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Clean Energy Standards: Selected Issues for the 117th Congress

February 22, 2021

Congressional Research Service
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R46691

CRS REPORT
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SUMMARY

R46691

February 22, 2021

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Clean Energy Standards: Selected Issues for the 117th Congress

For many years, policies to reduce greenhouse gas (GHG) emissions have been of interest to Congress. Congressional and constituent interest continues in the 117th Congress. One option to reduce GHG emissions from electricity generation is a clean energy standard.

A clean energy standard (CES), sometimes called a clean electricity standard, is a policy that requires a minimum share of electricity to be generated from eligible "clean" sources. No universal definition of clean energy exists, and proposals differ in what technologies are included. Some proposals, usually referred to as a renewable portfolio standard (RPS), include only certain renewable energy sources (e.g., solar), while other proposals also include nuclear power, fossil fuels equipped with carbon capture and storage (CCS) technology, certain natural gas technologies, or other energy sources. As of 2020, thirty states and the District of Columbia have implemented a CES, including 10 jurisdictions that will ultimately require 100% of covered electricity sales to come from eligible clean energy sources.

Members of Congress have demonstrated a longstanding interest in CES policies, with proposals for a national CES dating at least to 1997. None has been enacted. Most recently, six bills introduced in the 116th Congress would have established a national CES (sometimes in conjunction with other policies). The measures differed in eligible sources, final targets, and implementation details. For example, one bill would have required 100% of covered electricity sales to come from renewable energy sources by 2035. Another measure would have established CES targets consistent with 80% reductions in electricity GHG emissions, but only after certain new technologies like CCS for coal-fired power plants met defined market penetration thresholds. Four of the bills would have established a 100% clean energy requirement for U.S. electricity generation with target dates ranging from 2035 to 2050.

Other proposals put forward in 2020 also might be relevant to CES discussions in the 117th Congress. Two separate House committees supported 100% CES policies. One aimed to achieve 100% clean energy used for electricity generation by 2050 and the other aimed for 100% by 2040. Additionally, President Biden campaigned on a goal of 100% clean energy used for electricity generation by 2035, and an executive order issued in January 2021 reiterates that goal.

For context, renewable sources made up 18% of U.S. electricity generation in 2019, nuclear power made up 20%, natural gas made up 38%, and coal (without CCS) made up 24%. In February 2021, the U.S. Energy Information Administration (EIA) projected the share of total U.S. electricity generation coming from renewable sources in 2050 might vary from 33% to 57%, depending on factors such as future energy prices and economic growth. The share from non-emitting sources (i.e., renewables and nuclear) in 2050 varied from 44% to 67% in the projections, and the share from non-emitting sources together with natural gas varied from 86% to 93%.

The future makeup of the U.S. electricity system might affect congressional perceptions of the necessity or feasibility of a CES. Estimating the future energy system makeup typically is challenging, especially over 15 years or more (i.e., the time periods covered by recent CES proposals). The ongoing coronavirus disease 2019 (COVID-19) pandemic makes such outlooks especially challenging, because of the impact the pandemic is having on U.S. energy consumption and production. Another complicating factor is the possibility that the 117th Congress could change U.S. energy policy (not including consideration of a CES). For example, legislation might aim to change the relative price of certain energy sources through tax incentives, carbon pricing, or other means. Legislation could seek to alter future U.S. electricity demand, for example with policies to increase electricity use for transportation or, alternatively, policies to decrease electricity use through improved efficiency. Legislation not directly targeting the U.S. electricity system also could be relevant, for example legislation directed towards affecting overall economic activity or infrastructure. Finally, non-congressional action such as executive actions or state policies also could affect the U.S. electricity system.

In short, numerous policies the 117th Congress might consider could affect the future makeup of the U.S. electricity system, as could non-congressional actions. The interactions among some or all of these factors might be relevant, should Congress choose to debate a CES.

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Introduction

Congress continues to study and discuss a range of policies to reduce U.S. greenhouse gas (GHG) emissions, and the Biden Administration has made reducing GHG emissions a priority. Several legislative and executive actions could achieve such a goal. One legislative option, targeting the U.S. electricity system, is a clean energy standard.

A clean energy standard (CES), sometimes called a clean electricity standard, aims to increase the share of U.S. electricity generated from qualified clean energy sources. No agreed-upon definition of "clean energy" exists, so the exact set of energy sources supported by a CES proposal is one of its defining characteristics. Members of Congress have introduced legislation to establish a national clean energy standard in every Congress since at least the 105th (1997-1998).[1] Congressional and constituent interest in this policy continues in the 117th Congress.

As of 2020, thirty states and the District of Columbia have a CES.[2] Of these, 10 ultimately will require all covered electricity sales to come from eligible clean energy sources. The 10 jurisdictions are California, Colorado, the District of Columbia, Hawaii, Massachusetts, New Jersey, New Mexico, New York, Virginia, and Washington.[3] Additionally, five states have non-binding goals of 100% covered electricity sales from eligible clean energy sources: Connecticut, Maine, Nevada, Rhode Island, and Wisconsin.

This report provides two analyses to inform potential CES policy discussions in the 117th Congress. First, this report summarizes CES proposals from the 116th Congress. Second, this report analyzes the current and potential future makeup of the U.S. electricity system, for context.

Bills Introduced in the 116th Congress

CRS identified six bills introduced in the 116th Congress that would have established a national clean energy standard.[4] **Table 1** summarizes the CES proposals identified in these six bills, focusing on two key policy features: the final target and eligible sources. The final target is typically expressed as the maximum required share of covered electricity sales to come from eligible sources and the year by which that share is to be met. Final targets for many state CES

[1] Seven of these measures were passed in at least one chamber, in all cases as part of comprehensive energy or environmental legislation. No CES provision was enacted into law. For more information, see CRS In Focus IF11316, *A Brief History of U.S. Electricity Portfolio Standard Proposals*, by Ashley J. Lawson. Past proposals have used alternative names such as renewable portfolio standard (RPS) or clean electricity standard. An RPS includes only renewable sources while a clean energy (or electricity) standard typically also includes non-renewable sources like nuclear power. Most policy considerations apply equally to RPS or CES. For simplicity, this report generally uses the term CES to refer to any policy that would require certain sources be used for electricity generation, reflecting the predominant usage in the proposals in the 116th Congress. For more information about CES, see CRS Report R45913, *Electricity Portfolio Standards: Background, Design Elements, and Policy Considerations*, by Ashley J. Lawson.

[2] Some of these states have an RPS in place, setting goals for renewable energy use only. Three U.S. territories also have an RPS. Eight additional states and one additional territory have voluntary renewable portfolio goals in place. N.C. Clean Energy Technology Center Database of State Incentives for Renewables & Efficiency (DSIRE), *Renewable Portfolio Standards and Clean Energy Standards*, September 2020.

[3] The District of Columbia, Hawaii, Massachusetts, and Virginia each require 100% of covered electricity sales to come from renewable energy sources. The dates for achieving those targets vary. In 2020, Arizona regulators approved a 100% CES, but the policy is not yet finalized.

[4] Bills were identified by searching Congress.gov using the phrases "clean energy," "clean energy standard," "renewable electricity standard," "renewable energy," "renewable energy standard," and "renewable portfolio standard" in full bill text or bill summaries. Search results were refined by including only the Subject-Policy Area terms "Energy" and "Environmental Protection." Some bills contained policy provisions other than CES, but those other policies are not summarized in this report.

policies and past legislative proposals applied across all utilities; however, several bills in the 116th Congress would have set targets for each utility individually. This distinction is noted in the table. Eligible sources are the sources that may be used for compliance with the CES. Bills in the 116th Congress defined eligible sources by either source type (e.g., renewable energy, nuclear power) or carbon intensity (i.e., the volume of GHG released per unit of electricity generated).

Table 1. National Clean Energy Standard (CES) Legislative Proposals in the 116th Congress

Short Title	Bill Number(s)	Final Target	Eligible Sources	Selected Distinguishing Feature(s)
Climate Solutions Act of 2019	H.R. 330	100% by 2035	Renewables	Additional policy details not set in legislation; instead, to be determined by DOE regulations.
Clean Energy Standard Act of 2019	S. 1359 / H.R. 2597	100% by 2050, or potentially later for some utilities	Renewables, nuclear, CCS, natural gas	Targets set individually for every electric utility up to 90% before 2040, then increasing 1 percentage point each year after utility reaches 90%.
Renewable Electricity Standard Act	S. 1974	1.5 percentage points greater than 2019 levels in 2020; increasing by 2 percentage points annually for 2021-2029 and by 2.5 percentage points annually for 2030-2035	Renewables	Targets set individually for every electric utility.
Clean Energy Innovation and Deployment Act of 2020	H.R. 7516	100% by 2050	Renewables, nuclear, CCS, natural gas	Targets set individually for every electric utility. Emissions reductions outside the power sector (e.g., electrified space heating, electric vehicle charging, direct air capture) covered by the CES.
Clean Energy Future Through Innovation Act of 2020	H.R. 9054	Target set to achieve 80% reductions in power sector emissions by 2050	Any source with annual carbon intensity less than 0.825 metric tons carbon dioxide per megawatt-hour	CES comes into effect only after defined market penetration criteria are met for certain technologies (e.g., coal-fired power plants with CCS).

Source: Prepared by CRS.

Notes: DOE = U.S. Department of Energy; CCS = fossil fuel-fired power plants equipped with carbon capture and sequestration. Bills are listed in chronological order by date of introduction. Final target is the maximum share of eligible clean energy sources to be used for electricity generation required by the CES, and the year by which that share is to be met. Carbon intensity refers to the volume of greenhouse gases released per unit of electricity generation. Bills may have additional eligibility requirements for some sources (e.g., limitations on biomass sources, minimum carbon intensity requirements for natural gas). Some bills contain additional policy provisions.

Other legislation introduced in the 116th Congress would have addressed energy sources for electricity generation directly (e.g., fossil fuel bans, net-zero emissions target) or indirectly (e.g., tax incentives for certain sources), but these measures are not discussed in this report. This report also does not discuss carbon pricing proposals, although they, too, could potentially affect the share of electricity coming from different sources.[5]

Other Proposals

Several other CES proposals were released during the 116th Congress.[6] Generally, these had fewer specific policy details compared to the introduced bills. Unlike some introduced bills, none of these other CES proposals call for 100% renewable energy.

On January 28, 2020, majority leaders of the House Committee on Energy and Commerce released draft legislative text of the Climate Leadership and Environmental Action for our Nation's Future Act (the CLEAN Future Act). Its sponsors describe the CLEAN Future Act as "a comprehensive proposal of sector-specific and economy-wide solutions to address the climate crisis."[7] Among the provisions in the CLEAN Future Act is a CES with a final target of 100% by 2050.[8]

On June 30, 2020, Democrats on the House Select Committee on the Climate Crisis released a majority staff report, *Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America*. The report aims to "[lay] out the Climate Crisis Action Plan, full of detailed, ambitious and actionable climate solutions that Congress should enact to benefit American families in communities across the nation."[9] Among

[5] In carbon pricing proposals, policymakers attach a price to GHG emissions or the inputs that create them. A price on emissions or emissions inputs—namely fossil fuels—would increase the relative price of the more carbon-intensive energy sources. This result is expected to spur innovation in less carbon-intensive technologies and stimulate other behavior that may decrease emissions. A summary of carbon pricing bills is provided in CRS Report R45472, *Market-Based Greenhouse Gas Emission Reduction Legislation: 108th Through 116th Congresses*, by Jonathan L. Ramseur.

[6] In addition to the other proposals discussed in this report, the Senate Democrats' Special Committee on the Climate Crisis released a report, *The Case for Climate Action: Building a Clean Economy for the American People*. The report identified a CES as a policy that "could guarantee the electric sector's contribution to meeting the global target of net-zero by no later than 2050," but the report did not make a specific recommendation or proposal for a CES. Senate Democrats' Special Committee on the Climate Crisis, *The Case for Climate Action: Building a Clean Economy for the American People*, August 2020, p. 20.

[7] House Committee on Energy and Commerce, "E&C Leaders Release Draft CLEAN Future Act Legislative Text to Achieve a 100 Percent Clean Economy," press release, January 28, 2020, https://energycommerce.house.gov/newsroom/press-releases/ec-leaders-release-draft-clean-future-act-legislative-text-to-achieve-a-100.

[8] Title II-Power, Subtitle A-Federal Clean Electricity Standard, CLEAN Future Act discussion draft, https://energycommerce.house.gov/sites/democrats.energycommerce.house.gov/files/documents/0128%20CLEAN%20Future%20Discussion%20Draft.pdf.

[9] House Select Committee on the Climate Crisis, "Select Committee Democrats Release 'Solving the Climate Crisis,' a Congressional Roadmap for Ambitious Climate Action," press release, June 30, 2020, https://climatecrisis.house.gov/news/press-releases/climate-plan-press-release.

the recommendations in the report is that Congress should enact a CES with a final target of 100% by 2040.[10]

Outside of Congress, President Biden supported a goal of "a carbon pollution-free power sector by 2035" in his campaign, and has continued to support that goal in his administration. For example, an executive order issued January 27, 2021, aims to use federal procurement authorities to "achieve or facilitate a carbon pollution-free electricity sector no later than 2035."[11]

Putting a 100% Target in Context

As summarized above, most CES proposals in the 116th Congress would have required nearly all electricity to come from eligible clean energy sources in the 2035-2050 timeframe. The distinction between "all" and "nearly all" arises from the policy details provided in some of the proposals. A 100% target does not necessarily require 100% of electricity to come from eligible clean sources. For example, a CES might exempt electricity sales from small utilities or allow alternative compliance payments. The actual amount of clean energy used would be affected by utility compliance choices, future technology costs, and other factors.

The U.S. electricity system is large and complex, and many power plants and associated infrastructure have lifetimes of 40 years or more. Experts disagree about the extent to which these features present cost and feasibility challenges to achieving a 100% CES in three decades or less. Much of the debate focuses on wind and solar energy because of their unique operating characteristics.[12] Assessing the cost and feasibility of a 100% CES is beyond the scope of this report. However, this section provides some relevant data and discussion to put a 100% CES target in context.

How much clean energy was used in the U.S. electricity sector in 2019? The answer depends upon what sources are considered to be clean, as shown in **Figure 1** and discussed in the following paragraphs. In 2019, renewable energy fueled 18% of U.S. electricity, while renewable energy plus nuclear power fueled 38%.[13] These sources together with natural gas fueled 76% of U.S. electricity in 2019.

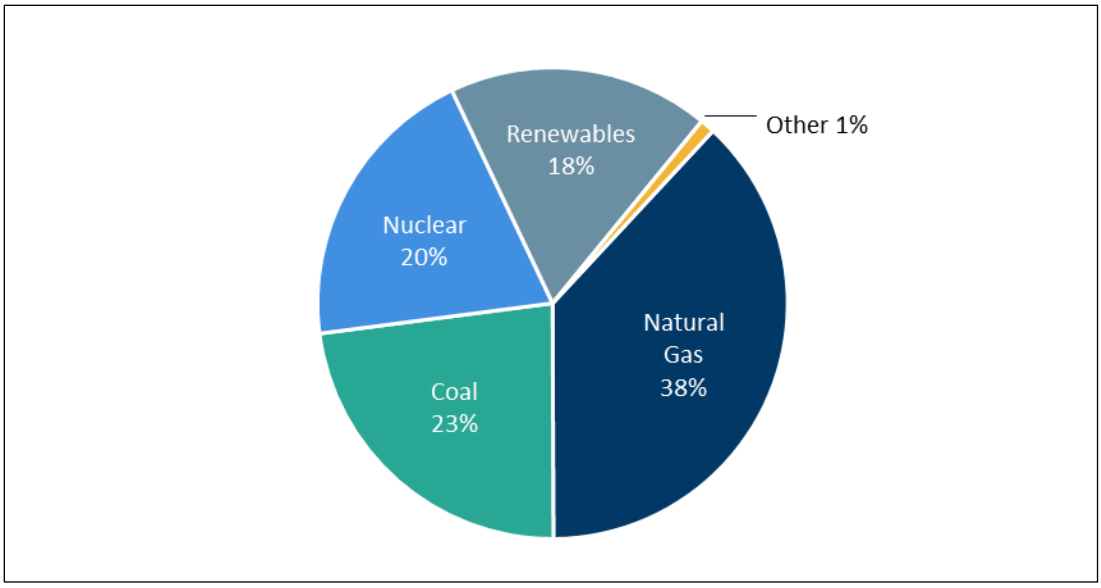
[10] *Solving the Climate Crisis: The Congressional Action Plan for a Clean Energy Economy and a Healthy, Resilient, and Just America*, p. 4, https://climatecrisis.house.gov/sites/climatecrisis.house.gov/files/Climate%20Crisis%20Action%20Plan.pdf.

[11] Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad," 86 *Federal Register* 7619, February 1, 2021. Campaign quote comes from https://joebiden.com/clean-energy/#, accessed January 15, 2020.

[12] For more information on issues associated with using high levels of wind and solar, see CRS In Focus IF11257, *Variable Renewable Energy: An Introduction*, by Ashley J. Lawson, and CRS Insight IN11065, *An Electric Grid Based on 100% Renewable Energy?*, by Richard J. Campbell.

[13] This estimate does not include the 3,959,824 megawatt-hours (MWh) generated in 2019 by Unit 8 of the W.A. Parish power plant in Texas, widely known as Petra Nova. That unit is equipped with carbon capture and sequestration (CCS) capable of sequestering about 33% of the unit's carbon dioxide (CO_2) emissions. Petra Nova's output was 0.1% of total U.S. electricity generation in 2019. For readability, the main body of this report rounds values to zero decimal places and does not identify Petra Nova's generation. Petra Nova's operators shut down the CCS equipment in 2020, citing impacts of the COVID-19 pandemic. Generation data is from U.S. Energy Information Administration (EIA), *Form EIA-923*, https://www.eia.gov/electricity/data/eia923/. Additional information about Petra Nova comes from EIA, *Petra Nova Is One of Two Carbon Capture and Sequestration Power Plants in the World*, October 31, 2017.

Figure 1. 2019 U.S. Electricity Generation by Source Type



Source: U.S. Energy Information Administration, *Electric Power Monthly*, "Table 1.1. Net Generation by Energy Source: Total (All Sectors)."

Notes: Other includes petroleum and gases derived from fossil fuels. Details of energy source classification are provided in this report and in the EIA source.

Figure 1 uses the following classifications. Renewable energy means all renewable energy sources, including small-scale and distributed sources (e.g., rooftop solar), all hydropower, and all biomass. Some CES bills introduced in the 116th Congress would limit the eligibility of hydropower and biomass, for example by specifying types of eligible biomass feedstocks, but those limitations are not considered here. Natural gas means any power plant using primarily natural gas, regardless of technology type or carbon intensity. Some CES bills introduced in the 116th Congress would allow natural gas plants to be eligible if they met certain carbon intensity thresholds, but those limitations are not considered here. Should Congress debate a national CES, it could set eligibility criteria based on energy source, carbon intensity, or other characteristics.

Outlook for Clean Energy in the U.S. Electricity System

The possible future makeup of the U.S. electricity system might affect (among other things) congressional perceptions related to the necessity or feasibility of a CES. Estimating the future energy system makeup typically is challenging, especially over multi-decadal periods. The COVID-19 pandemic and other factors make such outlooks especially challenging.

One prominent estimate of future changes in the U.S. energy system is made each year by the U.S. Energy Information Administration (EIA) in its Annual Energy Outlook (AEO).[14] In February 2021, EIA released its first long-term projections accounting for the pandemic. In EIA's assessment, the pandemic's impacts on the electricity sector will be mostly felt in the next few

[14] For an overview of the Annual Energy Outlook, see CRS In Focus IF11691, *The Annual Energy Outlook (AEO): A Brief Overview*, by Ashley J. Lawson and Kelsi Bracmort.

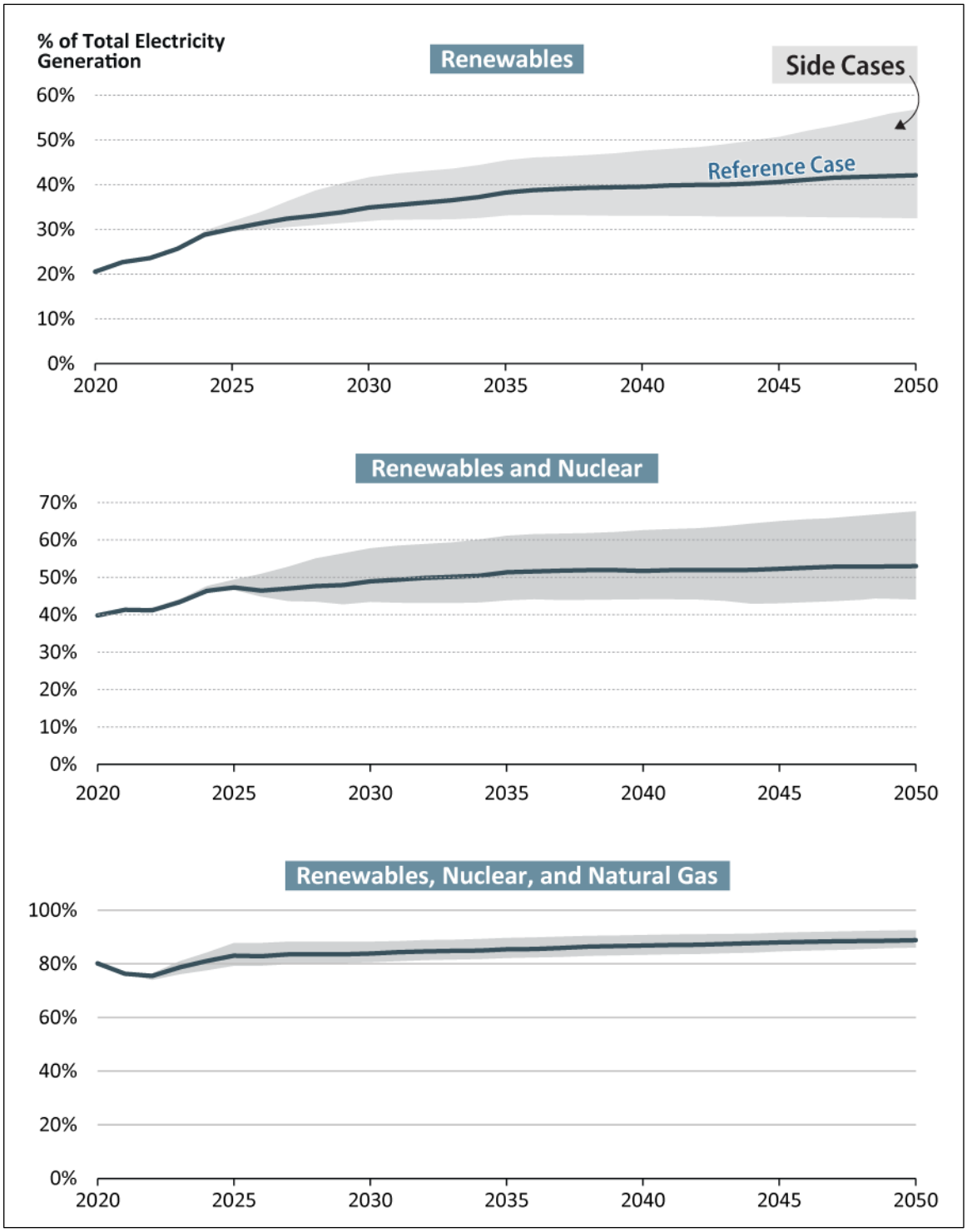
years. After that, long-term sectoral trends return to dominance: "EIA does not project long-term structural changes in electricity demand resulting from the pandemic, and the AEO2021 Reference case projects that demand largely returns to 2019 levels by 2025."[15]

In EIA's 2021 projections, the share of total U.S. electricity generation coming from renewable sources in 2050 varied from 33% to 57%, depending on factors such as future energy prices and economic growth. The share from non-emitting sources (i.e., renewables and nuclear) in 2050 varied from 44% to 67% in the projections, and the share from non-emitting sources together with natural gas varied from 86% to 93%.[16] **Figure 2** compares EIA's 2021 projections for the share of total U.S. electricity generation coming from these different source types. The classifications in **Figure 2** match those in **Figure 1**, and are used to provide context.

[15] EIA, *Annual Energy Outlook 2021 Narrative*, February 2021, p. 12, https://www.eia.gov/outlooks/aeo/pdf/AEO_Narrative_2021.pdf.

[16] CRS calculations based on data from EIA, *Annual Energy Outlook 2021*, February 3, 2021. EIA's projections do not include projections for CCS.

Figure 2. Projected Share of Total U.S. Electricity Generation, by Source Type



Source: CRS calculations based on data from EIA, *Annual Energy Outlook 2021*, February 3, 2021.

Notes: Details of energy source classification are provided in this report and in the EIA source. EIA side cases include alternative assumptions about future energy supply and prices, technology costs, and economic growth.

It is unknown how the COVID-19 pandemic ultimately will affect clean energy's trajectory, because the pandemic is ongoing and the economic impacts could still change. In any case, two key factors affecting the share of clean energy in the future U.S. electricity system are (1) the pace of additions of new clean energy, and (2) total electricity demand.[17] Legislative responses to the pandemic or other issues such as climate change could affect either or both of these factors, increasing the uncertainty in long-term projections.

The pace of clean energy additions is affected by the pace of new power plant construction overall, and the share of clean energy within new power plants. New power plants are planned when needed to meet increasing electricity demand, but demand in the United States overall was mostly unchanged from 2005 to 2019.[18] Generally, electricity demand increases with increasing population and economic activity, though energy efficiency and conservation can offset these factors. New power plants also are planned to replace retired power plants as part of the natural aging and turnover of the U.S. power plant fleet.

While a number of factors affect the share of clean energy within new power plant additions, technology and fuel costs are two main drivers. Power plant developers generally choose an energy source primarily based on economics. In other words, the sources that usually are used by new power plants are the ones that can generate electricity at the lowest cost per unit of electricity, inclusive of tax incentives or other financial factors. Policies, like state CES requirements, also can influence decisions about new power plants. Economics and policy have been favorable for new power plants using wind and solar energy for several years, and most experts expect that will continue. For example, wind and solar are expected to make up 70% of new capacity additions in 2021.[19]

Currently, when overall demand for electricity decreases, the share of clean energy goes up, all else being equal. This outcome is driven mostly by wind and solar energy. Those sources have relatively low operating costs (because the "fuel" is free), so they typically are used to generate electricity whenever the wind is blowing and the sun is shining. In other words, once a power plant using wind or solar is built, it often operates to the maximum extent possible, for economic reasons. Decreases in electricity demand disproportionately affect non-renewable sources (e.g., coal) because of their relatively higher operating costs. These economic factors are part of the reason why generation from coal-fired power plants fell in 2020.[20]

[17] Retirement of existing clean energy power plants is another factor, mostly for nuclear power plants. For more information, see CRS Report R42853, *Nuclear Energy: Overview of Congressional Issues*, by Mark Holt. The relative share of different energy sources used for electricity additionally might be affected by other factors such as state policies, but those are not discussed in this report.

[18] From 2005 to 2019, total annual U.S. electricity generation was 4.1 trillion kilowatt-hours (kWh) on average, with a high of 4.2 trillion kWh in 2018 and a low of 4.0 trillion kWh in 2009. EIA, *Electricity Data Browser*. Despite national trends, some regions of the country may be experiencing electricity demand growth and a corresponding higher buildout of new power plants.

[19] EIA, *Renewables Account for Most New U.S. Electricity Generating Capacity in 2021*, January 11, 2021, https://www.eia.gov/todayinenergy/detail.php?id=46416.

[20] According to EIA, total U.S. electricity consumption fell an estimated 4% in 2020, compared to 2019 levels. At the same time, the share of generation from coal fell from 24% in 2019 to an estimated 20% in 2020. In contrast, the share of generation from natural gas and renewables increased from 2019 to 2020. EIA, *Short-Term Energy Outlook*, December 2020, https://www.eia.gov/outlooks/steo/archives/dec20.pdf.

As noted above, Congress could enact non-CES legislation that could affect the pace of additions of new clean energy, total electricity demand, or both. For example, legislation could influence power plant developers' choice about energy sources by altering their relative prices in the market (e.g., tax incentives to lower prices for certain sources or carbon pricing to increase prices for certain sources). Legislation also could affect electricity demand by increasing use of electricity in the economy (e.g., for transportation) or decreasing electricity demand by promoting efficiency measures. Legislation not directly targeted at the electricity system also could affect the outlook for clean energy in the U.S. electricity system. For example, legislation affecting overall economic activity could affect future electricity demand, and infrastructure policy could influence the private sector's decisions about what energy sources to use for electricity generation. Also, non-congressional actions (e.g., executive actions, state policies) affect the U.S. electricity system. In short, numerous policies the 117th Congress might consider (and non-congressional actions as well) could affect the future makeup of the U.S. electricity system. Should Congress also choose to debate a CES, the interactions among some or all of these factors might be relevant.

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