CLIMATE REGULATION OF THE ELECTRICITY INDUSTRY: A COMPARATIVE VIEW FROM AUSTRALIA, GREAT BRITAIN, SOUTH KOREA, AND THE UNITED STATES

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I. INTRODUCTION

In the face of the climate crisis, the future of the electricity industry is vital. Globally, the electricity sector ranks first in terms of greenhouse gas (GHG) emissions, accounting for 25% of such emissions in 2010.[1] Among Organisation for Economic Co-operation and Development (OECD) countries, the figures are even starker: electricity is the number one contributor to climate change for this group, comprising 42% of GHG emissions.[2]

The trajectory of the electricity industry, moreover, is one only of expansion. From the inception of the industry with the first central power station, on Pearl Street in New York City in 1882, through today, the electricity industry has only continued to grow. This, of course, is a dual-edged sword. Access to electricity improves lives in

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[1] *IPCC, 2014: Summary for Policymakers, in* CLIMATE CHANGE 2014, MITIGATION OF CLIMATE CHANGE 8 (Ottmar Edenhofer et al. eds., 2014), https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/drafts/fgd/ipcc_wg3_ar5_summary-for-policymakers_approved.pdf.

[2] *Recent Trends in the OECD: Energy and CO_2 Emissions*, INT'L ENERGY AGENCY 9 (2016), http://www.iea.org/media/statistics/Recent_Trends_in_the_OECD.pdf.

innumerable ways,[3] but its broader environmental impacts can be deeply problematic.[4] Relevant to this tension, while global access to electricity increased from 78% in 2008 to 84% in 2014,[5] global demand for power grew steeply from 10,092 terawatt hours (TWh) in 1990 to 19,562 TWh in 2012, and is expected to climb yet higher still, to 29,442 TWh in 2030.[6]

Critically, as the electricity industry continues to grow, its shape is also rapidly changing. This can be seen perhaps most prominently in the makeup of electricity generation worldwide. While the use of fossil fuels to produce electricity rose from 63% of generation in 1990 to 68% in 2012, that share is expected to decrease to between 55 and 66% of global generation in 2040, depending on the policies

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[3] *See generally, e.g.*, J. Stuart McMenamin et al., *Environmental Benefits of Electrification and End-use Efficiency*, 10 ELECTRICITY J. 26 (1997); Shonali Pachauri et al., *Access to Modern Energy: Assessment and Outlook for Developing and Emerging Regions*, INTERNATIONAL INSTITUTE FOR APPLIED SYSTEMS ANALYSIS (2012), http://www.iiasa.ac.at/web/home/research/researchPrograms/Energy/IIASA-GEF-UNIDO_Access-to-Modern-Energy_2013-05-27.pdf; B. Attigah & L. Mayer-Tasch, *The Impact of Electricity Access on Economic Development: A Literature Review*, PRODUSE (2013), http://www.produse.org/imglib/downloads/PRODUSE_study/PRODUSE%20Study_Literature%20Review.pdf; Randall Spalding-Fecher, *Health Benefits of Electrification in Developing Countries: A Quantitative Assessment in South Africa*, 9 ENERGY FOR SUSTAINABLE DEV. 53 (2005); Margaret Wilson et al., *A New Slant on Slopes: Measuring Benefits of Increased Electricity Access in Developing Countries*, WORLD BANK ENERGY SECTOR MGMT. ASSITANCE PROGRAM (Feb. 2011), https://www.esmap.org/sites/esmap.org/files/Final%20ESMAP%20Report%20for%20grey%20cover%20February%202011_0.pdf.

[4] *See, e.g.*, *World Energy Outlook Special Report: Energy and Air Pollution,* INT'L ENERGY AGENCY 43-49 (2016), https://www.iea.org/publications/freepublications/publication/WorldEnergyOutlookSpecialReport2016EnergyandAirPollution.pdf.

[5] *World Energy Outlook 2009*, INT'L ENERGY AGENCY 128 (2009), http://www.worldenergyoutlook.org/media/weowebsite/2009/WEO2009.pdf; *World Energy: Energy Access Database*, INT'L ENERGY AGENCY (2009) http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/#d.en.8609.

[6] *World Energy Outlook 2014*, INT'L ENERGY AGENCY 208 (2014), http://www.iea.org/publications/freepublications/publication/WEO2014.pdf [hereinafter INT'L ENERGY AGENCY 2014].

that states implement and adopt.[7] Likewise, from a climate perspective, although the share of the worst GHG-polluting generation fuel—coal—grew from 37 to 41% globally from 1990 to 2012,[8] its portion of generaiton is expected to consistently shrink going forward: to 38% in 2020, 33% in 2030, and then 29% in 2040.[9] Similarly, global use of lower GHG-emitting renewable sources increased from 1% in 1990 to 5% in 2012,[10] and is expected to climb to between 12 and 17% in 2040.[11]

Still, despite this changing—and expected greening—of the electricity sector, climate emissions from power generation remain a major threat. This is because of the industry's expansive nature, driven by both a growing world population and a concomitant rise in demand for power, magnified by the increasing electrification of global society. Indeed, while the overall *proportion* of coal-fired generation is expected to decline in future years, it is almost a certainty that the total *amount* of electricity production from coal will increase. As the International Energy Agency projects, coal-fired electricity production will grow from 9,204 TWh in 2012 to between 12,239 and 17,734 TWh in 2040—a 33 to 93% jump.[12] This should not come as a surprise, given the rapid industrialization of many nations. China, for instance, has built an average of one coal-fired power plant every seven to ten days in recent years,[13] while India, as of 2012, had 100 more coal plants than China in the pipeline.[14]

In short, there can be no question that the world's climate trajectory is tethered tightly to the future of the power industry. Any

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[7] *See id.*

[8] *Id.*

[9] U.S. Energy Info. Admin., *Chapter 5. Electricity*, *in* INTERNATIONAL ENERGY OUTLOOK 2016: WITH PROJECTIONS TO 2040, Figure 5.3 (John Conti et al., eds., (2016), https://www.eia.gov/outlooks/ieo/pdf/0484(2016).pdf.

[10] INT'L ENERGY AGENCY 2014, *supra* note 6, at 208.

[11] *Id.*

[12] *Id.*

[13] *As U.S. Shutters Coal Plants, China and Japan are Building Them*, INST. FOR ENERGY RES. (Apr. 23, 2015), http://instituteforenergyresearch.org/analysis/as-u-s-shutters-coal-plants-china-and-japan-are-building-them/.

[14] Lisa Friedman, *India's Plans for Coal-Fired Power Plants Soar – Study*, E&E NEWS (Sept. 17, 2012), http://www.eenews.net/stories/1059970017.

effort to reduce climate change must address electricity directly, as scientists and, increasingly, lawmakers across the world recognize.

In light of electricity's key role in climate change, this Article surveys climate regulation of the electricity industry using case studies from four jurisdictions: Australia, Great Britain, South Korea, and the United States. These jurisdictions offer a useful platform for comparison because, while all four are industrialized societies playing important roles in the global economy, each has chosen a separate path for addressing the climate change effects of this critical sector. Moreover, these states demonstrate varied ways of how difficult maintaining consistent regulation of climate emissions in the electricity industry has been to date.

This Article thus provides a window into global climate regulation of the electricity sector by showing a variety of legal tools curently used to address GHG emissions, from carbon tax and cap-and-trade mechanisms to renewable energy support regimes. This Article's contribution is threefold. First, it offers a primer on both the electricity sectors and the climate policies of each of the surveyed countries. Second, by tracing these countries' policies, it offers an introduction into global climate regulation of electricity. Third, by juxtaposing the experiences of these four jurisdictions, the Article points to both the areas of success and the challenges of mitigating climate change through forcing technological change in the electricity industry. Indeed, these case studies make clear several lessons about the influence of climate regulation and its interaction with the electricity sector: (1) jurisdictions are using a wide array of policy tools; (2) those policy tools are rapidly evolving; (3) that rapid change risks undermining the policies' effectiveness; (4) policies are affecting each other internationally, including through cross-pollination and by changing electricity markets that are not physically interconnected; (5) there are inherent limits on the effectiveness of electricity climate laws, including their tension with traditional energy regulation; (6) the design and details of these laws influences their efficacy; and (7) the laws are changing the shape of the global electricity mix, even as other forces are driving change as well.

Six parts comprise the balance of this Article. Parts II–V are the case studies of each of the respective countries surveyed. Part VI is the analysis section drawing on the jurisdiction-specific case studies. Part VII summarizes and concludes.

II. AUSTRALIA

As one of the most vulnerable countries to the negative environmental impacts of climate change,[15] Australia historically has sought to implement innovative solutions to addressing this problem. It created the world's first government agency to support the reduction of greenhouse gas emissions and also established "the world's first emissions trading scheme (albeit at a state level)."[16] However, in more recent years, the issue of climate change, and in particular, the impact of climate change legislation on the fossil-fuel intensive electricity sector, has become highly politicized and a key focus of federal elections. In 2012, the first national Carbon Price Mechanism was introduced by the Labor Party.[17] This Mechanism was then repealed in July 2014 following a change in government and the election of the Liberal/National Coalition.[18] This meant that Australia was the first country in the world to repeal legislated action on climate change.[19]

In its place, an Emissions Reduction Fund (ERF) was introduced. However, the largest source of greenhouse gas emissions in the Australian economy—the electricity sector—did not participate in the initial rounds of the ERF.[20] This has led to considerable regulatory and policy uncertainty within the electricity sector, with state governments increasingly introducing or

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[15] *See* Ross Garnaut, *Chapter 6: Climate Change Impacts on Australia, in* THE GARNAUT REVIEW 2011: AUSTRALIA IN THE GLOBAL RESPONSE TO CLIMATE CHANGE 121 (2011).

[16] Anita Talberg et al., AUSTRALIAN CLIMATE CHANGE POLICY TO 2015: A CHRONOLOGY (2016), http://parlinfo.aph.gov.au/parlInfo/download/library/prspub/4590624/upload_binary/4590624.pdf;fileType=application/pdf.

[17] *Clean Energy Act 2011* (Cth) s 100 (Austl.).

[18] *Clean Energy Legislation (Carbon Tax Repeal) Act 2014*, s 66 (Austl.); *see generally Carbon Farming Initiative Amendment Act 2014* (Austl.).

[19] Talberg et al., *supra* note 16.

[20] *State of the Energy Market 2015*, AUSTRALIAN ENERGY REGULATOR 1, 8 (2015), https://www.aer.gov.au/system/files/State%20of%20the%20energy%20market%202015%20(A4%20format)%20–%20last%20updated%204%20February%202016.pdf [hereinafter AER 2015].

strengthening their climate change and renewable energy legislation in an attempt to address climate change in the absence of effective Commonwealth Government action. This has created a highly fragmented approach, with layers of duplication and regulatory overlap.

Since the end of 2016, one of the states operating within the National Electricity Market, South Australia, has begun to experience extensive blackouts, prompting a broad national review of energy security within the National Electricity Market (the Finkel Review).[21] Despite repeated calls from the energy sector, key stakeholders, and market participants for the consideration of reintroducing a carbon price or the creation of a national emissions trading scheme, these calls have been ignored by the Commonwealth Government.[22] Without such a scheme in place, it is difficult to see how Australia can meet its international commitments to address climate change, including from the electricity sector.

A. ELECTRICITY SECTOR AND GOVERNANCE

Under the constitutional settlement between the Commonwealth Government and the Australian states at the time of Australia's federation in 1901, the regulation of electricity became largely the purview of the Australian states.[23] Thus, prior to the electricity market reforms of the early to mid-1990s, vertically integrated, state-government-owned monopolies provided all aspects of electricity supply, including generation, transmission, distribution, and retail services to customers. During this period, each state had its own agencies responsible for planning, developing, commissioning, and

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[21] *See, e.g.*, Blueprint for Energy Security in the National Electricity Market: Independent Review, COAG ENERGY COUNCIL (2016), http://coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/Independent%20Review%20ToR-%207%20October%202016.pdf.

[22] *Energy reform is urgent to avert systemic crises*, CLEAN ENERGY COUNCIL (Dec. 13, 2016), https://www.cleanenergycouncil.org.au/news/2016/december/energy-reform-needed.html.

[23] *See Australian Constitution* s 107.

operating their own electricity supply system, with only limited interconnection between the states.[24]

Several reviews of the electricity sector in the early 1990s found the existing market structure inefficient, with low productivity and high barriers to entry.[25] This prompted negotiations between the Commonwealth, states, and territories about the future governance of the electricity sector and the need to implement market competition. The product of these negotiations formed the National Electricity Market Legislation Agreement (NEMLA),[26] which sought to introduce a uniform, single wholesale electricity market across eastern and southern Australia, as well as to harmonize the laws and regulations governing electricity supply in participating jurisdictions. These reforms were designed to facilitate interstate trade, lower barriers to competition, increase regulatory certainty, and improve productivity within the electricity sector as it transitioned from dominance by large, unbundled, state-owned monopolies to privatized corporations. In 1996, the National Electricity Law (NEL) was enacted[27]—in its own right, a major achievement because it was only the second time cooperative legislation had been agreed to and passed by the jurisdictions.[28] Then, in 1998, the National Electricity Market (NEM) commenced operation.

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[24] *See* Commonwealth, *Senate Select Committee on Electricity Prices: Reducing Energy Bills and Improving Efficiency*, Parl Paper No ISBN 978-1-74229-712-5 (2012) 2.10 (2012).

[25] *See* Frederick G. Hilmer, *Independent Committee of Inquiry into Competition Policy in Australia* (1993), http://ncp.ncc.gov.au/docs/National%20Competition%20Policy%20Review%20report,%20The%20Hilmer%20Report,%20August%201993.pdf.

[26] *Australian Energy Market Agreement*, signed 30 June 2004, [2004], https://web.archive.org/web/20130505164040/http://www.ret.gov.au/Documents/mce/_documents/IGA_FINAL_(30JUNE2004)20040713100323200411 12162849.pdf. In 2004, the Commonwealth, state, and territory governments replaced the NEMLA with the Australian Energy Market Agreement (AEMA). This agreement sets the ongoing agenda for a transition from standalone electricity systems to national energy regulation. The AEMA also aims to "promote the long term interests of consumers with regard to the price, quality and reliability of electricity and gas services." *Id.* at 6.

[27] *National Electricity (South Australia) Act 1996*, 44 (Austl.) sch. 1. (1996).

[28] *See National Energy Market: A Case Study in Successful Microeconomic Reform,* AUSTRALIAN ENERGY MARKET COMMISSION 1, 31

1. THE NATIONAL ELECTRICITY MARKET

The NEM is a wholesale electricity market through which producers generate, sell, transmit, and distribute electricity across six jurisdictions in eastern and southern Australia: Queensland, New South Wales (NSW), the Australian Capital Territory (ACT), Victoria, South Australia, and Tasmania. Despite its name, the NEM is not a truly national market, with Western Australia and the Northern Territory continuing to operate as separate markets, because the long distance between these areas and Australia's east coast make efficient interconnection of the grids infeasible.[29] The NEM is made up of approximately "330 large generators, five state based transmission networks (linked by six cross-border interconnectors) and 13 major distribution networks that supply electricity to end use customers,"[30] with an aggregate installed capacity of 47,641 MW.[31] These industry players are physically linked to over 9 million residential and business customers in participating jurisdictions via one of the longest continuous alternating current (AC) transmission networks in the world.[32]

(2013), http://www.aemc.gov.au/getattachment/8c426f7d-ea5c-4823-9b86-510dfd4e82dd/The-National-Electricity-Market-A-case-study-in-mi.aspx.

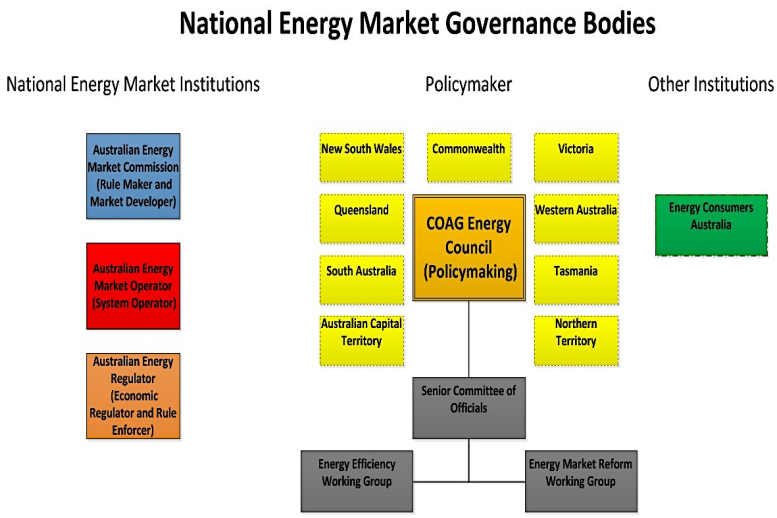
[29] *National Electricity (South Australia) Bill: Second Reading Speech*, S. Austl. Parl. Deb., L. C. 1481 (1996).

[30] AER 2015, *supra* note 20, at 24.

[31] *Id.*

[32] *Id.*

FIGURE 1. GOVERNANCE OF THE AUSTRALIAN NATIONAL ENERGY MARKET



The institutional and governance structures of the NEM are highly complex, as detailed in Figure 1. The key market institutions include (1) the Council of Australian Governments Energy Council,[33]

[33] This entity is made up of the "ministers from the Commonwealth, each state and territory, and New Zealand, with portfolio responsibility for energy and resources." COAG Energy Council, *Terms of* Reference, http://www.coagenergycouncil.gov.au/sites/prod.energycouncil/files/publications/documents/COAG%20Energy%20Council%20Terms%20of%20Reference%20-%20FINAL.pdf. The original form of the COAG (Council of Australian Governments) Energy Council was the Ministerial Council on Energy (MCE), which was established on June 8, 2001. It was designed to be the forum through which the Commonwealth, state, and territory ministers having primary responsibility for energy matters could meet to formulate national energy policy. The role of the MCE is described in cl 4 of the Australian Energy Markets Agreement (AEMA) (as amended on 9 December 2013). Over the past fourteen years, three institutions have held these legally enduring roles and powers: the MCE, from June 8, 2001 through September 16, 2011; the Standing Council on Energy and Resources (SCER), from September 17, 2011 through December 12, 2013; and the COAG Energy Council, from December 13, 2013 to present.

which is the entity responsible for national energy policy; (2) the Australian Energy Market Commission (AEMC), which is the entity responsible for market development as well as rulemaking under the National Electricity Law;[34] (3) the Australian Energy Regulator (AER), which is the entity responsible for implementing the rules, monitoring, and ensuring compliance; (4) the Australian Energy Market Operator (AEMO), which is the system operator and the entity responsible for market development; and (5) the Energy Consumers Australia (ECA), which is charged with promoting the long-term interests of consumers and advocating on their behalf.[35]

These institutions must act in accordance with the National Electricity Objective (NEO). The NEO, in turn, identifies several specific objectives for the National Energy Market. These include "promot[ing] efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to . . . (a) price, quality, safety, reliability and security of supply of electricity; and (b) the reliability, safety and security of the national electricity system."[36]

The NEO has long been criticized,[37] with questions increasingly being asked about whether it is still fit to carry out its purpose. In particular, many observers have expressed concerns that the NEO's narrow focus on the economic interests of consumers limits the ability of the Australian energy market institutions to adequately plan for the long-term future of the electricity sector, especially in relation to growing environmental concerns and sustainability.[38]

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[34] While ostensibly this appears to be a mundane regulatory function, the reality of the operations of the AEMC has been that of a chief policymaker in relation to electricity in the NEM.

[35] *See, e.g.*, *Energy market institutions*, AUSTRALIAN GOV'T DEP'T OF THE ENV'T & ENERGY (2016), http://www.environment.gov.au/energy/markets/energy-market-institutions.

[36] *National Electricity (South Australia) Act*, *supra* note 27, at sch. 1, s 7.

[37] *See, e.g.*, Penelope Crossley, *Review of the Institutional Governance Arrangements of the National Electricity Market*, PUBLIC INTEREST ADVOCAY CTR. (2015).

[38] This may be contrasted with the position of the European Union and China, which both include a focus on sustainability within their equivalent provisions.

2. AUSTRALIA'S ENERGY MIX IN A TIME OF MARKET TRANSFORMATION

The need to prepare for a changing energy mix is acute in Australia, particularly because the Australian electricity sector is one of the most carbon-intensive in the world. In 2014–15, black and brown coal generators accounted for 54% of registered capacity within the NEM and supplied 76% of all output.[39] Gas-powered generators accounted for 20% of registered capacity but only 12% of production.[40] By contrast, hydroelectric generators accounted for 16% of registered generation and supplied just 7% of output, while wind accounted for 6.6% of registered installations but only 4.9% of production.[41]

Despite the current carbon intensity of Australian electricity generation, the above figures are somewhat misleading because small-scale renewables are exempt from registration in the NEM. Taking these resources into account reveals that Australia is currently undergoing a profound electricity market transformation. Over 1.5 million homes currently have residential photovoltaic (PV) solar panels, accounting for the highest penetration of residential PV solar in the world.[42] In fact, in its 2014 State of the Energy Market Report, the AER observed that "solar PV generation reduced grid consumption by 2.9%" in the 2013–14 financial year alone.[43] This trend is expected to continue, with AEMO projecting growth rates in photovoltaic solar installations of approximately 24% annually over the next three years.[44] Further, the first large-scale commercial solar plant came online in 2015, with many more now in the planning or construction phases.

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[39] AER 2015, *supra* note 20, at 27.

[40] *Id.*

[41] *Id.* at 29.

[42] *Id.* at 30.

[43] *State of the Energy Market 2014*, AUSTRALIAN ENERGY REGULATOR 1, 23 (2014), https://www.aer.gov.au/system/files/State%20of%20the%20energy%20market%202014%20-%20Complete%20report%20(A4)_0.pdf [hereinafter AER 2014].

[44] *National Electricity Forecasting Report for the National Electricity Market*, AUSTRALIAN ENERGY MARKET OPERATOR I, ii (2014), http://www.aemo.com.au/-/media/Files/PDF/NEFR_final_published_Nov_2014.pdf.

In addition to the rapid growth of PV in Australia, there is emerging development and commercialization of grid-scale and residential energy storage. While energy storage is already cost-competitive in some rural and remote areas of Australia,[45] UBS predicts that it will be cost-competitive for residential electricity consumers by 2018.[46] Indeed, AGL Energy has suggested that 3 million customers will be either wholly or partially off-grid by 2030.[47] This is likely to have profound impacts on the NEM—and the roles played by the institutions governing it.

B. DOMESTIC CLIMATE REGULATION OF ELECTRICITY

As the fifth-largest exporter of coal and largest consumer of coal per capita in the world, Australia contributes heavily to global carbon emissions.[48] Despite this, climate change policy in Australia is highly politicized and the source of much debate in federal elections.[49] In turn, this has created significant regulatory uncertainty at the Commonwealth level—effectively, a political seesaw over what climate policy in Australia will be.

For example, under the Clean Energy Act of 2011, the Gillard Labor Government introduced the Carbon Pollution Reduction Scheme, which came into force on July 1, 2012. This scheme—which set an effective price on carbon of $23 AUD per ton[50]—was designed to shift from a fixed to a floating carbon price under an

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[45] *See* Jonathan Gifford, *Solar Plus Storage Becoming "New Normal" in Rural and Remote Australia*, RENEWECONOMY (Dec. 4, 2014), http://reneweconomy.com.au/2014/solar-plus-storage-becoming-new-normal-rural-remote-australia-59236.

[46] Giles Parkinson, *UBS: Australian Households Could Go Off-Grid by 2018*, RENEWECONOMY (May 9, 2014), http://reneweconomy.com.au/2014/ubs-australian-households-go-grid-2018.

[47] Giles Parkinson, *AGL Energy Pick New CEO with Eye to Solar and Storage*, RENEWECONOMY (Nov. 18, 2014), http://reneweconomy.com.au/2014/agl-energy-pick-new-ceo-with-eye-to-solar-and-storage-35344.

[48] *New Report Reveals that Australia Is Among the Worst Emitters in the World*, CLIMATE COUNCIL (May 18, 2015), https://www.climatecouncil.org.au/new-report-reveals-that-australia-is-among-the-worst-emitters-in-the-world.

[49] Talberg et al., *supra* note 16.

[50] *Clean Energy Act 2011*, *supra* note 17.

Emissions Trading Scheme after three years. This policy was highly successful in reducing carbon emissions, with the Australian Energy Regulator reporting that in just two years of operation, the scheme helped reduce "output from brown coal fired generators . . . by 16 per cent (with plant use dropping from 85 per cent to 75 per cent), and output from black coal generators . . . by 9 per cent."[51] At the same time, the market share of coal-fired generation "fell to an historical low of 73.6 per cent of NEM output in 2013-14," which in turn "led to a 10.3 per cent fall in emissions from electricity generation over the two years that carbon pricing was in place."[52] However, following a change of federal government, the Carbon Pollution Reduction Scheme was repealed in July 2014, and an alternative Direct Action policy was introduced by the Abbott Liberal/National Government.[53] Following the repeal, Australia's carbon emissions rose for the first time in three years, increasing by 4.3% through June 2015.[54]

Frequent changes to climate action are not uncommon in Australia. As the Research Service at the Australian Parliamentary Library has described:

> Australia's commitment to climate action over the past three decades could be seen as inconsistent and lacking in direction. At times Australia has been an early adopter, establishing the world's first government agency dedicated to reducing greenhouse gas emissions; signing on to global climate treaties the same day they are created; establishing the world's first emissions trading scheme (ETS) (albeit at a state level); and pioneering an innovative land-based carbon offset scheme. But at other times, and for many reasons, Australia has erratically altered course: disbanding the climate change government agency, creating a new one then disbanding that; refusing to ratify global treaties until the dying minute; and being the first nation in the world to undo legislated action

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[51] AER 2015, *supra* note 20, at 8.

[52] *Id.*

[53] *Clean Energy Legislation (Carbon Tax Repeal) Act*, *supra* note 18; *Carbon Farming Initiative Amendment Act*, *supra* note 18.

[54] AER 2015, *supra* note 20, at 8.

> on climate change, with the repeal of the Carbon Price Mechanism.[55]

In short, climate action in Australia has hardly been consistent. That is true across all areas of climate change regulatory policy, and in the electricity sector in particular.

This has led to the Australian states and territories creating their own climate change initiatives, with significant variability among the different jurisdictions. For example, the ACT has committed to achieve 100% renewable energy by 2020.[56] South Australia and Queensland seek to achieve 50% renewables by 2025.[57] And Victoria is targeting a 40% goal by 2025.[58]

This divergence among subnational governments has created real issues within the context of the National Electricity Market, as some states have elected to both encourage very high levels of deployment of intermittent renewable generation and shut down their older coal-fired generators. However, due to the lack of a coordinated national approach, some states are at times dependent on their ability to import baseload fossil fuel generation on an interstate basis across the interconnectors. This, of course, limits the ability of exporting states to change their own energy mixes.

Despite the zigzagging nature of its climate policy, Australia is a signatory of the Paris Agreement. Still, even then, the bipolarity of the nation's approach to climate mitigation remains: Australia has agreed to reduce its emissions in the form of an Intended Nationally Determined Contribution of 26 to 28% of 2005 levels by 2030,[59] and

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[55] Talberg et al., *supra* note 16.

[56] *Policy Options for Australia's Electricity Supply Sector — Special Review Research Report*, AUSTRALIAN GOV'T CLIMATE CHANGE AUTH. 1, 19 (2016), http://climatechangeauthority.gov.au/sites/prod.climatechangeauthority.gov.au/files/files/SR%20Electricity%20research%20report/Electricity%20research%20report%20-%20for%20publication.pdf [hereinafter *Policy Options*].

[57] *Id.*

[58] *Id.*

[59] *Towards a Climate Policy Toolkit: Special Review on Australia's Climate Goals and Policies*, AUSTRALIAN GOV'T CLIMATE CHANGE AUTH. 1, 41 (2016) [hereinafter *Policy Toolkit*], http://climatechangeauthority.gov.au/sites/prod.climatechangeauthority.gov.au/files/files/Special%20review%20Report%203/Climate%20Change%20Authority%20Special%20Review%20Report%20Three.pdf.

it ratified the Paris Agreement on November 9, 2016.[60] But meeting its emissions reductions target will be difficult in the absence of an ETS. Instead, Australia, for now, will rely on two key mechanisms: the Emissions Reductions Fund and the Renewable Energy Target.

1. THE EMISSIONS REDUCTION FUND

The primary mechanism currently used in Australia to reduce emissions is the Emissions Reductions Fund (ERF). The ERF was enacted in 2014 via amendments to the Carbon Credits (Carbon Farming Initiative) Act of 2011 and the Carbon Credits (Carbon Farming Initiative) Regulations Act of 2011, with a recent addition in the form of the Carbon Credits (Carbon Farming Initiative) Rule of 2015. It is a voluntary scheme that aims to provide incentives for the adoption of new practices and technologies that reduce emissions, with the intent of helping Australia meet its 2020 emissions reduction target—5% below 2000 levels—for the second commitment period of the Kyoto Protocol.[61]

The ERF has three key elements: crediting, purchasing, and a safeguard mechanism. Registered participants can earn one Australian carbon credit unit (ACCU) for each ton of carbon dioxide equivalent (tCO_2-e) stored or avoided by an eligible emission reduction project. In order to claim ACCUs, the emission reduction project must conform with the requirements of an approved emissions reduction method. Methods have already been established for a wide range of activities, including agriculture, transport, oil and gas, and the "combustion of coal mine waste gas . . . , improving the energy efficiency of commercial buildings and industrial facilities, reducing energy demand of small users, flaring landfill gas, [using] alternative waste treatment, reforesting and revegetating land and managing savanna burning."[62] The Commonwealth Government has committed $2.55 billion AUD for purchasing ACCUs,[63] with further

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[60] Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, 2016 T.I.A.S. No. 16-1104.

[61] *About the Emissions Reduction* Fund, AUSTRALIAN GOV'T DEP'T OF THE ENV'T & ENERGY (2016), http://www.environment.gov.au/climate-change/emissions-reduction-fund/about.

[62] *Policy Toolkit*, *supra* note 59, at 48.

[63] *Third Auction Secures High Volume at Low Prices*, AUSTRALIAN GOV'T CLEAN ENERGY REGULATOR (May 5, 2016) [hereinafter *Third Auction*

funding possibly available under future budgets. This provides the main source of demand for ACCUs.

Any eligible registered project may participate in the competitive reverse auction process used for ACCUs, which is run by the Clean Energy Regulator.[64] Successful bidders under this process, which is designed to ensure that ACCUs are purchased at least cost, are awarded a carbon abatement contract of up to ten years' duration. Under these contracts, the government purchases the ACCUs earned by the project.[65] In order to prevent bidders from overstating their projected volume of ACCUs, successful bidders must purchase the shortfall amount of ACCUs on the secondary market in order to make good their contractual obligation. There have been three auction rounds thus far under the ERF, with the government contracting 143 $MtCO_2$-e of emissions reductions from 348 projects, at an average price of $12.10 AUD per ton[66]—at a total cost of $1.7 billion AUD.[67]

The third element of the ERF is the safeguard mechanism, which took effect on July 1, 2016.[68] The safeguard mechanism ensures that emissions reductions purchased through the ERF are not offset by significant increases in emissions elsewhere in the economy. It does this by encouraging large businesses (so-called "responsible emitters") not to increase their emissions above a baseline, which will ordinarily be "the highest level of reported emissions over the five years ending in 2013–14."[69] The baseline may be increased "to accommodate economic growth, natural resource availability and other circumstances."[70] For new investments coming online after 2020, "baselines will be set with reference to best practice."[71] In

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Press Release], http://www.cleanenergyregulator.gov.au/ERF/Pages/News%20and%20updates/News-item.aspx?ListId=19b4efbb-6f5d-4637-94c4-121c1f96fcfe&ItemId=253.

[64] *Carbon Credits (Carbon Farming Initiative) Act 2011* (Cth) s 20G(4) (Austl.).

[65] *Id.* at s 20C(1).

[66] *Third Auction Press Release*, *supra* note 63.

[67] *Id.*

[68] *Carbon Farming Initiative Amendment Act 2014*, *supra* note 18, at sch. 2.

[69] *Id.* ss 22XG–22XM; *Policy Toolkit*, *supra* note 59, at 48.

[70] *Policy Toolkit*, *supra* note 59, at 48.

[71] *Id.*

meeting its obligations under the safeguard mechanism, a responsible emitter can either (1) ensure that its facility does not exceed its baseline, (2) generate its own ACCUs under the ERF to meet the shortfall, or (3) purchase ACCUs on the secondary market and then surrender them to offset the emissions. This regulatory measure applies to over 370 facilities across a broad range of industries that create direct emissions of over 100,000 tCO_2-e per year, including electricity generation, mining, oil and gas, manufacturing, transport, and construction and waste,.[72] These facilities collectively account for approximately 50% of Australia's emissions.[73]

2. THE RENEWABLE ENERGY TARGET

The other policy mechanism used in tandem with the ERF is the Australian Renewable Energy Target (RET), which is "projected to reduce emissions by about 200 Mt CO2 e (cumulatively) between 2015 and 2030."[74] The RET was enacted under the Renewable Energy (Electricity) Act of 2000, the Renewable Energy (Electricity) (Small-scale Technology Shortfall Charge) Act of 2010, the Renewable Energy (Electricity) (Large-scale Generation Shortfall Charge) Act of 2000, and the 2001 Renewable Energy (Electricity) Regulations. It is essentially a "technology pull" scheme requiring liable entities to buy renewable energy certificates to meet their RET liability. The RET is divided into two components: the Small-scale Renewable Energy Scheme (SRES) and the Large-scale Renewable Energy Target (LRET).

a. The Small-scale Renewable Energy Scheme

The SRES creates a financial incentive for residential households and small businesses to install eligible small-scale

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[72] *Id.*; *The Safeguard Mechanism*, AUSTRALIAN GOV'T CLEAN ENERGY REGULATOR (Jan. 13, 2016), http://www.cleanenergyregulator.gov.au/ERF/About-the-Emissions-Reduction-Fund/the-safeguard-mechanism.

[73] *See Safeguard Mechanism*, *supra* note 72.

[74] *RET Review Modeling: Market Modelling of Various RET Policy Options*, ACIL ALLEN CONSULTING (2014), http://www.acilallen.com.au/cms_files/ACILAllen_RETReport2015.pdf; *Policy Toolkit*, *supra* note 59, at 45.

renewable energy systems such as solar water heaters, heat pumps, solar PV systems, small-scale wind systems, or small-scale hydro systems.[75] Eligible small renewable systems may create Small-scale Technology Certificates (STCs) at the time of installation, for the amount of electricity the systems are expected to produce or displace during the system's expected lifespan.[76] For example, eligible PV solar systems are permitted to create, at the time of installation, one STC for each megawatt hour (MWh) of eligible renewable electricity over fifteen years of the expected system output.[77] The government has legislated demand for STCs, with RET-liable entities that have an obligation under the LRET also having a legal requirement under the SRES to buy STCs and surrender them.[78] Individual owners of renewable energy systems rarely create and sell the STCs themselves. Rather, accredited installers typically create the STCs and then sell them in larger bundles, offering either a discount on the installation price or cash to the owner in return.[79]

b. The Large-scale Renewable Energy Target

Similar to the SRES, the LRET creates a financial incentive for the installation and expansion of renewable energy generators, including wind farms, concentrated solar thermal projects, and hydroelectric power stations. It does this by legislating demand for Large-scale Generation Certificates (LGCs) through annual targets that must be met by liable entities, such as electricity retailers.[80] In short, the LRET is what other jurisdictions may refer to as a renewable portfolio standard (RPS), a renewable energy standard

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[75] *Renewable Energy (Electricity) Act 2000* (Cth) (Austl.) [hereinafter REE Act].

[76] *Id.* at ss 20B–23E.

[77] *Renewable Energy (Electricity) Regulations 2001* (Cth) reg 19D(2)(d) (Austl.).

[78] REE Act ss 38AA–38AI, *supra* note 75.

[79] *Claiming Small-scale Technology Certificates*, AUSTRALIAN GOV'T CLEAN ENERGY REGULATOR (Sept. 30, 2016), http://www.cleanenergyregulator.gov.au/RET/How-to-participate-in-the-Renewable-Energy-Target/Financial-incentives/Claiming-small-scale-technology-certificates.

[80] REE Act, *supra* note 75, at ss 36–38.

(RES), or a renewable obligation (RO).[81] Under this scheme, one LGC can be created for each MWh of eligible renewable electricity produced by an accredited renewable power station.[82] LGCs can then be sold to liable entities, which surrender them annually to the Clean Energy Regulator to demonstrate compliance with the RET scheme's annual targets.[83] The revenue earned by the renewable energy generator from the trading and sale of their LGCs is in addition to that received for the sale of the electricity generated.[84]

c. The RET Review

In 2014, Australia held an expert RET Review chaired by Dick Warburton, the former Chairman of Caltex Oil in Australia.[85] The Review was launched after the electricity industry raised concerns in the context of declining electricity demand and greater energy efficiency, including the charge that the LRET's volumetric requirement of 41,000 GWh of production from large-scale renewables by 2020 was too high. The industry projected that approximately 27% of electricity would come from renewables,[86] an amount significantly higher than the 20% originally intended when the RET was designed. The Review found that the RET "had led to the abatement of around 20 million tonnes of carbon emissions and, if left in place, would abate a further 20 million tonnes of emissions per year from 2015 to 2030—almost 10 per cent of electricity sector emissions."[87] However, the Review found that while the cumulative impact on household energy bills over the period of the RET was likely to be small, the RET was "an expensive emissions abatement tool that subsidizes renewable generation at the expense of coal fired

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[81] *See, e.g.*, Lincoln L. Davies, *Evaluating RPS Policy Design: Metrics, Gaps, Best Practices, and Paths to Innovation*, 4 KLRI J. OF L. & LEGIS. 3 (2014).

[82] REE Act, *supra* note 75, at s 18(1).

[83] *Id.* at ss 20, 44A.

[84] *Id.* at s 8.

[85] *See* Dick Wharburton et al., *Renewable Energy Target Scheme: Report of the Expert Panel*, COMMONWEALTH OF AUSTRALIA i (2014), http://apo.org.au/system/files/41058/apo-nid41058-82456.pdf [hereinafter WARBURTON REVIEW].

[86] *Id.* at 120.

[87] AER 2014, *supra* note 43, at 30; WARBURTON REVIEW, *supra* note 85, at 60.

electricity generation."[88] The Review thus recommended that, to protect existing generators, the RET be revised to a "real 20 per cent target" for large-scale renewable generation (equivalent to approximately 33,000 GWh), rather than using the current 41,000 GWh production target. The Review suggested this 20% target be achieved through a series of yearly targets, set one year in advance and corresponding to 50% of growth in electricity demand.[89] On June 23, 2015, these changes were adopted through legislative amendments to the existing RET scheme.[90]

C. CLIMATE REGULATORY IMPACTS ON THE ELECTRICITY SECTOR

Australia's electricity sector accounts for almost 35% of Australia's greenhouse gas emissions.[91] Yet the Australian Energy Council[92] recently suggested that to keep global warming to less than 2 degrees Celsius will likely require Australia to reach "net zero greenhouse gas emissions over the next few decades."[93] Such an ambitious effort will require significant change within the Australian electricity sector, which is currently dominated by highly emissions intensive generation. Indeed, in 2013, "the emissions intensity of Australia's electricity supply was around 85 per cent above the OECD average and around 11 per cent above that of China," with electricity emissions "projected to remain flat to 2020."[94]

More problematic, two of the most successful Australian climate change policies used to reduce emissions from the electricity sector—the price on carbon and the RET—have either been entirely repealed or significantly scaled back. This has had a direct and tangible impact on the electricity sector. While coal-fired generation

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[88] AER 2014, *supra* note 43, at 30; WARBURTON REVIEW, *supra* note 85, at 18.

[89] WARBURTON REVIEW, *supra* note 85, at iii–iv.

[90] *See Renewable Energy (Electricity) Amendment Act 2015* (Cth) (Austl.).

[91] *Australia's Climate Policy Options – Special Review Second Draft Report*, AUSTRALIAN GOV'T CLIMATE CHANGE AUTHORITY 1, 31 (2015), http://climatechangeauthority.gov.au/sites/prod.climatechangeauthority.gov.au/files/SpecialReport2/Options%20paper%20Final.pdf.

[92] The Australian Energy Council is the body representing electricity generators and retailers.

[93] *Policy Options*, *supra* note 56, at 19.

[94] *Id.* at 23.

output fell by 12% over the two years that carbon pricing was in place, the output of brown coal rose by 10% from 2014–15 after carbon pricing was abolished.

By contrast, the ERF appears to have had less of a direct impact on electricity generators than other policy initiatives, particularly prior to the introduction of the safeguard mechanism. No electricity generation projects participated in the first two rounds of ERF auctions.[95] Beginning in July 2016, however, the electricity industry became subject to a sector-wide baseline as part of the safeguard mechanism. The baseline was set by reference to the sector's highest historical annual emissions over the reference period.[96]

The effectiveness of this safeguard mechanism as an efficient means of reducing emissions remains to be seen. What is clear is that given the long timeframes and high capital costs associated with investments in the electricity sector, stakeholders need more regulatory and policy certainty if Australia's electricity industry is to reduce its emissions intensity going forward.

III. GREAT BRITAIN

Great Britain (GB)[97] is a pioneer in moving its energy sector into private hands and creating consistent standards for operating its energy markets. Great Britain's membership in the European Union (EU) has had significant implications for its energy and environmental policy, influencing its adoption of targets for both

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[95] AER 2015, *supra* note 20, at 8. The vast majority of projects in these rounds were "sequestration projects that trap carbon through measures such as planting trees and storing carbon in soil; landfill and waste related projects; and bushfire prevention through savannah burning."

[96] *Id.*

[97] While the United Kingdom of Great Britain and Northern Ireland have collective climate change goals, energy regulation and policy treats Northern Ireland (NI) as largely separate, with its own electricity regulator and close links to electricity provision in the Republic of Ireland. Great Britain (England, Scotland, and Wales) is commonly treated as a single unit, though there are significant examples of devolved powers being applied to climate change targets and renewable and energy efficiency generation and industrial policy in these separate jurisdictions. Thus, this Part discusses the climate policy of Great Britain's electricity sector, although policy directives established at both the EU and UK level are relevant.

reducing climate change emissions and increasing renewable energy production. The likely withdrawal of the United Kingdom (UK) from the EU creates significant uncertainty regarding ongoing commitments in both of these areas. A number of UK politicians have already raised the possibility of a clearing of environmental and other regulations subsequent to withdrawal. The future of climate regulation in Great Britain, then, is murky indeed.

A. ELECTRICITY SECTOR AND GOVERNANCE

Globally, Great Britain was one of the first jurisdictions to liberalize its electricity sector. The 1989 Electricity Act divided the publicly held utilities and passed most of them into private hands.[98] Generation was sold to two private companies specializing in fossil fuel generation and to one nuclear company, which retained its government subsidy. State-owned regional distribution and supply became privately held, the former as regulated monopolies and the latter competing for consumers. Three transmission companies emerged from the privatization. Two smaller grids in Scotland are now owned by Scottish & Southern Electricity Networks and by SP Energy Networks. The transmission network in England and Wales is owned by National Grid plc, which also acts as the GB-wide System Operator, with responsibility for all aspects of balancing the grid. The privatization also created the Office of Electricity Regulation (OFFER), which in 2000 merged with the gas regulator to create an overarching energy regulator, the Office of Gas and Electricity Management (Ofgem).

The primary purpose of this restructuring was to minimize electricity costs by ensuring competition and applying rigorous price controls to network regulation. Over time, however, Ofgem's priorities have evolved, reflecting rising social concerns over equitable and environmental issues such as fuel poverty and climate change. Most recently, security of supply concerns related to the UK's falling capacity margin also have become particularly politically salient and are now reflected in Ofgem's priorities.

Since privatization, the initial three generation companies have been joined by many others. Over 90% of power consumption is supplied by the "Big Six" companies: the French state provider

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[98] Electricity Act 1989, c. 29 (UK).

EDF, RWE and Eon (both German), Scottish Power (Spanish-owned), and British Gas and SSE, both of which are listed on the London Stock Exchange. Each of these companies has traditional thermal as well as renewable generation arms, with EDF also importing some power through a 2 GW interconnection with France. Further interconnections tie Great Britain to the Netherlands (1 GW), Northern Ireland (500 MW), and the Republic of Ireland (500 MW). Plans for further interconnections are currently underway.[99] The UK also continues to have a nuclear fleet, but with one exception, that fleet is nearing the end of its life, so its capacity has begun to diminish.[100] The current government supports the growth of new nuclear capacity, in part as a way to address both climate change and energy security. This position can be seen most prominently in the government's support for new reactors in a partnership between EDF and a Chinese company, the so-called Hinkley Point C plant, which will have a 3.2 GW capacity, or roughly 7% of all UK generation.[101] This project is scheduled for opening in 2026, and the UK government plans for further development of up to 16 GW more in nuclear capacity with these partners and others.[102]

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[99] *Electricity Interconnectors*, OFGEM, https://www.ofgem.gov.uk/electricity/transmission-networks/electricity-interconnectors (last visited Nov. 18, 2016).

[100] *Cf., e.g.*, *Toshiba Woes Expose Fragility of UK's Future Electricty* Supply, FINANCIAL TIMES (Feb. 14, 2017), https://www.ft.com/content/c8cb5fb6-f2ca-11e6-8758-6876151821a6;, *Engineering the UK Electricity Gap*, INSTITUTION FOR MECHANICAL ENGINEERS (2016), http://www.imeche.org/docs/default-source/position-statements-energy/imeche-ps-electricity-gap.pdf?sfvrsn=0; *Electricity Capacity Assessment*, ofgem (Oct. 5, 2012), https://www.ofgem.gov.uk/ofgem-publications/40203/electricity-capacity-assessment-2012.pdf.

[101] *See, e.g.*, *Hinkley Point: UK Approves Nuclear Plant Deal*, BBC NEWS (Sept. 15, 2016), http://www.bbc.com/news/business-37369786; Stephen Castle, *Hinkley Point Nuclear Plant Will Go Ahead, Britain Says*, N.Y. TIMES (Sept. 15, 2016), https://www.nytimes.com/2016/09/16/world/europe/britain-hinkley-point.html?_r=0.

[102] Dep't of Energy & Climate Change, *Planning our Electric Future: A White Paper for Secure, Affordable and Low-Carbon Electricity*, UK GOV'T (2011), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48129/2176-emr-white-paper.pdf; Grant Harris et al., *Cost Estimates for*

It is important to note that both energy policy and climate change policy in Great Britain are strongly influenced by commitments at the European level. The main routes of influence are via collective negotiations concerning delivery of targets for emission reductions and for renewable energy uptake, and via the adoption of directives to formalize agreements that can touch upon both areas. Thus, EU directives (essentially acts of law at the EU level) establish targets, but EU Member States decide how to reach their agreed national goals via policies selected at their own national levels. There are, however, some limits on the latitude Member States enjoy. One key limit is EU legislation on State Aid. This legislation restricts how national spending can be directed, with the specific goal of preventing Member States from directing funds preferentially to benefit national competitiveness.[103]

Significant EU legislation impacting UK energy policy includes the 2001 and 2009 Renewable Energy Directives,[104] the 2012 Energy Efficiency Directive,[105] the 2004 CHP Directive,[106] and the 2001

Nuclear Power in the UK, 62 ENERGY POL'Y 431**,** 431–42 (2013); Emily Cox et al., *Understanding the Intensity of UK Policy Commitments to Nuclear Power* (University of Sussex Science Policy Research Unit, Working Paper No. SWPS 2016-16, Sept. 26, 2016).

[103] On EU energy governance generally, *see, e.g.*, House of Lords EU Comm., 6th Rep. of Session 2015-16: EU Energy Governance (Dec. 18, 2015), https://www.publications.parliament.uk/pa/ld201516/ldselect/ldeucom/71/71.pdf; Mehmet B. Karan & Hasan Kazdagli, *The Development of Energy Markets in Europe*, *in* FINANCIAL ASPECTS IN ENERGY: A EUROPEAN PERSPECTIVE 11 (2011), http://pierrepinson.com/31761/Literature/karan2011.pdf; *2030 Energy Strategy*, EUR. COMM., https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/2030-energy-strategy (last visited May 18, 2017).

[104] Directive 2009/28/EC, of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, 2009 O.J. (L 140/16), http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0028&from=en; Directive 2001/77/EC, of the European Parliament and of the Council of 27 September 2001 on the Promotion of Electricity Produced from Renewable Energy Sources in the Internal Electricity Market, 2001 O.J. (L283) 33.

[105] Directive 2012/27/EU, of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and

Large Combustion Plant Directive.[107] A new renewable energy directive is expected to be agreed to shortly, codifying Member State commitments on renewables for the period beyond 2020.

B. DOMESTIC CLIMATE REGULATION OF ELECTRICITY

As a signatory to both the Kyoto Protocol and the Paris Agreement, the United Kingdom has agreed to substantially reduce its climate emissions. Specifically, the United Kingdom agreed to aim for a reduction in emissions of 12.5% against the 1990 baseline under the Kyoto Protocol, and eventually achieved a 22% reduction in the target period of 2008-12.[108] Post-Kyoto, the EU's current 20:20:20 commitments seek to reduce emissions by 20%, stimulate energy consumption from renewables by 20%, and improve EU-wide energy efficiency by 20%, all by 2020. Under the 2009 EU directive legislating these goals, the United Kingdom agreed to an emissions reduction of 16% by 2020 against 2005 emissions.[109] The United Kingdom ratified the Paris Agreement in November 2016, and has also taken some of the steps required by Member States to implement

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2006/32/EC, 2012 O.J. (L 315/1), http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32012L0027&from=EN.

[106] Directive 2004/8/EC, of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC, 2004 O.J. (L 52/50), http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32004L0008&from=EN.

[107] Directive 2001/80/EC, of the European Parliament and of the Council of 23 October 2001 on the limitation of emissions of certain pollutants into the air from large combustion plants, 2001 O.J. (L 309/1), http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32001L0080&from=en.

[108] Dep't of Energy & Climate Change, *UK Progress Towards GHG Emissions Reduction Targets*, UK GOV'T (2015), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414241/20150319_Progress_to_emissions_reductions_targets_final.pdf [hereinafter *UK Progress Towards GHG Emissions Reduction Targets*].

[109] Directive 2009/28/EC, of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, 2009 O.J. (L 140/16).

plans to achieve appropriate emission reductions under the Agreement post-2020.[110]

Although EU Member States have wide latitude to select their own policy instruments to meet these goals, the EU itself has erected its own measures to facilitate compliance. The most notable shared instrument for climate change emission reduction is the EU Emissions Trading Scheme (EU-ETS). The EU-ETS is a cap-and-trade approach to emissions reduction. It applies to bodies with significant energy use, including power stations and factories, across all twenty-eight EU Member States, plus Norway, Iceland, and Liechtenstein. Thus, it covers sectors accounting for almost 50% of CO_2 emissions. Under the scheme, all applicable parties are assigned emissions allowances, and excess emissions require purchase of more allowances while excess allowances can be sold to other parties. The mechanism has been repeatedly criticized for affording an overabundance of allowances, a resulting low carbon price, and the effect of undermining incentives for innovation in low carbon energy.[111]

UK commitments to reduce climate emissions do not hinge entirely on international and EU treaties, however. The UK previously set for itself a legally binding national target of reducing emissions by 80% by 2050, against its baseline 1990 figures,[112] exercising its right to adopt a more ambitious goal than required by its EU commitment. Progress against these figures is reviewed through a five yearly carbon budget. Currently, in the second budget

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[110] *UK Climate Action Following the Paris Agreement*, COMM. ON CLIMATE CHANGE (2016), https://www.theccc.org.uk/wp-content/uploads/2016/10/UK-climate-action-following-the-Paris-Agreement-Committee-on-Climate-Change-October-2016.pdf; Dep't for Bus. Energy & Indus. Strategy, *UK ratifies the Paris Agreement*, UK GOV'T (Nov. 18, 2016), https://www.gov.uk/government/news/uk-ratifies-the-paris-agreement. There has been some suggestion renegotiation in this area may not occur once the UK leaves the EU.

[111] *See, e.g.*, Timothy Laing et al., *The Effects and Side-Effects of the EU Emissions Trading Scheme*, 5 WILEY INTEDISC. REVS.: CLIMATE CHANGE 509, 509–19 (2014).

[112] Climate Change Act 2008, c. 27 (Eng.).

period, the UK must reduce emissions by 50% by 2025 and 57% by 2030.[113]

To achieve both its EU and domestic targets, the United Kingdom has developed and implemented a suite of policy devices. These include laws on renewables, energy efficiency, carbon pricing, and emissions performance.

1. RENEWABLE ELECTRICITY

The government introduced its first policy to incentivize large-scale renewable energy sources for electricity (RES-E) in 1990: the Non-Fossil Fuel Obligation (NFFO), an auction mechanism for contracts on a per MWh basis.[114] Specifically, the NFFO offered contracts to RES-E technologies on a competitive basis within technology categories.[115] A primary objective of the NFFO was to subsidize the nuclear sector, which had fallen on economic hard times following the 1990 privatization, with renewables acting as something of a fig leaf for this provision.[116] Using this program, the government collected roughly £1 billion per year from 1990 to 1998 using a tax applied to consumers via supply companies, with nuclear claiming 99% of this initially, although that proportion fell to 90% in 1998. RES-E accounted for the remainder until an EU ruling that forced the government to cease nuclear support and cut the NFFO to around £100 million a year, solely for RES-E.[117]

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[113] *Carbon budgets: how we monitor emissions targets,* COMM. ON CLIMATE CHANGE, https://www.theccc.org.uk/tackling-climate-change/reducing-carbon-emissions/carbon-budgets-and-targets/ (last visited Nov. 21, 2016). All figures are against a 1990 baseline.

[114] *See, e.g.*, Geoff Kelly, *Renewable Energy Strategies in England, Australia, and New Zealand*, 38 GEOFORUM 326, 328 (2007); David Toke & Volkmar Lauber, *Anglo-Saxon and German Approaches to Neoliberalism and Environmental Policy: The Case of Financing Renewable Energy*, 38 GEOFORUM 677, 681 (2007).

[115] Catherine Mitchell & Peter Connor, *Renewable Energy Policy in the UK 1990-2003*, 32 ENERGY POL'Y 1935, 1935–47 (2004).

[116] Catherine Mitchell, *The England and Wales Non-Fossil Fuel Obligation: History and Lessons*, 25 ANN. REV.OF ENERGY & THE ENV'T 285, 285–312 (2000); *see also* Davies, *supra* note 81, at 16-23.

[117] Mitchell & Connor, *supra* note 5, at 1935–47.

In 2002, the United Kingdom replaced the NFFO with the Renewables Obligation (RO), an RPS-style mechanism using tradable green certificates (TGCs). The RO was initially technology neutral and engendered upticks in RES-E capacity, particularly wind energy and biomass, which were the cheapest options available.[118] In 2009, however, the government amended the RO to encourage a broader range of technologies, most notably offshore wind, after a review suggested that this technology was essential to achieving the EU-mandated RE targets.[119] Specifically, the 2009 amendments adopted a new "banding" structure for the RO, removing the initial technology-blind approach and instead setting technology-specific targets within the umbrella RO renewable energy goal.[120]

The RO aimed primarily at deploying larger scale RES-E, with an attempt to apply it to smaller applications leading to poor administrative efficiency.[121] Thus, in 2010, the government added a feed-in tariff (FIT), which sought to support smaller scale installations of up to 5 MW. The FIT was immediately effective. It

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[118] *Id.*

[119] Geoffrey Wood & Stephen Dow, *What Lessons Have Been Learned in Reforming the Renewables Obligation? An Analysis of Internal and External Failures in UK Renewable Energy Policy*, 39 ENERGY POL'Y 2228, 2230-34 (2011).

[120] Bridget Woodman & Catherine Mitchell, *Learning From Experience? The Development of the Renewables Obligation in England and Wales 2002-2010*, 39 ENERGY POL'Y 3914, 3914–21 (2011); Dep't of Energy & Climate Change, *The UK Renewable Energy Strategy*, UK GOV'T (2009), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228866/7686.pdf.

[121] *Renewables Obligation: Annual Report 2007–2008*, OFGEM (2009), https://www.ofgem.gov.uk/ofgem-publications/58192/annual-report-2007-08version-4-pdf. For more on different types of renewable energy support mechanisms, including their relationship to climate policy, *see generally*, *e.g.*, William Dean, *Interactions Among Market Mechanisms for Reducing Greenhouse Gas Emissions in California*, 29 ELECTRICITY J. 17, 20–22 (2016); Shahrouz Abolhosseini & Almas Heshmati, *The Main Support Mechanisms to Finance Renewable Energy Development*, 40 RENEWABLE & SUSTAINABLE ENERGY REVS 876, 801–881, 884 (2014); Lincoln L. Davies, *Incentivizing Renewable Energy Deployment: Renewable Portfolio Standards and Feed-In Tariffs*, KLRI J. OF L. & LEG. 39 (2011), https://ssrn.com/abstract=2007935 [hereinafter *Incentivizing Renewable Energy Deployment*]; Lori A. Bird et al., *Implications of Carbon Cap-and-Trade for U.S. Voluntary Renewable Energy Markets*, 36 ENERGY POL'Y 2063 (2008).

led to rapid growth in PV particularly, aided by a global downturn in PV prices that coincided with the FIT's introduction. The result was an increase in PV capacity from 10 MW in 2010 to 11.4 GW in December 2016.[122] However, while the rapidly falling global price of PV panels aided the FIT's success, it also provided a tough political test for this mechanism, since the compensation levels set by the law quickly fell out of line with real world price drops, which in turn led to excessive payments and uncapped expansion of total public costs.[123] Indeed, controversy soon erupted over reductions in the tariff as the government tried to bring down the level of support while seeking to balance continued renewables growth and cost effectiveness. Nonetheless, growth in RES-E deployment under the FIT continued, even with various rounds of cuts to the tariff rate, although further substantial cuts in January 2016 appear to have flattened growth through that year.[124]

Currently, the RO is being phased out and replaced with a new mechanism, Contracts for Difference (CfD), to comply with E.U. legislation requiring minimization of costs for supporting RES-E by all EU Member States by 2017.[125] The CfD applies a competitive auction for contracts for new RES-E generation. Winning bids receive the difference between a reference price (representing the market price based on the day-ahead market) and the strike price (which is set by the highest winning bid in each technology category). This policy device comes with its own risks. High market prices mean it is possible contracted generators might have to pay funds back to the contracting party. There thus remains an onus on the contracting generator to maximize income from

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[122] Dep't for Bus., Energy & Indus. Strategy, *Solar Photovoltaics Deployment*, UK GOV'T (May 29, 2014), https://www.gov.uk/government/statistics/solar-photovoltaics-deployment#history [hereinafter *Solar Photovoltaics Deployment*] (updated Mar. 30, 2017).

[123] Saed Alizamir et al., *Efficient Feed-In-Tariff Policies for Renewable Energy Technologies*, 64 OPERATIONS RES. 52, 52–66 (2016).

[124] *Solar Photovoltaics Deployment*, *supra* note 122.

[125] Pablo del Río & Pedro Linares, *Back to the Future? Rethinking Auctions for Renewable Electricity Support*, 35 RENEWABLE & SUSTAINABLE ENERGY REVS. 42, 42–56; Pablo del Río et al., *Identification of Alternative Policy Options to Auctions for RES-E Support*, AURES (2016), http://auresproject.eu/sites/aures.eu/files/media/documents/aures_d6_1_final.pdf.

electricity sales, since it is possible to earn below the amount of the reference price. Further, as with the NFFO, the CfD ties subsidization of new nuclear capacity and RES-E support together. It is possible this may cause problems for RES-E in the future, as the total fund is now capped through the Levy Control Framework (LCF).[126]

[126] *See* Matthew Lockwood, *The UK's Levy Control Framework for Renewable Electricity Support: Effects and Significance*, 97 ENERGY POL'Y, 193, 193–201 (2016). The LCF is a budget framework put in place by the UK Government to limit total allowable public spending on renewable energy and some other energy sources. Until 2010, there was no limit on financial support, although mechanisms such as the RO had built in limits on spending. The coalition government elected in 2010 introduced an upper limit as part of the UK's first feed-in tariff for RES-E and the first support mechanism for renewable energy sources of heat. Both of these could theoretically have undefined upper costs, so there was some justification for this. The limit was formalized as the LCF shortly thereafter.

The LCF limits the total spending across various financial support instruments, including the FIT, RO, and the CfD. A key drawback of the LCF, however, is it creates considerable uncertainty for renewable energy planning. This is because the LCF only includes the top-up element of the CfD strike price. High future electricity prices mean little requirement for top-up from the reference (or market) price to the strike price, but low future electricity prices mean a much larger top-up (and thus, a much greater draw down from the LCF). This draw down clearly has substantial implications for forward planning regarding investment in renewables, since the UK Government has already shown its willingness to skip auctions rounds under the CfD.

Further, the CfD also includes the expected subsidy spending on new nuclear power stations. Since there is considerable uncertainty concerning when new nuclear capacity will come online, this creates problems with predicting drawdown from the LCF. To address this, a strike price of £92.50 (2012 prices) was agreed to for all power from the UK's first new proposed plant, Hinkley Point C, rising with inflation and available for the first thirty-five years of production. A second nuclear facility at Sizewell would engender a price of £89.50 (2012 prices) for production across both plants. This has led to at least one commentator to suggest that the LCF is poorly designed and already in need of reform, while acknowledging the political difficulties of supporting environmental goals in an era of squeezed incomes. Public subsidy for carbon capture and storage (CCS) was originally tied into the LCF mechanism. However, this was withdrawn in 2015.

2. ENERGY EFFICIENCY

The UK also has committed to improving energy efficiency as part of its obligation under EU climate change policy. Accordingly, the government has introduced a number of policy instruments on energy efficiency, including the Climate Change Levy (CCL). The CCL is a simple tax, introduced in 2001 and applied to all electricity, coal, and gas delivered to commercial and industrial consumers. The CCL was initially set and frozen at 0.43p/kWh, but since has been increased in line with inflation from 2007.[127] Thus, by increasing the total price of electricity, the CCL sought to decrease power production from carbon-emitting sources and, in turn, drive down GHG emissions. Renewables initially were exempted from the tax, providing them with a slight competitive advantage.[128] However, beginning in 2015, electricity production from renewables was made subject to the tax.[129] Electricity from nuclear power has been subject to the tax since its introduction.[130]

3. CARBON PRICING

The Electricity Market Reform (EMR) that introduced the CfD also implemented other mechanisms aimed at mitigating the climate change impacts of Great Britain's electricity market. Most prominently, the carbon floor price (CFP) was introduced with the intent of providing stability for carbon prices that the volatile EU-ETS failed to afford. Specifically, the CFP set a minimum carbon price in the UK, with the idea that this would incentivize low carbon technologies. As Figure 2 details, the initial UK carbon floor price, established in 2012, exceeded many projections of the EU-ETS price going forward. Despite this excess, in 2014, the government

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[127] DEPT. FOR BUS., ENERGY & INDUS. STRATEGY, *Environmental Taxes, Reliefs and Schemes for Businesses*, UK GOV'T https://www.gov.uk/green-taxes-and-reliefs/climate-change-levy (last updated Mar. 27, 2017). Nuclear was taxed despite an absence of carbon emissions, but renewable electricity was exempt until 2015. Prior to this date, the effect was to slightly change the economics of renewable adoption.

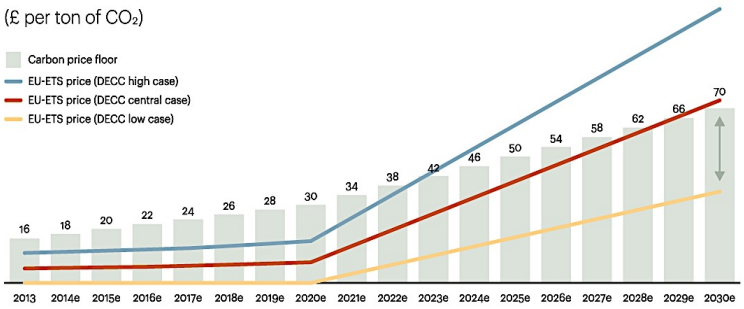
[128] HER MAJESTY'S REVENUE & CUSTOMS, *Excise Notice CCL1/4: Electricity from Renewable Sources*, UK GOV'T https://www.gov.uk/government/publications/excise-notice-ccl14-electricity-from-renewable-sources (last updated Apr. 20, 2016).

[129] *Id.*

[130] *Id.*

announced that it would freeze the CFP at £18/tCO_2 from 2016 to 2019 in order to avoid undermining national competitiveness.[131] This change reflects the shift in the UK from a coalition government to a Conservative government following the 2015 elections.

FIGURE 2. INITIAL PROJECTION OF CFP VERSUS EU-ETS PRICES



4. EMISSIONS PERFORMANCE

The other relevant Electricity Market Reform mechanism is the Emissions Performance Standard (EPS). The EPS will place an upper limit of 450 grams of CO_2/kWh[132] on emissions from new power stations, unless the facilities are CCS-enabled. This is because the UK presently considers CCS a useful method for maintaining its fossil-fuel-thermal-generation fleet while continuing to decarbonize production. Initially, in 2007, the government offered a £1 billion subsidy to bring a CCS-enabled power station online by 2014.[133] However, because of concerns over cost escalation, no contract was

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[131] *Carbon Price Floor: Reform and Other Technical Adjustments*, HER MAJESTY'S REVENUE & CUSTOMS (2014), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/293849/TIIN_6002_7047_carbon_price_floor_and_other_technical_amendments.pdf.

[132] Energy Act 2013, c.32 (UK).

[133] *See* ENERGY AND CLIMATE CHANGE COMMITTEE, FUTURE OF CARBON CAPTURE AND STORAGE IN THE UK, 2015-16, HC 692, at 6 (UK).

signed.[134] A later attempt in 2012 to offer a capital subsidy of £1 billion to two preferred bidders, with additional support from the CfD mechanism, likewise failed. In late 2015, the government withdrew unexpectedly from the arrangement, citing a lack of funding.[135] Now, no further progress is expected. Given the EPS, this suggests that no new coal-power stations will be built in the United Kingdom in the short- or medium-term.

C. CLIMATE REGULATORY IMPACTS ON THE ELECTRICITY SECTOR

Although the UK has used a number of policy devices over time to regulate the climate impact of the electricity sector, there are a number of important commonalties that can be drawn from them. This is perhaps most apparent in the government's successive adoptions of the NFFO, RO, and CfD as the main instruments for promoting large-scale renewable electricity installations.

First, the motivation for adopting both the RO and the CfD reflects the government's goal of minimizing interference with the wider electricity market. Subsidies through the RO had to be won competitively, while generators also competed in the electricity market. Similarly, the CfD requires RES-E generators to maximize market value. By contrast, as with other FIT schemes across Europe, the British FIT mechanism directly interferes with the cost prioritization of energy sources in the market, since the scheme compels supply companies to pay for all power from eligible FIT recipients. Precisely because of this, the government resisted a FIT to support large-scale RES-E in favor of the RO, and only relented when the RO proved too expensive administratively for promoting smaller scale installations.[136]

Second, the selection of these mechanisms to support RES-E reflects a deep political tension in Britain between ensuring low-cost energy and mitigating climate change. Just as there is clear evidence that the RO's methodology of creating a market for certificates was favored for minimizing market interference, it is likewise plain that this preference for market function reveals a political desire to keep

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[134] *See id.*

[135] *See id.* at 7.

[136] *See Renewables Obligation: Annual Report 2007–2008*, *supra* note 121, at 2.

costs down. The same desire can be seen in the selection of the CfD and the explicit rejection of a FIT as an alternative. It also has been argued that the top-up element of the strike price within the CfD will mean that RES-E (and contracted nuclear) generators will be incentivized to continue generating, even when the market price becomes negative. This has not yet happened in Britain, but increasing volumes of intermittent generation may make it a possibility in the future, where high production intersects with low demand. The top-up element of the CfD actively incentivizes generators to produce more power when less supply might be preferable. Addressing this concern, the government has now ruled that CfD contracts do not pay out where prices fall below zero, and that no strike prices will be paid in periods where negative pricing persists for over six hours.[137] Nonetheless, where the price remains low but above zero, there remains the issue that RES-E generators with CfD contracts will be incentivized to keep generating until the market price hits zero, as they will continue to receive the full strike price for each unit generated.

Third, the actual operation of these devices shows how difficult matching policy design to desired performance can be. The RO was selected on the basis that its competitive elements would provide the greatest downward pressure on costs, thus minimizing taxpayer burden.[138] In retrospect, however, evidence comparing performance of quota regimes like the RO and tariff mechanisms in Europe suggests this choice did not achieve the optimal economic efficiency that was one of the key justifications for its adoption.[139] This was, in part, why a FIT became necessary, in addition to the desire to promote smaller scale installations. The government has since welcomed the auction format of the CfD to encourage RES-E generators to engage with the market to maximize income, thus making effective management of their companies even more important. As noted above, however, operational problems may arise

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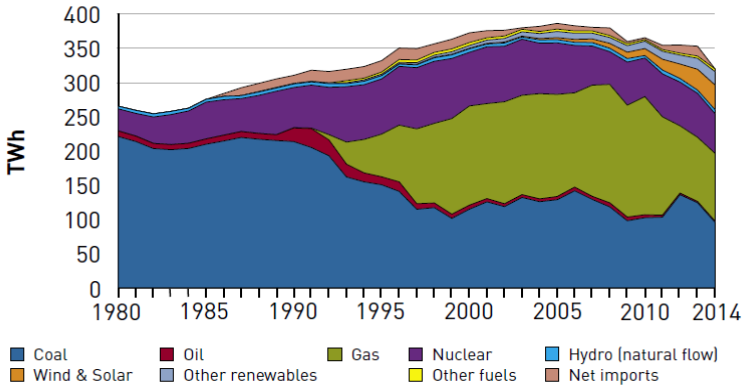
[137] *See Negative Pricing in the GB Wholesale Electricity Market*, BARINGA 1, 5 (2015), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/441809/Baringa_DECC_CfD_Negative_Pricing_Report.pdf.

[138] *See* Catherine Mitchell et al., *Effectiveness Through Risk Reduction: A Comparison of the Renewable Obligation in England and Wales and the Feed-in System in Germany*, 34 ENERGY POL'Y 297, 299 (2006).

[139] *See generally id.* at 302–04.

as this approach progresses, though it is too early to draw conclusions.

FIGURE 3. U.K. ELECTRICITY CONSUMPTION BY FUEL INPUT, 1980-2014[140]



Despite these lessons, the UK met its Kyoto Protocol targets each year from 2008-2012.[141] This was a result of the shift to gas generation, mild weather, and an increase in renewable energy generation. Specifically, the UK achieved an overall reduction of 34.9% in GHG emissions from 1990 to 2014.[142]

It should be emphasized that the majority of this displacement was driven by economic rather than environmental motivations, even as national policies seeking to limit emissions were instituted. The UK benefitted in meeting its emissions reduction targets from a phenomenon known as the "dash for gas."[143] That is, the 1990

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[140] Dep't of Energy & Climate Change, *UK Energy in Brief 2015*, NAT'L STAT. 1, 26 (2015), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/516837/UK_Energy_in_Brief_2015.pdf.

[141] *UK Progress Towards GHG Emissions Reduction Targets*, *supra* note 108.

[142] EEA Technical Report, *Approximated EU GHG Inventory: Proxy GHG Estimates for 2014*, EUR. ENV'T AGENCY 1, 9 (2015), http://www.eea.europa.eu/publications/approximated-eu-ghg-inventory-2014 (follow "Approximated EU GHG inventory: proxy GHG estimates for 2014 - Full report.pdf [3.4 MB]" hyperlink to download).

[143] DIETER HELM, ENERGY, THE STATE, AND THE MARKET: BRITISH ENERGY POLICY SINCE 1979 (Oxford University Press ed., 2004); DEP'T FOR

liberalization of the electricity market created the opportunity for new supply companies to diversify and for new sector entrants to generate and sell power.[144] The most cost-effective way to generate power at the time was through construction of combined-cycle gas plants, which benefitted from smaller scale and modularity, resulting in lower bulk-capital costs and comparatively low gas prices.[145] Further, since the 2008 global economic downturn, the UK has reduced electricity consumption and enjoyed the attendant emission-reduction benefits.[146] Figure 3 details both these effects.

IV. SOUTH KOREA

The Republic of Korea, commonly known as South Korea (hereinafter Korea) has achieved economic growth through its heavy dependence on energy-intensive and export-oriented industries. As a result, this nation quickly has become one of the world's largest energy consumers and a major greenhouse gas emitter, ranking seventh in the world for both categories in 2013. To address these trends, beginning in 2008 Korea has initiated a series of active policies and measures to combat climate emissions, including Asia's first nationwide cap-and-trade system. Yet despite these efforts, the Korean electricity sector's overall dependency on fossil fuels really has not changed. Even under the much-publicized "Green Growth" initiative, the government permitted dozens of new coal-fired power plants to meet its projected energy demand. Going forward, then, finding a way for the Korean government to bridge the discrepancy between its progressive climate policies and its more traditional electricity policies remains a key challenge.

BUS., ENERGY & INDUS. STRATEGY (2017), *Updated Energy and Emissions Projections 2016*, UK GOV'T (2017), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/599539/Updated_energy_and_emissions_projections_2016.pdf.

[144] HELM, *supra* note 143; *Updated Energy and Emissions Projections 2016*, *supra* note 143.

[145] HELM, *supra* note 143; *Updated Energy and Emissions Projections 2016*, *supra* note 143.

[146] HELM, *supra* note 143; *Updated Energy and Emissions Projections 2016*, *supra* note 143.

A. ELECTRICITY SYSTEM AND GOVERNANCE

Korea has achieved dramatic economic growth over the past few decades, which in turn has led to an ever-increasing demand for energy. In 2015, Korea was the ninth largest consumer of primary energy in the world[147] and the eigth largest consumer of electricity globally.[148] On both counts, this ranks Korea as the eighth-largest consumer of energy in the world.[149] Despite its high energy consumption, Korea's domestic energy reserve is limited. Korea imports more than 95% of its fuel from foreign countries, making it one of the top energy importers globally.[150] Indeed, in 2014, Korea was the second largest importer of liquefied natural gas (LNG) in the world, the fourth largest importer of coal, and the fifth largest net importer of total petroleum and other liquids.[151]

Fossil fuel-fired power plants make up a significant portion of the country's installed generation capacity. Although natural gas-fired plants account for the largest proportion of the nation's generation fleet, baseload generation is provided mainly from coal and nuclear power, while natural gas meets peak demand.[152] Overall, natural gas accounts for 28.7% of installed capacity, while coal makes up 28.2% and nuclear 22.2%.[153] By contrast, the current generation mix of Korean electricity production is 39.1% coal, 30%

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[147] BP, *Statistical Review of World Energy 2016*, 1, 42 (2016), http://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2016/bp-statistical-review-of-world-energy-2016-full-report.pdf.

[148] *Global Energy Statistical Yearbook 2016*, ENERDATA, https://yearbook.enerdata.net/electricity-domestic-consumption-data-by-region.html (last visited May 17, 2017).

[149] Ministry of Trade, Industry, and Energy & Korea Energy Agency, NEW & RENEWABLE ENERGY WHITE PAPER 2016, 1, 56.

[150] Country Analysis Brief: South Korea, U.S. ENERGY INFO. ADMIN. 1, 1 (last updated Jan. 19, 2017), https://www.eia.gov/beta/international/analysis_includes/countries_long/Korea_South/south_korea.pdf.

[151] *Id.* at 5, 9, 11 & 13.

[152] *Jechilcha Jeollyeok Sooguen Gibon Gyehyeok (2015-2029)*, [The 7th Basic Plan for Long-term Electricity Supply and Demand: 2015–2029] (July 24, 2015), https://www.kpx.or.kr/eng/selectBbsNttView.do?key=328&bbsNo=199&nttNo=14547&searchCtgry=&searchCnd=all&searchKrwd=&pageIndex=1&integrDeptCode= (click file "7th_Basic_Plan_English_20160303.pdf" to download) [hereinafter The 7th BPE].

[153] *Id.* at 6.

nuclear, 21.4% natural gas, and 1.5% oil.[154] Hydropower and renewable energy account for only 4.1% of electricity production.[155]

The state-owned Korea Electric Power Corporation (KEPCO) controls almost all aspects of electricity generation, transmission, distribution, and retail sales in Korea. In 2001, KEPCO's generation assets were divided into six separate subsidiary power generation companies. Although this initial restructuring included plans to subsequently divest KEPCO of these subsidiaries, the reform stalled in 2004, and KEPCO still owns each of them.[156] Besides KEPCO, a few independent power producers (IPPs) participate in the Korean electricity market. KEPCO and its subsidiaries produce about 83% of all generation, and IPPs produce the remaining 17%.[157] The Korea Electric Power Exchange (KPX), also established in 2001 as part of the electricity sector reform, coordinates the wholesale electric power market and determines prices sold between generators and the KEPCO grid. Generation companies compete to sell power into an hourly auction pool operated by the KPX, with KEPCO acting as a single buyer. The auction pool is a "cost-based pool," meaning that

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[154] *Id.*

[155] Korea Electric Power Co., Annual Report (Form 20-F, 36) (Apr. 26, 2016). This is data based on the Korean definition of "new and renewable" energy. Based on international categories, only 1.6% of electricity comes from renewable energy. NEW & RENEWABLE ENERGY WHITE PAPER, *supra* note 149, at 742.

[156] The 1999 "Basic Plan for Electricity Industry Restructuring" included a step-by-step action plan for transforming the Korean electricity industry from a state-owned monopoly to a privatized industry operating in a competitive power market. In summary, the first phase was to spin off several generation companies from KEPCO's generation division to introduce competition in the supply of wholesale power. The second phase worked toward gradual privatization of generation companies. And the third phase was to unbundle the distribution segment from the transmission segment and introduce a freely competitive retail market. Currently, only the first phase has been implemented. For further discussion of Korea's electricity sector reform, *see* Maria Vagliasindi & John Besant-Jones, *Chapter Eight: Republic of Korea*, *in* POWER MARKET STRUCTURE: REVISITING POLICY OPTIONS 193–204 (World Bank, 2013), http://documents.worldbank.org/curated/en/795791468314701057/pdf/761790PUB0EPI00LIC00pubdate03014013.pdf; Russell Pittman, *Which Direction for South Korean Electricity Policy?*, 3 KOREAN ENERGY ECON. REV. 145, 145–87 (`2014).

[157] Korea Electric Power Co., Annual Report, *supra* note 155.

the generation companies are required to bid at their variable cost of operations.[158] However, end-use electricity prices in Korea are heavily regulated by the government,[159] are not necessarily tied to the actual cost of service, and remain far below the levels of other economically developed countries.[160] That is, the electricity tariff pricing system, designed to protect agricultural and industrial consumers, historically has not reflected the true costs of generation and distribution, and has not provided incentives to conserve electricity.[161] While the Korean consumer price index increased by 254% from 1982 to 2011, electricity prices increased by only 30% in the same period.[162]

Within the government, the Ministry of Trade, Industry and Energy (MOTIE) leads energy policy development and implementation. The Basic Energy Act had governed all aspects of the country's energy policy until the new Framework Act on Low Carbon and Green Growth (Framework Act) was enacted in 2010.[163]

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[158] Pittman, *supra* note 156, at 156.

[159] *See id.* at 147. MOTIE must approve all changes in end-use electricity prices. Even the wholesale competition process remains tightly regulated, including separate power auctions and wholesale price ceilings for baseload (nuclear and coal) and mid-level and peak (natural gas and oil) electricity, as well as plant-specific capacity payments.

[160] Sangho Ji & Ijung Jang, *Hangukgwa OECD Jooyogookgagan Jeongiyogeum Soojoon Bikyoboonsok* [Comparative Analysis of Electricity Price among Korea and major OECD member countries, CEO Report], KEPCO ECON. & MGMT. RESEARCH INST. 1, 5-6 (July 17, 2013).

[161] *See* Pittman, *supra* note 156, at 155. Prices paid by residential, commercial, and educational customers have traditionally been set by government regulation at levels at or above their costs of service, while prices paid by industrial and agricultural customers have been set below cost.

[162] *Energy Policies of IEA Countries: The Republic of Korea 2012 Review*, INT'L ENERGY AGENCY 1, 99 (2012), https://www.iea.org/publications/freepublications/publication/Korea2012_free.pdf.

[163] The Framework Act was enacted in January 13, 2010. Article 8 of the Framework Act (Relationship with other Acts) indicates that it takes priority over all other laws regarding low carbon and/or green growth. Accordingly, the Basic Energy Law was amended on the same date. The Framework Act was most recently amended on April 18, 2017. *See* Framework Act on Low Carbon, Green Growth, Act No. 11965, July 30, 2013 (S. Kor.), *translated in* National Korean Law Information Center, http://www.law.go.kr/lsInfoP.do?lsiSeq=142380&chrClsCd=010203&urlMode=engLsInfoR&viewCls=engLsInfoR#0000 [hereinafter Framework Act].

That law both addressed energy and established Korea's climate change agenda. Korea's energy policy includes forecasting a long-term energy mix and announcing that in the form of the Basic Energy Plan, which is mandated by the Framework Act.[164]

The second Basic Energy Plan, adopted in 2014, revised down the share of nuclear capacity in the previous plan and increased the share of fossil fuel-fired generation. This was due to the combination of a nuclear safety scandal in Korea and the Fukushima disaster in Japan.[165]

As an electricity policy, the Electricity Utility Act requires MOTIE to prepare and publish a Basic Plan for Long-term Electricity Supply and Demand (BPE) every two years. The BPE is a lower-level plan within the Basic Energy Plan. It details the policy direction for the electricity sector, including supply and demand forecasts, a capacity plan, and infrastructure needs. The most recent BPE, announced in July 2015, forecasts annual demand growth at 2.2%.[166] According to that plan, a total of forty-seven powerplants are either under construction or are planned for construction, to meet Korea's growing electricity demand by 2029. These include thirteen nuclear reactors, twenty coal plants, and fourteen gas plants, together totaling 46,487 MW of new installations.[167]

B. DOMESTIC CLIMATE REGULATION OF ELECTRICITY

Since 1990, Korean greenhouse gas emissions have doubled, with total emissions reaching 572 metric tons in 2013, making Korea the world's seventh largest greenhouse gas emitter—and the fastest growing emission source among the OECD's thirty-four

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The Energy Act was most recently amended on July 1, 2015. *See* Energy Act, Act No. 12931, Apr. 14, 2010, *translated in* National Korean Law Information Center, http://www.korealaw.go.kr/lsInfoP.do?lsiSeq=98472&chrClsCd=010203&urlMode=engLsInfoR&viewCls=engLsInfoR#0000.

[164] Framework Act, *supra* note 163, art. 41.

[165] For a detailed analysis of Korea's climate change and nuclear energy policy, *see* Siwon Park, *Korea's Nuclear Energy Policy in the Climate Era – Policy Change after the Fukushima Accident*, 37 KOREA ENVTL. L. REV. 223, 223–62 (2015).

[166] The 7th BPE, *supra* note 152.

[167] *Id.*

industrialized countries.[168] Likewise, Korea's cumulative emissions for the past fifty years (1971–2013) rank as eleventh most in the world.[169]

In part to address this, Korea has actively promoted "green growth" initiatives, primarily under the administration of former President Lee Myung-bak, who took office in 2008. The Lee administration's green growth agenda sought to make an active response to climate change by reducing emissions while also ensuring energy security and promoting job creation in the field.[170]

In anticipation of the 2009 climate change summit in Copenhagen, Korea pledged to reduce GHG emissions by 30% relative to the country's projected business-as-usual level by 2020. In December 2009, the National Assembly then passed the Framework Act on Low Carbon Green Growth (Framework Act), which included various policy measures to mitigate greenhouse gases. Most notably, this included an emissions trading system, carbon disclosure, and promotion of renewable energy.[171] Based on the Framework Act, the government later passed the Enforcement Decree of the Framework Act, which established Korea's 30% GHG mitigation target and made that target legally binding.[172] The Lee administration also decided to replace Korea's prior feed-in-tariff system with a renewable portfolio standard, beginning in 2012.[173]

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[168] Statistics: CO_2 Emissions from Fuel Combustion, Highlights, INT'L ENERGY AGENCY 1, 12 (2016), https://www.iea.org/publications/freepublications/publication/CO2EmissionsfromFuelCombustion_Highlights_2016.pdf.

[169] Onsilgaseu Gamchugmogpyo [Korean Greenhouse Gas Information Center], http://www.gir.go.kr/home/index.do?menuId=22#biz_con4 (last visited Apr. 24, 2017).

[170] For more information on Korea's green growth initiative, *see Green Growth, Now and the Future*, COMMITTEE ON GREEN GROWTH, http://www.greengrowth.go.kr/download/green-eng-bro.pdf

[171] Framework Act, *supra* note 163.

[172] Enforcement Decree of the Framework Act on Low Carbon, Green Growth, Presidential Decree No. 24474, Mar. 23, 2013, art. 25(1) (S. Kor.), *translated in* National Korean Law Information Center, http://www.law.go.kr/lsInfoP.do?lsiSeq=136485&chrClsCd=010203&urlMode=engLsInfoR&viewCls=engLsInfoR#0000.

[173] *See* Lincoln L. Davies & Kirsten Allen, *Feed-in Tariffs in Turmoil*, 116 W. VA. L. REV. 937, 937 (2014).

The idea was to stimulate domestic investment in the renewable energy sector, which the FIT had failed to achieve.[174]

Following the Lee administration, in 2013, Park Geun-hye assumed the presidency. Her administration seemed noticeably less interested in a climate change agenda, especially compared to her predecessor. Nonetheless, in January 2014, the government announced a "Roadmap for Achieving National GHG Reduction Target," which laid out detailed implementation plans to meet the nation's emissions reduction goal. This Roadmap reconfirmed the prior reduction targets for each sector of the economy. Specifically, it projected that Korea's greenhouse gas emissions will reach 776 million tons of CO_2 equivalent by 2020, and stated that the country will aim to reduce those emissions by 30%, or to 543 million tons of CO_2 equivalent.[175] Reduction targets for each of the seven major economic sectors were set: 34.4% in transport, 26.9% in building, 26.7% in power generation, 18.5% in industry, 12.3% in waste, and 5.2% in agriculture.[176]

To prepare for the Paris Agreement in 2015, the Korean government quickly updated the greenhouse emissions reduction goals. In that regard, the government announced it would reduce its GHG emissions by 37% from its 2030 emission projection. This commitment, however, drew criticism from both within and outside of the country as too weak, especially considering Korea's significant contribution to global emissions.[177]

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[174] *See id.*

[175] *Gookga Onshilgas Gamchukmokpyo Dalsungeul Wihan Roadmap* [Roadmap to Achieve National Greenhouse Gas Mitigation Target], COLLABORATED MINISTRIES 11. *See also Greenhouse Gas Reduction Road Map*, MINISTRY OF THE ENV'T, http://eng.me.go.kr/eng/web/index.do?menuId=212 (last visited Apr. 24, 2017).

[176] *Id.*

[177] *See* Choi Hyeonjung & Lee Soo-hyun, *Not Good Enough: South Korea's 2030 Carbon Mitigation Target and the INDC*, CTR. FOR GLOB. GOVERNANCE 8–16 (Oct. 29, 2015), http://en.asaninst.org/contents/not-good-enough-south-koreas-2030-carbon-mitigation-target-and-the-indc-2/; *see also Tracking (I)NDCs*, CLIMATE ACTION TRACKER, (last updated Nov. 8, 2016), http://climateactiontracker.org/indcs.html.

Today, to achieve these emissions reduction goals, Korea is implementing two key systems to alter its electricity sector: an emissions trading scheme and a renewable portfolio standard.

1. EMISSIONS TRADING SCHEME

In May 2012, under former president Lee Myung-bak, the government promulgated the Act on the Allocation and Trading of Greenhouse Emission Permits, which established a cap-and-trade emissions trading scheme (ETS) for greenhouse gas emissions.[178] This was the first national emission trading scheme in Asia. The Korean ETS started on January 1, 2015, after two years of delay due to opposition from industry. The ETS covers facilities emitting more than 25,000 CO_2 equivalent annually, representing 525 of the country's largest emitters, or about 68% of national greenhouse gas emissions.[179] The government set emissions caps and reduction targets for each trading period. Three initial phases have been outlined. The first phase runs from 2015 to 2017, the second from 2018 to 2020, and the third from 2021 to 2025.[180] In the first phase, all carbon allowances were offered for free. The government will offer 97% of allowances for free in the second phase and less than 90% in the third phase.[181] The remainder will be auctioned.[182] Energy-intensive and trade-exposed (EITE) companies will receive

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[178] Act on the Allocation and Trading of Greenhouse—Gas Emission Permits, Act No. 11690, Mar. 23, 2013 (S. Kor.), *translated in* National Korean Law Information Center, http://www.law.go.kr/lsInfoP.do?lsiSeq=137271&chrClsCd=010203&urlMode=engLsInfoR&viewCls=engLsInfoR#0000.

[179] *Korea Emissions Trading Scheme*, INT'L CARBON ACTION P'SHIP, ETS DETAILED INFO. 1, 1 (last updated Mar. 14, 2017), https://icapcarbonaction.com/en/?option=com_etsmap&task=export&format=pdf&layout=list&systems%5B%5D=47.

[180] *Id.* at 2.

[181] *Id.*

[182] Enforcement Decree of the Act on the Allocation and Trading of Greenhouse Gas Emission Permits, Presidential Decree No. 24429, Mar. 23, 2013, art. 13 (S. Kor.), *translated in* National Korean Law Information Center, http://www.law.go.kr/lsInfoP.do?lsiSeq=135892&chrClsCd=010203&urlMode=engLsInfoR&viewCls=engLsInfoR#0000.

100% of their allowances for free in all phases, a concession made to address international competitiveness concerns.[183]

Banking and borrowing of credits is allowed under the ETS, although borrowing is limited to 10% of all permits.[184] Offsets are also allowed up to 10% of all emissions. Overseas offsets will be permitted beginning in the third phase.[185] The government may also adjust or cancel allowances under the certain circumstances, including unexpected facility expansion or shutdown.[186] Non-complying facilities may be penalized in an amount equivalent to or less than three times the average market prices of allowances, or KRW 100,000 per ton.[187]

Just a few months before the ETS was implemented, the new Park Geun-hye administration loosened the regulation in response to the business sector. Specifically, the government increased allowances by 10% for all sectors above the initial allowance plan. For the power generation sector, the government set the allowances to the level of actual mitigations in 2013 and 2014, further reducing the mitigation burden.[188]

Initially, the Ministry of Environment was designated as the single authority to administer and manage the ETS. This included all key responsibilities—allocation planning, decision of scope of covered entities, determination of allowances, management of the allowance register, allowance certification, imposition of fines, and

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[183] *See* Act on the Allocation and Trading of Greenhouse—Gas Emission Permits, *supra* note 178, at art. 12.4 (this act creates the exemption); *see also* Enforcement Decree of the Act on the Allocation and Trading of Greenhouse Gas Emission Permits, *supra* note 182, at art. 14 (this decree contains the list of criteria for eligible businesses).

[184] Enforcement Decree of the Act on the Allocation and Trading of Greenhouse Gas Emission Permits, *supra* note 182, at art. 36.

[185] *Id.* at art. 38.

[186] Act on the Allocation and Trading of Greenhouse-Gas Emission Permits, *supra* note 178, at art. 23.

[187] *Id.* at art. 33.1.

[188] *See* Press Release, Ministry of Strategy & Finance, Government to Implement Emissions Trading System in 2015, Postpone Implementing Low Emission Vehicle Standards Until 2020 (Sept. 2, 2014) (S. Kor.), http://english.mosf.go.kr/skin/doc.html?fn=[MOSF%20Press%20Release]%2030th%20Ministerial%20Meeting%20on%20the%20Economy.pdf&rs=/result/upload/mini/2014/09/.

fact-finding research.[189] However, in February 2016, the government transferred implementation authority to the Ministry of Strategy and Finance. The government also designated the Prime Minister's Office as the central authority for all climate change-related policy, instead of the Ministry of Environment. The stated rationale for these moves was to establish better coordination and implementation of the climate change policy.[190] Yet, many critiqued this new institutional arrangement as an effort to be more business friendly while diminishing the role of the Ministry of Environment.[191]

It is too early to discern the ETS's impact. In the first year-and-a-half of operation, trade under ETS has been limited.[192] At the end of the first year of phase one, total emissions of all facilities covered by the system were reported to be 542.6 million tons of CO_2 equivalent, or about 6.1 million tons of CO_2 equivalent less than the

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[189] *See* Enforcement Decree of the Act on the Allocation and Trading of Greenhouse Gas Emission Permits, *supra* note 182, at art. 6; *see also* Act on the Allocation and Trading of Greenhouse-Gas Emission Permits, *supra* note 178, at art. 7 (listing various multi-ministry consultative bodies that have been organized among the Ministry of Environment, the Ministry of Trade, Industry and Energy, the Ministry of Land, Infrastructure and Transport, and the Ministry of Agriculture, Food and Rural Affairs, such as the Emission Allowance Allocation Committee, the Allocation Approval Committee, and the Allowance Certification Committee).

[190] Press Release, Prime Minister's Secretariat, Enhancement of institutional arrangement for effective implementation of Paris Agreement (Feb. 25, 2016) (S. Kor.), http://www.pmo.go.kr/pmo/news/news01.jsp?mode=view&article_no=88980&board_wrapper=%2Fpmo%2Fnews%2Fnews01.jsp&pager.offset=0&search:search_key:search=article_title&search:search_val:search=%25C6%25C4%25B8%25AE%25C7%25F9%25C1%25A4&board_no=6.

[191] Park Eli Sejong, *Go to the Ministry of Strategy and Finance for Greenhouse System*, ETODAY (Feb. 25, 2016), http://www.etoday.co.kr/news/section/newsview.php?idxno=1294837.

[192] Ministry of Strategy & Finance, *Baechulgwon Goereje Shihang 1-nyeon, Jindangwa Pyunga* [The first year of implementing ETS, assessment and evaluation], NAT'L ASSEMBLY CLIMATE CHANGE FORUM 1, 7 (Aug. 24, 2016). According to the government data, 1.8 million tons of allowance units (KAU) were traded and 2.9 million tons of offset units (KCU) were traded, totaling 70.9 billion KRW (about 60 million USD) as of June 2016. The allowance price ranges from 15,000 to 20,000 KRW (about 13 to 16 USD).

total allowance cap set by the government.[193] This suggests that there was an over-allocation in the first phase.

2. RENEWABLE PORTFOLIO STANDARD

Korea's renewable energy generation is among the lowest in the OECD.[194] In 2013, Korea's renewable energy use accounted for only 1% of total primary energy supply and 1.6% of total electricity supply.[195] By source, waste and bioenergy account for the majority of renewable energy production in Korea (60% and 24.3%, respectively), while solar and wind account for only small fractions of renewables use (4.7% and 2.1% in 2014).[196] A notable feature of Korean renewable energy law is that it includes non-renewable resources, including gasified coal, gasified heavy residual oil, and fuel cells; these are counted as eligible "new energy" resources.[197] Further, Korean law defines waste energy to include non-renewable—and environmentally controversial—industrial waste. Korea's broad definition of "new and renewable energy" thus explains, at least in part, the country's low reliance on other renewables, such as wind and solar.[198]

As noted, the government replaced Korea's feed-in tariff mechanism with this renewable portfolio standard in 2012.[199] Korea's RPS scheme requires the largest public and private power

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[193] *Id.* at 9.

[194] *Energy Policies of IEA Countries*, *supra* note 162, at 10, 96.

[195] NEW & RENEWABLE ENERGY WHITE PAPER, *supra* note 149, at 740–42.

[196] *See id.* at 734–35. In regard to electricity generation, waste accounts for 53.3%, biomass 17.3%, solar 9.5%, and wind 4.3%.

[197] Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy, Act No. 13087, art. 2, Jan. 28, 2015 (S. Kor.), *translated in* National Korean Law Information Center, http://www.law.go.kr/lsInfoP.do?lsiSeq=167700&chrClsCd=010203&urlMode=engLsInfoR&viewCls=engLsInfoR#000.

[198] *See* NEW & RENEWABLE ENERGY WHITE PAPER, *supra* note 149, at 734, 740–42 (explaining the discrepancy between domestic and international renewable energy data). For example, in 2013, the domestic statistics show that new and renewable energy accounted for 3.52% of all energy supply, while international statistics estimated the share as 1%.

[199] Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy, *supra* note 197, at art. 12.5.

companies—those with installed capacity greater than 500 MW—to steadily increase their use of renewables for electricity generation through 2022. Specifically, the initial RPS set targets at 2% electricity from renewables in 2012, elevating to 10% by 2022.[200] However, RPS targets are reviewed and adjusted every three years. As of 2017, the obligated generators include eighteen power companies, but the RPS's end target of 10% has been delayed to 2024.[201]

Compliance under the Korean RPS functions in two ways. First, in order for power companies to meet their RPS targets, they can either invest in renewable energy installations themselves or purchase tradable certificates—RECs—on the market.[202] Second, non-complying power companies must pay a financial penalty up to a 50% above the average market price of RECs for that year.[203] The number of RECs allocated for electricity from renewable sources varies depending on the technology used, the location, and the size of the installation.[204]

Within the general RPS target, the government also set a mandatory quota for solar PV specifically for each year.[205] After reaching 1,971 GWh of solar PV production, however, the government concluded that the mandatory quota had sufficiently facilitated expansion of PV and thus terminated the quota at the end of 2015.[206]

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[200] *See generally Renewable Portfolio Standards (RPS),* KOREA ENERGY AGENCY, http://www.energy.or.kr/renew_eng/new/standards.aspx (last visited Apr. 24, 2017).

[201] *Id.*

[202] Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy, *supra* note 197, at art. 12.5.

[203] *Id.* at art. 12.6.

[204] *Korea Energy Master Plan: Outlook and Policies to 2035*, MOTIE – MINISTRY OF TRADE, INDUS. AND ENERGY 1, 118 (2014), http://www.motie.go.kr/common/download.do?fid=bbs&bbs_cd_n=72&bbs_seq_n=209286&file_seq_n=2.

[205] *See* Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy, *supra* note 197, at art. 12.5(2).

[206] Sin-eneoji mich jaesaeng-eneoji gaebal · iyong · bogeub chogjinbeob sihaenglyeong [Enforcement decree of the Act on the Promotion of the Development, Use and Diffusion of New and Renewable Energy], Presidential Decree No. 27660, Dec. 5, 2016, art. 18.4(3), app. 4 (S. Kor.).

During the first four years of RPS implementation, 6,041 MW of new eligible generation were installed. This stands in stark contrast to Korea's experience with its former FIT regime. The new RPS has already yielded six times more installations than what the prior FIT regime led to in ten years of operation.[207] The compliance rate of RPSs has increased from 64.7% in 2012 (4.154 million RECs) to 90.2% in 2015 (12.486 million RECs).[208] A close analysis of compliance patterns shows that generators tend to use energy sources that are easily accessed and convertible with fossil fuels, such as imported wood pallets. As a result, wood pallet imports to Korea have increased at an unprecedented rate,[209] and compliance with the RPS has been achieved mainly by relying on biomass. Compliance figures for 2014 indicated 32.2% use of biomass, 14.1% use of fuel cells, 11.6% use of solar PV, and 7.4% use of wind.[210]

C. CLIMATE REGULATORY IMPACTS ON THE ELECTRICITY SECTOR

Today, Korea's electricity sector accounts for about 35% of Korea's greenhouse gas emissions—a sharp increase from 1990, when it accounted for only 12% of emissions. The electricity sector thus leads the nation's overall emissions growth. This growth mainly resulted from decreased reliance on nuclear power and increased use of coal plants in Korea, which in 2012 accounted for 77% of GHG emissions within the sector compared to 48% in 1990.[211] More importantly, coal's growing prominence in Korea's energy mix is only expected to continue under the nation's long-term energy

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[207] NEW & RENEWABLE ENERGY WHITE PAPER, *supra* note 149, at 697.

[208] *Id.*

[209] *See* INT'L TRADE ADMIN., *2016 Top Markets Report Renewable Fuels: Country Case Study*, U.S. DEP'T OF COM., 1, 2 (2016), http://trade.gov/topmarkets/pdf/Renewable_Fuels_South_Korea.pdf (reporting that from 2013 to 2014, imports quadrupled from 485 million kg to 1.85 billion kg).

[210] *RPS Jedo Hyunhwang mit Hyanghoo Junmang* [*The Status of RPS and its Prospect*], KOREA ENERGY AGENCY (Jan. 2016).

[211] Suyi Kim & Sung-Kyun Kim, *Decomposition Analysis of the Greenhouse Gas Emission in Korea's Electricity Generation Sector*, 7 CARBON MGMT. 249, 249–60 (2016); *see also* GREENHOUSE GAS INVENTORY & RES. CTR. OF KOR., 2015 NATIONAL GREENHOUSE GAS INVENTORY REPORT OF KOREA 37 (2015).

plans.[212] The second Basic Energy Plan adopted in 2014, which will drive Korea's energy policy through 2035, revised down the share of nuclear capacity from the previous plan (from 41 to 29%) and increased the share of fossil fuel energy[213]—while keeping renewable energy production at the same level (11%) as in the previous plan. Further, the government forecasted that total energy demand will double by 2035, and said that it plans to meet this demand by installing twenty additional coal plants by 2029.

So far, then, Korea's climate change policies have had very limited impact on the nation's electricity sector. Although Korea's new emission trading scheme includes the electricity industry, and its RPS mandates increased use of renewables for power generation, those policies have done little to transform the sector to date. There are several fundamental reasons for this.

First, end-use electricity prices are heavily regulated by the government and remain artificially low compared to other economically developed countries. As a result, electricity consumption has skyrocketed over the past few decades, with a growth rate much higher than that of the overall energy sector. This demand control failure has pushed the government to increase electricity supply and grant licenses to build new power plants. Against rising opposition to nuclear energy following the Fukushima Daiichi disaster in neighboring Japan, Korea plans to meet this energy demand primarily through new fossil-fuel energy plants.

Second, electricity planning in Korea has not been compatible with climate change planning. Under the Framework Act on Low Carbon and Green Growth, green growth plans take top priority, and energy and climate change plans are subordinate to these economic goals. Further, energy plans and climate change plans are prepared separately by different agencies, through different planning processes. In particular, the Basic Plan for Long Term Electricity Supply and Demand (BPE) has been prepared and drafted solely by MOTIE, a government agency with a top policy priority of sufficient electricity supply and no real focus on the national greenhouse gas

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[212] *See* The 7th BPE, *supra* note 152; *see also Korea Energy Master Plan*, *supra* note 204.

[213] *Korea Energy Master Plan*, *supra* note 204, at 9.

mitigation target.[214] Only in 2013, following a controversy pertaining to the sixth BPE, which included plans for a massive expansion in coal plants, did the Electricity Utility Act direct MOTIE to: (1) "make effort" to align its plans with the national GHG mitigation target; (2) consult with other ministries, including Ministry of Environment; and (3) conduct public hearings before finalizing a plan.[215]

Third, the cost-based operation of the Korean electricity market does not give sufficient attention to climate change considerations. Under the current merit-order dispatch system, which the Korea Power Exchange uses to identify the generation units that will supply electricity during each hour and at what price, the generation unit with the lowest variable cost is awarded first priority of operation.[216] Thus, less carbon-intensive gas power plants cannot win bids over coal plants, and climate emissions are exacerbated.[217] As a result, electricity from gas plants is currently used only during peak times, when it can supplement coal and nuclear baseload generation.

Therefore, under the current structure of Korea's electricity market and policy, major climate change regulations, including the ETS and RPS, are necessarily constrained in their effects. Until there is a fundamental change in Korea's supply-focused electricity policy, including improved coordination between electricity and climate change policy planning, Korean dependence on coal will only continue. Potentially, that change is already coming. A significant amendment of the Electricity Utility Act, adopted in March 2017 and set to take effect on June 22, 2017, requires consideration of

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[214] *See* Cheolhung Cho & Eui-chan Jeon, *Is Energy Policy Compatible with Climate Change Policy?*, 13 KOREAN ENERGY ECON. REV. 199–230 (2014) (showing the projection of GHG emissions according to the sixth BPE will exceed the 2020 GHG emissions target of the electricity sector, which is a 26.7 reduction from the BAU scenario); *see also* IJIN KIM & SOOCHUL KIM, *A Study on National Plans for Greenhouse-gas Reduction*, KOR. ENV'T INST. 87 (2013–17).

[215] Electric Utility Act, Act No. 12612, art. 25.2, 25.5, 25.7, May 20, 2014 (S. Kor.), *translated in* National Korean Law Information Center, http://www.korealaw.go.kr/lsInfoP.do?lsiSeq=154034&chrClsCd=010203&urlMode=engLsInfoR&viewCls=engLsInfoR#0000.

[216] *See* Korea Electric Power Co., Annual Report, *supra* note 155, at 30.

[217] Natural gas used in Korea is all liquefied natural gas imported by ship, with a price higher than imported coal.

environmental impacts and public safety in both the operation and planning of the electricity.[218] This amendment reflects the growing concern over the safety of nuclear plants and the deleterious impacts on air quality from coal plants. The amendment is expected to change the current electricity dispatch system to encourage operation of natural gas plants while discouraging coal and nuclear power. Meanwhile, GHG emissions from the nation's electricity sector continue to increase, although the impact of this new amendment remains to be seen.

V. UNITED STATES

Although the United States has a strong reputation for—and a long history of—environmental protection, the nation often is seen as lagging behind in climate change mitigation efforts. This is due in part to the United States' significant contribution to global climate emissions. The United States ranks second globally in greenhouse gas (GHG) emissions,[219] consistently comprising about a tenth or more of worldwide GHG emissions since 1990.[220] These contributions, moreover, are high due in part to the way the United States regulates electricity. It is well-documented that U.S. energy governance is fractured and fragmented,[221] and that this is

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[218] Electric Utility Act, Act No. 12612, *amended by* Act No. 9680, May 21, 2009 (S. Kor.). In March 21, 2017, Articles 3.2 and 3.3 were newly added to Electricity Utility Act.

[219] *See, e.g.,* Duncan Clark, *Which Nations are Most Responsible for Climate Change?*, THE GUARDIAN (Apr. 21, 2011, 15:40 BST), https://www.theguardian.com/environment/2011/apr/21/countries-responsible-climate-change; *see also Biggest Contributors To Global Warming In The World By Country*, WORLD ATLAS (last updated Feb. 9, 2017), http://www.worldatlas.com/articles/biggest-contributors-to-global-warming-in-the-world.html.

[220] *See Summary of GHG Emissions for United States of America*, U.N. CLIMATE CHANGE SECRETARIAT 1, 1 (2012), http://unfccc.int/files/ghg_emissions_data/application/pdf/usa_ghg_profile.pdf; *see also Total Greenhouse Gas Emissions*, THE WORLD BANK, http://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE?end=2013&start=1960&view=chart (last visited Jan. 2017).

[221] *See, e.g.*, Lincoln L. Davies, *Alternative Energy and the Energy-Environment Disconnect*, 46 IDAHO L. REV. 473 (2010); Amy J. Wildermuth, *Is Environmental Law a Barrier to Emerging Alternative Energy Sources?,* 46 IDAHO L. REV. 509 (2010); Amy J. Wildermuth, *The Next Step: The*

particularly true in the electricity sector, where statutes like the New Deal-era Federal Power Act[222] continue to draw bright lines between what parts of government can shape the sector and how.[223] As a consequence of this regulatory fragmentation, as well as sharp divides politically in the United States over what efforts should be taken to combat climate change, U.S. climate policies have been very much a piecemeal, start-and-stop proposition. The electricity sector's response, in turn, also has been less than uniform. Over roughly the last decade, the United States seemed increasingly poised to begin mitigating the climate impacts of its electricity sector, both through federal efforts like the Clean Power Plan and state efforts such as renewable portfolio standards. Following the recent election of Donald J. Trump as president, however, there is now much doubt about the future of climate regulation in the United States.

A. ELECTRICITY SECTOR AND GOVERNANCE

The U.S. electricity grid is composed of three primary interconnections: the Western Interconnection, which runs roughly from the Pacific Ocean to just east of the Continental Divide; the Eastern Interconnection, which runs from its seam with the Western Interconnection to the Atlantic Ocean; and the Electricity Reliability Council of Texas (ERCOT), which covers much of that state.[224] In addition, Alaska and Hawaii have independent electricity systems separate from those in the continental United States.[225]

Integration of Energy Law and Environmental Law, 31 UTAH ENVTL. L. REV. 369 (2011).

[222] Federal Power Act, 16 U.S.C. §§ 791(a)–828c (2016).

[223] *See generally, e.g.*, Joel B. Eisen, *Smart Regulation and Federalism for the Smart Grid*, 37 HARV. ENVTL. L. REV. 1 (2013); Alexandra B. Klass & Elizabeth J. Wilson, *Interstate Transmission Challenges for Renewable Energy: A Federalism Mismatch*, 65 VAND. L. REV. 1801 (2012); Hari M. Osofsky & Hannah J. Wiseman, *Dynamic Energy Federalism*, 72 MD. L. REV. 773 (2013); Hari M. Osofsky, *Diagonal Federalism and Climate Change Implications for the Obama Administration*, 62 ALA. L. REV. 237 (2011); Hannah J. Wiseman, *Clean Energy Incentives: Risk, Capture, and Federalism*, 67 FLA. L. REV. F. 161 (2016).

[224] *Electricity Explained: How Electricity Is Delivered To Consumers*, U.S. ENERGY INFO. ADMIN. (last updated Dec. 19, 2016), http://www.eia.gov/energy_in_brief/article/power_grid.cfm.

[225] *Id.*

Historically, vertically-integrated, investor-owned utilities dominated electricity service in the United States. Thus, in 1970, investor-owned utilities served over 78% of retail customers.[226] As part of a larger wave of industrial deregulation and restructuring that swept the nation beginning in the 1970s and 1980s, however, the U.S. electricity sector soon began a steady march toward liberalization.[227] It is difficult to say precisely when this effort began, but it arguably was marked by passage of the Public Utility Regulatory Policies Act of 1978 (PURPA).[228] That Act sought to encourage generation diversity by requiring incumbent utilities to purchase power from so-called "qualifying facilities," or "QFs," such as cogeneration and renewable energy producers. The Energy Policy Act of 1992 followed,[229] which further opened the electricity generation market to competition by allowing non-utility generators to supply power without being subject to utility holding company regulation.[230]

At the same time, the Federal Energy Regulatory Commission (FERC), the federal agency charged with regulating portions of the electricity sector, did its own work to liberalize U.S. electricity markets. In the late 1980s and early 1990s, FERC began allowing

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[226] EDISON ELECTRIC INST., STATISTICAL YEARBOOK OF THE ELECTRIC UTILITY INDUSTRY 325, TABLE 48 (1993).

[227] *See* Joe D. Pace & John H. Landon, *Introducing Competition into the Electric Utility Industry: An Economic Appraisal*, 3 ENERGY L.J. 1, 9–65 (1982*)*; *see also* Charles H. Koch, Jr., *Collaborative Governance in the Restructured Electricity Industry*, 40 WAKE FOREST L. REV. 589, 601–02 (2005); Richard J. Pierce, Jr., *Completing the Process of Restructuring the Electricity Market*, 40 WAKE FOREST L. REV. 451, 463–79 (2005). For an overview of the history of electricity regulation in the United States, *see* Joseph P. Tomain, *Electricity Restructuring: A Case Study in Government Regulation*, 33 TULSA L.J. 827, 829 (1998).

[228] Public Utility Regulatory Policies Act, Pub. L. No. 95-617, § 2, 92 Stat. 3117, 3119 (1978) (codified at 7 U.S.C. § 918c, 42 U.S.C. § 6808, scattered sections of 15 U.S.C., 16. U.S.C., and 43 U.S.C. (2012)).

[229] Energy Policy Act, Pub. L. No. 102-486, 106 Stat. 2776 (1992) (codified at 12 U.S.C. §§ 1701z–16, 25 U.S.C. §§ 3501–3506, scattered sections of 16 U.S.C., 26 U.S.C., 30 U.S.C., 42 U.S.C. (2012)).

[230] Jeffrey D. Watkiss & Douglas W. Smith, *The Energy Policy Act of 1992—A Watershed for Competition in the Wholesale Power Market*, 10 YALE J. ON REG. 447, 464–65 (1993); *see also,* Arturo Gándara, *United States-Mexico Electricity Transfers: Of Alien Electrons and the Migration of Undocumented Environmental Burdens*, 16 ENERGY L.J. 1, 23 (1995).

utilities and other entities to sell wholesale electricity at "market-based" rates—that is, at prices and terms the parties negotiated.[231] This was a sharp break from FERC's traditional practice of approving individual power purchase agreements one at a time using cost-of-service regulation under the Federal Power Act's "just and reasonable" standard.[232] Then, in 1996, FERC pushed the industry even further toward competition. The agency adopted its landmark Order No. 888, which required transmission owners to sell excess capacity on a first-come, first-served basis using standard terms and conditions.[233] The result was a rush to competition for wholesale electricity. "Order No. 888 amplified the paradigm shift to more competitive and restructured wholesale electricity markets."[234]

While FERC was busy encouraging electricity competition at the wholesale level, states also joined the fray. As part of the nation's federalist system of governance, FERC and states share regulatory authority over the electricity sector in the United States. FERC has jurisdiction over wholesale power sales, transmission sales, and reliability of the bulk power system.[235] States have jurisdiction over retail electricity sales, distribution, siting of facilities, and the structure of their generation fleets.[236] Thus, FERC's efforts in promoting competition only went so far. State action was also needed.

That state action came in the form of a wave of restructuring efforts in the 1990s. As of 2003, twenty-four states and the District of Columbia had passed legislation or adopted policies either requiring or encouraging incumbent utilities to sell off their generation assets, with the aim of further breaking up the hold of vertically integrated utilities on the market.[237] This had a

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[231] LINCOLN L. DAVIES ET AL., ENERGY LAW AND POLICY 399–409 (2014) [hereinafter ENERGY LAW AND POLICY].

[232] *See* 16 U.S.C. § 824d.

[233] Order No. 888, Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, 61 Fed. Reg. 21,540 (1996) (to be codified at 18 C.F.R. pts. 35, 385).

[234] Jeffery S. Dennis, *Twenty-Five Years of Electricity Law, Policy, and Regulation: A Look Back*, 25 NAT. RESOURCES & ENV'T 33, 36 (2010).

[235] *See* 16 U.S.C. § 824(a).

[236] *See* New York v. Fed. Energy Reg. Comm'n, 535 U.S. 1 (2002).

[237] Channele Carner, *Status of State Electric Industry Restructuring Activity*, U. S. ENERGY INFO. ADMIN. 1, 2 (Feb. 2003),

meaningful, reinforcing impact on FERC's policies seeking to restructure the wholesale market. "In 1996 there [were] about 750,000 Mw of utility-owned electric generating capacity in the U.S. of which investor-owned utilities (IOUs) accounted for about 580,000 Mw."[238] After 1996, however, "about 100,000 Mw of generating capacity was divested by IOUs and another 100,000 Mw transferred to unregulated utility affiliates to compete in the wholesale market."[239] This quickly ushered in more competition. Thus, by 2004, roughly 80% of new generating capacity was from "independent power companies and unregulated affiliates of utilities."[240]

As states adopted these restructuring laws, many also aimed to bring electricity competition to the retail level. For two reasons, however, these efforts quickly plateaued. First, the California energy crisis of 2000, marked conspicuously by the fall of Enron after that company manipulated prices in western markets, scared off every other state that was considering restructuring—and convinced some to abandon the process.[241] Second, state efforts to roll out retail competition were quite uneven and often ineffective. Roughly twenty states moved to retail competition, and while none of these reverted to cost-of-service regulation, only four have seen more than a quarter of their customers switch retail providers: Texas (100%), Connecticut (44.1%), Ohio (42.2%), and Pennsylvania (31.5%).[242]

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http://www.eia.gov/electricity/policies/legislation/california/pdf/restructure.pdf.

[238] Paul L. Joskow, *Markets for Power in the United States: An Interim Assessment* 10 (AEI-Brookings Joint Ctr. for Reg. Stud., Working Paper No. 05-20, 2005).

[239] *Id.*

[240] *Id.*

[241] RICHARD F. HIRSH, POWER LOSS: THE ORIGINS OF DEREGULATION AND RESTRUCTURING IN THE AMERICAN ELECTRIC UTILITY SYSTEM 248–53 (1999); *see also* Shelley Welton, *Non-Transmission Alternatives*, 39 HARV. ENVTL. L. REV. 457, 476 n.109 (2015); *see* Hon. Richard D. Cudahy & William D. Henderson, *From Insull to Enron: Corporate (Re)regulation After the Rise and Fall of Two Energy Icons*, 26 ENERGY L.J. 35 (2005).

[242] *Abaccus: An Assessment of Restructured Electricity Markets*, DISTRIBUTED ENERGY FIN. GRP. LLC 1, 20 (2012), http://defgllc.com/publication/2012-abaccus-electricity-restructuring-scorecard/ (under Download heading, select "Defg-abaccus-2012.pdf2.72mb" hyperlink; log-in required).

The result of these decades of changes is that the U.S. electricity sector today is a mishmash of different systems of governance, regulation, and competition. Layered on top of the three major interconnections is a conglomeration of regional transmission organizations (RTOs) and independent system operators (ISOs) that, depending on their specific circumstances, are the successors to historic power pools that utilities had voluntarily formed or are new creations made to promote competition in the sector. These organizations, which FERC originally had wanted to force all major utilities to join,[243] operate the grid in many parts of the country and run formal transmission and generation markets.[244] Meanwhile, beneath this tangle of systems is also significant diversity in how electricity is provided to ultimate consumers. Some states continue to run retail competition programs, while most do not.[245] Thus, roughly 61% of retail electricity continues to be delivered by incumbent utilities, just over 13% comes from cooperatives, and almost 13% comes from local municipalities, while only the remainder is provided by new competitors in the market.[246]

Generation also varies heavily. Coal and natural gas currently make up the bulk of U.S. electricity production, each comprising about a third, while nuclear power provides about a fifth, renewables

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[243] *See, e.g.*, FERC Order No. 2000, Regional Transmission Organizations, 65 Fed. Reg. 810, 810 (Jan. 6, 2000) (codified at 18 C.F.R. pt. 35); *see also* Joel B. Eisen, *Regulatory Linearity, Commerce Clause Brinksmanship, and Retrenchment in Electric Utility Deregulation*, 40 WAKE FOREST L. REV. 545, 551 (2005); Welton, *supra* note 241, at 476–78.

[244] Ill. Commerce Comm'n v. Fed. Energy Reg. Comm'n, 721 F.3d 764, 764 (7th Cir. 2013); Midwest ISO Transmission Owners v. Fed. Energy Reg. Comm'n, 373 F.3d 1361, 1364 (D.C. Cir. 2004); *see also What are RTOs and Organized Markets*?, ELECTRIC POWER SUPPLY ASS'N, https://www.epsa.org/industry/primer/?fa=rto (last visited Jan. 28, 2017); *The Role of ISOs and RTOs*, ISO/RTO COUNCIL, http://www.isorto.org/about/Role (last visited Apr. 25, 2017); Clinton A. Vince et al., *What Is Happening and Where in the World of RTOs and ISOs?*, 27 ENERGY L.J. 65 (2006).

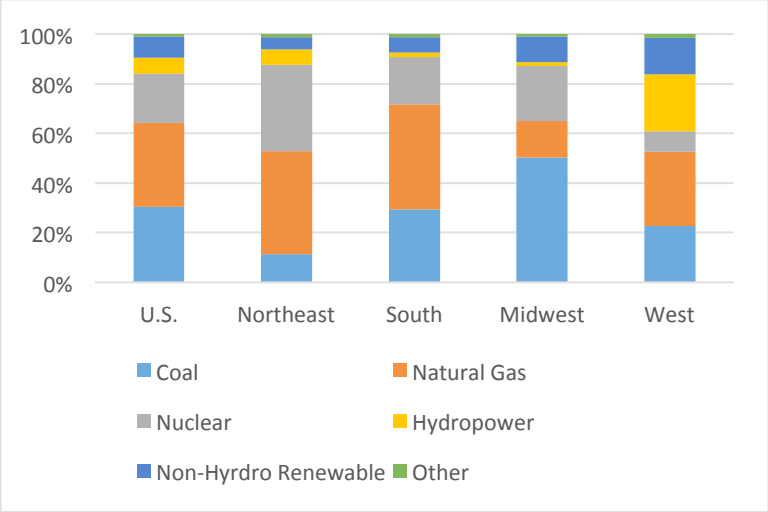
[245] *See Abaccus*, *supra* note 242, at 8.

[246] *Electric Sales, Revenue, and Average Price*, U.S. ENERGY INFO. ADMIN., 1, Table 10 (Oct. 16, 2016), http://www.eia.gov/electricity/sales_revenue_price/pdf/table10.pdf.

comprise 13%, and petroleum accounts for about 1%.[247] As Figure 4 details, however, there is substantial geographic diversity in how electricity is produced in the U.S. today.

[247] *Frequently Asked Questions: What is U.S. Electricity Generation by Energy Source?*, U.S. ENERGY INFO. ADMIN. (Apr. 1, 2016), https://www.eia.gov/tools/faqs/faq.cfm?id=427&t=3.

FIGURE 4. U.S. ELECTRICITY GENERATION BY REGION AND SOURCE – 2016[248]



In short, then, what best typifies the electricity sector in the U.S. is complexity at the national level in terms of how the sector operates and is governed, and divergence at the state level in terms of how that governance and operation is implemented. Those trends also play out in how the United States has chosen to regulate greenhouse gas emissions from electricity use.

B. DOMESTIC CLIMATE REGULATION OF ELECTRICITY

Despite being responsible for a sizeable portion of global

[248] This figure is based on data from the U.S. Energy Information Administration. *See Short-Term Energy Outlook (STEO): Forecast Highlights*, U.S. ENERGY INFO. ADMIN., 1, 40, Table 7d, https://www.eia.gov/outlooks/steo/pdf/steo_full.pdf. The category of "other" includes petroleum (residual fuel oil, distillate fuel oil, petroleum coke, and other petroleum liquids, as defined by EIA), other gases, pumped storage hydropower, and other non-renewables (batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, nonrenewable waste, and miscellaneous technologies, as defined by EIA).

greenhouse gas emissions,[249] the United States' leadership on climate change has been quite tenuous over time. This can be seen perhaps most readily in the nation's interface with global climate change mitigation efforts. While the United States joined 153 other countries in ratifying the United Nations Framework Convention on Climate Change ("UNFCCC") in 1992[250]—the Kyoto Protocol, as it is more commonly known—the country failed to take further action five years later when the world made its first concrete effort to implement that agreement. Instead, President Clinton never submitted the Kyoto Protocol to the Senate for ratification because it appeared clear it would fail in that chamber.[251] This was part of why so many subsequent efforts were necessary to implement the Kyoto Protocol at the international level: one of the biggest contributors to GHGs failed to put enforceable regulatory mechanisms in place.[252] Eventually, those efforts climaxed at the end of 2015 with the creation of the Paris Accord.[253] Again, the United States joined the

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[249] *Greenhouse Gas Emissions: Emissions by Country*, U. S. ENVTL. PROTECTION AGENCY (Aug. 6, 2016), https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data (citing T.A. Boden et al, *Global, Regional, and National Fossil-Fuel CO_2 Emissions*, OAK RIDGE NAT'L LABORATORY, U.S. DEP'T. OF ENERGY (2017)).

[250] United Nations Framework Convention on Climate Change, S. Treaty Doc. No. 102-38, art. 2 (May 9, 1992); *see generally Essential Background: Publications*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/essential_background/background_publications_htmlpdf/items/2625.php (last visited Oct. 2016); *Background on the UNFCC: The International Response to Climate Change,* U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/essential_background/items/6031.php (last visited Apr. 25, 2017). The United States is a signatory to the Kyoto Protocol. *See* Kyoto Protocol to the United Nations Framework Convention on Climate Change art.3 & Annex B, Dec. 11, 1997, 37 I.L.M. 32.

[251] Jean Chemnick, *How Clinton and Blair Talked About Global Warming*, SCI. AM. (Jan. 11, 2016), https://www.scientificamerican.com/article/how-clinton-and-blair-talked-about-global-warming/.

[252] Quirin Schiermeier, *The Kyoto Protocol: Hot Air*, NATURE (Nov. 28, 2012), http://www.nature.com/news/the-kyoto-protocol-hot-air-1.11882.

[253] *Paris Agreement - Status of Ratification*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE (last updated Dec. 12, 2016), http://unfccc.int/paris_agreement/items/9444.php; *see also* Patrick Goodenough, *Obama on Paris Climate Accord: 'History Will Judge Today as a Turning Point for our Planet*,' CNSNEWS.COM (Oct. 5, 2016, 7:33 PM

agreement but did not send it to the Senate for ratification, with President Obama taking the position that because it was not a new treaty, but rather merely an "extension of existing obligations" under the UNFCCC, it did not require Senate advice and consent, and could simply be implemented via executive order.[254]

This kind of international ambivalence toward climate change is reflective of the fractured public perception of the problem domestically. While a significant portion of U.S. residents favor action on climate change, many oppose it, with some of those denying that climate change even exists or that human actions are driving it.[255] As recent surveys have indicated, 65% of Americans worry about climate change a great deal or a fair amount, with the same portion of the population blaming human activity for rising temperatures.[256] But only 45% of Americans consider climate change a very serious problem.[257] Moreover, 16% of U.S. residents do not believe there is solid scientific evidence to support a finding that climate change is caused by humans.[258]

EDT), http://www.cnsnews.com/news/article/patrick-goodenough/obama-paris-climate-accord-history-will-judge-today-turning-point; Tanya Somanader, *President Obama: The United States Formally Enters the Paris Agreement*, THE WHITE HOUSE (Sept. 3, 2016, 10:41 AM ET), https://obamawhitehouse.archives.gov/blog/2016/09/03/president-obama-united-states-formally-enters-paris-agreement.

[254] Goodenough, *supra* note 253.

[255] *See* Cary Funk & Brian Kennedy, *The Politics of Climate*, PEW RESEARCH CTR. (Oct. 4, 2016), http://www.pewinternet.org/2016/10/04/the-politics-of-climate/.

[256] Lydia Saad & Jeffrey M. Jones, *U.S. Concern About Global Warming at Eight-Year High*, GALLUP (Mar. 16, 2016), http://www.gallup.com/poll/190010/concern-global-warming-eight-year-high.aspx.

[257] Bruce Stokes, Richard Wike & Jill Carle, *Global Concern about Climate Change, Broad Support for Limiting Emissions – U.S., China Less Worried; Partisan Divides in Key Countries*, PEW RESEARCH CTR. (Nov. 5, 2016), http://www.pewglobal.org/2015/11/05/global-concern-about-climate-change-broad-support-for-limiting-emissions/.

[258] Christopher Borick, Barry G. Rabe & Sarah B Mills, *Acceptance of Global Warming Among Americans Reaches Highest Level Since 2008*, 25 ISSUES IN ENERGY & ENTL. POL'Y 1, 1 (2015), http://closup.umich.edu/files/ieep-nsee-2015-fall-climate-belief.pdf.

In turn, these public divisions over climate change have translated into legislative gridlock at the federal level.[259] From 1999 to 2014, over 1,163 climate-oriented bills were introduced in Congress; however, no comprehensive legislation was enacted.[260]

This was not for lack of trying. Most prominent among these failed efforts was the American Clean Energy and Security Act of 2009, also known as H.R. 2454 or the Waxman-Markey Bill. This bill would have established an economy-wide, greenhouse gas cap-and-trade system, with a goal of reducing GHG emissions by 17% from 2005 levels by 2020, and 83% by 2050.[261] Although Waxman-Markey passed the House of Representatives by a 219-to-212 vote in

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[259] Hari M. Osofsky & Jacqueline Peel, *The Grass Is Not Always Greener: Congressional Dysfunction, Executive Action, and Climate Change in Comparative Perspective,* 91 CHI.-KENT L. REV. 139, 144 (2016); *see* Hari M. Osofsky & Jacqueline Peel, *Energy Partisanship,* 65 EMORY L.J. 695, 699 (2016).

[260] *See Legislation in the 106th Congress Related to Global Climate Change*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, http://www.c2es.org/federal/congress/106 (last visited Apr. 25, 2017); *Overview of Legislative Proposals in the 107th Congress*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, http://www.c2es.org/federal/congress/107 (last visited Apr. 25, 2017); *Legislation in the 108th Congress Related to Global Climate Change*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, http://www.c2es.org/federal/congress/108 (last visited Apr. 25, 2017); *Legislation in the 109th Congress Related to Global Climate Change*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, http://www.c2es.org/federal/congress/109 (last visited Apr. 25, 2017); *Legislation in the 110th Congress Related to Global Climate Change*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, http://www.c2es.org/federal/congress/110 (last visited Apr. 25, 2017); *111th Congress Climate Change Legislation*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, http://www.c2es.org/federal/congress/111 (last visited Apr. 25, 2017); *Legislation in the 112th Congress Related to Global Climate Change*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, http://www.c2es.org/federal/congress/112 (last visited Apr. 25, 2017). *See generally* Tom Mounteer, *Comprehensive Federal Legislation to Regulate Greenhouse Gas Emissions*, 39 ENVTL. L. REP. 11068, 11074–076 (2009); Andrew Schatz, *Climate Regulation Takes Shape, but Uncertainty Prevails*, 14 ABA AGRIC. MGMT. COMMITTEE NEWSL., 13, 16 (2010).

[261] American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 703(a)(4) (2009).

June 2009, the bill then languished in the Senate,[262] effectively ending action on climate legislation for the 111th Congress.[263]

In the vacuum created by Congress' failure to adopt comprehensive climate legislation, two key efforts have been made to address the problem in the United States. First, states and other subnational forms of government have stepped into the breach, adopting a wide array of policies of their own.[264] Second, at the federal level, Congress has passed a number of measures that deal with climate change around the edges and, more prominently, the Obama administration invoked its executive power to address climate change directly. Of course, with the Obama administration now out of office, the future of its extensive legacy on climate action is very much in doubt, particularly following issuance of the Trump administration's March 28, 2017 executive order on climate change.[265]

1. SUBNATIONAL CLIMATE ACTION

Subnational action on climate change in the U.S. electricity sector can be divided into five primary categories: efforts to (1) establish greenhouse gas emission targets or industry-specific limits; (2) mandate GHG emissions reporting;[266] (3) impose renewable energy production targets; (4) encourage GHG emission reductions through energy efficiency measures; and (5) develop

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[262] *See* Ryan Lizza, *As the World Burns: How the Senate and the White House Missed Their Best Chance to Deal With Climate Change*, THE NEW YORKER (Oct. 11, 2010), http://www.newyorker.com/magazine/2010/10/11/as-the-world-burns.

[263] *111th Congress Climate Change Legislation* , *supra* note 260.

[264] *See* Rosina Bierbaum et al., *A Comprehensive Review of Climate Adaptation in the United States: More Than Before, But Less Than Needed*, 18 MITIGATION & ADAPTION STRATEGIES FOR GLOBAL CHANGE 361, 369–373 (2013); *see generally* COLUM. L. SCH., SABIN CTR. FOR CLIMATE CHANGE L., http://web.law.columbia.edu/climate-change/resources/climate-change-laws-world/united-states-america (last visited Apr. 25, 2017).

[265] Exec. Order No. 13783, 82 Fed. Reg. 16093 (Mar. 28, 2017).

[266] *See State Legislation from Around the Country*, CTR. FOR CLIMATE & ENERGY SOLUTIONS http://www.c2es.org/us-states-regions/key-legislation (last visited Nov. 2016).

climate change adaptation plans.[267] As a complement to these individual strategies, many states have banded together to cooperate regionally in an effort to drive down GHG emissions.

First, some states have established GHG emission reduction objectives, doing so in two primary ways: through economy-wide emission targets or by imposing GHG emission reduction limits on the energy sector specifically.[268] Of these, economy-wide emission targets are the most common.[269] For instance, California has set economy-wide GHG emission targets to revert to 1990 levels by 2020.[270] By contrast, in New York, new or expanded baseload plants (25 MW and larger) must meet an emission rate of either 925 lbs CO_2/MWh (output-based) or 120 lbs CO_2/MMBTU (input-based), while non-baseload plants must meet an emission rate of either 1450 lbs CO_2/MWh (output-based) or 160 lbs CO_2/MMBTU (input-based).[271] In all, nineteen states have adopted economy-wide emission targets, and fourteen states have adopted GHG emission standards for the electricity sector.[272]

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[267] Bierbaum et al., *supra* note 264, at 370; Kirsten H. Engel, *Mitigating Global Climate Change in the United States: A Regional Approach*, 14 N.Y.U. ENVTL. L.J. 54, 54–61 (2005).

[268] *See generally* CTR. FOR CLIMATE & ENERGY SOLUTIONS, *supra* note 260.

[269] *See Greenhouse Gas Emission Targets*, CTR. FOR CLIMATE & ENERGY SOLUTIONS (last updated Sept. 2016), http://www.c2es.org/us-states-regions/policy-maps/emissions-targets.

[270] Global Warming Solutions Act, A.B. 32, 2005-2006 Gen. Assembly, Reg. Sess. § 38,510 (Cal. 2006) (codified at Cal. Health & Safety Code § 38,500-38,599).

[271] Press Release, New York Department of Environmental Conservation, Part 251: CO_2 Performance Standards for Major Electric Generating Facilities (Jun. 12, 2012), http://www.dec.ny.gov/press/83269.html; *see Survey of Existing State Policies and Programs that Reduce Power Sector CO_2 Emissions*, U.S. ENVTL. PROTECTION AGENCY (June 2, 2014), https://19january2017snapshot.epa.gov/sites/production/files/2014-06/documents/existing-state-actions-that-reduce-power-sector-co2-emissions-june-2-2014_0.pdf.

[272] *See* CTR. FOR CLIMATE & ENERGY SOLUTIONS, *supra* note 260; *Standards for Electricity GHG Emissions*, CTR. FOR CLIMATE & ENERGY SOLUTIONS (last updated Sept. 2016), http://www.c2es.org/us-states-regions/policy-maps/electricity-emissions-caps.

Second, and less aggressively, states have adopted policies requiring major source polluters, including the electricity sector, to report their greenhouse gas emissions. Twenty-two states and the District of Columbia are part of the Climate Registry, a tool to measure, track, verify, and publicly report greenhouse gas emissions consistently and transparently between states.[273] In New Mexico, for instance, all major sources that have potential to emit more than 100 tons/year of criteria pollutants are required to report their CO_2, methane, and nitrous oxide emissions to the EPA or to New Mexico's Air Quality Bureau.[274]

Third, more than two-thirds of states have imposed requirements on their electric utilities to produce a given percentage of power from renewable energy resources.[275] While these renewable portfolio standards are not climate change mitigation tools per se, combatting climate change is clearly one of the key goals that they embody. Moreover, RPSs epitomize other subnational climate legislation in the United States in their sheer diversity.[276] Indeed, these laws vary from state to state in how much renewable generation they require,[277] when such goals must be met,[278] and whether they target only least-cost renewables or also seek to promote more emergent technologies

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[273] *Greenhouse Gas Reporting and Registries*, CTR. FOR CLIMATE & ENERGY SOLUTIONS (last updated Sept. 2016), http://www.c2es.org/us-states-regions/policy-maps/ghg-reporting-and-registries.

[274] *See generally* New Mexico Greenhouse Gas Emissions Reporting and Quantification Procedures, §20.2.73 NMAC (2015), https://www.env.nm.gov/aqb/GHG/documents/NM_GHGEI_quantification_procedures_2015.pdf.

[275] Lawrence H. Goulder & Robert N. Stavins, *Interactions Between Sate and Federal Climate Change Policies* 7 (Harv. Kennedy Sch., John F. Kennedy Sch. of Gov't Discussion Paper 10–36, 2010), http://belfercenter.ksg.harvard.edu/files/StavinsGoulderFinal-3.pdf.

[276] *See* Robert B. McKinstry et al., *Federal Climate Change Legislation As If the States Matter*, 22 NAT. RESOURCES & ENV'T 3, 4–5 (2008); Galen Barbose, *Renewables Portfolio Standards in the United States: A Status Update*, LAWRENCE BERKELEY NAT'L LAB. (2013), http://resource-solutions.org/images/events/rem/presentations/2014/Barbose_Galen.pdf; J. Heeter et al., *A Survey of State-Level Cost and Benefit Estimates of Renewable Portfoilio Standards*, NAT'L RENEWABLE ENERGY LAB. 79–97 (2014), http://www.nrel.gov/docs/fy14osti/61042.pdf.

[277] Barbose, *supra* note 276.

[278] *Id.*

like solar,[279] to name just a few RPS design features that differ significantly across jurisdictions.[280] Notwithstanding this variety, RPSs have had a meaningful impact on climate mitigation in the United States: the U.S. Department of Energy has estimated that RPSs contributed "$2.2 billion in benefits . . . from reduced greenhouse gas emissions and $5.2 billion from reductions in other air pollution" in 2013 alone.[281] Today, twenty-nine states, the District of Columbia, and three territories have adopted mandatory RPSs, while eight states and one territory have adopted voluntary RPSs, or "renewable portfolio goals" (RPGs).[282]

Fourth, states have adopted a number of measures aimed at promoting efficiency in electricity use.[283] These include setting new minimum efficiency standards for appliances and lighting,[284] implementing construction standards and building codes for new buildings, and encouraging onsite generation, also known as distributed generation.[285] Today, twenty-six states have Energy Efficiency Resource Standards (EERS) in place, which impose efficiency targets similar to how RPSs impose renewable energy production quotas.[286] In 2015, savings from electricity efficiency programs totaled approximately 26.5 million megawatt-hours

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[279] *Id.* at 5, 9–10, 15.

[280] Lincoln L. Davies, *Power Forward: The Argument for a National RPS*, 42 CONN. L. REV. 1339 (2010); *see also Incentivizing Renewable Energy Deployment*, *supra* note 121, at 39; Lincoln L. Davies, *State Renewable Portfolio Standards: Is There a 'Race' and Is It 'To the Top'?*, 3 SAN DIEGO J. OF CLIMATE & ENERGY L. 3 (2011–12).

[281] *Multi-Year Analysis Examines Costs, Benefits, and Impacts of Renewable Portfolio Standards*, NATI'L RENEWABLE ENERGY LAB. 1, 1–2 (2016), http://www.nrel.gov/docs/fy16osti/65409.pdf.

[282] Jocelyn Durkay, *State Renewable Portfolio Standards and Goals*, NAT'L CONF. OF STATE LEGISLATORS (July 27, 2016), http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx.

[283] *See* Michael T. Burr, *Turning Energy Inside Out*, 151 PUB. UTIL. FORT. 28, 29 (2013).

[284] *See State Standards*, APPLIANCE STANDARDS AWARENESS PROJECT, http://www.standardsasap.org/states (last visited Apr. 25, 2017).

[285] *See State Energy Efficiency Policy*, AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON., http://aceee.org/sector/state-policy#tabs-0-left_bottom-2 (last visited Apr. 25, 2017).

[286] *Climate Change 101: Understanding and Responding to Global Climate Change*, PEW CTR. ON GLOBAL CLIMATE CHANGE 1, 5 (2011), http://www.c2es.org/docUploads/climate101-state.pdf.

(MWh), a 3.1% increase over 2014.[287] This was the equivalent of reducing total retail electricity sales by about 0.7%.[288]

Fifth, thirty-four states and the District of Columbia have adopted—or established processes for adopting—broader climate change adaption plans.[289] These plans typically include research and education, as well as planning to improve societal resilience to climate change, incuding the idea of climate change adaptation.[290] On the electricity side of the ledger, some states, like California, are recommending that utilities formulate vulnerability assessments and resilience plans as the first steps towards climate change mitigation efforts.[291] Others, like New Jersey, are making additional infrastructure investments to increase resiliency against extreme weather events.[292] In total, twenty-nine states have included electricity policies or recommendations in their climate change adaption plans, ranging from RPSs for sources used in electricity generation to retrofitting traditional electricity facilities and reducing electricity waste.[293]

Beyond these state efforts, many jurisdictions have banded together to form regional climate change collaborations. There are six current regional or multi-state climate initiatives in the United

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[287] Weston Berg et al., *The 2016 State Efficiency Scorecard*, AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON. i, ix (Sept. 2016), http://aceee.org/sites/default/files/publications/researchreports/u1606.pdf.

[288] *Id*.

[289] *Climate Action Plans*, CTR. FOR CLIMATE & ENERGY SOLUTIONS (last updated Feb. 2016), http://www.c2es.org/us-states-regions/policy-maps/climate-action-plans.

[290] Bierbaum et al., *supra* note 264, at 370; Engel, *supra* note 267, at 54–61.

[291] *Climate Adaptation in the Electricity Sector: Vulnerability Assessment & Resiliency Plans*, CAL. PUB. UTIL. COMM'N 1, 27 (2016), http://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/About_Us/Organization/Divisions/Policy_and_Planning/PPD_Work/PPD_Work_Products_(2014_forward)/PPD%20-%20Climate%20Adaptation%20Plans.pdf.

[292] *See Making The Energy Sector More Resilient to Climate Change,* INT'L ENERGY AGENCY 1, 9 (2015), https://www.iea.org/publications/freepublications/publication/COP21_Resilience_Brochure.pdf.

[293] *See Climate Action Plans*, *supra* note 289.

States,[294] all primarily designed to reduce greenhouse gas emissions and spur public and private investment in clean energy, energy efficiency, and sustainable infrastructure. The Regional Greenhouse Gas Initiative ("RGGI"), comprised of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont, was the first cooperative effort to cap and reduce CO_2 emissions from the power sector.[295] In an effort to reduce GHG emissions, each participating state created individual CO_2 Budget Trading Programs and independent regulations, based on the RGGI Model Rule and the Summary of RGGI Model Rule Changes.[296] These programs limit CO_2 emissions from electric power plants, set CO_2 allowances, and frame participation in regional CO_2 allowance auctions.[297] In 2012, the RGGI set a cap of ninety-one million short tons of CO_2 equivalent, with the cap declining 2.5% each year from 2015 through 2020.[298] In all, RGGI cut CO_2 emissions by 36%, or fifty million short tons, from 2008 to 2014.[299] The other regional initiatives include: the Western Climate Initiative, the Midwest Greenhouse Gas Reduction Accord, North American 2050, the Pacific Coast Collaborative, and the Transportation and Climate Initiative.[300] While most of these operate similarly to the RGGI, there is variety among the groups, with some focusing on low-carbon development[301] and others on reducing greenhouse gases in the transportation sector[302] or coordinating collaboration with multiple regional initiatives.[303]

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[294] *See Multi-State Climate Initiatives*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, http://www.c2es.org/us-states-regions/regional-climate-initiatives (last visited Apr. 25, 2017).

[295] *See generally* REG'L GREENHOUSE GAS INITIATIVE, https://www.rggi.org (last visited Mar. 3, 2017).

[296] *See Program Design*, REG'L GREENHOUSE GAS INITIATIVE, https://www.rggi.org/design (last visited Apr. 25, 2017).

[297] *Id.*

[298] *Id.*

[299] Katherine Tweed, *What 10 Years of RGGI's Carbon-Trading Agreement Means for the Future*, GREENTECH MEDIA (Aug. 15, 2016), https://www.greentechmedia.com/articles/read/what-10-years-of-rggis-carbon-trading-agreement-means-for-the-future.

[300] *Multi-State Climate Initiatives*, *supra* note 294.

[301] *See generally* PACIFIC COAST COLLABORATIVE, http://pacificcoastcollaborative.org (last visited Jan. 2017).

[302] *See About Us*, TRANSP. & CLIMATE INITIATIVE OF THE NORTHEAST AND MID-ATLANTIC STATES,

2. FEDERAL CLIMATE ACTION

As states rose up to address climate change, federal action also eventually came, primarily through President Obama's executive action in the absence of comprehensive climate regulation. This federal action falls into two broad categories with respect to the electricity sector: (1) direct regulation and (2) indirect regulation.

Direct federal regulation of the electricity sector's climate emissions began in 2013, under the Obama administration's umbrella Climate Action Plan (CAP).[304] This plan established the goal of cutting the 2005 carbon pollution levels by 17% by 2020.[305] For electricity, President Obama directed the U.S. Environmental Protection Agency (EPA) to build on "the successful first-term effort to develop greenhouse gas and fuel economy standards for cars and trucks" and "state leadership" in order "to work expeditiously to complete carbon pollution standards for both new and existing power plants" and to "double renewable electricity generation once again by 2020."[306] Thus, the EPA began putting in place a number of programs and new regulatory initiatives to achieve this goal. The EPA primarily relied on the Clean Air Act (CAA) to implement these programs, which, in 2007, the Supreme Court held covers GHG emissions.[307]

The first of these regulatory initiatives were the so-called "new source" rules, which apply CO_2 emissions standards to new, modified, and reconstructed facilities, including power plants.[308]

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http://www.transportationandclimate.org/content/about-us (last visited Jan. 2017).

[303] *See North America 2050: A Partnership for Progress*, NORTH AM. 2050, https://www.c2es.org/docUploads/na2050-fact-sheet.pdf (last visited Jan. 2017).

[304] *See The President's Climate Action Plan*, EXECUTIVE OFFICE OF THE PRESIDENT 1, 6 (2013), https://obamawhitehouse.archives.gov/sites/default/files/image/president27sclimateactionplan.pdf.

[305] *Id.*

[306] *Id.*

[307] *See* Massachusetts v. EPA, 549 U.S. 497, 528–29 (2007).

[308] Standards of Performance for Greenhouse Gas Emissions From New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, 40 C.F.R. §§ 60 et seq. (2015).

Developed under Section 111(b) of the CAA, the new source rules impose emissions performance standards to achieve "the best system of emission reduction (BSER)" available for "each type of unit."[309] Specifically, the new source rules set separate standards for both new natural gas and new coal plants. For the former, the rules limit emissions to "no more than 1,000 lbs" of CO_2/MWh, and for the latter, to "no more than 1,400 lbs" CO_2/MWh.[310] Effectively, this means that new coal plants cannot be built in the United States without employing carbon capture and storage (CCS) technology.[311]

On the heels of the new source rules, the EPA also promulgated regulations addressing existing power plants. These rules—known more commonly as the Clean Power Plan (CPP)—were finalized in August 2015 and seek to reduce CO_2 emissions from existing fossil fuel-fired power plants by 32% by 2030.[312] The CPP set this target on a state-by-state basis, using three "building blocks" for CO_2 emission reductions that it said meets the CAA's BSER standard:[313] improving the heat rate of existing coal-fired power plants, substituting lower emission generation (*i.e.*, natural gas) for higher emitting generation (*i.e.*, coal), and increasing electricity generation from new zero-emitting renewable energy sources.[314] Although the EPA used these building blocks to establish emissions targets, states are free to use any strategy to reduce their emissions, including energy efficiency and nuclear generation.[315] States must develop plans to reach compliance with the CPP, and those plans must be approved by the EPA. In establishing their plans, states may choose whether to meet the mass-based or rate-based emission goals set

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[309] *Id.* at part 60, subpart TTTT.

[310] *EPA Regulation of Greenhouse Gas Emissions from New Power Plants*, CTR. FOR CLIMATE & ENERGY SOLUTIONS, http://www.c2es.org/federal/executive/epa/ghg-standards-for-new-power-plants (last visited Apr. 25, 2017).

[311] *See id.*

[312] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64662 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60).

[313] *See Legal Memorandum Accompanying Clean Power Plan for Certain Issues*, U.S. ENVTL. PROTECTION AGENCY (2015), https://www.epa.gov/sites/production/files/2015-11/documents/cpp-legal-memo.pdf.

[314] *See id.*

[315] *See id.* at 5.

forth in the CPP.[316] Although the CPP was initially met with enthusiastic fanfare from the U.S. environmental community, it was immediately challenged in court,[317] with the Supreme Court taking the extraordinary step of staying the rule on February 9, 2016.[318]

At the same time the federal government was adopting measures to directly regulate climate emissions from the electricity sector, a bevy of other federal rules also began to impact the way—and the level at which—the sector produces GHG emissions. Key among these is the EPA's 2011 Mercury and Air Toxic Standard (MATS), which limits the emission of mercury, acid gases, and other toxic pollutants from power plants.[319] Although not a climate regulatory tool per se, these limits clearly have impacted GHG emissions in the United States. Since the rule targets air pollution from coal- and oil-fired power plants,[320] it is projected that 60 GW of coal-fired capacity subject to MATS will retire between 2012 and 2020.[321]

Likewise, the United States has a number of other longstanding federal measures in place that influence GHG emissions from the electricity sector by promoting production of power from renewable energy sources. These measures include the Public Utility Regulatory Policies Act (PURPA) of 1978, which provides incentive rates to renewable energy producers, although the Energy Policy Act of 2005 significantly circumscribed the scope of this law.[322] Also

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[316] *See id.* at 6.

[317] *See* West Virginia v. EPA, 2015 WL 926755, at 53–54 (D.C. Cir. Mar. 4, 2015); *see also* West Virginia v. EPA, 2015 WL 926753, at 58 (D.C. Cir. Apr. 16, 2015).

[318] *See* West Virginia v. EPA, No. 15A773, 136 S. Ct. 1000 (Feb. 9, 2016).

[319] *See Legal Memorandum Accompanying Clean Power Plan for Certain Issues*, *supra* note 313.

[320] *Basic Information About Mercury and Air Toxics Standards*, U.S ENVTL. PROTECTION AGENCY, https://www.epa.gov/mats/basic-information-about-mercury-and-air-toxics-standards (last visited Apr. 25, 2017).

[321] *See* Patrick Ambrosio, *Court Leaves Power Plant Mercury Rule in Place*, BLOOMBERG BNA (Dec. 16, 2015), http://www.bna.com/court-leaves-power-n57982065169/; *see also* Elias Johnson, *Planned Coal-Fired Power Plant Retirements Continue to Increase*, U.S. ENERGY INFO. ADMIN. 1, 1 (Mar. 20, 2014), http://www.eia.gov/todayinenergy/detail.php?id=15491.

[322] *See* Lincoln L. Davies, *Tracing U.S. Renewable Energy Policy*, 43 ENVTL. L. REP. NEWS & ANALYSIS 10320, 10326 (2013). *See generally*, Michael D. Hornstein & J. S. Gebhart Stoermer, *The Energy Policy Act of*

relevant are tax incentives for renewable electricity production, most prominently an Investment Tax Credit (ITC) benefiting solar technology, fuel cells, and small wind turbines,[323] and a Production Tax Credit (PTC) for a wider array of renewables.[324] The current tax credit regime has worked best for more "mature industries that generate steady flows of taxable income to offset," although some have called for tax credit reform that will more effectively promote renewable energy.[325]

Despite these efforts to combat climate change taken during the Obama administration, there is now significant question whether any of these measures will persist. On November 9, 2016, Donald J. Trump was elected as the forty-fifth president of the United States. While details of his energy policies are only beginning to emerge, from the outset it has been clear that the new administration will seek to abruptly discontinue President Obama's climate initiatives. Prior to the election, Donald Trump suggested via social media that "Global warming is a total, and very expensive, hoax!"[326] As Mr.

2005: Purpa Reform, the Amendments and Their Implications, 27 ENERGY L.J. 25 (2006).

[323] *See* U.S. DEP'T OF ENERGY, *Business Energy Investment Tax Credit*, ENERGY.GOV, http://energy.gov/savings/business-energy-investment-tax-credit-itc (last visited Apr. 25, 2017); *see also* Stephen Lacey, *Congress Passes Tax Credits for Solar and Wind: 'Sausage-Making at Its Most Intense*,' GREENTECH MEDIA (Dec. 18, 2015), https://www.greentechmedia.com/articles/read/breaking-house-passes-1.1-trillion-spending-bill-with-renewable-energy-tax; Daniel Cusick, *Renewables Boom Expected Thanks to Tax Credit*, SCI. AM. (Dec. 21, 2105), https://www.scientificamerican.com/article/renewables-boom-expected-thanks-to-tax-credit/.

[324] *See* U.S. DEP'T OF ENERGY, *Renewable Electricity Production Tax Credit*, ENERGY.GOV, http://energy.gov/savings/renewable-electricity-production-tax-credit-ptc (last visited Apr. 25, 2017); *see also* Cusick, *supra* note 323; Lacey, *supra* note 323, at 2. S*ee generally* Felix Mormann, *Enhancing the Investor Appeal of Renewable Energy*, 42 ENVTL. L. 681, 711–13 (2012); Felix Mormann, *Requirements for a Renewables Revolution*, 38 ECOLOGY L.Q. 903, 940 (2011).

[325] Felix Mormann, *Beyond Tax Credits: Smarter Tax Policy for A Cleaner, More Democratic Energy Future*, 31 YALE J. ON REG. 303, 360 (2014).

[326] Donald Trump (@realDonaldTrump), TWITTER (Dec. 6, 2013, 9:13 AM), https://twitter.com/realDonaldTrump/status/408977616926830592?ref_src=t

Trump tweeted on November 6, 2012, "The concept of global warming was created by and for the Chinese in order to make U.S. manufacturing non-competitive."[327] Then, during his campaign for the White House, Mr. Trump pledged to "rescind all the job-destroying Obama executive actions including the Climate Action Plan" and "cancel the Paris Climate Agreement and stop all payments of U.S. tax dollars to U.N. global warming programs."[328] Following the inauguration, the Trump administration appeared unready to back down from these promises, pledging on the White House home page to "eliminat[e] harmful and unnecessary policies such as the Climate Action Plan . . . and to reviv[e] America's coal industry, which has been hurting for too long."[329] Meanwhile, the new administration has methodically removed mentions of climate change, the Paris Accord, and the Obama Climate Action plan from EPA websites.[330]

Yet, precisely how the new administration will proceed remains unclear. Shortly after the election, then-President-Elect Trump noted that there is "'some connectivity' between human activity and rising global temperatures," and he suggested that he would keep "an open mind" concerning the United States' involvement to Paris climate accord.[331] Moreover, while presidents have much latitude in setting

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wsrc%5Etfw&ref_url=http%3A%2F%2Fwww.motherjones.com%2Fenvironment%2F2016%2F11%2Ftrump-climate-timeline.

[327] Donald Trump (@realDonaldTrump), TWITTER (Nov. 6, 2012, 11:15 AM), https://twitter.com/realdonaldtrump/status/265895292191248385?lang=en.

[328] *An America First Energy Plan*, DONALD J. TRUMP FOR PRESIDENT, INC. (May 26, 2016), https://www.donaldjtrump.com/press-releases/an-america-first-energy-plan.

[329] *An America First Energy Plan*, THE WHITE HOUSE, https://www.whitehouse.gov/america-first-energy (last visisted Apr. 25, 2017).

[330] Brian Kahn, *Trump's EPA Is Removing Climate Change Information from Website*, INSIDE CLIMATE NEWS (Feb. 3, 2017), https://insideclimatenews.org/news/03022017/epa-donald-trump-climate-change-science-scott-pruitt.

[331] Karen Tumulty, *Trump backs away from some of his strident campaign promises*, THE WASHINGTON POST (Nov. 22, 2016), https://www.washingtonpost.com/national/trump-says-he-could-continue-to-run-his-company-in-theory-from-the-oval-office/2016/11/22/935745da-b0e3-11e6-be1c-8cec35b1ad25_story.html?hpid=hp_hp-top-table-main_transition-print-335pm%3Ahomepage%2Fstory.

policy agendas, regulations already in place cannot be simply spirited away, as the repeal of rules is subject to judicial review under the Administrative Procedure Act (APA).[332] Nonetheless, and notwithstanding the limits of the APA and the risk of judicial review, on March 28, 2017, the Trump administration issued an executive order directly targeting the Obama-era climate rules. The executive order mandates all agency heads to "review all existing regulations, orders, guidance documents, policies, and any other similar agency actions . . . . that potentially burden the development or use of domestically produced energy resources, with particular attention to oil, natural gas, coal, and nuclear energy resources."[333] The idea, of course, is that such review will lead to modification or recission of Executive Branch rules addressing climate emissions, including from the electricity sector. Indeed, the executive order affirmately rescinds a number of President Obama's climate actions, including the Climate Action Plan itself as well as his June 25, 2013 presidential memorandum on Power Sector Carbon Pollution Standards.[334] Further, the executive order directs the EPA administrator to review the final rule implementing the Clean Power Plan and "if appropriate, . . . as soon as practicable, suspend, revise, or rescind the guidance, or publish for notice and comment proposed rules suspending, revising, or rescinding those rules."[335]

C. CLIMATE REGULATORY IMPACTS ON THE ELECTRICITY SECTOR

Although the United States recently has taken a number of prominent measures, both federal and sub-federal, to address climate change emissions from the electricity sector, the impact of these policies is not as clear. Further, because the new presidential administration has already cast a large shadow over the Obama administration's climate change efforts, even more uncertainty exists about what the future of climate regulation in the U.S. electricity sector will be.

One thing that is clear is that how the United States produces electricity has changed significantly over the last decade in at least

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[332] *See, e.g.*, Motor Vehicle Mfrs. Ass'n v. State Farm, 463 U.S. 29, 41-42 (1983).

[333] Exec. Order No. 13783, *supra* note 265.

[334] *Id.*

[335] *Id.*

two regards. First, the use of coal for electricity production has decreased substantially, while natural gas has made up a good portion of that difference. Thus, as Figure 5 details, coal comprised 50% or more of U.S. electricity production from 1991 through 2005, but the next year, it dipped to 49%, and it has not ticked back up above that marker since. In 2016, coal fell to a modern low, making up only 30% of U.S. electric generation. At the same time, natural gas use has steadily risen. That fuel, which previously had been banned for use in electricity production,[336] comprised between 12% and 19% of generation between 1991 and 2005, finally breaking the 20% mark in 2005. By 2015, it matched coal's role, accounting for 33% of electricity production, and in 2016, it surpassed the amount of generation from coal, comprising 34% of the nation's electricity production. This is important from a climate change perspective because CO_2 emissions from natural gas are roughly 50 to 60 percent lower than from coal.

Second, renewable energy use has steadily risen in the last decade, albeit not as dramatically as has natural gas. While hydropower has remained relatively constant, ranging from 9% of production in 1991 to 7% in 2016—and while nuclear also has quite consistently contributed about one-fifth of U.S. production—non-hydro renewables have increased their share of generation year over year, like gas, also beginning around 2006. Until that year, non-hydro renewables accounted for 2% of production. Beginning in 2007, however, renewables made up 3% of production, and in 2016 comprised over 8%—notably, more than hydropower.

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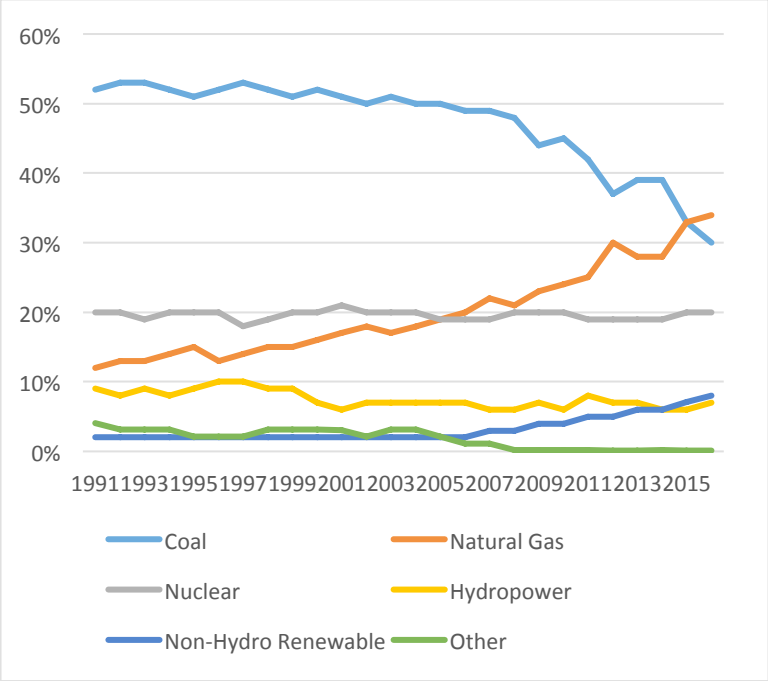
[336] *See* Powerplant and Industrial Fuel Use Act of 1978 (Fuel Use Act), Pub. L. No. 95-620, 92 Stat. 3289 (1978) (codified in scattered sections of 42 U.S.C.), *repealed in relevant part*, Pub. L. No. 100-42, § 1, 101 Stat. 310 (1987).

FIGURE 5. U.S. ELECTRICITY PRODUCTION BY SOURCE OVER TIME[337]



[337] This figure is based on historical data aggregated from the U.S. Energy Information Administration's Electric Power Monthly Reports (Table 1.1 Net Generation by Energy Source: Total (All Secotrs)) and Electricity Data Browser. *See Electric Power Monthly*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/electricity/monthly/ (last visited May 21, 2017); *Electricty Data Browser*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/electricity/data/browser/#/topic/0?agg=2,0,1&fuel=vvg&geo=g&sec=g&linechart=ELEC.GEN.ALL-US-99.A~ELEC.GEN.COW-US-99.A~ELEC.GEN.NG-US-99.A~ELEC.GEN.NUC-US-99.A~ELEC.GEN.HYC-US-99.A&columnchart=ELEC.GEN.ALL-US-99.A~ELEC.GEN.COW-US-99.A~ELEC.GEN.NG-US-99.A~ELEC.GEN.NUC-US-99.A~ELEC.GEN.HYC-US-99.A&map=ELEC.GEN.ALL-US-99.A&freq=A&ctype=linechart&ltype=pin&rtype=s&maptype=0&rse=0&pin= (last visited May 21, 2017).

Importantly, while lower GHG-emitting sources, like natural gas and renewables, have been growing in prominence in the United States, and higher emitting sources, namely coal, have been diminishing, it is not clear that the shifts in American electricity generation hinge on climate regulation as such.[338] Rather, the sharp uptick in natural gas use is clearly linked to two key, non-climate-related trends: the opening up of the wholesale electricity market to competition in the 1990s and, even more critically, the shale gas boom from the rise of hydraulic fracturing technology in this century, which drove natural gas prices to historic lows. The cold facts of these economics encouraged electricity producers to use more gas and less coal, with some large utilities affirmatively retrofitting existing coal facilities to burn gas instead. Likewise, while the growth of non-hydro renewables appears to be driven at least in part by the adoption of pro-renewable laws like RPSs or the extension of pertinent tax credits, those laws must be characterized as only partially climate regulatory measures. Drops in renewable technology costs also clearly are playing a role in the growth of these resources, particularly solar and wind.

It should not be surprising, then, that even as lower-GHG generation sources grew in stature in the American electricity generation fleet, the proportion of GHG emissions coming from the U.S. electricity sector did not decrease. The electricity sector has accounted for the largest portion of net U.S. GHG emissions in every year since 1990, when the EPA began reporting numbers: 33% in 1990, 37% in 2005, 33% in 2010, and 34% in 2014.[339] Still, changes in the electricity generation fleet are reflected in that sector's GHG emissions. U.S. electricity sector emissions peaked in 2007, at 2454.1 MMT CO_2 equivalent, and have decreased every year since then, reaching as low as 2060.7 in 2012 and 2080.7 in 2014—the smallest total for the sector since 1996–97.[340] This is because

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[338] *See, e.g.*, Vaclav Smil, *Trump's coal policy will likely do just what Obama's did* , THE WASHINGTON POST (Mar. 29, 2017), https://www.washingtonpost.com/opinions/trumps-coal-policy-will-likely-do-just-what-obamas-did/2017/03/29/7c5bb868-14b4-11e7-9e4f-09aa75d3ec57_story.html?utm_term=.214d75464d1f.

[339] *See Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2014*, U.S. ENVTL. PROTECTION AGENCY (2016), https://www.epa.gov/sites/production/files/2017-04/documents/us-ghg-inventory-2016-main-text.pdf.

[340] *See id.*

growing consumption, driven in large part by growing population, is one of the key factors keeping emissions from the electricity sector at such a high proportional level.

VI. THE SHAPE OF CLIMATE REGULATION OF ELECTRICITY: EMERGING LESSONS FROM THE INTERNATIONAL SPHERE

Although there are clear limits in what lessons can be drawn about the scope and trajectory of climate regulation internationally from four case studies, a comparison of the experiences in Australia, Great Britain, Korea, and the United States has much to teach. While understanding climate regulation of the electricity sector in these jurisdictions does not give a comprehensive picture of law and policy efforts worldwide, it does provide a useful, and somewhat expansive, view of both the types of regulatory tools in use and the impact these devices are having. Thus, such a comparision also gives some perspective on the overall shape of climate regulation in the electricity sector, both extant and potential, worldwide.

Gaining this cross-jurisdictional perspective is useful for a number of reasons, including that jurisdictions may wish to borrow tools from each other, may choose not to implement a given policy when it is clear it has failed elsewhere, and may improve how they regulate by learning from others' experiences. Moreover, the use of policy devices and their effects in Australia, the United Kingdom, South Korea, and the United States align remarkably well in a range of respects, thus highlighting several generalizations worth noting about climate regulation of the electricity sector.

Most conspicuous of these is that these jurisdictions adopted a diverse set of measures to address climate emissions in their electricity sectors. This should make sense given the equally diverse set of political, physical, economic, and social contexts in which jurisdictions regulate. But at the same time, each of the jurisdictions surveyed underwent significant—and rapid—change in their policies. That such policy change is so prevalent reveals a third lesson offered by the case studies, namely, that climate regulation is bound to be influenced by a wide array of outside forces, just as the electricity sector itself is. Finally, the overall design, including the design details, of this regulation appear to matter very much, something that should stay at the forefront of the conversation as lawmakers continue to evolve their regulatory programs over time.

A. POLICY DIVERSITY

It should come as little surprise that the variety of regulatory tools used to address GHG emissions in the electricity sector is quite wide, even when looking at just four jurisdictions. While all four of the countries surveyed are heavily industrialized and major economic players on the world stage, these jurisdictions also differ in a number of key respects. The socio-political cultures of Australia, the United Kingdom, Korea, and the United States are somewhat divergent. The countries had very different fuel mixes heading into their efforts to impose climate regulation on their electricity sectors. And while competition is prevalent in three of the countries (Australia, the United Kingdom, and the United States), one utilizes a state-sponsored utility that runs much like a monopoly to provide power to its citizens (Korea).[341] Policy diversity, in short, should be expected.

Nonetheless, the amount of diversity among the four jurisdictions is noteworthy. Australia currently uses a voluntary emissions reduction scheme,[342] while the UK has a legally binding GHG reduction target and participates in the EU emissions trading scheme as part of its effort to meet its EU emissions reductions obligation.[343] By contrast, the United States failed to adopt any comprehensive climate scheme at the national level, neither a trading scheme nor a carbon tax,[344] even as Korea instituted the first national cap-and-trade mechanism for GHG emissions in Asia.[345]

Similarly, these countries employed a variety of different policy devices to promote renewable energy, all in part as a way to reduce climate emissions, although it is noteworthy that all four of the countries have used quota mechanisms, such as RPSs, while feed-in tariffs were more popular across the globe. Australia uses what is effectively a two-part renewable portfolio standard requirement,[346] and Korea likewise implemented a system-wide renewable energy mandate in the same vein.[347] The UK previously imposed a similar Renewable Obligation, but it is now phasing that mechanism out in favor of a tendering regime referred to as "contracts for

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341 *See supra* Parts II–V.
342 *Supra* Part II.B.
343 *Supra* Part III.B.
344 *Supra* Part V.B.
345 *Supra* Part IV.B.
346 *Supra* Part II.B.
347 *Supra* Part IV.B.

difference,"[348] with some feed-in tariffs in place for smaller renewables. Meanwhile, the United States repeatedly failed to adopt a nationwide RPS but instead relied on widespread, but not uniform, state laws, federal tax credits, and piecemeal implementation of the Public Utility Regulatory Policies Act, a precursor to modern feed-in tariffs, and that, today, now looks much like a watered-down version of a FIT.[349]

The United States, indeed, stands apart from Australia, the United Kingdom, and Korea in several respects in its approach to climate regulation for its focus on subnational rather than federal efforts. While there are certainly criticisms that can be leveled against the policies of the other jurisdictions, they at least have taken the first step of developing and implementing a coordinated, national approach to reducing GHG emissions from the electricity sector. The United States, instead, relies heavily on uncoordinated state (and sometimes regional) policies, which by definition leave large swaths of the country's electricity sector untouched by climate regulation.[350] The Obama Administration sought to plug these holes by adopting regulations under the auspices of its Climate Action Plan, but less than three full months into the Trump administration, that Plan is already on the table to be undone.[351]

B. POLICY CONVULSION

It is somewhat difficult to conjure the correct word to describe the course of climate regulation of the electricity sector over the relatively short time in which that regulation has applied. "Evolution" does not capture the speed of the change; "transubstantiation" perhaps overstates the degree to which the regulations have morphed. The phrase "policy convulsion," then, may be a useful if imperfect descriptor, for its conveyance of the idea that the climate regulatory regimes in the electricity sector appear to be changing sharply, rapidly, and repeatedly.

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[348] *Supra* Part III.B.

[349] *Supra* Part V.B; *see also* Lincoln L. Davies, *Reconciling Renewable Portfolio Standards and Feed-in Tariffs*, 32 UTAH ENVTL. L. REV. 311 (2012).

[350] *See supra* Part V.B.

[351] *See id.*

To be sure, each of the four jurisdictions surveyed has already seen this change in a number of respects. Australia went from using a quite effective emissions trading scheme, to repealing it, to replacing it with its current policy, the Emissions Reduction Fund.[352] In so doing, Australia moved from a mandatory regime to a voluntary one, and from a more national policy to one where the subnational Australian states and territories are now adopting their own laws to help try to fill the gap.[353]

Similarly, the UK charted a rather circuitous route as it seeks to find the right balance in promoting renewable energy, a key component of its effort to bring electricity sector GHG emissions down. That effort began with the Non-Fossil Fuel Obligation in 1990, a bidding regime that was subsequently replaced by the quota-based Renewable Obligation, which then had added to it feed-in tariffs.[354] And now, these tools are being phased out to be replaced with the CfD, bringing the jurisdiction full circle back to the NFFO in many ways, by using auctions to try to meet its renewable energy targets.[355]

Korea and the United States cut similar pictures by making sharp changes to their climate regulation of the electricity sector over time. Following the example of many European jurisdictions, Korea adopted a feed-in tariff to much fanfare, only to quickly abandon it in favor of an RPS.[356] Likewise, in the United States a cycle of efforts to adopt federal legislation, followed by state innovations to try to make up for congressional gridlock, then federal executive action, and now likely federal executive withdrawal, mark the very uneven path of how that nation has sought to address electricity industry climate emissions.[357]

Of course, there are socio-political, context-specific reasons for each of these changes, reasons that necessarily differ from one jurisdiction to the next. However, the fact that all four of the nations surveyed here have already undergone such substantial change in a rather short period of time is itself illuminating. It underscores the tentative approach many countries continue to have toward regulating

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352 *See supra* Part II.B.
353 *See id.*
354 *See supra* Part III.B.
355 *See id.*
356 *See supra* Part IV.B.
357 *See supra* Part V.B.

climate change, both in the electricity sector and more broadly—and the tenuous position of those regulations once they are adopted.

C. ELECTRICITY SHIFTS AND NON-POLICY FACTORS

Another lesson made clear by the experience of the four jurisdictions surveyed here is that while climate policies certainly can have a meaningful impact on the electricity sector, these laws must always be understood in the broader context in which they operate. That is, other factors besides direct climate regulation clearly influence the electricity mix. This certainly was borne out as each of the countries surveyed here began to implement their climate regulations, and it perhaps is even more evident as electricity systems worldwide are undergoing other significant economic transformations today.

Importantly, external forces influencing the electricity system do not necessarily enhance, or restrain, the effectiveness of climate regulation. They cut both ways. Thus, notwithstanding its climate policies, the high cost of importing natural gas compared to coal has driven a stronger proportion of the latter resource in Korea's generation mix, and consequently, higher GHG emissions.[358] By contrast, the United States was able to reduce the proportion of coal in its generation fleet, despite its lack of national GHG emissions limits, largely because the shale gas boom has made that resource so cost-effective and thus attractive to utilities.[359]

Similarly, nations must recognize that while their electricity systems may be islanded off from other jurisdictions physically, they are not isolated from the effects of distant policy decisions. The United Kingdom, for instance, has seen an increase in wind and other renewables as policies across Europe have helped make those resources more affordable,[360] just as the falling cost of solar PV following the proliferation of European feed-in tariffs helped Australia become a leader in distributed generation.[361] Likewise, there is clear cross-pollination of policies across jurisdictions. RPSs in the United States, for instance, have become more nuanced in

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358 *See supra* Part IV.C.
359 *See supra* Part V.C.
360 *Cf. supra* Parts III.B.–C.
361 *Cf. supra* Part II.

recent years, in part to promote solar power, which itself is partially a response to highly granular European feed-in tariffs,[362] while the United Kingdom's own RO similarly was amended in 2009 to become more "banded."[363]

These are but a few aspects of the larger socio-legal-physical ecosystem in which climate regulations operate. Recognizing that this ecosystem exists, and influences policy, is a key observation—and one that this Article's juxtaposition of these four jurisdictions points up well.

Nonetheless, it is also true that there are commonalities across jurisdictions showing the limits to the efficacy of climate regulation. Given that many electricity regulatory systems, including the market-based systems of the jurisdictions studied here, emphasize price as an inherent end-goal, recognizing the wider forces at play in how electricity systems are developing today is critical. That is, climate regulation does not aim to fundamentally rewrite how energy law or utility regulation as a whole operates. Instead, it seeks only to modify or tweak it, giving a "price" of some kind to carbon where one did not previously exist. But in a system where low prices are preferred, any effort to increase costs will always remain in tension with the larger legal system—and global forces may dictate what those costs are, irrespective of what any one nation decides to do with its own climate regulation. All four countries examined here have experienced this to some degree.

D. CLIMATE PERFORMANCE AND POLICY DESIGN

At the same time that it is clear climate regulation of electricity operates in a much larger fabric of physical, economic, and legal systems, it is equally plain that the presence of these laws matters. Their content matters as well.

The first point—that climate regulation actually has impacted the electricity sector—is perhaps obvious, but it is important nevertheless. It is also consistent with the literature,[364] and it is

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[362] *Cf. supra* Parts V.B.–C.

[363] *See supra* Part III.B.

[364] William Dean, *Interactions Among Market Mechanisms for Reducing Greenhouse Gas Emissions in California*, 29 THE ELECTRICITY J. 17, 20–22 (2016); Shahrouz Abolhosseini & Almas Heshmati, *The Main*

demonstrated across each of the jurisdictions analyzed here. Part of how the United Kingdom was able to meet its GHG emission target emissions, for instance, is by growing the share of both natural gas and renewables in its generation mix.[365] More dramatically, Australia's former Emissions Trading Scheme drove down the use of coal for power production, whereas the lifting of that mandate and its replacement with a voluntary scheme led immediately to an uptick in coal consumption, as well as the failure of electricity producers to participate.[366] A more blatant example of the impact of a regulation's influence is hard to imagine.

Still, simply regulating GHG emissions from electricity is unlikely to be enough by itself. It also matters how those regulations are designed and implemented, as the experiences in Australia, the UK, Korea, and the United States emphasize. In the United States, for instance, the historically state-by-state nature of climate regulation consistently presents the risk that emissions reductions in one jurisdiction may simply be offset by emissions growth in another jurisdiction[367]—what some scholars have referred to as "policy leakage."[368] Likewise, projections show that what impact the Clean Power Plan might have on the electricity mix depends heavily on

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Support Mechanisms to Finance Renewable Energy Development, 40 RENEWABLE & SUSTAINABLE ENERGY REVS. 876, 8801–81, 8884 (2014); *Incentivizing Renewable Energy Deployment*, *supra* note 121, at 39; Lori A. Bird, Edward Holt & Ghita Levenstein Carroll*, Implications of Carbon Cap-and-Trade for US Voluntary Renewable Energy Markets*, 36 ENERGY POL'Y 2063 (2008).

[365] *See supra* Part III.C.

[366] *See supra* Part II.

[367] *Cf. supra* Part V.B.1.

[368] *See, e.g.*, Julia Reinaud, *International Energy Agency, Climate Policy and Carbon Leakage: Impacts of the European Emissions Trading Scheme on Aluminium* 2 (2008), http://www.iea.org/publications/freepublications/publication/Aluminium_EU_ ETS.pdf; *see also, e.g.*, Rachel Brewster, *Stepping Stone or Stumbling Block: Incrementalism and National Climate Change Legislation*, 28 YALE L. & POL'Y REV. 245 (2010); Cary Coglianese & Jocelyn D'Ambrosio, *Policymaking Under Pressure: The Perils of Incremental Responses to Climate Change*, 40 CONN. L. REV. 1411, 1419-1425 (2008); Daniel A. Farber, *Carbon Leakage Versus Policy Diffusion: The Perils and Promise of Subglobal Climate Action*, 13 CHI. J. INT'L L. 359 (2013); Jonathan B. Wiener, *Think Globally, Act Globally: The Limits of Local Climate Policies*, 155 U. PA. L. REV. 1961, 1967 (2007).

which compliance mechanisms states choose, with natural gas growth and efficiency measures in particular having a strong interplay.[369] Yet perhaps the starkest example of the importance electricity climate policy design comes from South Korea. There, because the nation's RPS defines what counts as "renewable" quite broadly, wood pallet imports—rather than homegrown wind or solar installations—are serving as the dominant fuel used for regulatory compliance.[370]

VII. CONCLUSION

This is the most exciting time to be involved in electricity since the dawn of the industry. Much today is changing, rapidly, from global electrification to increased competition, from disruption from distributed generation to the sudden, unexpected emergence of natural gas as not just a "bridge" fuel to a clean energy economy but also a dominant force based on economics alone. The electricity industry, it increasingly seems clear, is very much in a time of transition.

There is no doubt that part of this transition is driven by governments seeking to quell the rising tide of climate emissions from the industry. From a global perspective, this is a daunting enough task, particularly as both general demand growth as well as the industrialization and increased electrification of developing and other countries means that even major shifts in generation portfolios can be easily overwhelmed.

This Article shows that even for developed, already-industrialized jurisdictions willing to make concerted efforts to reshape electricity generation, achieving meaningful and lasting reductions in climate emissions is no easy endeavor. There are myriad policies to choose from; once that choice is made, policy and legal change seems inevitable; and climate regulation does not operate in a vacuum, but rather, a much larger, messier, and complicated socio-legal context—including interactions with traditional energy law that in many jurisdictions by its nature intrinsically preferences price risk over climate risk.

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[369] Lincoln L. Davies & Victoria Luman, *The Role of Natural Gas in the Clean Power Plan*, 49 J. MARSHALL L. REV. 325 (2016).

[370] *See supra* Parts IV.B.–C.

As we look to the future of climate regulation of the electricity industry, then, one thing above all else seems certain. Many challenges remain.