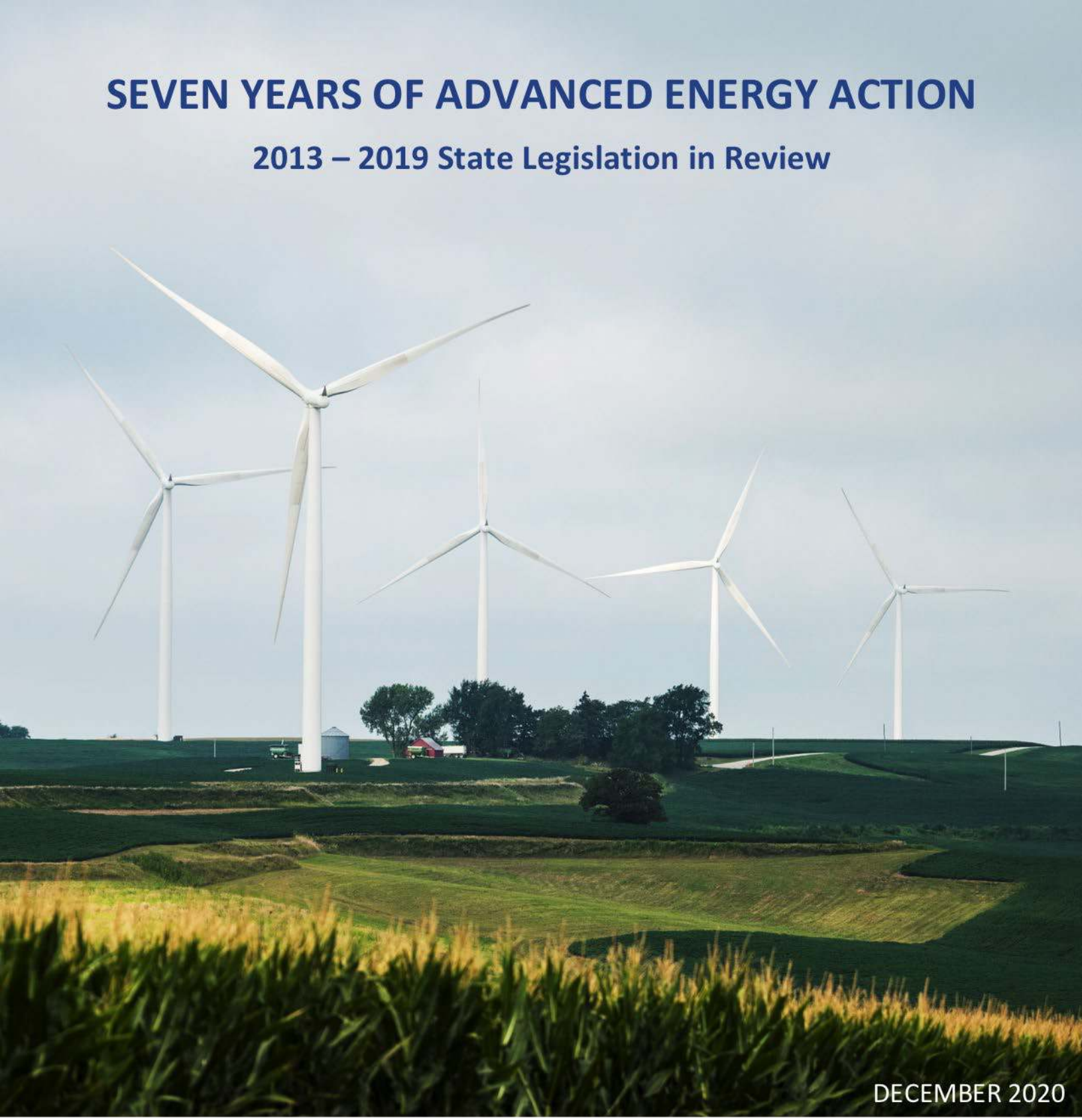
SEVEN YEARS OF ADVANCED ENERGY ACTION

2013 – 2019 State Legislation in Review



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CENTER FOR THE NEW ENERGY ECONOMY
COLORADO STATE UNIVERSITY

SEVEN YEARS OF ADVANCED ENERGY ACTION

2013 – 2019 State Legislation in Review

December 2020

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About the Center for the New Energy Economy: Founded in 2011 as a department of Colorado State University, the Center for the New Energy Economy is an initiative led by Colorado's 41st Governor, Bill Ritter, Jr. and assisted by a team of energy and environmental policy experts. The Center works directly with governors, legislators, regulators, utilities, and stakeholders by providing technical and strategic assistance to help decision-makers create policies that facilitate America's transition to a clean energy economy.

This report can be accessed on our website at https://cnee.colostate.edu/

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Seven Years of Advanced Energy Action
2013 – 2019 State Legislation in Review

States have taken the lead in developing the climate and energy policies that drive clean energy adoption. The period between 2013 and 2019 was characterized by shifts in public opinion concerning energy and climate, dramatic changes in energy markets, and technological innovation. Managing energy supply and demand has become more complex, and as technological progress accelerates, state legislatures have been empowered to lay the policy groundwork to transform energy markets. State responses anticipating and reacting to systemic changes have varied widely.

There is no one-size-fits-all approach for advancing a clean energy economy. There are a multitude of policy tools to facilitate transitions in states with diverse economies, political dynamics, and social values. For these reasons, tracking state legislative activity is important for understanding the direction of U.S. energy policy. Using AEL Tracker data, this report looks back at the 3,542 energy-related bills enacted by state policymakers between 2013 and 2019. Throughout this report, we identify notable trends and new policy developments.

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Introduction

In the U.S., states have taken the lead in developing the climate and energy policies that drive clean energy adoption. For this reason, tracking state legislative activity is important for understanding the direction of U.S. energy policy. This was the impetus behind the creation of the Center for the New Energy Economy's (CNEE) Advanced Energy Legislation Tracker (AEL Tracker). The AEL Tracker categorizes, tracks, and archives energy-related legislation introduced in the 50 states and the District of Columbia. Our extensive database contains information on nearly 27,000 bills introduced across the country since 2013. Using AEL Tracker data, the team at CNEE has produced several state-level energy policy trends papers. In this report, we look back at the 3,542 energy-related bills enacted between 2013 and 2019.[1]

This report begins with an overview of broad national trends emerging between 2013 and 2019. Following this discussion, the report examines key findings, notable trends, and new policy developments across nine of AEL Tracker's ten policy categories (see box).[2] In each section, we highlight noteworthy legislation enacted in 2017, 2018, and 2019.[3] We conclude with a discussion of the energy market impacts of the COVID-19 pandemic and other events in 2020 that influenced energy policy and markets across the U.S.[4]

AEL Tracker Policy Categories	
Economic Development	Infrastructure
Electricity Generation	Natural Gas Development
Emissions	Other Energy[2]
Energy Efficiency	Regulatory
Financing and Financial Incentives	Transportation

National Trends 2013 – 2019

Ideally, state clean energy policy prepares a state to address the challenges of climate change, responds to popular support for clean energy, creates and expands clean energy markets, and evolves relative to changes in markets and technological advancements. The period between 2013 and 2019 was characterized by shifts in public opinion concerning energy and climate, dramatic changes in energy markets, and technological innovation. According to a 2020 report by the Pew Research Center, public concern about climate change

[1] Bill totals throughout this report might not match search results on the AEL Tracker for two reasons. First, companion legislation, identical or very similar bills introduced and enacted by both chambers of a state's legislature, as is the case for a handful of states, are counted as a single bill in all analyses by CNEE. Second, companion legislation that was not enacted appears in search results on the AEL Tracker website. More on this is available here.

[2] We do not cover the Other Energy policy category in this report.

[3] Readers interested in noteworthy legislation enacted between 2013 and 2016 can access our trends papers here: https://www.aeltracker.org/p/trends-analysis.

[4] This report was finalized during the 2020 COVID-19 pandemic, any impact the pandemic might have on clean energy trends and public support may not be reflected here.

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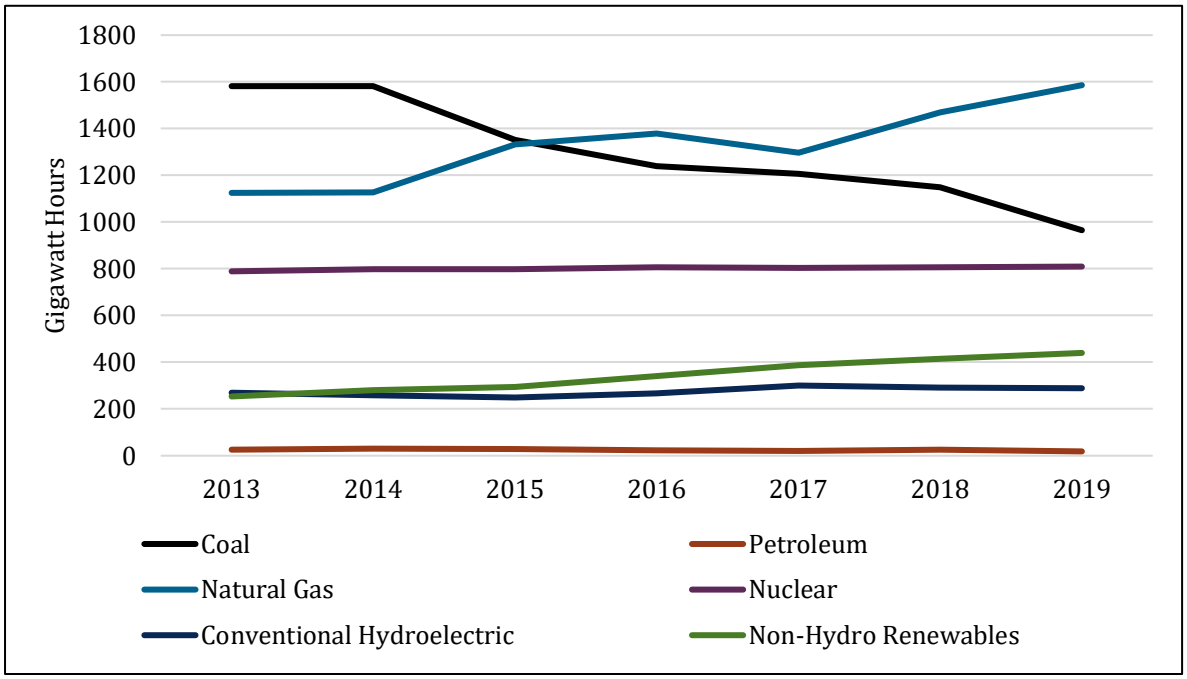
increased 20% between 2013 and 2020.[5] Technological advances created new markets, natural gas surpassed coal in net electricity generation, new non-hydroelectric renewable resources, especially wind and solar, increased by 73% (Figure 1), and the number of jobs in the clean energy sector grew to nearly three million (see Figures 5 and 6). We discuss these changes in more detail below.

Figure 1. Net Generation by Resource: 2013 - 2019



Source: U.S. EIA. Electricity Data Browser. Net Generation, United States, All Fuels, All Sectors*, Annual.
* 'All sectors' refers to electric utilities, independent power producers, and the commercial and industrial sectors.

Public Opinion on Climate Change and Clean Energy

A majority of Americans are concerned about and willing to take action to address climate change. At least 60% of Americans think climate change is a major threat to the U.S. (Figure 2).[6] Similarly, 60% of Americans think Congress should do more to address climate change and support imposing stricter environmental laws;[7,8] 75% of Americans support regulating CO_2 as a pollutant.[9]

U.S. polling results also demonstrate widespread support for clean and renewable energy. At least 70% of Americans believe that the U.S. should put more emphasis on producing energy from wind and solar, though support for solar is higher (80% in 2019).[10] At least 63% of Americans support requiring electric utilities in

[5] Kennedy, B. 2020. U.S. Concern about Climate Change is Rising, but Mainly among Democrats. *Pew Research Center*. 16 April.
[6] Ibid.
[7] Marlon, J., Howe, P., Mildenberger, M., Leiserowitz, A., and Wang, X. 2020. Yale Climate Opinion Map 2020. *Yale Program on Climate Change Communication*.
[8] Pew Research Center. 2020. Majority of Americans say stricter environmental laws are 'worth the cost'. April 20
[9] Marlon, J., Howe, P., Mildenberger, M., Leiserowitz, A., and Wang, X. 2020. Yale Climate Opinion Map 2020. *Yale Program on Climate Change Communication*.
[10] Gallup. 2020. In Depth: Topics A to Z: Energy.

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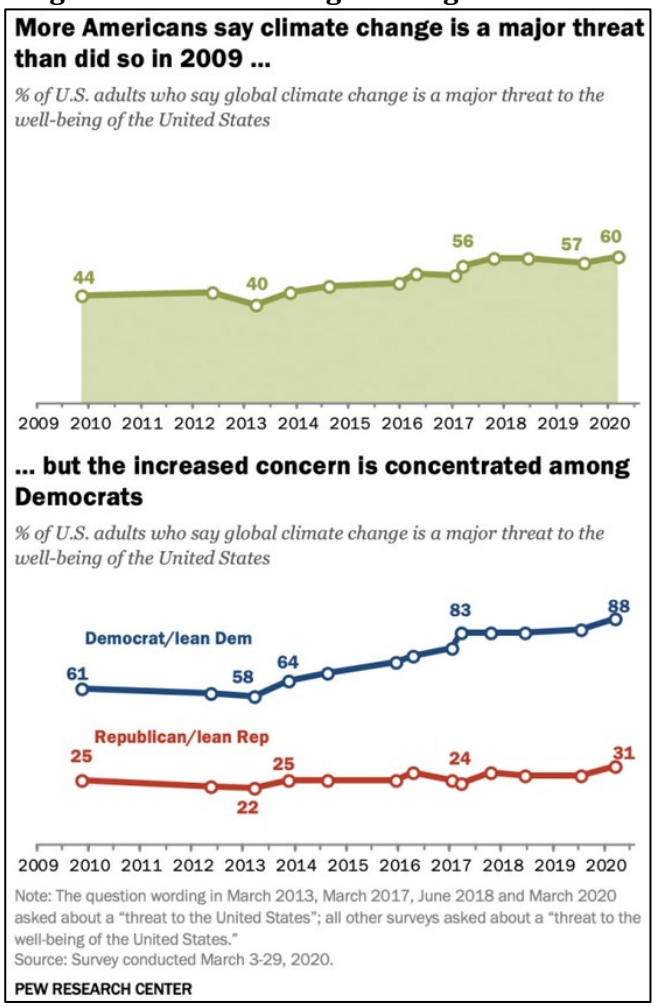
their state to produce 100% of their electricity with clean and renewable resources by 2050.[11,12,13] The level of support for climate- and clean energy-related action varies between Democratic, Independent / Unaffiliated, and Republican voters. For instance, a survey conducted for the Conservative Energy Network found that 59% of Republicans said they would vote for "elected officials or candidates who support clean energy development like solar and wind" while just 31% would vote against such candidates. When asked the same question, 79% of Independents would vote for clean energy supporters, while 11% would not.[14,15]

Popular support for action to address climate change and develop advanced energy technologies is not limited to clean electricity generation. Seventy-seven percent of American voters have a positive opinion about electric vehicles (EVs). At least 44% would consider an EV for their next purchase. That number increases to more than 70% when asked whether a $7500 federal tax credit would impact their choice.[16,17]

In the absence of comprehensive federal clean energy policy, states have taken the lead. Between 2013 and 2019, over 3,500 energy-related bills were enacted by the 50 states and the District of Columbia. Popular support for climate and clean energy-related action is reflected in state and local policies.

Figure 2. Climate Change Polling 2009 – 2020



Source: Kennedy, B. 2020. U.S. Concern about Climate Change is Rising, but Mainly among Democrats. *Pew Research Center*. 16 April.

The World Resources Institute (WRI) called 2018 the year of a "quiet clean energy revolution."[18] In 2018, candidates running for Governor and other state and local offices were elected on platforms supportive of

[11] The Green Advocacy Project. 2019. National Green Advocacy Project Polling. *Change Research*.
[12] Leiserowitz, A., Maibach, E., Rosenthal, S., Kotcher, J., Gustafson, A., Bergquist, P., Ballew, M., and Goldberg, M. 2019. Energy in the American Mind: December 2018. *The Yale Program on Climate Change Communication*.
[13] The Climate Nexus, Yale Program on Climate Change Communication, and the George Mason University Center for Climate Change Communication survey found higher levels of support: "A large majority of registered voters (85%) – including 95% of Democrats and 71% of Republicans – support requiring utilities in their state to produce 100% of their electricity from clean, renewable sources by 2050."
[14] Bolger, G. 2019. Clean Energy Survey Memo: 2019 National Polling Results: Attitudes Towards Clean Energy. *Public Opinion Strategies.*
[15] See also: Conservative Energy Network. 2020. Tipping Point: Clean Energy Fueling Conservative Voters Going Into 2020.
[16] Climate Nexus, the Yale Program on Climate Change Communication, and the George Mason University Center for Climate Change Communication. 2019. Poll: Bipartisan Interest in EV Tax Credit: More than Four in 10 Say They will Consider Buying or Leasing an EV. *Climate Nexus.*
[17] The Union of Concerned Scientists and Consumer Reports. 2019. Surveying Consumers on Electric Vehicles. *The Union of Concerned* Scientists. 17 July.
[18] Kaldjian, E. and Barua, P. 2019. The U.S. Underwent a Quiet Clean Energy Revolution Last Year. *World Resources Institute*. 23 January.

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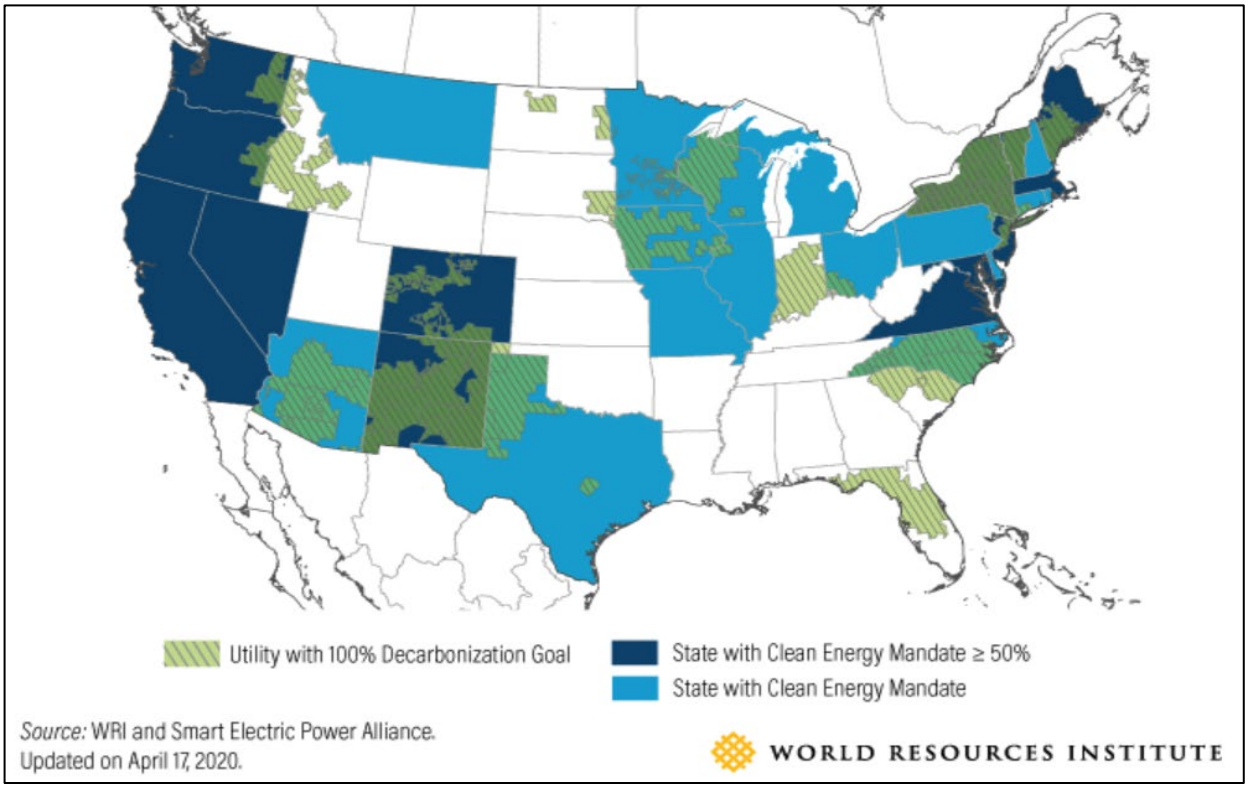
clean energy; a large number of cities across the country set a variety of target dates by which they would be powered 100% by renewable energy; a record 6.43 gigawatts of renewable energy was procured through corporate purchases; and several major utilities announced emissions reduction goals (e.g., Xcel Energy's goal of 100% carbon-free electricity by 2050).

Figure 3. U.S. States with Clean Electricity Mandates and Utilities with Decarbonization Goals



Source: Bird, L. and Clevenger, T. 2019. 2019 Was a Watershed Year for Clean Energy Commitments from U.S. States and Utilities. *World Resources Institute*. 20 December.

If 2018 was the year of a quiet revolution, 2019 was the year of bold action. Eleven states, Puerto Rico, and the District of Columbia adopted 100% clean energy targets and goals to be met at varying dates. At least 10 additional utilities committed to 100% clean energy or net-zero emissions targets, also to be met on varying timelines from 2025 to 2050 (Figure 3).[19]

As of December 2020, 254 cities, 37 counties, 10 states, and 12 tribes had signed the "We Are Still In" declaration committing to achieve the U.S. climate targets set in the Paris Climate Accord.[20] The governors of 25 states had joined the U.S. Climate Alliance, through which states commit to take actions that will advance the greenhouse gas (GHG) reduction goals of the Paris Agreement.[21] At least 170 cities and 11 counties have set a 100% renewable energy target or goal.[22]

[19] Bird, L. and Clevenger, T. 2019. 2019 Was a Watershed Year for Clean Energy Commitments from U.S. States and Utilities. *World Resources Institute*. 20 December.
[20] We Are Still In. 2020. Who's In.
[21] United States Climate Alliance. Governors.
[22] Sierra Club. 2020. 100% Commitments in Cities, Counties, and States. *Ready for 100*.

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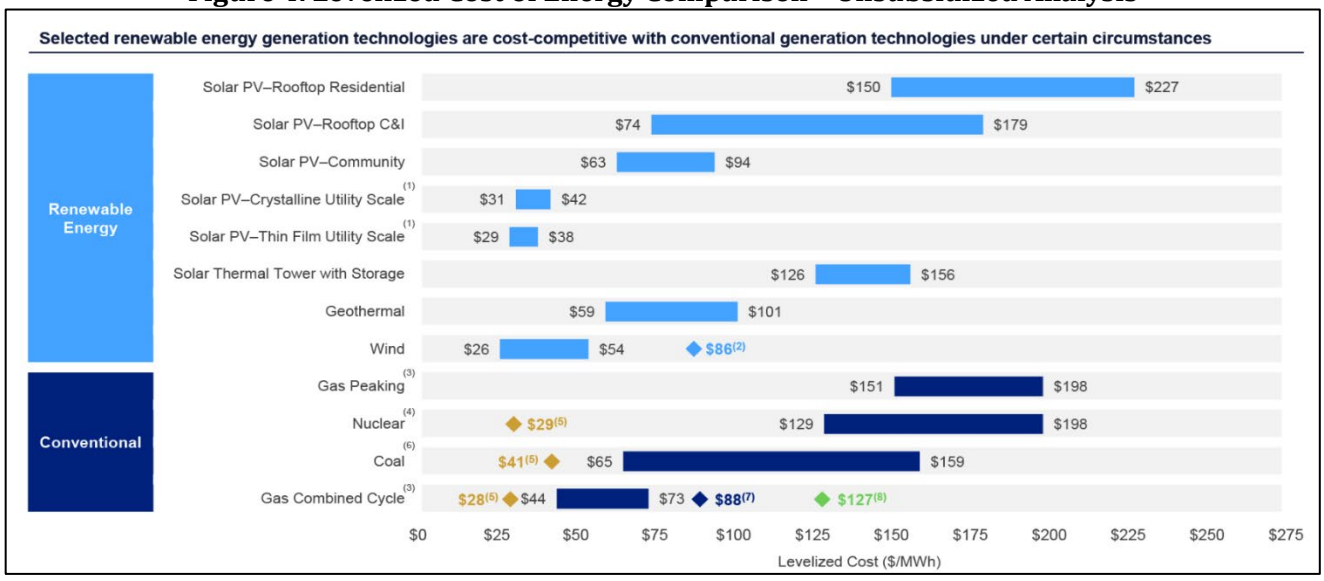
The Clean Energy Market

In 2019, renewable energy supplied more than 18% of U.S. net electricity generation, with the bulk of this coming from wind (7%) and hydropower (6.9%).[23] According to Bloomberg New Energy Finance's (BNEF's) New Energy Outlook (2019), wind and solar will supply 15% of U.S. generation by 2025, and renewable energy will supply 43% of U.S. electric generation by 2050 with overall emissions 54% lower than today's.[24] The Department of Energy's Energy Information Administration (EIA) models the interactions of economic changes, energy supply, demand, and prices. The EIA's 2020 Annual Energy Outlook (AEO) predicts that in all cases, renewable energy consumption would grow the most (on a percent basis) over time.[25] The 2020 AEO model also projects an increase in natural gas consumption accompanied by a decrease in consumption of energy generated by coal and nuclear.

Policies implemented at the state level (e.g., renewable portfolio standards) and at the federal level (e.g., production and investment tax credits) have encouraged investments in renewable energy. Increased renewable energy production, use, and technological innovation have driven the costs of renewable technologies down, further supporting their expanding adoption by the electric power, commercial and industrial, and residential sectors.[26] The International Renewable Energy Agency found that the costs of all commercially available renewable power generation technologies declined between 2010 and 2019. Specifically, the global weighted-average levelized cost of electricity (LCOE) declined 82% for utility-scale solar photovoltaic (PV), followed by concentrated solar power (CSP) (-47%), onshore wind (-39%), and offshore wind (-29%).[27] Lazard's 2020 Levelized Cost of Energy Analysis found that onshore wind and utility-scale solar, which became cost-competitive with conventional generation several years ago on a new-build basis, remain competitive with the marginal cost of existing conventional generation technologies (marginal costs appear in gold in Figure 4 below).

Figure 4. Levelized Cost of Energy Comparison – Unsubsidized Analysis



Source: Lazard. 2020. Lazard's Levelized Cost of Energy Analysis – Version 14.0.

[23] U.S. EIA. Electricity Data Browser. Net Generation, United States, All Fuels, All Sectors, Annual.
[24] Bloomberg New Energy Finance. 2019. New Energy Outlook 2019: Executive Summary.
[25] The EIA has been known to under-predict future deployment of non-hydropower renewable energy and over-predict the use of fossil fuels.
[26] U.S. EIA Office of Energy Analysis. 2019. Annual Energy Outlook 2019.
[27] International Renewable Energy Agency. 2020. Renewable Power Generation Costs in 2019.

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Between 2010 and the end of 2018, 810 megawatts (MW) of large-scale battery storage power capacity was installed in the United States. More than half of this capacity (459 MW) was installed between 2016 and the end of 2018.[28] The utility-scale storage market continues to grow. For instance, Pacific Gas and Electric received approval in 2018 for several storage projects, including a single 300 MW project to be completed by the end of 2020, which will be one of the two largest batteries in service in the world.[29] As the size and duration of batteries increase, this creates a shift from batteries primarily supporting the transmission of electricity (ancillary services), to increasingly providing capacity and meeting generation requirements during peak electricity-consumption hours (resource adequacy). Grid operators can invest in storage to incrementally defer or reduce the need for new generation capacity and minimize the risk of over-investment. According to the EIA, large-scale battery storage costs declined 61% between 2015 and 2017 (from $2,153/kilowatt hour (kWh) to $834/kWh).[30] Analysts predict that the costs of a 4-hour battery energy storage system will decline from approximately $380 per kilowatt-hour (kWh) in 2019 to $144 to $293 per kWh in 2030.[31,32]

In 2016, transportation surpassed the electric sector to become the largest sectoral source of GHG emissions in the U.S. Within this sector, passenger cars and light, medium, and heavy-duty trucks are the largest source of emissions. EIA's 2019 AEO predicts that as sales of battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and hybrid electric vehicles (HEVs) increase, the share of sales attributable to gasoline and flex-fuel vehicles will decline from 93% in 2018 to 75% in 2050.[33] BNEF estimates that 58% of all new passenger vehicle sales will be electric by 2040 and that price parity with conventional vehicles will be met for most segments in the mid-2020s.[34] As electric vehicle (EV) market penetration increases, and major automakers simplify battery pack design and standardize across EV models, battery prices will continue to fall. BNEF found that EV battery prices, which were above $1,100 per kWh in 2010, had fallen 87% to $156/kWh in 2019. The company forecasts that average prices will be close to $100/kWh, the price associated with price parity for EVs, by 2023.[35,36]

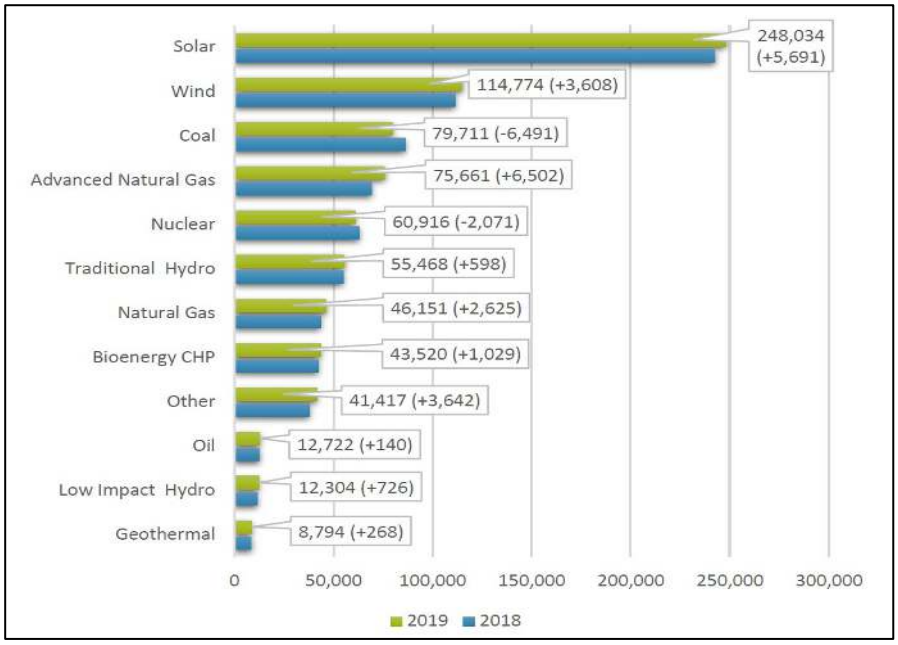
Jobs in Clean Energy

As demand for clean energy technologies increases, job growth in these industries follows. In 2019, the solar industry provided more than 248,000 American jobs, and there were more than 114,000 jobs in wind energy

[28] U.S. EIA. 2020. Battery Storage in the United States: An Update on Market Trends. July.
[29] Bade, G. 2018. Storage Will Replace 3 California Gas Plants as PG&E Nabs Approval for World's Largest Batteries. *Utility Dive*. 9 November.
[30] U.S. EIA. 2020. Battery Storage in the United States: An Update on Market Trends. July. The report defines large-scale battery storage as systems connected directly to the electric grid with a nameplate capacity greater than 1 MW.
[31] Cole, W., and Frazier, A.W. 2020. Cost Projections for Utility-Scale Battery Storage: 2020 Update. *National Renewable Energy Laboratory*. NREL/TP-6A20-75385. The report is a meta-analysis of existing battery storage cost studies. The range presented here reflects differences in analysts' predictions present in existing literature.
[32] Because there are relatively few current applications, the costs associated with utility-scale battery storage are rather difficult to capture, especially as compared to the costs associated with batteries for electric vehicles, for which far more data is available.
[33] U.S. EIA Office of Energy Analysis. 2019. Annual Energy Outlook 2019.
[34] Bloomberg New Energy Finance. 2019. Electric Vehicle Outlook 2019.
[35] Bloomberg New Energy Finance. 2019. Battery Pack Prices Fall as Market Ramps Up with Market Average at $156/kWh in 2019. 3 December.
[36] Because far more EV batteries are being produced today than are utility scale batteries, the costs in the former market have declined far more rapidly than they have in the latter.

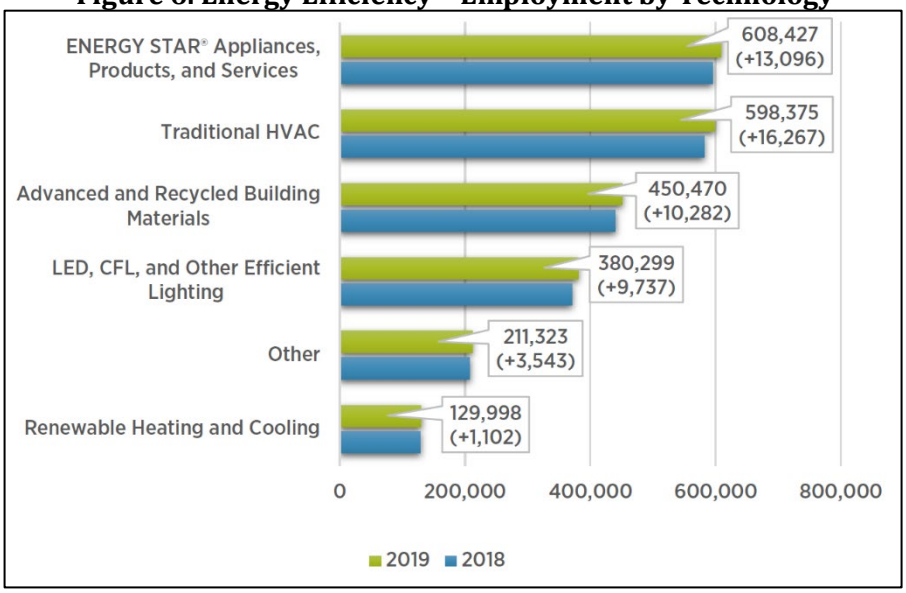
(Figure 5).[37,38] The 2020 National Association of State Energy Officials (NASEO) and Energy Futures Initiative (EFI) survey of U.S. Energy and Employment found that the energy efficiency sector provided the largest number of new jobs of any energy sector in 2019 (Figure 6). This sector added more than 54,000 jobs in 2019, growing 2.3% to 2.38 million total jobs.[39] In terms of contributions to the economy, in 2018, building energy efficiency services and technologies accounted for nearly $84 billion in U.S. revenue, with a 10% annual growth rate.[40]

Figure 5. Electric Power Sector – Employment by Technology



Source: NASEO and EFI. 2020. The 2020 U.S. Energy and Employment Report.

Figure 6. Energy Efficiency – Employment by Technology



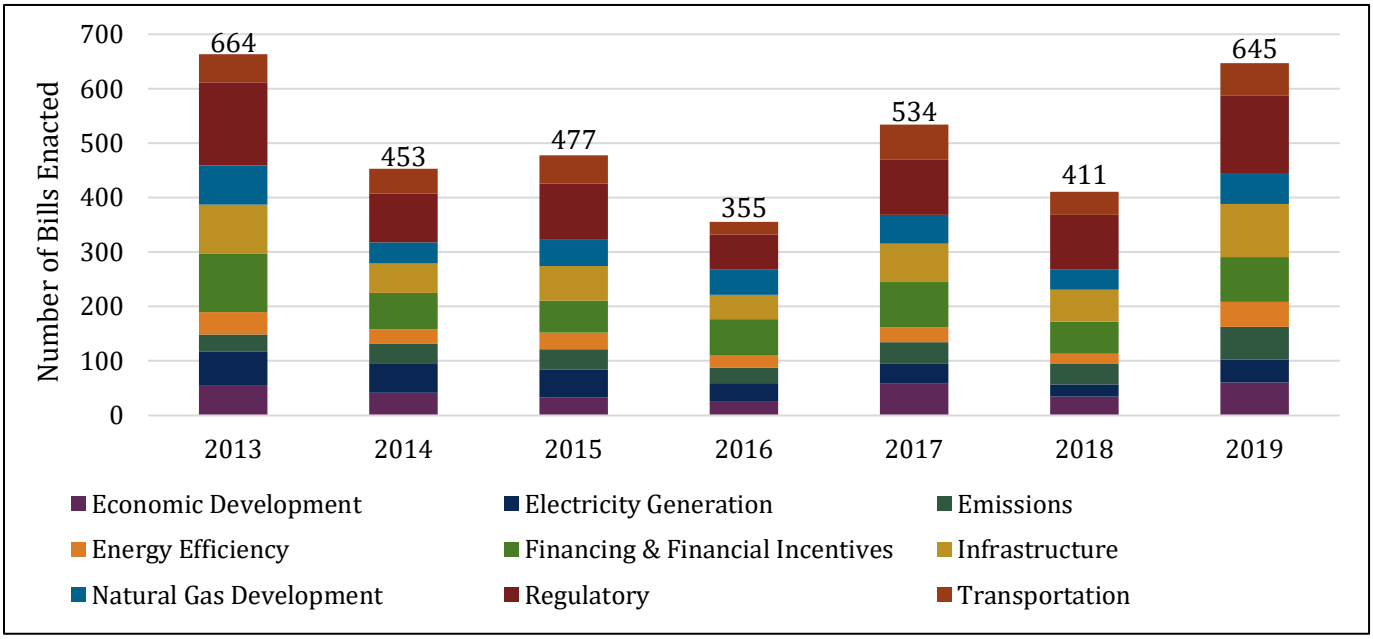
Source: NASEO and EFI. 2020. The 2020 U.S. Energy and Employment Report.

[37] Jobs reported are full-time equivalent.
[38] National Association of State Energy Officials (NASEO) and the Energy Futures Initiative (EFI). 2020. The 2020 U.S. Energy and Employment Report.
[39] Ibid.
[40] Advanced Energy Economy (AEE). 2019. Advanced Energy Now 2019 Market Report.

U.S. Legislative Trends 2013 - 2019

State policy has an interactive relationship with public opinion, clean energy markets, and technological advancements. In general, the total volume of enacted advanced energy-related legislation decreased between 2013 and 2018 before returning to near 2013 levels in 2019. However, this trend was not uniform across years or policy categories (Figure 7).

Figure 7. Volume of Enacted Advanced Energy Legislation, by Policy Category 2013 – 2019



We expect to see reduced activity in even years when four states (Montana, Nevada, North Dakota, and Texas) do not hold regular sessions and 16 states hold shorter (and in some cases, budget-only) sessions. The pattern observed in Figure 7 could also be influenced by a number of factors including shifts in state government party control, reactions to federal policy positions and activity, and changes in the market and in state economies.

The smallest volume of enacted legislation is observed in 2016, a year in which state officials were likely focused on the upcoming election. We have also observed, perhaps unsurprisingly, that the years in which a state is under divided party control are often associated with a reduced volume of enacted legislation. Anecdotally, we saw increased volumes of enacted legislation in Maine, Nevada, and New Mexico in 2019 following the establishment of a Democratic trifecta in those states. However, unified party control is not always associated with more activity, suggesting other factors also influence state activity.

State policymakers also react to federal policy positions and activities. For instance, following the Supreme Court's stay of the Clean Power Plan, activity associated with implementing the Federal regulation dropped to zero (see the Emissions section below). On the other hand, as the Trump Administration's Department of Energy drafted rules to rollback appliance efficiency standards, several states enacted legislation that would set a floor on those requirements to maintain efficiency requirements before the rollback (see the Energy Efficiency section below).

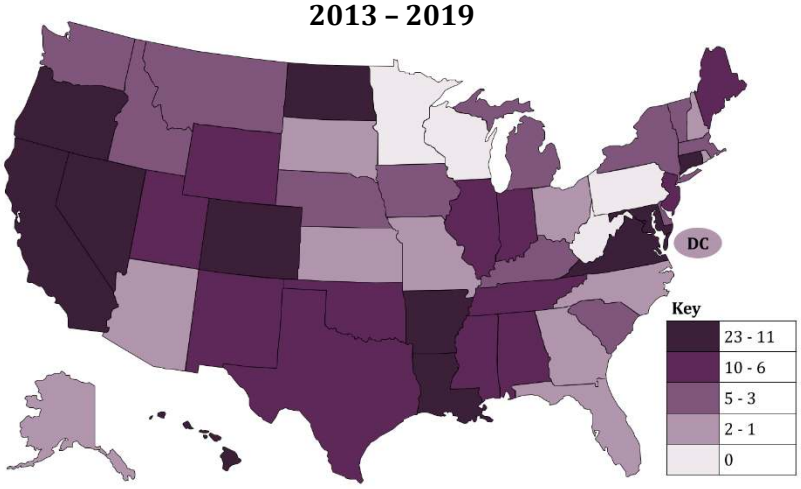
States also react to changes in the market and in their economies. For instance, as energy storage prices decline and as it becomes clearer that storage will be a necessary resource in a new energy economy, an increasing number of states have adopted policies to mandate or incentivize utility procurement of storage systems (see

the Infrastructure section below). As consumer demand for distributed energy resources (e.g., EVs, battery storage, rooftop solar) increases, as utilities integrate more and more cost effective renewable energy supply-side resources, and as new technologies enter the market, managing energy supply and demand has become more complex. Perhaps a reaction to this, we found that the period between 2016 and 2019 was marked by an increase in the number of omnibus bills enacted by states. These omnibus bills accomplished with a single piece of legislation what would have taken multiple bills in the more nascent stages of the energy transition. In the sections that follow, we examine trends in the nine policy categories highlighted in Figure 7.

Economic Development

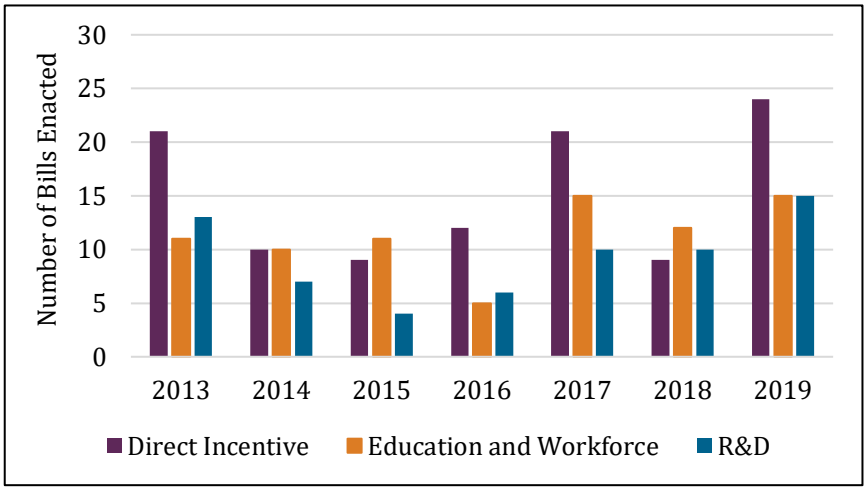
Legislation in the economic development category aims to attract new clean energy businesses while also maintaining an environment that supports existing businesses. This type of legislation can be a tool for transitioning a state to a clean energy economy. Legislatures around the U.S. continue to adopt new and modify existing incentives aimed at advanced energy investment.

Figure 8. Enacted Economic Development Legislation by State: 2013 – 2019



Between 2013 and 2019, 311 Economic Development bills were enacted by 46 states and the District of Columbia.[41] Legislation providing direct incentives to retain and attract clean energy-related businesses was the most common, followed by bills to promote workforce development. Bills promoting research and development were the third most frequently enacted type of legislation in this category (Figure 9).

Figure 9. Most Frequently Enacted Types of Economic Development Legislation 2013 – 2019



[41] Virginia was the most active state in this category, enacting 23 bills during this period. The state was followed by California and Maryland, with 15 bills each.

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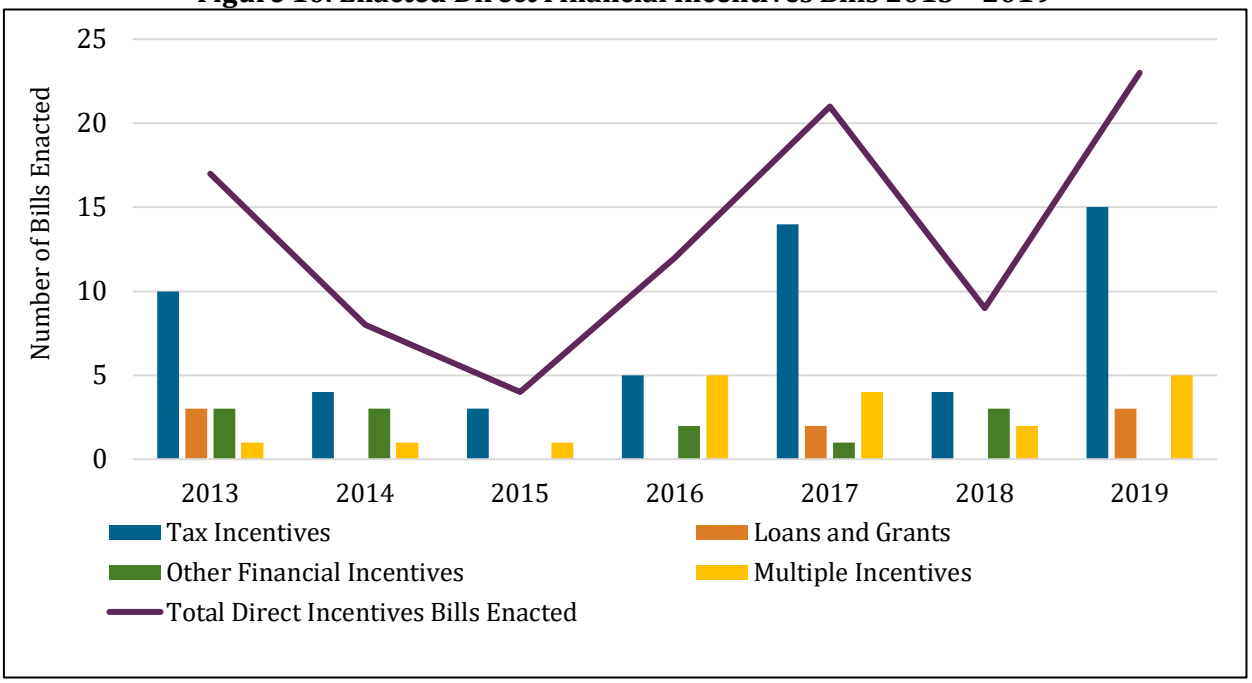
Direct Incentives

Between 2013 and 2015, the total number of enacted bills providing direct financial incentives to businesses declined. In 2016, this reversed, with another low point in 2018. The observed pattern appears to be heavily dependent on the number of tax incentive bills enacted (Figure 10). Of the 94 direct incentive bills enacted between 2013 and 2019, 55 were tax incentive bills.

Most of the tax incentive bills extended or increased tax credits. For example, Washington's SB17-5977 extended tax credits for solar manufacturers from 2017 to 2027. Maryland's SB17-873 altered the Job Creation Tax Credit calculation, reducing the job creation threshold to increase eligibility for small businesses. States also created tax credits to incentivize emerging technologies. For instance, Utah's HB19-0109 creates an income tax credit for companies that construct a plant or a facility that stores, produces, or distributes hydrogen for use as a fuel in zero emission motor vehicles, electrical generation, or for industrial uses.

Figure 10. Enacted Direct Financial Incentives Bills 2013 – 2019



In each year, at least one bill providing multiple economic development incentives was enacted. An example of this, Virginia's HB17-1565 authorized local governments to create green development zones that provide tax incentives, reduced permitting fees, and other incentives for businesses operating in a green building or that produce products that reduce negative environmental impacts.

Education and Workforce Development

Between 2013 and 2019, bills to promote in-state workforce development were the second most frequently enacted type of legislation in the economic development category (79 bills total). Iowa (HF18-2458) enacted the Future Ready Iowa Act, which provides incentives for apprenticeships, matching grants for employers and community organizations offering education and training, and scholarships and grants for students enrolled in courses related to high-demand jobs. New Mexico's HB19-7 created a handful of "centers of excellence" at institutions of higher education to promote the development of the cybersecurity and renewable energy fields among others. A noticeable trend, the number of bills enacted to provide incentives for science, technology, engineering, and math (STEM) workforce development increased between 2013 and 2019. Louisiana's HB18-144 created a fund to provide matching grants to support degree and certificate programs in high-demand and

STEM fields offered by public postsecondary educational institutions. New Jersey's S18-2723 created a STEM loan forgiveness program.

Research and Development

Bills providing funding and promoting public-private partnerships to support in-state research and development efforts were the third most frequently enacted type of legislation in the economic development category between 2013 and 2019 (65 bills total). Arkansas' SB17-249 created the Arkansas Small Business Innovation Research Matching Grant Program to encourage research and commercialization and to create and retain high-wage, high-tech jobs in moderately and highly skilled occupations. In California, AB17-523 requires that at least 25% of research and development funding be allocated for technology demonstration and deployment projects benefitting disadvantaged communities. As part of this provision, the Energy Commission is required to give preference to clean energy projects. North Dakota's SB19-2224 created a bioscience innovation grant program to support innovation and commercialization in several areas, including biofuels.

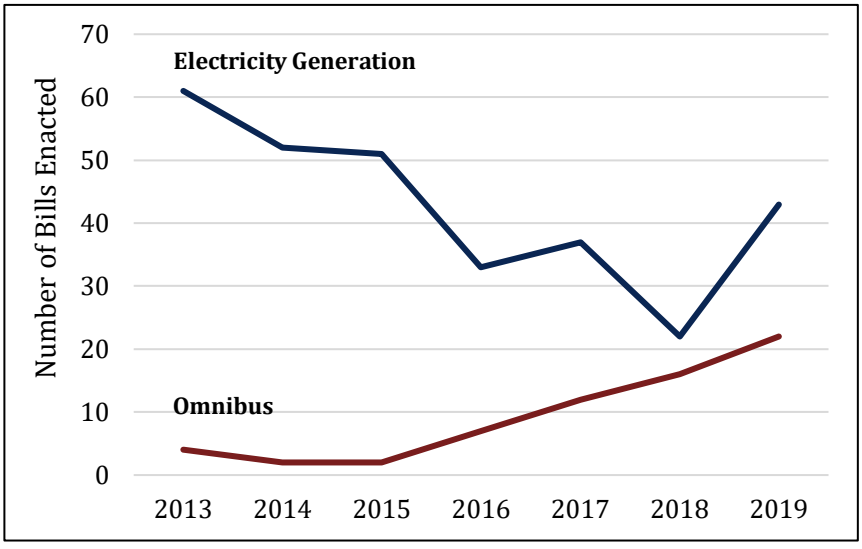
Legislation has also incentivized public-private partnerships to drive innovation. For example, Virginia (SB17-1258) expanded the purposes of the Virginia Solar Energy Development Authority to include energy storage. The Authority was also directed to promote collaboration among public and private institutions of higher education and to work with industries and nonprofit partners to position Virginia as a leader in energy storage technologies. Arkansas SB19-632 permits the Arkansas Economic Development Commission to work with universities, colleges, government agencies, and the private sector to establish the "Arkansas Cyber Initiative" intended to improve cybersecurity and promote cyber job-creating research activities.

Electricity Generation

The electric power sector is the second largest source of GHG emissions (behind transportation) in the U.S. State policy related to promoting renewable energy development through such mechanisms as renewable portfolio standards, shared or community renewable energy programs, and other policies to promote distributed generation have been effective tools for reducing emissions and supporting a clean energy transition.

Overall, the volume of enacted legislation in the AEL Tracker's electricity generation policy category declined between 2013 and 2019. Discussed in more detail in the regulatory section below, at least part of this can be explained by an increase in omnibus bills enacted after 2016 (Figure 11).

Figure 11. Electricity Generation Legislation and Omnibus Legislation 2013 – 2019



Renewable Portfolio Standards

Renewable portfolio standards (RPSs) require that in-state electric suppliers supply a specific amount of renewable energy as part of their electric portfolio by a certain date. Historically, about half of all growth in renewable energy capacity was attributable to RPS requirements. While in some regions – the Northeast and Mid-Atlantic – RPSs remain important tools for driving renewable energy growth, this is less true in other regions today. In 2018, just under 30% of U.S. renewable energy capacity additions were attributable to RPS requirements.[42]

Between 2013 and 2019, 30 states enacted 95 amendments to their RPSs. Most of these made relatively minor modifications to existing policy or increased RPS targets. Relatively few rolled back renewable energy requirements (Figure 12). This trend has held over time. Since 2015, 23 states have increased their RPS and/or added new clean energy targets while only three states have reduced targets. A few states adopted significant increases to RPS requirements in 2019. Maine (LD19-1494) increased its renewable requirement to 80% by 2030 and 100% by 2050 and gave preference to the "highest value, lowest environmental impact resources." Nevada (SB19-358) established the goal of zero-carbon electricity by 2050. Oregon (SB19-98) and Nevada (SB19-154) created new renewable natural gas targets for natural gas utilities.

Figure 12. RPS Legislation 2013 – 2019

	2013	2014	2015	2016	2017	2018	2019	Total
Increase	3	2	4	3	2[1]	6[2]	6[1]	26
Modify	18	10	8	5[1]	12[1]	6[1]	4	63
Rollback	0	2	3	0	0	1	0	6
Total	21	14	15	8	14	13	10	95

[1] One of these amendments was enacted through omnibus legislation, typically found in AEL Tracker's regulatory category.

[2] Three of these amendments were enacted through omnibus legislation, typically found in AEL Tracker's regulatory category.

Recently, major increases to RPSs have been enacted through omnibus legislation. Examples include Connecticut's SB18-9, which increased the state's RPS to 40% by 2030. Washington D.C's B22-904 (introduced in 2018, enacted in 2019) increased the District's RPS to 100% by 2032, and Massachusetts H18-4857 increased the RPS from 1% to 2% annually from 2020 through 2029, bringing the overall RPS to 35% by 2030. The bill also established a clean peak standard[43] and set storage goals for the state. New Jersey's A18-3723 increased the state's RPS to 50% by 2030. The bill also requires generators in the state to source an increasing amount of energy from distributed solar, with a goal to reach 5.1% by 2021. Finally, New York passed the Climate Leadership and Community Protection Act (S19-6599), which directs the Public Service Commission (PSC) to create a program for the state to reach 70% renewable energy generation by 2030 and zero-carbon electricity by 2040.

[42] Barbose, G.L. 2019. U.S. Renewables Portfolio Standards: 2019 Annual Status Update. *Lawrence Berkeley National Laboratory*.

[43] A clean peak standard credits renewable energy delivered during times of peak demand.

Shared Renewables

Due to building and property attributes and ownership issues, many customers are unable to install renewable energy technologies where they live or work. Allowing shared or community renewable energy projects addresses these barriers. These projects have multiple owners or subscribers who pay for a portion of the project or the generation provided by the system and receive credit for that generation through virtual net metering.

Between 2013 and 2019, the volume of enacted legislation addressing shared renewable energy was relatively stable at two to four bills a year. The outlier during this period occurred in 2015, when eight bills were enacted in seven states. While four states amended existing statute, Connecticut, Hawaii, and Maryland authorized new programs. In 2017, New Jersey and Virginia created new shared renewables provisions. New Jersey's A16-2204 authorized virtual net metering for small (3 MW or less) hydropower facilities and resource recovery facilities through which power could be delivered or sold to up to 10 end-use customers. Virginia's SB17-1393 required two major utilities in the state to initiate community solar pilot programs for their customers. In 2018, New Jersey's A18-3723 directed the Board of Public Utilities to create a community solar energy pilot program and to adopt rules to make the program permanent within 36 months of the adoption of the rules establishing the pilot program. Connecticut's SB18-9 created new provisions related to community solar, in what the Coalition for Community Solar Access called a "small, modest step forward."

Policy activity surrounding shared renewables ticked upward again in 2019, when six bills were enacted in as many states. One state – Nevada (AB19-465) – adopted a new community solar program, which carves out 25% of program capacity for low-income recipients and another 25% for disadvantaged businesses and nonprofit organizations. The remaining bills entailed expansions to shared renewables programs already on the books. For example, Colorado (HB19-1003) removed siting restrictions for community solar facilities based on size and location, and New Hampshire (SB19-165) added an incentive payment for low-income subscribers.

Net Metering and Distributed Generation

In general, customers want a clear, streamlined, affordable, and predictable system for connecting distributed renewable energy systems to the grid. Between 2013 and 2019, state legislatures across the nation addressed both the rising popularity and affordability of rooftop solar and the obstacles sometimes presented by local policies and organizations. While some states enacted provisions to promote distributed generation, other states took actions that might have the opposite effect.

For instance, many states have enacted laws prohibiting homeowner associations (HOAs) from adopting unreasonable restrictions on solar system installations. Idaho (H19-158), Oregon (HB17-2111), and D.C. (B17-22-229) established provisions to prohibit the adoption of HOA bylaws that prevent the installation of solar panels. As is typical in most states, HOAs are allowed to adopt reasonable size, aesthetic, placement, and safety requirements for solar installations. States have also addressed obstacles created by local permitting and zoning regulations. To streamline permitting, Rhode Island (H17-5575) adopted provisions requiring the Office of Energy Resources to create a statewide universal solar photovoltaic (PV) application that encompasses building and electric permitting.

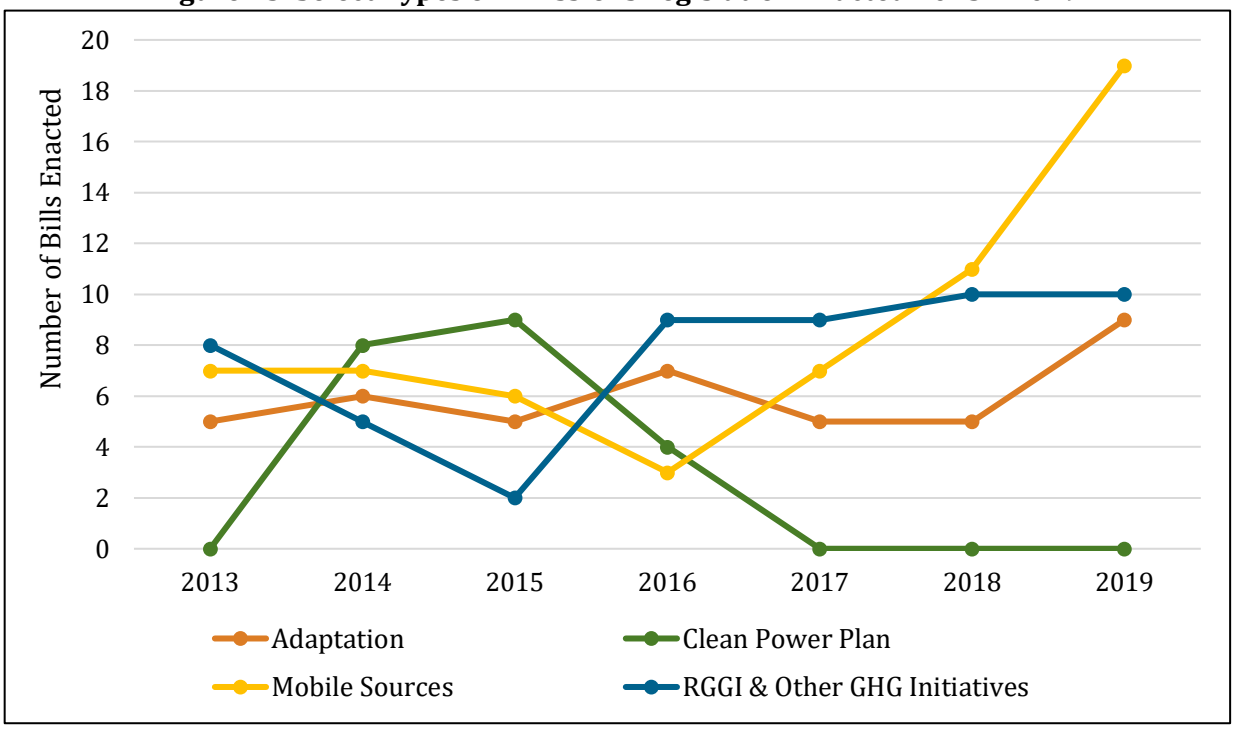
Net metering policies have traditionally provided a direct kilowatt hour (kWh) credit to the solar owner – one kWh delivered to the grid is credited against one kWh used from the grid. Utilities often refer to this as providing the customer with a "retail rate" credit for solar power delivered to the grid. Recently, there has been a move by some states to shift to more of a "net billing" structure, where a price per kWh is credited for power delivered to the grid rather than crediting the kWh itself. In some cases, states are adjusting net

metering credit rates in ways that some fear will negatively impact the solar energy market. For instance, Indiana's SB17-309 gradually phases out retail rate compensation for net metered customers. Connecticut's SB18-9 also phases out net metering. New customers will be allowed to select either a net billing or buy-all, sell-all option under which utilities will buy all of the energy produced by a customer at a fixed kWh rate and customers will pay the full retail rate for energy they consume.[44] In Kentucky, SB19-100 made several changes to net metering policy. Among other provisions, the bill increases system size limitations from 30 kilowatts (kW) to 45 kW, and allows utilities to petition the state's public service commission to adjust their net metering rate – the retail rate – to recover "all costs necessary to serve [net metered] customers, independent of the rate structure for all other customers." Customers with distributed systems installed before the new rates are developed will be grandfathered in and compensated at the retail rate for 25 years.[45]

Emissions

Bills included in the emissions policy category typically address the regulation of mobile and point-source emissions, implement provisions of the Clean Air Act (CAA), and establish policies to adapt to and mitigate the effects of climate change. Between 2013 and 2019, 39 states and the District of Columbia enacted 272 emissions-related bills. Here, we discuss trends in legislation addressing transportation-related emissions, greenhouse gas (GHG) emissions, and climate change adaptation (see Figure 13).

Figure 13. Select Types of Emissions Legislation Enacted 2013 – 2019



[44] EnerKnol. 2018. Solar Connecticut Unveils 'Buy-All, Sell-All' Compensation Plan for Residential Solar Customers. 27 December.
[45] Brandt, J. 2019. Kentucky PSC Allows More Time for Comments on New Net Metering Rates for Electric Utilities. *Daily Energy Insider*. 11 September.

Mobile Source Emissions

In general, the bulk of legislation addressing mobile source emissions deals with vehicle emissions testing requirements, exemptions, and the use of testing fees revenues. Likely in reaction to the successful 2016 civil lawsuit against Volkswagen in which the manufacturer was found to have violated the CAA (discussed in more detail in the Transportation section below), a handful of bills related to emissions testing addressed diesel emissions and emissions testing defeat devices. For instance, Utah's HB18-101 created a program under which certain counties in non-attainment areas would be required to participate in a three-year diesel emissions testing pilot program. Under the program, counties are required to report findings of emissions equipment tampering. California's AB18-2381 allowed the State Air Resources Board to impose a new fee on motor vehicle manufacturers to fund the Board's activities related to the detection of emissions testing defeat devices and software.

Colorado (SB17-278), Delaware (SB18-249), and Maine (LD19-1769), acted to prohibit "coal rolling", the practice of modifying diesel engines to emit large amounts of dark-colored exhaust that can be released on command from within the vehicle. In 2018, California's State Air Resources Board was required (SB18-1014) to create GHG emissions reduction targets for transportation network companies (e.g., Uber, Lyft).

The Clean Power Plan

In 2014, the U.S. EPA proposed the Clean Power Plan (CPP) to regulate carbon dioxide (CO_2) emissions from existing power plants under Section 111(d) of the CAA. President Barack Obama announced the final Plan in 2015, and states were expected to submit initial compliance plans in 2016 and final plans in 2018. In early 2016, the U.S. Supreme Court stayed implementation of the CPP pending judicial review, and the rule was subsequently rescinded by the Trump Administration. State legislative activity related to complying with the CPP responded: the number of bills introduced and enacted peaked in 2015 and fell to zero by 2017 (see Figure 13).[46]

RGGI and Other GHG Initiatives

"GHG initiatives" refers to measures designed to reduce greenhouse gas emissions statewide or from a particular sector (e.g., transportation, electric power). This includes bills related to the Regional Greenhouse Gas Initiative (RGGI) and California's Cap and Trade Program. Legislative activity related to GHG initiatives between 2013 and 2019 was nearly opposite that of activity related to the CPP. At the height of legislative activity regarding implementing the CPP (2015), only two enacted emissions bills addressed GHG initiatives. As the federal government reversed course, it became clear that states would need to continue to be the primary drivers of GHG emissions policies. Correspondingly, state activity related to GHG initiatives resumed and held steady beginning in 2016 (see Figure 13).

Many of the states enacting legislation related to GHG initiatives might be rather expected. California's AB17-398 made several amendments to the Global Warming Solutions Act and other energy-related provisions. For instance, the bill extends the cap and trade program, dedicates a portion of revenues from the program to fire prevention activities, and requires the Workforce Development Board to report on the workforce development-related activities necessary to help industry, labor, and communities' transition to clean energy. Colorado's renewable energy standard (expiring in 2020) was replaced by HB19-1261, which sets a statewide emissions reduction target of 90% by 2050. The bill also codifies Xcel Energy's 80% by 2030 emissions reduction goal. Connecticut (SB18-7) adopted a requirement that public utilities' integrated resource plans (IRPs) reflect statewide GHG reductions goals of 45% below 2001 levels by 2030.

[46] For more on CPP-related legislative trends in 2015 and 2016, see the AEL Tracker's Trends and Analysis page.

In 2017, Hawaii (SB17-559) became the first state to commit itself to the goals of the Paris Climate Accord. In 2018, two states, Maryland (HB18-3) and New Jersey (S18-598), joined the U.S. Climate Alliance (committing to the U.S. emissions targets agreed to in Paris in 2016) via legislative action.[47] Maryland's HB19-277 authorizes the Governor to include the state as a full participant in a regional compact to reduce GHG emissions from the transportation sector (the Transportation and Climate Initiative), and limits withdrawal from such initiative to an Act of the General Assembly.[48] New Jersey's A19-1212 reconfirmed the state's commitment to RGGI and clarified its intent to provide incentives or funding to reduce emissions and reduce overall energy demand. This bill also requires that funding be prioritized to serve communities most impacted by environmental degradation and climate change.

Climate Change Adaptation

Legislation related to adapting to the effects of climate change generally focuses on sea level rise, increased drought and fire activity, ocean acidification, and climate change-related impacts to state economies. State-level activity in this area held steady between 2013 and 2018 and increased in 2019 (see Figure 13). Many of the states enacting legislation in this area are coastal; 12 of the 19 adaptation bills enacted between 2017 and 2019 explicitly mention sea level rise. Florida (H17-181) created an interagency workgroup to develop strategies to deal with extreme heat, drought, wildfires, sea level change, and flooding. Connecticut (HB18-5360) now requires that operators of hazardous chemical facilities develop and submit evacuation plans to address the risks of flooding, severe weather, and sea level rise. Local emergency planning committees are directed to use these evacuation plans when planning for chemical emergencies. Hawaii (HB18-2106) adopted provisions to require that all environmental impact assessments incorporate consideration of sea level rise.

States have also added resiliency and adaptation considerations as part of municipal planning and development. Connecticut's SB19-01062 allows municipalities to establish reserve funds to be used to pay for both property losses related to the effects of climate change and capital projects to mitigate climate change-related hazards and vulnerabilities. Maine's LD19-563 allows comprehensive plans to include projections of sea level rise and potential effects of sea level rise on public and private infrastructure. The bill also authorizes municipalities to create a coordinated plan to address projected sea level rise. New Hampshire's SB19-285 allows municipalities to unify, to create coastal resilience districts, and create coastal resilience funds in response to sea level rise.

Energy Efficiency

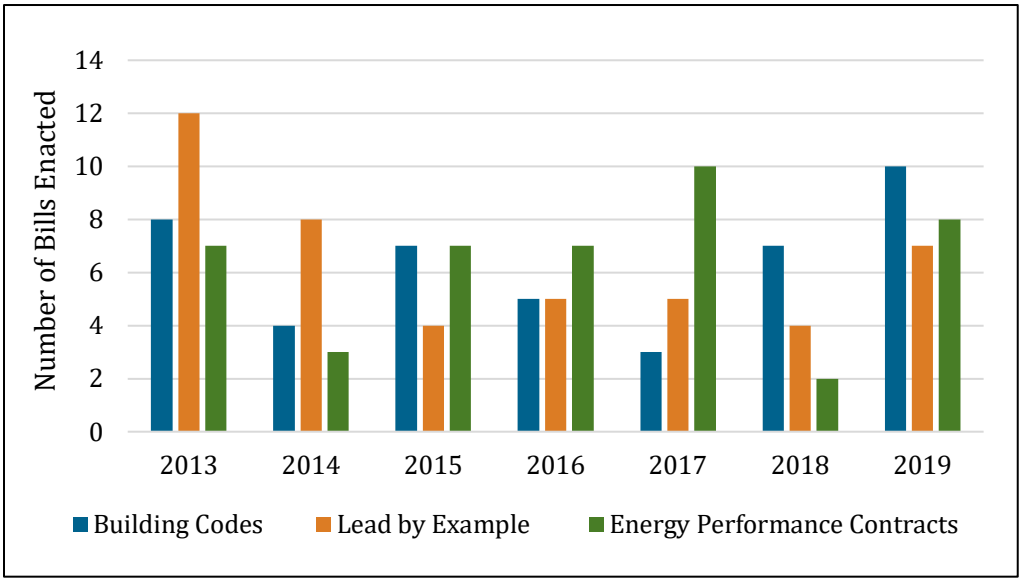
Often referred to as the "first fuel," energy efficiency continues to play a prominent role in state energy and climate policies while also creating savings for utility customers. Between 2013 and 2019, 211 energy efficiency bills were enacted. While the volume of legislation tracked in the AEL Tracker's energy efficiency category has been low year-over-year, this can be attributed to the fact that energy efficiency-related bills often fall into the economic development category (e.g., workforce development), the financing and financial incentives category (e.g., funding for energy efficiency projects), or the regulatory category (e.g., omnibus legislation). For instance, Illinois (SB17-518) directed the Department of Commerce and Economic Opportunity to provide grants to the Illinois Green Economy Network to fund education and training related to renewable energy and energy efficiency. California (SB17-110) amended the Clean Energy Jobs Act to direct funding to improve energy efficiency at public schools and community colleges. And, Iowa's omnibus energy

[47] Most states that have joined the Alliance have done so via executive order.
[48] In 2018, Maryland (SB18-290) adopted a similar requirement for RGGI, requiring that any withdrawal be approved by the General Assembly.

bill SF18-2311 made significant changes to the state's energy efficiency policies. The legislation set a cost cap for utility energy efficiency programs and created a rather broad opt-out provision for all customers.[49]

Bills addressing lead by example programs, energy savings performance contracting (ESPC), and building energy codes were the most enacted type of legislation in the energy efficiency category. While the total number of each of these types of bills varied year to year (Figure 14), these three subcategories accounted for 133 bills, or about 63% of all legislation enacted in the energy efficiency category between 2013 and 2019.

Figure 14. Lead by Example, ESPC, and Building Codes 2013 – 2019



Lead by Example, Energy Savings Performance Contracting, and Building Energy Codes

Lead by example programs, typically created by legislative or executive action, direct units of government to meet certain targets related to energy. As an example, states have required that public buildings meet green building and Leadership in Energy and Environmental Design (LEED) standards. In 2018, Illinois (SB18-3031) required that state funded building construction and renovation projects be designed to achieve LEED silver certification or an equivalent standard. Maryland's HB18-1783 directed the Interagency Commission on School Construction to develop incentives for the construction of net-zero school buildings. In 2019, Pennsylvania (SB19-700) made changes to the Public School Code that allow for construction projects to receive a 10% reimbursement if the project will be constructed to meet high performance building standards.

ESPC is a mechanism by which institutional customers such as governments, universities, schools, and hospitals can finance building energy efficiency improvements. New equipment is paid for over time through the utility bill savings, or other savings, generated by the improvements themselves. After the Department of Energy released guidelines for state and local EPSC programs in April 2016, the volume of ESPC legislation increased significantly, with 11 states responding to the guidelines in 2017 and 2018. For instance, Mississippi's SB17-2402 directed the Division of Energy to create a prequalification approval process and a list of prequalified energy services providers authorized to enter into ESPCs in the state. Tennessee's HB18-2432 created a pilot program for implementing ESPC in state buildings. ESPC can be used to fund other types of energy savings measures beyond energy efficiency improvements. For instance, Hawaii's HB19-401

[49] The Midwest Energy Efficiency Alliance published a clear explanation of these provisions, found here: https://www.mwalliance.org/blog/iowas-ee-rollback-explained.

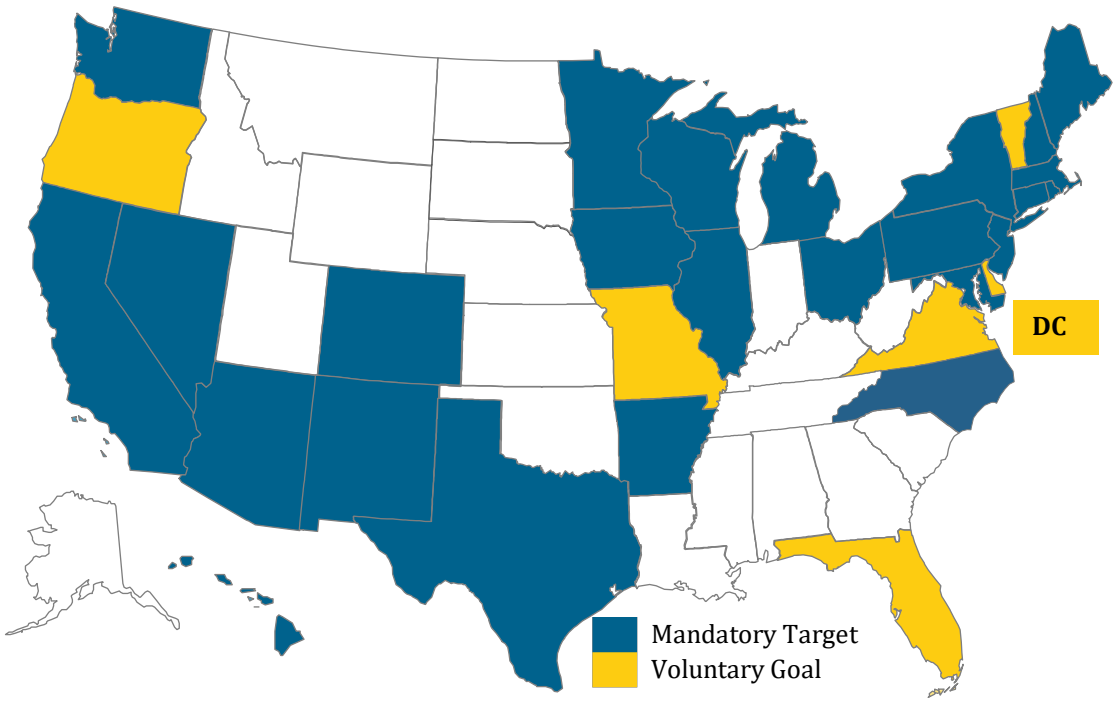
requires public agencies to identify and evaluate vehicle fleet efficiency programs and to implement these using ESPC to fund fleet and alternative fueling infrastructure acquisitions.

State building energy codes are often based on the American Society of Heating, Refrigerating, and Air-Conditioning Engineers' (ASHRAE) Energy Standards for commercial buildings or the International Energy Conservation Code (IECC) for residential construction. Both establish minimum energy conservation codes, addressing such things as the design of energy-efficient building envelopes and the installation of energy-efficient mechanical, lighting, and power systems. Building code legislation typically makes amendments to building energy codes or their review committees. Legislation can also require the adoption of newer energy codes. For instance, Hawaii's HB17-637 requires that the State Building Code Council adopt updated energy codes or standards within two years of official publication. If the Council fails to do so, the updated code will be automatically adopted into the state building code. Colorado's HB19-1260 requires that when local jurisdictions adopt or update building codes, they adopt one of the three most recent versions of the IECC. Some states require that home builders offer buyers certain information or energy-efficient building options. For instance, Maryland (SB18-648) requires that homebuilders with developments of 11 new homes or more provide purchasers with information on energy-efficient options and tax credits that may be available if those options are installed in the home.

Energy Efficiency Resource Standards

An energy efficiency resource standard (EERS) is a long-term binding energy savings target for utilities or third-party program administrators. As of June 2020, 25 states had mandatory EERSs and six states and the District of Columbia had voluntary goals.

Figure 15. Energy Efficiency Resource Standards and Goals as of June 2020



In 2017, three states made notable revisions to their energy efficiency programs. Colorado's HB17-1227 extended demand side management programs to 2028 and enabled the state's utilities commission to revise savings targets. Maryland's HB17-514 set an energy savings goal of 2% annual savings through 2023. The bill also directs the state's Public Service Commission to use the total resource cost test and the social cost test

when determining program cost-effectiveness. Nevada's SB17-150 made significant changes to the state's energy efficiency policy. The bill directs the Public Utilities Commission of Nevada (PUCN) to set annual savings goals for each utility in the state; authorizes the commission to establish a rate adjustment mechanism to remove financial disincentives for utilities that implement energy efficiency programs; and requires that utilities direct at least five percent of their energy efficiency program budgets to programs for low-income customers. In 2019, New Mexico's HB19-291 amended energy efficiency targets to require that utilities meet a savings goal of no less than 5% of total 2020 retail sales through programs implemented between 2021 and 2025. The bill also requires that the Public Regulation Commission adopt new energy savings targets for 2026 through 2030 and provide performance incentives based on savings achieved.

Appliance Efficiency Standards

While the Obama Administration finalized energy efficiency standards for certain types of equipment at the end of 2016, the Trump Administration delayed implementing these standards, missed deadlines to review existing standards for 21 products, and rolled-back light bulb efficiency requirements. In recent years, states have reacted, crafting legislative provisions meant to lock standards in place and avoid further rollbacks. In 2017, Vermont (H17-411) adopted the federal appliance and lighting efficiency standards in effect on January 19, 2017. Two years later, Colorado (HB19-1231), Hawaii (HB19-556), and Washington (HB19-1444) followed suit, adopting the federal standards in place before January 20, 2017.

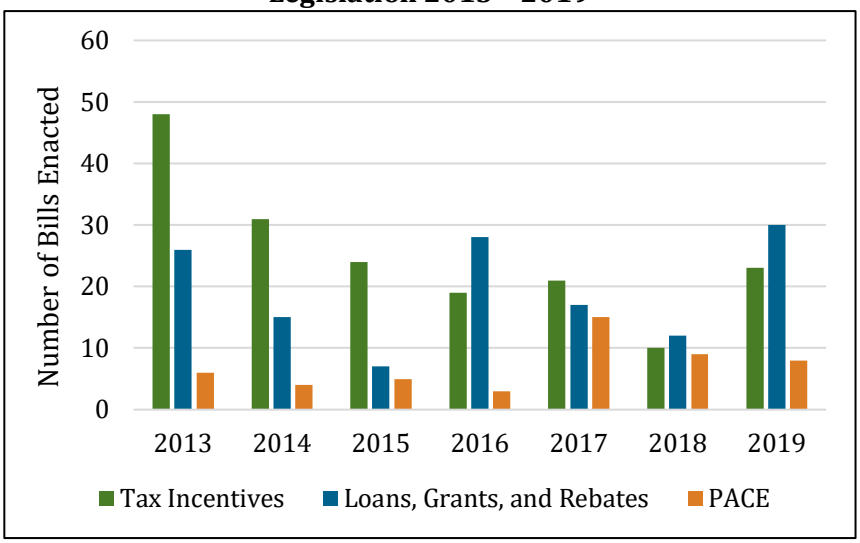
Financing and Financial Incentives

State-level financing and financial incentive policies have been important drivers of advanced energy technology adoption. This policy category includes basic incentives like tax exemptions and more innovative programs that reduce the upfront cost barrier for businesses and residential consumers. Between 2013 and 2019, financing and financial incentive-related legislation was the second most frequently enacted type of legislation, just behind regulatory bills. Within the financing and financial incentives category, bills related to tax incentives, loans and grants, and property assessed clean energy (PACE) were most frequently enacted.

Tax Incentives, Loans, Grants, and Rebates

From 2013 to 2015, bills related to tax incentives and loans, grants, and rebates trended downward. Between 2016 and 2019, bill volume fluctuated, with little evidence of a clear pattern (Figure 16). To try to gain a better understanding of trends in this area, the CNEE team examined all legislation related to advanced energy tax incentives, loans, grants, and rebates enacted between 2017 and 2019 and

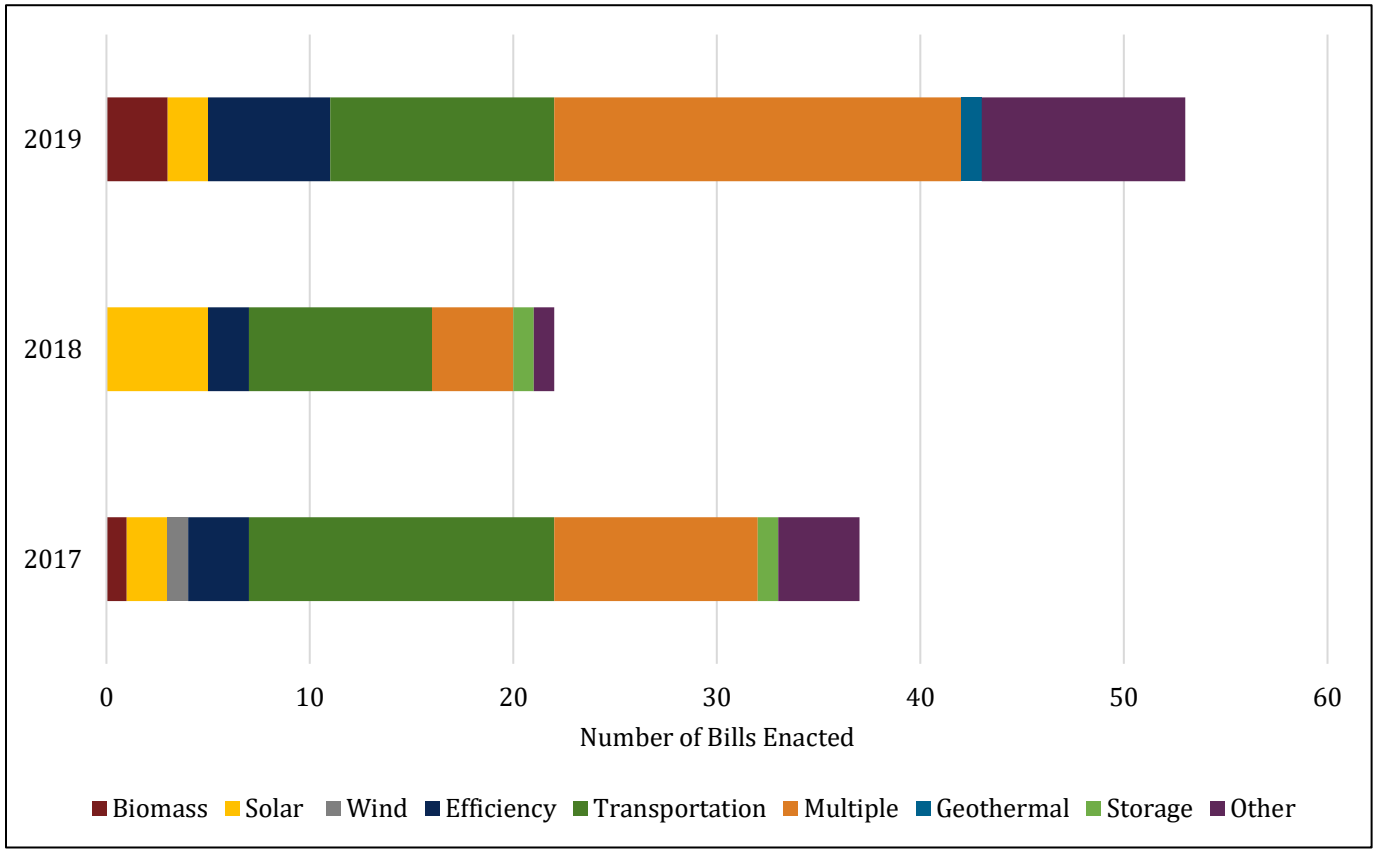
Figure 16. Tax Incentives, Loans, Grants and Rebates, and PACE Legislation 2013 – 2019



organized them by the type of technology supported (Figure 17).[50]

Bills addressing transportation-related financial incentives for such things as diesel retrofits and electric vehicle charging equipment were most frequently enacted across the three years. Legislation amending incentive programs for multiple technology types comprised the second-largest class.

Figure 17. Tax Incentives, Loans, Grants, and Rebates Bills by Technology 2017 – 2019



Some notable trends in clean energy financing are more recently evident. States are beginning to explore incentives for battery storage technologies, including California's (AB19-1144) inclusion of community storage systems in high fire threat districts in its self-generation incentive program, New Hampshire's (HB19-464) property tax exemption for energy storage, and Oregon's (HB19-2618) rebate program for paired solar and storage systems. States are also expanding financing options for low-income customers. For example, Virginia's HB19-2741 establishes the state Clean Energy Advisory Board, which will administer a loan and rebate pilot program for the installation of solar energy infrastructure serving low- and moderate-income households.

Property Assessed Clean Energy

Property assessed clean energy (PACE) is a financing mechanism that allows customers – residential and/or commercial, depending on the state's policy – to repay the costs of an energy efficiency or renewable energy project through property tax assessments. From 2017 to 2019, the number of PACE-related bills enacted was higher than in previous years (Figure 16). This activity might be a response to federal policy. In July of 2016, the Federal Housing Administration (FHA) released guidelines related to residential PACE loans and

[50] After an error in the data was discovered, Figure 17 was updated in November 2021. This error did not require any change to the analysis presented in 2020.

announced that they would approve, purchase, and refinance mortgages in states that followed the federal PACE guidelines. The policy was short-lived. In December 2017, the FHA reversed course and announced that it would cease insuring mortgages for homes with PACE liens.

Of the 32 bills enacted between 2017 and 2019, all either created or amended an existing PACE program. Between 2013 and 2019, only one bill, Louisiana's HB16-766, repealed a PACE authorization. Three states – Alaska (HB17-80), Illinois (HB17-2831), and Utah (SB17-273) – passed PACE-enabling legislation in 2017, and two others – Delaware (SB17-113) and Pennsylvania (SB17-274) – followed suit in 2018. States were also active extending eligibility for PACE financing to additional project types. For instance, California's SB17-465 added wildfire safety improvements, Michigan's SB17-375 added anaerobic digesters, Oregon's HB17-2132 added energy storage and electric vehicle charging stations, Virginia's SB19-1559 added climate resilience projects, including shoreline enhancements and stormwater management improvements, and Wisconsin's SB17-173 added brownfield remediation.

Green / Infrastructure Banks

Green banks deploy public or private capital to fund clean energy improvements. Between 2013 and 2019, states created new green or infrastructure banks and amended provisions related to existing programs. For instance, following a legislative study of the issue mandated by SB15-360, Nevada created a state infrastructure bank (AB17-399) and a clean energy fund (AB17-407). In 2018, the District of Columbia (B17-22-257) established its Green Finance Authority. States with existing banks typically expanded their authority. California's SB16-1207 expanded their green bank's bonding authority. Hawaii's HB17-957 authorized Green Infrastructure Authority loans for heat abatement programs in public schools. The state also established (Hawaii HB17-1508) a revolving loan fund for state agency energy efficiency improvements within the state's green infrastructure fund. In 2019, Rhode Island (SB19-994) expanded its infrastructure bank's authority, allowing funds to be used for resiliency projects.

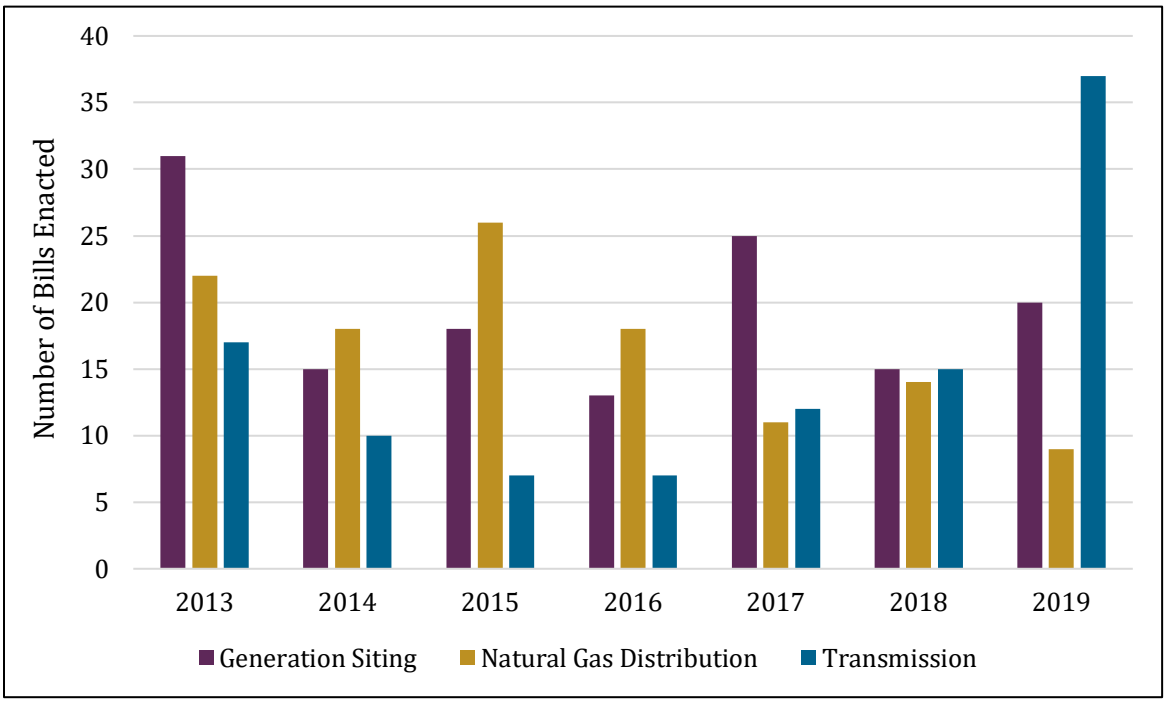


Infrastructure

The AEL Tracker's infrastructure category covers a range of topics including utility-scale electric generation facility permitting and siting, battery energy storage, transmission, and natural gas distribution infrastructure. While bills related to the technologies associated with grid modernization are also included here, comprehensive grid modernization legislation is typically found in the regulatory category.

Between 2013 and 2019, bills related to generating facility siting were most frequently enacted, followed by natural gas distribution and pipeline-related legislation. Transmission infrastructure-related bills rounded out the top three (Figure 18).

Figure 18. Generation Siting, Natural Gas Distribution, and Transmission Legislation 2013 – 2019



Generation Siting

Bills addressing the permitting process for new electric generation facilities were the most frequently enacted type of legislation within the siting category (137 bills). Much of the activity involved wind facilities. For instance, Oklahoma's SB17-593 created a new requirement that wind developers notify oil and gas operators, lessees, and mineral rights owners of an intent to build. States also enacted bills related to wind farms and military bases: An omnibus bill in North Carolina imposed an 18-month moratorium on wind development (H17-589) to study the impact of wind projects on military installations. Oklahoma passed a pair of bills in 2018 (HB18-3561 and SB18-1576) related to the interaction of wind farms and military bases.

States also addressed solar site permitting. Oregon's HB17-3456 expanded the types of farmland on which solar facilities can be located. Illinois (SB18-3214), New York (A17-8083), and Vermont (H18-676) created "pollinator friendly" certification programs for solar sites. Several states imposed decommissioning and end-of-life requirements for renewable generation facilities. For instance, Montana's SB19-93 clarified existing bonding and decommissioning requirements for wind farms, and added new requirements for solar sites. New Jersey's S18-601 creates the New Jersey Solar Panel Recycling Commission to investigate recycling and other end of life management options for solar panels and other equipment associated with solar generation facilities. Virginia's HB19-2621 requires, as a condition of local permitting, that solar site developers enter into a written decommissioning agreement.

Natural Gas Distribution

Between 2013 and 2019, bills related to natural gas distribution systems and pipelines were the second most frequently enacted type of legislation (118 bills). Southeastern and Western states, in particular, passed several bills related to extending natural gas service to underserved areas (e.g. Arkansas' SB17-265, Mississippi's SB18-3057, and Utah's HB18-422). New York extended its moratorium on the issuance of environmental safety certificates for the construction of new natural gas pipelines four times (S13-3846, S15-2543, A17-7082, and A19-4959). Other states addressed land, soil, and water impacts from pipeline

construction. For instance, Virginia's SB18-698 authorizes the Department of Environmental Quality to conduct inspections on the "land-disturbing activities" associated with pipeline construction and authorizes the Department to issue a stop work order if an actual or imminent threat to water quality exists. The year 2019 saw an uptick in activity focused on pipeline safety and methane leakage, in which seven out of nine total bills related to natural gas distribution addressed safety. For instance, New Hampshire (SB19-123), Texas (HB19-864), and Virginia (SB19-1176) passed legislation to increase reporting requirements and enforcement authority over distribution system leaks.

Transmission

Between 2017 and 2019, state-level policy activity related to transmission infrastructure was focused on security and reliability, and states enacted provisions to address a variety of threats. For instance, California's SB18-1076 requires that the state's Office of Emergency Services include an evaluation of risks from an "electromagnetic pulse attack, a geomagnetic storm event, and from other potential causes of a long-term electrical outage in the next update of the State Hazard Mitigation Plan." Delaware (HB18-429) created a Cyber Security Advisory Council, tasked with developing mitigation strategies related to cyber security threats to critical infrastructure. Texas also addressed cybersecurity threats: SB19-475 created the Texas Electric Grid Security Council to create, disseminate, and coordinate best security practices for the electricity industry. North Dakota (SB17-2199) created an out-of-state business tax exemption for disaster work on critical infrastructure.

In response to wildfires caused by electric transmission and distribution infrastructure, California's policymakers have enacted several bills related to liability, transmission and distribution line safety, and de-energization events. For instance, California's AB19-1054 among other provisions, requires that the Public Utilities Commission (PUC) and the Office of Infrastructure Safety develop consistent approaches to data sharing and infrastructure safety, allows for reasonable and just cost recovery of certain wildfire-related expenses by utilities, and establishes a Wildfire Fund into which utilities can opt-in and which will pay eligible claims arising from a wildfire if the PUC determines that the wildfire was not the result of negligence.[51] Washington state has followed this lead, SB19-5305 created the utility wildland fire prevention task force to develop recommendations for managing wildfire risks associated with both vegetation and transmission infrastructure.

In addition to security and reliability, states have begun exploring how transmission infrastructure can be deployed to provide greater access to broadband. In 2019, seven bills related to broadband access were enacted. For example, Virginia's HB19-2691 required the State Corporation Commission to establish a pilot program through which the state's major investor-owned utilities will be allowed to provide broadband capacity to underserved areas.

Battery Energy Storage

To date, eight states have adopted energy storage procurement targets for utilities.[52] State-level activity related to energy storage accelerated in 2017. Between 2017 and 2018, a handful of states created new provisions or adopted notable amendments related to energy storage. Nevada created a right to store energy (AB17-405) and instructed the Public Utilities Commission to evaluate the creation of energy storage procurement targets (SB17-204). Maryland's HB17-773 directed the Power Plant Research Program to report on policy reforms and market incentives to increase the deployment of storage and the state adopted an energy

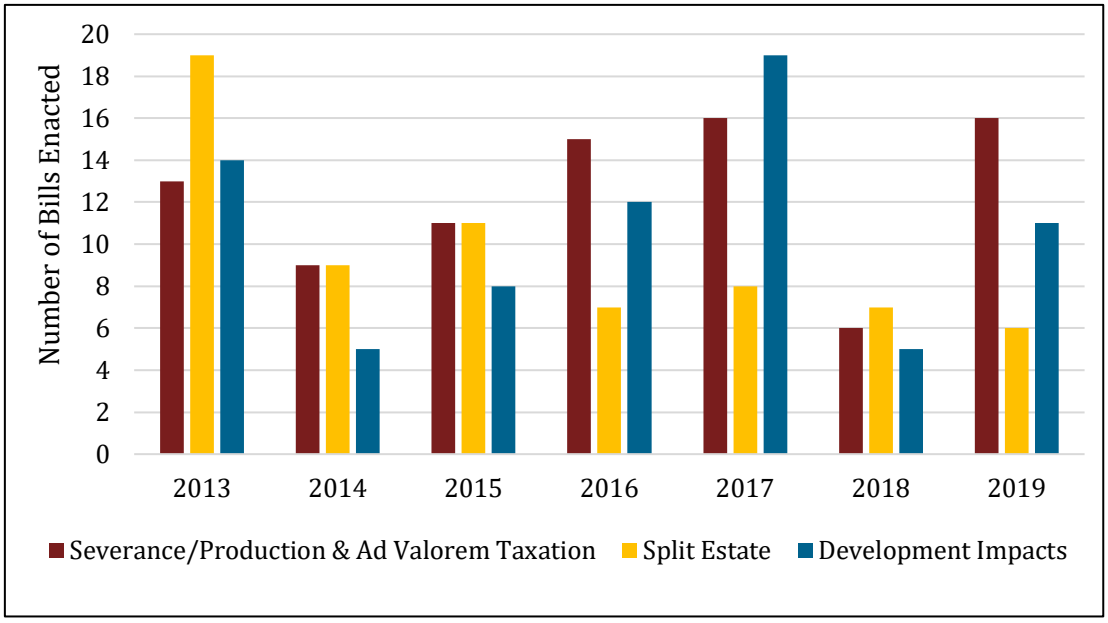
[51] The fund will be supported by a ratepayer surcharge. For more on this bill, see: Nikolewski, R. 2019. California Regulators Approve Funding for Controversial Wildfire Law. *The San Diego Union-Tribune*. 24 October.
[52] See: Pacific Northwest National Laboratory. 2020. Energy Storage Policy Database. Not included in the database, Virginia adopted a procurement target in April 2020.

storage pilot program in 2019 (SB19-573). In 2018, Colorado (SB18-9) became the second state to establish a right to store energy and HB18-1270 instructed the PUC to establish mechanisms to induce utility deployment of energy storage systems. Implementing A17-6571, which created an energy storage deployment program, New York's A18-11099 required that the Public Service Commission adopt a 2030 energy storage goal and deployment policy.

Natural Gas Development

U.S. annual natural gas production increased by approximately 38.6% from 29.5 trillion cubic feet (TCF) in 2013 to 40.9 TCF in 2019.[53] The percentage of dry natural gas production from shale increased from approximately 35% in 2013 to approximately 75% in 2019.[54] Natural gas commodity prices fluctuated over this time, peaking in February 2014 ($6 per million British thermal units (MMBtu)) and were lowest in March 2016 ($1.73 per MMBtu), prices averaged $3.14 per MMBtu between 2013 and 2019.[55] It seems likely that legislation enacted by states during this time was driven at least in part by natural gas extraction industry growth and price fluctuation. Between 2013 and 2019, bills related to severance and other taxes on natural gas production, split estate-related issues, and health and environmental impacts associated with natural gas development were most frequently enacted, accounting for 64% of all enacted legislation over the course of this period (Figure 19).

Figure 19. Taxes, Split Estate, and Development Impacts Legislation 2013 – 2019



Severance and Other Taxes

Between 2013 and 2019, 86 natural gas taxation-related bills were enacted. Of those 86 bills, the majority (59) addressed severance / production taxes, which are based on either the volume or value of the natural gas produced. The remainder of the legislation included in this category addressed property and sales taxes, including a handful of tax exemptions related to natural gas production and carbon dioxide (CO_2) sequestration.

[53] U.S. EIA. 2020. U.S. Natural Gas Gross Withdrawals.
[54] U.S. EIA. 2020. FAQs: How Much Shale Gas Is Produced in the United States?
[55] U.S. EIA. 2020. Henry Hub Natural Gas Spot Price.

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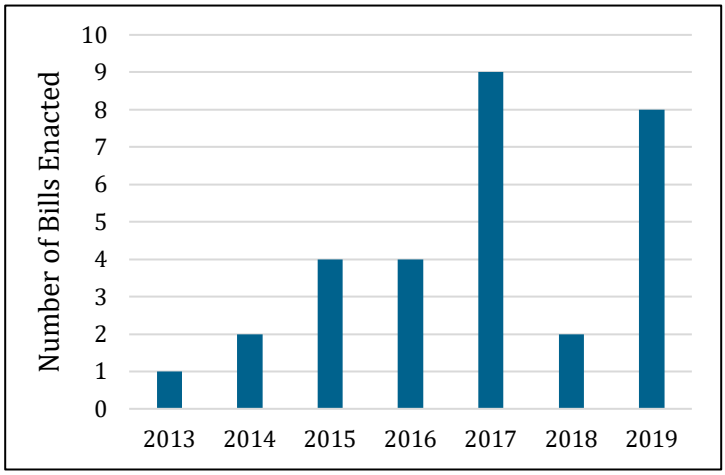
Between 2017 and 2019, 16 states revised their tax codes.[56] The vast majority of these bills made minor changes to the distribution of tax revenues, tax incentive programs, and tax collection procedures. A few states made more substantial revisions. For instance, while Alaska's HB17-111 ended the state's system of cashable tax credits by repealing the Oil and Gas Tax Credit Fund in 2022,[57] HB18-331 allowed the state to issue bonds to pay outstanding cashable tax credits. House Bill 331 was overturned by the Alaska Supreme Court in September 2020 due to limitations in the state constitution regarding state debt. Other states, for instance North Dakota (HB19-1439), have created tax incentives for geological sequestration projects and the use of CO_2 in enhanced recovery projects. While the creation of these types of incentives was a rather rare occurrence between 2013 and 2019, these types of incentives may become more common as part of an effort to meet statewide greenhouse gas reduction targets.

Split Estate

Between 2015 and 2019, all the bills related to surface and mineral rights, or the split estate, addressed mineral rights. This was very different than the case in 2013, when 10 of 19 split estate bills addressed impacts to and notification requirements for surface rights owners.[58] Split estate legislation enacted between 2017 and 2019 made minor amendments to provisions related to pooling, royalty payments, and the conveyance of mineral rights.

Development Impacts

Figure 20. Remediation Bills 2013 – 2019



Seventy-four bills to address the health and environmental impacts of natural gas development were enacted between 2013 and 2019. Within this set of legislation, bills amending provisions related to site remediation were the most frequently enacted (30 bills), with 12 states adjusting provisions related to such things as well-capping, hazardous sites, and clean-up funding. Enacted legislation targeted specific facilities and set more general remediation requirements. For instance, New Mexico (SB17-4 and HB17-29) created an advisory body and a fund to address remediation of the Carlsbad brine well. North Dakota's SB17-2333 set new reclamation requirements for any land disturbed by the development of natural gas resources. In general, the number of remediation bills enacted by states seems to have increased over time (Figure 20).[59] This might indicate that states are responding to the growth of the natural gas sector and are preparing for the remediation challenges this growth could create.

Bills by State and Production Regions

Natural gas production is regionally dependent. Examining bills enacted by states provides insight into how production-intensive states are planning for and regulating the development of resources. Figure 21 displays

[56] These states were: Alaska, Arkansas, Colorado, Idaho, Indiana, Louisiana, Mississippi, Montana, New Mexico, North Dakota, Ohio, Oklahoma, Texas, Utah, Virginia, and Wyoming.
[57] For additional analysis of the bill see: Brehmer, E. 2017. Unpacking House Bill 111. *Alaska Journal of Commerce*. 19 July.
[58] In 2014, two of nine total bills related to landowner impacts and notification.
[59] The trend is clearer when taking into account that two of the top 10 states for volume of enacted natural gas legislation between 2013 and 2019 – Texas and North Dakota – do not hold even year sessions. While Texas enacted a single remediation bill during this time frame, North Dakota enacted six.

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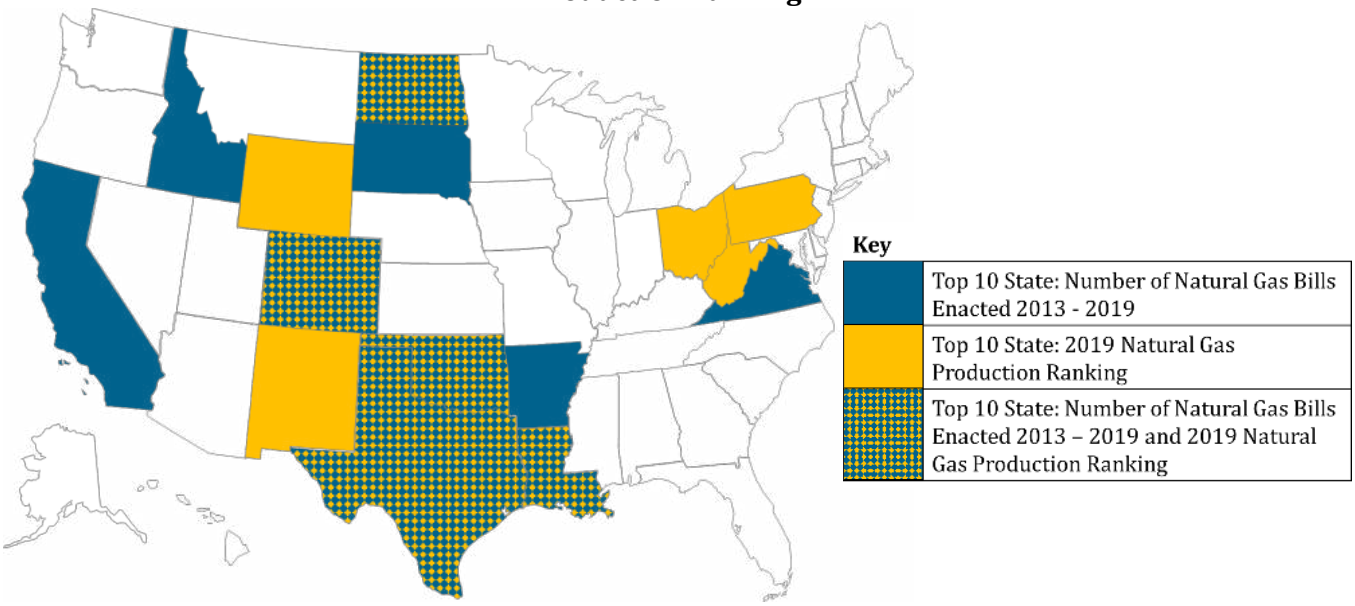
the overlap in the top ten states in gross marketed natural gas production with the top ten states with the most enacted natural gas development legislation.

Figure 21. Top States: Volume of Natural Gas Legislation 2013 – 2019 and 2019 Natural Gas Production Ranking



Colorado, Louisiana, North Dakota, Oklahoma, and Texas are all in the top 10 states in terms of both volume of enacted legislation and 2019 natural gas production,[60] suggesting robust industries and developing regulatory regimes. While North Dakota ranks 10th in marketed natural gas production, the state is tied for first with Louisiana in terms of the number of bills enacted between 2013 and 2019 (32 bills). This activity might be tied to the state's oil industry – in 2019, the state ranked second, behind Texas, in crude oil production, which occurs primarily in the Bakken Shale Basin. The Bakken is an oil rich basin with lagging natural gas capture and transportation infrastructure. Because of this, operators have historically flared gas instead of capturing it. North Dakota's HB13-1134 was the only specific flaring bill enacted. The bill restricted flaring and created a tax exemption for natural gas processing. More recently, the state's policymakers have focused on addressing the health and environmental impacts of oil and natural gas development. For instance, of the six bills enacted in 2017, four addressed development impacts.[61] In the subsequent legislative session (2019), of seven bills enacted, one addressed remediation requirements (SB19-2123) and another pair of bills created incentives for the use of CO_2 in enhanced recovery projects (HB19-1439 and SB19-2344).[62]

Colorado ranks sixth in overall bill volume (16 bills enacted between 2013 and 2019) and seventh in natural gas production in 2019. As the state's oil and gas industry has gone through several changes over the years, so too has the regulatory regime. Colorado's latest major policy reform was enacted in 2019. An omnibus oil and gas bill, SB19-181, among other provisions, directs the Air Quality Control Commission (AQCC) to consider adopting more stringent rules to minimize the emissions, including methane emissions, associated with the industry; clarifies that local governments have the authority to regulate the siting and safety of oil and gas operations; and amends the Oil and Gas Conservation Commission's (OGCC) organic act to establish a greater emphasis on a duty to protect human health and the environment.

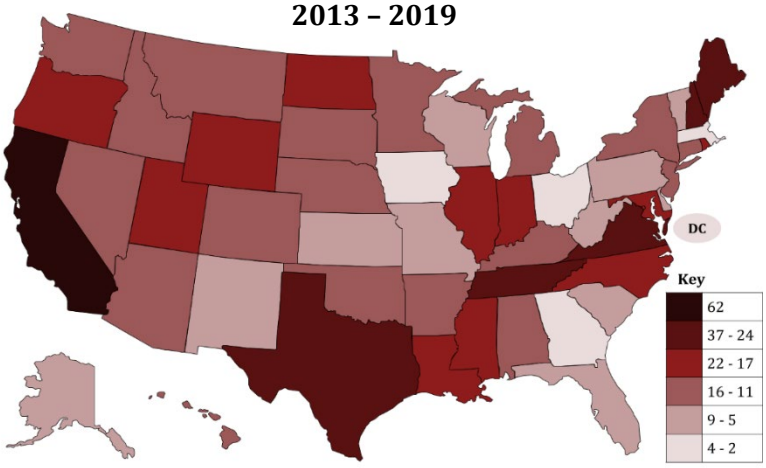
[60] U.S. EIA. 2020. Rankings: Natural Gas Marketed Production, 2019.
[61] See North Dakota's SB17-2333, HB17-1347, HB17-1151, and HB17-1409.
[62] Two other bills addressed production taxes.

While California is a substantial hydrocarbon producing state (14th in natural gas production and 7th in crude oil production),[63] its placement among the top 10 states with the most bills enacted (19) is partially attributable to one problematic natural gas storage facility. The Aliso Canyon facility was a large oil deposit near Los Angeles that was depleted in the early 1970s, and subsequently converted to store natural gas underground for consumption.[64] In 2015, California enacted a moratorium on storage at Aliso (SB15-380). The next year, following a large methane leak at the facility, California's SB16-887 and SB16-888 set new safety and leak mitigation, response, and liability requirements for natural gas storage facilities. Some of these provisions were amended and updated in 2019 (SB19-463). As the oil and gas industry continues to evolve across the U.S., it seems likely that bills to reform regulatory regimes, including bills to address the human health and environmental impacts of natural gas development, will continue to be enacted.

Regulatory

AEL Tracker's regulatory category covers a broad range of bill types, including those related to utility business models, utility rates and planning requirements, legislative oversight of state agencies and regulatory bodies, and omnibus energy legislation. Between 2013 and 2019, each of the 50 states and the District of Columbia enacted at least two regulatory bills, and 35 states each enacted 11 or more (Figure 22).

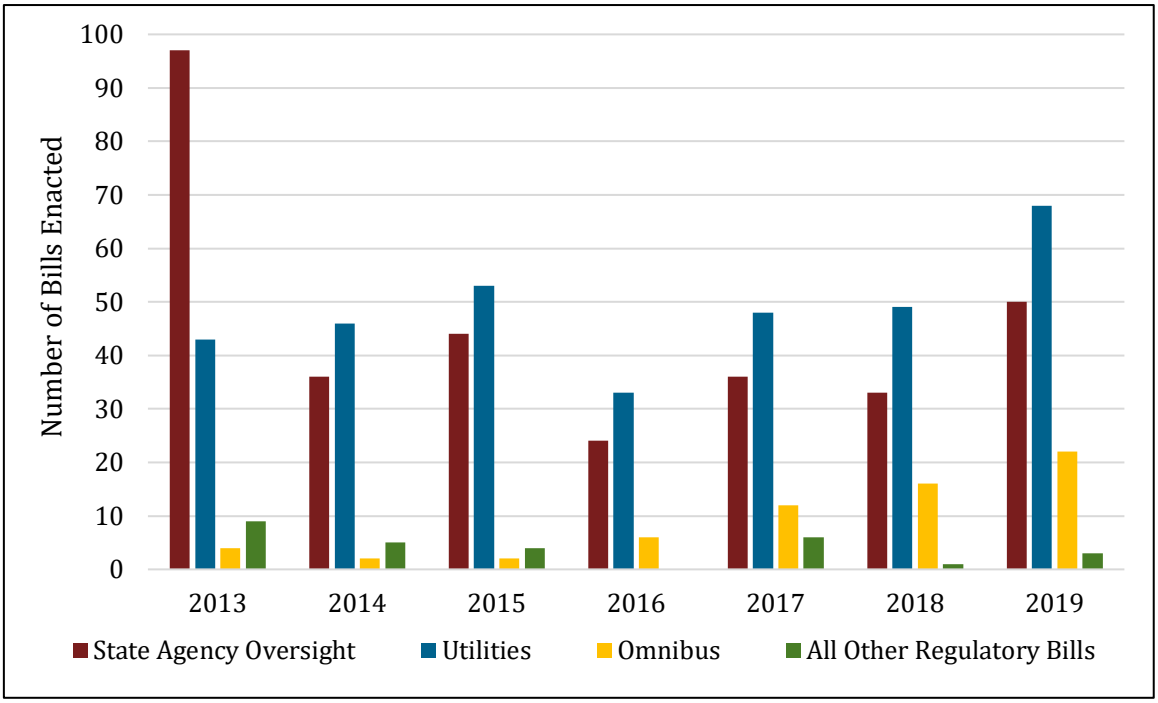
Figure 22. Enacted Regulatory Legislation by State: 2013 – 2019



In total, 752 regulatory bills were enacted between 2013 and 2019. Bills relating to the oversight of investor-owned, cooperative, and municipal utilities were most frequently enacted (340 bills). A close second, 320 bills related to legislative oversight of state agencies were enacted over this time. Rounding out the top three, 25 states enacted 64 omnibus bills between 2013 and 2019 (Figure 23).

[63] U.S. EIA. 2020. State Profile and Energy Estimates: California.
[64] California Public Utilities Commission. 2013. Decision 13-11-023: Application of Southern California Gas Company to Amend its Certificate of Public Convenience and Necessity for the Aliso Canyon Gas Storage Facility. 22 November.

Figure 23. Enacted Regulatory Legislation by Bill Type: 2013 – 2019



Utility Oversight

Bills related to utility oversight cover a range of topics including cost recovery, property tax assessments, integrated resource and other planning requirements, and business model reforms. States were active in this policy area across the years, and the legislation most frequently enacted within this subset related to the taxes and other fees utilities are required to pay to a local government or state. For instance, Maryland's SB18-1251 authorized municipalities to enter into payment in lieu of taxes (PILOT) agreements with owners of electric generation facilities.[65] Missouri's HB19-220 provided for the taxation of wind energy projects and created a task force to examine a statewide uniform assessment and taxation methodology for these projects. Oregon's SB19-68 increased the annual fee imposed on public utilities from .3% to .45% of in-state gross operating revenues. The proceeds of the fee are used to defray the operating costs of the Oregon Public Utility Commission (PUC).

While bills to create new or amend existing provisions relating to utility planning requirements and business models were less frequently enacted, a handful of states made significant changes. For instance, California (SB17-338), Nevada (SB17-146), and Washington (HB19-1126) enacted new requirements related to distributed energy resources (DERs) planning. While the legislation in California and Nevada requires that utilities undertake this during the development of an integrated resource plan (IRP), Washington's legislation does not require such integration, but does require that utilities' IRPs include DERs identified in a separate plan. Hawaii's SB18-2939 directed the state's PUC to establish performance incentives and penalty mechanisms to tie revenues to utility performance on such metrics as electric service reliability, customer engagement and satisfaction, and rapid integration of renewable energy resources. Pennsylvania's HB18-1782 and Nevada's SB19-300 allow utilities to petition the PUC to establish, among other things, performance-based rates based on financial or operating performance, or other metrics established by the commission.

[65] Payments in lieu of taxes are made to compensate local governments in place of property taxes. They can include payments that local governments use for infrastructure and public services, like county roads or fire protection.

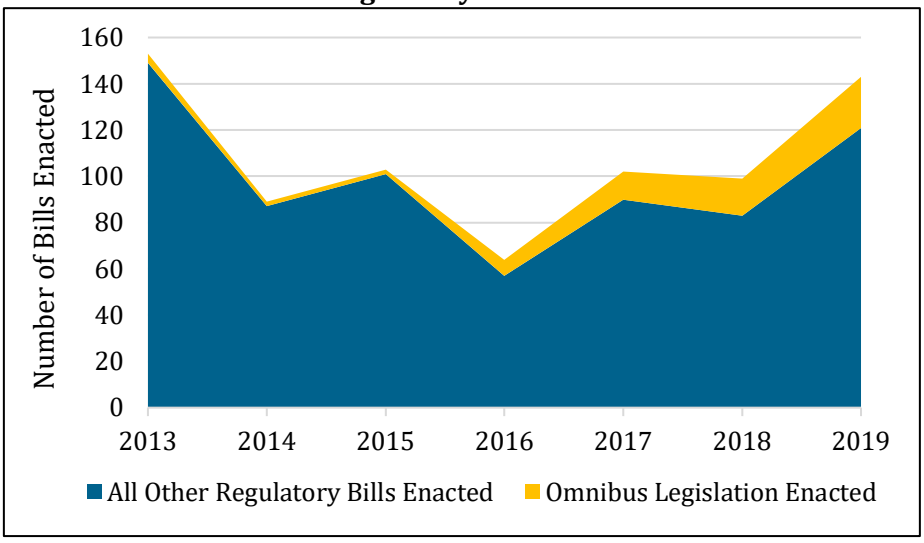
State Agency Oversight

Executive branch agencies often derive their authority from state statute, creating an important oversight role for state legislators. While legislatures across the U.S. were most active in amending provisions related to the duties and functions of state agencies in 2013,[66] state legislatures continued to exercise their oversight authority across the 2013 to 2019 time frame. These bills took a variety of forms. For instance, Illinois' HB19-2460 (The Illinois Sustainable Investing Act) provides that public agencies should develop sustainable investment policies to govern the investment of public funds. The sustainability factors that agencies are directed to consider include environmental, social, and human capital impacts as well as corporate governance and leadership. Maine's LD19-1830 created an Office of Policy Innovation and the Future tasked with supporting the development of a coherent system of energy resource and economic development policy planning and implementation through intergovernmental coordination. New York's S19-2385 created an environmental justice policy group and interagency coordinating council to ensure that no racial, ethnic, or socioeconomic group bears a disproportionate share of the negative effects of industrial operations or public policy. The bill requires that stakeholder engagement processes during the development, implementation, and enforcement of laws and regulations represent and meaningfully involve affected communities and that the policy group monitor and report on state agency compliance with the model environmental justice policy developed by the group.

Omnibus Legislation

Omnibus bills amend provisions related to multiple advanced energy policy categories through a single piece of legislation and sometimes prove a more efficient mechanism for reforming state energy policy than trying to pass many separate bills. The period between 2016 and 2019 was marked by a sharp increase in the number of omnibus bills enacted by states (Figure 24). Between 2017 and 2019, 50 omnibus bills were enacted in three years, more than tripling the number enacted in the four years between 2013 and 2016 (15 bills).

Figure 24. Enacted Omnibus Legislation Relative to All Other Enacted Regulatory Bills 2013 – 2019



[66] For an overview of 2013 activity related to PUCs, see CNEE's paper: State Legislatures Active in Setting Public Utilities Commissions' Authority in 2013.

Examples of omnibus advanced energy legislation have been discussed in previous sections of this report. Other notable examples include Minnesota's SF17-1456 which, among other provisions, expanded the allowable uses of funds in the renewable development account to include grid modernization, energy storage, load control, smart meter deployment, and other innovative projects. Virginia's SB18-966 amended the cost-benefit calculation for new energy efficiency programs, established a new rate adjustment clause category for grid modernization, energy storage, and electric vehicle charging projects, "increases the amount of capacity of solar and wind generation facilities constructed by a utility that are in the public interest from 50 MW to 5,000 MW, …declares that offshore wind generation facilities with a capacity of not more than 16 MW, and all onshore wind generation facilities, are in the public interest,"[67] requires the state's investor-owned utilities (IOUs) to fund energy assistance and weatherization programs for low-income, elderly, and disabled customers, and directs the State Corporation Commission to create an energy storage pilot program, among other provisions.

Colorado's SB19-236 directs the Public Utilities Commission (PUC) to promulgate rules requiring IOUs to develop distribution system plans, requires that IOUs proposing to retire an electric generation facility also file a workforce transition plan for that facility, directs the PUC to investigate performance-based incentives, requires that wholesale electric cooperatives submit IRPs to the commission, directs the PUC and public utilities to consider the cost of CO_2 emissions in certain proceedings and filings, and adopts the "Colorado Energy Impact Bond Act", under which electric utilities may finance the retirement of fossil-fuel-powered generation facilities by issuing low-cost corporate securities (securitization). Maine's LD19-1282 creates an energy facility construction apprenticeship program, and directs Efficiency Maine Trust to arrange power purchase agreements for solar capacity at newly constructed schools. Also in Maine, LD19-1679 adopts a GHG reduction standard of 80% below 1990 levels by 2030 and creates a 39-member Maine Climate Council. The Council is tasked with developing a state climate plan that includes a clean energy economy transition plan for the electric and transportations sectors that addresses strategies to mitigate the impacts of the transition on low-income, historically disadvantaged, and rural communities.

Minnesota's HF19-2 allows utilities to petition the state's utilities commission to recover the costs of an energy storage system pilot project, expands PACE loan eligibility to new construction, and directs the Public Utilities Commission to convene a stakeholder group to report on strategies to diversify current utility employment and purchasing patterns. North Carolina's H19-329 directs the Environmental Management Commission to adopt rules regulating end-of-life recycling requirements for solar PV modules and energy storage system batteries as well as decommissioning requirements for utility-scale solar and wind facilities. The bill also amends the definition of "public utility" to exclude certain operators of electric vehicle charging stations and extends the swine waste-to-energy small power producer program.



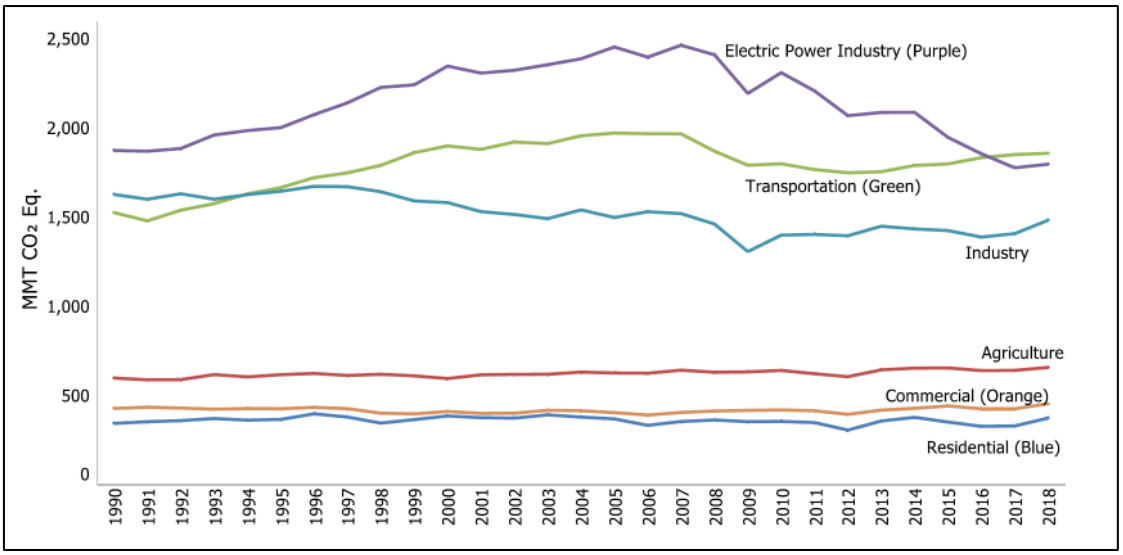
Transportation

In 2016, the transportation sector surpassed the electric sector as the largest source of CO_2 emissions in the United States (Figure 31). Because of this, the transportation sector offers some of the greatest policy opportunities for achieving emissions reductions and improving air quality. State policy action in this area will also have reverberating impacts on the clean energy transition as a whole. Increasing electricity demand and shifting loads through the electrification of transportation can enable increased adoption of clean

[67] Virginia General Assembly. 2018. SB 966 Electric Utility Regulation; Grid Modernization, Energy Efficiency: Bill Summary.

energy technologies, and tying transportation to a decarbonizing electric sector ensures continuing reductions in transportation-related emissions.

Figure 25. U.S. CO2 Emissions by Economic Sector: 1990 – 2018



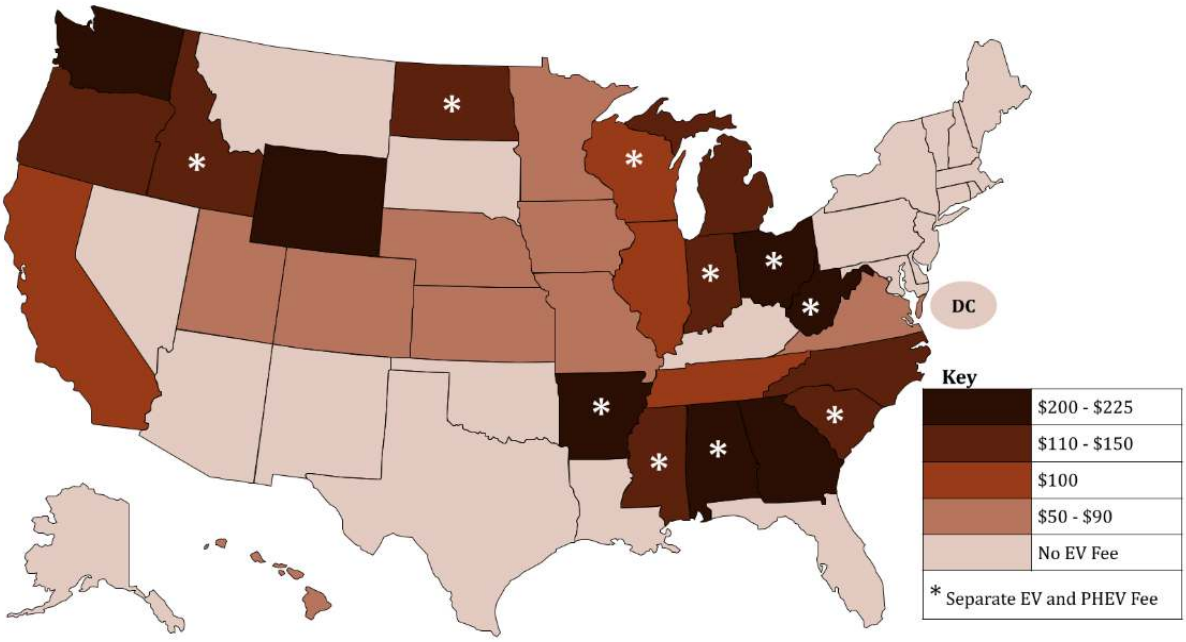
Source: U.S. EPA. 2020. Draft Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2018.

States have capitalized on the policy opportunities associated with the transportation sector by enacting legislation that incentivizes the purchase of electric vehicles (EVs), increases access to EV charging stations, and otherwise expands the market for alternative fueled-vehicles (AFVs). Over time, states have expanded their policy toolkits beyond tax incentives, rebates, consumer education, and lead-by-example programs for state fleets. For instance, as of November 2020, 12 states[68] had adopted both a low- and zero-emission vehicle (ZEV) standard, while two states[69] and the District of Columbia had adopted a low-emission vehicle (LEV) standard.

With increased adoption of EVs, states continue to experiment with policy options that replace lost gas tax revenues. For instance, a growing number of states are implementing additional registration fees for EVs. At the end of 2020, 28 states had separate EV and plug-in hybrid EV (PHEV) registration fees (Figure 26). While these approaches may serve as stop-gap measures, ultimately, a long term solution for reduced highway revenue will rely on a wholesale change in revenue sources away from volumetric taxes on fuel sold and registration fees. We expect that states will continue to evaluate policy options to replace lost revenue while also incentivizing the purchase and use of alternative-fueled vehicles.

[68] California, Colorado, Connecticut, Massachusetts, Maryland, Maine, New Jersey, New York, Oregon, Rhode Island, Vermont, and Washington. (Washington's SB19-5811, enacted in March 2020 directed the Department of Ecology to adopt rules to implement the ZEV program.)
[69] Delaware and Pennsylvania.

Figure 26. Annual EV Registration Fees by State in 2020



** Oregon's and South Carolina's fees are biennial.

Source: Hartman, K. and Shields, L. 2020. Special Fees on Plug-In Hybrid and Electric Vehicles. *National Conference of State Legislatures*. 1 December.

Autonomous Vehicles

As advances in self-driving vehicles continue, states have taken a variety of steps to address the challenges associated with regulating the use of autonomous vehicles on public roads. In general, the number of autonomous vehicle-related bills enacted between 2013 and 2019 increased. Examples of the types of legislation enacted include Connecticut's (SB17-260) creation of both a pilot program for testing the operation of autonomous vehicles and a task force to study and make policy recommendations for their regulation. Arkansas' HB19-1561 also creates a pilot program, allowing autonomous vehicles on the streets and highways of the state. Oklahoma (SB19-365) preempted local government authority to regulate autonomous vehicles. In 2018, Nebraska (LB18-989) authorized the use of autonomous vehicles and set basic provisions governing their use and regulation in the state. Legislative activity in this area has also addressed platooning – the practice of grouping vehicles closely together on the road to increase efficiency. California (AB17-669) authorized the Highway Patrol and the Department of Transportation to test platooning technologies that enable drivers to operate with fewer than 100 feet between vehicles. In 2017, Nevada (AB17-69) adopted a range of provisions relating to the use of autonomous vehicles technologies, including by transportation network companies (e.g., Uber, Lyft), and for platooning.

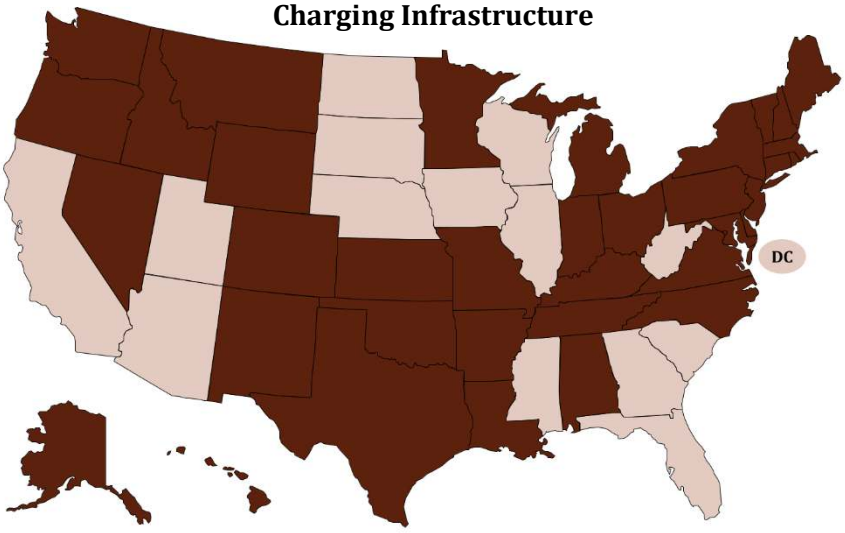
Electric Vehicle Charging Infrastructure

Between 2013 and 2019, state legislatures were quite active in developing policy to support the increased adoption of EVs and EV supply equipment (EVSE) or charging infrastructure. Between 2013 and 2019, state legislatures were quite active in developing policy to support the increased adoption of EVs and EV supply equipment (EVSE) or charging infrastructure. Legislation enacted included California's AB18-2127, which required that the Energy Commission, State Air Resources Board, and the public utilities commission (PUC) prepare a biennial assessment of the electric charging infrastructure needed for the state to meet its five

million ZEVs by 2030 goal. California also enacted SB19-676, which required the PUC, by December 31, 2020, to establish strategies and quantifiable metrics to maximize the use of feasible and cost-effective electric vehicle grid integration by January 1, 2030. In Virginia, a pair of bills (SB18-908 and HB18-922) allow the installation of charging stations in state parks, public recreation areas, and on other public properties. A fairly common policy enacted in relation to EV charging access, Massachusetts (H17-4069) limited the ability of homeowners' associations to restrict the installation of charging equipment. States have also increasingly recognized the importance of dynamic electric rates to incentivize the installation of charging infrastructure and to promote the use of such equipment at certain times of the day. For instance, New York (A17-288) requires that investor-owned utilities offer dedicated EV charging tariffs – rates applicable only to the electricity used for recharging and EV and New Hampshire (SB18-575) required that the PUC investigate rate designs that encourage the efficient use of resources for EV charging.

Automobile manufacturer Volkswagen (VW) was the subject of a 2016 civil lawsuit in which the company was found guilty of violating the federal Clean Air Act (CAA) by installing equipment on certain diesel vehicles that masked actual levels of oxides of nitrogen (NOx) during compulsory vehicle emissions tests.[70] VW subsequently entered into a consent decree that required the company to use settlement funds for several purposes. First, VW was directed to spend $10 billion to buy back or modify vehicles that were not in compliance with the CAA. VW was also required to create a $2 billion national ZEV investment plan to support ZEV infrastructure projects and increase EV awareness. VW launched the Electrify America initiative to implement the ZEV investment plan. Additionally, the settlement mandated the creation of an environmental mitigation trust fund, in which $2.9 billion was allocated to the 50 states, Puerto Rico, and Washington D.C. to use for a number of eligible diesel emissions mitigation projects. Under the settlement, states were authorized to use up to 15% of their share of the settlement funds for light-duty vehicle charging infrastructure investments.[71] Most states have opted to use the full share (Figure 27). Other states plan to use the remaining portion of the allocation for public fleet procurement and EV incentives.[72] In 2017, legislation enacted in Oregon (SB17-1008) directed mitigation funds to the Oregon Clean Diesel Program, which provides tax incentives, loans, and grants for diesel vehicle retrofits and replacements.

Figure 27. States Using Full 15% VW Settlement Allocation for Charging Infrastructure



Source: Rogotzke, M., Eucalitto, G., and Gander, S. 2019. Transportation Electrification: States Rev Up. *National Governors Association Center for Best Practices.*

[70] U.S. Environmental Protection Agency. Volkswagen Clean Air Act Civil Settlement.
[71] The other 85% of the funding was reserved for heavy duty vehicle investments to reduce emissions – those investments have targeted everything from electric school buses to natural gas and diesel retrofits of heavy duty vehicles.
[72] Rogotzke, M., Eucalitto, G., and Gander, S. 2019. Transportation Electrification: States Rev Up. *National Governors Association Center for Best Practices.*

Biofuels

The number of bills enacted that were focused solely on biofuels declined after 2013 and by 2019, a lack of supportive legislation might have signaled trouble for the biofuels market. For instance, legislation enacted in Montana (SB17-101) repealed the state's ethanol blending requirements. Recent (2019) waivers under the Renewable Fuel Standard authorized by the Trump Administration meant that dozens of small refineries were no longer required to blend biofuels into their gasoline. These waivers further chilled an already lagging market struggling to cope with the pressures of the trade war between the U.S. and China, which resulted in reduced exports of biofuels and discouraged investment in the market. In Minnesota, the country's fourth largest ethanol producer and the first state to require ethanol blended fuel, Governor Tim Walz established a Governor's Biofuel Council in response to the ethanol plant closures that many other Midwestern states are also experiencing.

Conclusion

In the U.S., states have taken the lead in developing the climate and energy policies that drive clean energy adoption. For this reason, tracking state legislative activity is important for understanding the direction of U.S. energy policy. In this report, we looked back at the 3,542 energy-related bills enacted across the U.S. between 2013 and 2019. In general, the total volume of enacted advanced energy-related legislation decreased between 2013 and 2018 before returning to near 2013 levels in 2019. However, this trend was not uniform across years or policy categories.

State advanced energy policy has an interactive relationship with public opinion, clean energy markets, and technological advancements. Managing energy supply and demand has become more complex over time. One of the most significant trends to emerge is the gravitation toward energy policy integration at the state level. That is, between 2016 and 2019, state legislatures more frequently employed omnibus legislation to comprehensively address energy, environmental, and climate policy. This might suggest a growing recognition among state lawmakers that clean energy, environmental, and public health objectives are inextricably linked. State policymakers are also increasingly acknowledging the socioeconomic ramifications of the energy transition, as more states explore methods for facilitating a just transition for traditional energy workers, rural communities, and historically disadvantaged groups.

The remainder of this report discusses the energy market impacts of the COVID-19 pandemic and other events in 2020 that influenced energy policy and markets across the U.S.

COVID-19's Impacts on Energy Markets

In April 2020, the World Health Organization declared the COVID-19 outbreak a global pandemic. While the effects of the pandemic are still evolving, and future ramifications are uncertain, the pandemic has had a number of impacts on the economy and energy sector. Pew Research Center found that 15% of adults report that they personally were laid off or lost their jobs because of the coronavirus outbreak (of that 15%, one third had returned to work as of September 2020). Pew also found that one in four adults has had trouble paying their bills, a third have used retirement or savings, and one in six have borrowed money from friends and family.[73] Households are also having trouble paying electricity bills.[74] Compounding this, working from home has meant increased electric bills for some consumers.[75]

[73] Bennett, J., Minkin, R., and Parker, K. 2020. Economic Fallout from COVID-19 Continues to Hit Lower-Income Americans the Hardest. *Pew Research Center.* 24 September.
[74] Garsd, J. 2020. More People Unable to Pay Utility bills with Colder Months Coming. *Market Place Morning Report.* 13 November.
[75] Horsley, S. 2020. Pandemic Electric Bills are Searing Hot, as Families Stay Home. *NPR.* 17 August.

The socioeconomic effects of the pandemic have impacted the electric grid. While commercial consumption declined, at-home demand increased. The timing of peak demand has also shifted. Hourly consumption data showed lower morning peaks, which in some regions also shifted to later hours in the day.[76] In California, the infamous 'duck curve' has been more pronounced.[77] In a single day, the state has seen near-zero electricity prices due to supply outstripping demand. These are followed by soaring prices mere hours later. This development has highlighted the potential for energy storage technologies and policies to alleviate market fluctuations.

The pandemic has also meant broader impacts to energy markets. Total electric power generation declined by 6% from 2019 to 2020. The U.S. Energy Information Administration (EIA) projects that generation will increase in 2021 but does not expect it to return 2019 levels.[78] Global coal use and emissions peaked in 2018 and natural gas in 2019.[79] Demand for renewable energy continued to grow. Bloomberg New Energy Finance reports that demand for renewable energy now exceeds now exceeds developers' ability to install it by a wide margin.[80] However, uncertainty caused by the pandemic has prevented businesses from making long-term energy procurement decisions even while companies continue to make renewable energy pledges.[81]

Prior to the pandemic, oil demand was already on the decline. As stay-at-home orders were implemented and remote work was encouraged, demand declined further. In April 2020, Saudi Arabia and Russia initiated an oil price war.[82] This combined with the COVID-19 pandemic, sent global oil prices crashing.[83] While prices recovered close to the pre-crash level by December 2020, demand has not. Even though U.S. population and vehicle miles traveled have both increased from 2005 levels, oil consumption in 2019 was below 2005 levels.[84] The pandemic and price war may have accelerated the decline in demand for oil. These developments, partially driven by the pandemic, may be signs of additional shifts in the transportation sector, especially with increased uptake of higher fuel-efficiency and electric vehicles.

2020 and the Energy Transition

An important year for state clean energy policy and the energy transition in general, 2020 was marked by several notable developments. State decision-makers enacted transformative energy policies and utilities set substantial carbon reduction goals. Some of these developments are highlighted here.

Adding to the clean energy policy successes discussed throughout this report, Virginia built upon recent efforts to expand distributed generation programs, by extending access to community solar projects (HB20-1634) and providing for third-party financing of on-site generation facilities (HB20-1184). Virginia also enacted the Virginia Clean Economy Act (HB20-1526) requiring utilities to meet a 100% renewable energy standard by 2050. Finally, Virginia officially joined the regional cap and trade program, RGGI (SB-1027). In Arizona in 2020,

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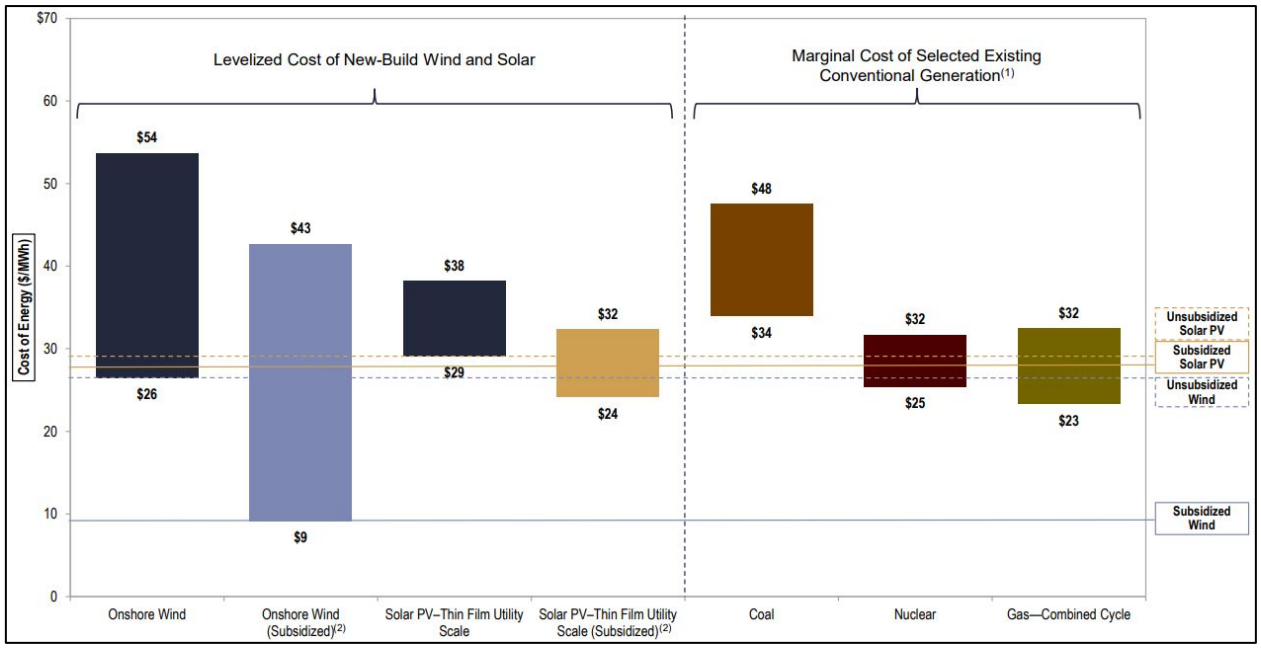
[76] Association Staff. 2020. How Has COVID-19 Affected the Electricity Markets? *American Public Power Association.* 2 July.
[77] T&D World. 2020. COVID-19 Crisis Reveals Turbulent Future for US Electricity Markets. 10 June.
[78] U.S. EIA. 2020. Trends and Expectations Surrounding the Outlook for Energy Markets. August.
[79] Bloomberg. 2020. New Energy Outlook. *Bloomberg New Energy Future.*
[80] Ibid.
[81] Penrod, E. 2020. US Energy Sector Takes Beating from COVID-19, but Demand for Renewable Energy Surges. *Utility Dive.* 14 August.
[82] Tan, W. 2020. Oil Prices Fall to 17-year Low as Saudi Arabia- Russia Standoff Continues, Coronavirus Hits Demand. *CNBC*. 30 March.
[83] Montgomery, S. 2020. The Oil Shock of 2020 Appears to be Here – and the Pain Could be Wide and Deep. *The Conversation.* 13 March.
[84] See: U.S. EIA. 2020. Annual Energy Outlook 2020.

the Corporation Commission (ACC) approved regulations requiring investor-owned utilities (IOUs) to meet a 100% carbon-free electricity standard by 2050.[85] In the absence of federal leadership on energy policy, 25 states have now committed to upholding the Paris Climate Accord by joining the U.S. Climate Alliance.

Utilities across the U.S. have committed to decarbonizing and cutting emissions. As of December 2020, at least 57 electric utilities operating around the U.S. had adopted a clean energy and/or GHG emission reduction goal. Of these, 30 have adopted 100% clean energy or net zero goals. Of the utilities that have adopted clean energy or GHG emissions reduction goals, 26 operate in the Western U.S., and 13 have set 100% clean energy or net zero GHG emissions goals.[86]

The economic and societal benefits clean energy presents are immense, and the transition to a clean energy economy is not driven solely by policy, but also by market forces. In 2020, Lazard found that new-build wind and solar energy projects are approaching a levelized cost of energy (LCOE) that is competitive with the marginal cost of existing conventional generation (Figure 28).[87] Electricity generated using coal now has a higher LCOE than electricity generated by natural gas combined cycle (NGCC) units, unsubsidized wind, and unsubsidized utility-scale solar. The falling cost of renewables and rise in natural gas production increasingly makes operating existing coal plants uneconomical. The economic benefits are clear, and utilities around the nation are increasingly investing in lower-cost and less risky clean energy technologies and retiring uneconomical coal plants.

Figure 28. Levelized Cost of Energy Comparison 2020: New Build Renewable Energy versus Marginal Cost of Existing Conventional Generation



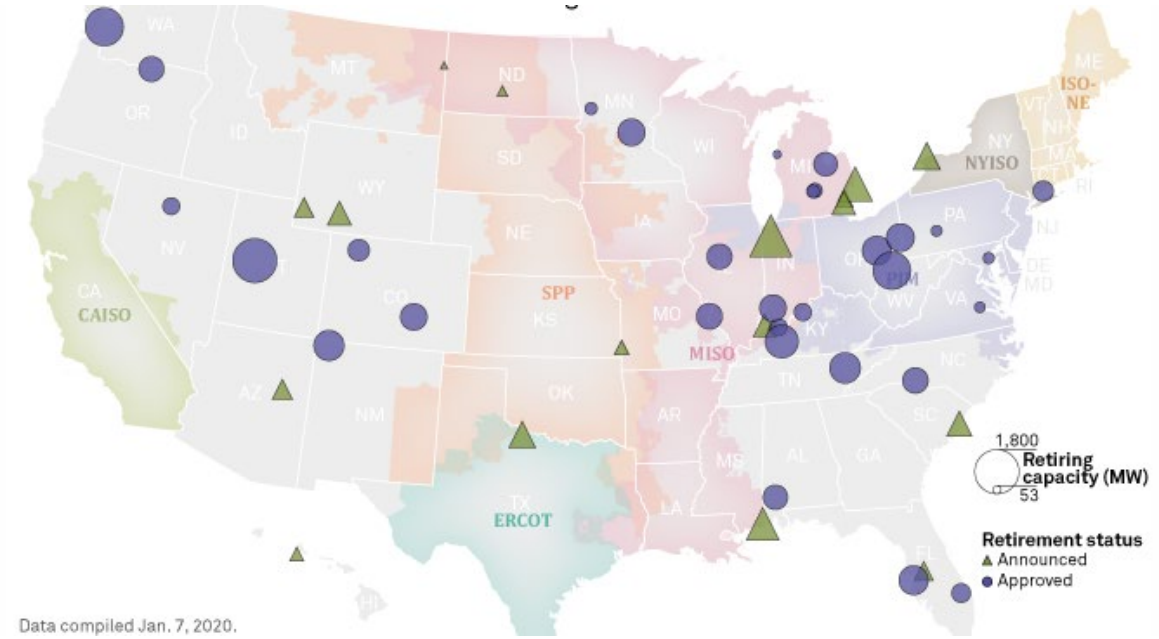
Source: Lazard. 2020. Lazard's Levelized Cost of Energy Analysis – Version 14.0.

Due to economies of scale, coal plant closures in the past consisted of smaller, older plants that only ran sporadically. In 2019, this changed with the closures of larger "super polluters" like the Navajo Generating Station in Arizona and the Bruce Mansfield power plant in Pennsylvania. These larger generating plants are

[85] Randazzo, R. 2020. Carbon-free Energy Rules Move Ahead in Arizona; Renewable Source Requirement Scrapped. *AZ Central.* 13 November.
[86] Smart Electric Power Alliance. 2020. Utility Carbon Reduction Tracker.
[87] Lazard. 2020. Lazard's Levelized Cost of Energy Analysis – Version 14.0.

typically more cost-effective than their smaller counterparts. But despite cost efficiencies, "super polluters" are being priced out of the market, and replaced with more cost-effective and environmentally responsible resources. A recent S&P Global Market Intelligence analysis of federal data found that 2019 marked the highest level of annual coal capacity retirements in the U.S. since 2015. The amount of coal capacity planned for retirement in 2020 is expected to exceed the amount retired in 2014, 2016, and 2017. Since 2014, U.S. power generators have retired nearly 62,000 MW of coal-fired generation capacity, with another 26,947 MW of retired coal generation set to retire through 2025 (Figure 29).[88]

Figure 29. Future Coal Capacity Retirements Through 2025



Source: Duquiatan, A., Kuykendall, T., Sweeney, D., and Tomas, L. 2020. U.S. Power Generators Set for another Big Year in Coal Plant Closures in 2020. *S&P Global Market Intelligence.* 13 January.

As coal plants retire, the mines that supply them will most often also shutter. Coal-reliant communities are facing a great deal of economic and social uncertainty. This is especially the case because these communities can be mono-industrial, where the industry is not only a crucial economic driver but is also associated with identity and heritage. As the transition to clean energy takes place, states are increasingly addressing impacts to the communities most affected by these closures. For instance, Colorado's HB19-1314 created the nation's first Office of Just Transition in the Department of Labor and Employment. The bill also established a Just Transition Advisory Committee, tasked with developing and drafting a just transition plan with input from a wide range of stakeholders. Similarly, New Mexico's Energy Transition Act (SB19-489), in addition to setting a new clean energy goal for the state, provides millions of dollars for economic development and workforce support for communities. The bill also incentivizes the development of renewable replacement power in previously coal-reliant communities.

As for global climate change, in terms of meeting targets set by the Paris Climate Agreement, there is reason for optimism in the U.S. context; the Unites States consumed record amounts of renewable energy in 2019

[88] Duquiatan, A., Kuykendall, T., Sweeney, D., and Tomas, L. 2020. U.S. Power Generators Set for another Big Year in Coal Plant Closures in 2020. *S&P Global Market Intelligence.* 13 January.

(19% of total U.S. electricity consumption, and 11% of total U.S. energy consumption), and experts project even more growth in the future.[89]

As technological progress accelerates, state legislatures are empowered to lay the policy groundwork to transform the power grid, which enables decarbonization of other sectors such as transportation, buildings, and industry. As the electric grid and energy markets undergo paradigmatic shifts, old business models become increasingly out-of-step. The long-standing regulatory construct of cost-of-service utility regulation based on volumetric electricity sales is at odds with two broad developments: (a) public policy objectives prioritizing energy efficiency and carbon-free electricity, and (b) the movement from utility-owned centralized generation toward an increasingly distributed power grid. As discussed throughout this report, state responses anticipating and reacting to systemic changes have varied widely. There is no one-size-fits-all approach for advancing a clean energy economy. There are a multitude of policy tools to facilitate transitions in states with diverse economies, political dynamics, and social values.

The Center for the New Energy Economy continues to work with state-level decision-makers and utilities to facilitate a just and equitable transition to cleaner energy future, while emphasizing the importance of a transition that works for under-represented and rural communities heavily reliant on fossil fuel extraction. The AEL Tracker (www.aeltracker.org) and Spot for Clean Energy (spotforcleanenergy.org) are free online tools that identify trends in state energy legislation, provide resources for development of new legislation, and link to the latest information to drive informed policymaking. These along with all of our other resources are available on our website: cnee.colostate.edu.

[89] U.S. EIA. 2020. The United States Consumed a Record Amount of Renewable Energy in 2019. *Today in Energy*. 19 October.