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Federalism as a Double-Edged Sword: The Slow Energy Transition in the United States

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Abstract

Much literature on federalism and multilevel governance argues that federalist institutional arrangements promote renewable energy policies. However, the U.S. case supports a different view that federalism has ambivalent effects. Policy innovation has occurred at the state level and to some extent has led to policy adoption by other states and the federal government, but the extent is limited by the veto power of fossil fuel interests that are rooted in many state governments and in Congress, buttressed by increasing Republican Party hostility to environmental and climate policy. This argument is supported by a detailed analysis of five periods of federal and state renewable energy policy-making, from the Carter to the Trump administrations. The negative effects of federalism on national renewable energy policy in the United States, in contrast to the West European cases in this special issue, are mainly due to the interaction of its federalist institutions with party polarization and a strong domestic fossil fuel industry.

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Many countries are proceeding with energy transitions from fossil fuels to renewable energy sources, which have the advantage of reducing greenhouse gas emissions and other pollutants. Energy transitions depend on government policy to help renewable energy sources overcome the advantages that fossil fuels possess in relative prices (due to the market's failure to price environmental externalities), economies of scale, sunk costs (due to large investments in extraction, processing, generation, and distribution facilities and infrastructure), and government subsidies (Compston & Bailey, 2013, p. 151). Because they depend on government policy, energy transitions are proceeding at very different speeds in different jurisdictions.

Compared to other countries, the United States is a mixed, intermediate case. On the one hand, its energy transition has been slower than in most West European countries, and in renewable source electricity, the topic of this article, its national policies have been weak on the whole. There is no national target, feed-in tariff, quota system, or carbon-pricing system. The main supportive policy, a small production tax credit, peaked at only 2.4 cents/kWh for wind power in 2017. This is much lower than, for example, in Germany, where the average feed-in tariff support for wind and solar power has been 11 and 35–60 U.S. cents/kWh since 2000, respectively (German Wind Energy Association (BWE) data).[1] Moreover, the congressional renewal of the U.S. production tax credit was fraught with uncertainty during the past 20 years.

Although national renewable energy policies have been weak in the United States, state government policies have filled the gap, to a large extent, mainly through renewable portfolio standards (RPSs), net metering, green power purchasing, and tax breaks, which together added an estimated 1 to 6 cents/kWh in support for wind power in the 2000s, depending on the state (Karapin, 2014, p. 119). These policies vary greatly across states; their extent is limited by economic competitiveness concerns, because they create costs that are borne by business as well as residential consumers of electricity. Nonetheless, the United States' energy transition has picked up speed recently, especially in some states that have adopted ambitiously supportive policies for renewable energy. Electricity from wind (6.6%), solar (1.6%), biomass (1.3%), and geothermal (0.4%) reached a total of 9.9% of consumption in 2018 (U.S. Energy Information Administration data), placing the United States in the middle ranks among industrialized democracies.

This article aims to identify drivers and obstacles of renewable energy policies in the United States, in order to explain why this country has had some effective policies and why its overall set of policies is less supportive and effective than in many other countries. I focus on renewable energy in the electricity sector, because so far it has contributed more to the energy transition than the

transportation or buildings sectors. Like the other articles in this special issue, I focus on how federal institutions affect the innovation of renewable energy policies. Does the state or the federal level of government take the initiative in promoting or hindering renewable energy? To what extent are state-level innovations adopted by other states? To what extent do state-level initiatives lead to federal policies and vice versa?

This article seeks to contribute to the literature on federalism and renewable energy policy, by showing that the U.S. case supports the view that federalism has ambivalent rather than only positive effects. State-level innovation in renewable policy has occurred and to some extent has led to adoption of supportive policies by other states and by the federal government. However, the extent to which this has occurred has been limited by the veto power of fossil fuel interests, which are rooted in many state governments, in Congress, and in presidential electoral coalitions; those forces have been buttressed by party polarization, as the Republican Party has become increasingly hostile to environmental and climate policy.

The next section discusses theories of federalist institutions in relation to environmental, climate, and renewable energy policy, followed by a description of U.S. federalist institutions in general and in energy policy. The growth of U.S. renewable energy over time and in comparative perspective is briefly described. Then, I analyze federal and state policy-making in five periods, in order to test whether federalism has positive effects, or ambivalent effects, on renewable energy policy. The conclusions summarize the empirical findings from these subcases in terms of the theoretical issues and in comparative perspective.

Theoretical Arguments and Methods

Much literature on federalism and multilevel governance argues that federalist institutional arrangements promote renewable energy policies. This is the finding of a large-N study concerning feed-in tariffs and certificate programs (Schaffer & Bernauer, 2014) as well as many studies of individual jurisdictions. For example, in Germany, researchers find that the federal states, known as *Länder*, innovated and drove renewable energy development (Hager, 2016; Ohlhorst, 2015; Schönberger & Reiche, 2016). The *Länder* also have defended renewable energy policy against attempts at retrenchment, in part because many of them have substantial wind or solar sectors (Lauber & Mez, 2006, p. 112; Weidner, 1995, p. 77). In Switzerland, cantons have innovated in renewable energy policy, with diffusion through horizontal coordination and model regulations (Strebel, 2011; van der Heiden & Strebel, 2012, pp. 350–351), although others show that cantons and municipalities also resist renewable energy sources that are promoted by the federal government (see articles in this special issue: Ejderyan, Ruef, & Stauffacher 2020; Stadelmann-Steffen, Rieder, & Strotz 2020). In the European Union, there is much evidence that multilevel governance has led to positive feedback in climate policies, including in renewable energy policy (Jänicke, 2013; Schreurs, 2008; Schreurs & Tiberghien, 2007).

Moreover, flexible target setting and implementation have allowed member states to innovate policies appropriate to their contexts (Selin & VanDeveer, 2012, p. 354), which has led to the likely exceedance of the European Union's renewable energy target of 20% of gross final energy consumption by 2020 (European Commission, 2015; Jayanti, 2012). In the United States, research has highlighted the role of state governments in promoting renewable energy through portfolio standards and other policies (Byrne, Hughes, Rickerson, & Kurdgelashvili, 2007, pp. 4562–4566; Rabe, 2004, 2006).

By contrast, the broader literatures on climate change policy, environmental policy, and environmental outcomes argue that federalism is likely to be ambivalent in its effects. Several comprehensive large-N studies have argued that federalism can both promote environmental performance *and* hold it back, and hence, there is little difference in environmental quality outcomes between federal and unitary systems (Jahn & Wälti, 2007, p. 263; Scruggs, 2003, pp. 171–174; see also Braun, 2000a, pp. 2, 4). Federalism aids environmental policy development by promoting experimentation, bottom-up innovation, and flexibility, but it also hinders such policies by increasing the number of veto players. Subnational governments can veto environmental policies through their representatives in national legislatures, drag their feet on the implementation of federal laws, or adopt contrary policies through their own legislation and regulations.

The argument about the ambivalence of federalism is also supported by single-country studies, which identify factors that condition the effects of federalism. For example, work on climate and energy policy-making in U.S. states has focused on both the innovative roles of progressive states such as California (Karapin, 2016; Rabe, 2009) and the resistance and veto power over federal policy exercised by conservative states (Bartosiewicz & Miley, 2013; Skocpol, 2013; Stokes, 2015). Research on Germany shows that the effects of federalism depend on how progressive or conservative the national and subnational governments are (Weidner, 1995, pp. 76–78). Finally, the impact of federalism also depends on relatively structural features: Veto players are more likely to limit renewable energy policy if there is a strong domestic fossil fuel industry and a weak national commitment to climate policy, as in the United States in comparison to Germany (Brown, 2012). In short, in this view, the impact of federalism depends on the strength of fossil fuel interests and on political processes such as elections and shifts in political parties' positions—factors that can vary across subnational units and between subnational and national governments.

In this article, I use case-study methods to test two rival hypotheses in the context of the United States: that federalism has positive effects on renewable energy policy; or that it has ambivalent effects. I have chosen to analyze the entire period of U.S. renewable energy policy development, from the 1970s to the present, in order to avoid selection bias, maximize the variation in policy adoption, and identify any long-term trends. I first identified five subcases of policy adoption or retrenchment, defined mainly in terms of presidential

administrations, because the outcomes of presidential elections strongly affect the degree of national political commitment in this policy area. I then used government data and reports, secondary literature, and news articles to construct brief policy histories and identify causal linkages through process tracing (Collier, 2011; George & Bennett, 2005).[2]

U.S. Federalism and Energy Policy

Like Germany and Switzerland, the United States has a decentralized, federalist political system, in which the regional governments restrict the central government more than in unitary systems and the national legislature is strongly bicameral (Braun, 2000b, pp. 49–50; Lijphart, 2012, p. 178). Its state governments have strong financial powers; they raised 42% of total governmental revenue in the 1990s, when only Canada and Switzerland (out of 21 Organisation for Economic Co-operation and Development countries) had higher regional government shares (Braun, 2000b, p. 52; see Lijphart, 1984, p. 178 for the 1970s). While there has been a centralization trend in the United States, it has been moderate, and state governments retain substantial autonomy in many policy areas (Broschek, 2016, pp. 34–35).

In energy policy, including policies in the electricity sector, the decentralization of U.S. federalism is evident. Historically, states have regulated electricity utilities, and the energy policy area overlaps with other traditional state roles in job creation, air-pollution policy, and land-use planning. Hence, the public expects the states to act on energy and climate policy (Byrne et al. 2007, p. 4567). Federal policy-making capacity is relatively weak and fragmented across the Federal Energy Regulatory Commission (FERC), the Department of Energy, and the Environmental Protection Agency (EPA).

Hence, states have enjoyed much autonomy in energy policy, especially concerning electricity, which has allowed them to innovate policies and influence renewable energy development through the implementation of federal policies. In the areas of energy efficiency and renewable energy, state governments have taken the initiative regarding power plant siting, building codes, appliance and equipment standards, utility demand-side management, renewable energy tax incentives and portfolio standards, net metering, and green-power purchasing. California, New York, and a few other states such as Iowa and Texas have usually taken the lead (Karapin, 2016; Rabe, 2004). However, as in any regulatory, spending, or taxation policy, state governments are constrained by interstate economic competition, and they respond differentially to those constraints and to the economic opportunities posed by renewables. Hence, the combination of federal inaction and state autonomy can both promote renewable energy policy (in leading states) and hinder it (in laggard states).

In terms of state–federal linkages, states are strongly represented in Congress, because of the territorial basis of representation in both chambers, relatively undisciplined parties (which allow representatives and senators to sometimes

vote their local interests rather than party interests), equal representation for each state in the Senate, and Senate rules that allow a 41% minority of the chamber (which may represent much less than 41% of the U.S. population, due to large differences in state populations) to block most legislation. In addition, U.S. presidents are elected through a territorial system (the electoral college) that makes them sensitive to state-level interests. These mechanisms facilitate bottom-up innovation if enough states favor a policy, but for policies that fall short of very widespread support, it permits opponents to block policies in Congress, especially in the Senate, or at the president's desk. The executive branch also can roll back or block renewable energy policies through implementation (via spending proposals and regulation) if they are opposed by states in the president's electoral coalition. However, not all action and inaction by the federal government is due to its responsiveness to state interests. Another important factor is party ideology, which allows one party (in this policy area, the Republicans) to block policy adoption if it controls the presidency, the House, or the Senate and to roll back regulatory policies if it controls the presidency. Also, the separation of powers between the branches, including the role of the federal judiciary, creates veto points independently of federalism.

The Growth of U.S. Renewable Energy in Comparative Perspective

In renewable electricity, the United States lags other countries. It was in 12th place in terms of its wind power share of generation (6.3%) in 2017 and in 24th place in terms of its solar power share (about 1.9%) in 2018 (International Energy Agency, 2017, p. 20; 2018, p. 13). It trails other large countries such as Spain, Germany, and the United Kingdom in both areas and even trails China and India in solar power. On the other hand, the United States' renewable sectors are very large in absolute terms, so its policy decisions have global implications for renewable energy markets. The United States in 2018 ranked second in the world in total installed capacity and in annual capacity additions in both wind and solar (REN21, 2019, pp. 95 & 222). Moreover, U.S. wind and solar power is growing rapidly, with wind power taking off after 2007 and solar after 2013 (see Figure 1); the country is currently adding about 8 GW (gigawatts) of wind power capacity and 10 GW of solar capacity each year.[3] The takeoff in wind and solar power was the result of the combined effect of U.S. national policies adopted in the 1990s and state policies adopted in the 2000s, as well as the declining costs for those technologies. Although new renewables have been growing exponentially at an average rate of 13% per year since 2005, future growth rates are uncertain, given a weakening national policy environment.

The growth in renewable source electricity is concentrated in certain states. For wind power, Figure 2 shows that California was an early leader, overtaken

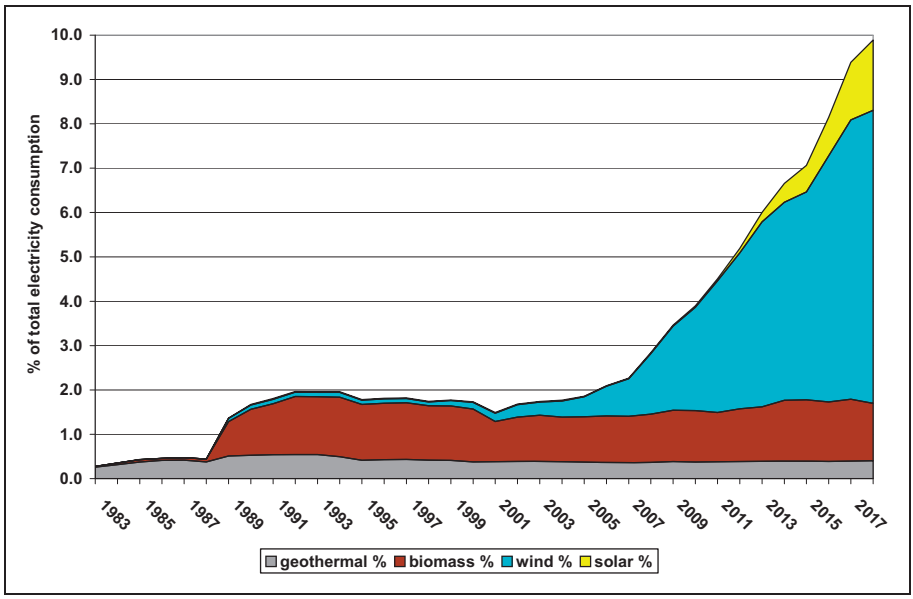

Figure 1. U.S. electricity consumption from new (nonhydro) renewable sources, in percent, 1983–2018.
Source. U.S. Energy Information Administration data.

by Texas and Iowa in the late 2000s and by Oklahoma in the 2010s, while Figure 3 shows that the top five states had 56% of total U.S. installed capacity in 2018. For solar power, Figure 4 shows that California is still by far the leader (with 39% of U.S. capacity in 2019), but other states are catching up. The top six states have almost 70% of the nation's total solar capacity, and these include some with relatively small technical solar potentials (North Carolina, New Jersey, and Massachusetts). While technical potential is one factor driving renewable energy development, it is not determinative; for example, the five states with the highest wind energy potential were ranked 1st, 5th, 17th, 19th, and 11th, respectively, out of 50 states in installed wind power capacity in 2017, respectively (National Renewable Energy Laboratory & American Wind Energy Association data).[4]

In short, the United States is a mixed case: It lags behind many other countries but has seen strong recent growth, which is uneven across states in ways that can be explained only partially by differences in technical potential. These observations support the argument (made in the upcoming sections) that the U.S. policy mix—including subnational policies that vary greatly across states—has been somewhat effective in promoting wind and solar power, although not as effective as the policies in many other countries.

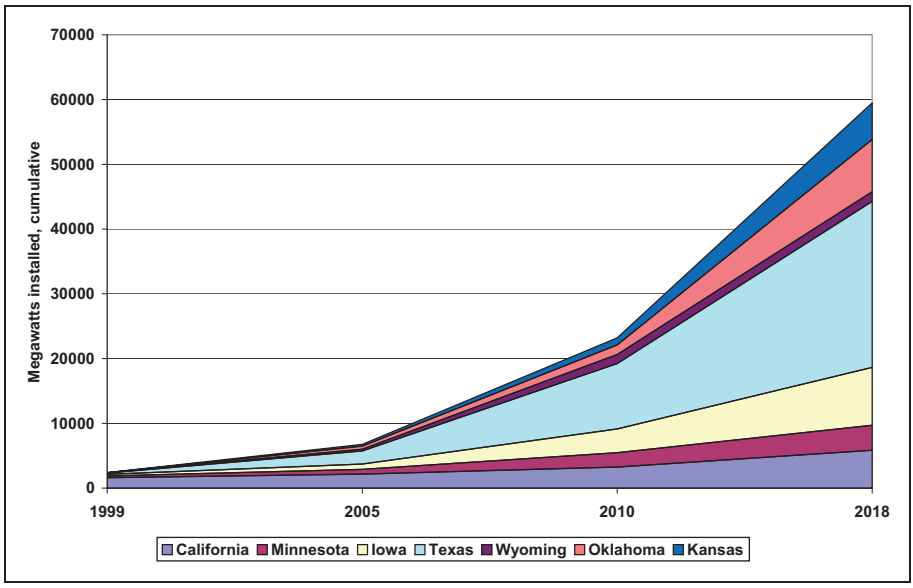

Figure 2. Wind power capacity in the leading states, 1999–2018.
Sources. U.S. Department of Energy (2019); American Wind Energy Association data.

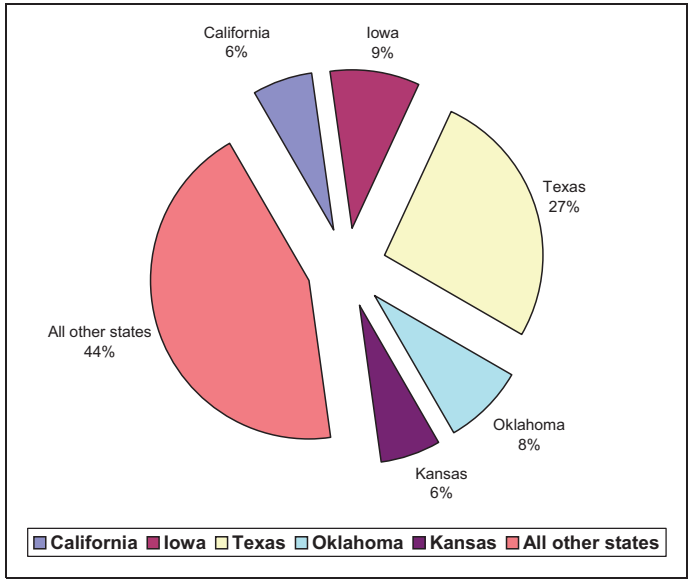

Figure 3. Wind power capacity in the leading states, 2018 (total: 89,379 MW).
Source. American Wind Energy Association data.

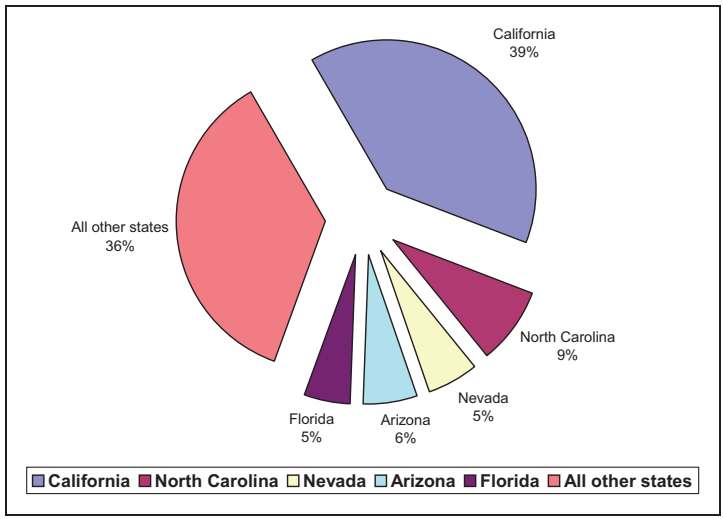

Figure 4. Solar power capacity in the leading states, 2019 Q1 (total: approx. 64,000 MW). *Source*. Solar Energy Industries Association data.

Federal and State Policies in the 1970s and 1980s (Carter and Reagan Administrations)

Federal

Partisan differences in national policy preferences were evident in this period and widened with the election of Ronald Reagan as president. While the Ford administration had responded to the 1970s' energy supply crises with largely voluntary measures, the Carter administration took initiatives to support renewable energy development. In 1978, the Democratic-controlled Congress passed legislation known as PURPA (the Public Utilities Regulatory Policies Act) that required utilities to give grid access to independent power producers and to buy power from them at avoided costs; however, the implementation of these feed-in tariffs was left to the states (Karapin, 2014, p. 125; Swisher & Porter, 2006, p. 186). Congress also passed investment tax credits for wind and solar power in 1978. By 1980, together with an existing investment tax credit for utility property, these totaled 25%, and an accelerated depreciation for investments in wind facilities was also allowed beginning that year (Chirinko, 2000, p. 2; Cox, Blumstein, & Gilbert, 1991, p. 354; Gipe, 1995, p. 31). Federal research and development (R&D) spending for wind and solar photovoltaic power also increased greatly in the late 1970s, peaking in 1980 (Nemet & Kammen, 2007, p. 750). However, in the early 1980s, after Reagan became president and fossil

fuel prices fell sharply, the federal government reversed course, cutting renewable energy R&D spending by about 90% during the 1980s and allowing the tax breaks for wind power to expire in 1985 (Karapin, 2014, p. 127).

State

Some state governments responded to federal policies and took their own initiatives in the late 1970s and early 1980s. In response to PURPA, state governments adopted feed-in tariffs, mainly in California, New York, Maine, and other New England states, where environmental organizations were strong and retail electricity prices high (Joskow, 2001, p. 34). While a few states offered high feed-in tariffs, most rates were very low (de Azua, 2001, p. 505). California was the leader in undertaking a broad range of initiatives to support renewable energy. During the administration of Governor Jerry Brown (1975–1983), California adopted generous tax credits (25%) and a renewable energy target (10% by 2000), mapped the state's wind resources, and guaranteed independent power producers high feed-in tariffs of about 7 cents/kWh for 10 years (Karapin, 2014, pp. 125–126; 2016, pp. 128–129).

California also decoupled utility revenues from electricity sales in 1982, which helped to make the utilities into advocates of energy efficiency and renewables, and it initiated demand-side management and integrated resource (or "least cost") planning in the 1980s, heavily influenced by environmental organizations (Joskow, 2001, pp. 12 & 18; Karapin, 2016, p. 131). Under integrated resource planning, utilities must assess supply options and demand, plan to meet demand reliably and at lowest cost, consider diversifying sources, and invest in demand-side management (de Azua, 2001, p. 508). In these efforts, California was joined by other states, mainly New York, Massachusetts, and Maine; by 1991, 14 states had fully implemented integrated resource planning and 18 others had done so partially (Mitchell, 1992, pp. 11–12). The combination of federal and state policies encouraged early wind power development in California, which attracted $2 billion in private investment and had produced 1,100 MW of installed capacity in 1985. California had 87% of world wind power capacity at this time, and the state also developed 2,700 MW of geothermal power in the 1980s (Karapin, 2014, p. 126; Martinot, Wiser, & Hamrin, 2005, p. 4).

Federal and State Policies in the 1990s (George H. W. Bush and Clinton Administrations)

Federal

Beginning in 1989, the climate change issue rose on the national agenda, but the partisan differences on environmental policy that had emerged during the Reagan administration were quickly extended to climate policy. This blunted the prospect that a strong national climate policy, including a vigorous

renewable energy policy, would emerge. While the George H. W. Bush administration initially favored climate policy, resistance from business and conservative Republicans caused it to retreat. Nonetheless, the 1992 Energy Policy Act included some substantial federal government support for renewable energy: a production tax credit for wind and closed-loop biomass starting in 1994 at 1.5 cents/kWh, to be adjusted for inflation; a 10% solar investment tax credit (preexisting, but now made permanent); a new renewable energy R&D program (with a 10-year proposed budget); and, at the initiative of some states, provisions that encouraged states to engage in integrated resource planning (Eikeland, 1993, p. 991; Joskow, 2001, pp. 14–15).

However, the rest of the 1990s did not provide supportive conditions for renewable energy development. Climate and energy policy stalled during the Clinton administration, as Congress rejected its proposed 1993 BTU (British Thermal Unit) tax and radically antigovernment Republicans led by Speaker Newt Gingrich took control of the House in the 1994 elections; the Senate also preemptively refused to ratify the Kyoto Protocol. The Clinton administration did promote renewables and energy efficiency within limits set by existing law and by its influence with Congress; it developed appliance standards and increased spending on renewables (Joskow, 2001, pp. 52–53; Nemet & Kammen, 2007, p. 750). But congressional Republicans generally opposed spending, so no new subsidies were adopted for renewables, and after 1995, wind and solar R&D spending dropped again, although it stayed higher than before 1994 (Harborne & Hendry, 2009, p. 3583; Joskow, 2001, p. 53).

Other aspects of federal policy hindered renewable energy. A key FERC ruling in 1995 on feed-in tariffs in California held that the state's avoided cost method was improper; this scuttled a large planned wind power expansion of 1,000 MW through new contracts in that state (de Azua, 2001, pp. 500 & 510). Moreover, the 1992 federal energy act also undermined renewables indirectly. It required utilities to open transmission lines to independent power producers, and FERC implemented this provision aggressively via Order 888 in 1996 (Menz & Vachon, 2006, p. 1788). This federal policy went much farther than PURPA had, by requiring nondiscrimination and creating an "exempt wholesale generator" status that freed independent power producers as well as some utility-affiliated generators from regulation (Joskow, 2001, p. 35).

In the late 1990s, this new federal competition policy led to the restructuring of electricity utilities and competition in electricity markets in about a dozen states, which also had been the most progressive states on renewables and energy efficiency. The reform created wholesale electricity markets that largely benefited fossil fuel and nuclear generation and undercut the states' renewable energy and energy efficiency policies, because the utilities, now under competition, no longer had slack revenues to invest in those areas (Joskow, 2001, pp. 39–40; York & Narum, 1996).

State

During the 1990s, state governments also took initiatives that enhanced the effects of the new federal competition policy. California, Texas, and most Northeastern states went farther than FERC had anticipated by requiring utilities to unbundle generation and transmission (Electric Choice, 2016; Huber, 2013, pp. 99 & 189); 16 states had implemented competition policies to some extent by 2014 (U.S. Energy Information Administration data). California was the leading force in competition policy at the state level, both by helping to design it (together with FERC) and by inadvertently demonstrating its potential problems. The state began restructuring for competition in 1993–1994 and ultimately adopted a partial deregulation policy that required investor-owned utilities to buy power on the open market while regulating the rates they were allowed to charge. This led to a dramatic electricity crisis in California in 2000–2001, with large price increases and rolling blackouts (Joskow, 2001, pp. 39–40).

Federal and State Policies, 2001–2008 (George W. Bush Administration)

Federal

The extremely close and legally contested 2000 presidential election dramatically changed the prospects for renewable energy, energy efficiency, and climate policies, although the impact was buffered by congressional Democrats' continued support for those policies. During the George W. Bush administration, federal renewable energy policy was marked almost completely by inaction and stalemate. With the president hailing from the country's number one oil producing state (Texas) and the vice president from the number one coal-producing state (Wyoming), the administration's policy was very sensitive to fossil fuel interests. In March 2001, under pressure from the fossil fuel industry and electric utilities, Bush retreated from climate policy by rejecting the Kyoto Protocol, and he reversed his previous intention to pursue CO_2 regulation via the Clean Air Act. The administration prioritized fossil fuel development in legislative proposals written by a secret task force with much input from the fossil fuel industries; 1,300 new power plants were planned by 2020 (Karapin, 2016, pp. 208–210). Congressional Democrats resisted this policy course and defended renewable energy and energy efficiency policies. This resulted in a 2005 compromise that included an extension of the production tax credit and its expansion to some new sources, a fund to finance municipal and cooperative renewable energy projects, and a large increase in the investment tax credit for solar energy, from 10% to 30% (Martinot et al., 2005, p. 2; Union of Concerned Scientists, 2010). The latter was a result of lobbying by solar firms, which

targeted congressional representatives from districts that would benefit (Stokes & Breetz, 2018, p. 81).

In this period, Congress considered and rejected many major bills that would have benefited renewable energy. Bills to establish a national RPS passed in the Senate during 2002 and 2004, but failed in the Republican-controlled House (Swisher & Porter, 2006, p. 190). In December 2007, the Democrats controlled the House and passed a bill for a national RPS and a $13 billion increase in oil taxes, which was killed by a Senate filibuster due to opposition by most electricity utilities—especially those in the South, which burned mainly coal—and by politicians linked to the oil and coal industries (Vasi, 2011, pp. 103–105; see also Bang, 2009, p. 20). At that time, coal was extracted in 26 states, and in still others, electricity utilities burned coal (Fisher, 2006, p. 480). Emissions trading bills failed in the Senate between 2003 and 2008 for similar reasons (Bang, 2009, pp. 17–18 & 22; Fisher, 2006, pp. 484–486).

Moreover, due to conflict between the parties over how to pay for revenue lost due to the production tax credit, Congress allowed the credit to expire in 1999, 2001, and 2003, as well as in 2014 and 2015, and it extended the credit in 2008 only at the last minute. Analyses of episodes in 2003 and 2008 show that oil, gas, and coal interests opposed and delayed the extension of the tax credit (Skodvin, 2010, pp. 4217–4220; Vasi, 2011, pp. 101–103). The uncertainty over these extensions led to boom-bust cycles in wind power development that hampered long-term investments (Harborne & Hendry, 2009, p. 3583; Sherlock, 2017; Union of Concerned Scientists, 2010).

State

Many state governments responded to federal inaction in this period by taking the initiative on renewable energy policy as well as on climate policy, in an example of "compensatory federalism" (Derthick, 2010, p. 66). By 2011, 31 states had adopted RPSs (all but one since the late 1990s), which covered 40% of the national electrical load by 2004. Net metering policies had been adopted by 45 states, all but 6 of them since 1996. Between 1999 and 2004, utilities in 34 states began to offer green power purchasing on a voluntary basis; 7 states made it mandatory for utilities to do so. Income tax credits for renewable energy investments were offered by 24 states (half of them since 2000), grants by 15 states (most of them in the early 2000s), and financing by 37 states. Beginning in the late 1990s, 15 states used public benefits funds to support renewables, spending $400 million for that purpose in 2004 (Martinot et al., 2005, pp. 1, 2, 6, & 12; Williamson & Sayer, 2012; data from dsireusa.org; see also Barbose, 2018, p. 8; Carley & Miller, 2012, p. 449; de Azua, 2001, pp. 515–523; Rabe, 2006).

Texas took the lead in adopting an ambitious RPS in 1999, which called for 2,000 MW of wind power to be installed by 2009. Later increased to a requirement of 5,000 MW by 2015, the RPS was motivated by energy security concerns, lobbying by the Environmental Defense Fund, and the 1992 federal energy law. The latter required the state to engage in energy planning, which led to public involvement that showed that green pricing to pay for renewables was popular (Rabe, 2004, pp. 56–60; Vasi, 2011, p. 105).

Although it was initially slow to adopt an RPS, California adopted the country's most comprehensive and ambitious set of renewable energy policies during the George W. Bush administration. It had already created a public benefits fund in 1998, with $135 million annually for renewables, and adopted an ambitious RPS in 2002, calling for 20% of electricity consumption to be renewable by 2017. The state government accelerated those requirements in 2006 (20% by 2010), in 2011 (33% by 2020), and in 2015 (50% by 2030). The California Solar Initiative, created in 2006, provided $330 million annually for 10 years, making it the second largest solar program in the world, after Germany's (Karapin, 2016, p. 39). California's appetite for imported electricity has also promoted renewable power development in other Western states. An electricity performance standard adopted in 2006 bars California utilities from entering into new long-term contracts to import coal-fired power; in 2017, only 14% of the state's imports were from coal-fired plants, while 27% were of renewable source electricity (Roselund, 2018). As a result of these state policies, the federal production tax credit, and falling costs, U.S. wind power grew to become a noticeable part of the U.S. electricity mix, rising to 2.3% of consumption in 2010 (Karapin, 2014; Price, 2002; Shrimali, Lynes, & Indvik, 2015; see Figure 1).

Federal and State Policies, 2009–2016 (Obama Administration)

Federal

The 2008 elections marked another large shift in political commitment to environmental policy, although this was tempered by Republicans and moderate Democrats in Congress, especially because party polarization on environmental and climate policy increased compared to the Bush administration (Dunlap, McCright, & Yarosh, 2016). As the Republican Party moved to the right in reaction to Obama's 2008 election, partisanship became an increasingly strong driver of actions on both levels of government, in this as in other policy areas. Democrats in governorships, state legislatures, Congress, and the White House took the lead in renewable energy policy, and Republicans resisted, blocked, or

attempted retrenchment. Congressional votes on renewable energy legislation have become increasingly partisan (Goldfarb, Buessing, & Kriner, 2016, p. 301).

Hence, during the Obama administration, federal policies only modestly expanded support for renewable energy. The 2009 economic stimulus bill included temporary funding for renewables: $6 billion in state and local renewable and efficiency funding, $11 billion for energy grid modernization, and $21 billion for renewable energy and energy efficiency tax credits (Pew Charitable Trusts, 2009, p. 40). Congress stabilized the production tax credit via extensions in 2009 and 2015, the latter for 5 years, and gave wind power facility owners the option to take a 30% investment tax credit instead of the production credit (Sherlock, 2017). The solar investment credit was extended for 8 years during the 2008 financial crisis, and in 2016, it was extended again due to pressure from solar leasing companies (Stokes & Breetz, 2018, p. 81). However, Congress and the president also agreed on major phasedowns of these subsidies in 2015: The production tax credit dropped to 40% of its original value during the 2016–2019 period, the wind investment tax credit declined from 30% to 12% during that period, and the solar investment tax credit will fall from 30% to 10% during the 2019–2022 period for nonresidential solar and to zero for residential solar installations (American Wind Energy Association, 2018; Runyon, 2015; Sherlock, 2017, p. 5).

In addition, the EPA in 2012 barred new coal plants that lacked carbon capture-and-storage technology, and for existing power plants, it finalized a Clean Power Plan in 2015, which required state-specific CO_2 reductions while giving states multiple compliance options, including by enacting renewable energy requirements (Karapin, 2016, p. 219). However, the plan's implementation was delayed until 2022, and then the Supreme Court suspended it altogether in February 2016 (Ballotpedia, 2018).

Moreover, during the Obama administration, Congress failed to pass a national RPS or emissions trading program; these were defeated in 2009, when the Waxman-Markey emissions-trading bill, which included an RPS with a 20% by 2020 target, narrowly passed the House and then never came to a vote on the Senate floor. Representatives from fossil fuel states played a large role in its defeat. In the House, coal-state Democrats won free allowances and other concessions, which coal-state Democrats in the Senate also wanted, but the concessions went so far that other Senators and some environmental organizations abandoned the bill in favor of a simpler and more rigorous cap-and-dividend proposal (Mildenberger, 2015, pp. 262 & 266; Skocpol, 2013, p. 62). Lobbyists from the National Mining Association and electricity utilities targeted moderate Democrats in 2009, showing them the bill's state-by-state impacts on coal mining and coal-fired power plants, and a group of 16 senators from coal-dependent states publicly expressed their reservations in a letter to the Senate majority leader (Mildenberger, 2015, pp. 247–248 & 282; Mulkern, 2009).

State

State governments continued to develop their renewable energy policies in this period, although the trend was limited by increasing party polarization and political backlash in some cases. Sixteen different states strengthened their RPSs in the 2009–2016 period; 14 of them did so with complete Democratic control of the state government and only two with complete Republican control (Wisconsin, Michigan). Moreover, two other Republican-controlled states retrenched their programs (Ohio and Kansas; data from Ballotpedia, 2018; Barbose, 2018, p. 8). This contrasts with the bipartisanship of the 1990s and early 2000s, when RPSs were actually adopted more often under Republican than Democratic governors (Rabe, 2006, p. 6).

On the whole, state RPSs became more stringent after 2005, with most targets rising from less than 10% to over 20% (Williamson & Sayer, 2012). By 2015, 20 states had adopted RPSs that include solar carve-outs, which, along with net metering, have led to a solar boom in North Carolina, Nevada, Massachusetts, Arizona, and New Jersey (data from dsireusa.org; McElroy and Chen, 2017; see Figure 4). Yet a backlash, led by electric utilities, large industrial customers, Republicans, and the American Legislative Exchange Council (a conservative interest group), produced many proposals to undermine RPSs and net metering, and the latter is being phased out in five states (Hess, 2016; Stokes, 2015; Vogel, 2018, p. 219). Between 2013 and 2015, at least 71 state bills to weaken or abolish RPSs were introduced, but only two real rollbacks occurred, when Ohio froze its RPS for 2 years and Kansas made its RPS voluntary (Center for the New Energy Economy, 2015, p. 2); by contrast, 13 different states strengthened their RPSs during those 3 years.

California continued to play a leading role in renewable energy during the Obama administration, especially in promoting solar photovoltaics. As noted earlier, it accelerated its RPS in 2011 and 2015, which may have led other states to strengthen theirs (Barbose, 2017, p. 8). Although California's RPS lacks a carve-out for solar power, the state has a range of other supportive policies dating in part to the 2007 California Solar Initiative, including an auction mechanism for larger projects and a feed-in tariff for smaller ones (Energy Sage, 2018; Mormann, Reicher, & Hanna, 2016, pp. 79–80). The state had adopted net metering already in 1995, quickly followed by 16 other states (Stokes & Breetz, 2018, pp. 79–80).

As a result of the combination of state and federal policies, as well as further declines in the costs of new renewables (Energy Innovation, 2018; U.S. Energy Information Administration, 2018, p. 104), this period saw the takeoff of solar power and the continued growth of wind power in the United States, which rose from a combined 1.4% of electricity consumption in 2008 to 7.6% in 2017 (see Figure 1). However, this period also saw coordinated litigation against the federal Clean Power Plan by coal companies, utilities, and 27 state governments

(Ballotpedia, 2018; Mildenberger, 2015, pp. 37 & 39), which led to the Supreme Court's suspension of the plan in 2016.

Federal and State Policies, 2017 to the Present (Trump Administration)

Federal

The 2016 elections, in which Donald Trump won an electoral college majority despite losing the popular vote by a 48% to 46% margin and Republicans kept control of Congress, marked another major reversal in political commitment at the federal level. The Trump administration immediately began to roll back Obama-era policies that affect renewable energy. In March, Trump issued an executive order directing the EPA to cancel the Clean Power Plan and begin developing a replacement that is more favorable to the coal industry (Ballotpedia, 2018). In actions similar to those taken by the George W. Bush administration, Trump announced the United States' eventual withdrawal from the 2015 Paris Climate Agreement and seeks to promote fossil fuel development through a variety of policies, including opening federal lands for leasing, reducing royalties, cutting taxes, expediting pipelines, and rolling back fracking and methane regulations (Ritchie, 2018). The 30% tariffs on imported solar panels announced in January 2018 have a more immediate impact on renewable energy development, as they are expected to increase installed costs by 10% to 15%.

State

State governments have responded to the national policy reversal by continuing to develop supportive renewable energy policies. In 2017–2018, 10 different states strengthened their RPSs, about the same pace as before Trump's election (Barbose, 2018, p. 8). Attempts to roll back state RPSs peaked between 2013 and 2015, with the ratio of strengthening bills to weakening bills rising from about 1:1 in those years to about 2:1 between 2016 and 2018 (data from Center for the New Energy Economy, 2015; see also Barbose, 2018, p. 10). In 2017–2018, 96 strengthening bills were introduced and 11 were enacted, while only 56 weakening bills were introduced and only 1 of them was enacted (Barbose, 2018, p. 10). However, current RPSs are not very ambitious; they indicate only slow renewable energy growth through 2030, of 4 GW/year, less than the average 6 GW/year associated with RPSs since 2000 (Barbose, 2017, p. 24). On the other hand, in June 2017, a group of 17 governors (15 of them Democrats) formed the U.S. Climate Alliance in response to Trump's pullout from the Paris Climate Agreement. They pledged to meet the Obama administration's greenhouse gas targets and the Clean Power Plan targets, through measures that include some that would promote renewable energy: clean energy finance, rethinking of utility

regulation to meet renewable and greenhouse gas goals, and zero-emission vehicle development. As part of the first of these, New York State's Green Bank is mobilizing $1 billion for projects outside the state (United States Climate Alliance, 2018).

Conclusion

The foregoing shows that state governments have taken the initiative in renewable energy policy in every period, but the role of the federal government has depended strongly on the president's political commitments. Hence, in the 1970s, 1990s, and from 2009 to 2016, under Presidents Carter, George H. W. Bush (a moderate Republican), and Obama, respectively, both state and federal governments took new actions to support renewable energy. By contrast, during the George W. Bush and Trump administrations, the federal government has been inactive or sought to roll back renewable energy policies, while many state governments, when controlled by Democrats or moderate Republicans, have sought to compensate. Increased party polarization over the past two decades has sharpened this pattern at the national level and has extended it to the state level. Partisanship in Congress has also limited what Democratic presidents can do, as seen in the congressional defeats under Clinton (BTU tax and Kyoto Protocol) and Obama (Waxman-Markey bill).

In all periods, the extent of state government initiatives has varied and was limited to certain states. The number of states adopting strong renewable energy policies was small in the 1970s (feed-in tariff policies and tax credits), was somewhat larger in the 1980s and 1990s (integrated resource plans and restructuring policies), and increased further to a plateau in the 2000s (RPSs, net metering, and other policies). California was usually a leader, although other states were also pioneers (e.g., Iowa and Texas in RPSs). While many states seemed to follow the leaders, this was not simply due to diffusion, because their policy adoptions also had common internal determinants, such as affluence, Democratic Party control, environmental organization mobilization, solar and wind technical potential, and small fossil fuel sectors (Matisoff, 2008; Vasseur, 2014, pp. 1640–1642).

The limited extent of state policy adoption shows that bottom-up federalism can go only so far in producing strong renewable energy policies in the United States. States with RPSs vary greatly in the stringency of their targets (Carley & Miller, 2012), and on the whole, the RPSs currently in place are not very ambitious. Only 20 states have solar carve-outs or multipliers in their RPSs; another 10 states have very high technical solar potential, but no supportive policies (Ryan, 2016). Moreover, about 20 states lack mandatory RPSs, including some with extremely large technical wind potentials—such as Utah, Wyoming, North Dakota, Nebraska, and Oklahoma—that get most of their electricity from coal or natural gas (U.S. Energy Information Administration data).

On the whole, the links between state and federal actions have been weak and have not favored renewable energy policy. The degree of positive feedback found in other environmental policy areas (Carlson, 2009) has not occurred, and to the extent that bottom-up diffusion mechanisms exist, they also make bottom-up rollbacks possible. The 1970s saw some bottom-up (solar investment tax credit) and top-down (feed-in tariff) linkages, while the 1990s saw both bottom-up and top-down linkages in integrated resource planning and competition policy, although the latter was to the detriment of renewable energy. But from 2000 to the present, there has been little linkage of either kind, aside from the bottom-up rollback of the Clean Power Plan.

The subcases also show that the lack of vertical diffusion and positive feedback is due to the interaction of partisan politics and domestic fossil fuel interests with federalist and other institutions, in two ways. First, the territorial representation features of U.S. federalism give a veto power to states with strong fossil fuel industries, through elections to the House of Representatives, the Senate, and sometimes the presidency. The Senate's filibuster rules have also magnified the power of fossil fuel states. Second, increasing partisan polarization and Republican hostility to environmental and climate policy mean that changes in partisan control of the presidency have led to dramatic shifts in federal policy since 2001, and that Republican-dominated state governments increasingly do not adopt supportive policies.

The political mobilization of fossil fuel industries and partisan polarization (the effects of which are magnified by the United States' two-party system) can help to explain why national renewable energy policy is so much weaker in the United States than in most West European countries. There, the diversity of subnational responses often unfolds in the context of stable, supportive national policies, as observed by Stadelmann-Steffen, Rieder, and Strotz's (2020) study of the cantons' responses to small hydro development and in Ejderyan, Ruef, and Stauffacher's (2020) analysis of localities' blockage of geothermal development. Another reason for cross-national differences is that the United States has more veto points than most democratic systems, created by the separation of executive, legislative, and judicial powers and by other institutional rules such as the Senate filibuster.

Overall, federalism has had ambivalent impacts on renewable energy policy in the United States, which supports the view of the comparative environmental policy literature. Advocates and opponents each have made use of different institutional leverage points in the federalist system, and state governments' autonomy in energy policy has allowed many of them to undertake vigorous policies. This has led to some renewable energy development and to the eventual takeoff of wind and solar power, which also received important support from the federal tax credits that were adopted in the 1990s and just barely maintained through 2019. But state autonomy also allows many states to adopt little or no supportive policy. Moreover, the federal government's many veto points,

combined with fossil fuel industry interests and Republican ideology, have limited federal policy, even given much pressure for bottom-up policy diffusion. Federalism has placed a ceiling on renewable energy policies due to the weak national government role, at the same time that it has placed a floor by leaving space for state governments to develop policies that have state-level political support.

What does this history tell us about the prospects of the U.S. energy transition over the next few decades? A rapid transition, which would close the gap between the United States and leaders in renewable energy, seems unlikely. It would depend on either a depolarization of the U.S. party system (of which there are no signs at this writing) or an extremely fortuitous combination of problem pressure and political commitment. The latter would necessarily include events that put climate and energy policy high on the political agenda at the same time that Democrats win both presidential and congressional elections and decide to abolish the Senate filibuster to prevent Republican-dominated states from vetoing national policy. A more likely scenario is a continuation of weak federal and very diverse state policies, which, combined with continued declines in the costs of renewable relative to fossil fuel electricity, will lead to the continued growth of renewable energy at a pace that still lags well behind the world's leaders.

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Notes

1. Currency converted at the 2000s average rate of $1.20 per Euro. Where data sources are cited, calculations are by the author.
2. While space constraints do not permit fully documenting how sources were used to check for linkages, the subcases involve judgments about mechanisms that link key variables to policy adoption and nonadoption, and sources are always cited for those linkages.
3. By contrast, its geothermal power has not grown since 1985 and biomass power not since 1992.

4. The picture is similar for solar power; only two of the five states with the highest solar potentials ranked in the top 10 states for installed solar capacity in 2017 (data from the National Renewable Energy Laboratory and the Solar Energy Industries Association, accessed at www.nrel.gov and www.seia.org).

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