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State Innovation on Climate Change: Reducing Emissions from Key Sectors While Preparing for a “New Normal”

Vicki Arroyo, Kathryn A. Zyla, Gabe Pacyniak, and Melissa Deas*

INTRODUCTION

Climate change is a global phenomenon that is causing sea levels to rise, floods and droughts to become more severe, and countless other impacts. States and local communities are on the front lines of these impacts and are taking action—often with limited federal guidance or funding support. Many have started to prepare for changes while implementing policies that also promote efficiency and clean energy alternatives that reduce their own emissions that contribute to climate change.

States are implementing many innovative initiatives that are helpful models for other state and federal action—catalyzing changes well beyond their borders. States develop and test new approaches, assess what works, and create new constituencies as they build cleaner energy economies. States like California and New York are also important emitters in their own right—given that their state economies, size, and emissions rival entire countries. California’s GDP would rank it the 7th or 8th largest economy in the world—roughly on par with Brazil and France.¹

State and local governments possess important legal authorities in areas such as utilities regulation, infrastructure investment, and land use—governing important policies, programs and investments that have long-term consequences in the fight against climate change. Some states are tackling emissions from the transportation sector—promoting deployment of cleaner vehicles and fuels and supporting transit and biking. More recently, states have begun to undertake efforts to prepare for the consequences of climate change—developing “adaptation plans” aimed at increasing resilience to extreme weather events, fires, and rising seas.

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¹ See *California Remains the World’s 8th Largest Economy*, CTR. FOR CONTINUING STUDY OF THE CAL. ECON. (2015), <http://www.ccsce.com/PDF/Numbers-July-2015-CA-Economy-Rankings-2014.pdf> [<https://perma.cc/P6CS-J3P6>]; see also *Trade Statistics*, CAL. CHAMBER OF COMMERCE, <http://advocacy.calchamber.com/international/trade/trade-statistics> [<https://perma.cc/9A8Q-TB5Y>].

Given the multiple causes and contributors to climate change, action at the state and local level is necessary—though clearly not sufficient—to address this global challenge. More comprehensive national policies are needed as well as successful international agreements that curb emissions. State and city leaders from the United States and around the world have encouraged such agreements—urging action that builds on their efforts.

This article describes the efforts of states to reduce greenhouse gas (GHG) emissions from two major sectors (transportation and electricity) and to prepare for the impacts of climate change. By examining state innovation, lessons can be shared with other states and the federal government to inform decisions regarding future national and international efforts to curb climate change and adapt to its consequences.

HISTORICAL CONTEXT FOR STATE LEADERSHIP ON CLIMATE CHANGE

To understand why states have shown leadership on a global problem when they have not been required to do so, some historical perspective might be helpful. A major reason for state efforts and innovations on climate change has been years of inaction at the federal and international level. In 2001 when George W. Bush took office and immediately turned his back on Kyoto Protocol negotiations and walked away from his campaign pledge to reduce carbon dioxide (CO₂) from power plants,² many states—at the time led by Republican as well as Democratic governors from around the United States—decided to fill the vacuum and demonstrate leadership.³

While there were also some bipartisan federal attempts at legislation in the form of a cap-and-trade bill—first led by John McCain and then-Democrat Joseph Lieberman⁴ and later by Senators John Warner,⁵ Lindsey Graham, and John Kerry⁶ and Congressmen Henry Waxman and Ed Markey⁷—states (especially the coastal states) were getting creative.

Newly elected California Assemblywoman Fran Pavley crafted a ten-page bill⁸ that would set the first GHG standards on vehicles—using California's unique authority under Section 209(b) of the Clean Air Act to set standards different from federal emissions standards. These were signed into law by Democratic Governor Gray Davis and supported by Republican Governor Arnold Schwarzenegger, who faced legal challenges from the automobile

² See Pres. George W. Bush, *Address on Global Climate Change*, THE WHITE HOUSE (June 11, 2001), <http://georgewbush-whitehouse.archives.gov/news/releases/2001/06/20010611-2.html> [<https://perma.cc/AFS2-UVU2>].

³ Vicki Arroyo, *Regional Action: A U.S. Perspective*, in *SHARING SOLUTIONS: TRANSATLANTIC COOPERATION FOR A LOW-CARBON ECONOMY* 18 (Phil Hill et al. eds., 2011).

⁴ See Climate Stewardship Act of 2003, S. 139, 108th Cong. (2003).

⁵ See Climate Security Act of 2007, S. 2191, 110th Cong. (2007).

⁶ See Clean Energy Jobs and American Power Act, S. 1733, 111th Cong. (2010).

⁷ See American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009).

⁸ CAL. HEALTH & SAFETY CODE § 43018.5(a), 2002 Cal. Stat. ch. 200, as amended by A.B. 1493, 2001–2002 Leg., Reg. Sess. (West, Westlaw through Ch. 2 of 2016 Reg. Sess. and Ch. 1 of 2015–2016 2d Ex. Sess.).

manufacturers and fought the Bush Administration for California's right to proceed using their Clean Air Act authority.⁹

Governor Schwarzenegger also issued executive orders and worked with the legislature to pass a statute requiring emissions reductions across the economy.¹⁰ California's climate leadership has continued under Governor Jerry Brown. California is reducing emissions through a combination of policies, including aggressive renewables targets, a comprehensive program to reduce a suite of GHGs statewide under its Global Warming Solutions Act of 2006 (A.B. 32), and related policies such as cap-and-trade, a low carbon fuel standard, and more.¹¹

On the east coast, Republican Governors Pataki of New York, Romney of Massachusetts, and others of both parties joined together to form the Regional Greenhouse Gas Initiative or "RGGI"—the first cap-and-trade program for CO₂ covering the power sector. RGGI is especially innovative in how the states used auction proceeds to invest in efficiency and renewables—bringing positive net economic benefits to the region. The RGGI approach illustrates the difference between providing allowances for free (as the United States acid rain sulfur dioxide trading program and European Union GHG trading program did) and auctioning allowances and using proceeds to invest in efficiency and renewables.¹² The vulnerable state of Florida's then-Republican Governor Charlie Crist was another leader on both curbing emissions that cause climate change and preparing for impacts.¹³

⁹ See *Clean Car Standards: Pavley, Assembly Bill 1493*, CAL. AIR RES. BD. (May 6, 2013), <http://www.arb.ca.gov/cc/ccms/ccms.htm> [<https://perma.cc/L7S2-MRHF>].

¹⁰ See CAL. HEALTH & SAFETY CODE §§ 38500–38599, 2006 Cal. Stat. ch. 488, as amended by A.B. 32, 2005–2006, Leg., Reg. Sess. (West, Westlaw through Ch. 2 of 2016 Reg. Sess. and Ch. 1 of 2015–2016 2d Ex. Sess.); see also Cal. Exec. Order No. S-21-09 (Sept. 15, 2009), <https://www.gov.ca.gov/news.php?id=13269> [<https://perma.cc/FB9E-UHX4>]; Cal. Exec. Order No. S-14-08 (Nov. 17, 2008), <https://www.gov.ca.gov/news.php?id=11072> [<https://perma.cc/5JG4-XUAT>]; Cal. Exec. Order No. S-17-06 (Oct. 16, 2006), <https://www.gov.ca.gov/news.php?id=4455> [<https://perma.cc/9ULK-KWM6>].

¹¹ The Global Warming Solutions Act of 2006 requires California to reduce its GHG emissions to 1990 levels by 2020. See CAL. HEALTH & SAFETY CODE §§ 38500–38599. California Governor Jerry Brown issued an executive order to establish a 2030 statewide GHG reduction target of forty percent below 1990 levels. See Cal. Exec. Order No. B-30-15 (Apr. 29, 2015), <https://www.gov.ca.gov/news.php?id=18938> [<https://perma.cc/BJ89-HFWQ>]. In 2015, the California cap-and-trade program expanded to include distributors of various transportation fuels. See CAL. CODE REGS. tit. 17, §§ 95811, 95840, 95851-52 (2015). California adopted a Low Carbon Fuel Standard pursuant to the Global Warming Solutions Act of 2006. See Cal. Code Regs. tit. 17, § 95480.

¹² See generally Paul J. Hibbard et al., *The Economic Impacts of the Regional Greenhouse Gas Initiative on Ten Northeast and Mid-Atlantic States*, ANALYSIS GRP. (Nov. 15, 2011), http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Economic_Impact_RGGI_Report.pdf [<https://perma.cc/XS7G-VDYC>]; *Memorandum of Understanding, REGIONAL GREENHOUSE GAS INITIATIVE* (2005), http://www.rggi.org/docs/mou_final_12_20_05.pdf [<https://perma.cc/5B4Q-KNFY>].

¹³ See Charlie Crist, Fla. Gov., State of the State Speech (Mar. 6, 2007), <http://www.ccfj.net/GovCristopspeech.htm> [<https://perma.cc/3X98-L7HD>]; see also Tristram Korten, *Climate Change: A Tale of Two Governors*, FLA. CTR. FOR INVESTIGATIVE REPORTING (Dec. 26, 2015), <http://fcir.org/2015/12/26/a-tale-of-two-governors-florida-climate-change-denial> [<https://perma.cc/8XRT-LWE5>].

Many states began stakeholder planning efforts to set targets and reduce emissions, and the majority (twenty-nine plus the District of Columbia) passed standards requiring a certain percentage of power to come from renewable energy such as solar and wind.¹⁴ Over time, many of these renewable portfolio standards (RPSs) have been achieved and the bar has been raised in states like Texas, California and New York.¹⁵ Nearly every state has “demand-side” programs that foster energy efficiency such as through investment in weatherization.¹⁶ While making progress on their own, a number of states also supported comprehensive federal legislation by suing the federal Environmental Protection Agency to compel the agency to use its existing Clean Air Act Authority (in *Massachusetts v. EPA* in 2007)¹⁷ and by asking courts to regulate emissions directly from power plants as a common law nuisance in *Connecticut v. AEP* in 2011.¹⁸

States have also engaged on the international front—working with other provinces and states to share best practices, link programs with other states and provinces, and support a global agreement. Often, state leaders attend international negotiations and share their positive experiences in transforming their energy sector while pointing to the severe climate change-related impacts they are already facing: impacts they cannot avoid without concerted global action.¹⁹ In December 2015, Governors Jerry Brown (CA), Jay Inslee (WA), and Peter Shumlin (VT) and many mayors participated in the international climate negotiations in Paris (COP21) urging action.²⁰

¹⁴ See *Multi-State Climate Initiatives*, CTR. FOR CLIMATE & ENERGY SOLS., <http://www.c2es.org/us-states-regions/regional-climate-initiatives> [<https://perma.cc/688K-W8E8>]; *Renewable Portfolio Standards Detailed Summary Map*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & ENERGY EFFICIENCY (DSIRE), <http://www.dsireusa.org/resources/detailed-summary-maps/> [<https://perma.cc/8BFP-DVTW>]; *State Renewable Portfolio Standards Hold Steady or Expand in 2013 Session*, CTR. FOR NEW ENERGY ECON. (2013), <http://www.ael-tracker.org/graphics/uploads/2013-State-By-State-RPS-Analysis.pdf> [<https://perma.cc/T7EW-VMTX>]; see also Jim Malewitz, *The Renewable Energy Rollback That Wasn't*, USA TODAY (June 25, 2013), <http://www.usatoday.com/story/news/2013/06/24/stateline-renewable-energy/2452093/> [<https://perma.cc/M8BM-WPX2>].

¹⁵ See DSIRE, *supra* note 14; see also Courtney Fairbrother and Dan Cross, *New York Just Proposed its Plan to Reach 50% Renewables*, ROCKY MOUNTAIN INST. (Feb. 3, 2016), http://blog.rmi.org/blog_2016_02_03_new_york_just_proposed_its_plan_to_reach_50_percent_renewables [<https://perma.cc/U9BK-TJ6T>] (discussing RPS increases in Hawaii, California, Vermont, Oregon, and New York).

¹⁶ See, e.g., *Reforming the Energy Vision*, N.Y. DEP'T OF PUB. SERV., (Jan. 28, 2016), <http://www3.dps.ny.gov/W/PSCWeb.nsf/All/CC4F2EFA3A23551585257DEA007DCFE2?OpenDocument> [<https://perma.cc/PDV6-VHX4>].

¹⁷ See generally *Massachusetts v. Env'tl. Prot. Agency*, 549 U.S. 497 (2007).

¹⁸ See generally *Am. Elec. Power Co. v. Conn.*, 564 U.S. 410 (2011).

¹⁹ See, e.g., *Global Alliance Accelerates Transition to Zero-Emission Vehicles*, CAL. ENVTL. PROT. AGENCY (Sept. 29, 2015), <http://www.calepa.ca.gov/PressRoom/Releases/2015/Alliance.htm#sthash.hfcrxyzw.dpuf> [<https://perma.cc/9STX-DJFH>]; see also *International ZEV Alliance Announcement*, INT'L. ZERO-EMISSION VEHICLE ALL. (Dec. 3, 2015), <http://zevalliance.org/content/cop21-2050-announcement> [<https://perma.cc/2HR9-GPBB>].

²⁰ See *Georgetown at the U.N. Climate Change Conference in Paris (COP21)*, GEORGETOWN CLIMATE CTR. (Nov. 24, 2015), <http://www.georgetownclimate.org/georgetown-at-the-un-climate-change-conference-in-paris-cop21> [<https://perma.cc/JH96-JRK2>].

Following years of federal inaction, the Obama Administration is using existing Clean Air Act authority to reduce emissions from transportation and power plants. Yet states remain important leaders in both mitigating climate change (by reducing GHG emissions) and adapting to climate impacts. This article examines state leadership on climate issues in the U.S. and how it has catalyzed and informed federal action in three important areas: reducing emissions from the transportation sector, reducing emissions from electric power generation, and adapting to climate change.

STATE LEADERSHIP IN REDUCING EMISSIONS FROM TRANSPORTATION

The transportation sector contributes twenty-seven percent of United States GHG emissions—second only to electricity²¹—and is a challenging sector to address because of the large number and diversity of individual vehicles producing the emissions. Just as significant reductions will only be achieved by tackling all sectors, transportation-sector emissions can only be significantly reduced by using policy levers at different levels of government and attacking all factors underlying transportation emissions (including the fuel consumption of vehicles, the carbon content of fuels, and the amount of travel that occurs). This section explores the many ways that state and local governments—as well as federal agencies—are working to address each of these factors: vehicle fuel consumption, fuel content, and vehicle miles traveled (VMT). It will also highlight the role that states have played in serving as models for other states and ultimately for federal policies.

Fuel Consumption by Vehicles: Fuel Economy and GHG Standards, Zero-Emission Vehicle Programs

Vehicle policies demonstrate the role that state policies can play as models for actions by other states and the federal government. For example, California's leadership and ambition led to nationwide fuel economy and GHG standards that will dramatically reduce emissions from cars, and California and other states continue to lead efforts to bring advanced vehicle technologies to drivers.²²

Under the Clean Air Act, states are prohibited from regulating emissions from new motor vehicles or new motor vehicle engines.²³ However, because of its historic leadership on environmental policy and its unique air pollution problems, California was allowed to apply for waivers from this provision and to adopt its own standards.²⁴ Other states may then choose to

²¹ See *Draft U.S. Greenhouse Gas Inventory Report: 1999–2014*, ENVTL. PROT. AGENCY, <http://www3.epa.gov/climatechange/ghgemissions/usinventoryreport.html> [<https://perma.cc/4N7A-UKKJ>].

²² See generally Vicki Arroyo & Kathryn Zyla, *Transportation Policy*, in *CLIMATE CHANGE AND PUBLIC HEALTH* (Barry Levy & Jonathan Patz eds., 2015).

²³ See 42 U.S.C. § 7543(a) (2012).

²⁴ See *id.* § 7543(b) (2012).

adopt California standards once waivers are granted under Section 177 of the Clean Air Act.²⁵ In May 2009, an agreement between California, the Environmental Protection Agency (EPA), the Department of Transportation (DOT), and automakers led to the approval of the California waiver and the adoption of nationwide standards for fuel economy and GHGs for light-duty vehicles produced for model years 2012–2016 that matched California’s regulations.²⁶ In 2012, this rule was followed by another, which further reduced GHGs and improved fuel economy for light-duty vehicles for model years 2017–2025. This rule will achieve an average GHG emissions per mile for the light-duty vehicle fleet in model year (MY) 2025 that is equivalent to 54.5 mpg—an increase of about five percent annually for passenger cars. Combined with MY 2012–2016 standards, this additional program will result in MY 2025 vehicles emitting one-half of the GHGs that MY 2010 vehicles emitted.²⁷

With incentives and mandates, states also are promoting the development of, and the market for, low- or zero-emission vehicles like electric or fuel cell cars. State and local incentives designed to boost purchases include tax credits and rebates, access to high-occupancy lanes on highways, and preferential parking. States and cities are also developing electric vehicle charging and natural gas or hydrogen fueling networks, and working to remove regulatory barriers, such as complicated permitting processes for installing stations. Collaborations across states, such as the Northeast Electric Vehicle Network of the Transportation and Climate Initiative (TCI), a regional collaboration of the energy, environment, and transportation agencies from eleven northeast and mid-Atlantic states and the District of Columbia,²⁸ and the West Coast Electric Highway (an initiative of California, Oregon, and Washington), can enable seamless long-distance travel in electric vehicles by providing accessible and clearly marked charging stations.

In addition, California has implemented a Zero Emission Vehicle standard under its Clean Air Act authority, requiring automakers to produce and sell non-emitting vehicles within the state.²⁹ Nine states have joined California in enacting that standard,³⁰ and in 2013, the governors of California and seven of these states—Connecticut, Maryland, Massachusetts, New York,

²⁵ See *id.* § 7507 (2012).

²⁶ Notice of Upcoming Joint Rulemaking to Establish Vehicle GHG Emissions and CAFE Standards, 74 Fed. Reg. 24,007–12 (proposed May 22, 2009), <https://www.gpo.gov/fdsys/pkg/FR-2009-05-22/pdf/E9-12009.pdf> [<https://perma.cc/J3LZ-EF92>]

²⁷ 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, 77 Fed. Reg. 62,624–63,200 (proposed Oct. 15, 2012) (to be codified at 40 C.F.R. pt. 85, 86, 600), <https://www.gpo.gov/fdsys/pkg/FR-2012-10-15/pdf/2012-21972.pdf> [<https://perma.cc/Z5ZP-6U4U>].

²⁸ See *Northeast Electric Vehicle Network*, TRANSP. & CLIMATE INITIATIVE, <http://www.transportationandclimate.org/node/30> [<https://perma.cc/7RQM-XYGU>].

²⁹ See CAL. CODE REGS. tit. 13, § 1962 (2015); see also *Advanced Clean Car Summary*, CAL. AIR RES. BD. (2012), http://www.arb.ca.gov/msprog/clean_cars/acc%20summary-final.pdf [<https://perma.cc/W47W-NYWB>].

³⁰ See *ZEV Program*, CTR. FOR CLIMATE & ENERGY SOLS., <http://www.c2es.org/us-states-regions/policy-maps/zev-program> [<https://perma.cc/QTH9-ZLYV>].

Oregon, Rhode Island, and Vermont—agreed to work together to put 3.3 million zero-emission vehicles on the road by 2025.

These same eight U.S. states joined the International ZEV Alliance, launched in August 2015 to promote awareness and increase adoption of zero-emission vehicles.³¹ Along with Germany, the Netherlands, Norway, the United Kingdom, and the Canadian provinces of British Columbia and Quebec, the states have a goal of all new passenger vehicles in their jurisdictions being zero-emission by 2050.³² These efforts demonstrate that federal policy is not the only way to promote lower-emitting vehicles.

Carbon Content of Fuels: Renewable and Low-Carbon Fuel Programs

Given our heavy reliance on liquid fuels, states have led efforts to reduce GHGs from fuels as well. The leading example is California's low carbon fuel standard (LCFS). The state legislature provided broad authority for the California Air Resources Board (CARB) to establish regulations as part of its comprehensive climate legislation in 2006 and a 2007 governor's executive order called on CARB to establish an LCFS.³³ In 2010, CARB established a program that will reduce the carbon intensity of transportation fuels used in California by an average of ten percent by 2020, and the program has been operating since January 2013.³⁴

California's LCFS has undergone some changes in response to litigation, but the 2020 target and standard are moving forward.³⁵ In September 2015, CARB re-adopted the state's LCFS regulations³⁶ in order to remedy procedural issues that a state court of appeals found violated the California Administrative Procedures Act and the California Environmental Quality Act.³⁷ A federal district court dismissed upon remand most of the remaining claims alleging that the LCFS violates the dormant commerce clause, although it has allowed litigation to proceed on a claim that the LCFS's ethanol provisions discriminate in purpose or effect.³⁸ In 2013, the Ninth Circuit vacated a preliminary injunction by the lower court in *Rocky Mountain Farmers Union v. Corey*, and the program continues to operate.³⁹

In 2015, the Oregon Legislature authorized that state's Clean Fuels Program by passing Senate Bill 324, removing a 2015 sunset clause from previ-

³¹ See CAL. ENVTL. PROT. AGENCY, *supra* note 19.

³² See INT'L ZERO-EMISSION VEHICLE ALL., *supra* note 19.

³³ See *Low Carbon Fuel Standard Program Background*, CAL. AIR RES. BD., <http://www.arb.ca.gov/fuels/lcfs/lcfs-background.htm> [<https://perma.cc/Y873-AU98>].

³⁴ *Id.*

³⁵ See CAL. CODE REGS. tit. 17, §§ 95840–95497 (2015).

³⁶ See *Notice of Decision, Re-Adoption of the Low Carbon Fuel Standard*, CAL. AIR RES. BD. (Oct. 2, 2015), <http://www.arb.ca.gov/regact/2015/lcfs2015/modlcfs.pdf> [<https://perma.cc/HEM5-PEH9>].

³⁷ See *POET, LLC v. Cal. Air Res. Bd.*, 218 Cal. App. 4th 681, 698 (Cal. Ct. App. 2013).

³⁸ See *Am. Fuels & Petrochemical Mfrs. Ass'n v. Corey*, No. 1:09-cv-2234-LJO-BAM, 2015 U.S. Dist. LEXIS 106901, at *105 (E.D. Cal. Aug. 13, 2015).

³⁹ See *Rocky Mt. Farmers Union v. Corey*, 730 F.3d 1070, 1078 (9th Cir. 2013).

ous legislation.⁴⁰ S.B. 324 requires a ten percent reduction in the carbon intensity of fuels by 2025 from 2010 levels.⁴¹ On December 9, 2015, the state's Environmental Quality Commission amended implementing regulations in light of S.B. 324 and affirmed a January 1, 2016, program start date. Like California's LCFS, the Oregon program faces political and legal challenges. Three ballot measures have been proposed for 2016 that would repeal or scale back the program.⁴² In 2015, a federal district court dismissed challenges to the Oregon program, largely relying on the decision in the California *Corey* case.⁴³ Versions of a LCFS are also being enacted in British Columbia⁴⁴ and the European Union.⁴⁵

In Washington State, Governor Jay Inslee announced in 2015 that the state would not pursue a clean fuel standard after the legislature passed a transportation revenue bill that included a "poison pill" provision. The provision would withhold \$2 billion for multi-modal transportation projects if the state moved forward with the low carbon fuel regulation.⁴⁶ Governor Inslee's decision highlights the connection between state environmental policies and transportation funding—and helps show why California included transportation fuels within its GHG cap-and-trade program.

While federal LCFS models have been proposed by policy experts,⁴⁷ none have been adopted. Federal fuel policies have focused instead on the production of renewable fuels, as in the national Renewable Fuel Standard created by the 2005 Energy Policy Act.⁴⁸ This diversity of approaches demonstrates that state and federal policies can complement each other and use different strategies to promote the development of cleaner fuels.

Vehicle Miles Traveled: Land Use Planning to Reduce Emissions

Land use decisions and changes in development patterns and personal behavior can reduce emissions by allowing people to achieve mobility needs

⁴⁰ S.B. 324-A, 2015 Reg. Sess. (Or. 2015) (enacted).

⁴¹ *Id.*

⁴² See Ian K. Kullgren, *Oregon Delays Clean-Fuels Enforcement until 2017*, OREGONIAN (Dec. 14, 2015), http://www.oregonlive.com/politics/index.ssf/2015/12/oregon_delays_clean_fuels_enfo.html [https://perma.cc/Q62P-A55U].

⁴³ See *Am. Fuel & Petrochemical Mfrs. v. O'Keeffe*, No. 3:15-CV-00467-AA, 2015 U.S. Dist. LEXIS 128277, at *5 (D. Or. Sept. 23, 2015).

⁴⁴ See *Renewable & Low Carbon Fuel Requirements Regulation*, BRITISH COLUM. MINISTRY OF ENERGY, MINES, & PETROLEUM RES., <http://www.empr.gov.bc.ca/RET/RLCFRR/Pages/default.aspx> [https://perma.cc/647G-MWMF].

⁴⁵ See *Transport & Env't.: Fuel Quality Monitoring*, EUR. COMM'N, <http://ec.europa.eu/environment/air/transport/fuel.htm> [https://perma.cc/J8NL-VM66].

⁴⁶ See S.B. 5987 § 202, 2015 Reg. Sess. (Wa. 2015); see also Kate Prengeman, *Inslee Drops Low-Carbon Fuel Standard*, YAKIMA HERALD (July 28, 2015), http://www.yakimaherald.com/news/local/inslee-drops-low-carbon-fuel-standard-sparing-m-for-yakima/article_dc00c4d6-3570-11e5-bf26-63fdcef13b42.html [https://perma.cc/NTB7-9JVN] (noting that Gov. Inslee will not pursue low carbon fuels standard).

⁴⁷ See, e.g., NATIONAL LOW CARBON FUEL STANDARD PROJECT, <http://nationalcfsproject.ucdavis.edu/index.php> [https://perma.cc/5HAU-DM3X].

⁴⁸ See *Renewable Fuel Standard Program*, ENVTL. PROT. AGENCY, <http://www.epa.gov/renewable-fuel-standard-program> [https://perma.cc/GL2Y-UBRB].

while driving less. Attractive alternatives to driving single-occupancy vehicles can be provided through improved transit and transit-oriented development, high occupancy vehicle lanes and other incentives, and “complete streets” programs that promote bicycling and walking. Other strategies, such as training drivers to accelerate and brake more gently or promoting use of anti-idling technologies in vehicles so that engines are shut off when stopped at red lights, can also reduce emissions. A 2009 study found that aggressively trying to reduce VMT could cut on-road GHG emissions by eighteen to twenty-four percent by 2050.⁴⁹

Strategies that get people to drive less typically fall under the jurisdiction of local and regional government entities, such as metropolitan planning organizations, rather than state or federal regulators. However, the federal government can provide funding, and states can provide financial incentives and enact enabling laws to give local governments more authority and financial resources. For example, federal transportation legislation provides grants to states and local governments for transportation investments,⁵⁰ and California’s Sustainable Communities Act (S.B. 375) lays out a framework that encourages metropolitan areas to reduce GHG emissions through planning requirements and incentives.⁵¹ In 2010, CARB set regional 2020 and 2035 targets for GHG emission reductions from passenger vehicle use for each region covered by a state metropolitan planning organization (MPO). Each MPO prepares a “sustainable communities strategy” as part of its regional transportation plan, and technical evaluations and implementation progress reports are tracked and posted on the state’s website.⁵²

On the east coast, TCI jurisdictions are promoting sustainable communities and developing indicators for monitoring progress, such as the proportion of travel by different modes of transport, the combined costs of housing and transportation, and the proportion of jobs and housing near mass transit.⁵³ Several states, such as Florida, now require pedestrian- and bicycle-friendly designs in all new road construction projects.⁵⁴

⁴⁹ See CAMBRIDGE SYSTEMATICS, INC., MOVING COOLER: AN ANALYSIS OF TRANSPORTATION STRATEGIES FOR REDUCING GREENHOUSE GAS EMISSIONS 5 (2009), <https://www.fta.dot.gov/sites/fta.dot.gov/files/docs/MovingCoolerExecSummaryULI.pdf> [<https://perma.cc/ANU4-QWSS>].

⁵⁰ See, e.g., Fixing America’s Surface Transportation Act, Pub. L. No. 114-94, 129 Stat. 1312 (2015).

⁵¹ See CAL. GOV’T CODE § 65080 (2011); *Sustainable Communities*, CAL. AIR RES. BD. (Jan. 21, 2016), <http://www.arb.ca.gov/cc/sb375/sb375.htm> [<https://perma.cc/GF9K-VFZ9>].

⁵² See *Sustainable Communities*, *supra* note 51.

⁵³ See *Indicators to Measure Progress in Promoting Sustainable Communities*, TRANSP. & CLIMATE INITIATIVE, <http://www.transportationandclimate.org/indicators-measure-progress-promoting-sustainable-communities> [<https://perma.cc/PUH3-WX65>].

⁵⁴ See FLA. STAT. § 335.065 (West, Westlaw through the 2016 2d Reg. Sess. of the 24th Legis.).

Other Approaches: Market-Based Strategies to Reduce Emissions

In addition to emissions challenges, transportation funding is a growing problem nationwide. The 18.4 cent-per-gallon federal gasoline tax enacted in 1993 has not been increased (or even indexed to inflation) and is no longer enough to support the nation's transportation needs. Six times between 2008 and 2014, Congress was forced to transfer money—about \$63 billion in total—from the general treasury to the Highway Trust Fund, and in August 2014, the Congressional Budget Office estimated that \$157 billion in additional revenue would be needed to maintain current spending levels plus inflation between 2015 and 2024.⁵⁵ Nonetheless, the Fixing America's Surface Transportation (FAST) Act passed in December 2015 provides no new source of transportation funding.⁵⁶ As a result, states are taking broader approaches using market signals to drive emissions reductions and raise funds for transportation systems often in dire need of repair.

In 2015, California's comprehensive cap-and-trade program began to cover transportation fuels. In addition to the reductions achieved by the cap itself, proceeds from the program's auction of allowances are invested to support clean transportation projects and programs that meet other objectives under the Global Warming Solutions Act (A.B. 32).⁵⁷ Another law mandates that twenty-five percent of the funds generated be used to benefit low-income communities and that ten percent be spent within these communities.⁵⁸

The first two appropriations of auction proceeds in fiscal years 2013–14 and 2014–15 totaled over \$900 million, and provided significant new funds for transportation and emissions-reduction programs at a time when state DOTs all over the country are struggling to find funds to maintain transportation systems and struggling to raise gas taxes.⁵⁹ The state's 2015–16 plan includes \$500 million for high-speed rail, \$100 million for low-carbon transit operations, \$265 million for a transit and intercity rail capital program, \$400 million for affordable housing and sustainable communities programs, and \$350 million for low-carbon transportation, which includes electric vehicles (trucks, buses, and light-duty vehicles) and supports California's zero-emission vehicle goal.⁶⁰

⁵⁵ See *Funding the Nation's Surface Transportation System*, U.S. GOV'T ACCOUNTABILITY OFF., http://www.gao.gov/key_issues/funding_nations_surface_transportation_system/issue_summary [https://perma.cc/HQ66-UMZ8].

⁵⁶ See Fixing America's Surface Transportation Act, Pub. L. No. 114-94, 129 Stat. 1312 (2015).

⁵⁷ *California Climate Investments*, CAL. AIR RES. BD., <http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/auctionproceeds.htm> [https://perma.cc/SK85-2WUH].

⁵⁸ S.B. 535, 2011–2012 Reg. Leg. Sess. (Ca. 2012); CAL. HEALTH & SAFETY CODE § 39713 (West, Westlaw through Ch. 1 of 2016 Reg. Sess.).

⁵⁹ See CAL. AIR RES. BD., ANNUAL REPORT TO THE LEGISLATURE ON INVESTMENTS OF CAP-AND-TRADE AUCTION PROCEEDS 4 (2015), <http://www.arb.ca.gov/cc/capandtrade/auctionproceeds/2015ggrf-annual-report-to-legislature.pdf> [https://perma.cc/GL7L-E48B].

⁶⁰ See CAL. AIR RES. BD., CAP-AND-TRADE AUCTION PROCEEDS SECOND INVESTMENT PLAN: FISCAL YEARS 2016–17 THROUGH 2018–19, REVISED DRAFT, B-3 (2015), <http://www>

On the east coast, six jurisdictions (Connecticut, Delaware, the District of Columbia, New York, Rhode Island, and Vermont) announced that they will work together through TCI to develop potential market-based policies to achieve substantial reductions in GHGs and other pollutants from transportation.⁶¹ The announcement accompanied the release of a report finding the region could reduce transportation-sector emissions twenty-nine to forty percent by 2030 from 2011 levels.⁶² While it is yet to be seen which strategies the TCI states will explore, market-based policies in the northeast have the potential to support transportation-related projects and other goals using proceeds from an emissions budget program.

As climate change brings more heat waves, more extreme storms, and rising seas, the need for investing in transportation infrastructure—and in clean and resilient transportation systems—will only increase over time. The innovations in state policy described here, such as market-based strategies that reduce emissions while also providing new sources of funds, can be models for similarly innovative solutions at the federal level in the future.

STATE LEADERSHIP IN REDUCING EMISSIONS FROM THE POWER SECTOR

Electric power is the largest emitting sector of GHG emissions in the United States. Since 2005, however, carbon dioxide emissions from this sector have dropped fifteen percent,⁶³ due not only to market-driven shifts from coal to natural gas but also to dramatic increases in renewable energy generation and decreased demand from efficiency improvements. Once again, states have pioneered and implemented a number of innovative energy policies that have helped drive these emission reductions, and this state leadership has paved the way for federal GHG emission standards for the power sector that have been recently finalized.⁶⁴

This section will describe three key areas of state innovation: (1) state renewable and efficiency standards and mandates; (2) state GHG targets and

arb.ca.gov/cc/capandtrade/auctionproceeds/draft-second-investment-plan.pdf [https://perma.cc/9QNA-DGEL].

⁶¹ See *Five Northeast States and DC Announce They Will Work Together to Develop Potential Market-Based Policies to Cut Greenhouse Gas Emissions from Transportation*, GEORGETOWN CLIMATE CTR. (Nov. 24, 2015), <http://www.georgetownclimate.org/five-northeast-states-and-dc-announce-they-will-work-together-to-develop-potential-market-based-poli> [https://perma.cc/AG4B-KT2A].

⁶² See Gabriel Pacyniak et al., *Reducing Greenhouse Gas Emissions from Transportation: Opportunities in the Northeast and Mid-Atlantic*, GEORGETOWN CLIMATE CTR. (Nov. 24, 2015), <http://www.georgetownclimate.org/reducing-greenhouse-gas-emissions-from-transportation-opportunities-in-the-northeast-and-mid-atlanti> [https://perma.cc/K6VY-FJHG].

⁶³ See *State Carbon Dioxide Emissions*, U.S. ENERGY INFO. ADMIN. (Oct. 26, 2015), <http://www.eia.gov/environment/emissions/state/> [https://perma.cc/X3G8-EBCW].

⁶⁴ See generally Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,510, 64,582 (Oct. 23, 2015) (to be codified at 40 C.F.R. pts. 60, 70, 71 and 98) (providing standards for both new and existing power plants); see also Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,622 (to be codified at 40 C.F.R. pts. 60, 70, 71 and 98).

related policies; and (3) state efforts to inform development of sound national standards to reduce emissions from the power sector.

Innovative state policies include state renewable energy and energy efficiency mandates. States have been implementing these policies for over twenty years with the majority of states having at least one such mandate in place.⁶⁵ This portion of the article will discuss how state policies have promoted increased use of renewable energy and energy efficiency in the United States, demonstrated that these resources could be successfully integrated into the electricity system, and ultimately reduced GHG emissions from the power sector.

A number of states have gone beyond promoting renewable energy and efficiency and established regulatory standards to reduce GHGs from power plants, including through RGGI and California's cap-and-trade programs. Several states have also established GHG performance standards for new power plants. These efforts will be described in additional detail (including how cap-and-trade programs have successfully reduced emissions, created functioning carbon markets, and provided revenues for clean energy and energy efficiency investments).

Each of these innovations provided critical technical, legal, and policy foundations for recent federal GHG regulations. This section will end with a discussion of the Clean Power Plan, which regulates carbon dioxide from existing power plants nationally. In designing its approach to the Clean Power Plan, EPA relied on the success of state programs in both setting the federal emission guidelines as well as in identifying approaches that states can use for compliance. This included setting minimum limits on emissions based in part on the potential for reductions in emissions from shifting to renewable energy, and establishing a compliance framework that allows for the use of cap-and-trade programs and energy efficiency. The section also analyzes how state new source performance standards informed setting of similar federal new source standards. Although the Clean Power Plan was temporarily stayed by the Supreme Court in an unprecedented action on February 9, 2016, many states have said that they intend to continue planning for compliance with the Clean Power Plan until pending litigation is resolved.⁶⁶

Even beyond Clean Power Plan compliance, states are continuing to move forward with policy innovations. In order to achieve the dramatic GHG reductions that will be needed to avoid dangerous human interference with the climate system, deep decarbonization of the electricity system will

⁶⁵ See ENVTL. PROT. AGENCY, ENERGY AND ENVIRONMENT GUIDE TO ACTION: STATE POLICIES AND BEST PRACTICES FOR ADVANCING ENERGY EFFICIENCY, RENEWABLE ENERGY, AND COMBINED HEAT AND POWER 4-6, 5-1 (2015), https://www.epa.gov/sites/production/files/2015-08/documents/guide_action_full.pdf [<https://perma.cc/3VL7-VFV9>].

⁶⁶ See *State Statements Following the Supreme Court's Decision to Stay the Clean Power Plan*, GEORGETOWN CLIMATE CTR. (Mar. 16, 2016), <http://www.georgetownclimate.org/state-statements-following-the-supreme-courts-decision-to-stay-the-clean-power-plan> [<https://perma.cc/SWK6-KQCV>] (listing statements from state officials saying they would consider planning for Clean Power Plan implementation).

be required. With this challenge firmly in mind, a number of states continue to take on even more ambitious medium- to long-term targets. Many are moving forward with executive orders, regulations, and legislation to dramatically boost the proportion of renewable electricity, to increase investments in end-use energy efficiency, and to amend utility regulations to allow utilities to invest in smart grid technologies, renewable generation, and energy storage.

States are indeed leading the way in making the power sector cleaner, more innovative, and more efficient, and will continue to do so under the Clean Power Plan and through other complementary policies.

State Renewable Energy Policies

Since the 1990s, state policies have driven deployment of renewable energy and energy efficiency, created market incentives that accelerated private-sector investments, and demonstrated that such strategies can be deployed at scale and can be successful in reducing CO₂ emissions. Both RPSs and Energy Efficiency Resource Standards (EERS) have now been widely adopted by states. Leading states have also implemented GHG reduction programs, including new source performance standards and market-based models like cap-and-trade, demonstrating that these models can operate effectively to reduce GHGs and provide economic benefits.

A major factor in cutting CO₂ and other GHG emissions has been the growth of renewable energy.⁶⁷ In the past decade, electricity generation from non-hydropower renewable sources in the United States has more than doubled.⁶⁸ In 2014, installation of new renewable energy generation outpaced installations of all other new electricity generation resources, including natural gas,⁶⁹ increasing the amount of renewable power to 13.5% of all electricity generation.⁷⁰ In 2014, fifteen states produced more than ten percent of their total electricity generation from non-hydropower renewable resources.⁷¹

The growth in renewable energy has been driven in large part by the widespread adoption of state RPSs and other renewable policies, as well as by federal tax policies. States began enacting requirements that a portion of electricity be sourced from renewable energy as early as 1983, with most

⁶⁷ See U.S. ENERGY INFO. ADMIN., U.S. ENERGY-RELATED CARBON DIOXIDE EMISSIONS 12 (2014), https://www.eia.gov/environment/emissions/carbon/pdf/2014_co2analysis.pdf [<https://perma.cc/P824-5YQM>].

⁶⁸ See U.S. DEPT OF ENERGY, 2014 RENEWABLE ENERGY DATA BOOK 18 (2014), <http://www.nrel.gov/docs/fy16osti/64720.pdf> [<https://perma.cc/WV9V-5WZT>].

⁶⁹ See *id.* at 3.

⁷⁰ See *id.*

⁷¹ Computed from U.S. ENERGY INFO. ADMIN., ELECTRIC POWER MONTHLY WITH DATA FOR DECEMBER 2014, tbl. 1.14.B (2015), http://www.eia.gov/electricity/monthly/current_year/february2015.pdf [<https://perma.cc/5PE4-BD36>]. The states are Iowa, South Dakota, Idaho, California, Kansas, Minnesota, North Dakota, Oklahoma, Oregon, Colorado, Hawaii, Nevada, Vermont, and New Hampshire.

requirements enacted between 1997 and 2004.⁷² Today, twenty-nine states have implemented RPSs,⁷³ and many states have adopted other policies that support renewable energy deployment.⁷⁴

A 2014 analysis by the Lawrence Berkeley National Laboratory (LBNL) found that state “RPS policies are a key driver for new renewable electric generation facility development in the United States.”⁷⁵ A subsequent analysis found that fifty-eight percent “of all non-hydroelectric RE capacity built in the United States from 1998 through 2014 is being used to meet RPS requirements.”⁷⁶ The federal Energy Information Administration writes in its most recent Annual Energy Outlook that state RPSs, along with federal tax credits, “continue to drive the relatively robust near-term growth of non-hydropower renewable sources.”⁷⁷ Other state policies that are contributing to the growth of renewables include financial and tax incentives, policies that require or encourage long-term renewable power purchase agreements, and net metering and interconnection standards that support distributed renewable generation.⁷⁸

States’ experiences with RPSs have also shown that renewable energy mandates can operate successfully within the United States electric power system.⁷⁹ RPSs have been adopted by states with very different potential for renewable energy, including both states with high renewable resource potential (e.g., Minnesota and California) and states with more modest resource potential (e.g., New York and New Jersey).⁸⁰ Similarly, RPSs have been implemented in states with both regulated retail electricity rates, like Minne-

⁷² See Ryan Wiser et al., *Renewables Portfolio Standards: A Factual Introduction to Experience from the United States*, LAWRENCE BERKELEY NAT’L LAB. (Apr. 2007), <https://emp.lbl.gov/sites/all/files/lbnl-62569.pdf> [<https://perma.cc/8MYA-7HFA>].

⁷³ See *Renewable Portfolio Standards Detailed Summary Map*, DSIRE (2015), <http://ncsolarcenter-prod.s3.amazonaws.com/wp-content/uploads/2015/11/Renewable-Portfolio-Standards.pdf> [<https://perma.cc/8L8C-R39X>].

⁷⁴ See generally *State Renewable Energy and Energy Efficiency Programs Summary Tables*, DSIRE, <http://programs.dsireusa.org/system/program/tables> [<https://perma.cc/DBZ5-6AGC>] (listing various state incentive and regulatory programs to promote renewable energy).

⁷⁵ U.S. ENVTL. PROT. AGENCY, *supra* note 65, at 5-1 (citing to Galen Barbose, *Renewables Portfolio Standards in the United States: A Status Update*, LAWRENCE BERKELEY NAT’L LAB. 3 (2014), https://emp.lbl.gov/sites/all/files/rps_summit_nov_2013.pdf [<https://perma.cc/U3SK-PDAC>]).

⁷⁶ Ryan Wiser et al., *A Retrospective Analysis of the Benefits and Impacts of U.S. Renewable Portfolio Standards*, LAWRENCE BERKELEY NAT’L LAB. (Jan. 2016), <https://emp.lbl.gov/sites/all/files/lbnl-1003961.pdf> [<https://perma.cc/YUD7-U6KY>].

⁷⁷ U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2015 ES-7 (2015), [http://www.eia.gov/forecasts/aeo/pdf/0383\(2015\).pdf](http://www.eia.gov/forecasts/aeo/pdf/0383(2015).pdf) [<https://perma.cc/G9RZ-ALVU>].

⁷⁸ See U.S. ENVTL. PROT. AGENCY, SURVEY OF EXISTING STATE POLICIES AND PROGRAMS THAT REDUCE POWER SECTOR CO₂ EMISSIONS 39–40 (2014), http://www.epa.gov/sites/production/files/2014-06/documents/existing-state-actions-that-reduce-power-sector-co2-emissions-june-2-2014_0.pdf [<https://perma.cc/CCJ5-TXN3>].

⁷⁹ See U.S. ENVTL. PROT. AGENCY, *supra* note 65, at 4-94.

⁸⁰ See *Renewable Energy Technology Resource Maps and Technical Potential for the United States*, NAT’L RENEWABLE ENERGY LAB. (July 2012), http://www.nrel.gov/gis/docs/resource_maps_201207.pptx [<https://perma.cc/PP75-UHED>].

sota, Kansas, and Washington, and those with competitive markets, like New York, Oregon, and Nevada.⁸¹

Most state programs allow electric companies to comply by submitting renewable electricity credits (RECs) that are issued by other states. As a result of this interstate compliance mechanism, a successful system of tradable interstate RECs has developed, including interoperable tracking systems and functioning markets.⁸² The 2014 LBNL analysis found that compliance with RPS targets has “generally been strong,” meaning that in recent years compliance was generally achieved through the actual provision of renewable energy (i.e., generation of in-state renewable electricity or submission of out-of-state RECs) even where mechanisms like alternate compliance payments or price caps existed.⁸³ This demonstrates that state policies taken as a whole have been successful in promoting ever-higher levels of renewable electricity generation to meet these state mandates.

These state RPSs have consequently driven significant reductions in carbon pollution from the power sector. As renewable energy has increased to meet these mandates, generation from fossil-fuel sources has decreased. Compliance with RPSs in 2013 was projected to have reduced fossil-fuel generation by 3.6%, a reduction of fifty-nine million metric tons of CO₂e (carbon dioxide equivalents) on a lifecycle basis.⁸⁴

There has been some concern that state RPSs, depending on how they are designed, may be unconstitutional under the dormant commerce clause doctrine.⁸⁵ One avenue for challenge is that programs that disallow or restrict use of out-of-state renewable electricity for compliance could be found to discriminate against commerce from other states. A 2013 Seventh Circuit Court of Appeals decision in *Illinois Commerce Commission v. FERC* heightened these concerns when Judge Posner implied in dicta that Michigan’s RPS unconstitutionally discriminated against other states by not allowing out-of-state energy to count towards Michigan’s renewable energy

⁸¹ See *Most States Have Renewable Portfolio Standards*, U.S. ENERGY INFO. ADMIN.: TODAY IN ENERGY (Feb. 3, 2012), <https://www.eia.gov/todayinenergy/detail.cfm?id=4850> [<https://perma.cc/R9AA-QBM9>].

⁸² See Warren Leon, *Clean Energy Champions: The Importance of State Programs and Policies*, CLEAN ENERGY STATES ALL. 22 (June 2015), <http://www.cesa.org/assets/2015-Files/Clean-Energy-Champions-LR.pdf> [<https://perma.cc/Y7WX-JZ4K>]. But see Warren Leon, *The State of State Renewable Portfolio Standards*, CLEAN ENERGY STATES ALL. 13–15 (June 2013), <http://www.cesa.org/assets/2013-Files/RPS/State-of-State-RPSs-Report-Final-June-2013.pdf> [<https://perma.cc/396M-4URW>] (discussing challenges and weaknesses of RPS implementation and markets).

⁸³ Different RPS laws may allow compliance through alternative compliance payments, or may subject compliance targets to price caps or other mechanisms. See Galen Barbose, *Renewables Portfolio Standards in the United States: A Status Update*, LAWRENCE BERKELEY NAT’L LAB. 10 (2014), https://emp.lbl.gov/sites/all/files/rps_summit_nov_2013.pdf [<https://perma.cc/U3SK-PDAC>].

⁸⁴ See Ryan Wiser et al., *A Retrospective Analysis of the Benefits and Impacts of U.S. Renewable Portfolio Standards*, LAWRENCE BERKELEY NAT’L LAB. (Jan. 2016), <https://emp.lbl.gov/sites/all/files/lbnl-1003961.pdf> [<https://perma.cc/YUD7-U6KY>].

⁸⁵ See, e.g., Steven Ferry, *Threading the Constitutional Needle With Care: The Commerce Clause Threat to the New Infrastructure of Renewable Power*, 7 TEX. J. OIL GAS & ENERGY L. 59, 86 (2011–12).

mandate.⁸⁶ Some states have dropped in-state requirements in response to legal challenges, but no state program has been struck down on such grounds, and most programs allow out-of-state electricity to be used for compliance.⁸⁷ Another potential dormant commerce clause challenge is the argument that state RPSs control commercial conduct in other states because the RPS creates an economic incentive for out-of-state renewable producers and therefore disadvantages out-of-state fossil-fuel-fired electricity generators. In 2015, the Tenth Circuit Court of Appeals issued an important ruling on this issue in *Energy and Environment Legal Institute v. Epel*, affirming that Colorado's RPS did not constitute control of extraterritorial conduct. The appellate court found that Colorado's RPS did not have any of the three "essential characteristics" required to find extraterritorial conduct under Supreme Court precedent: "it isn't a price control statute, it doesn't link prices paid in Colorado with those paid out of state, and it does not discriminate against out-of-staters."⁸⁸ The decision is the first time that a federal appellate court has ruled directly on this issue.

In addition to challenges in court, in the past several years, efforts to repeal RPSs have been introduced in at least eighteen state legislatures, largely due to a campaign by the right-leaning, fossil-fuel-industry funded American Legislative Exchange Council.⁸⁹ In spite of this unprecedented attack, all but two of these efforts failed, mainly because of widespread public support for renewable energy.⁹⁰ Indeed, a number of states have actually strengthened and expanded their RPS programs recently, as described below.

In short, the majority of states in the United States have implemented renewable mandates, and many of these policies date back fifteen years or more. Together with federal tax credits, these policies have been major drivers of renewable energy deployment. States have successfully demonstrated

⁸⁶ "Michigan's . . . argument—that its law forbids it to credit wind power from out of state against the state's required use of renewable energy by its utilities—trips over an insurmountable constitutional objection. Michigan cannot, without violating the commerce clause of Article I of the Constitution, discriminate against out-of-state renewable energy." Ill. Commerce Comm'n v. FERC, 721 F.3d 764, 775–76 (7th Cir. 2013) (The case concerned whether FERC's approval of a multi-value projects (MVP) tariff coerced states to approve all MVPs proposed within its territory, and Michigan argued that it was not benefitting from a transmission line that would be built as part of the project).

⁸⁷ See, e.g., *State Cases*, STATE POWER PROJECT, <http://statepowerproject.org/states/> [<https://perma.cc/YZ2M-BCKJ>] (Delaware, Missouri, and Massachusetts revised RPSs in response to legal challenges).

⁸⁸ *Energy & Env't Legal Inst. v. Epel*, 793 F.3d 1169, 1173 (10th Cir. 2015) (The court found that these three "essential characteristics" were present in each of the three Supreme Court cases where the court used the extraterritoriality principle to strike down state law.).

⁸⁹ See *State Renewable Portfolio Standards Hold Steady or Expand in 2013 Session*, CTR. FOR NEW ENERGY ECON. (2013), <http://www.aeltracker.org/graphics/uploads/2013-State-By-State-RPS-Analysis.pdf> [<https://perma.cc/ES69-4CGG>]; see also Malewitz, *supra* note 14.

⁹⁰ See, e.g., W. VA. CODE R. § 24-2F-5 (West, Westlaw through 2016 Reg. Sess.) (In January 2015, West Virginia repealed the state's alternative and renewable energy portfolio standard, originally passed into law in 2009. H.B. 2001, 82d Leg., 1st Reg. Sess. (W.V. 2015)); see also OHIO REV. CODE ANN. § 4928.64 (West, Westlaw through 131st Gen. Assemb. (2015–2016)) (In Ohio, the state legislature also froze implementation of the state's standard in 2014. S.B. 310, 130th Gen. Assemb. Sess. (Ohio 2014)).

that such mandates can work in different geographic regions and in both competitive and rate-regulated markets. Through the use of RECs, they have also pioneered an interstate market-based system of compliance. Taken as a whole, state renewable mandates are driving increases in renewable energy that are displacing fossil-fuel fired generation and reducing GHG emissions. They have survived political and legal challenges and have been popular with the public across regions and both “red” and “blue” states.

State Efficiency Policies that Reduce Electricity Demand

States have also widely implemented energy efficiency programs that reduce energy use. Such programs are often referred to as “demand-side” programs because they reduce demand for energy rather than promoting cleaner energy supply by the generators. As with renewable energy programs, states have widely implemented energy efficiency programs, demonstrating that such programs can successfully be integrated into electricity planning, cut carbon emissions from electricity generation, lower electricity bills for customers, and create jobs in local communities.

Twenty-three states have EERSs, which set mandatory targets for the amount of electricity demand that can be met by demand-side energy efficiency measures.⁹¹ Two additional states have voluntary targets, while two states allow energy efficiency as a means of complying with an RPS.⁹² EERS programs are often combined with other policies that promote energy efficiency, such as financial incentives to utilities for meeting targets or other mechanisms that decouple increased energy sales from profits.⁹³

These policies can yield high levels of annual electricity savings. In 2012, eleven states had incremental annual savings greater than one percent of retail sales, and three had achieved savings rates of at least 1.5%.⁹⁴ In the same year, states with EERS policies accounted for eighty-five percent of energy savings in the United States, indicating that state policies are significant drivers of energy savings.⁹⁵

⁹¹ See U.S. ENVTL. PROT. AGENCY, *supra* note 65, at 4-3.

⁹² *Id.*

⁹³ See Annie Downs and Celia Cui, *Energy Efficiency Resource Standards: A New Progress Report on State Experience*, AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON. 18-20 (2014), <http://aceee.org/sites/default/files/publications/researchreports/u1403.pdf> [<https://perma.cc/H4TN-KA6P>].

⁹⁴ The eleven states are: Arizona, California, Connecticut, Iowa, Maine, Michigan, Minnesota, Oregon, Pennsylvania, Vermont, and Wisconsin. Arizona, Maine, and Vermont achieved savings of over 1.5%. See U.S. ENVTL. PROT. AGENCY, TECHNICAL SUPPORT DOCUMENT (TSD) FOR CARBON POLLUTION GUIDELINES FOR EXISTING POWER PLANTS: GHG ABATEMENT MEASURES 5-33 (2014), <http://www.epa.gov/sites/production/files/2014-06/documents/20140602tsd-ghg-abatement-measures.pdf> [<https://perma.cc/N24C-3JGG>].

⁹⁵ See Annie Downs and Celia Cui, *supra* note 93, at iv-v. (These aggregate numbers are based on a group of twenty-six states, which includes the two states (North Carolina and Nevada) that count efficiency for purpose of their RPS targets); see also *id.* at 4-6 (discussion of how definitions of EERS differ).

As with RPSs, the state efficiency programs are generally performing well. In 2012, states actually exceeded their targets, saving a total of 20,000 gigawatt hours of electricity, more than their total target of 18,000 gigawatt hours.⁹⁶ In New England, the independent system operator forecasts that combined state programs will effectively flatten projected demand growth through 2022.⁹⁷

These policies not only reduce electricity demand and cut carbon emissions, they also reduce electricity bills and create local jobs. For example, Maryland's efficiency program, EmPOWER Maryland, has funded measures that will reduce ratepayer electricity use by more than two million megawatt hours (MWh) per year and save \$250 million annually. The projected savings for ratepayers add up to \$3.7 billion.⁹⁸ The Efficiency Vermont program reports electricity bill savings of \$2.30 for every dollar spent on efficiency programs.⁹⁹ An independent study of the RGGI program found that the investment in energy efficiency by participating states was the main driver for the creation of 16,000 jobs in the program's first three years of operation.¹⁰⁰

Building on their early successes, several states have increased the ambition of their programs in recent years, as described below.

State Carbon Pollution Reduction Policies

A number of states have gone beyond policies that promote renewable energy and energy efficiency, and have implemented policies that explicitly seek to reduce GHG pollution from the power sector. Four states have implemented performance standards for new power plants, and ten states have implemented cap-and-trade programs that set an aggregate limit on GHG emissions.

California, New York, Oregon, and Washington all have implemented state emission performance standards for new power plants.¹⁰¹ These standards require new power plants to meet a pounds of CO₂ per megawatt hour performance rate based on what a highly efficient combined-cycle natural

⁹⁶ *Id.*

⁹⁷ See *Final 2013 Energy-Efficiency Forecast 2016–2022*, ISO NEW ENGLAND, http://www.iso-ne.com/committees/comm_wkgrps/othr/enrgy_effncy_frctst/2013frctst/iso_ne_final_ee_forecast_2016_2022.pdf [https://perma.cc/X8F6-CLQZ].

⁹⁸ See Letter from Georgetown Climate Ctr., to Gina McCarthy, EPA Admin. (Dec. 1, 2014) http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/GCC-States_CPP_Support_and_Comments-Dec%202014.pdf [https://perma.cc/T2C2-XZ9R].

⁹⁹ U.S. ENVTL. PROT. AGENCY, *supra* note 65, at 4-4.

¹⁰⁰ Jobs are "job years," or one job sustained for one year. Paul J. Hibbard et al., *supra* note 12, at 47.

¹⁰¹ See CAL. PUB. UTIL. CODE §§ 8340-41 (2013) (West, Westlaw through Ch. 2 of 2016 Reg. Sess. and Ch. 1 of 2015–2016 2d Ex. Sess.); see also OR. S.B. 101 (2000); N.Y. COMP. CODES R. & REGS. tit. 6, § 251 (2013) (West, Westlaw through amendments included in the New York State Register, XXXVIII, Issue 9 dated March 2, 2016); WASH. REV. CODE § 80.80 (2013) (West, Westlaw through all laws from the 2015 Reg. and Special Sess. and Laws 2016, chs. 1 and 2, Wash. S.B. 6001 (2007)).

gas plant could achieve.¹⁰² Montana and Illinois also have implemented standards that require new coal-fired power plants to include at least partial carbon capture and sequestration technologies.¹⁰³ These standards were the first time in the United States that regulatory agencies had evaluated and set standards for electricity generating technology based on GHG emissions performance. The standards were implemented prior to recently-promulgated federal performance standards for new fossil-fuel fired power plants (along with the Clean Power Plan regulations for *existing* sources) and informed those standards, as discussed below.

Beginning in 2003, several northeast and mid-Atlantic states came together to develop and launch RGGI, a state-implemented CO₂ cap-and-trade program for the power sector.¹⁰⁴ Each state has independently established regulations that create allowances equal to the state's cap, require electricity generators to hold allowances equal to their CO₂ emissions, allow regulated entities to use allowances from other RGGI states for compliance, and distribute some or all of the state's allowances through a joint auction platform.¹⁰⁵ The initial MOU with seven states was signed in 2005,¹⁰⁶ the program's first auction took place in 2008, and compliance requirements began in 2009.¹⁰⁷ The program currently includes nine states.¹⁰⁸

Unlike previous cap-and-trade programs in the United States, such as the acid rain program that reduced sulfur dioxide emissions, or the European Union's emissions trading scheme, RGGI uses a significant portion of the proceeds from auctioning allowances for public benefit programs like weatherization and assistance with energy bills.¹⁰⁹ Those proceeds have totaled \$2.4 billion since the first auction in 2008,¹¹⁰ and reinvesting a significant portion of that money into the communities has created substantial

¹⁰² These laws generally apply to base load facilities. *See* sources and accompanying text, *supra* note 101; *see also* Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,510, 64,582 (Oct. 23, 2015) (to be codified at 40 C.F.R. pts. 60, 70, 71 and 98) (describing performance standards of California, Washington, Oregon, and New York).

¹⁰³ MONT. CODE ANN. § 69-8-421(g)(8) (2015) (West, Westlaw through the 2015 sess.); 220 ILL. COMP. STAT. 5/16-115 (2015) (West, Westlaw through P.A. 99-500 of the 2016 Reg. Sess.); *see also* Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,582 (describing standards of Montana and Illinois).

¹⁰⁴ REG'L GREENHOUSE GAS INITIATIVE (RGGI), <http://www.rggi.org/> [<https://perma.cc/AZ65-G7ZM>].

¹⁰⁵ *Program Design*, REG'L GREENHOUSE GAS INITIATIVE (RGGI), <http://www.rggi.org/design> [<https://perma.cc/AZ65-G7ZM>].

¹⁰⁶ *Memorandum of Understanding*, *supra* note 12.

¹⁰⁷ Paul J. Hibbard et al., *supra* note 12, at 10.

¹⁰⁸ The states are Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. REG'L GREENHOUSE GAS INITIATIVE (RGGI), *supra* note 104.

¹⁰⁹ *The Investment of RGGI Proceeds Through 2013*, REGIONAL GREENHOUSE GAS INITIATIVE (2015), <http://www.rggi.org/docs/ProceedsReport/Investment-RGGI-Proceeds-Through-2013.pdf> [<https://perma.cc/YAU4-8FZN>].

¹¹⁰ Press Release, Regional Greenhouse Gas Initiative, CO₂ Allowances Sold for \$7.50 in 30th RGGI Auction (Dec. 4, 2015), http://rggi.org/docs/Auctions/30/PR120415_Auction30.pdf [<https://perma.cc/4G5S-WUZK>].

environmental and economic benefits—especially because states faced budgetary pressures during the Great Recession.¹¹¹

Participating states use revenue from allowance auctions for energy efficiency and clean energy programs that benefit consumers and contribute to carbon pollution reductions.¹¹² An independent study found that the net benefit of RGGI in the participating states after three years was \$1.6 billion, in large part because of energy efficiency investments that reduced consumer electricity spending and increased economic activity.¹¹³ These investments in efficiency effectively reduced overall consumer electricity *bills* even as the program resulted in small increases in electricity *rates*, because consumers used less electricity overall.¹¹⁴

The nine states currently participating in RGGI have collectively reduced carbon pollution in the region by over forty percent between 2005 and 2012.¹¹⁵ After completing a program review in 2012, the states increased the ambition of the program by tightening the CO₂ emissions cap to seventy-eight million tons in 2020, a forty-five percent reduction from the previous cap level.¹¹⁶ The new emission limits, which began in 2014, recognized the fact that the region's emissions were well below the cap during the program review, reflecting both changes in electricity markets and the effects of the program itself.¹¹⁷ State agency leaders cited the success of the program in reducing emissions, in providing incentives for a shift to cleaner power, and in providing funding for clean energy initiatives—all with minimal costs to ratepayers—as reasons for significantly tightening the program cap.¹¹⁸

California has also implemented an economy-wide cap-and-trade program that includes the power sector under the authority of its comprehensive climate change statute, A.B. 32.¹¹⁹ The California program's compliance requirement began in 2013, and in 2015 the program expanded to include

¹¹¹ See Paul J. Hibbard et al., *supra* note 12; see also Paul J. Hibbard et al., *The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States: Review of RGGI's Second Three-Year Compliance Period (2012-2014)*, ANALYSIS GRP. (2015), http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf [https://perma.cc/4ER4-BJX7].

¹¹² THE INVESTMENT OF RGGI PROCEEDS, *supra* note 109.

¹¹³ See Paul J. Hibbard et al., *supra* note 12, at 2–5.

¹¹⁴ See Paul J. Hibbard et al., *Economic Impacts*, *supra* note 111.

¹¹⁵ Letter from RGGI States, to Gina McCarthy, EPA Admin. (Nov. 5, 2014), http://www.rggi.org/docs/PressReleases/PR110714_CPP_Joint_Comments.pdf [https://perma.cc/NDG2-XXPS].

¹¹⁶ Press Release, Regional Greenhouse Gas Initiative, RGGI States Propose Lowering Regional CO₂ Emissions Cap 45%, Implementing a More Flexible Cost-Control Mechanism (Feb. 7, 2013), http://www.rggi.org/docs/PressReleases/PR130207_ModelRule.pdf [https://perma.cc/R2QQ-3LZ6].

¹¹⁷ See N.Y. STATE ENERGY RESEARCH AND DEV. AUTH., RELATIVE EFFECTS OF VARIOUS FACTORS ON RGGI ELECTRICITY SECTOR CO₂ EMISSIONS: 2009 COMPARED TO 2005, REG'L GREENHOUSE GAS INITIATIVE (2010), http://www.rggi.org/docs/Retrospective_Analysis_Draft_White_Paper.pdf [https://perma.cc/22QS-WB5P].

¹¹⁸ Press Release, *supra* note 116.

¹¹⁹ CAL. HEALTH & SAFETY CODE § 38570 (West, Westlaw through Ch. 2 of 2016 Reg. Sess. and Ch. 1 of 2015–2016 2d Ex. Sess.).

transportation fuels as planned.¹²⁰ The program cap required two percent annual reductions in 2013 and 2014, and requires approximately a three percent annual reduction from 2015 to 2020.¹²¹ Under California's program (due in part to legal constraints on a full auction), most allowances were distributed for free to electricity distributors, industrial facilities, and natural gas utilities in early years, but an increasing portion will be auctioned as the program continues.¹²²

In the first year of the program, actual capped emissions declined four percent while California's economy experienced a two percent increase in gross state product and job growth outpaced the national average.¹²³ In 2014, California linked its cap-and-trade program with the Canadian province of Quebec through the Western Climate Initiative.¹²⁴ The provinces of Ontario and Manitoba have also recently announced their intentions to link with California's program over time.¹²⁵

California has also been innovative in its investment of significant auction revenue to support transit, energy efficiency and solar energy for low income households, and its statutory requirement that twenty-five percent of auction proceeds be used to benefit disadvantaged communities.¹²⁶

Both RGGI and California's program have survived legal challenges, although challenges are still pending in California. In several different instances, challengers argued that the states had exceeded their authority in implementing programs. For example, challengers in both New York and California argued that the respective cap-and-trade programs exceeded legislative authority or violated state administrative requirements. Both those challenges were unsuccessful, although an appeal is still pending in California.¹²⁷ In California, however, environmental justice petitioners succeeded

¹²⁰ CAL. CODE REGS. tit. 17, §§ 95811, 95840, 95851-52 (2015) (specifying that distributors of various transportation fuels become subject to the regulation in the second compliance period).

¹²¹ *Overview of ARB Emissions Trading Program*, CAL. AIR RES. BD. (2015), http://www.arb.ca.gov/cc/capandtrade/guidance/cap_trade_overview.pdf [<https://perma.cc/J92V-2HBN>].

¹²² *Id.*

¹²³ KATHERINE HSIA-KIUNG & ERICA MOREHOUSE, CARBON MARKET CALIFORNIA: A COMPREHENSIVE ANALYSIS OF THE GOLDEN STATE'S CAP-AND-TRADE PROGRAM, YEAR TWO 4 (2015), http://www.edf.org/sites/default/files/content/carbon-market-california-year_two.pdf [<https://perma.cc/GFT6-2ZAB>].

¹²⁴ WESTERN CLIMATE INITIATIVE, INC., <http://www.wci-inc.org/> [<https://perma.cc/TX9M-554U>] (The first joint auction was held in November 2014.). See also *Cap and Trade Program Auction and Reserve Sale Information*, CAL. AIR RES. BD. (Dec. 11, 2015), <http://www.arb.ca.gov/cc/capandtrade/auction/auction.htm> [<https://perma.cc/ZL5L-YBX9>].

¹²⁵ *Memorandum of Understanding Between the Governments of Ontario, Québec, and Manitoba Concerning Concerted Climate Change Actions and Market-Based Mechanisms*, ONT. NEWSROOM (Dec. 7, 2015), <https://news.ontario.ca/opo/en/2015/12/memorandum-of-understanding-between-the-government-of-ontario-the-government-of-quebec-and-the-gover.html> [<https://perma.cc/PA69-MPHB>].

¹²⁶ KATHERINE HSIA-KIUNG & ERICA MOREHOUSE, *supra* note 123, at 18.

¹²⁷ The New York Supreme Court, Appellate Division held that each of the challenges was either time-barred or moot. See *Thrun v. Cuomo*, 112 A.D.3d 1038, 1040–41 (2013). The Sacramento Superior Court of California found in two related cases that the cap-and-trade program was lawful under A.B. 32 and that it was not an illegal tax. See *Morning Star Packing Co. v. Cal. Air Res. Bd.*, No. 34-2013-80001464, 2013 Cal. Super. LEXIS 169, at *6 (Cal.

prior to the program start in arguing that the California Air Resources Board (CARB) had failed to follow all procedural requirements. CARB responded by adopting revised regulations.¹²⁸

Both programs have worked to avoid economic harm to low-income residents by investing in weatherization and low-income energy assistance programs (RGGI) and transit and job training (CA).¹²⁹

RGGI and California have demonstrated that cap-and-trade programs for GHGs can operate successfully in the United States—just as similar programs have for reducing conventional pollution. Both RGGI and California reduced emissions and integrated smoothly with the operations of regional electricity markets, including with various Independent System Operators (ISOs). They both established successful carbon markets, with RGGI holding thirty auctions¹³⁰ and California holding five auctions, generating billions of dollars to reinvest to help achieve program goals.¹³¹

Other states have implemented their own tailored programs to drive changes in the electricity sector. These include Colorado's Clean Air Clean Jobs Act, which requires Colorado's utilities to develop plans that dramatically cut both conventional and carbon pollution from the power sector.¹³²

Programs such as those detailed above not only provided important models of successful clean energy strategies for other states and stimulated in-state investments in alternatives, but served as an important foundation for federal action as described below.

State Policies Served as a Foundation for the Federal Clean Power Plan and New Source Standards

The widespread adoption by states of RPSs and EERSs, along with the pioneering adoption of GHG cap-and-trade programs for the power sector,

Super. Ct. Dec. 20, 2013) (joint ruling also applying to Cal. Chamber of Commerce v. Cal. Air Res. Bd., No. 34-2012-80001313, 2013 Cal. Super. LEXIS 1798 (Cal. Super. Ct. Nov. 12, 2013)). Appeals in both cases are currently pending in a consolidated docket. Cal. Chamber of Commerce v. Air Res. Bd., No. C075930 (Cal. 3d Dist. Ct. App.).

¹²⁸ In May 2011 the San Francisco County Superior Court of California enjoined the cap-and-trade program, requiring the CARB to more thoroughly explore alternatives to cap-and-trade in order to meet procedural requirements under the California Environmental Quality Act. Ass'n of Irrigated Residents v. Cal. Air Res. Bd., No. CPF-09-509562, 2011 Cal. Super. LEXIS 1782, at *3–4 (Cal. Super. Ct. May 20, 2011). CARB subsequently issued a revised analysis of alternatives and adopted a revised scoping plan to move forward with the cap-and-trade program. This satisfied both the Superior Court, which lifted the injunction, and a higher court hearing an appeal in the case. Ass'n of Irrigated Residents v. State Air Res. Bd., 206 Cal. App. 4th 1487, 1489 (Cal. Ct. App. 2012).

¹²⁹ INVESTMENT OF RGGI PROCEEDS, *supra* note 109, at 23; KATHERINE HSIA-KIUNG & ERICA MOREHOUSE, *supra* note 123.

¹³⁰ *CO₂ Allowances*, *supra* note 110.

¹³¹ *Auction and Reserve Sale Information*, CAL. AIR RES. BD., <http://www.arb.ca.gov/cc/capandtrade/auction/auction.htm#novauction> [<https://perma.cc/894Q-5T8S>].

¹³² See Press Release, Gov. Ritter, Bipartisan Lawmakers & Coalition Introduce Colorado Clean Air-Clean Jobs Legislation (Mar. 16, 2010), <https://votesmart.org/public-statement/491906/gov-ritter-bipartisan-lawmakers-coalition-introduce-colorado-clean-air-clean-jobs-legislation/> [<https://perma.cc/J7QJ-EEAU>].

served major roles in the development of the federal Clean Power Plan and federal performance standards for new power plants. State RPSs and EERSs have shown that renewable energy and energy efficiency are effective carbon cutting strategies that are already being deployed cost-effectively at scale and can function well in the United States electricity system. RGGI and the California cap-and-trade program served as models for one potential flexible compliance pathway under the Clean Power Plan. State new source performance standards for power plants were relied on as examples in setting similar federal standards. Taken together, these state policies formed technical, legal, and policy foundations for EPA's Clean Power Plan and performance standards for new sources.

In August 2015, EPA promulgated the final Clean Power Plan rule, which established emission guidelines for existing power plants under Section 111(d) of the Clean Air Act.¹³³ This is the single most significant federal action for reducing GHGs to date. It is projected to achieve a thirty-two percent reduction in CO₂ emissions from the power sector in 2030 from 2005 levels.¹³⁴

As of this writing, litigation over the Clean Power Plan and the federal new source performance standards is pending in the D.C. Circuit Court of Appeals. Such litigation is quite common for major environmental legislation.¹³⁵ However, in an unprecedented decision, on February 9, 2016, the Supreme Court issued a stay of the Clean Power Plan, supported by five justices, after the D.C. Circuit had denied a motion to stay.¹³⁶ Some have questioned whether the Supreme Court had jurisdiction to step in and essentially order a halt to EPA action until it decides either to deny cert in an appeal or to render a final decision on the merits at some point in the future.¹³⁷ Given the timing, this action will likely occur during the next Presidential Administration. The federal government and state intervenors have said that they are confident of success on the merits despite the Supreme Court's unusual action.¹³⁸ The death of Justice Antonin Scalia—who voted to stay the rule and died just four days after the stay was issued—will also

¹³³ Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,622 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60).

¹³⁴ *Id.* at 64,679.

¹³⁵ See generally *Petition for Review, West Virginia v. EPA*, No. 15-01363 (D.C. Cir. 2016).

¹³⁶ Order in Pending Case issued by Supreme Court, *West Virginia v. EPA*, Order No. 15A773 (Feb. 9, 2016) (five separate but identical orders were issued in response to five separate applications to stay). The Supreme Court had never before stayed an administrative regulation before it received a full review on the merits in a lower court.

¹³⁷ Lisa Heinzerling, *The Supreme Court's Clean-Power Power Grab*, 28 *GEORGETOWN ENVTL. L. REV.* (forthcoming 2016).

¹³⁸ Press Release, Joint Statement by A.G. Schneiderman, States, Cities and Counties in Response to Temporary Stay of Clean Power Plan (Feb. 10, 2016), <http://www.ag.ny.gov/press-release/joint-statement-ag-schneiderman-states-cities-and-counties-response-temporary-stay> [https://perma.cc/9Z4F-DGXS].

factor into the ultimate resolution of these cases, making it more likely that the rule will survive in some form, according to most analysts.¹³⁹

Like much of the Clean Air Act, Section 111(d) functions through a cooperative federalism framework. The EPA issues “emission guidelines” that identify a level of emission reduction achievable for a category of stationary sources based on the “best system of emission reduction” (BSER).¹⁴⁰ States must then submit plans that establish performance standards on affected sources in the category.¹⁴¹ The standards established in the state plan must meet the minimum levels of emission reduction required, similar to the process used in meeting National Ambient Air Quality Standards.¹⁴²

In the final Clean Power Plan emission guidelines, EPA designated a BSER based on three building blocks that together reflect the way in which carbon pollution reductions from fossil-fuel fired power plants are already being achieved on the grid. The three building blocks are: 1) improvements in the efficiency of coal-fired generation units, 2) reductions in coal-fired generation due to shifts in generation to existing, more-efficient combined cycle natural gas units, and 3) reduction in generation of existing fossil-fuel fired generating units due to shifts to new renewable energy generation.¹⁴³

State policies and the on-the-ground effects of those policies played significant roles in demonstrating that substantial shifts away from existing coal-fired generation to renewable energy and existing natural gas generation were adequately demonstrated and cost-effective. In fact, EPA explicitly pointed to state RPSs as primary evidence that the building block three strategy of expanding renewable energy is a “well-established practice.”¹⁴⁴ Similarly, in describing support for incorporating shifts to less polluting fossil-fuel fired power plants as part of BSER, EPA relied upon RGGI as an example of how state market-based pollution policies can drive shifts in electricity dispatch to lower-polluting resources.¹⁴⁵ Joint comments from state officials in fourteen states, including those participating in RGGI as well as in Cali-

¹³⁹ See, e.g., Robinson Meyer, *Will a Reconfigured Supreme Court Help Obama's Clean-Power Plan Survive?*, ATLANTIC (Feb. 14, 2016), <http://www.theatlantic.com/politics/archive/2016/02/antonin-scalia-clean-power-plan-obama-climate-change/462807/> [<https://perma.cc/PN5G-H7VT>]; Anthony Adragna, *Observers: Without Scalia, Clean Power Plan's Odds Boosted*, BLOOMBERG BNA (Feb. 17, 2016), <http://www.bna.com/observers-without-scalia-n57982067390/> [<https://perma.cc/LG2R-5UTL>].

¹⁴⁰ Clean Air Act § 111(d), 42 U.S.C. § 7411(d) (2012); Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,622, 64,707, 64,717–23 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60).

¹⁴¹ 42 U.S.C. § 7411(d); Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,707.

¹⁴² Section 111(d) explicitly requires EPA to develop a “procedure similar” to Clean Air Act Section 110. 42 U.S.C. § 7411(d). See also Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,664.

¹⁴³ Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,667.

¹⁴⁴ “States are already pursuing policies that encourage production of greater amounts of RE, such as the establishment of targets for procurement of renewable generating capacity.” *Id.* at 64,747.

¹⁴⁵ *Id.* at 64,796.

ifornia, noted how their state programs had achieved carbon pollution reductions through all three strategies, demonstrating the viability of the three building blocks. The comments also documented how the states had found these strategies to be cost-effective in reducing carbon emissions and to operate well within the broader electricity system.¹⁴⁶

State policies thus served as an important legal foundation for EPA's determination of the "best system of emission reduction," which is based in part on factors required by statute, including that BSE be "adequately demonstrated" and that the EPA Administrator take into account cost, the amount of emission reductions achievable, and other "energy requirements" in determining the "best system."¹⁴⁷

At the same time that EPA released its final Clean Power Plan, EPA also finalized GHG performance standards for new sources under its authority in Clean Air Act Section 111(b).¹⁴⁸ Similarly, EPA cited state GHG new source performance standards as key "demonstrations" of the feasibility of the federal regulation.

State policies also served as models for the compliance options that EPA has outlined in the Clean Power Plan emission guidelines and proposed as model rules. In the final Clean Power Plan rule, EPA expressed its emission guidelines as nationally uniform rate-based standards for two subcategories of power plants—fossil steam units and combined cycle-natural gas units. In addition, EPA provided states the option of implementing the standards as a statewide aggregate emission rate or as a mass-based emission budget.¹⁴⁹ EPA outlined at least six different types of compliance pathways that states could pursue¹⁵⁰ and has proposed two model rules, one that establishes rate-based performance standards and another that establishes mass-

¹⁴⁶ Letter from Georgetown Climate Ctr., *supra* note 98, at 15–19.

¹⁴⁷ The Clean Air Act's Section 111 defines a "standard of performance" in part as "a standard for emissions of air pollutants which reflects the degree of emission limitation achievable through the application of the best system of emission reduction which (taking into account the cost of achieving such reduction and any nonair quality health and environmental impact and energy requirements) the Administrator determines has been adequately demonstrated." 42 U.S.C. § 7411(a)(1). In *Sierra Club v. Costle*, the D.C. Circuit held that the statutory definition of "best system" required consideration of the amount of emission reduction achievable. 657 F.2d 298, 331 (D.C. Cir. 1981) ("[W]e can think of no sensible interpretation of the statutory words 'best . . . system' which would not incorporate the amount of air pollution as a relevant factor to be weighed when determining the optimal standard for controlling . . . emissions."). See also Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,721.

¹⁴⁸ 42 U.S.C. § 7411(b); Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,510 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60).

¹⁴⁹ Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,664.

¹⁵⁰ EPA published a visual "State Plan Decision Tree" that shows six primary types of compliance pathways. ENVTL. PROT. AGENCY, STATE PLAN DECISION TREE (2015), http://www.epa.gov/sites/production/files/2015-08/documents/flow_chart_v6_aug5.pdf [https://perma.cc/MZ9A-TJUF]. In the final emission guidelines, EPA discusses four streamlined plan pathways and a "range of additional custom plan approaches." Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,832–33.

based emission budget standards.¹⁵¹ EPA proposes to finalize one or both of these options as the federal plan that would be implemented if a state fails to submit an adequate plan.¹⁵² Both the rate-based and mass-based compliance options build on policy mechanisms developed through state programs, and allow states to build on those programs.

For example, the rate-based compliance options allow regulated entities to comply by either improving their carbon intensity or by using “emission rate credits” (ERC) generated through new renewable energy or energy efficiency projects, as well as certain other resources.¹⁵³ The ERC guidelines established by EPA, as well as the regulations in the proposed model rule, build on and seek to complement existing REC markets developed as a result of state RPS policies.¹⁵⁴ EPA specifically pointed to the “well-established” REC markets as evidence that the ERC framework would likely generate functioning markets.¹⁵⁵

EPA similarly offers states a mass-based compliance pathway, where states can comply with federal requirements by establishing an emission budget program where regulated entities comply by submitting emission allowances for each ton of carbon dioxide emitted. Many states and power companies requested a mass-based compliance program as an option, citing the successful experience of RGGI and California.¹⁵⁶ EPA cited the states’ programs in explaining why it offered the mass-based compliance options.¹⁵⁷

¹⁵¹ Federal Plan Requirements for Greenhouse Gas Emissions From Electric Utility Generating Units Constructed on or Before January 8, 2014; Model Trading Rules; Amendments to Framework Regulations, 80 Fed. Reg. 64,966 (proposed Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60).

¹⁵² *Id.* at 64,968.

¹⁵³ Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,834, 64,894–903.

¹⁵⁴ *Id.* at 64,735, 64,908 (supporting trading as an element of BSER based on the fact that “many states have adopted RE standards that promote RE through the trading of renewable energy certificates (RECs)” and recognizing that “ERC may be issued based on the same data and verification requirements used by existing REC . . . tracking systems”); Proposed Clean Power Plan, 79 Fed. Reg. 34,830, 34,922 (proposed June 18, 2014) (to be codified at 40 C.F.R. pt. 60) (noting that proposed approach to RE crediting mirrors the way that RECs “allow for interstate trading of RE attributes and the fact that a given state’s RPS requirements often allow for the use of qualifying RE located in another state to be used to comply with that state’s RPS”).

¹⁵⁵ Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,747 (“[M]arkets are likely to develop for ERCs that would facilitate investment in increased RE generation as a means of helping sources comply with their standards of performance; indeed, markets for RECs, which similarly facilitate investment in RE for other purposes, are already well-established.”).

¹⁵⁶ *See, e.g.*, Letter from Representatives of Fifteen States Providing Input on the Development of the Clean Power Plan, to Gina McCarthy, EPA Admin., 22 (Dec. 16, 2013) http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/EPA_Submission_from_States-FinalCompl.pdf [<https://perma.cc/6P4C-K866>] (calling on EPA to provide mass-based emission budget compliance option).

¹⁵⁷ Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,887 (noting emission budget compliance option designed in part to allow California and RGGI to use their programs for compliance). In the proposed rule, EPA explicitly noted that its proposal builds on state programs including RGGI and California cap-and-trade programs. Proposed Clean Power Plan, 79 Fed. Reg. at 34,848, 34,897.

Finally, EPA also offered a “state measures” approach for compliance, which allows states to rely on a broad range of state programs to achieve emission reductions from the affected power plants—even if those programs do not set legally binding emission limits consistent with the EPA guidelines—as long as the state plan includes a federally enforceable backstop.¹⁵⁸ This model was developed to allow states to build on existing programs or to use other state-developed compliance pathways. California has proposed using this model to accommodate its unique, economy-wide program.¹⁵⁹

Although energy efficiency is not a building block in the final rule, states may use demand-side energy efficiency for compliance—reflecting state requests to include efficiency as a way of meeting emissions targets. EPA contemplates that efficiency will be a preferred mechanism for compliance because of its multiple benefits and cost-effectiveness.¹⁶⁰ Again, state demand-side energy efficiency policies, including EERS policies, serve as models and precedents for EPA proposals for allowing states to incorporate efficiency into compliance mechanisms, for example, through awarding emission rate credits.¹⁶¹

Many states have joined litigation over the Clean Power Plan as either petitioners challenging the rule or as intervenors supporting EPA, reflecting the sharp political divide over climate change in this country.¹⁶² The vast majority of states challenging the rule, however, were developing state compliance plans prior to the stay, and many power companies are urging states to do so.¹⁶³ Even with the stay in place, many states continue to plan for compliance.¹⁶⁴ The experience of states with renewable, efficiency, and carbon reduction policies are informing these conversations about how states should design their plans to comply with the Clean Power Plan—and ulti-

¹⁵⁸ Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,835.

¹⁵⁹ See CAL. AIR RES. BD., CLEAN POWER PLAN COMPLIANCE DISCUSSION PAPER (2015) <http://www.arb.ca.gov/cc/powerplants/meetings/2015whitepaper.pdf> [<https://perma.cc/4JV2-2A6Q>].

¹⁶⁰ See Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. at 64,666 (“Each state will have the opportunity to take advantage of a wide variety of strategies for reducing CO₂ emissions from affected EGUs, including demand-side EE programs and mass-based trading, which some suggested in their comments.”).

¹⁶¹ See *id.* at 64,695 (noting that twenty-five states had implemented EERSs or efficiency goals and that budgets for efficiency are growing rapidly). See also Proposed Clean Power Plan, 79 Fed. Reg. at 34,835, 34,849–50, 34,872 (noting that proposed BSER that included demand-side efficiency based in part on actions states were already taking, including efficiency policies, and identifying some EERSs as best practices).

¹⁶² See Petition for Review, *West Virginia v. EPA*, No. 15-01363 (D.C. Cir. 2016).

¹⁶³ Joby Warrick, *States Sue to Block EPA’s Pollution Rule—Even as Some Try to Comply*, WASH. POST (Oct. 23, 2015), https://www.washingtonpost.com/national/health-science/states-sue-to-block-epas-pollution-rules—even-as-some-try-to-comply/2015/10/23/1002a1de-79c6-11e5-b9c1-f03c48c96ac2_story.html [<https://perma.cc/TEE5-F9KY>].

¹⁶⁴ Elizabeth Holden et al., *Court Stay May Slow, Not Stop, State Carbon-Cutting Talks*, CLIMATE WIRE (Feb. 12, 2016), <http://www.eenews.net/stories/1060032320> [<https://perma.cc/L5WP-SEQZ>].

mately informing design and implementation of a federal policy that builds on state innovation.

State Policies and Deep Decarbonization in the Power Sector

The Clean Power Plan is a very significant step in the effort to cut greenhouse gas emissions. But further actions will be required to meet the United States' goal of reducing emissions by twenty-six to twenty-eight percent below 2005 levels by 2025 as set forth in the United States Intended Nationally Determined Contribution (INDC) submitted in the international climate negotiations.¹⁶⁵ Even greater efforts will be needed to reach the Paris Agreement's goal of "holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels."¹⁶⁶

Some of those actions to achieve steeper reductions are already taking place in a number of states. In the past two years, several states have set very ambitious medium- and long-term renewable energy goals. For example, Michigan established a goal of meeting 30–40% of the state's 2025 energy needs with renewable sources and energy waste reduction.¹⁶⁷ New York and California both are moving forward with regulations that would establish RPS targets of 50% by 2030.¹⁶⁸ Vermont has set a 75% renewable energy standard for 2032.¹⁶⁹ Hawaii established a 100% RPS target for 2045, making Hawaii the first state to set a 100% RPS target.¹⁷⁰

California and New York have also set ambitious new energy efficiency goals that will bring dramatic energy savings. California's Clean Energy and Pollution Act (S.B. 350) requires the state to double the energy efficiency of

¹⁶⁵ U.S. Cover Note, INDC, and Accompanying Information, U.S. DEP'T OF STATE (2015), <http://www4.unfccc.int/submissions/INDC/Published%20Documents/United%20States%20of%20America/1/U.S.%20Cover%20Note%20INDC%20and%20Accompanying%20Information.pdf> [https://perma.cc/LR8N-EKWA].

¹⁶⁶ The Paris Agreement, art. 2, *opened for signature*, Apr. 22, 2016, <https://unfccc.int/resource/docs/2015/cop21/eng/109r01.pdf> [https://perma.cc/5GZF-F4VY]. The agreement also states that to achieve these levels, parties will aim as to achieve a "balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century." *Id.* at art. 4.

¹⁶⁷ Rick Snyder, Gov. of Mich., *Ensuring Affordable, Reliable, and Environmentally Protective Energy for Michigan's Future* (Mar. 13, 2015), http://www.michigan.gov/documents/150313_Energy_Message_FINAL_484033_7.pdf [https://perma.cc/4RXG-NVFR].

¹⁶⁸ Letter from Andrew M. Cuomo, Gov of N.Y., to Audrey Zibelman, CEO of N.Y. Dep't of Pub. Serv. (Dec. 2, 2015) https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/Renewable_Energy_Letter.pdf [https://perma.cc/8BGY-CYHR]; see A.B. 693, 2015–2016 Sess. (Cal. 2015) (to be codified at CAL. PUB. UTIL. CODE §§ 748.5, 2870 (West, Westlaw through Ch. 1 of 2016 Reg. Sess. and Ch. 1 of 2015–2016 2d Ex. Sess.)).

¹⁶⁹ VT. STAT. ANN. tit. 30, § 8005 (West, Westlaw through the 1st Sess. of the 2015–2016 Vt. Gen. Assemb. (2015)).

¹⁷⁰ HAW. REV. STAT. § 269–92 (West, Westlaw through Act 243 [End] of the 2015 Reg. Sess.).

buildings by 2030.¹⁷¹ New York set a goal of reducing energy consumption from buildings twenty-three percent by 2030 from 2012 levels.¹⁷²

Other steps for reaching the goals in the U.S. INDC and the Paris Agreement are greatly improving the electricity sector's ability to store electricity through improved battery technologies, thus making it possible to deploy more renewable energy on the electricity grid, and changing the fundamental business models for utilities.

In both of these areas, states are moving ahead with innovative policies. In 2013 the California Public Utility Commission (PUC) mandated that utilities add 1.3 gigawatts of energy storage capacity by 2020 in the state, following a 2010 law authorizing such a mandate.¹⁷³ In June 2015, the Oregon Legislative Assembly passed a similar law requiring major power providers to deploy at least five megawatt hours of storage by 2020 through a PUC-governed procurement process.¹⁷⁴

The combination of new technologies and carbon reduction strategies will dramatically change both the way the electricity system operates and the business model of utilities. These changes will include rapid increases in distributed renewable energy, greater energy efficiency efforts, increased use of demand side management, and expanded use of microgrids and other smart grid technologies that can provide additional resilience and reliability in the face of increasing extreme weather events. The energy system of the future will place a greater emphasis on reducing electricity demand and on decentralizing electricity generation. This will provide more flexibility and autonomy for consumers as well as a cleaner electricity sector.

Several states have begun to create new regulatory frameworks to speed this transition to a cleaner, more efficient electricity system. For example, New York has launched its "Reforming the Energy Vision" initiative, which is designed to "enable and facilitate new energy business models for utilities, energy service companies, and customers" and to help meet the state's energy policy goals by promoting distributed energy, fuel diversity, efficiency, and resilience.¹⁷⁵ Massachusetts and Minnesota have begun similar processes.¹⁷⁶

¹⁷¹ S.B. 350, 2015–2016 Sess. (Cal. 2015) (to be codified at CAL. PUB. RES. CODE § 25310 (West, Westlaw through Ch. 1 of 2016 Reg. Sess. and Ch. 1 of 2015–2016 2d Ex. Sess.)).

¹⁷² *Id.*

¹⁷³ CAL. PUB. UTIL. COMM'N, R.10-12-007, DECISION ADOPTING ENERGY STORAGE PROCUREMENT FRAMEWORK AND DESIGN PROGRAM (Oct. 17, 2013), <http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M078/K929/78929853.pdf> [<https://perma.cc/PB2N-TRDW>]; CAL. PUB. UTIL. CODE §§ 2835-3829 (West, Westlaw through Ch. 1 of 2016 Reg. Sess. and Ch. 1 of 2015–2016 2d Ex. Sess.).

¹⁷⁴ H.B. 2193, 78th Leg. Assemb., Reg. Sess. (Or. 2015).

¹⁷⁵ N.Y. STATE DEP'T OF PUB. SERV., CASE 14-M-0101, REFORMING THE ENERGY VISION, STAFF REPORT AND PROPOSAL (2014), <http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B5A9BDBBD-1EB7-43BE-B751-0C1DAB53F2AA%7D> [<https://perma.cc/LM78-P7UM>].

¹⁷⁶ MASS. DEP'T OF PUB. UTIL., D.P.U. 12-76B, INVESTIGATION BY THE DEPARTMENT OF PUBLIC UTILITIES ON ITS OWN MOTION INTO MODERNIZATION OF THE ELECTRIC GRID (2012), <http://www.mass.gov/eea/docs/dpu/orders/dpu-12-76-b-order-6-12-2014.pdf> [<https://perma.cc/>]

FOSTERING EMISSION REDUCTIONS ACROSS SECTORS

Reducing emissions significantly from all major sectors—transportation and electric power as discussed above, as well as buildings, industrial fuels and processes, agriculture, forestry and land use—is critical to protecting the planet from possibly catastrophic climate change. But it’s important to realize that emissions from many of these sectors are inextricably linked. Many state efforts build on the opportunities that result from these connections. Perhaps the greatest opportunity for deep reductions in carbon emissions in both the transportation and building sectors is through electrification—switching from internal combustion vehicles to electric cars, trucks, and buses, and from oil or gas heating and cooling to electric HVAC systems. Electrification can actually cut overall energy use, since using electricity is almost always more efficient than directly burning fossil fuels.¹⁷⁷ But achieving the reductions that are possible through the electrification of buildings and transportation obviously requires an accompanying rapid transformation of the power sector to make it cleaner and more efficient. That’s why it is crucial that states—and national governments—continue to move ahead with policies that operate across multiple sectors and fuels.

Once again, states are leading the way in facilitating shifts from using petroleum to electric vehicles. They are making it easier and more affordable to drive electric vehicles by providing access to electric charging infrastructure, offering incentives for the purchase of alternative vehicles or for their use (such as priority lanes on highways for clean vehicles), and eliminating regulatory barriers that have stood in the way of developing robust and visible electric vehicle charging networks. For example, many states are taking steps to clarify that providing electric vehicle charging infrastructure to the public does not automatically trigger status as an “electric utility” so that private businesses can offer workplace or customer charging without significant bureaucratic red tape, and to consider questions that greater EV charging raises.¹⁷⁸ Here, the federal government has also played a role by supporting development of tools and guidance documents as well as providing financial support to promote the use of alternative vehicles in some cities, states, and regions.

Another technological innovation is the development of “smart grids” which allow for innovations in electricity delivery including variable pricing and the delivery of renewable energy from homes back into the electric grid. Microgrids and “smart metering” programs encourage the use of solar and

5N6W-AGWK]; MINN. PUB. UTIL. COMM’N, E999/CI-15-556, NOTICE OF GRID MODERNIZATION STAKEHOLDER MEETING AND REQUEST FOR STAKEHOLDER PERSPECTIVES (2015), <https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B0C75C45C-EB8E-42DC-9F7F-1C3DB5B0E468%7D&documentTitle=20158-113573-01> [<https://perma.cc/CT5S-KZSR>].

¹⁷⁷ See CAL. COUNCIL ON SCI. & TECH., CALIFORNIA’S ENERGY FUTURE: THE VIEW TO 2050 (2011), <http://ccst.us/publications/2011/2011energy.pdf> [<https://perma.cc/8H99-6HYJ>].

¹⁷⁸ KATHRYN A. ZYLA, CHARGING AHEAD—OPTIONS FOR POLICYMAKERS REGARDING THE REGULATION OF ELECTRIC VEHICLE CHARGING MARKETS (2014).

other renewable sources that can also enhance resilience to climate disruption. When power goes out, smart grid technology can be used to reroute electricity to critical facilities (e.g., hospitals or nursing homes) that need it most. Such flexibility is especially important because our climate is already changing and extreme weather events are on the rise, and states are beginning to explore ways in which the regulation of the electricity system will have to change to enable these new technologies.¹⁷⁹ In spite of impressive efforts by a number of states to transform to lower-emission energy systems, communities around the United States and beyond already face a “new normal”—including more frequent intense storms and floods, heat waves, prolonged droughts, rising seas, and other impacts. Coping with this “new normal” is the focus of our next and final section—a look at innovative state actions aimed at adapting to climate change and at bolstering resilience in the face of the changes that lie ahead.

STATE LEADERSHIP IN ADAPTING TO CLIMATE CHANGE IMPACTS

In addition to reducing emissions to prevent catastrophic climate change, states are preparing for the inevitable impacts caused by GHGs already in the atmosphere.¹⁸⁰ The 2014 National Climate Assessment (NCA) profiles the observed changes across the United States, including longer summers, more extreme heat waves, warmer winters, heavier rains, increased coastal flooding, and an average foot of sea-level rise. These changes will have more serious repercussions over time. By the end of the century, the United States could experience as much as six feet or more of sea-level rise and an average temperature change of up to 11 °F if concerted global action to curb emissions is not taken.¹⁸¹ This section outlines the pioneering approaches states are taking to protect lives, health, property, economies, and ecosystems through changes in planning, regulations, and investments.

While both adaptation and mitigation (reducing emissions that cause climate change) are necessary, they differ in some important ways. Impacts of climate change vary by region (e.g., sea-level rise and storm surge felt in coastal communities, increased drought and wildfires in the west), therefore action at the state and local level can directly make communities more resilient. While states have worked to reduce emissions for a whole variety of

¹⁷⁹ See, e.g., REFORMING THE ENERGY VISION, *supra* note 175.

¹⁸⁰ See generally Susan Solomon et al., *Irreversible Climate Change due to Carbon Dioxide Emissions*, 106 PROC. NATL. ACAD. SCI. 1704 (2009); H. Damon Matthews & Ken Caldeira, *Stabilizing Climate Requires Near-Zero Emissions*, 35 GEOPHYS. RES. LETT. L04705 (2008), <http://onlinelibrary.wiley.com/doi/10.1029/2007GL032388/full> [<https://perma.cc/RG79-4YA2>]; Tom M.L. Wigley, *The Climate Change Commitment*, 307 SCIENCE 1766 (2005); Gerald A. Meehl et al., *How Much More Global Warming and Sea Level Rise?*, 307 SCIENCE 1769 (2005).

¹⁸¹ U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 841 (Jeffrey M. Melillo, T. C. Richmond & Gary W. Yohe eds., 2014).

reasons—including creating clean energy jobs in their communities and reducing local air pollution, the actual climate benefits are limited without concerted global action to reduce GHG emissions.

In adaptation, state and local governments are the primary actors—assessing and addressing vulnerabilities within their jurisdictions. In spite of having the incentive and often the commitment to prepare for changes, state and local governments face challenges. They often lack resources and technical capacity to evaluate and act upon risks, and they are not generally aided in doing so by federal programs.

While states cannot shoulder the entire burden of adapting to climate change, they have key roles to play. States control public lands and infrastructure investments. Their regulations control or influence everything from development patterns to wetlands protection. State leaders and agencies can improve climate resilience by integrating adaptation into state programs. They can also ensure that state planning efforts take climate change into account in their long-term management plans. In addition, states can require or encourage local governments and the private sector to take steps to adapt to climate change through regulation, funding, technical support, and incentives.¹⁸²

The opportunities for the federal government to support and promote state and local adaptation are important to explore, and this section offers some recent examples of collaboration across levels and sectors that can serve as models. Drawing on a number of examples, this discussion explores how the federal government can learn from state experiences to remove barriers to adaptation and catalyze action in states and communities where state regulations, climate champions, and robust grassroots campaigns are not driving action. At the same time, the federal government can learn from local and state governments regarding protecting their own assets and incorporating considerations of climate risks into federal programs and investments. In recent years, many federal agencies have begun taking steps to incorporate climate change in federal programs and investments, but much more can be done at all levels and sectors of government.

To adapt, governments at all levels must be able to measure and understand future risks, develop methods for responding to those risks, and determine if those responses are working. To take one example, it is no longer possible to rely on historical data to determine the risks of flooding, heat waves, drought, and other extreme weather events, because those risks are changing. The Federal Emergency Management Agency's (FEMA) calcula-

¹⁸² See, e.g., Rosina Bierbaum et al., *A Comprehensive Review of Climate Adaptation in the United States: More than Before, but Less than Needed*, 18 MITIG. ADAPT. STRATEG. GLOB. CHANGE 361, 369–70 (2012); Lara Hansen et al., *The State of Adaptation in the United States: An Overview. A Report for the John D. and Catherine T. MacArthur Foundation, ECOADAPT* (2013), <http://www.ecoadapt.org/data/library-documents/TheStateofAdaptation-intheUnitedStates2013.pdf> [<https://perma.cc/PCG3-43Y5>]; Vicki Arroyo & Terri Cruce, *State and Local Adaptation*, in *THE LAW OF ADAPTATION TO CLIMATE CHANGE: U.S. AND INTERNATIONAL ASPECTS* 569–600 (Michael B. Gerrard & Katrina Fisher Kuh eds., ABA 2012).

tion of the “100-year base flood,”¹⁸³ based upon historical flood data, is no longer a meaningful estimation of what is at risk of flooding for purposes of siting coastal development. Instead, new projections of sea-level rise, shoreline changes, and other climate impacts must be incorporated into all planning and investment decisions.

As such, many states have developed statewide vulnerability assessments and adaptation plans that assess risks to their programs, facilities, and investments. Without any federal mandates or clear templates, states are once again choosing to act and to “learn by doing”—both from themselves and each other. Federal agencies are also learning from the leading states’ planning and implementation efforts as discussed below.

State Leadership in Adaptation Planning

As of December 2015, fifteen states have finalized statewide, comprehensive adaptation plans for their individual states.¹⁸⁴ Additionally, seven states and the District of Columbia are in the process of drafting adaptation plans.¹⁸⁵ In early 2015, the Georgetown Climate Center analyzed these adaptation plans and assessed the progress states are making in meeting their goals. This research identified major differences in plan development, content, and progress. In part, these differences reflect state diversity in anticipated climate impacts, demographics, political environments, resources, and many other factors. However, the research also reflects an evolving sophistication around adaptation planning as state leaders learn from each others’ planning processes, and as leaders implement and update their plans.¹⁸⁶

Planning without clear models and guidelines gives states the opportunity to innovate—to truly serve as “laboratories” piloting different approaches. It also comes with challenges. One risk is creating plans that are too high-level and aspirational, making implementation and measuring progress difficult. In fact, our Center’s assessment shows that the vast majority of adaptation plans (seventy-three percent) focus on “soft” adaptation activities like planning and capacity building efforts rather than implementing actual changes to programs and investments. For example, many plans include recommendations to expand research on climate change and vulnerability, increase technical capacity, or increase collaboration across agencies and

¹⁸³ Areas that would be inundated by a flood having a one percent chance of occurring in any given year based upon historical data. This is also known as the “base flood” and is used by FEMA and the National Flood Insurance Program (NFIP) for setting a threshold for requiring flood insurance and regulating new development.

¹⁸⁴ Alaska, California, Colorado, Connecticut, Delaware, Florida, Maine, Maryland, Massachusetts, New Hampshire, New York, Oregon, Pennsylvania, Virginia, and Washington.

¹⁸⁵ District of Columbia, Hawaii, Michigan, Minnesota, New Jersey, Rhode Island, Vermont, and Wisconsin.

¹⁸⁶ See generally Aaron Ray & Jessica Grannis, *From Planning to Action: Implementation of State Climate Change Adaptation Plans*, 3 MICH. J. SUSTAIN. 5 (2015), <http://hdl.handle.net/2027/spo.12333712.0003.001> [<https://perma.cc/RHB2-2E8G>].

sectors.¹⁸⁷ Given that most states are still relatively new to adaptation planning, this emphasis on planning and capacity building is not surprising or necessarily concerning. However, states must also move beyond these activities and begin the more difficult challenge of implementing real changes in laws, policies, and programs if they are going to build their resilience to future impacts.¹⁸⁸

State plans vary in the number and nature of their goals and objectives. While some plans are more aspirational, a few states are setting more aggressive, measurable goals. Of the fifteen states with plans, Pennsylvania has the highest percentage of goals directed at changes to law and policy. Those goals include protecting habitat corridors and updating storm water regulations to create storm water systems capable of handling increases in rainfall and run-off. California's plan includes the highest number of goals devoted to monitoring in order to figure out what works.¹⁸⁹ For example, the state aims to monitor forest health to better understand the effectiveness of adaptive measures aimed at improving forest resiliency to drought and wildfire.¹⁹⁰

Of course, goals are only useful if states actually try to meet them. There is a real risk that those goals may be neglected because of conflicting priorities, funding limitations, legal constraints, and changing political leadership. Our research found that Maryland stands out as a leader in following through on its adaptation plan. Maryland has made progress implementing eighty percent of its goals, compared to an average of fifty-three percent for all states.¹⁹¹ Much of Maryland's progress came under former Governor Martin O'Malley. It is unclear to what degree the work will continue to move forward under his successor, Governor Larry Hogan, though early signs of continuing work of the Climate Change Commission are encouraging.¹⁹²

The Role of the Federal Government in Fostering Planning

While states are making progress, fewer than half the states are planning for the risks related to climate change. Statewide adaptation planning is not a requirement—only states that are internally motivated are moving forward without federal requirements or incentives. Without a national approach, climate adaptation is likely to remain uneven. Even states with plans

¹⁸⁷ *Id.*

¹⁸⁸ JESSICA GRANNIS ET AL., PREPARING FOR CLIMATE IMPACTS: LESSONS FROM THE FRONT LINES (2014), <http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/GCC-%20Preparing%20for%20Climate%20Impacts%20-%20July%202014.pdf> [https://perma.cc/B26N-MF2L].

¹⁸⁹ *Id.*

¹⁹⁰ CAL. NAT. RES. AGENCY, 2009 CALIFORNIA CLIMATE ADAPTATION STRATEGY (2009), http://resources.ca.gov/docs/climate/Statewide_Adaptation_Strategy.pdf [https://perma.cc/M36V-MJYB].

¹⁹¹ See GRANNIS, *supra* note 188.

¹⁹² See generally DEP'T OF THE ENV'T., REPORT OF THE MD. COMM'N ON CLIMATE CHANGE (MCCC), <http://www.mde.state.md.us/programs/Marylander/Documents/MCCC2015FinalReport.pdf> [https://perma.cc/THR5-K92Y].

are making limited progress towards achieving their goals given limited funding and competing demands.

Fortunately, federal agencies are taking steps to support adaptation planning in key sectors. A number of agencies, including the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, and the U.S. Economic Development Administration have released guidelines on how to incorporate climate change into planning within specific sectors that can be used by national, state, and local partners.¹⁹³ Federal agencies are also beginning to require climate considerations in plans necessary for federal funding. For example, in March 2015, FEMA released updated guidance requiring states to consider future climate change in Hazard Mitigation Plans that states and communities must develop in order to be eligible for some types of federal disaster recovery assistance.¹⁹⁴ Hazard Mitigation Plans are an important tool for facilitating adaptation because they govern how billions of dollars in disaster recovery dollars are spent in the aftermath of a presidentially declared disaster.

While such progress is encouraging, more widespread requirements are needed to reach the range of vulnerable sectors (energy, water resources, etc.) subject to state and federal regulations. Moreover, when federal agencies encourage climate adaptation planning, standards for meeting those requirements must be set high enough that they are not simply perfunctory or aspirational. Instead, states and other decision makers should be challenged to set achievable and concrete adaptation goals that will increase on-the-ground resilience.

Fostering Cross-Agency Collaboration at the State and Federal Level

Adaptation planning involves states developing whole new planning processes: historically, state agencies have developed plans covering single sectors. Adaptation, however, requires agencies to think across agency missions to address impacts that will cross sectors and jurisdictional boundaries, since successful adaptation requires engagement of different parties, agencies, and levels of government. For example, the decreased snow pack resulting from drought in the Western states has cascading repercussions for water supplies, electricity generation, stream flows, habitat conservation,

¹⁹³ U.S. ECON. DEV. ADMIN., COMPREHENSIVE ECONOMIC DEVELOPMENT STRATEGY CONTENT GUIDELINES (2015); NAT'L FISH, WILDLIFE AND PLANTS CLIMATE ADAPTATION P'SHIP, NATIONAL FISH, WILDLIFE AND PLANTS CLIMATE ADAPTATION STRATEGY (2012), <http://www.wildlifeadaptationstrategy.gov/pdf/NFWPCAS-Final.pdf> [<https://perma.cc/3KJB-DYD6>]; EPA, CLIMATE READY WATER UTILITIES INITIATIVE (2015), <http://www.epa.gov/crwu> [<https://perma.cc/7AST-XVCT>].

¹⁹⁴ FEMA, FP 302-094-2, STATE MITIGATION PLAN REVIEW GUIDE (2016), http://www.fema.gov/media-library-data/1425915308555-aba3a873bc5f1140f7320d1ebeb18c6/State_Mitigation_Plan_Review_Guide_2015.pdf [<https://perma.cc/UF2V-6PAD>].

and tourism, among other things.¹⁹⁵ No single agency can respond to these impacts alone, so decision makers must work together to respond and craft robust plans in concert with stakeholders. Moreover, collaborations allow diverse parties to share expertise and best practices and learn from one another.

To break down agency and sector silos, many states are developing working groups and task forces to increase cross-agency coordination and to create partnerships between different levels of government and outside experts and stakeholders. These interagency groups are becoming a common model for state planning. For example, Maryland's governor issued an executive order in 2007 creating the Commission on Climate Change, which includes members from various state agencies, nongovernmental organizations, businesses, and local governments.¹⁹⁶ This Commission released the Maryland Climate Action Plan in 2008 and published an update in 2011.¹⁹⁷ Recognizing the commission's value, the Maryland state legislature passed H.B. 514, extending and codifying the commission in May 2015.¹⁹⁸ Similar interagency, intergovernmental commissions have been created in Hawaii,¹⁹⁹ New Hampshire,²⁰⁰ and other states.

The federal government can learn from innovations such as these state-wide efforts—often involving not only different government agencies but engaging with university scientists and diverse stakeholders as well. In addition, the federal government has been supporting federal interagency and cross-jurisdictional coordination. In 2009, President Obama created the Interagency Climate Change Adaptation Task Force (later replaced by the Council on Climate Preparedness and Resilience) to coordinate federal adaptation efforts horizontally across federal agencies.²⁰¹

Recognizing that federal actions also affect state and local adaptation efforts, President Obama created the State, Local and Tribal Leaders Task Force on Climate Preparedness and Resilience in 2013 to strengthen coordination across different levels of government. The Task Force included elected leaders such as governors and mayors from around the country and developed recommendations on how existing federal programs could be

¹⁹⁵ U.S. DEPT OF INTERIOR, U.S. GEOLOGICAL SURVEY, CALIFORNIA WATER SCIENCE CENTER: SCIENCE-BASED DECISION MAKING, <http://ca.water.usgs.gov/data/drought/drought-water-decisions.html> [https://perma.cc/58HQ-4FHU].

¹⁹⁶ MD. EXEC. ORDER NO. 01.01.2007.07, *Establishing the Maryland Commission on Climate Change* (2007), http://www.mde.state.md.us/assets/document/Air/ClimateChange/AppendixA_Executive_Order.pdf [https://perma.cc/7QEW-4H2B].

¹⁹⁷ See generally DEPT OF THE ENV'T., *supra* note 192.

¹⁹⁸ H.B. 514, 2015 Md. Laws; Md. Code Ann., Env'r., § 2-1301 (2015).

¹⁹⁹ H.B. 1714, 2014 Haw. Sess. Law; see Haw. Rev. Stat. § 225M-2 (2014); *Hawai'i Climate Change Adaptation Committee Begins Work*, GOVERNOR OF THE STATE OF HAWAII DAVID Y. IG, <http://governor.hawaii.gov/newsroom/dlnr-news-release-hawaii-climate-change-adaptation-committee-begins-work/> [https://perma.cc/R9F8-RHQD].

²⁰⁰ S.B. 163, 2013 NH Laws; N.H. Rev. Stat. Ann. § 483-E:3 (2013).

²⁰¹ Exec. Order No. 13,514, 74 Fed. Reg. 52,117 (Oct. 5, 2009), *superseded by* EO 13,653.

retooled or reformed to support state, local, and tribal adaptation efforts.²⁰² In November 2014, the Task Force provided recommendations to the President on how to modernize federal programs and remove barriers to state and local innovation. The Task Force's report was informed by extensive input—including a series of dialogues hosted by the Georgetown Climate Center in collaboration with the White House Council on Environmental Quality that produced over 100 recommendations for action.²⁰³ Since the Task Force report was released, the Obama Administration has made strides in implementing its recommendations.²⁰⁴ Such changes will necessarily go beyond planning to include implementation in order to be effective. These changes will require new authority and resources as described below.

State Legal Authorities and Investments Promoting Adaptation

In addition to statewide adaptation planning, states are beginning to consider climate change and its impacts when agencies develop policies and direct financial investments. Given that states control roads and other important infrastructure, are major employers, and administer vital services such as public healthcare and education, states need to ensure their own programs and investments can cope with changing conditions. These initial state efforts to improve decision-making and investments are already being used as models for federal programs. Making such changes requires authority and leadership to drive action.

Adaptation action is being driven through states by both legislation and executive orders. State legislatures have passed laws both requiring statewide adaptation planning and requiring state agencies to integrate climate change considerations in state programs and projects. For example, the Oregon legislature called for the development of a statewide adaptation plan in H.B. 3543. In New York, the legislature passed the Community Risk and Resilience Act in September 2014, requiring state agencies to consider climate change in state planning, permitting, and funding decisions including,

²⁰² WHITE HOUSE COUNCIL ON ENVTL. QUALITY, STATE, LOCAL, AND TRIBAL LEADERS TASK FORCE ON CLIMATE PREPAREDNESS AND RESILIENCE, <https://www.whitehouse.gov/administration/eop/ceq/initiatives/resilience/taskforce> [<https://perma.cc/8R3G-S8UY>]. State officials on the Task Force included representatives from Hawaii, California, Washington, Delaware, Maryland, Illinois, and Vermont. Local officials included mayors and county commissions from Salt Lake City, UT; Carmel, IN; Franklin County, OH; Santa Barbara County, CA; Des Moines, IA; Greensburg, KS; Los Angeles, CA; Grand Rapids, MI; Broward County, FL; Sacramento, CA; Philadelphia, PA; Houston, TX; Perdido Beach, AL; Knoxville, TN; Fort Collins, CO; and Hoboken, NJ.

²⁰³ See generally Jessica Grannis et al., *Preparing our Communities for Climate Impacts: Recommendations for Federal Action*, GEORGETOWN CLIMATE CTR. (2014), <http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/GCC%20-%20Recommendations%20for%20Federal%20Action%20-%20September%202014.pdf> [<https://perma.cc/GE5D-LU9K>].

²⁰⁴ President's State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience, *Recommendations to the President*, THE WHITE HOUSE (Nov. 2014), https://www.whitehouse.gov/sites/default/files/docs/task_force_report_0.pdf [<https://perma.cc/W84R-WCV5>].

for example, the siting and design of public infrastructure and hazardous waste facilities.²⁰⁵

In other states, adaptation actions are prompted by executive orders. For example, Governor Schwarzenegger of California called for statewide adaptation planning through an executive order signed in 2008;²⁰⁶ work that has been continued by his successor Governor Jerry Brown. In some states, executive orders have also been used to create the initial momentum for adaptation, which was later taken up by the state legislature. For example, in 2014 Maryland passed “Coast-Smart” legislation requiring potential future flooding to be accounted for when constructing state facilities. This was preceded by a similar executive order issued by Governor Martin O’Malley in 2012.²⁰⁷ By codifying adaptation requirements, legislatures can make it more difficult for future administrations to roll back the requirements. In Virginia and Florida, adaptation efforts ordered by executive action were later put on hold by succeeding Administrations.²⁰⁸

Legislation can also remove legal barriers to adaptation. Existing laws, often passed before climate change was a known concern, can limit or hinder adaptation. For example, many state coastal management statutes grandfather existing development, forcing regulators to allow those properties to be rebuilt even where they are located in highly flood-prone areas. This can prevent states or localities from encouraging retreat from vulnerable coastal areas through land-use regulations.²⁰⁹ In addition, state agencies may lack the necessary authority to implement adaptation measures. For example, in Minnesota, the state building code preempts localities from adopting higher standards.²¹⁰ This can restrict local efforts to require that buildings be more efficient or more resilient to flooding, heat waves or both.²¹¹ To facilitate the broad changes that are needed at both the state and local levels, state laws will need to be reformed or enacted to remove legal barriers to adaptation.

In addition, implementing policy and program changes requires changes to funding and financing. The next section identifies opportunities and provides examples of how investments can be made with climate change

²⁰⁵ Cmty. Risk & Resiliency Act, 2014 N.Y. LAW Ch. 355.

²⁰⁶ Cal. Exec. Order No. S-13-08 (2008), <https://www.gov.ca.gov/news.php?id=11036> [<https://perma.cc/XWQ4-PVUA>].

²⁰⁷ Md. Exec. Order No. 01.01.2012.29, *Climate Change and “Coast Smart” Construction* (2012), http://wetlandswatch.org/Portals/3/WW%20documents/sea-level-rise/exec_order.pdf [<https://perma.cc/7BNY-3F4B>].

²⁰⁸ Arroyo and Cruce, *supra* note 182.

²⁰⁹ Jessica Grannis et al., *Coastal Management in the Face of Rising Seas: Legal Strategies for Connecticut*, 5 SEA GRANT L. & POL’Y J. 59, 77 (2012), <http://nsglc.olemiss.edu/SGLPJ/vol5No1/Grannis.pdf> [<https://perma.cc/6UMK-B4SC>].

²¹⁰ Minn. Stat. Ann. § 326B.121, Subd. 1 (West, Westlaw current with laws of the 2016 Reg. Sess. through ch. 96); *see also* Sara Hoverter et al., *Minnesota Options to Increase Climate Resilience in Buildings*, MINN. POLLUTION CONTROL AGENCY (Jan. 2015), <https://www.pca.state.mn.us/sites/default/files/tdr-fg15-01.pdf> [<https://perma.cc/79VN-BNC7>].

²¹¹ ENVTL. PROT. AGENCY, USING SMART GROWTH STRATEGIES TO CREATE MORE RESILIENT COMMUNITIES IN THE WASHINGTON, D.C., REGION 41 (2013), <http://www.epa.gov/sites/production/files/2014-06/documents/mwocg-guidebook-final-508-111313.pdf> [<https://perma.cc/G7N4-VYR4>].

in mind—including consideration of barriers and opportunities for additional reforms requiring federal action.

State Funding for Infrastructure

Improving the resilience of critical infrastructure is one of the most direct ways states can prepare for climate impacts. Potentially lifesaving steps include elevating bridges over flood-prone rivers, installing larger culverts to handle increased run-off, upgrading water treatment facilities to cope with bigger rainfalls, and burying or hardening power lines so they can better withstand storms. Such retrofits can also reduce maintenance costs and extend the life of equipment.

After the devastation caused by Hurricane Sandy, New Jersey's legislature passed S.2815 (2013) authorizing the Natural Disaster Relief Emergency Loan Financing Program to improve drinking water systems and wastewater infrastructure.²¹² Sandy damaged 100 wastewater treatment plants, which served about 3.5 million people.²¹³ The program supports short-term and long-term financing for infrastructure improvements that mitigate flood and natural disaster risk. While it was designed to address Hurricane Sandy damage, the legislation also establishes a permanent source of emergency funding for water or wastewater utilities damaged in future events.²¹⁴

New York's Public Service Commission also has ordered all state utilities to familiarize themselves with climate projections and anticipate impacts in their system planning and construction forecasts and budgets.²¹⁵

Some states are also leveraging private financing for resilience. For example, New York created an Infrastructure Bank, using state and federal relief funds, to coordinate infrastructure investments following Hurricane Sandy. The bank uses public funds to encourage private investment in projects that strengthen critical infrastructure, such as bridges, to withstand future threats including winds, storm surge, and other climate impacts.²¹⁶

²¹² S. 2815, 2013 N.J. Laws Ch. 93 (the program is funded from the New Jersey Environmental Infrastructure Trust and prior loan repayments from the state's infrastructure improvement program).

²¹³ Press Release, N.J. Dep't of Env'tl. Prot., DEP Commissioner Bob Martin Discusses Progress in Hardening Critical Water and Wastewater Infrastructure Against Storms (Aug. 27, 2015), http://www.nj.gov/dep/newsrel/2015/15_0071.htm [<https://perma.cc/HRC4-G74A>].

²¹⁴ Press Release, Christie Administration Takes Action to Protect Water and Wastewater Systems against Disasters Like Sandy (Feb. 24, 2014), http://www.state.nj.us/dep/newsrel/2014/14_0012.htm [<https://perma.cc/UC8M-KCTU>].

²¹⁵ *In Re* Consol. Edison Co. of New York, Inc., No. 09-E-0428, 2014 WL 2743140 (N.Y.P.S.C. Feb. 20, 2014).

²¹⁶ *20 Good Ideas for Promoting Climate Resilience: Opportunities for State and Local Governments*, GEORGETOWN CLIMATE CTR. (2014), <http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/GCC-20%20Good%20Ideas-July%202014.pdf> [<https://perma.cc/SH6H-WFQP>]; *About NY Green Bank*, NY GREEN BANK, <http://greenbank.ny.gov/About/Overview> [<https://perma.cc/MHF4-B5NS>].

Federal Authorities and Financial Support for Adaptation

At the federal level, most adaptation activities have occurred at the agency level or through executive authority. President Obama spurred adaptation planning and action among federal agencies through a variety of executive orders: requiring federal agencies to develop climate change adaptation plans in 2009,²¹⁷ convening the State Local and Tribal Leaders Task Force on Climate Preparedness and Resilience in 2013,²¹⁸ and establishing Federal Flood Risk Management Standards (FFRMS) in 2015.²¹⁹ Similar to Maryland's Coast-Smart requirements, when implemented, the FFRMS will require all federal agencies to consider future flood risks posed by climate change in the siting and design of all federal "projects." Because this standard applies to all federally funded projects, it will also affect how states can use federal dollars and will ensure the long-term resilience of federal investments.

Although there is much that federal agencies can do with existing authority to promote adaptation in states, many federal laws require structural reform that must involve Congress. For example, federal disaster relief programs that reimburse states that rebuild typically limit the ability of states to build back more resiliently.²²⁰ In order to make the systemic changes that are needed to prepare for climate change, Congress needs to reform these programs and laws to respond to the new threats. However, given the reluctance of the current Congress to even acknowledge the threat of climate change,

²¹⁷ Exec. Order No. 13,514, *supra* note 201.

²¹⁸ Exec. Order No. 13,653, 79 Fed. Reg. 66,819 (2013), <https://www.whitehouse.gov/the-press-office/2013/11/01/executive-order-preparing-united-states-impacts-climate-change> [<https://perma.cc/TA2G-RJGK>]. In its *Recommendations for Federal Action* report, the Georgetown Climate Center identified a range of changes in law that are needed to promote state and local action but require Congressional action, including reforms to the National Flood Insurance Program, Stafford Act, and Clean Water Act, among others. See generally Jessica Grannis et al., *Preparing our Communities for Climate Impacts: Recommendations for Federal Action*, GEORGETOWN CLIMATE CTR. (2014), <http://www.georgetownclimate.org/preparing-our-communities-for-climate-impacts-recommendations-for-federal-action> [<https://perma.cc/L6U5-ERCT>].

²¹⁹ Exec. Order No. 13,690, 80 Fed. Reg. 6,425 (2015), <http://energy.gov/sites/prod/files/2015/02/f19/EO%2013690-%20Flood%20Risk%20Management.pdf> [<https://perma.cc/WH4H-JGZA>]; FEMA, GUIDELINES FOR IMPLEMENTING EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT, AND EXECUTIVE ORDER 13690, ESTABLISHING A FEDERAL FLOOD RISK MANAGEMENT STANDARD AND A PROCESS FOR FURTHER SOLICITING AND CONSIDERING STAKEHOLDER INPUT (2015), http://www.fema.gov/media-library-data/1444319451483-f7096df2da6db2adfb37a1595a9a5d36/FINAL-Implementing-Guidelines-for-EO11988-13690_08Oct15_508.pdf [<https://perma.cc/YB45-W9LM>].

²²⁰ Justin B. Clancy & Jessica Grannis, *Lessons Learned From Irene: Climate Change, Federal Disaster Relief, and Barriers to Adaptive Reconstruction*, GEORGETOWN CLIMATE CTR. (Nov. 1, 2013), <http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/Lessons%20Learned%20From%20Irene%20-%20Finalv2.pdf> [<https://perma.cc/EKC7-HG5W>]; Jeffrey Thomas & James Dewese, *Reimagining New Orleans Post-Katrina: A Case Study in Using Disaster Recovery Funds to Rebuild More Resiliently*, GEORGETOWN CLIMATE CTR. (2015), http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/GCC-Reimagining_New_Orleans_Post_Katrina-August2015-Final.pdf [<https://perma.cc/NY5E-2KQR>].

legislation at the federal level to incorporate climate considerations in existing programs seems unlikely in the near term.

In spite of Congressional inaction, the Obama Administration has made efforts to protect federal assets by increasing funding to agencies to support resilience goals. For example, the fiscal year 2017 proposed budget includes \$2 billion for reducing coastal risks. Funds would go to the Department of the Interior's Coastal Climate Resilience Program, the National Oceanic and Atmospheric Administration's (NOAA) Regional Coastal Resilience Grants, and investments in Alaskan communities facing extreme risks.²²¹ It remains to be seen how Congress will respond to these proposals.

Federal agencies are also beginning to integrate climate change considerations in programs designed to spur private investment in infrastructure. For example, the U.S. Environmental Protection Agency administers the Clean Water and Safe Drinking Water State Revolving Funds (SRF), which provide federal funding to capitalize loan programs in each state to finance water infrastructure investments.²²² EPA has indicated that incorporating climate change in the SRF process is one of its priority actions for supporting adaptation.²²³

Supporting Local Adaptation Efforts

Climate change impacts are felt where people live, at the community level. Another critical role for states is helping local communities adapt to climate change with technical and financial support—or compelling them to adapt through mandates.²²⁴ In recent years, the federal government has also begun a number of similar initiatives encouraging local planning efforts to enhance resilience to climate impacts—including supporting technical assistance through federal reports, databases, and tool kits and through competitions offering significant federal funding to support innovation.

1. Technical Assistance

States are able to support research by state universities and develop expertise within agencies to assess climate risks and the vulnerabilities of

²²¹ Office of Mgmt. and Budget, *The President's Budget: Fact Sheets on Key Issues: Advancing Clean Energy Domestically and Abroad and Taking Action on Climate Change* (2016), https://www.whitehouse.gov/sites/default/files/omb/budget/fy2017/assets/fact_sheets/Advancing%20Clean%20Energy%20Domestically%20and%20Abroad%20and%20Taking%20Action%20on%20Climate%20Change.pdf [https://perma.cc/Q53G-2BMM].

²²² The CWSRF was created by 1987 amendments to the Clean Water Act (33 U.S.C. §1251(a)(4)), and the DWSRF was created by the 1996 amendments to the Safe Drinking Water Act. See EPA, *Clean Water State Revolving Fund*, http://water.epa.gov/grants_funding/cwsrf/cwsrf_index.cfm [https://perma.cc/SGP2-F78T]; EPA, *Drinking Water State Revolving Fund*, http://water.epa.gov/grants_funding/dwsrf/ [https://perma.cc/5FMF-SL5A].

²²³ EPA, OFF. OF WATER, OFFICE OF WATER CLIMATE CHANGE ADAPTATION IMPLEMENTATION PLAN 11 (2014), <http://www3.epa.gov/climatechange/Downloads/OW-climate-change-adaptation-plan.pdf> [https://perma.cc/K9FX-2V2F].

²²⁴ Hansen et al., *supra* note 182.

important sectors or regions within a state—providing information that local governments cannot produce themselves, and at a scale appropriate for local decision-making. States also can provide or endorse projections of climate impacts and provide guidance for conducting vulnerability assessments.

California has developed an innovative web-based tool to deliver climate science information called Cal-Adapt. For every part of the state, the tool shows how much temperatures are projected to climb, sea levels to rise, wildfires to increase, and snowpack to decline, among other impacts, so any community can understand the changes it is expected to face.²²⁵ Similarly, Maryland developed the Coastal Atlas, an online mapping and planning tool that allows local decision makers to explore predictions for future erosion, storm inundation, and sea-level rise.²²⁶

The federal government also provides climate science information and technical assistance. In November 2014, the Obama Administration released the U.S. Climate Resilience Toolkit to help states and communities access climate information at the appropriate scales, identify mapping, modeling tools and data sets to help government officials understand their risks, and highlight case studies of states and communities preparing for impacts.²²⁷ In partnership with the U.S. Department of Transportation, the Georgetown Climate Center has developed over 100 case studies of state and local changes to transportation systems with climate change in mind—adding these to the Center’s Adaptation Clearinghouse database.²²⁸ Additionally, in June 2015, the Obama Administration announced a new Resilience AmeriCorps Pilot Program, in which AmeriCorps VISTA volunteers will be placed in ten pilot communities to provide technical support and assistance to help communities plan and implement measures to reduce their risks to climate change.²²⁹

2. Funding for Local Planning and Implementation

Some states are encouraging local action by providing financial assistance to communities. For example, Massachusetts offers seventy-eight

²²⁵ CAL. ENERGY COMM’N, CAL-ADAPT - EXPLORING CALIFORNIA’S CLIMATE CHANGE RESEARCH (2016), <http://cal-adapt.org/tools/> [<https://perma.cc/WU5T-DERW>] (information is presented either for individual counties or for twelve square kilometer grids).

²²⁶ Md. Dep’t of Nat. Res., COASTAL ATLAS, <http://dnr.maryland.gov/ccs/coastalatlus/> [<https://perma.cc/XW69-9SQX>].

²²⁷ U.S. CLIMATE RESILIENCE TOOLKIT, <https://toolkit.climate.gov/> [<https://perma.cc/VYX8-SAQ8>].

²²⁸ *More Than 100 Transportation Adaptation Case Studies*, GEORGETOWN CLIMATE CTR., http://www.georgetownclimate.org/search/apachesolr_search?filters=tid%3A1024 [<https://perma.cc/8FX7-CCZX>]; FED. HIGHWAY ADMIN., CLIMATE CHANGE ADAPTATION CASE STUDIES, https://www.fhwa.dot.gov/environment/climate_change/adaptation/case_studies/ [<https://perma.cc/J9QA-UT6T>].

²²⁹ Press Release, The White House, Resilience AmeriCorps Announces Ten Cities for its Pilot Program to Support Communities Building Capacity and Technical Support for Climate Resilience, <https://www.whitehouse.gov/the-press-office/2015/08/19/resilience-ameri-corps-announces-ten-cities-its-pilot-program-support> [<https://perma.cc/P485-ZJR3>]. The ten pilot communities include Anchorage, AK; Boulder, CO; Chicago, IL; El Paso, TX; Minot, ND; New Orleans, LA; Norfolk, VA; Phoenix, AZ; Pittsburgh, PA; and Tulsa, OK.

coastal municipalities funding through its Coastal Resilience Pilot Grant Program. This program provides money and technical assistance to build nature-based flood and erosion management systems that use organic materials such as wetland plants and oyster reefs to stabilize shorelines instead of rocks or concrete. In August 2015, Massachusetts awarded \$2.2 million in grants to fourteen municipalities in its 2016 program.²³⁰

A number of state programs use funding to encourage individual action. In 2013, Connecticut launched Shore Up Connecticut, a low-interest loan program aimed at helping homeowners and business owners not eligible for federal disaster aid following Sandy to retrofit buildings to be more resilient to flood impacts. Homeowners can borrow up to \$300,000 and must agree to elevate their homes one foot above the 500-year flood elevation.²³¹ Commercial structures can either be flood-proofed or raised. Loan recipients must also maintain flood insurance.²³²

The Obama White House and federal agencies have also announced several funding opportunities to encourage state and local resilience efforts. In the aftermath of Hurricane Sandy, the United States government launched the “Rebuild by Design” competition, which fostered innovative investments in communities affected by Sandy considering future climate risks.²³³ In June 2015, the U.S. Department of Housing and Urban Development announced that it would be competitively allocating \$1 billion in disaster recovery funding to sixty-seven states and communities that had Presidential disaster declarations between 2011 and 2013.²³⁴ The state and local applicants designed innovative solutions for increasing their resilience to future disasters. Training and technical assistance was provided to the applicants through an innovative public-private partnership with the Rockefeller Foundation that hosted a series of resilience academies around the country to help the applicants develop resiliency approaches and projects. Winners from eight states and five cities or counties from around the country were announced in January 2016.²³⁵ NOAA is also using federal funding to en-

²³⁰ *Baker-Polito Administration Announces Grants for Coastal Communities to Combat Effects of Climate Change*, MASS. EXEC. OFFICE OF ENERGY & ENVTL. AFFAIRS, <http://www.mass.gov/eea/pr-2015/grants-for-coastal-communities-announced.html> [<https://perma.cc/2U5Y-N88B>].

²³¹ One foot above the area with 0.2% to 1% chance of flooding in any given year.

²³² Conn. Dep’t of Housing, *SHORE UP CONN.*, <http://shoreupct.org/> [<https://perma.cc/F5WH-YQD9>].

²³³ *HUD Announces Winning Proposals From The “Rebuild By Design” Competition*, U.S. DEP’T OF HOUS. & URBAN DEV., (2014) http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2014/HUDNo_14-063 [<https://perma.cc/S3WF-VKZA>].

²³⁴ *National Disaster Resilience Competition—HUD Exchange*, U.S. DEP’T OF HOUS. & URBAN DEV., <https://www.hudexchange.info/programs/cdbg-dr/resilient-recovery/> [<https://perma.cc/NH3X-R7EJ>].

²³⁵ The NDRC winners are California, Connecticut, Iowa, Louisiana, New Jersey, New York, Tennessee, Virginia, New York City (NY), New Orleans (LA), Minot (ND), Shelby County (TN), and Springfield (MA). *HUD Awards \$1 Billion through National Disaster Resilience Competition—HUD Exchange*, U.S. DEP’T OF HOUS. & URBAN DEV. (2016), <https://www.hudexchange.info/news/hud-awards-1-billion-through-national-disaster-resilience-competition/> [<https://perma.cc/XKU2-CE8D>].

courage adaptation by offering \$5 million through competitive grants through the Regional Coastal Resilience Grant Program and the Coastal Ecosystem Resiliency Grant Program.²³⁶ These grant programs acknowledge that climate impacts will cross jurisdictional lines and, therefore, they encourage applicants to develop regional and cross-jurisdictional approaches.

3. Mandates for Local Climate Adaptation

In addition to providing incentives and technical assistance, states can promote local adaptation by requiring local governments include adaptation in planning documents, such as land-use plans (often called “comprehensive” or “master” plans).

In October 2015, California passed S.B. 379. The law requires cities and counties to include climate adaptation and resilience in their local land-use plans, which local governments use to ensure that development patterns reflect larger goals such as safety or protecting natural resources.²³⁷ Along with Cal-Adapt, California offers local governments planning guidance and regional risk assessments through its Adaptation Planning Guide, minimizing the work local governments must take on themselves.²³⁸

In March 2015, Florida passed S.B. 1094, officially recognizing sea-level rise as contributing to flood risks in the state and requiring local governments to reduce those risks when drafting comprehensive coastal management plans.²³⁹ Florida is an example of how less restrictive legislation can pave the way for more aggressive action. S.B. 1094 was preceded by the 2011 Community Planning Act, which gave local governments the option of designating Adaptation Action Areas for areas vulnerable to sea-level rise and storm surge.²⁴⁰ A number of counties, including Broward County and the City of Fort Lauderdale used this opportunity to identify priority areas for adaptation, along with potential adaptation policies for reducing risks (e.g., overlay zones, land acquisition programs, and hazard mitigation projects).²⁴¹

Local governments can only increase resilience through land use if they can implement the requisite zoning changes. However, local governments often face legal challenges when adding restrictions to the use and development of private land. For example, regulations preventing shoreline armoring or the redevelopment of structures or facilities damaged in storm events all face potential legal challenges under federal and state constitutional protec-

²³⁶ *Coastal Ecosystem Resiliency Grants*, NAT'L OCEANIC & ATMOSPHERIC ADMIN., NAT'L MARINE FISHERIES SERV., <http://www.habitat.noaa.gov/funding/coastalresiliency.html> [<https://perma.cc/7F2P-Z2QZ>]; Grant 2015 Regional Coastal Resilience Program, NOAA OFFICE FOR COASTAL MGMT., <https://coast.noaa.gov/resilience-grant/> [<https://perma.cc/V73H-E9DT>].

²³⁷ S.B. 379, 2015 Cal. Stat., codified at CAL. GOV'T CODE § 65,302.

²³⁸ CAL. NAT. RES. AGENCY, ADAPTATION PLANNING GUIDE (2012), http://resources.ca.gov/climate/safeguarding/adaptation_policy_guide/ [<https://perma.cc/G9AZ-PK32>].

²³⁹ S.B. 1094, FLA. STAT. § 163.3178 (2015). Comprehensive coastal management plans outlines strategies to reduce flood risks and encourage smart development in coastal areas.

²⁴⁰ H.B. 7207, FLA. STAT. § 163.3177(6)(g)(10) (2011).

²⁴¹ 20 *Good Ideas for Promoting Climate Resilience: Opportunities for State and Local Governments*, *supra* note 216.

tions against government regulations that “take” private property; and government entities found liable for a taking must pay affected landowners for the fair market value of the property. The costs of potential liability can have a chilling effect on both state and local regulations, even though regulators can justify such restrictions as necessary for protecting public safety, emergency responders, and sensitive coastal resources.²⁴² To remedy this problem, courts must also begin to recognize the need for state and local regulators to respond to a changing environment.

Opportunities for More Innovation in Adaptation

States that have taken action deserve credit for their leadership; however, even those leading states are at early stages of implementation and their efforts (as they acknowledge) pale in comparison to what is needed given the changes that lie ahead. Many states facing significant climate risks, such as most Gulf Coast states, do not have comprehensive adaptation plans. Even for states with plans, implementation remains a constant challenge. In addition to shortfalls in funding and staffing, existing laws and policies often pose barriers to promoting adaptation because they were written before human-induced climate change impacts were experienced and may inhibit building and investing differently.

While climate change is a global challenge, its adverse effects hit close to home. Every level of government has a role to play, and innovation at every level and agency of government is needed. Many of the laws and policies that currently inhibit innovation are federal. Federal agencies also administer funding programs, such as the National Flood Insurance Program and federal disaster recovery assistance, which have profound effects on national resilience, as do investments made by the Corps of Engineers, Department of Transportation, the Department of Defense and other federal agencies. In recognition of these important roles, the Obama Administration has taken a number of key steps to ensure that federal agencies are leveraging existing programs to better support state and local adaptation and launching innovative pilot programs, but these too must be expanded. Unfortunately, there are real challenges to doing so in the near future given the denial and dysfunction in Congress. Further, the progress made by the Obama Administration in identifying and addressing these issues across agencies and levels of government could be rolled back under a future Administration that denies or ignores the challenges associated with human-induced climate change.

While there has been progress, there is much more work to do. Significant political will and consistent leadership will be needed to successfully

²⁴² J. Peter Byrne & Jessica Grannis, *Coastal Retreat Measures*, in *THE LAW OF ADAPTATION TO CLIMATE CHANGE: U.S. AND INTERNATIONAL ASPECTS*, Ch. 9 (Michael B. Gerrard & Katrina Fischer Kuh eds., 2012).

plan for and implement the many large- and small-scale changes that can help prepare states and communities for a changing climate.

CONCLUSION

For many years, states have been crafting innovative policies to promote clean energy and efficiency and to reduce emissions that cause climate change. Many states have actual emissions reduction targets codified in executive orders and legislation and are reducing emissions from important sectors such as transportation, electricity, building, and manufacturing.

Their leadership has made a meaningful difference in its own right, because states like California rival many countries in economic output, size, and population. In addition, state policies complement federal policy and provide levers to reduce emissions in sectors and at scales that federal policy is not well suited to address, such as through land use and building codes. Even more important, state leadership provides models that inform other state efforts and national programs, from federal automobile standards to EPA's Clean Power Plan. Federal regulations have been more ambitious and durable because of the innovation by leading states and communities—allowing the United States to negotiate and sign stronger international commitments. With the example and encouragement of leaders at the “subnational” level, the United States and other nations have taken more ambitious GHG reductions as seen in the Paris Agreement.

Yet even these international commitments cannot completely avert serious consequences of climate change. States and communities are also planning for the unavoidable impacts of climate change—taking action to prepare for changes and to promote greater resilience in facing the challenges climate change will bring.

While state actions are not sufficient to prevent catastrophic climate change or to adapt fully to its impacts, they are essential to meeting the challenge before us. They help to inform and support broader efforts to fight climate change, protect people where they live, and help protect our planet for future generations.