COUNTER-INTUITIVE CLIMATE FORCING: POST PARIS AGREEMENT CORPORATE INCENTIVES

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I. CORPORATIONS AND CLIMATE

I am pleased in this Article to examine the interface of the corporation in the 21st century American legal system and its critical role in climate change causation and mitigation. In my prior scholarship for both the *Vermont Law Review* and the *Vermont Journal of Environmental Law*, rather than examining this legal policy interface, I have examined in detail court decisions on energy and environmental law, including: analysis of the evolving line demarcating state violations of the Constitution's Dormant Commerce Clause embedded in energy regulation,[1] a legal analysis of conflicting arguments in the still-pending challenge to the Obama Administration Clean Power Plan (CPP) implementing carbon control,[2] and the conflicts in private rights of action under Section 107 of the Superfund law which reallocates billions of dollars of liability of private parties for hazardous substance damage to the environment.[3] For this Article, the *Vermont Law Review* asked me to examine changing U.S. legal policy on one of the most pressing issues of the century and the role of corporate actors.

Corporate responsibility and roles in the U.S. legal system are something that I have addressed from different perspectives at the invitation of other law school symposia and law reviews in the last decade.[4] Here, now post-Paris Agreement, I examine the state of climate through the legal prism of the corporation as both a consumer and a producer of power,

1. Steven Ferrey, *ZEC Oscillations in the Commerce Clause*, 19 VT. J. ENVTL. L. 365, 367 (2018).

2. Steven Ferrey, *Black Swan Reconfiguration: Legal Separation of American Powers*, 43 VT. L. REV. 29, 31–32 (2018).

3. Steven Ferrey, *The Superfund Cost Allocation Liability Conflicts Among the Federal Courts*, 11 VT. J. ENVTL. L. 249, 252 (2009).

4. Steven Ferrey, *Corporate Energy Responsibility: International and Domestic Perspectives on Supply and Demand in the New Millennium*, 25 FORDHAM ENVTL. L. REV. 84, 84 (2013) [hereinafter *Corporate Energy Responsibility*]; Steven Ferrey, *The New Climate Metric: The Sustainable Corporation and Energy*, 46 WAKE FOREST L. REV. 383, 384 (2011) [hereinafter *The New Climate Metric*]; Steven Ferrey, *Corporate Responsibility and Carbon-Based Life Forms*, 35 B.C. ENVTL. AFF. L. REV. 419, 420 (2008); Steven Ferrey, *Corporate Governance and Rational Energy Choices*, 31 WM. & MARY ENVTL L. & POL'Y REV. 113, 113 (2006).

whose operations comprise the major source of anthropogenic climate warming emissions.[5] This Article then takes:

- A microeconomic perspective on now-changing incentives and disincentives for corporations contained in the new federal tax law and other applicable regulations; and
- A macroeconomic assessment of how the U.S. is or is not hitting its climate targets two decades into the 21st century.

There are recent U.S. actions to withdraw from the Paris Agreement of 2015[6] and the U.S. Clean Power Plan[7]—which, as one examines the actual statistics, yield counter-intuitive results as well as an interesting perspective on the role of law in a market-driven economy.[8] This Article starts discussing climate, which bridges both environment and energy law, featuring corporations as the legal vehicle through which much of the Western economic system operates.[9] Environmentally, global temperatures are higher today than at any time in the past 800,000 years.[10] The impacts on the U.S. and the world are well-documented.[11]

Energy is the core technology undergirding the U.S. and all developed-country economies.[12] Electricity production accounts for less than 5% of

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5. *See* PAUL GRIFFIN, THE CARBON MAJORS DATABASE: CDP CARBON MAJORS REPORT 2017, at 8 (2017), climateaccountability.org/pdf/CarbonMajorsRpt2017%20Jul17.pdf (noting that since 1988, 100 companies have produced 71% of all greenhouse gas emissions).

6. Michael D. Shear, *Trump Will Withdraw U.S. from Paris Climate Agreement*, N.Y. TIMES (June 1, 2017), https://www.nytimes.com/2017/06/01/climate/trump-paris-climate-agreement.html (explaining that the U.S. will withdraw from the Paris Agreement of 2015).

7. Exec. Order No. 13,783, 82 Fed. Reg. 16,093, 16,095 (Mar. 31, 2017).

8. *See infra* Part V.B (outlining the U.S. carbon emission statistic estimations placing electricity emissions 27–35% below 2005 levels, "even with the CPP regulation repealed by the Trump Administration").

9. *See* STEVEN FERREY, UNLOCKING THE GLOBAL WARMING TOOLBOX v (Pennwell Pub. 2010) [hereinafter GLOBAL WARMING TOOLBOX] (laying out the framework for this explanation).

10. *Figure 14: 800,000 Years of Temperature and Carbon Dioxide Records*, NAT'L ACADS. SCI., ENGINEERING & MED., https://nas-sites.org/americasclimatechoices/more-resources-on-climate-change/climate-change-lines-of-evidence-booklet/evidence-impacts-and-choices-figure-gallery/figure-14/ (last visited Apr. 27, 2019) [hereinafter *800,000 Years of Temperature*] (documenting that carbon dioxide levels are higher now than within the last 800,000 years and showing a close connection between CO_2 levels and temperature change); ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, EMISSIONS OF GREENHOUSE GASES IN THE UNITED STATES 2005: EXECUTIVE SUMMARY 2–3 (2007), http://www.eia.doe.gov/oiaf/1605/ggrpt/summary/pdf/0573(2005)es.pdf [https://web.archive.org/web/20170302105210/http://www.eia.gov/oiaf/1605/ggrpt/summary/pdf/0573(2005)es.pdf]; *Frequently Asked Global Change Questions*, CARBON DIOXIDE INFO. ANALYSIS CTR., https://cdiac.ess-dive.lbl.gov/faq.html#Q7 (last visited Apr. 27, 2019).

11. *800,000 Years of Temperature*, *supra* note 10.

12. *See* MICHAEL TOMAN & BARBORA JEMELKOVA, ENERGY AND ECONOMIC DEVELOPMENT: AN ASSESSMENT OF THE STATE OF KNOWLEDGE 3 (2003), http://ageconsearch.umn.edu/bitstream/10685/1/dp030013.pdf (explaining the significant role energy technology plays in economic development); WORLD ECON. FORUM, ENERGY FOR ECONOMIC GROWTH: ENERGY VISION UPDATE 2012, at 6 (2012), www3.weforum.org/docs/WEF_EN_EnergyEconomicGrowth_IndustryAgenda_

U.S. economic activity, yet is held responsible for about one-quarter of emissions of certain criteria air pollutants.[13] Electric power derived from burning gaseous, liquid, and solid fossil fuels to create electric power releases large quantities of CO_2 into the environment.[14] Fossil-fuel power generation results in 57% of total human-made atmospheric CO_2, and this amount has increased significantly since 1990.[15] Electric power demand worldwide is continuing to increase dramatically.[16] The share of all burned fossil fuels converted to create electricity increased during the 21st century from 1% in 1900 to 25% in 1990.[17]

The importance of the electric sector to the modern corporate industrial economy and to climate change is reflected in its changing dominant role.[18] In 1949, only 11% of global warming gases in the U.S. came from the electric sector; today it contributes more than one-third.[19] The U.S. Energy Information Administration concluded that the electric power sector offered the most cost-effective opportunities to reduce CO_2 emissions, compared to transportation, the next sector.[20] Fossil-fuel-fired power plants and petroleum refineries collectively emit nearly 40% of our national greenhouse gas (GHG) emissions—significantly more than the next most

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2012.pdf ("Energy is the lifeblood of the global economy – a crucial input to nearly all of the goods and services of the modern world. Stable, reasonably priced energy supplies are central to maintaining and improving the living standards of billions of people.").

13. *The New Climate Metric*, *supra* note 4, at 388, 389 n.34.

14. The amount of carbon released per unit of usable energy decreased each time as human populations moved from wood to coal as the dominant CO_2-releasing fuel in the late-19th century, again moved from coal to oil in the mid-20th century, and will move toward natural gas in the future. 1 STEVEN FERREY, LAW OF INDEPENDENT POWER § 2:1, at 2–8 (Thomson Reuters 46th ed. 2018) [hereinafter LAW OF INDEPENDENT POWER]; *see generally* Peter A. O'Connor et al., *U.S. Energy Transitions 1780–2010*, 7 ENERGIES 7955, 7963, 7969, 7972 (2014) (charting and explaining historical uses of wood, oil, and natural gas in the U.S.).

15. *The New Climate Metric*, *supra* note 4, at 390 (citing INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT 36 (2007), https://www.ipcc.ch/site/assets/uploads/2018/02/ar4_syr_full_report.pdf); *see generally* Pachauri et al., *supra* note 11, at 45–47 (showing an increase in greenhouse gas emissions); U.S. ENERGY INFO. ADMIN., EMISSIONS OF GREENHOUSE GASES IN THE UNITED STATES 2009 (2011), https://www.eia.gov/environment/emissions/ghg_report/ (documenting an increase in greenhouse gas emissions since 1990).

16. *See, e.g.*, INT'L ENERGY AGENCY, WORLD ENERGY OUTLOOK 2017, at 47, 49–50 (2017), http://www.iea.org/media/weowebsite/2017/Chap1_WEO2017.pdf (explaining that the downward pressure on energy costs, population expansion, and GDP growth is causing global energy demand to increase).

17. Steven Ferrey, *Power Future*, 15 DUKE ENVTL. L. & POL'Y F. 261, 267 (2005).

18. *See id.* at 261 (describing the importance of energy, especially electric energy, to humans and electric energy's effect on the environment).

19. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY REVIEW 2011, at 303, 309 (2012), https://www.eia.gov/totalenergy/data/annual/pdf/aer.pdf.

20. U.S. ENERGY INFO. ADMIN., INTERNATIONAL ENERGY OUTLOOK 2008, at 4 (2008), http://large.stanford.edu/publications/coal/references/docs/0484(2008).pdf.

significant sector, transportation.[21] This Article addresses the corporation as an actor in both of these significant sectors,[22] which now are heavily dependent upon fossil-fuel combustion.[23] The next Part addresses direct and indirect aspects of transportation.

II. CORPORATIONS, TRANSPORTATION, LOCATION

A. Corporations as Transportation Magnets

"California will fight this stupidity in every conceivable way possible."

—California Governor Jerry Brown, regarding Trump Administration plan to roll back federal fuel economy standards and terminate California's ability to set separate, more rigorous vehicle standards[24]

The use of oil as a commodity over the last 150 years is not evenly distributed over time.[25] About 50% of all historic petroleum consumption took place after 1984, while about 90% of all petroleum consumption occurred after 1958, in the most recent trimester of oil usage.[26]

As of 2006, the U.S. transportation sector consumed about 13.99 million barrels of petroleum per day, 86% more than the 6.87 million barrels then produced in the U.S. per day.[27] According to the U.S. Census in 2000, "[a]mong the 128.3 million workers in the United States in 2000, 76 percent drove alone to work."[28] The report determined that "12 percent carpooled, 4.7 percent used public transportation, 3.3 percent worked at

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21. *Settlement Agreement*, EPA, http://www.epa.gov/airquality/cps/settlement.html [https://web.archive.org/web/20120602100227/http://www.epa.gov/airquality/cps/settlement.html] (last visited Apr. 27, 2019).

22. *See infra* Parts II.A & III.A (discussing how corporations have a significant role in the electric and transportation sectors).

23. *See* Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 Fed. Reg. 66,496, 66,539–40 (Dec. 15, 2009) (to be codified at 40 C.F.R. pt. 1) (describing the significant GHG emissions produced by § 202(a) sources and comparing the percentage of emissions generated by the electricity sector and the industrial sector).

24. Ryan Beene et al., *Trump Moves to Ease Obama Auto-Mileage Rules, California's Clout*, BLOOMBERG (Aug. 2, 2018), https://www.bloomberg.com/news/articles/2018-08-02/u-s-proposes-easing-auto-mileage-rules-california-s-authority.

25. *See* U.S. ENERGY INFO. ADMIN., ENERGY SOURCES HAVE CHANGED THROUGHOUT THE HISTORY OF THE UNITED STATES (2013), https://www.eia.gov/todayinenergy/detail.php?id=11951.

26. *See id.* (graphing historic petroleum consumption in the U.S.).

27. *Table 4-1: Overview of U.S. Petroleum Production, Imports, Exports, and Consumption*, BUREAU OF TRANSP. STAT., https://www.bts.gov/archive/publications/national_transportation_statistics/2007/table_04_01 (last visited Apr. 27, 2019).

28. U.S. CENSUS BUREAU, C2KBR-33, JOURNEY TO WORK: 2000, at 1 (2004), http://www.census.gov/prod/2004pubs/c2kbr-33.pdf.

home, 2.9 percent walked to work, and 1.2 percent used other means (including motorcycle or bicycle)."[29]

One thing many service corporations could shift to at this point in the 21st century, is to not have all employees commute from home to a business location every day, with modern communications providing low-cost audio and video communication interconnection.[30] For example, Sun Microsystems' Open Work Program gives employees the option to work from home and, "in 2006, Sun saved $67.8 million in real-estate costs, prevented nearly 29,000 tons of CO_2 emissions, and increased worker productivity by 34%."[31] "Transportation-related solutions include developing Microsoft Office Live Meeting and other technologies that can, according to a joint study by Microsoft and Forrester Research, reduce corporate travel by 10% to 30%."[32]

There are certain micro-economic incentives which would facilitate this.[33] However, there has not been great success to date in reducing people's transportation needs by state or local regulation.[34] Gasoline use corresponds in reverse relation to the price of gasoline.[35]

Looking just at options in the New England region, in 2011, Massachusetts unveiled a new concept for a transportation plan for GHG emission reductions by suggesting a change in auto insurance rates that could be offered in Massachusetts; yearly miles driven would be a factor in setting individual consumer auto insurance rates.[36] This pay-as-you-drive concept, not dissimilar to pay-as-you-throw rates in several communities

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29. *Id.*

30. *See* Andrea Loubier, *Benefits of Telecommuting for the Future of Work*, FORBES (July 20, 2017), https://www.forbes.com/sites/andrealoubier/2017/07/20/benefits-of-telecommuting-for-the-future-of-work/#7f15c75816c6 (describing the growing acceptance of working from home).

31. Mark Borden et al., *50 Ways to Green Your Business*, FAST COMPANY (Nov. 1, 2007), http://www.fastcompany.com/magazine/120/50-ways-to-green-your-business.html.

32. *The New Climate Metric*, *supra* note 4, at 424.

33. *See, e.g.*, *id.* at 422–24 (listing potential incentives, such as reduced travel times, lower transportation costs, and more reliable delivery; and how some businesses are obtaining those incentives).

34. *See* Chris Anderson, *The Legal Challenges of Telecommuting*, HR PROF'L MAG., http://hrprofessionalmagazine.com/the-legal-challenges-of-telecommuting/ [https://web.archive.org/web/20180114070600/http://hrprofessionalsmagazine.com/the-legal-challenges-of-telecommuting/] (explaining the legal issues that employers face when considering telecommuting) (last visited Apr. 27, 2019).

35. *But see* Eliana Eitches & Vera Crain, *Using Gasoline Data to Explain Inelasticity*, BEYOND NUMBERS, Mar. 2016, at 1, 2, https://www.bls.gov/opub/btn/volume-5/pdf/using-gasoline-data-to-explain-inelasticity.pdf ("[I]ndividual households (excluding commercial use) buy as many gallons of gas and travel as many or more miles regardless of the price of gasoline.").

36. IAN A. BOWLES, EXEC. OFFICE OF ENERGY & ENVTL. AFFAIRS, MASSACHUSETTS CLEAN ENERGY AND CLIMATE PLAN FOR 2020, at 61 (2010), https://www.greenneedham.org/blog/wp-content/uploads/2011/02/2020-clean-energy-plan.pdf.

trying to minimize waste disposal and increase recycling of waste, was developed in a 2008 Brookings Institution study and MIT research.[37] The *Boston Globe* responded with an editorial position that insurance rates based on greater miles driven disadvantages those with long commutes and encouraged purchasing of more efficient gas-saving cars should be pursued instead.[38] Massachusetts never adopted this proposal that would have impacted mostly those who drive the most thereby contributing the most to global warming and other vehicle pollution; nor has Massachusetts increased its gasoline tax.[39] President Trump announced he is freezing existing increases in the national Corporate Average Fuel Efficiency (CAFE) standards required for new car miles-per-gallon efficiency.[40]

However, in July 2018, the Massachusetts State Senate adopted the first legislation in the U.S., either federal or state, to approve revenue-neutral fees as a way to "put a price on carbon" to curb pollution in the transportation sector by the end of 2020, (which is Massachusetts's biggest source of GHGs), "on commercial and industrial buildings and processes by the end of 2021, [and] on residential buildings by the end of 2022."[41] This affects transportation and corporate buildings first.[42] This now awaits approval in the second chamber of the legislature.[43]

B. The Law on Federal Environmental Review

Environmental review and environmental impact statements (EISs) are embedded in both federal and some state laws since the early 1970s.[44] Section 102(c) in the federal National Environmental Protection Act

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37. *Id.* at 51 n.46.

38. Editorial, *Driving: No "Pay as You Go" Premiums*, BOS. GLOBE (Jan. 13, 2011), http://archive.boston.com/bostonglobe/editorial_opinion/editorials/articles/2011/01/13/driving_no_pay_as_you_go_premiums/.

39. *See* MATTHEW A. BEATON, EXEC. OFFICE OF ENERGY & ENVTL. AFFAIRS, MASSACHUSETTS CLEAN ENERGY AND CLIMATE PLAN FOR 2020, at 56 (2015), https://www.mass.gov/files/documents/2017/12/06/Clean%20Energy%20and%20Climate%20Plan%20for%202020.pdf (indicating that Massachusetts did not adopt the pay-as-you-drive program).

40. Todd Spangler & Nathan Bomey, *Trump Administration Wants to Freeze Gas-Mileage Standards, Reversing Obama*, USA TODAY (Aug. 2, 2018), https://www.usatoday.com/story/money/cars/2018/08/02/trump-epa-fuel-economy-standards/887683002/.

41. Press Release, MassInsider, MA Makes History: Carbon Pricing Passes the Senate (July 17, 2018), https://myemail.constantcontact.com/MA-makes-history--carbon-pricing-passes-the-Senate--The-Barrett-Report--July--2018-.html?soid=1110058483636&aid=gHSGacHd0wE.

42. *See id.* (stating that the regulations issued by the governor will "impose carbon pricing of some kind on the transportation sector by the end of 2020, [and] on commercial and industrial buildings and processes by the end of 2021").

43. *See id.* (indicating that the bill will now go before the House).

44. National Environmental Policy Act (NEPA) of 1969 § 102, 42 U.S.C. § 4332 (2012).

(NEPA) requires pre-action environmental impact studies where a "major Federal action[] significantly affect[s] the quality of the human environment," the agency must evaluate "the environmental impact . . . [and] any adverse environmental effects" of its actions.[45] This requires "a detailed statement" for "major Federal actions significantly affecting the quality of the human environment,"[46] where a "detailed statement," more commonly known as an EIS, addresses the proposed action's environmental impacts,[47] unavoidable adverse impacts,[48] and alternatives to the proposed action.[49]

While an EIS need not include all of the underlying data on which it is based,[50] an EIS must disclose and discuss responsible opposing views,[51] taking a "hard look" at the environmental consequences of its decision to go forward with a project.[52] A "[c]ourt is not required to decide whether the EIS is based on the best scientific methodology available, or to resolve disagreements among experts. Instead, the [c]ourt's task is to ensure that the procedure followed resulted in a reasoned analysis of the evidence."[53] "While the review [of an EIS] must be careful, the ultimate standard is a narrow one. A court is not to substitute its judgment for that of the agency."[54] The "arbitrary and capricious" standard of judicial review applies, however, there is no private right of action for private parties.[55]

The number, time, and cost of NEPA compliance is less than expected.[56] The Government Accountability Office estimated that approximately 95% of agency actions requiring possible environmental review escape such review based on Categorical Exclusions,[57] while

45. *Id.* § 102(2)(C), 42 U.S.C. § 4332(C).

46. *Id.*

47. *Id.* § 102(2)(C)(i), 42 U.S.C. § 4332(2)(C)(i).

48. *Id.* § 102(2)(C)(ii), 42 U.S.C. § 4332(2)(C)(ii).

49. *Id.* § 102(2)(C)(iii), 42 U.S.C. § 4332(2)(C)(iii).

50. *See* Sierra Club v. Kimbell, 595 F. Supp. 2d 1021, 1039 (D. Minn. 2009) ("There is no requirement that an EIS include all of the underlying data on which it is based.").

51. Pac. Coast Fed'n of Fishermen's Ass'ns v. Nat'l Marine Fisheries Serv., 482 F. Supp. 2d 1248, 1253 (W.D. Wash. 2007).

52. Wilderness Soc'y v. Salazar, 603 F. Supp. 2d 52, 59 (D.D.C. 2009) (citations omitted).

53. *Pac. Coast*, 482 F. Supp. 2d at 1253.

54. *Wilderness Soc'y*, 603 F. Supp. 2d at 59.

55. *See* Exec. Order No. 12,898, 59 Fed. Reg. 7629, 7632–33 (Feb. 16, 1994) (implying that there is no right to judicial review); Lujan v. Nat'l Wildlife Fed'n, 497 U.S. 871, 872 (1990) (holding that there is no private right of action for parties under NEPA); Nevada v. Dep't of Energy, 457 F.3d 78, 87 (D.C. Cir. 2006) (explaining how the arbitrary and capricious standard works for the EIS process).

56. *See* GOV'T ACCOUNTABILITY OFFICE, NATIONAL ENVIRONMENTAL POLICY ACT: LITTLE INFORMATION EXISTS ON NEPA ANALYSES 8–9, 13–14, 16 (2014) [hereinafter GAO], https://www.gao.gov/assets/670/662546.pdf (implying that environmental impact assessments are rare contrary to general expectations).

57. *Id.* at 8.

approximately 5% proceed only to much more abbreviated Environmental Assessments (EAs),[58] leaving less than 1% of all reviewed projects that proceed to a full EIS.[59] Full EISs now typically number less than 200 filed each year by all federal agencies, with federal court cases challenging agency compliance with NEPA now less than 100 cases filed annually, with approximately half challenging the adequacy or completeness of the EIS prepared.[60] A NEPA task force report "estimated that an EIS typically cost[s] from $250,000 to $2 million," whereas "an EA typically costs from $5,000 to $200,000."[61] From 2000 to 2012, the average preparation time for an EIS was 4.6 years, having increased on average at a rate of 34 days per year.[62]

In 2010, the Council on Environmental Quality issued a Draft NEPA Guidance on consideration of climate change and GHG emissions, which suggests a threshold level of direct GHG emissions of 25,000 metric tons annually as an indicator that the climate impacts of a proposed project are significant and warrant analysis under NEPA.[63] The guidance suggests that EISs should address climate mitigation and adaptation measures when considering project alternatives, and that EISs should consider emissions from all stages of a project's life cycle when feasible.[64] This includes indirect or induced emissions from vehicles and material supply chains whenever initial scoping indicates that they might be significant.[65]

Two significant changes have happened since. First, during the Obama Administration, to address climate change, EPA enacted regulations

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58. *Id.*

59. *Id.*

60. Letter from Robert H. Abrams et al., to Chairman Bishop et al. (Apr. 24, 2018), http://progressivereform.org/articles/Law_Professor_Letter_House_NEPA_Hearing_042418.pdf. *But see* GAO, *supra* note 56, at 9 (showing that although there is a downward trend, the numbers have yet to slip below 190).

61. GAO, *supra* note 56, at 13–14.

62. *See* NAT'L ASS'N OF ENVTL. PROF'LS, ANNUAL NEPA REPORT 2012 OF THE NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) PRACTICE 11 (Judith Charles et al. eds., 2013), https://ceq.doe.gov/docs/get-involved/NAEP_2012_NEPA_Annual_Report.pdf (noting that the average completion time for an EIS was about 4.6 years in 2012). The average completion time for an EA issued by the Department of Energy was thirteen months; by contrast, the average for the U.S. Forest Service was about nineteen months in 2012. GAO, *supra* note 56, at 14–15.

63. *See* Memorandum from Nancy H. Sutley, Chair, Council on Envtl. Quality, to Heads of Fed. Dep'ts & Agencies, Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions 1–2 (Feb. 18, 2010), https://www.nrc.gov/docs/ML1006/ML100601337.pdf (encouraging the concept that sources emitting less than 25,000 metric tons a year should still be considered when analyzing a project's cumulative long-term emissions). For long-term projects that have annual emissions of less than 25,000 metric tons, the guidance encourages federal agencies to consider whether the project's cumulative long-term emissions might still warrant analysis. *Id.*

64. *Id.* at 1.

65. *Id.*

pursuant to the Clean Air Act to regulate CO_2 emissions from electric power generation facilities.[66] The Clean Air Act covers all "major stationary sources" that can potentially emit at least 100 or 250 tons of the relevant pollutant annually.[67] As to GHG regulation, EPA chose only to regulate those sources whose GHG emissions exceeded 75,000 tons per year for modifications or 100,000 tons per year for new construction.[68] When challenged, the Supreme Court held that: "an agency has no power to 'tailor' legislation to bureaucratic policy goals by rewriting unambiguous statutory terms. Agencies exercise discretion only in the interstices created by statutory silence or ambiguity; they must always 'give effect to the unambiguously expressed intent of Congress.'"[69] The agency's power to execute the laws "does not include a power to revise clear statutory terms that turn out not to work in practice."[70]

This decision did permit the EPA to impose its GHG regulations on facilities also emitting CO_2 that were already regulated under another part of the Clean Air Act.[71] EPA separately also enacted distinct Clean Air Act Section 111(d) rules restricting CO_2 emissions from existing, as opposed to new, power plants in the Clean Power Plan, which allowed pollution controls administered beyond the fence line of the affected project's site metes and bounds.[72] The *Utility Air Regulatory Group* majority opinion stressed that CO_2 emission controls are placed at the plant.[73]

Second, changing course in November 2017, the Trump Administration announced the repeal of the CPP.[74] In the last few days of 2017, the EPA issued an Advance Notice of a Proposed Rulemaking to replace the CPP.[75] In the interim, the unprecedented stay of the CPP by the

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66. JAMES E. MCCARTHY, CONG. RES. SERV., R44312, EPA STANDARDS FOR GREENHOUSE GAS EMISSIONS FROM POWER PLANTS: MANY QUESTIONS, SOME ANSWERS, at 2 (Nov. 15, 2013), https://fas.org/sgp/crs/misc/R44312.pdf.

67. STEVEN FERREY, ENVIRONMENTAL LAW: EXAMPLES & EXPLANATIONS 208 (7th ed. 2016).

68. Util. Air Regulatory Grp. v. EPA, 134 S. Ct. 2427, 2437 (2014).

69. *Id.* at 2445 (quoting Nat'l Ass'n of Home Builders v. Defs. of Wildlife, 551 U.S. 644, 665 (2007)).

70. *Id.* at 2446.

71. *See id.* at 2449 ("Our narrow holding is that nothing in the statute categorically prohibits EPA from interpreting the BACT provision to apply to greenhouse gases emitted by 'anyway' sources.").

72. *Id.* at 2453–54.

73. *Id.* at 2450.

74. Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 82 Fed. Reg. 51,787, 51,787 (Nov. 8, 2017) (to be codified at 40 C.F.R. pt. 60).

75. State Guidelines for Greenhouse Gas Emissions from Existing Electric Utility Generating Units, 82 Fed. Reg. 61,507, 61,507 (proposed Dec. 28, 2017) (to be codified at 40 C.F.R. pt. 60).

Supreme Court in *West Virginia v. EPA*[76] reflects the progressive retreat from *Chevron* deference, previously afforded to agency decisions—embodied indirectly in several recent Supreme Court cases,[77] including *Utility Air Regulatory Group v. EPA*,[78] *King v. Burwell*,[79] and *Michigan v. EPA*.[80] The Court's order granting the stay applied directly to EPA's CPP rule, rather than to a lower court judicial decision as it does in all other matters.[81] No party in the matter was able to point to any previous case in which the Supreme Court had stayed an agency rule before any court had reviewed it on its merits.[82] And, in 2018, the Trump Administration removed GHG emissions from EIS consideration.[83]

C. State Environmental Review Requirements

Even with a retreat in environmental and climate matters at the federal level, many states have similar environmental consideration requirements at the state level.[84] Here we highlight an example from both coasts. The California Sustainable Communities and Climate Protection Act requires the state Air Resources Board to establish GHG emission reduction targets for each Metropolitan Planning Organization (MPO) in California, each including a county.[85] Each MPO must then prepare a Sustainable Community Strategy, combining land-use and transportation planning, to achieve state goals, which allows qualifying developments to enjoy streamlined NEPA-like review under California's Environmental Quality Act.[86] This is designed to reduce work-related vehicle miles traveled by

76. West Virginia v. EPA, 136 S. Ct. 1000, 1000 (2016).

77. *Compare* Chevron U.S.A., Inc. v. Nat. Res. Def. Council, Inc., 467 U.S. 837, 842–43 (1984) (establishing the legal test given to determine deference to a government agency's interpretation of a statute), *with* Nicholas R. Bednar & Kristin E. Hickman, Chevron*'s Inevitability*, 85 GEO. WASH. L. REV. 1392, 1408 (2017) (discussing the Court's retreat from *Chevron*).

78. *See* Util. Air Regulatory Grp. v. EPA, 573 U.S. 302, 324 (2014) (disfavoring new agency interpretation).

79. *See* King v. Burwell, 135 S. Ct. 2480, 2488–89 (2015) (disregarding the opinion of non-expert agencies).

80. Michigan v. EPA, 135 S. Ct. 2699, 2707–08 (2015) (interpreting a statute as requiring agency consideration of costs before regulation).

81. *West Virginia*, 136 S. Ct. at 1000.

82. Lisa Heinzerling, *The Supreme Court's Clean-Power Power Grab*, 28 GEO. ENVTL. L. REV. 425, 425 (2016).

83. Nadja Popovich et al., *78 Environmental Rules on the Way Out Under Trump*, N.Y. TIMES, https://www.nytimes.com/interactive/2017/10/05/climate/trump-environment-rules-reversed.html (last updated Dec. 28, 2018).

84. S.B. 375, 2007–2008 Leg., Reg. Sess. (Cal. 2008).

85. *Id.*

86. *Id.*

impacting housing development patterns.[87] Consistent projects that enjoy expedited review must include dense residential developments near public transit, to be served by existing utility infrastructure, and be more energy efficient than required by code.[88]

Moreover, California became the first state to preempt local zoning to require each city or town to permit accessory residential units on existing parcels to promote infilling of more dense residential land-use patterns, which could reduce transportation mileage.[89] In Massachusetts, under the Massachusetts Environmental Policy Act (MEPA)[90]—a NEPA analogue[91]—a 2010 GHG policy provides a list of 95 mitigation measures that should be considered by a proponent during the MEPA review process.[92] Pursuant to the MEPA Greenhouse Gas Emissions Policy and Protocol, if a project requires a mandatory Environmental Impact Report (EIR) or the Secretary requires the preparation of an EIR on a discretionary basis, the Secretary's Certificate on the Environmental Notification Form will include a scope for the quantification of project-related GHG CO_2 emissions.[93] Applicants must identify both the "direct"[94] and "indirect"[95]

87. *Id.*

88. *See The Basics of SB 375*, INST. FOR LOCAL GOV'T, https://www.ca-ilg.org/post/basics-sb-375 (last visited Apr. 27, 2019) (explaining the requirements placed on California through S.B. 375).

89. S.B. 375.

90. 301 MASS. CODE REGS. 11.00 (2013).

91. *See generally* Daniel P. Selmi, *Themes in the Evolution of the State Environmental Policy Acts*, 38 URB. L. 949, 951 n.16 (2006) (highlighting MEPA as one of several state statutes analogous to NEPA).

92. EXEC. OFFICE OF ENERGY & ENVTL. AFFAIRS, COMMONWEALTH OF MASS., REVISED MEPA GREENHOUSE GAS EMISSIONS POLICY AND PROTOCOL 14–17 (2010), https://www.mass.gov/files/documents/2016/08/tb/ghg-policy-final.pdf [hereinafter MEPA REVISED POLICY AND PROTOCOL]. Some of the suggestions made by the Office of Energy and Environmental Affairs include: design the project to support alternative transportation to site including transit, walking, and bicycling; minimize energy use through proper building orientation and use of appropriate landscaping (e.g., trees for shading parking lots or southern facing facades); design roofs at a minimum to be solar ready; use energy efficient boilers, heaters, furnaces, incinerators, or generators; construct green roofs to reduce heat load on roof, further insulate, and retain and filter rainwater; use demand control ventilation; seal and leak-check all supply air ductwork, etc. *Id.* at 14–15.

93. *Id.* at 2. The CO_2 quantification process requires the proponent to: (1) identify the project baseline, (2) calculate estimated GHG emissions from the project baseline condition, and (3) calculate estimated emissions reductions based on mitigation measures by comparing project alternatives to the baseline. *Id.* at 3.

94. EXEC. OFFICE OF ENERGY & ENVTL. AFFAIRS, COMMONWEALTH OF MASS., SUMMARY OF THE FINAL REVISIONS TO THE MEPA GREENHOUSE GAS EMISSIONS POLICY AND PROTOCOL 8 (2010), https://www.mass.gov/files/documents/2016/08/rp/ghg-policy-final-summary.pdf [hereinafter MEPA FINAL REVISIONS]. On-site combustion occurs whenever a stationary source such as a boiler, heater, furnace, incinerator, oven, etc. burns fossil fuels for heat, hot water, or on-site electricity generation. *Id.* If the proposed project will have fleet vehicles on-site, such as forklifts, tractors, fueling trucks, maintenance and security vehicles, then the CO_2 emissions from those vehicles must be included in the calculation of "direct" emissions. *Id.*

sources of GHG emissions that the project will emit or produce. "Indirect" emissions include the CO_2 emitted through the generation of electricity for the project,[96] employing the ISO-New England Marginal Emissions Report, which calculates the average amount of CO_2, expressed in pounds, produced for every megawatt hour of electricity generated for a variety of stationary combustion sources.[97] Projects also generate GHG emissions indirectly through traffic generation and associated fuel combustion, which under state law must be modeled for employees, vendors, customers, and others.[98]

While this Massachusetts analysis focuses primarily on CO_2, analysis of other GHGs may be required for certain projects including emissions from various manufacturing processes, including hydrofluorocarbons and perfluorocarbons from the manufacturing, servicing, and disposal of refrigeration and air conditioning equipment, using the Energy Information Administration's Emissions Factor and Global Warming Potentials or similar sources.[99] When calculating the baseline for transportation-related emissions for a new facility, this state GHG policy requires estimation of the net new trips within the study area identified for the project's traffic study.[100]

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95. *Id.* "Indirect" emissions are emissions from generating plants supplying electricity to the proposed project and emissions from vehicle trips generated by the project. MEPA REVISED POLICY AND PROTOCOL, *supra* note 92, at 4. The proponent must calculate how much energy, including electricity, heat, and cooling the project will consume and then calculate the GHG emissions produced by off-site facilities providing such energy. *See id.* (explaining what constitutes indirect emissions). With regard to vehicle trips, the proponent must determine the number of employees, vendors, customers, and others who will drive to the project and calculate the CO_2 emissions produced by those trips. *Id.* at 5.

96. MEPA FINAL REVISIONS, *supra* note 94.

97. ISO NEW ENGLAND INC., 2007 NEW ENGLAND MARGINAL EMISSION RATE ANALYSIS 4–5 (2009), http://www.iso-ne.com/genrtion_resrcs/reports/emission/2007_mea_report.pdf.

98. *See* MEPA REVISED POLICY AND PROTOCOL, *supra* note 92, at 9 (detailing the steps required to "calculate a baseline for [indirect] transportation-related emissions from [most] proposed Projects"). The model must estimate projected net new trips within the study area identified for the project traffic study. *Id.* Net new trips are expressed in daily vehicle miles of travel for weekday and weekend conditions, multiplied by annual miles per year by the appropriate EPA MOBILE 6.2 CO_2 emission factors (grams per mile) and divided by 907,185 grams per ton to obtain annual CO_2 emissions (tons per year). *Id.* at 9 & n.6. MOBILE 6.2 provides emission factors by vehicle type, ranging from 368.5 grams per mile for light-duty gasoline vehicles up to 1,633.1 grams per mile for the heaviest diesel trucks. *Id.* at 9 n.7.

99. *Id.* at 3. These data sources are available online at *Frequently Asked Questions*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/tools/faqs/faq.php?id=76&t=11 (last updated Feb. 6, 2019) (noting emissions factors) and *Emissions of Greenhouse Gases in the United States 2009*, U.S. ENERGY INFO. ADMIN. (Feb. 2011), https://www.eia.gov/environment/emissions/ghg_report/pdf/tbl1.pdf (noting global warming potentials).

100. MEPA REVISED POLICY AND PROTOCOL, *supra* note 92, at 9. This should be expressed in daily vehicle miles of travel (VMT) for weekday and weekend conditions and the calculations for

Once the baselines are determined, the proponent must calculate and compare GHG emissions associated with alternative mitigation measures.[101] In addition to outlining the mitigation measures that were chosen, the proponent should explain which alternative measures were rejected, and the reasons for rejecting them.[102] Mitigation for siting and design variables include smaller corporate or industrial building footprints, on-site deployment of solar photovoltaic or other renewable energy sources, and transportation CO_2 mitigation alternatives, like carpooling or alternative means of transportation.[103] The list of measures that corporations can take to reduce the amount of emissions created as a result of transportation could include: changes in siting and project design to emphasize transit options, subsidizing transit passes, bicycle storage and shower areas, a reduction in idling or a prohibition of engine idling in loading areas, an increase in telecommuting, rightsizing parking capacity, alternative fuel, and a concentration on pedestrian access.[104]

For new corporate activities that require a major federal or state permit, funding, or other major action, the EIS process requires evaluation of significant environmental impacts, alternatives, and mitigation options.[105] This now includes GHG emissions and climate impact.[106] However, the consideration of carbon as part of an EIS at the federal or state levels has not been that effective in changing carbon emissions.[107] These consideration processes are procedural rather than substantive.[108] The primary reduction in carbon has been in the regulated power sector and less so in the transportation sector or under the NEPA process, which only

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customers, employees, and truck trips should be analyzed separately. *Id.* The direct emissions from fleet vehicles, if any, are also calculated by determining VMT. *Id.* at 10. The Office of Energy and Environmental Affairs suggests that proponents consider the vehicle class, number of vehicles, vehicle speeds, and average number and distance of on-site trips for the various fleet vehicles. *Id.*

101. *Id.* at 6.

102. *Id.* at 7.

103. *Id.* at 9.

104. ALICIA MCDEVITT, EXEC. OFFICE OF ENERGY & ENVTL. AFFAIRS, MASSACHUSETTS ENVIRONMENTAL POLICY ACT (MEPA) GREENHOUSE GAS (GHG) EMISSIONS POLICY AND PROTOCOL OVERVIEW 14 (2008)[hereinafter MEPA POLICY AND PROTOCOL].

105. *Corporate Energy Responsibility*, *supra* note 4, at 115.

106. Sierra Club v. FERC, 867 F.3d 1357, 1371 (D.C. Cir. 2017) (citations omitted).

107. MEPA POLICY AND PROTOCOL, *supra* note 104, at 6, 9.

108. *See* ELIZABETH SHEARGOLD & SMITA WALAVALKAR, COLUM. CTR. FOR CLIMATE CHANGE LAW, NEPA AND DOWNSTREAM GREENHOUSE GAS EMISSIONS OF U.S. COAL EXPORTS 27 (2013), http://wordpress.ei.columbia.edu/climate-change-law/files/2016/06/Sheargold-and-Walavalkar-2013-08-NEPA-and-Downstream-GHG-Emissions.pdf (describing NEPA as a procedural statute).

requires a consideration of major new actions that require permits or benefits from government funding.[109]

III. THE CORPORATION ROLE AS SUPPLIER OF POWER

A. The Corporation as Microeconomic Stakeholder

The International Energy Agency predicts that by 2030, world demand for energy will grow by 57% and fossil fuel sources will still supply 82% of the total, with non-carbon renewable energy sources supplying only 6%.[110] It has been estimated that a $10 trillion expenditure in renewable resources will be required over the next two decades just to limit the rise in Earth temperature.[111] This is equal to 0.5–1.1% of global gross domestic product.[112] The role of renewable energy must change dramatically, and quickly, to mitigate climate change.[113]

And there is significant corporate change in the U.S.[114] Recently, renewable energy and energy efficiency were primary sources responsible for the 4.2% decrease in power sector carbon emissions achieved in 2017.[115] Renewable electric energy and natural-gas-powered generation are quickly supplanting coal generation in the last five years in the U.S., with coal receding from supplying more than half of all U.S. electricity; coal provided 30.1% of our nation's electricity in 2017, while natural gas

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109. *See* EPA, INVENTORY OF U.S. GREENHOUSE GAS EMISSIONS AND SINKS 1990-2016, at ES-6 (2018), https://www.epa.gov/sites/production/files/2018-01/documents/2018_complete_report.pdf (highlighting that from 2005 to 2016, CO_2 emissions decreased in the power sector by 591.6 million metric tons CO_2 equivalent and decreased in the transportation sector by 73.2 million metric tons CO_2 equivalent).

110. *Corporate Energy Responsibility*, *supra* note 4, at 87. This assumes an absence of new regulatory renewable energy incentives. INT'L ENERGY AGENCY, *supra* note 16. According to the EPA, the purpose of this new rule is to collect accurate and timely data to inform future policy decisions. *Id.*

111. *IEA's $10 Trillion Climate Price Tag*, ELECTRICITY J., Dec. 2009, at 1–2. It might achieve about as much in saved energy acquisition costs—$8.6 trillion by 2030. *Id.*

112. *Id.*

113. *See* Deepa Badrinarayana, *"Gatting" the New Climate Treaty Right: Leveraging Energy Subsidies to Promote Multilateralism*, 39 FORDHAM INT'L L.J. 179, 197 (2015) ("Renewable energy is crucial to reduce greenhouse gas emissions.").

114. *See* Brad Plumer, *A Year After Trump's Paris Pullout, U.S. Companies Are Driving a Renewables Boom*, N.Y. TIMES (June 1, 2018), https://www.nytimes.com/2018/06/01/climate/companies-renewable-energy.html (explaining companies' investment in wind and solar projects that contribute significantly to renewable energy's growth).

115. BLOOMBERG NEW ENERGY FIN. & BUS. COUNCIL FOR SUSTAINABLE ENERGY, 2018 FACTBOOK: SUSTAINABLE ENERGY IN AMERICA 3–4 (2018), http://www.bcse.org/wp-content/uploads/2018-Sustainable-Energy-in-America-Factbook_Executive-Summary.pdf [hereinafter SUSTAINABLE ENERGY IN AMERICA].

supplied 37.1%.[116] The cost of wind power has dropped to be competitive with the price of some more traditional fossil fuel resources for electricity generation.[117] Wind, along with natural gas, has dominated new sources of electric energy deployed in the most recent decade.[118] In 2012, wind energy was the most installed new U.S. electricity generation source, at 43% of all new electric generation.[119] Wind energy provided 6.3% of total U.S. power supplies in 2017.[120]

Since 2009, U.S. solar generation has increased by 2,000%.[121] The cost to install photovoltaic solar panels has fallen dramatically by about 60%, with photovoltaic module prices decreasing from approximately $1.90 per watt in 2009 to $0.36 per watt in 2017.[122] Solar power inverter prices have also declined by more than 60% from $0.60 to $1.00 or more per watt in 2005 to under $0.20 per watt in 2013.[123] This has permitted the solar photovoltaic market to grow at an average rate of more than 40% each year between 2010 and 2016.[124] Solar energy was predicted to be competitive in cost with retail electricity prices in 47 U.S. states by 2016 under current federal and state subsidies.[125]

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116. *Industry Data*, EDISON ELECTRIC INST., http://www.eei.org/resourcesandmedia/industrydataanalysis/industrydata/Pages/default.aspx [http://webcache.googleusercontent.com/search?q=cache:kP5cQJxo4O4J:www.eei.org/resourcesandmedia/Pages/IndustryData.aspx+&cd=1&hl=en&ct=clnk&gl=us] (last visited Apr. 27, 2019).

117. Tara Patel, *Fossil Fuels Losing Cost Advantage over Solar, Wind, IEA Says*, BLOOMBERG (Aug. 31, 2015), http://www.bloomberg.com/news/articles/2015-08-31/solar-wind-power-costs-drop-as-fossil-fuels-increase-iea-says.

118. *Energy Dept. Reports: U.S. Wind Energy Production and Manufacturing Reaches Record Highs*, U.S. DEP'T OF ENERGY (Aug. 6, 2013), http://energy.gov/articles/energy-dept-reports-us-wind-energy-production-and-manufacturing-reaches-record-highs.

119. *Id.*

120. *Frequently Asked Questions: What Is U.S. Electricity Generation by Energy Source?*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/tools/faqs/faq.php?id=427&t=3 (last updated Oct. 29, 2018).

121. *Solar Industry Research Data*, SOLAR ENERGY INDUSTRIES ASS'N, https://www.seia.org/solar-industry-research-data (last visited Apr. 27, 2019).

122. WILSON RICKERSON ET AL., INT'L ENERGY AGENCY: RENEWABLE ENERGY TECH. DEPLOYMENT, RESIDENTIAL PROSUMERS - DRIVERS AND POLICY OPTIONS (RE-PROSUMERS) 9 (2014), http://iea-retd.org/wp-content/uploads/2014/06/RE-PROSUMERS_IEA-RETD_2014.pdf.

123. *Id.*; *see* Ian Clover, *IHS Cuts Global Inverter Market Forecast in Face of Dramatic Price Drops*, PV MAG. (Oct. 16, 2013), https://www.pv-magazine.com/2013/10/16/ihs-cuts-global-inverter-market-forecast-in-face-of-dramatic-price-drops_100013052/ (forecasting increased sales of solar inverter units based on a drop in the prices). *See generally* A REVIEW OF PV INVERTER TECHNOLOGY COST AND PERFORMANCE PROJECTIONS, NAT'L RENEWABLE ENERGY LAB. (2006) (detailing the state of inverters in 2006), https://www.nrel.gov/docs/fy06osti/38771.pdf.

124. FRAUNHOFER INST. FOR SOLAR ENERGY SYS., PHOTOVOLTAICS REPORT 5 (2017), https://perma.cc/LH54-ZJYD.

125. Ari Natter, *Solar Energy to Reach 'Grid Parity' in Nearly All States by 2016, Deutsche Bank Predicts*, Energy & Climate Rep. (BNA) No. 207, at 11 (Oct. 27, 2014). This is based on the assumption that the cost of solar systems will decline by about 20% more, from less than $3 per watt

New solar power surpassed new wind and new gas power plant construction in the fourth quarter of 2017, as well as in the first quarter of 2018.[126] Wind projects in the U.S. cost an average $45 per megawatt hour for capacity and energy without other subsidies and $58 per megawatt hour for solar.[127] By 2040, as solar panels become more efficient and manufacturing costs continue to decline, solar could operate at the identical cost to wind.[128] This creates a positive, cost-effective option for corporations to generate some of their own power requirements from wind or solar power on-site on any unblocked roof with solar insolation.[129] Many large retail chain stores and manusfacturers are putting solar panels on their roofs.[130] In descending order of most 2012 solar use: Wal-Mart, Costco, Kohl's, IKEA, Macy's, McGraw-Hill, Johnson & Johnson, Staples, Campbell's, and Walgreens.[131] The amount of solar power capacity per company ranged from 8 to65 megawatts, among the 5,700 megawatts of then-installed solar capacity in the U.S.[132] Wal-Mart is seeking to supply 100% of its energy needs with on-site solar power.[133]

To put solar energy in context: solar energy is the source of all energy on earth, creating wind and water movement and ultimately creating plants, biomass, and animals that become fossil fuels when their organic matter decays.[134] While the energy output of the sun in the direction of the Earth is about 1,300 W/m^2 at its source, only one-quarter of the solar constant value

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installed to less than $2.50 per watt installed, resulting in a net price from $0.09 to $0.14/kWh, and lowered financing cost for solar projects. *Id*. "The average cost of residential electricity in the U.S. in 2013 was 12.12 cents per kilowatt hour, an increase from 8.95 cents per kilowatt hour in 2004." *Id.*

126. Chris Martin, *Solar Has Overtaken Gas and Wind as Biggest Source of New U.S. Power*, BLOOMBERG (June 12, 2018), https://www.bloomberg.com/news/articles/2018-06-12/solar-surpasses-gas-and-wind-as-biggest-source-of-new-u-s-power.

127. Jim Efstathiou Jr & Brian K Sullivan, *Smarter Wind Turbines Try to Squeeze More Power on Each Rotation*, BLOOMBERG (May 9, 2018), https://www.bloomberg.com/news/articles/2018-05-09/smarter-wind-turbines-try-to-squeeze-more-power-on-each-rotation.

128. *Id.*

129. *Id.*

130. Gail Roberts, *Retail Industry Sees Bright Future with Solar at More Big Stores as Panel Prices Plummet*, ELECTRIC UTIL. WK., Oct. 29, 2012, at 20.

131. *Id.*

132. *Id.*

133. *Id.*

134. Plants are a significant source of energy. Photosynthesis is an endothermic reaction requiring 2.8 mega joules of solar radiation to synthesize one molecule of glucose from six molecules of CO_2 and H_2O. VACLAV SMIL, ENERGIES: AN ILLUSTRATED GUIDE TO THE BIOSPHERE AND CIVILIZATION 42 (1999). Most of the terrestrial phytomass productivity in storage is in large trees in forests; phytoplankton species in the oceans store this mass in the hydrologic cycle. *Id.* at 46. Phytoplankton productions are 65–80% of the terrestrial phytomass total, but phytoplankton has a life span of only 1–5 days. *Id.* at 48. The most voluminous trees are the most massive life forms on Earth, with the most phytomass, and are even larger than blue whales in mass. *Id.* at 51. Tropical forests use available nutrients rather inefficiently. *Id.*

reaches the Earth's spherical surface, one-third of which is reflected back into space by the Earth's atmosphere.[135] Solar energy yields as much as 342 W/m^2 at the surface of the Earth at noon on a cloudless day, or about 170 W/m^2 of solar radiation in an average hour over the course of a year reaches the Earth's oceans, and about 180 W/m^2 reaches the land surfaces.[136]

Human capture of this energy is not efficient; energy used by humans equals only about 0.01% of the total solar energy reaching the Earth.[137] Wind power's global energy potential is 35 times that of current world electricity use.[138] Solar energy provides as much potential energy as humankind uses each year approximately every 70 minutes.[139] In fact, no nation on earth uses more energy than the energy content contained in the sunlight striking existing buildings within the U.S. every day.[140] The solar energy falling on American roads each year contains roughly as much energy content as all the fossil fuel consumed in the world during that same year.[141] All of this is available for corporate capture on land and roofs that corporations own or use.[142]

B. 2018 Tax Law Changes: Not Always Positive for Renewable Technologies

The Republican Tax Cuts and Jobs Act enacted at the end of 2017, effective for 2018 and after,[143] affects investment in the energy sector. The tax reforms particularly affect capital-intensive industries, which characterizes electricity and other energy corporate sectors.[144] Despite the attention over permanent, dramatically lower tax rates for corporations, this

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135. *Id.* at 4–5. This results in total solar radiation annually of 2.7×10^{24} joules. *Id.* at 6. This amount of energy reaching the Earth in the form of solar radiation is about 8,000 times more than worldwide consumption of fossil fuels and electricity. *Id.*

136. *Id.*

137. STEVEN FERREY WITH ANIL CABRAAL, RENEWABLE POWER IN DEVELOPING COUNTRIES: WINNING THE WAR ON GLOBAL WARMING 36 (2006).

138. Amory B. Lovins et al., *Forget Nuclear*, 24 ROCKY MOUNTAIN INST. 1, 25 (2008).

139. *Id.*

140. GLOBAL WARMING TOOLBOX, *supra* note 9, at 32.

141. *Id.*

142. *Id.*

143. Tax Cuts and Jobs Act, Pub. L. No. 115–97, § 11001(a)(j)(1), 131 Stat. 2054, 2054 (2017) (noting that the effective date begins "after December 31, 2017"). *See generally Legal Alert: Final Tax Reform Bill Released – What Does It Mean for the Energy Sector?*, EVERSHEDS SUTHERLAND (Dec. 19, 2017), https://us.eversheds-sutherland.com/NewsCommentary/Legal-Alerts/207153/Legal-Alert-Final-Tax-Reform-Bill-Released-What-Does-it-Mean-for-the-Energy-Sector (highlighting how the bill will affect investment in the energy sector).

144. For more information, see Michael H. Levin, *Will the Tax Cuts Act Cut Back AD?*, BIOCYCLE (Feb. 8, 2018), https://www.biocycle.net/2018/02/08/will-tax-cuts-act-cut-back-ad/ (discussing how capital-intensive industries, such as renewable energy projects, react to tax reforms).

tax reform, which helps businesses generally, may not significantly help corporations address technologies that mitigate climate change.[145] There are several 2018 tax law changes affecting corporations and climate.[146]

1. Decrease in Corporate Tax Rate

This tax-reform act, effective in 2018, dramatically lowered the corporate tax rate on a permanent basis, unlike the graduated rate reductions for individual taxpayers which are temporary.[147] The corporate tax rate was changed to a flat 21% tax.[148] This reduction of more than 40% from the prior rate creates a much less significant margin to attract tax equity financing for energy projects that cannot utilize non-refundable energy credits or losses in their early years of operation.[149] Tax-equity financing often will constitute one-third of energy investment capital for renewable energy projects that cannot utilize the non-refundable energy credits or losses in their early years of operation.[150] At the reduced corporate tax rate of 21%, reduced from a prior top rate of 35%, the value of these tax credits are reduced by more than 40%, as is the cash-value saving realized from depreciation and bonus depreciation taken by the corporation on capital investments.[151] This reduced cash value affects the ability to monetize both tax credits and depreciation deductions as part of independent renewable energy project financing.[152] This reduction also will cause some existing equity financing structures for energy projects to "flip" partnership structures at an earlier point in time.[153]

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145. Press Release, Ctr. for Am. Progress, As U.S. House Prepares to Vote on Yet More Tax Breaks and Extenders, New CAP Brief Highlights Fiscal Damage Stemming from the Tax Cuts and Jobs Act (Nov. 29, 2018), https://www.americanprogress.org/press/release/2018/11/29/461591/release-u-s-house-prepares-vote-yet-tax-breaks-extenders-new-cap-brief-highlights-fiscal-damage-stemming-tax-cuts-jobs-act/ (highlighting that the bill fails "to address any of the nation's most pressing challenges—such as . . . preventing climate change").

146. *See generally* Tax Cuts and Jobs Act, 131 Stat. at *passim* (providing an overview for the laws going into effect for fiscal year 2018).

147. Levin, *supra* note 144.

148. *Id.*

149. *Id.*

150. From author's experience working on financing energy projects. For detailed treatment of tax-equity finance for corporate energy projects, *see* LAW OF INDEPENDENT POWER, *supra* note 14, § 3:59.115, at 3–282.95.

151. *Id.*

152. *Id.*

153. Levin, *supra* note 144.

2. Depreciation Deductions

The tax-reform act affects the value of depreciation deductions for energy projects.[154] At the new, lower corporate tax rate of 21%, down from a prior top rate of 35%, the value of depreciation and bonus depreciation are reduced.[155] This reduced cash value affects the ability to monetize depreciation deductions as part of project financing.[156]

At the federal level, Modified Accelerated Cost Recovery System (MACRS) consists of two systems that determine how a business depreciates business property: the General Depreciation System (GDS) and the Alternative Depreciation System (ADS).[157] A business must use GDS unless it is specifically required by law to use ADS or it elects to use ADS.[158] The ADS is a system the IRS requires to be used in special circumstances to calculate depreciation on certain business depreciable assets.[159] ADS generally increases the number of years over which property is depreciated, thus decreasing the annual depreciation deduction against income.[160] Each item of property that can be depreciated under MACRS is assigned to a property class, determined by its class life.[161] Solar energy projects enjoy an accelerated five-year depreciation period for corporations under § 168 of the code,[162] as well as bonus depreciation.[163] Bonus depreciation earned by corporations in the power industry is estimated to be $10 billion.[164]

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154. *See id.* (describing the effect of the Republican tax-reform act).

155. *Id.*

156. *See* LAW OF INDEPENDENT POWER, *supra* note 14, § 3:59.115, at 3–282.95 ("[R]eduction . . . will cause some existing equity financing structures for energy projects to 'flip' partnerships at an earlier point in time to put these project ownership from equity financiers to project developers.").

157. *Id.* § 3:56, at 3–223.

158. *Id.*

159. *Id.*

160. *Id.*

161. *Id.*

162. I.R.C. § 168(e)(3)(B)(vi)(I) (2012); LAW OF INDEPENDENT POWER, *supra* note 14, § 3:56, at 3–223, § 3:57, 3–230.

163. I.R.C. § 168(k)(1)(A)–(B).

164. *See* Paul Carlsen, '*Bonus Depreciation' Boosting Industry Cash Flow About $10 Billion, But More IRS Guidance Awaited*, ELECTRIC UTIL. WK., Mar. 14, 2011, at 25, 25 (asserting that bonus depreciation would provide $10 billion over the next few years).

3. Expensing of Capital Investments

The tax-reform act[165] allows small businesses immediately to expense up to $1 million in qualified expenditures (including costs of modifications to use biogas or of new roofs to support solar panels)—a 33% increase from past amounts of $750,000.[166] It also allowed all businesses to claim 100% bonus depreciation in the first year on equipment purchased after September 27, 2017 and placed in service after January 1, 2018 (subject to a phase-down of 20% for equipment placed in service during each year after 2022).[167] The 100% figure represents a nominal doubling of the previous bonus depreciation deduction.[168]

4. Interest Deduction on Debt Financing

The tax-reform act capped business interest deductions to 30% of an entity's earnings before interest, taxes, depreciation, and amortization (EBITDA).[169] More severe caps are implemented after 2021.[170] Interest deductions previously were not capped, and all interest was deductible.[171]

5. Net-Operating Losses

The tax-reform act restricts the value and application of project operating losses.[172] Under past and current tax law, tax losses are not refundable in a given tax year.[173] Therefore, they need to be applied to either past or future tax years to offset net operating income.[174] For energy investments, project structure often utilizes special-purpose entities to

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165. Tax Cuts and Jobs Act, Pub. L. No. 115–97, § 11001(a), 131 Stat. 2054, 2054 (2017).

166. *Id.* § 13101(a), (f), 131 Stat. at 2101; *see also* Levin, *supra* note 144 ("[T]he Act allows small businesses immediately to expense up to $1 million in qualified expenditures (including costs of modifications to use biogas or of new roofs to support solar panels) . . . .").

167. Tax Cuts and Jobs Act, § 13201(a)(1)–(2), 131 Stat. at 2105.

168. *See id.* (doubling the rate from 50% to 100% for equipment "placed in service after September 27, 2017, and before January 1, 2023").

169. *Id.* § 13301(a), 131 Stat. at 2117; Levin, *supra* note 144.

170. Tax Cuts and Jobs Act, § 13301(8)(A)(v), 131 Stat. at 2120; Levin, *supra* note 144.

171. *See* Levin, *supra* note 144 (implying that, until 2018, interest deductions did not have a cap and noting that "all business-related interest generally was deductible").

172. *See id.* ("[T]he Act generally restricts NOL deductibility to 80 percent of an acquirer's taxable income.").

173. *See id.* (explaining that prior to the act, tax losses could either be carried forward or backward; after adopting the act, tax losses can only be carried forward).

174. *Id.*

manage the equity of the project.[175] This insulates company risk to the special purpose entity holding the equity of the project.[176]

Prior to the 2018 tax law changes, project net-operating losses (NOLs) were allowed to be carried back 2 previous tax years or carried forward to 20 future tax years at full 100% value to offset past or future net taxable income.[177] If applied to one of the prior two years with net income, they would generate immediate refundable tax rebates with an amendment of a prior year tax return.[178] If carried forward, the taxpayer would need to wait for future years to monetize these deductions against future taxable income.[179] The 2018 Act also makes use of NOLs unidirectional: it eliminates reverse direction "carryback" of losses.[180] The forward direction is preserved, with 20-year deductibility of NOLs being carried forward.[181]

There also is a 2018 change in value of business losses.[182] The 2018 Act restricts NOL deductibility to 80% of taxable income instead of the prior full 100% deductibility.[183] NOLs were monetized by bringing in new equity owners or partners who had past or future tax year net income against which they could utilize accumulated losses.[184] However, all owners, whether original or new, are subject to these new restrictions on percentage credit value.[185]

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175. *See* Joel Meister, *Sunny Dispositions: Modernizing Investment Tax Credit Recapture Rules for Solar Energy Project Finance After the American Recovery and Reinvestment Act*, 5 GEO. WASH. J. ENERGY & ENVTL. L. 15, 18 (2014) (explaining that for energy projects, developers often rely on special-purpose entities, such as LLCs).

176. *See id.* (highlighting that if a special-purpose entity defaults, investor assets will be secure from the project's lenders).

177. Levin, *supra* note 144.

178. *See id.* ("'Carrybacks' could generate immediate tax rebates when applied to previous returns.").

179. *See id.* ("'Carryforwards' could reduce future taxes.").

180. *See id.* (describing how the Act effectively eliminates "carryback[s]").

181. *Id.*

182. *See id.* ("[T]he Act generally restricts NOL deductibility to 80 percent of an acquirer's taxable income.").

183. *Id.*

184. *See* Christopher B. Grady, *Finding the Pearl in the Oyster: Supercharging IPOs Through Tax Receivable Agreements*, 111 NW. U. L. REV. 483, 506 (2017) ("NOLs occur when a taxpayer has deductions in excess of gross income for a given tax year, resulting in a net loss for the year. Taxpayers are permitted to carry the loss back to apply to the two preceding years, or carry it forward up to twenty years. In either case, the NOL is allowed as a deduction from the taxable income for that year. Monetization occurs through § 381, which permits an acquiring corporation to carry over certain tax attributes, including NOLs, of the acquired corporation.").

185. *See* Levin, *supra* note 144 ("[T]he Act generally restricts NOL deductibility to 80 percent of an acquirer's taxable income.").

6. Pass-Through Entity Taxes

The tax-reform act affects energy projects which utilize a "pass-through" entity structure, such as an LLC or equivalent structure.[186] The Act provides a permanent 20% tax deduction for these entities' qualifying business income for income-tax calculation.[187] As these tax aspects are passed through to individual energy-project owners, if their income is less than $157,500 for a single taxpayer or $315,000 for a joint taxpayer, this tax reduction can be realized.[188] This may affect how project ownership is structured on future projects or for projects resold.[189]

7. Alternative Minimum Tax

The tax-reform act repealed the corporate Alternative Minimum Tax (AMT), but not the individual AMT.[190] Previously, the AMT raised taxes from energy companies that offset tax by the use of energy investment or production tax credits and other "tax preference" items, and paid tax under AMT rather than ordinary tax rates in the Tax Code.[191] Repeal of the corporate AMT eliminates the risk of AMT recapture during the final six years of eligibility for the ten-year Production Tax Credit (PTC).[192]

C. Corporate Tax Credit Incentives are Reduced and Changing

The U.S. has a price- and cost-driven economic system in which corporations operate.[193] The U.S. tax system, which has embedded in its law and provides tax credits for certain investments and accelerated depreciation of those costs, delivers many incentives.[194] Federal and state

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186. *See id.* (highlighting that most energy projects utilize an LLC or similar "pass-through" structure).

187. Tax Cuts and Jobs Act, Pub. L. No. 115–97, § 11011(a), 131 Stat. 2054, 2063 (2017).

188. *Id.* § 11011(a), 131 Stat. at 2067.

189. *See generally id.* (providing an overview of the other changes to the tax code).

190. *Id.* § 12001(a)–(b), 131 Stat. at 2092; *see Changes to Alternative Minimum Tax for Corporations and Individuals*, BOWLES RICE, http://www.bowlesrice.com/tax-cuts-and-jobs-act-2018-changes-Alternative-Minimum.html (highlighting that the Act repealed the corporate AMT but left in place the individual AMT) (last visited Apr. 27, 2019).

191. *See* Levin, *supra* note 144 (discussing how AMT was used).

192. *Id.*

193. *See* Anne Sraders, *What Is a Mixed Economy? Pros, Cons and Examples in 2018*, STREET (Oct. 2, 2018), https://www.thestreet.com/markets/what-is-a-mixed-economy-14728913 ("The U.S. . . . [has] a large private sector and free market that allows ample competition and employs efficiency and innovation to produce products . . . .").

194. *See* Mona L. Hymel, *Environmental Tax Policy in the United States: A "Bit" of History*, 3 ARIZ. J. ENVTL. L. & POL'Y 157, 172 (2013) (explaining how the combination of tax credits and

tax credits and falling installation prices augment the success of the solar industry[195] and the proliferation of state net-metering programs—previously in 44 states and now in 38 states.[196] Renewable energy is expected to claim almost two-thirds of the spending on new power plants over the next quarter century—dwarfing spending on fossil fuels—as solar energy moves into a dominant position for new power-generation technology for consumers.[197]

1. Federal Production Tax Credit Legal Changes

Congress created the federal renewable PTC as part of the Energy Policy Act of 1992.[198] The PTC provided a tax credit for the first ten years of operation of renewable energy projects, linked to the amount of kilowatt hours (kWh) of renewable energy generated by the eligible facility.[199] Congress initially set the credit value at $0.015/kWh generated.[200] This value escalated more than 50% since 1992 to a value of $0.024/kWh.[201] The

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intangible drilling costs deductions caused a rapid depreciation of costs associated with the oil industry, providing an example of how these could apply to greener energy production).

195. *See Solar Industry Research Data*, *supra* note 121 (highlighting that a 70% decline in installation cost and the federal Solar Investment Tax Credit are largely related to the recent success of the solar industry); Sean Paul, *The Solar Industry in a Period of Transition*, GEO. PUB. POL. REV., Nov. 15, 2016, at 2, http://gppreview.com/2016/11/15/solar-industry-period-transition/ (describing how state tax credits for solar development contributed to the recent success of the solar industry).

196. *Compare State Net Metering Policies*, NAT'L CONF. ST. LEGISLATURES (Nov. 20, 2017), http://www.ncsl.org/research/energy/net-metering-policy-overview-and-state-legislative-updates.aspx (explaining that in 2017 there were 38 states that had net-metering programs), *with* Megan Cleveland & Jocelyn Durkay, *State Net Metering Policies*, NAT'L CONF. ST. LEGISLATURES, https://comm.ncsl.org/productfiles/85432742/NCSL_Net_Metering_11_2016.pdf (last updated Nov. 3, 2016) (explaining that in 2016 there were 44 states with net-metering programs).

197. Ehren Goossens, *Renewables to Beat Fossil Fuels with $3.7 Trillion Solar Boom*, BLOOMBERG (June 23, 2015), https://www.bloomberg.com/news/articles/2015-06-23/renewables-to-beat-fossil-fuels-with-3-7-trillion-solar-boom.

198. LAW OF INDEPENDENT POWER, *supra* note 14, § 3:58, at 3–236.7.

199. For past examples, see American Recovery and Reinvestment Act, Pub. L. No. 111–5, 123 Stat. 115, 319–20 (2009); American Tax Payer Relief Act of 2012, Pub. L. No. 112-240, 126 Stat. 2313, 2340–42 (2013); Tax Increase Prevention Act of 2014, Pub. L. No. 113–295, 128 Stat. 4010, 4014 (2014); Consolidated Appropriations Act, Pub. L. No. 114–113, § 301, 129 Stat. 2242, 2416–17 (2015); and the Bipartisan Budget Act of 2018, H.R. 1892, 115th Cong. § 40409 (2018).

200. Energy Policy Act of 1992, Pub. L. No. 102–486, § 45(a), 106 Stat. 2776, 3021 (1992); LAW OF INDEPENDENT POWER, *supra* note 14, § 3:58, at 3–236.7.

201. LAW OF INDEPENDENT POWER, *supra* note 14, § 3:58, at 3–236.7; *see also* Credit for Renewable Electricity Production and Refined Coal Production, and Publication of Inflation Adjustment Factor and Reference Prices for Calendar Year 2017, 82 Fed. Reg. 17,740, 17,740 (Apr. 12, 2017) ("Under the calculation required by [§] 45(b)(2), the credit for renewable electricity production for calendar year 2017 under [§] 45(a) is 2.4 cents per kilowatt hour on the sale of electricity produced from the qualified energy resources of wind, closed-loop biomass, [and] geothermal energy . . . .").

facility owner must sell the power produced that is eligible for the PTC to an unrelated person.[202]

The tax-reform act[203] does not change existing energy-tax credits.[204] The PTC remains at its inflation-adjusted 2018 value of $0.024/kWh for each unit of electricity that eligible renewable-energy projects generate;[205] however, during the Obama Administration, it began the phasing-out process.[206] The Act did not change the continuously constructed eligibility standard for beginning construction and the tax "safe harbor" for projects to look back to 2016 and continue construction by the existing deadlines.[207] Wind power projects typically use the PTC, although wind and solar projects have the alternative of utilizing the federal Investment Tax Credit (ITC), which solar power projects typically use.[208]

Most recently in 2015, there was a multi-year extension of the PTC.[209] This extended the year that a wind power project could qualify for the PTC through 2019.[210] However, the extension significantly phased-down the value and phased-out the tax credit for projects beginning in 2020 if project construction had not begun prior to January 1, 2020.[211] By contrast, the ITC 30% tax credit declines from 30% to 10% in 2021 and continues at the reduced rate.[212] Placing orders for wind turbines can count as beginning construction under the PTC, as long as completion of construction and commercial operation is achieved from 2021 to 2023, depending on the start date.[213] For the PTC, from 2017 until 2020, each year the credit value declines by 20% until there is a 60% reduction for projects begun in

202. LAW OF INDEPENDENT POWER, *supra* note 14, § 3:58, at 3–236.10.

203. *Id.* § 3:59.10, at 3–259.

204. *Id.* The act did not extend any credits set to expire or which had previously expired. *Id.* Included in those energy credits not extended, the act did not extend electricity PTCs for biomass projects for which there was a "begin construction" requirement which expired at the end of 2016. *Id.*

205. *Id.*

206. *Id.* § 3:55, at 3–219.

207. *See infra* text accompanying notes 222–24, 229 (discussing the tax-reform act's effects on the Investment Tax Credit).

208. *See infra* Part III.C.2 (comparing and contrasting PTC and ITC).

209. John Larsen & Whitney Herndon, *Renewable Tax Extenders: The Bridge to the Clean Power Plan*, RHODIUM GROUP (Jan. 27, 2016), http://rhg.com/notes/renewable-tax-extenders-the-bridge-to-the-clean-power-plan/ [hereinafter *Renewable Tax Extenders*]. Before Congress extended these programs, the PTC had already expired at the end of 2014 and the ITC was set to drop from 30% to a credit of 10% of project costs at the end of 2016. *Id.*

210. LAW OF INDEPENDENT POWER, *supra* note 14, § 3:59, at 3–258.

211. *Id.*

212. *Id.* § 3:59:10, at 3–262, § 3:59:40, at 3–274.

213. *Id.* § 3:58:10, at 3–236.7. For detailed treatment of what constitutes beginning construction, see *id.* § 3:59:10, at 3–260.

2019.[214] Projects beginning in 2020 and after will be phased-out of PTC eligibility.[215]

- The PTC grants a credit based on actual generation after construction. In contrast, depreciation of the wind project capital cost is earned on the invested capital expenditure itself, regardless of whether operation occurs.[216] There are particular advantages and disadvantages for wind projects taking the PTC in lieu of the ITC: the PTC is refundable, unlike the ITC, whether or not the project has net-operating income in a given year, thus minimizing the need for third-party, tax-equity financing for the project.[217]
- PTC benefits are stretched out over ten years, which is more than the accelerated five-year full depreciation period for wind power.[218]
- After the PTC phases out or is not renewed, renewable energy developers have the option of taking the ITC instead,[219] which declines from 30% to 10% in 2021 and continues rather than phases out.[220]

2. Federal Investment Tax Credit Legal Changes

The federal ITC provides 30% of capital investment tax credit upon completion of the renewable energy project investment.[221] While the PTC pays for 10 years based on renewable energy production output, the ITC is realized in year one based on the capital investment in the renewable energy project.[222] The tax-reform act of 2017 did not further change or eliminate existing PTC and ITC energy tax credits.[223] The 2018 Act did not extend the ITCs for biogas fuel cells, micro-turbines, and combined heat and

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214. *Id.* § 3:59, at 3–258.

215. *Id.*; I.R.C. § 45(b)(5) (Supp. V 2012).

216. *See* LAW OF INDEPENDENT POWER, *supra* note 14, § 3:59.10, at 3–259 (discussing PTC for renewable power); *id.* § 3:56, at 3–225 (discussing the corporate tax depreciation).

217. For more detailed treatment of tax equity financing, see *id.* § 3:59.40, at 3–274 (detailing treatment of tax equity financing).

218. *Id.* § 3:57, at 3–230.

219. *Id.* § 3:59.40, at 3–274; I.R.C. § 48(a)(6) (2012).

220. LAW OF INDEPENDENT POWER, *supra* note 14, § 3:59.10, at 3–263.

221. I.R.C. § 48(a)(1)–(2) (2012).

222. *See* NAT'L RESEARCH COUNCIL ET AL., ELECTRICITY FROM RENEWABLE RESOURCES: STATUS, PROSPECTS, AND IMPEDIMENTS 147–49 (2010), https://doi.org/10.17226/12619 (explaining the applicability of PTC and the effectiveness of PTC and ITC).

223. Philip Tingle, *Renewable Energy Tax Bill Update: No Change to PTC and ITC and Some BEAT Changes*, NAT'L L. REV. (Dec. 21, 2017), https://www.natlawreview.com/article/renewable-energy-tax-bill-update-no-change-to-ptc-and-itc-and-some-beat-changes.

power projects.[224] It left unchanged all then currently available provisions of the PTC and ITC.[225]

However, the ITC was already in a process of legislatively changed decline. The traditional 30% ITC declines to 10% in 2021 and continues indefinitely thereafter, unlike the PTC that is eliminated for future constructed projects now.[226]

The tax-reform act of 2017, effective in 2018,[227] did not change the continuously constructed eligibility standard for beginning construction to qualify for the ITC, or the tax "safe harbor" for projects to look back to 2016 and continue construction by the existing deadlines.[228] The IRS in 2018 consolidated what were different tests on "beginning of construction" for the ITC to be essentially consistent with the similar test for the PTC.[229] From mid-2018 forward, for the ITC typically applied to solar projects, taxpayers may establish the "beginning of construction" either through a "Physical Work Test" by starting physical work of "a significant nature," or by meeting a "safe harbor" defined as spending at least 5% or more of the total cost of the solar energy property investment.[230] Developers may claim the full 30% ITC for solar projects by meeting either test by the end of 2019, and finishing the project by the end of 2023.[231]

224. LAW OF INDEPENDENT POWER, *supra* note 14, § 3:58, at 3–236.15.

225. *Id.*

226. *Id.* § 3:59.10, at 3–262, § 3:59.40, at 3–274.

227. *Id.* § 3:58, at 3–236.15.

228. *See supra* note 213 and accompanying text (explaining the requirements for beginning construction).

229. LAW OF INDEPENDENT POWER, *supra* note 14, § 3:59.40, at 3–274.

230. Notice 2018–59, IRS, Beginning of Construction for the Investment Tax Credit Under Section 48, https://www.irs.gov/pub/irs-drop/n-18-59.pdf (last visited Apr. 27, 2019).

231. LAW OF INDEPENDENT POWER, *supra* note 14, § 3:59.40, at 3–274.

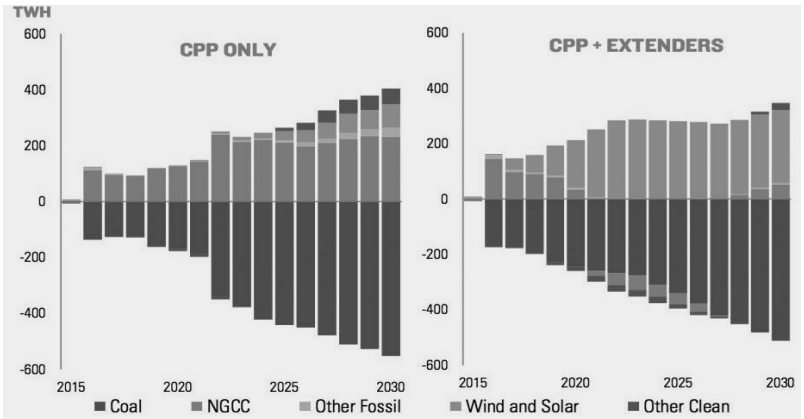

Figure 1. Change in 2015–2030 Power Generation Composition from Current Base Case with and without PTC and ITC[232]

By any measure, this is much less federal tax incentive available for a corporation's future renewable energy development.[233] As shown in Figure 1, coal use (shown below the "0" line in both images as the darkest color), declines dramatically with or without these federal tax credits. However, without these renewable energy tax credits extended (in the left image in Figure 1), declining coal below the "0" line is replaced primarily by natural gas combined cycle (NGCC) units (above the "0" line in the most significant amount) along with some modest amounts of wind, solar, and "other" clean and "other" fossil resources as the least-cost options that economic forces will dictate. Furthermore, with the PTC and ITC extended (in the right image in Figure 1), a similar amount of declining coal below the "0" line is replaced primarily by solar and wind power which replace NGCC as the dominant new energy generation source through 2021, adding almost 300 terrawatt hours of generation in lieu of NGCC generation, and continue to be the technology of choice. In the right image, "other" clean and NGCC technologies make only a modest new contribution at the margin in the later years.[234] This dominance of new renewable energy in lieu of natural gas- and coal-fired power reduces U.S. carbon emissions.[235]

232. David Roberts, *How Big a Deal Was Congress Extending the Renewable Energy Tax Credits? A Very, Very Big Deal*, VOX (Jan. 27, 2016), https://www.vox.com/2016/1/27/10849564/renewable-energy-tax-credits-big-deal.

233. LAW OF INDEPENDENT POWER, *supra* note 14, § 3:59.115, at 3–282.15.

234. Roberts, *supra* note 232.

235. *Id.*

In either scenario, without the CPP in place—either because of judicial or executive branch action—the major federal tax credit incentive for wind power development, the PTC, fades substantially for projects beginning construction after December 31, 2019.[236] Corporations will have less financial incentive to deploy wind power, unless the PTC is renewed or extended.[237] The ITC remains, but after 2019 decreases from a 30% tax credit to a 10% tax credit.[238] And the desirability and value of tax credits for a corporation is diminished by the dramatic decline in federal corporate income tax rates from 35% to 21%.[239] This will exert a suppressive impact on new wind projects.[240]

Nonetheless, a countervailing factor is that both wind and solar technologies are continuing to decline in their capital cost[241] and are becoming competitive with other power generation options for corporations.[242] Solar electric energy is now cost-competitive with traditional fossil fuels due to substantial subsidies[243] and will expand in use in the next decade.[244] Wind power is forecasted by the U.S. Department of Energy to be cheaper than electricity produced from natural gas by 2025, even without a continuing federal PTC incentive.[245] Wind projects in the U.S. cost, on average, $45 per megawatt hour for capacity and energy without other subsidies.[246] Comparatively, the average cost for solar is $58 per megawatt hour.[247] By 2040, as solar panels become more efficient and

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236. I.R.C. § 45(b)(5) (Supp. V 2012).

237. *See* Larsen & Herndon, *supra* note 209 ("[PTC and ITC] are the flagship federal deployment incentives for wind and solar, respectively.").

238. *Id.*

239. *See supra* text accompanying note 151 (noting that the tax rate changed from 35% to 21%).

240. *See* Joshua Rhodes, *Final GOP Tax Bill More Confusing, but Not Terrible for Wind and Solar*, FORBES (Dec. 22, 2017), https://www.forbes.com/sites/joshuarhodes/2017/12/22/final-gop-tax-bill-more-confusing-but-not-terrible-for-wind-and-solar (suggesting that the decrease in the corporate tax rate might induce wind projects to increasingly rely on debt).

241. Megan Mahajan, *Plunging Prices Mean Building New Renewable Energy Is Cheaper Than Running Existing Coal*, FORBES (Dec. 3, 2018), https://www.forbes.com/sites/energyinnovation/2018/12/03/plunging-prices-mean-building-new-renewable-energy-is-cheaper-than-running-existing-coal.

242. *See* Martin, *supra* note 126 (stating that solar has become a common sense option for U.S. homeowners and businesses); *supra* Part IV.A (explaining how net metering is helping solar energy become a competitive power generation option for corporations).

243. Zachary Shahan, *Low Costs of Solar Power & Wind Power Crush Coal, Crush Nuclear, & Beat Natural Gas*, CLEAN TECHNICA (Dec. 25, 2016), https://cleantechnica.com/2016/12/25/cost-of-solar-power-vs-cost-of-wind-power-coal-nuclear-natural-gas.

244. *Solar Investment Tax Credit (ITC)*, SOLAR ENERGY INDUS. ASS'N, https://www.seia.org/initiatives/solar-investment-tax- credit-itc (last visited Apr. 27, 2019).

245. Christopher Martin & Justin Doom, *Wind Power Without U.S. Subsidy to Become Cheaper Than Gas*, BLOOMBERG (Mar. 12, 2015), https://www.bloomberg.com/news/articles/2015-03-12/wind-energy-without-subsidy-will-be-cheaper-than-gas-in-a-decade.

246. Efstathiou & Sullivan, *supra* note 127.

247. *Id.*

manufacturing costs continue to decline, solar could operate at the identical cost of wind.[248]

IV. HOW CORPORATIONS FILL THE LOOMING FEDERAL TAX INCENTIVE GAP AND ADDRESS CLIMATE

A. State Net Metering of Corporate Renewable Energy Use

Net metering is a policy that allows retail electricity customers, including corporations, to receive credits on their utility bills for on-site renewable-energy generation in excess of their electric load exported to the state's regulated electric grid.[249] And each state has different statutory requirements for net metering; no two programs are identical in terms of eligible technologies, types, and value of net-metering credits, or vintage of credits.[250] Some states that allow net metering put a limit on the percentage of total power that can be net metered to avoid the problem of net metering power back to the utility when the utility does not need the power.[251] Massachusetts has a "virtual net metering" that is an order of magnitude more far-reaching than the other states because Massachusetts's net-metering credits can be transferred to other customers in the utility service territory at approximately 300% of the wholesale price.[252] In each of the 38 states now, net metering allows solar power on eligible corporate buildings to be net metered.[253] In 2016, the number of net-metering states had decreased to 38 states when Nevada, Georgia, and Hawaii ended their net-metering programs.[254]

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248. *Id.*

249. *Net Metering*, NAT'L GRID, https://www9.nationalgridus.com/masselectric/home/energyeff/4_net-mtr.asp (last visited Apr. 27, 2019).

250. *Id.*

251. Mary Powers, *Maryland Regulatory Staff Takes Side of Solar Producers on Net Metering Issues*, ELECTRIC UTIL. WK., Aug. 16, 2010, at 24.

252. Michael Puttre, *Massachusetts' Virtual Net-Metering Policy Seen as Key to Successful Community Solar Development*, SOLAR INDUSTRY (Sept. 1, 2015), https://solarindustrymag.com/massachusetts-virtual-net-metering-policy-seen-as-key-to-successful-community-solar-development/. Massachusetts net metering was originally created by order of the Massachusetts Department of Public Utilities in 1982. 220 MASS. CODE REGS. 8.04(8) (2009). In 1997, the Department of Telecommunications and Energy amended the net-metering program through 220 Code of Massachusetts Regulation, Section 11.04(7)(C) to increase the allowable capacity from 30 to 60 kilowatt for all renewable technologies, and larger for certain solar, wind, and agricultural renewable technologies. 220 MASS. CODE REGS. 18.03 (2017).

253. *See State Net Metering Policies*, NAT'L CONF. OF STATE LEGISLATURES (Nov. 20, 2017), www.ncsl.org/research/energy/net-metering-policy-overview-and-state-legislative-updates.aspx (providing an overview of state net-metering policy).

254. *See* Cleveland & Durkay, *supra* note 196 (explaining what policies the listed states have in place of net metering).

During times when energy is not being used by the customer, but a corporation's eligible renewable energy system is producing electricity, the meter spins in reverse direction.[255] The meter registers exported electricity to the utility as a reduction of the amount of power sold by the utility to the customer.[256] The utility gives credits to customers for every kWh of electricity not used by the customer but exported to the utility.[257] By turning the meter backwards, and because only a single rate applies to a single meter, net metering effectively compensates the generator/customer at, or near, the full retail rate for power. The full retail rate includes approximately half of the retail bill attributable to transmission, distribution, and taxes for transferring just the wholesale energy commodity—the power itself.[258] The value received for that net-metered power is an amount above the utility's avoided cost[259] or the wholesale rate set by either Federal Energy Regulatory Commission or independent system operators (ISOs) who manage the utility grids for more than half of U.S. consumers.[260]

The net-metered customer enjoys a free energy *banking* service and does not compensate the utility for using the grid to effectuate this energy banking or for the distribution services utilized.[261] The retail credit received in some high retail-rate states can be in the vicinity of $0.25/kWh, which corresponds to roughly 600% the wholesale $0.04/kWh value of this power in the U.S. during the prior decade.[262] For example, the author's current retail rate in Boston is an average cost of $0.25/kWh in a recent bill,[263] and a net-metered customer would be credited at near this retail rate; wholesale power in the New England region, and in most other areas of the country

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255. *See* 220 MASS. CODE REGS. 18.03(3)–(4) (2017) (stating that distribution companies can only charge host customers for net excess consumption and must provide customers with a credit for the net kilowatt-hours generated in excess of their usage).

256. *Id.*

257. *Id.*

258. *See Glossary*, DATABASE ST. INCENTIVES FOR RENEWABLE ENERGY, http://www.dsireusa.org/support/glossary (last visited Apr. 27, 2019) ("In effect, the customer uses excess generation to offset electricity that the customer otherwise would have to purchase at the utility's full retail rate."). As to whether electricity is a "good" or a "service" and how it should be treated under the law, see STEVEN FERREY, THE NEW RULES: A GUIDE TO ELECTRIC MARKET REGULATION 211–31 (2000) ("The contract rules that govern the power sale market.").

259. *See Avoided Cost*, INDEP. ENERGY PRODUCERS ASS'N, http://www.iepa.com/avoid.asp (last visited Apr. 27, 2019) (providing an overview of avoided cost rates).

260. *See* LAW OF INDEPENDENT POWER, *supra* note 14, § 10.106, at 10–468.12 (discussing treatment of ISOs).

261. *Id.* § 4:28, at 4–1000 to 4–1001.

262. *See* Bill from Eversource, to author (Mar. 2019) (on file with author) (showing a recent, typical electricity bill in the Boston area).

263. *Id.*

for the past 5 years, has been selling for approximately $0.04 or less.[264] Wholesale power prices across the U.S. in April 2018 ranged from $0.07/kWh to $0.13/kWh and in March 2016 ranged from $0.00/kWh to $0.13/kWh at a given hour of the year, and with the average for the whole country, across all sectors, being $0.01/kWh from 2013 to 2017.[265]

The utility shifts the direct and indirect costs incurred to ratepayers who do not participate in the net-metering program in the form of higher fixed cost charges on monthly utility bills. The utility does this by crediting net-metering value at high retail rates to renewable net-metering customers in return for receiving instantaneous wholesale power that, to the utility, is worth only a small fraction of the retail rate.[266]

B. State Renewable Portfolio Standards for Developing Corporate Solar and Wind Power

Thirty states and the District of Columbia have enacted state renewable portfolio standards (RPS).[267] Unlike for net metering, the number of RPS states has remained reasonably constant over time in 30 states.[268] All were enacted independently in different states at different times between 1983 and 2015 and revised periodically.[269] For example, Massachusetts was an early state in 1997, with revisions made in 2008, 2010, 2011, 2012, 2014, 2016, and 2017.[270] More than half the states have raised the amount of RPS percentages that must be achieved,[271] and 18 have added carve-out categories for specific (often solar) technologies to earn additional credits.[272]

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264. *Electricity Residential Price: New England*, U.S. ENERGY INFO. ADMIN., https://www.eia.gov/outlooks/steo/data/browser/?#/?v=21&f=M&s=&start=201901&end=201902&maptype=0&ctype=linechart&linechart=ESRCU_NEC&id= (last visited Apr. 27, 2019); INDEP. SYS. OPERATOR NEW ENGLAND, http://www.ISO-NE.com (last visited Apr. 27, 2019).

265. *Electric Power Monthly: Table 5.3, Average Price of Electricity to Ultimate Customers*, U.S. ENERGY INFO. ADMIN. (Jan. 25, 2019), https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_03.

266. *See* Cleveland & Durkay, *supra* note 196 (suggesting that those who participate in net metering avoid compensating utility companies for infrastructure maintenance, which is passed along to those who do not participate in net metering).

267. *See Most States Have Renewable Portfolio Standards*, U.S. ENERGY INFO. ADMIN. (Feb. 3, 2012), https://www.eia.gov/todayinenergy/detail.php?id=4850 (showing that 30 states have RPS policies).

268. *Id.*

269. GALEN BARBOSE, LAWRENCE BERKELEY NAT'L LAB., U.S. RENEWABLES PORTFOLIO STANDARDS: 2017 ANNUAL STATUS REPORT 8 (2017) [hereinafter 2017 ANNUAL STATUS REPORT], https://emp.lbl.gov/sites/default/files/2017-annual-rps-summary-report.pdf.

270. *Id.*

271. *Id.* at 9.

272. *Id.*

A resource portfolio standard requires certain retail-electricity sellers to maintain evidence of a predetermined percentage of designated clean resources in their wholesale electric-supply mixes.[273] RPS programs were denominated as one form of *backdoor* renewable energy subsidies for corporations and residences.[274] There is myriad variation on state RPS models.[275] These mandatory RPS programs cover 46% of nationwide retail-electricity sales.[276] In addition to a general RPS requirement for a range of renewable technologies, some states have a solar carve out for a different credit being generated for solar technologies.[277] The new 2018 Massachusetts Solar Massachusetts Renewable Target (SMART) program gives additional revenue premiums to corporations that deploy solar energy on roofs, parking canopies, or that add battery storage with their solar power.[278]

The value to a corporation with an eligible renewable energy technology of RPS Renewable Energy Credits (RECs) is determined by changing market prices. The market prices are influenced by the state-set demand requirements for RECs and the supply created by the qualifying project build-out and operation.[279] Over the last eight years, New England REC prices fluctuated up to $0.06/kWh and mid-Atlantic REC prices fluctuated up to $0.02/kWh.[280] Some states that allow net metering put a limit on the percentage of total power that can be net metered to avoid the problem of net metering power back to the utility when the utility does not need the power.[281] Massachusetts has a "virtual net metering" that is an order of magnitude more far-reaching than the other states[282] because net-

273. *Id.* The resources such as renewables, demand-side management, or high-efficiency-fossil combustion, as defined by a particular state, would be included in the company's overall resource portfolio. *Id.* Portfolio requirements can be applied to electricity sellers, such as generation companies and vertically integrated utilities, as a condition of continued market access. *Id.* The requirements could also be applied to wholesale electricity buyers, such as distribution companies and electricity brokers, but the states do not exercise authority over wholesale markets. *Id.* at 29.

274. Robert Glennon & Andrew M. Reeves, *Solar Energy's Cloudy Future*, 1 ARIZ. J. ENVTL. L. & POL'Y 91, 106 (2010).

275. RYAN WISER & GALEN BARBOSE, LAWRENCE BERKELEY NAT'L LAB., RENEWABLE PORTFOLIO STANDARDS IN THE UNITED STATES: A STATUS REPORT WITH DATA THROUGH 2007, at 1 (2008), https://escholarship.org/content/qt1r6047xb/qt1r6047xb.pdf.

276. *Id.*

277. *Id.*

278. 225 MASS. CODE REGS. 20.07(4) (2018) (setting the compensation rates for building-mounted-solar-generation units, canopy-mounted-generation units, and energy storage).

279. *Program Summaries*, COMMONWEALTH OF MASS., https://www.mass.gov/service-details/program-summaries (last visited Apr. 27, 2019).

280. *See Green Power Pricing*, EPA, https://www.epa.gov/greenpower/green-power-pricing (last visited Apr. 27, 2019) (documenting the fluctuating prices of RECs across varying regions).

281. Powers, *supra* note 251.

282. *See supra* note 252 (describing Massachusetts's "virtual net metering").

metering credits can be transferred to other customers in the utility service territory at approximately 300% of the wholesale price.[283]

Receiving up to $0.02/kWh or even $0.065/kWh, above and apart from the value of the power itself, which has been hovering in these regions at $0.04/kWh or less over these prior eight years, is a significant incentive for a corporate owner.[284] However, if instead a corporate owner receives a solar REC (SREC) in those states that offer them, this provides a subsidy of $0.25–0.60/kWh in a state such as Massachusetts.[285] Such a SREC subsidy is a 500–1300% bonus payment above and beyond the average $0.04/kWh sale value of the power itself.[286]

The amount of renewable energy rapidly increasing, four years ago the cost of these subsidies was already at $3 billion per year and climbing in each successive year, as there was more renewable energy.[287] These gross costs, in the billions of dollars per year, can be translated into the cost paid by individual retail-utility ratepayers for their states' policies.[288]

One other subsidy for corporations deploying renewable energy can be a system benefits charge (SBC), a per-kilowatt power charge imposed on all electricity consumers within a state.[289] Approximately one-third of U.S. states have enacted SBCs and "public benefit funds," as a direct subsidy mechanism to support the development of renewable energy resources.[290] Eighteen states, plus the District of Columbia, have established renewable trust funds in the U.S.[291] The money then can be given as grants or loans to companies that adopt renewable energy technology.[292] States raise revenues

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283. *See* Puttre, *supra* note 252 ("[V]irtual net metering . . . permits the transfer of monetary credit from the off-taker to third parties.").

284. *See supra* note 265 and accompanying text (discussing the fluctuating prices over the last five years).

285. *See* 225 MASS. CODE REGS. §§ 1406, 1408 (discussing SRECs and their relation to alternative compliance payments; payments that drive the value of SRECs, which can range from $0.25 to $0.60 per kilowatt-hour).

286. *See generally SRECs: Understanding Solar Renewable Energy Credits*, ENERGYSAGE, https://www.energysage.com/solar/cost-benefit/srecs-solar-renewable-energy-certificates/ (last updated Feb. 25, 2019) (explaining SRECs).

287. 2017 ANNUAL STATUS REPORT, *supra* note 269, at 34.

288. *See id.* (explaining that general costs were calculated based on available data from some states and utilities).

289. *See* ELIZABETH DORIS ET AL., NAT'L RENEWABLE ENERGY LAB., STATE OF THE STATES 2009: RENEWABLE ENERGY DEVELOPMENT AND THE ROLE OF POLICY 65–66 (2009), http://www.nrel.gov/docs/fy10osti/46667.pdf (noting that 17 states and the District of Columbia had at that date implemented public benefit fund programs).

290. *Id.*

291. Richard L. Revesz & Burcin Unel, *Managing the Future of the Electricity Grid*, 41 HARV. ENVTL. L. REV. 43, 57 (2017).

292. *See Renewable Energy Trust Fund*, U.S. DEP'T OF ENERGY, https://www.energy.gov/savings/renewable-energy-trust-fund (last visited Apr. 27, 2019) (providing an

for these renewable trust funds through a small surcharge on electricity bills.[293]

C. State Property Tax Exemptions

Distributed renewable energy generation tends to be capital intensive. Its value can incur additional property tax assessments as costs for a corporation over its operating lifetime if corporate solar and wind installations are taxable as personal property by local governments.[294] It depends on state and local law.[295] To illustrate the confusion between corporate owners and state taxing authorities on this issue, in 1975, the Massachusetts legislature enacted this tax provision:

> Any solar or wind powered system or device which is being utilized as a primary or auxiliary power system for the purpose of heating or otherwise supplying the energy needs of property taxable under this chapter; provided, however, that the exemption under this clause shall be allowed only for a period of twenty years from the date of the installation of such system or device.[296]

The Massachusetts Department of Revenue issued an opinion in 2012 that would provide an exemption from state property tax only if a corporation had a high enough demand to use all of the renewable energy it produced, rather than sell the excess power or net meter it by transferring its net-metering credits to other entities.[297] Based on this advisory

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example of a renewable trust fund that "may provide grants, contracts, loans, equity investments, energy production credits, bill credits, and rebates to customers").

293. Steven Ferrey, *Alternative Energy in a Spaghetti Western: Clint Eastwood Confronts State Renewable Energy Policy*, 32 UTAH ENVTL. L. REV. 279, 293 (2012).

294. *Renewable Energy Tax Assessment*, DATABASE OF ST. INCENTIVE FOR RENEWABLES & EFFICIENCY, http://programs.dsireusa.org/system/program/detail/2388 (last updated Oct. 7, 2015).

295. *Id.*

296. MASS. GEN. LAWS ch. 59, § 5 (2018).

297. *DLS Interpretation on Solar PV Property Tax Exemption*, CITY & TOWN, https://www.greenneedham.org/blog/documents/2012/10/dls-interpretation-on-solar-pv-property-tax-exemption.pdf (last visited Apr. 21, 2019) ("In our opinion, this means the exemption applies only to those systems or devices being used as the primary or backup heating or power system for the taxable real estate on which they are installed (or associated, e.g., a contiguous parcel owned and used by the same owner together with the other parcel). It is for property owners who install systems or devices for use on their own properties, not for solar or wind facilities or farms constructed and operated for purposes of generating energy for sale to the grid . . . . The exemption does not extend to the land and any other real or personal property . . . . [T]he assessor decides whether the assets are real estate or personal property based on the degree of attachment. *See Boston Edison Co. v. Board of Assessors of Boston*, 402 Mass. 1 (1988) (Taxable machinery of a utility used in the manufacture of electricity, and

interpretation of the state tax office, solar units, sized to supply only the power needs of the metes and bounds of the property on which it is placed, are not taxable for local property tax.[298] Corporations challenged this as too restrictive an interpretation of the above statutory provision, where a single taxpaying entity owned both an offsite-net-metered solar-photovoltaic system as well as separate properties to which 100% of the net-metering credits were allocated for payment of utility bills associated with electric service to those properties.[299]

The Appellate Tax Board, after hearing, disagreed with the Massachusetts Department of Revenue. The Board ruled and held that there was no statutory limitation on the location of the "property taxable under [this chapter]" and determined that, had the legislature wanted such a limitation, it would have drafted the statute to include one.[300] It rejected the reliance on the opinion letter by the Department of Revenue, which limited the application of the statute to solar property that is located on or "contiguous" to the property it is intended to power, holding that this limitation has no basis in the statute.[301] The Appellate Tax Board also noted that the Commonwealth received the same benefit from a solar energy system regardless of the physical location of the parcel to which it furnished its power.[302] The Massachusetts Appellate Tax Board held:

> The [Massachusetts] Department [of Revenue] . . . interpreted [the exemption] so as to limit its application only to solar property that is located either on the same parcel or a contiguous parcel to the property it is intended to power . . . and an *incorrect* interpretation of a statute by an administrative agency is entitled to no deference . . . . [T]he Department's limitation . . . [is found] to be an *illusory distinction*, which finds *no basis* in [the exemption].[303]

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significantly attached to a parcel of real estate, but traditionally assessed as personal property, may be assessed as either real or personal property.)").

298. Forrestall Enters., Inc. v. Bd. of Assessors, No. F317708, 2014 WL 6863331, at *1, *4 (Mass. App. Tax Bd. Dec. 4, 2014).

299. *Id.* at 1029–30. Bruce Forrestall, the sole owner of appellant, Forrestall Enterprises, owned a 5-acre property, "the Milk Street Property," on which a 240 kW solar photovoltaic system containing approximately 856 panels was installed, which was to be used to power the Forestall Westborough Properties through a net-metering agreement with National Grid. *Id.* at 1026, 1029.

300. *Id.* at 1033–34.

301. *Id.* at 1033.

302. *See id.* at 1035 (implying that taxpayers benefit from solar energy systems regardless of solar panels' locations).

303. *Id.* at 1033 (emphasis added).

This is a favorable court determination for corporations with multiple locations or which want to sell surplus renewable power that they produce.[304] A corporation could sell its renewable power to other consumers, which is legal under state law in Massachusetts, and the personal renewable energy property remains un-taxable.[305] In a subsequent decision of the Massachusetts Appellate Tax Board, the net metered project earned state net metering credits, of which 2% were allocated to the residential bills of the taxpayer and 98% of which were credited to the electricity bills of 4 branches of an unrelated corporation's electricity bills, located in different towns in Massachusetts.[306] The recipient corporation agreed to pay the owners 95% of the "dollar value for the credited electricity appearing on [their] . . . electricity bill."[307] The renewable energy property remained un-taxable for a period of 20 years from the date of installation, so long as it is producing energy.[308]

In New Jersey, there is an exemption from local property tax for the value added to property from corporate renewable energy systems that are used to supply on-site electricity, heating, cooling, or general energy needs.[309] Arizona exempts from property taxes all renewable energy systems used to meet on-site needs.[310] Rhode Island exempts from property taxation a corporate manufacturer's inventory, machinery, and equipment.[311] A person is considered a manufacturer within the State if they use property for the purpose of transforming raw materials into a finished product for trade.[312] In Rhode Island, where renewable energy, such as from a wind turbine, is used exclusively for the production of natural resources

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304. *See id.* (invalidating the Department of Revenue's interpretation that limited the application of tax exemptions for solar systems).

305. *Id.* at 1034 (implying that Clause Forty-Fifth applies broadly).

306. KTT, LLC v. Bd. of Assessors, No. F322736, 2016 A.T.B. 426, 429 (Mass. App. Tax Bd. Oct. 13, 2016).

307. *Id.* The appeal of the town was eventually dropped when a payment in lieu of taxes (PILOT) agreement was negotiated with the town. Michael Holtzman, *16-Year PILOT Agreement Signed for Swansea Solar Farm*, HERALD NEWS (Oct. 12, 2017), https://www.heraldnews.com/news/20171012/16-year-pilot- agreement-signed-for-swansea-solar-farm. The Cabrals were issued a tax abatement in the amount of $170,000 in February 2017, representing tax payments from 2014 through 2017. *Id*

308. Holtzman, *supra* note 307.

309. *Property Tax Exempt for Renewable Energy Systems*, DATABASE OF ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, http://programs.dsireusa.org/system/program/detail/3100 (last updated Oct. 1, 2014). In order to receive the exemption, taxpayers must apply for a certificate from their local assessor in order to reduce the assessed value of the property not to include the value added by the system. *Id.*

310. ARIZ. REV. STAT. ANN. § 42-11054 (2009).

311. 44 R.I. GEN. LAWS § 44-3-3 (2018).

312. *Id.*

into a finished product, the generation equipment qualifies as manufacturing equipment and therefore is exempt from property taxation.[313]

Unlike Rhode Island, the manufacturing exemption in Massachusetts's statute is limited to apply only to qualified manufacturing corporations and not to an organization or individual who engages in manufacturing,[314] and the equipment must be used in the corporation's basic manufacturing process to be exempt from property taxes.[315] Qualifying are increasingly used corporate cogeneration facilities with a total power production of 30 megawatts or less.[316] Each state tax law is distinct: A Colorado court held that the State's manufacturing exemption which encompasses machinery and tools used "directly and predominantly in manufacturing tangible personal property, for sale or profit," did not apply to the corporate taxpayer's machinery used for the generation of electricity.[317] In Arizona, third-party leased solar panels were not deemed as utility property to be taxed by the State. Although the court did not reach, and sent back to the state tax court, questions regarding whether municipalities could assess local property tax on leased solar panels on property.[318]

V. THE CORPORATION AS MACROECONOMIC ACTOR

A. Undoing the Law

What are the intermediate- and long-term effects of the Trump Administration step-back from the Obama Administration Clean CPP[319] and the Trump Administration stated withdrawal from the international Paris Agreement of 2015,[320] which took the next international step after the Kyoto Protocol which was in effect from 2005 to 2012,[321] to limit the

313. DePasquale v. Cwiek, 129 A.3d 72, 74 (R.I. 2016).

314. *See* LAW OF INDEPENDENT POWER, *supra* note 14, § 10.82, at 10–369.8 (discussing treatment of property taxes).

315. *Id.*

316. MASS. GEN. LAWS ch. 59, § 5 (2018).

317. *See* Dept. of Revenue v. Pub. Serv. Co. of Colo., 330 P.3d 385, 387 (Colo. 2014). The court reasoned that because the sales and use tax statutes treated electricity as a service, it was therefore not tangible personal property. *Id.*

318. SolarCity Corp. v. Ariz. Dep't of Revenue, 413 P.3d 678, 680, 683 (Ariz. 2018).

319. Exec. Order No. 13,783, 82 Fed. Reg. 16,093, 16,095, 16,097 (Mar. 31, 2017).

320. Remarks Announcing United States Withdrawal from the United Nations Framework Convention on Climate Change Paris Agreement, 2017 DAILY COMP. PRES. DOC. 373 (June 1, 2017); *see List of Parties That Signed the Paris Agreement on 22 April*, U.N. SUSTAINABLE DEV. GOALS, (Apr. 20, 2016), https://www.un.org/sustainabledevelopment/blog/2016/04/parisagreementsingatures/ (recording that the U.S. signed the Paris Agreement).

321. Kyoto Protocol to the United Nations Framework Convention on Climate Change, art. 3, Dec. 11, 1997, 37 I.L.M 22.

international emission of GHGs? The Paris Agreement agreed to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and to "pursu[e] efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change."[322] The Trump Administration pull-back leaves the U.S. as the only major nation in the world not continuing with the Paris Agreement of international climate-control efforts.[323]

The CPP, during the Obama Administration, was designed to meet the Kyoto Protocol and subsequent Paris Agreement 2015 pledges for GHG reductions.[324] The change in presidential administrations caused the EPA—under new management—to promulgate regulations in 2017 to reduce dramatically the calculated value of saving emissions of CO_2.[325] Executive Order 13,783, issued in March 2017, ordered the EPA to eliminate the CPP itself.[326]

In December 2017, the administration announced repeal of the CPP[327] with an Advance Notice of Proposed Rulemaking to Replace the CPP.[328] The Trump Administration estimated that its repeal of the CPP will save $33 billion in avoided compliance costs in 2030.[329] A group of 12 states responded to the EPA's Adavance Notice of Proposed Rulemaking on the CPP in February 2018,[330] 13 states urged President Trump not to replace

322. Paris Agreement art. 2.1(a), Dec. 12, 2015, https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

323. Robinson Meyer, *Syria Is Joining the Paris Agreement. Now What?*, ATLANTIC (Nov. 8, 2017), https://www.theatlantic.com/science/archive/2017/11/syria-is-joining-the-paris-agreement-now-what/545261/.

324. *What is the Clean Power Plan, and How Can Trump Repeal It?*, N.Y. TIMES (Oct. 10, 2017), https://www.nytimes.com/2017/10/10/climate/epa-clean-power-plan.html.

325. Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 82 Fed. Reg. 48,035, 48,043 (proposed Oct. 16, 2017) (to be codified at 40 C.F.R. pt. 60) ("This approach shifts the focus to the domestic (rather than global) social cost of carbon, and employs both 3 percent and 7 percent discount rates.").

326. Exec. Order No. 13,783, 82 Fed. Reg. 16,093, 16,095 (Mar. 31, 2017).

327. Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 82 Fed. Reg. 51,787, 51,787 (Nov. 8, 2017) (to be codified at 40 C.F.R. pt. 60).

328. FACT SHEET: PROPOSED ACE RULE—LEGAL OVERVIEW, EPA, https://www.epa.gov/sites/production/files/2018-08/documents/ace_legal_bser.pdf (last visited Apr. 27, 2019).

329. Press Release, EPA, EPA Takes Another Step to Advance President Trump's America First Strategy, Proposes Repeal of "Clean Power Plan" (Oct. 10, 2017), https://www.epa.gov/newsreleases/epa-takes-another-step-advance-president-trumps-america-first- strategy-proposes-repeal.

330. *See 12 States Encourage EPA to Implement a Meaningful Federal Program to Reduce GHG Emissions*, GEO. CLIMATE CTR. (Feb. 27, 2018), http://www.georgetownclimate.org/reports/12-states-encourage-epa-to-implement-a-meaningful-federal-program-to-reduce-ghg-emissions.html?utm_source=Agency+Leaders+for+14+States+Oppose+CPP+Replacement&utm_campaign=COP+Roundup%3B+EV+Report&utm_medium=email.

the CPP,[331] and 14 states immediately sent a letter in opposition to the actual repeal and replacement when the EPA proposed it in August 2018.[332] This compares with twice that many states, 27, who at this time were still suing and enjoining the EPA for initially promulgating the CPP in 2015.[333] The Trump Administration's CPP replacement plan focuses on boosting efficiency at coal-fired power plants instead of shutting them.[334]

The Obama Administration CPP exclusively targeted fossil-fuel electricity production for reductions of carbon in its October 2015 460-page CPP rule.[335] This rule was designed to achieve a required 32% reduction of annual CO_2 emissions of carbon from new and existing power plants by 2030,[336] compared to the U.S. 2005 carbon emission power generation baseline.[337] Of note, in *West Virginia v. EPA*, the Supreme Court preliminarily enjoined the entire CPP during the Obama Administration pending a lower court decision on the matter, which had not yet, and still has not, been rendered.[338] No party in the matter was able to point to any

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331. *See* Letter from 13 States, to E. Scott Pruitt, Adm'r, EPA (Apr. 17, 2018), https://www.georgetownclimate.org/files/report/State-Environmental-and-Energy-Regulators-CPP-Repeal-Comment-Letter-and-Appendix-041718.pdf (urging the EPA to continue the CPP).

332. *See Agency Leaders for 14 States Oppose Trump Administration's Clean Power Plan Replacement*, GEO. CLIMATE CTR. (Aug. 21, 2018), http://www.georgetownclimate.org/reports/agency-leaders-for-14-states-oppose-trump-administration-s-clean-power-plan-replacement.html?utm_source=Agency+Leaders+for+14+States+Oppose+CPP+Replacement&utm_campaign=COP+Roundup%3B+EV+Report&utm_medium=email.

333. *States Suing EPA*, CTR. FOR EARTH, ENERGY & DEMOCRACY, http://ceed.org/states-suing-epa/ (last visited Apr. 27, 2019).

334. Exec. Order No. 13,783, 82 Fed. Reg. 16,093, 16,095 (Mar. 31, 2017).

335. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,662, 64,662 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60).

336. EPA, FACT SHEET: THE CLEAN POWER PLAN BY THE NUMBERS 1 (2015), https://archive.epa.gov/epa/sites/production/files/2015-08/documents/fs-cpp-by-the-numbers.pdf. Between the rule's promulgation in 2014 and final rule issuance in 2015, the EPA delayed implementation. *See* 80 Fed. Reg. at 64,662, 64,736 (indicating a one-year gap between the comment period and the final rule issuance). This included more time for state compliance with a two-year delay for states filing required plans from 2016 to 2018, and a two-year delay in the first year of required CO_2 reductions, from 2020 to 2022. *Id.* at 64,669. The EPA's final regulation indicates that the goal of this rule is to substitute natural gas for coal in the generation of electricity. *Id.* at 64,667. The EPA increased how much CO_2 emissions will have to be brought down from the 2005 baseline by 2030 from the 30% proposed to 32% in the final rule. *Id.* at 64,736 n.384.

337. *Id.* at 64,679; *see also* Juliet Eilperin & Steven Mufson, *EPA Proposes Cutting Carbon Dioxide Emissions from Coal Plants 30% by 2030*, WASH. POST (June 2, 2014), https://www.washingtonpost.com/national/health-science/epa-to-propose-cutting-carbon-dioxide-emissions-from-coal-plants-30percent-by-2030/2014/06/01/f5055d94-e9a8-11e3-9f5c-9075d5508f0a_story.html.

338. West Virginia v. EPA, 136 S. Ct. 1000, 1000 (2016); *see* Jonathan H. Adler, Opinion, *Supreme Court Puts the Brakes on the EPA's Clean Power Plan*, WASH. POST: VOLOKH CONSPIRACY (Feb. 9, 2016), https://www.washingtonpost.com/news/volokh-conspiracy/wp/2016/02/09/supreme-

previous case in which the Supreme Court had stayed an agency rule in the entirety before any court had reviewed it on its merits or there was a substantive lower court decision on the merits appealed to the Supreme Court.[339]

B. Results in a New Era

Withdrawing from the international Paris Agreement and similarly pulling back from an already-stayed CPP—both of which were directed at significantly repressing power sector carbon emissions—would seem to foreshadow that the U.S. would not come close to the Paris Agreement carbon emission reductions pledged by it in conjunction with that of other major nations.[340] According to the most recent U.S. Department of Energy, Energy Information Administration (EIA) "International Energy Outlook": "Even with the CPP, the United States does not meet its NDC targets based on reductions projected from compliance with the CPP alone."[341] The EIA Annual Energy Outlook, released when the CPP was promulgated, projected then that U.S. CO_2 emissions would decrease by only 8% below 2005 levels by 2030.[342] What are the metrics? The U.S. submitted to the U.N. Framework Convention on Climate Change an intended U.S. nationally determined contribution (INDC) of 17% U.S. reductions below 2005 levels by 2020 and thereafter 26–28% reductions by 2025.[343]

However, under one estimate, significant power sector reductions are occurring without the CPP, now still three years before the CPP would have required any of its reductions to be implemented beginning in 2022.[344] The Rhodium Group estimated that U.S. electricity emissions are currently on

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court-puts-the-brakes-on-the-epas-clean-power-plan/?utm_term=.f8f7469b8324 (discussing the unusual nature of the Supreme Court's stay of EPA's CPP).

339. Ann Carlson, *The Decision to Halt the Implementation of the Clean Power Plan is Outrageous and Inconsistent with the Law*, LEGAL PLANET (Feb. 9, 2016), http://legal-planet.org/2016/02/09/the-decision-to-halt-the-implementation-of-the-clean-power-plan-is-outrageous/.

340. Steve Baragona, *Report: US Unlikely to Meet Paris Climate Pledge*, VOA NEWS (Sept. 12, 2018), https://www.voanews.com/a/report-us-unlikely-to-meet-paris-climate-pledge/4569150.html.

341. U.S. ENERGY INFO. ADMIN., INTERNATIONAL ENERGY OUTLOOK: EXECUTIVE SUMMARY 11 (2017), https://www.eia.gov/outlooks/ieo/pdf/exec_summ.pdf; INT'L ENERGY AGENCY, *supra* note 16.

342. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2015 WITH PROJECTIONS TO 2040, at E-12 n.31 (2015), https://www.eia.gov/outlooks/archive/aeo15/pdf/0383(2015).pdf. The CPP was projected to reduce power sector CO_2 emissions 32% below 2005 levels by 2030. JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., R44451, U.S. CARBON DIOXIDE EMISSIONS TRENDS AND PROJECTIONS: ROLE OF THE CLEAN POWER PLAN AND OTHER FACTORS 11, 13 (2017).

343. RAMSEUR, *supra* note 342, at 1.

344. John Larsen & Whitney Herndon, *What the Clean Power Plan Would Have Done*, RHODIUM GROUP (Oct. 9, 2017), https://rhg.com/research/what-the-cpp-would-have-done/ [hereinafter Larsen & Herndon, *Clean Power Plan*].

track to fall 27–35% below baseline 2005 levels by 2030, even with the CPP regulation repealed by the Trump Administration or otherwise enjoined by the courts.[345] The midpoint of this range is approximately the 32% reduction that the CPP would have required by 2032.[346] And it also is in the general zone of the U.S. Paris Agreement INDC pledge of 26–28% carbon reductions below 2005 levels by 2025, if approximately 1% of this projected reduction is discounted from each year before the CPP 2032 deadline.[347] For timing context, even if not enjoined by the Supreme Court or repealed during the Trump Administration, the CPP would not cause any CO_2 reductions until its first state filing and compliance in 2022.[348] By comparison, the Rhodium analysis places the U.S. on track to achieve a 32% reduction from 2005 CO_2 levels without a federal CPP, in the range of 27–35% reductions below 2005 levels.[349]

The Rhodium analysis projects that the U.S. could achieve the 2032 CPP-required levels of CO_2 reduction from power plants a full decade in advance, without the CPP or any other regulations in place and continuing under business-as-usual.[350] The U.S. could achieve the CPP 2032 carbon reduction goal by 2020 and maintain this level to 2032.[351] Today, power-sector carbon emissions are 28% below 2005 levels.[352] This places the U.S. power sector in a position to satisfy its 2030 Paris Agreement commitment.[353] Moreover, the power sector must reduce emissions by only 4% more to achieve the CPP's 32% reduction required by 2030.[354]

VI. CORPORATE ACTION

The International Energy Agency estimates that approximately 1,000 gigawatts of additional renewable power, featuring wind power, will be

345. *Id.*

346. *Id.*

347. *See* United Nations Framework Convention on Climate Change, U.S. Cover Note, Intended Nationally Determined Contribution (INDC) and Accompanying Information, https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/United%20States%20of%20America/1/U.S.%20Cover%20Note%20INDC%20and%20Accompanying%20Information.pdf (last visited Apr. 27, 2019) (stating the target goal of the U.S.).

348. Larsen & Herndon, *Clean Power Plan*, *supra* note 344.

349. *Id.*

350. *Id.*

351. *Id.*

352. SUSTAINABLE ENERGY IN AMERICA, *supra* note 115, at 4.

353. Anna Hirtenstein, *Dawn of Solar Age Declared as Sun Power Beats All Others*, BLOOMBERG LAW: ENV'T & ENERGY (Oct. 4, 2017), https://www.bloomberglaw.com/document/XA1H1HIK000000?bna_news_filter=environment-and-energy&jcsearch=BNA%252000000015ee748d25fa95ef7dba67f0000#jcite.

354. *Id.*

installed world-wide in the next five years.[355] This amount of additional power is equivalent to the amount that coal electric power achieved in its first 80 years as the dominant power source and exceeds the amount of electric generation capacity that is currently consumed in three of the largest countries: China, India, and Germany combined.[356] Much of this new power installation will be done by corporations.[357]

In the transportation sector, corporations play a major role facilitating indirect GHG emissions when their employees commute to work each day. There is now legal uncertainty with the Trump Administration's freeze of the progressive Obama Administration vehicle CAFE mileage standards required of new vehicles[358] and policy change to no longer consider carbon emissions as part of federal EISs.[359] In August 2018, the Environmental Protection Agency and the National Highway Traffic Safety Administration simultaneously proposed to freeze U.S. vehicle fuel-economy and tailpipe-greenhouse-gas-emissions requirements at their scheduled 2020 levels of 37 miles per gallon equivalent.[360] This proposal would replace the Obama Administration standards that continue increasing to approximately 47 miles per gallon equivalent by 2025.[361] States are filling some of this gap. California just became the first state to overrule traditional local zoning to require allowing accessory residential units to promote infilling of more dense land-use to result in less transportation mileage.[362] Additionally, Massachusetts became the first state to attempt to impose transportation carbon pricing on corporations by 2020.[363]

Of note, corporations are becoming a more influential factor: corporate use of electricity in the U.S. is increasing, while residential use is

355. *Id.*

356. *Id.*

357. *Id.*

358. *See infra* note 361 and accompanying text; Order at 1–2, California v. EPA, No. 18-1114 (D.C. Cir. Nov. 21, 2018) (challenging EPA's roll back of vehicle standards).

359. Popovich et al., *supra* note 83.

360. Ari Natter & Jennifer A Dlouhy, *Big Oil Cheers Quietly as Trump Moves to Ease Auto Standards*, BLOOMBERG (Aug. 3, 2018), https://www.bloomberg.com/news/articles/2018-08-03/big-oil-cheers-quietly-as-trump-moves-to-ease-auto-standards.

361. *See id.* ("Its now less important to conserve energy and to curb oil demand given the dramatic rise in U.S. crude production, the Trump administration said in its proposal.").

362. Henry Garber, *California Bill Would Allow Unrestricted Housing by Transit, Solve State Housing Crisis*, SLATE (Jan. 5, 2018), https://slate.com/business/2018/01/california-bill-sb827-residential-zoning-transit-awesome.html.

363. Mary C. Serreze, *Massachusetts Senate Approves Revenue-Neutral Carbon Tax as Part of Energy Bill*, MASSLIVE (June 15, 2018), https://www.masslive.com/politics/index.ssf/2018/06/massachusetts_senate_passes_ca.html.

decreasing.[364] The price of electricity has moved counter to the increase in the price of other goods.[365] Federal corporate tax credits (the PTC and the ITC) that incentivize corporate investment in renewable wind and solar power, respectively, are now phasing-down, and in the PTC's case, entirely disappearing.[366] This gap is now filled in many states by incentives: 29 states have Renewable Portfolio Standard programs for corporate renewable-power development, and 38 states have net-metering regulations for renewable-power development, allowing corporations to take advantage.[367]

Corporations are motivated by both law and economics.[368] Counter-intuitively, the Trump administration's 2017 tax cuts and changes, effective in 2018, on the surface seem extremely beneficial for many corporations. But they can actually frustrate the existing incentives perceived by corporations for both solar- and wind-renewable-energy deployment by diminishing the cash value of the corporate solar-ITC tax credit, the wind-PTC tax credit, and the carry-back provisions of both. Furthermore, the tax cuts and changes may diminish the value of depreciation even though it can be realized more rapidly.[369] This changes the U.S. legal context for climate-sensitive investments.[370]

What could be a pessimistic legal assessment of repeal of U.S. law and regulation limiting future climate emissions in the U.S. is not evident in the scientific data.[371] Despite the ongoing current withdrawal of the U.S. from the CPP and the international Paris Agreement,[372] the U.S. has continued to accelerate substantial reduction in power-plant carbon emissions with

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364. *Per Capita Residential Electricity Sales in the U.S. Have Fallen Since 2010*, U.S. ENERGY INFO. ADMIN. (July 26, 2017), https://www.eia.gov/todayinenergy/detail.php?id=32212.

365. U.S. Bureau of Labor Statistics, *Consumer Prices Up 2.9 Percent over 12 Months Ended June 2018*, ECON. DAILY (July 16, 2018), https://www.bls.gov/opub/ted/2018/consumer-prices-up-2-point-9-percent-over-12-months-ended-june-2018.htm. The federal government's Consumer Price Index report found the overall CPI rose 2.9% over the 12 months ending June 2018, during which time, the electricity CPI fell by 0.1%. *Id.*

366. Larsen & Herndon, *Clean Power Plan*, *supra* note 344.

367. *See supra* text accompanying notes 249–54, 267–72 (examining state RPS and net-metering regulations).

368. *See* David McBride, *General Corporation Laws: History and Economics*, 74 L. & CONTEMP. PROBS. 1, 1 (2011) (describing the relationship between law and economics to be symbiotic in corporations).

369. *See supra* Part III.B–C (reviewing the effects of the tax-reform act on the ITC and PTC).

370. *See supra* Part III.B–C (discussing the changes in the legal incentives for renewable energy investments).

371. *See, e.g.*, *supra* Part V.B (establishing that regardless of any Trump Administration changes to existing laws, electricity emissions are on track to decrease 27–35% by 2030).

372. Hai-Bin Zhang et al., *U.S. Withdrawal from the Paris Agreement: Reasons, Impacts, and China's Response*, ADVANCES CLIMATE CHANGE RES., Dec. 2017, at 220, 220–21.

corporate and utility substitution of lower-carbon technology notwithstanding withdrawal of federal legal mandates.[373] In fact, the actual real-time data suggests that the U.S. may achieve its Obama Administration carbon target and goals a decade earlier than required—by 2020, rather than 2030.[374] This "through the looking glass" outcome is facilitated by corporate adoption of less carbon-intensive production of electric power even in the absence of continuing regulations.[375]

373. *See supra* fig. 1 and text accompanying note 197 (explaining that renewable energy sources will outcompete fossil fuel energy sources in the future).

374. *See supra* notes 355–57 and accompanying text (detailing these projections).

375. *See supra* text accompanying notes 357, 364, 368, 371–74 (overviewing the corporate role in moving to renewable energy sources under both the market demands and the law).