vehicles and electric 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)

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
F.	Plug-in Electric Drive Vehicle (PEV) Tax Credit	The American Recovery and Reinvestment Act of 2009 (ARRA2009) grants a tax credit of up to \$2,500 for PEVs with at least 4 kWh of battery capacity, with larger batteries earning an additional \$417 per kWh in excess of 5 kWh, up to a maximum of \$7,500 for light-duty PEVs. The credits are phased out once cumulative sales of qualified vehicles reach 200,000 for a manufacturer	Federal tax credits for PEVs are incorporated	26 USC 30D, Energy Improvement and Extension Act (Public Law 111-5, 2008), as amended by the ARRA2009 (Public Law 111-5, Section 1141, 2009)
G.	State electric, hybrid, and alternative-fuel vehicle tax and other incentives	More than 30 states provide incentives to encourage the purchase of electric, hybrid, and/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. For example, Colorado offers a tax credit of up to \$5,000 for the purchase of qualified electric or plug-in hybrid electric vehicles through 2019	State taxes and other incentives for hybrid, electric, and other alternative-fuel vehicles are not incorporated	Various state laws in place: 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
H.	Heavy-Duty (HD) National Program; Greenhouse Gas Emissions and Fuel Consumption Standards for Heavy-Duty Vehicles	Establishes greenhouse gas emissions and fuel consumption standards for onroad 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 sulfur oxides and oxides of nitrogen emissions from ship exhausts and prohibits deliberate emissions of ozone depleting	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

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	substances. First entered into force 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, IMO members agreed to the 2008 MARPOL amendments that implement 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/mass		Pollution Prevention Act of 2008 (MPPA), RESOLUTION MEPC.320(74), Public Law 110-280, 122 Stat 2611)

Electric power sector

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
A. Clean Air Act Amendments of 1990 (CAAA1990)	Establishes a national limit on electricity generator emissions of sulfur dioxide (SO ₂) to be achieved through a cap-and-trade program	SO ₂ 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: 1) for the SO ₂ NAAQS issued in 2010 and 2) for the Ozone NAAQS 2015 issued in 2015. EPA is designating areas for the 2010 SO ₂ NAAQS in four rounds, of which the final three are court-ordered deadlines, with final round ending December 2020. States have until March 2026 to comply. For the Ozone NAAQS, the EPA Administrator extended the deadline for final designations until October 2018. Areas falling into the designation of <i>moderate</i> nonattainment have until late 2023 to comply	These standards are not explicitly represented, but the Cross State Air Pollution Rule is incorporated (described below) 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

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis	
	Requires EPA to develop standards for emissions from 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, replacing it with the most efficient demonstrated steam cycle, resulting in higher proposed CO2 emission rate targets for new steam and combined-cycle technologies	By withdrawing the ruling, EPA has affirmed its intention that new coal plants without CCS can be built, and AEO2021 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	
	Requires EPA to require states to establish CO2 standards for existing plants; in June 2019, EPA issued the Affordable Clean Energy (ACE) rule, which revised EPA's BSER finding for existing power plants to include only heat rate efficiency improvements; the rule provides states a list of candidate technologies that can be used to establish performance standards in state plants but does not set specific technology-based standards	The electricity model requires existing coal generating units with heat rate improvement options to upgrade their efficiency or retire by 2025; heat rate improvement options are based on a 2015 study developed for EIA's original CPP analysis	Repeal of the Clean Power Plan; Emission Guidelines for Greenhouse Gas Emissions From Existing Electric Utility Generating Units; Revisions to Emission Guidelines Implementing Regulations, Environmental Protection Agency, 84 FR 32520, July 8, 2019	
B.	Cross-State Air Pollution Rule (CSAPR)	CSAPR requires states to reduce SO2 and/or nitrogen oxides (NOx) emissions from power plants. CSAPR consists of four individual cap-and-trade programs, covering two different SO2 groups: an annual NOx group and a seasonal NOx 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 CSAPR ozone season program emission budgets and target dates	Cap-and-trade programs for SO2 and NOx are modeled explicitly, allowing the model to choose the best method for meeting the emission caps. Updated budgets and dates are incorporated	U.S. Environmental Protection Agency, <i>Cross-State Air Pollution Rule</i> , website epa.gov/air transport. Federal Register, Vol. 70, No. 91 (May 12, 2005), 40 CFR Parts 51, 72, 73, 74, 77, 78, and 96
C.	Mercury and Air Toxics Standards (MATS)	MATS sets standards to reduce air pollution from coal-and oil-fired power plants greater than 25 megawatts. The rule requires	The Electricity Market Module (EMM) assumes that all coal-fired generating plants above 25 megawatts have	U. S. Environmental Protection Agency, Mercury and Air Toxics Standards , website

Legislation	Brief description	<i>Annual Energy Outlook (AEO) handling</i>	Basis
	plants to achieve the maximum achievable control technology for mercury, hydrogen chloride (HCl), and fine particulate matter (PM 2.5)	complied by 2016. Plants are required to reduce mercury emissions by 90% relative to uncontrolled levels	
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 was enacted to legislate against 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	EIA assumes 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

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
F.	Federal Energy Regulatory Commission (FERC) Orders 888 and 889	FERC has issued two related rules, Orders 888 and 889, which are designed 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. Consequently, utilities are expected to functionally or physically unbundle their marketing functions from their transmission functions	These orders are represented in the forecast by assuming that all generators in a given region are able 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. Essentially 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	It is assumed that coal plants will be able to increase their output as electricity demand increases. Their maximum capacity factor is set at 65%; no increases in the capacity of existing plants is assumed	EPA, 40 CFR Parts 51 and 52, Deterioration (PSD) and Non- Replacement Provision of the Vol. 68, No. 207, page 61248, Prevention of Significant Attainment New Source Review (NSR): Equipment Routine Maintenance, Repair and Replacement Exclusion; Final Rule, Federal Register, October 27, 2003
H.	State Renewable Portfolio Standards (RPS) Laws, Mandates, and Goals	Several states have enacted laws requiring that a certain percentage of their generation come from qualifying renewable sources. Among these states, some have implemented technology specific carve-outs, requiring that a certain percentage of required generation come from a specific energy technology source	The AEO Reference case represents the renewable portfolio standard (RPS) or substantively similar laws from states with established enforcement provisions for their targets. As described in the Renewable Fuels Module section of the <i>Assumptions to AEO2021</i> document, mandatory targets from the various states are aggregated at the regional level, and achievement of nondiscretionary compliance criteria is evaluated for each region	The states with RPS or other mandates providing quantified projections are detailed in Table 1

I.	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	Regional and State Air Emissions Regulations	The Northeast Regional Greenhouse Gas Initiative (RGGI) applies to fossil-fueled power plants over 25 megawatts 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 ₂ emissions and requires that states account for CO ₂ 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	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. AEO2021 incorporates the latest model rule specifications, including adding Virginia to the program beginning in 2021.	Regional Greenhouse Gas Initiative Model rule, www.rggi.org
		The California Assembly Bill 32 (AB32) sets 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, 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	The EMM models the cap-and-trade program explicitly for CO ₂ 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	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)
		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	AEO2021 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	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

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
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, EIA assumes that line losses would fall slightly and customers would be more responsive to price signals
			and use tax manufacturing exemption (July 25, 2017)
			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	AEO2021 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.	Consolidated Appropriations Act, 2016	As part of this act, Congress extended the qualifying deadlines for the production tax credit (PTC) and investment tax credit (ITC) for renewable generation technologies. The deadline for PTC-eligible technologies to receive the full production credit was extended by two years. Wind technologies are eligible to receive the PTC after the two-year extension, but the value of the PTC declines gradually over time before final expiration. This extension is unlike the treatment in previous years, in which the tax credit maintained a constant inflation-adjusted value. The five-year ITC extension for solar projects also includes a gradual reduction in the value of the credit, as well as a provision that allows it to begin when construction starts	AEO2021 explicitly models the revised dates for these tax credits. It also models the revised dates for these tax credits subject to the Internal Revenue Service (IRS) issued guidance on the date construction begins, which allows wind projects four years to be completed, provided that the project owner has invested 5% of total project costs at the beginning of construction and engages in continual construction through the four-year period
			Consolidated Appropriations Act, 2016, Public Law 114-113, Sec. 187, December 2015

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
L.	Furthering carbon capture, Utilization, Technology, Underground storage and Reduced Emissions (FUTURE) Act, 2018	The FUTURE Act amended the IRS Code, section 45Q, to expand and extend the credit for CO2 sequestration; credits are available to power and industrial sources that capture and permanently sequester in geologic storage, and for use in enhanced oil recovery (EOR)	The 45Q tax credit is represented explicitly in the EMM to plants with CCS; credits are available to plants that start construction or begin a retrofit before January 1, 2024, and are assumed to be applied for the first 12 years of operation. The credit values vary depending on whether the CO2 is stored or used for EOR	U.S. Congress, Senate Bill 1535, FUTURE Act 2018
M.	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
N.	Illinois Future Energy Jobs Bill	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 must purchase ZECs to cover 16% of utility electricity sales in 2014. Existing nuclear units serving Illinois are eligible to receive the ZECs	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 provide support to existing nuclear generating plants (as is the Illinois Future Energy Jobs Bill), 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	State of Illinois, Future Energy Jobs Bill, Public Act 099-0906, June 1, 2017

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis	
O.	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 three years	payment is passed through to retail prices	State of New Jersey, Senate Bill No. 2313, May 23, 2018
P.	Creates Ohio Clean Air Program, House Bill Number 6, 133rd General Assembly	Ohio House Bill 6 provides payments for qualified nuclear resource credits for each megawatthour produced for a period of seven years (2020–26) based on a price of \$9.00 per credit, provided from an annual \$150 million Nuclear Generation Fund collected through ratepayer surcharges. Plant owners are required to provide financial and operational data and cost and production projections through 2026	For states with programs designed specifically to provide support to existing nuclear generating plants (as is the Creates Ohio Clean Air 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 Ohio, House Bill No. 6, July 23, 2019
Q.	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 2018, Connecticut’s Department of Energy and Environmental Protection selected a 10-year proposal from Millstone for about half of its 2.1 gigawatt output. Between 2022 and 2029, Millstone will receive higher prices based on environmental, economic,	As the Connecticut legislation creates a general clean energy auction, rather than specific support for existing nuclear generating plants, the standard modeling approach used to model other state programs is not applied to Connecticut. In the AEO2021 core cases, nuclear plants in New England tend to be economical and are not	Connecticut General Assembly, Senate Bill No. 1501, June 2017

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	and grid benefits. Seabrook NPP, in New Hampshire, was also selected, and its contract begins in 2022	projected to retire through at least 2030	

Oil and 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 United States Geologic Service (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
C.	Section 29 Tax Credit for Nonconventional Fuels	The Alternative Fuel Production Credit (Section 29 of the IRC) applies to qualified nonconventional fuels from wells drilled or facilities placed in service between January 1, 1980, and December 31, 1992. Natural gas production from qualifying wells could receive a \$3 (1979 constant dollars) per barrel of oil equivalent credit on volumes produced through December 31, 2002. The qualified fuels are oil produced from shale and tar sands, natural gas from	The Section 29 Tax Credit expired on December 31, 2002, and it is not considered in new production decisions. However, the effect of these credits is implicitly included in the parameters that are derived from historical data reflecting such credits	Alternative Fuel Production Credit (Section 29 of the Internal Revenue Code), initially established in the Windfall Profit Tax of 1980

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basis
	geopressurized brine, Devonian shale, coal seams, tight formations, and biomass. Liquid, gaseous, or solid synthetic fuels produced from coal, fuel from qualified processed formations or biomass, and steam from agricultural products also qualify		
D. Energy Policy Act of 2005	Establishes a program to provide grants to enhance oil and natural gas recovery through CO2 injection	Additional oil resources were added to account for increased use of CO2-enhanced oil recovery	Title III, Section 354 of the Energy Policy Act of 2005

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) may contain at most 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	Modeled by updating gasoline specifications to most current EPA gasoline survey data (2005), which represents anti-backsliding requirements	40 CFR Parts 60 and 86

Legislation		Brief description	Annual Energy Outlook (AEO) handling	Basics
		organic gases, and diesel particulate matter; establishes anti-backsliding and anti-dumping rules for gasoline		
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
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., final rule
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

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basics
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 current BTC was signed into law in December 2019, was retroactively applied to 2018 and 2019, and currently expires at the end of 2022.	The tax credits are applied against the production costs of the products into which they are blended. Biodiesel and renewable diesel is assumed to be blended into highway diesel, nonroad diesel, or heating oil	26 USC 40, 26 USC 6426, and 26 USC40A; Tax credits extended through December 31, 2016, by Public Law 114-113)
	b. Renewable Fuel Standard (RFS)	This section has largely been redefined by EISA2007 (see below); 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, with corn ethanol limited to 15 billion gallons. Any other biofuel may be used to fulfill the balance of the mandate, 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	The RFS is included; however, it is assumed that the schedule for cellulosic biofuel is adjusted downward, consistent with waiver provisions contained in the law	40 CFR Part 80, Subpart M; <i>RFS Program: Standards for 2014, 2015, and 2016 and Biomass-Based Diesel Volume for 2017</i> , page 4/100
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	Vermont Energy Act of 2011, Maine State Legislature HP1160, New Jersey State Department of Environmental Protection,

Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basics
		consumption of low sulfur diesel as heating oil	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 is designed to reduce the 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.	The LCFS is included as legislated for gasoline and diesel fuel sold in California and for other regulated fuels	California Air Resources Board, <i>Final Regulation Order: Subarticle 7. Low Carbon Fuel Standard</i>
N. California Assembly Bill 32 (AB32)	The California Assembly Bill 32 (AB32), the Global Warming Solutions Act of 2006, authorized the California Air Resources Board (CARB) 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-CO2 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, <i>California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms</i> , (Sacramento, CA: July 2011)
O. EPA ETS 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 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 Section 772.1 on May 12, 2016; see page 13
Q. U.S. Congress, H.R. 1314-Bipartisan Budget Act of 2015, Title IV – Strategic Petroleum Reserve, Sec. 401-403,	Sec. 401-403 requires a test drawdown, actual drawdown, and sale of crude oil from the Strategic Petroleum Reserve during FY 2018-FY 2025	Explicitly represents the crude oil withdrawals from the Strategic Petroleum Reserve (SPR) as specified by the act	H.R.1314 – Bipartisan Budget Act of 2015

	Legislation	Brief description	Annual Energy Outlook (AEO) handling	Basics
	114th Congress (2015–2016)			
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	H.R.22 – Fixing America’s Surface Transportation Act
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	H.R.2029 – Consolidated Appropriations Act, 2016

Source: U.S. Energy Information Administration, Office of Energy Analysis