

TORQUING THE LEVERS OF INTERNATIONAL POWER

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I. INTRODUCTION

The world is now at its climate’s “tipping point” at a precipice to redress global warming; after which our ability to halt a climate temperature rise below 2 degrees Centigrade (3.4 degrees Fahrenheit) is deemed unreachable.¹ How to arrest the fast-accelerating accumulation of long-term carbon in the atmosphere is the legal and environmental challenge of the 21st century. It involves intelligent implementation of legal mechanisms, not technical fixes. Governments must quickly torque the levers of international power, but U.S. courts are finding some of these levers unconstitutional.

International climate agreements have operated poorly to date: The 1997 Kyoto Protocol concluded its operative phase in 2012, and three major and necessary covered world powers—Russia, Japan and New Zealand—then refused to agree to any subsequent obligations.² The Paris COP-21 continued the two most criticized elements of the Kyoto

1. Dean Scott, *NASA Scientist Recalls 1988 Testimony by Seeking Phaseout of Coal-Fired Plants*, 39 ENV’T REP. (BNA) 1263, 1273 (2008).

2. Juliet Eilperin, *Kyoto Protocol Extended in Contentious U.N. Climate Talks*, WASH. POST, Dec. 8, 2012, available at http://www.washingtonpost.com/national/health-science/kyoto-protocol-extended-in-contentious-un-climate-talks/2012/12/08/f64a51c0-4178-11e2-ae43-cf491b837f7b_story.html; See also Michael Bastasch, *Only 37 Countries Willing to Back Kyoto Protocol Extension*, DAILY CALLER, Dec. 12, 2010, available at <http://dailycaller.com/2012/12/10/only-37-countries-willing-to-back-kyoto-protocol-extension/>.

Protocol—placing no definitive obligations for carbon reduction on any nation, and being totally unenforceable. If the levers of international power are not grasped immediately and manipulated carefully, experts, including the White House Science Advisor and NASA’s lead climatologist, state that the battle against manageable climate change is forfeited.³

The International Panel on Climate Change 2014 report concludes that in order to maintain world warming below 2°C, there must be a 40–70% reduction of greenhouse gases (“GHGs”) emission from 2010 levels by 2050.⁴ Not only was a solution nowhere in place under the Kyoto international climate protocols, but on the contrary, world carbon emissions each year are increasing rapidly rather than diminishing.⁵ Global GHG emissions increased by an average of 2.2% per year from 2000 to 2010, nearly double the 1.3% per year growth during the preceding 30 years.⁶

To address climate change in the narrow window of time before the battle for no increase more than 2° C is forfeited, the electric power sectors of the 200 world nations are the critical focus for effectively controlling carbon emissions.⁷ The technology exists to dramatically mitigate carbon emissions.⁸ However, all world nations must engage in a fundamental shift from the carbon-intensive methods by which electric power is produced.⁹ The levers of (electric) power are the critical controls that much be manipulated and applied.

The most used lever, internationally and in the European Union, to promote quick implementation of renewable power, feed-in tariffs (“FiTs”), has been declared fundamentally unconstitutional when mandated by U.S. states.¹⁰ When misused, states can be ordered to pay the

3. See *infra* notes 341–48.

4. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: SYNTHESIS REPORT 82 (2014), available at http://ipcc.ch/pdf/assessment-report/ar5/syr/SYR_AR5_FINAL_full.pdf.

5. U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-09-151, INTERNATIONAL CLIMATE CHANGE PROGRAMS: LESSONS LEARNED FROM THE EUROPEAN UNION’S EMISSIONS TRADING SCHEME AND THE KYOTO PROTOCOL’S CLEAN DEVELOPMENT MECHANISM 48 (2008), available at <http://www.gao.gov/assets/290/283397.pdf>.

6. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE: WORKING GROUP III CONTRIBUTION TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, Nov. 28, 2014, 6 (2014), available at http://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_summary-for-policymakers.pdf.

7. See *infra* Part II.

8. Andrea Vittorio, *Countries Could Double Global Share of Renewable Energy by 2030, Agency Says*, ENERGY AND CLIMATE REP. (BNA), Jan. 22, 2014, at 20, 21.

9. *Id.*

10. See *infra* Part III.C.

challengers' attorneys' fees.¹¹ Even though FiTs are legal in European Union countries at the national level, the record demonstrates flawed and uneconomic use of these mechanisms.¹² The program cost imposed on utility rate payers has caused backlash among stakeholders and significant financial hemorrhage in Germany, Italy and Spain, the primary countries aggressively employing FiTs.¹³

Renewable Portfolio Standards ("RPS"), the alternative international lever used by 29 U.S. states to maneuver sustainable power development,¹⁴ creates a separate tradable "virtual" credit earned by independent renewable energy producers, which utilities must purchase at a substantial price.¹⁵ When maneuvered in a discriminatory fashion, the RPS levers have resulted in successful constitutional attack on U.S. state RPS programs.¹⁶ RPS programs are now gaining popularity internationally;¹⁷ their costs, as with net metering, are imposed on utility customers.¹⁸

FiTs, net metering, and RPS are the primary legal levers in place to maneuver an international transition before the critical climate "tipping point" is exceeded in the next few years. Each lever operates differently, exerts distinct economic impacts, and now confronts different legal barriers in different national systems of law. This Article identifies, compares, contrasts, and torques the levers of international power. Sustainable development and continuation of world civilization in the manner we know it depend on effective and intelligent regulatory use of these comparative levers of power, and creation of legal space to do so.

Part II of this Article explores why electric power forms the critical crucible in which climate, policy and law now mix. Part III examines the legal implications of feed-in tariffs, which European and other world nations employ to promote renewable electric power. Comparing U.S. to international experience, Part III then analyzes why these same techniques

11. *See* Energy Nuclear Vermont Yankee, LLC et. al. v. Shumlin, 838 F. Supp. 2d 183 (D. Vt. 2012), *rev'd on appeal*. Similar request for fees were made after plaintiffs' constitutional challenges were upheld in cases in California, New Jersey, and Maryland. PPL Energyplus, LLC v. Nazarian, 974 F.Supp.2d 790 (D. Md. 2013), *aff'd*, 753 F.3d 467 (4th Cir. 2014) (field preemption and conflict preemption on wholesale power prices); PPL Energyplus, LLC v. Hanna, 977 F. Supp. 2d 372 (D. N.J. 2013), *aff'd* PPL Energyplus, LLC v. Solomon, 766 F.3d 241 (3d Cir. 2014) (field preemption on wholesale power prices and rates).

12. *See infra* Part III.B.2.

13. *See infra* Part III.B.

14. *See infra* Part IV.B.

15. *See infra* Part IV.B.1.

16. *See infra* Part IV.B.2.

17. *See infra* fig.5.

18. *See infra* notes 76, 114, 178, 181, 189, 289, 290.

have been held unconstitutional in the U.S. when implemented by California and other states. And even though legal in Europe, Part III examines the financial loss that has resulted from Germany's, Italy's, and Spain's misaligned positioning of this lever of power.

Part IV examines the alternative levers employed in the majority of U.S. states to promote renewable energy deployment: renewable portfolio standards and net metering. These are legal if carefully designed. However, the specific programs in several states have been found by federal Circuit Courts to violate the Constitution. A series of recent legal challenges has resulted in states having to legally remake their programs. Part IV also surveys where and how these levers of power are implemented internationally.

Warming molecules emitted anywhere on the Earth warm the entire Earth universally. The international legal challenge confronting the world nations that attended the Paris Conference of Parties in late 2015 was to correctly deploy these levers of power before we exceed scientists' declared "tipping point" of no known return. One size will not fit all nations. Part V strategically manipulates these key international levers of power for the developed and developing countries of the world.

II. POWER—ALTERING THE ELECTRIC CURRENT

A. *Climate Change*

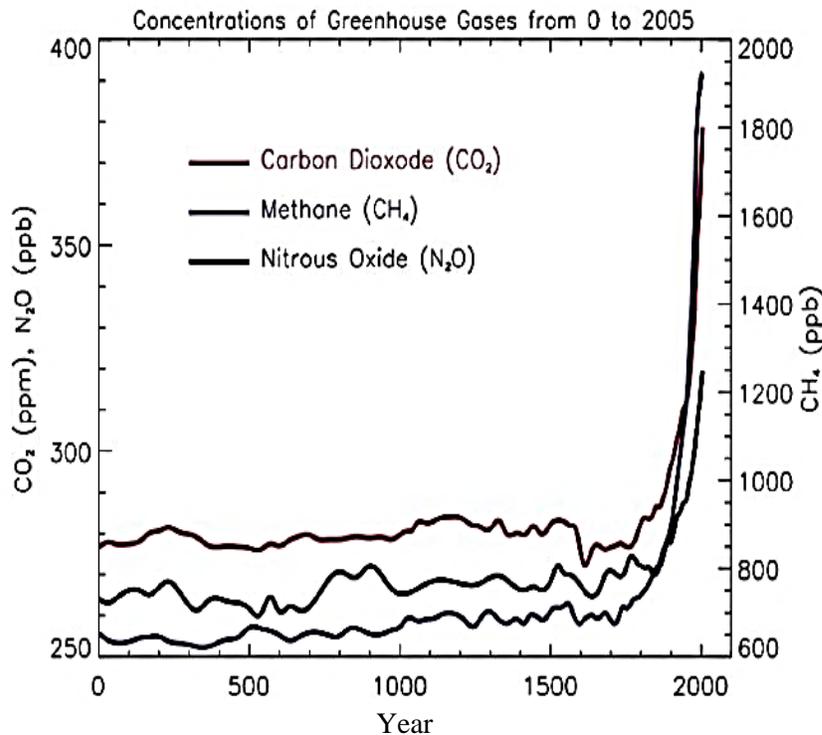
1. *The Effect of Carbon*

Climate change is a significant global issue; in some ways, perhaps, the global issue of the 21st century at which the world of nations must either succeed quickly or fail. After 800,000 years of GHG levels hovering between 180 and 280 parts per million (ppm) in the atmosphere, GHG levels have now precipitously increased to 400 ppm.¹⁹ See *infra* Figure 1. And the earth is warming and the sea level rising.²⁰

19. Brian Clark Howard, *Northern Hemisphere Cracks 400 ppm CO₂ for Whole Month for First Time*, NAT'L GEOGRAPHIC, May 27, 2014, available at <http://news.nationalgeographic.com/news/2014/05/140527-400-ppm-carbon-dioxide-global-warming-climate-science/>.

20. *Fourth Assessment Report: Climate Change*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, available at http://www.ipcc.ch/publications_and_data/ar4/wg1/en/faq-5-1.html.

FIGURE 1



GHG annual emissions increased about 70% between 1970 and 2004, with the combustion of fossil fuels accounting for 70% of GHG emissions, the subcategory of electric power generation responsible for 40% of CO₂ emissions, and the further subcategory of coal-fired electric power generation accounting for about 70% of the emissions in this electric power sector.²¹ Global energy-related emissions are expected to increase 57% from 2005 to 2030.²² At current rates of energy development, energy-related CO₂ emissions in 2050 would be 237% of their current levels under

21. Joëlle de Sépibus, *The Liberalisation of the Power Industry in the European Union and Its Impact on Climate Change: A Legal Analysis of the Internal Market in Electricity* 2–4, SWISS NAT'L CTR. OF COMPETENCE IN RESEARCH, Working Paper No. 2008/10, (2008), available at http://phase1.nccr-trade.org/images/stories/Brown%20Bags/de20Sepibus_EU20lib20CC--final.pdf.

22. U.S. GOV'T ACCOUNTABILITY OFFICE, *supra* note 5, at 48.

the existent pattern of power development and expansion.²³ And it is estimated that life as we know it would change fundamentally with the resultant warming.²⁴

According to a recent OECD report examining policy challenges for the next 50 years, unless CO₂ emissions are reduced, climate change could curb global gross domestic product (“GDP”) by 1.5% by 2060 and by nearly 6% in South and Southeast Asia.²⁵ “The electric power sector offers the most cost-effective opportunities to reduce CO₂ emissions,” compared to transportation and other sectors.²⁶ The International Energy Agency (“IEA”) presents evidence that the \$44 trillion²⁷ in additional investment needed to decarbonize the energy system in line with the IEA’s “2° scenario” by 2050 is more than offset by over \$115 trillion in fuel savings, resulting in net savings of \$71 trillion.²⁸ Economically, a successful end is within reach.

The global fleet of power plants will emit an estimated 300 billion tons of carbon dioxide before they are retired,” with coal-fired plants comprising about two-thirds of this.²⁹ According to a 2014 academic study, an average of 89 gigawatts per year of coal-fired capacity was added annually between 2010 and 2012, up from 66 gigawatts per year between 2000 and 2009 and 33 gigawatts per year between 1990 and 1999. Energy demand in fast-growing economies, such as China and India, is driving the projected emissions China alone represents 42% of projected future emissions³⁰

23. Press Conference Presentation, Int’l Energy Agency, Energy Technology Perspectives: Scenarios and Strategies to 2050, July 14, 2006, available at http://www.unece.lsu.edu/biofuels/documents/2007July/SRN_020.pdf; Holli Riebeek, *Global Warming*, NAT’L AERONAUTICS AND SPACE ADMIN. EARTH OBSERVATORY, June 3, 2010, <http://earthobservatory.nasa.gov/Features/GlobalWarming/printall.php?>

24. Riebeek, *supra* note 23.

25. ECON. DEPT., ORG. FOR ECON. COOP. AND DEV., POL’Y NOTE NO. 24, 25. See also SHIFTING GEAR: POLICY CHALLENGES FOR THE NEXT 50 YEARS 8 (2014).

26. STEVEN FERREY, UNLOCKING THE GLOBAL WARMING TOOLBOX 29 (2010).

27. International Energy Agency, INT’L ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2014: HARNESSING ELECTRICITY’S POTENTIAL 14 (2014). The \$44 trillion figure is “in real 2012 USD [United States dollars], i.e. excluding inflation”; it also includes other infrastructure beyond just sustainable energy. *Id.* at 14 n.1.

28. *Id.* at 14. “Even with a 10% discount rate, the net savings are more than USD 5 trillion.” *Id.*

29. Andrew Childers, *300 Billion Tons of Carbon Dioxide Will Be Emitted by Power Plants Globally*, Study Says, 45 ENV’T REP. (BNA) 2511, 2536, (2014) (citing Steven J. Davis & Robert H. Socolow, *Commitment Accounting of CO₂ Emissions*, ENV’T RES. LETTERS, Aug. 2014, at 5, available at <http://iopscience.iop.org/article/10.1088/1748-9326/9/8/084018/pdf>).

30. *Id.*

Choices made today about the types, features and location of long-lived electric energy infrastructure will determine the extent and impact of climate change and the vulnerability or resilience of world societies to it. Four-fifths of the total energy-related CO₂ emissions permitted to 2035 in the IEA “450 Scenario” are already locked in by existing capital stock, including power stations, buildings, and factories.³¹ Without further radical change and action by 2017, the energy-related infrastructure then in place would generate all the CO₂ emissions allowed in the “450 Scenario” up to 2035.³²

2. *International Regulation*

The United Nations Framework Convention on Climate Change (“UNFCCC”) is the parent treaty that generated the 1997 Kyoto Protocol.³³ Under the Protocol, 37 states, consisting of industrialized countries and the European community, have imposed GHG emission limitation and reduction commitments, while the remaining 155 developing countries among the 192 signatories, including the largest GHG emitter among all nations, have non-binding generic general undertakings to constrain emissions.³⁴ The Doha Amendment to extend the Protocol for the period 2013–2020 was not ratified, and further “soft” commitments embodied in the 2015 COP-21 Paris Agreement, which also is unenforceable.

Under the Protocol, there are 41 designated “Annex I” countries (including 27 members of the European Union, plus eight other European Union nations in Europe including Belarus, Iceland, Kazakhstan, Liechtenstein, Norway, Switzerland, Turkey, and Ukraine, as well as Australia, Canada, Japan, and New Zealand),³⁵ which are the only countries subject to carbon emission reduction amounts. While all U.N.

31. *The World Is Locking Itself into an Unsustainable Energy Future Which Would Have Far-Reaching Consequences*, IEA Warns in Its Latest World Energy Outlook, IEA, Nov. 9, 2011, available at <https://www.iea.org/newsroomandevents/pressreleases/2011/november/the-world-is-locking-itself-into-an-unsustainable-energy-future.html>.

32. *Id.*

33. *Status of Ratification of the Kyoto Protocol*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php (last visited Oct. 10, 2015).

34. *Kyoto Protocol*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/kyoto_protocol/items/2830.php (last visited Oct. 10, 2015).

35. *List of Annex I Parties to the Convention*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/parties_and_observers/parties/annex_i/items/2774.php (last visited Oct. 10, 2015).

members except Andorra and South Sudan are signatories, Japan, New Zealand, and Russia, which all participated in Kyoto's first round through 2012, did not agree to new targets in the current second commitment period.³⁶ The net 37 covered Annex I countries subject to Kyoto Protocol carbon emission reductions represent approximately 20% of world countries and less than 40% of world carbon emission sources.³⁷ The group of covered countries is responsible for the minority of emissions. While the Paris COP-21 2015 Agreement included a soft, non-quantitative general commitment from all countries to hold GHG emissions to a level to keep global warming below 2 degrees C. from historic levels, there is no specific commitment on any country. This could become either a new era of unified common world enterprise, or the classic "tragedy of the commons."

The European Union Greenhouse Gas Emission Trading System ("EU-ETS") is a continental emission limitation rubric that includes 85% of the subset of countries subject to binding regulation on carbon emissions under the Kyoto Protocol. The EU-ETS was implemented in 2005 as a parallel CO₂ regulatory system with an earlier start for the now 27 EU-member countries and three other participating European countries (Norway, Iceland, and Liechtenstein) that also are covered by the Kyoto Protocol.³⁸ The EU-ETS covers CO₂ emissions at approximately 5,000 companies at 12,000 industrial sites, unlike the Kyoto Protocol which covers all GHGs.³⁹

Starting in 2013 in the E.U., a renewable energy portfolio requirement (like the U.S. RPS discussed *infra*) mandates each country to achieve a certain percentage of renewable power production and use in future years. The EU-ETS provides different target percentages for different countries, placing less pressure on those countries that had not previously promoted

36. Eilperin, *supra* note 2.

37. See *GHG Data*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, available at http://unfccc.int/ghg_data/ghg_data_unfccc/items/4146.php. There are 196 recognized countries in the world. See Matt Rosenberg, *The Number of Countries in the World*, ABOUT.COM, <http://geography.about.com/cs/countries/a/numbercountries.htm> (last visited Oct. 10, 2015). Taiwan, Puerto Rico, Bermuda, Greenland, Palestine, and the Western Sahara are not recognized as independent countries. *Id.* If these were recognized, they would bring the total number of countries to more than 200.

38. The EU-ETS entered into force on 25 October 2003. Council Directive 2003/87, art. 32, 2003 O.J. (L 275) 32 (EC), available at <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003L0087&qid=1444433038489&from=EN> [hereinafter "Council Directive 2003/87"].

39. Compare *The Emission Trading Scheme*, OURCLIMATE.EU, <http://www.ourclimate.eu/ourclimate/ourclimate/euets.aspx> (last visited Oct. 10, 2015), with Kyoto Protocol to the U.N. Framework Convention on Climate Change art. 3, 2303 U.N.T.S. 148, Dec. 10, 1997, available at <http://unfccc.int/resource/docs/convkp/kpeng.pdf>.

renewable power measures.⁴⁰ To cut GHG emissions, countries are moving to more deployment of renewable energy.

B. Changes in Renewable Technology and Economics

There is a big change in the economics of wind and solar photovoltaic (“PV”) distributed generation. “PV module prices have experienced a . . . decline from ~\$1.90 [per] watt in 2009 to \$0.70 [per] watt (and below in some regions of the world)”⁴¹ Since 2008, the price of PV panels has fallen by 75%, and solar installations have multiplied by 1,000%.⁴² See *infra* Figure 2. Inverter prices, for the equipment necessary to convert PV direct current power to alternating current power used in world nations, have also declined by more than 60% in cost from \$0.60 to \$1.00 or more per watt in 2005 to under \$0.20 per watt in 2013.⁴³

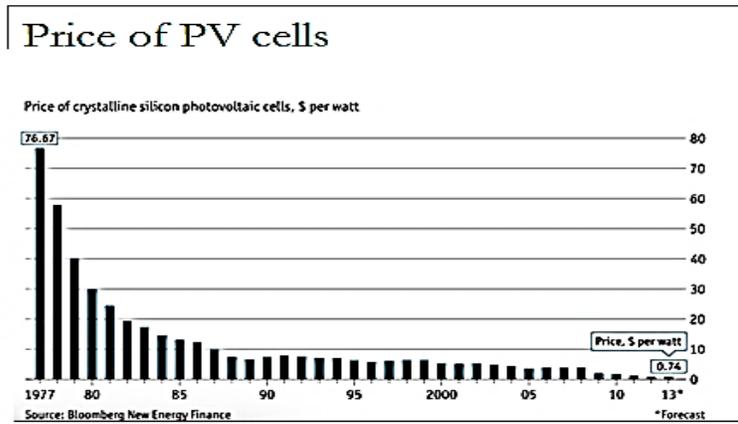
40. Kyoto Protocol Reference Manual, ¶¶ 18, 28, available at http://unfccc.int/resource/docs/publications/08_unfccc_kp_ref_manual.pdf.

41. RENEWABLE ENERGY TECH. DEPLOYMENT, INT’L ENERGY AGENCY, RESIDENTIAL PROSUMERS—DRIVERS AND POLICY OPTIONS (RE-PROSUMERS) 9 (2014), available at http://iea-retd.org/wp-content/uploads/2014/06/RE-PROSUMERS_IEA-RETD_2014.pdf (citing Jade Jones, *Regional PV Module Pricing Dynamics: What You Need to Know*, GREENTECH MEDIA, Nov. 22, 2013, available at <http://www.greentechmedia.com/articles/read/regional-pv-module-pricing-dynamics-what-you-need-to-know>).

42. Ker Than, *As Solar Power Grows, Dispute Flares over U.S. Utility Bills*, NAT’L GEOGRAPHIC, Dec. 24, 2013, available at <http://news.nationalgeographic.com/news/energy/2013/12/131226-utilities-dispute-net-metering-for-solar/>.

43. *Id.*; RENEWABLE ENERGY TECH. DEPLOYMENT, *supra* note 41 (citing *id.*; Ian Clover, *IHS Cuts Global Inverter Market Forecast in Face of Dramatic Price Drops*, PV MAGAZINE, Oct. 16, 2013, available at http://www.pv-magazine.com/news/details/beitrag/ihs-cuts-global-inverter-market-forecast-in-face-of-dramatic-price-drops_100013052/#axzz3o7isum1t).

FIGURE 2



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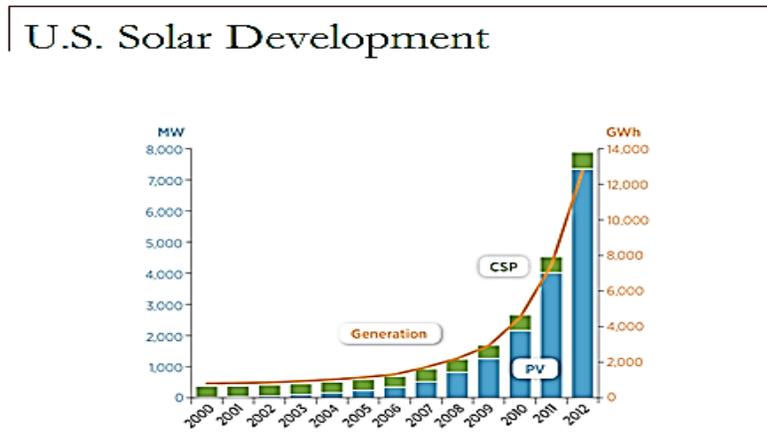
This has allowed the solar PV markets to grow at an average rate of “more than 40% each year since 2000.”⁴⁴ See *infra* Figure 3. The costs of renewable energy have declined significantly in recent years.⁴⁵ One additional rooftop solar system was installed every four minutes in 2013 in the United States.⁴⁶

44. RENEWABLE ENERGY TECH. DEPLOYMENT, *supra* note 41, at 10.

45. Ronald Lehr, *New Utility Business Models: Utility and Regulatory Models for the New Era*, 35 ELEC. J. 40 (Oct. 2013).

46. Than, *supra* note 42.

FIGURE 3



Even with prices falling dramatically, the amount of usable power that one can get out of a PV unit is also a function of latitude. Solar insolation ranges from 2.0–2.5 kWh/m²/day in Scandinavia to as much as 6.5–7.0 kWh/m²/day in north-central Africa.⁴⁷ “Countries could meet or exceed a United Nations goal to double the global share of hydropower, wind power and other forms of renewable energy by 2030 at almost no additional cost . . .” according to a report from an intergovernmental organization promoting renewable energy.⁴⁸ “The technology needed to meet the goal already exists, but targeted action by the public and private sector is necessary to accelerate the deployment of renewable energy across the buildings, transport, industry, and electricity sectors, the International Renewable Energy Agency [Remap 2030] report sa[ys].”⁴⁹ Studies of technical potential have found that rooftop PV could supply 20–

47. RENEWABLE ENERGY TECH. DEPLOYMENT, *supra* note 41, at 27. A 1 kW PV system in Namibia achieves a capacity factor of ~23% and produces about 2,000 kWh per year, while a similar size system in Scandinavia operates at a capacity factor half this value and produces half as much power output. *Id.*

48. Vittorio, *supra* note 8 (citing INT’L RENEWABLE ENERGY AGENCY, REMAP 2030: A RENEWABLE ENERGY ROADMAP 17 (2014), available at http://www.irena.org/remap/REmap%20Summary%20final_webdisplay%20no%20links.pdf).

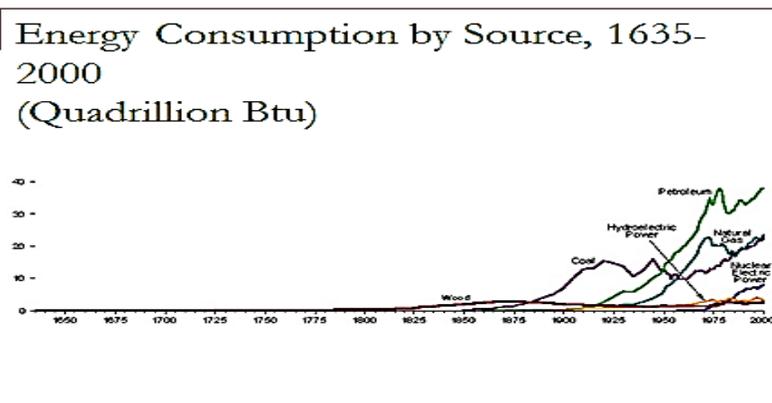
49. *Id.* at 49. Vittorio, *supra* note 8.

40% (or more) of total national electricity demand in Europe and the United States.⁵⁰

C. Renewable Power Transition, Benefits

The historic use of different energy sources over the past four centuries is illustrated in Figure 4.

FIGURE 4



Before use of large-scale steam turbines, energy requirements in the U.S. were met through on-site generation.⁵¹ The dominant fuel was wood for most of the past 400 years, a renewable energy source. A Ceres report forecasts reducing greenhouse gas emissions by up to 80% while placing less emphasis on fossil fuel generation of electricity.⁵²

50. RENEWABLE ENERGY TECH. DEPLOYMENT, *supra* note 41, at 35. See also Maya Chaudhari, Lisa Frantzis, & Tom E. Hoff, *PV Grid Connected Market Potential under a Cost Breakthrough Scenario*, THE ENERGY FOUNDATION (2004), available at <http://esc.fsu.edu/documents/lectures/SP07/EF-Final-Final2.pdf>; PHOTOVOLTAIC POWER SYSTEMS PROGRAMME, INT'L ENERGY AGENCY, REPORT IEA-PVPS T7-4: 2002 (SUMMARY), POTENTIAL FOR BUILDING INTEGRATED PHOTOVOLTAICS 8 (2002), available at <http://proclimweb.scnat.ch/portal/ressources/2418.pdf>; See generally GREENPEACE & THE EUROPEAN PHOTOVOLTAIC INDUSTRY ASSOCIATION, SOLAR GENERATION 6: SOLAR PHOTOVOLTAIC ELECTRICITY EMPOWERING THE WORLD (2011), available at <http://www.greenpeace.org/international/Global/international/publications/climate/2011/Final%20SolarGeneration%20V1%20full%20report%20lr.pdf>.

51. U.S. Dept. of Energy study, THE POTENTIAL BENEFITS OF DISTRIBUTED GENERATION AND RATE-RELATED ISSUES THAT MAY IMPEDE THEIR EXPANSION, at i (2007).

52. Forrest Small & Lisa Frantzis, *The 21st Century Electric Utility: Positioning for a Low-Carbon Future*, CERES (July 2010), available at <http://www.ceres.org/resources/reports/the-21st-century-electric-utility-positioning-for-a-low-carbon-future-1>.

Distributed power generation creates benefits for the larger energy system: Generating power onsite avoids energy loss of the transmission and distribution and can defer costs of distribution and transmission capacity upgrade modifications.⁵³ With more centralized large-scale power, centralized power sources require their electricity to be transported long distances to reach end-users, during which transit 7–10% of the electricity is lost as waste heat.⁵⁴ An on-site distributed generation system does not encounter these losses because the electricity travels a short distance, unless it is exported to the grid.⁵⁵

Distributed generation from renewable energy sources benefits the environment by reducing carbon emissions. Distributed generation provides reliability to consumers⁵⁶ by diversifying the sources that supply electricity.⁵⁷ Blackouts and brownouts of power supply to individual consumers can be prevented by distributing power sources on-site throughout the grid.⁵⁸ Even in the absence of a loss of centralized power distribution, distributed generation systems can provide supplemental or back-up power to supplement power reliability and redundancy to critical-use customers, such as data centers and hospitals.⁵⁹

Additional deployment of renewable energy resources can have measureable significant positive public externalities:

- Increasing power system reliability with more independent points of generation⁶⁰
- Creating a reliable and appropriately more-mixed generation supply diversity for the electric power system⁶¹
- Putting less pressure on the use of the aging power distribution system by utilizing on-site private power rather

53. *Id.* at 44. Most countries in North America and Europe experience T&D losses of 4–8%. *Id.*

54. Frederick R. Fucci, *Distributed Generation*, in *THE LAW OF CLEAN ENERGY: EFFICIENCY AND RENEWABLES* 345, 345 (Michael B. Gerrard ed., 2011).

55. See Shannon Baker-Branstetter, *Distributed Renewable Generation: The Trifecta of Energy Solutions to Curb Carbon Emissions, Reduce Pollutants, and Empower Ratepayers*, 22 *VILL. ENVTL. L.J.* 1, 3 (2011).

56. Fucci, *supra* note 54, at 347. Reliability is a measure of the grid's ability to meet consumers' demand for electricity. DEPT. OF ENERGY STUDY, *supra* note 51, at 2-1.

57. DEPT. OF ENERGY STUDY, *supra* note 51, at 2-4.

58. Solar Electric Power Association (SEPA), *Ratemaking, Solar Value and Solar Net Energy Metering—A Primer*, at 28 (2013). Distributed generation systems support localized electricity demand and thereby reduce the stress on the distribution grid. DEPT. OF ENERGY STUDY, *supra* note 51, at 2-5.

59. DEPT. OF ENERGY STUDY, *supra* note 51, at iii.

60. See *Distributed Energy Basics*, NAT'L RENEWABLE ENERGY LAB., http://www.nrel.gov/learning/eds_distributed_energy.html (last updated Dec. 3, 2012).

61. *Id.*

than moving more power through the regulated power distribution system⁶²

- Using solar PV systems that can add on-peak value to the power transmission network with which they interconnect by providing supply to proximately located end users.⁶³

Some have estimated that the value of distributed solar PV units that sell power back to the grid results in savings to the utility system due to not purchasing that amount of power elsewhere, saving use of transmission and distribution capacity, eliminating risk of changes in fossil fuel prices, and saving transmission and distribution losses of 5–10%—which they valued cumulatively at between \$0.09 and \$0.25 per Kwh.⁶⁴ In addition to these values to the utility system, articles note that there are other societal benefits in environmental and health improvements, jobs, and grid security, which increase the cumulative total by approximately 50%.⁶⁵

Self-generation of power, even if not economically based on generation costs alone compared to larger facilities (smaller fossil-fired units typically have greater environmental impacts per Kwh generated) achieves double avoidances of regulatory costs:

- The generator avoids all transmission, distribution, system benefit charge, and tax costs in the retail bill for the amount generated, which avoided fractions collectively typically constitute more than half of the retail bill
- The generator can receive a suite of cross-subsidies in the form of RECs, net metering credit value, system benefit charges, carbon credits; in Massachusetts, as one example, these state credits are collectively worth up to 1000% more than the value of power produced itself

62. See *Benefits of Solar*, STATES ADVANCING SOLAR, <http://www.statesadvancingsolar.org/solar-101/benefits-of-solar> (last visited Dec. 13, 2013).

63. Edward Kahn, *Avoidable Transmission Cost Is a Substantial Benefit of Solar PV*, 21 ELEC. J. 41, 45 (2008).

64. Richard Perez et al., *Solar Power Generation in the U.S.: Too Expensive, or a Bargain?*, 39 ENERGY POL'Y 7290, 7294 (2011). The range of value that this Article attaches to wholesale power is significantly above the average weighted price of wholesale power transactions in the last several years and uses the distributed power value in New York City, a location that is capacity constrained. See STEVEN FERREY, LAW OF INDEPENDENT POWER (ENVIRONMENTAL LAW SERIES) vol. 2, § 10:144 n.29 (Reuters-Thomson West 2015).

65. Perez et al., *supra* note 64, at 7293.

When combined with power sale revenues, the total value of solar PV benefits has been estimated to be higher than the levelized cost to install PV (e.g. \$0.15–\$0.41/kWh in the U.S.).⁶⁶

If that is true, PV system owners actually cross-subsidize other ratepayers.⁶⁷ As with any significant social change involving critical infrastructure, there will be winners and losers. And it is the role of government to manage this change, and examine the equities and the cost-justification of that change. And with utilities, as the last of the regulated industries,⁶⁸ there is an ability to manage this change. Let's examine one of the primary regulatory agents of this fundamental infrastructure change.

III. FITS: RENEWABLE ENERGY REGULATORY PRICE MECHANISMS IN DIFFERENT INTERNATIONAL LEGAL SYSTEMS

A. *The Fit Mechanism*

FiTs, net metering, and RPS,⁶⁹ in that order, are three mechanisms most used by the international community to promote a transition from GHG-emitting fossil-fired power technologies to sustainable energy technologies, as illustrated in Figure 5. Most recently, the dominant use of FiTs is declining while net metering and RPS use is increasing internationally. Neither net metering nor RPS is legally the sale of the power itself, as a feed-in tariff is. RPS is a state bonus credit for the production apart from the sale of the power itself, and net metering characterizes the renewable power as “banked” in a credit rather than sold, even though the power can be neither saved nor physically banked.

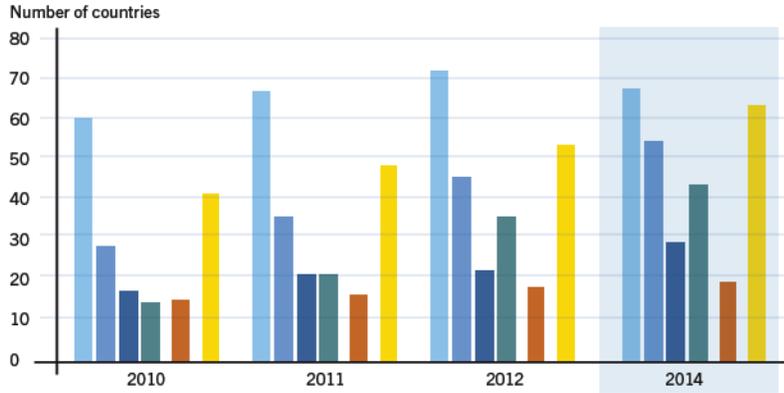
66. Richard Perez, Ken Zweibel & Thomas E. Hoff, *Solar Power Generation in the Us: Too Expensive, or a Bargain?*, 39 ENERGY POL'Y 7290–97, 2011; Lena Hansen & Virginia Lacy, *A Review of Solar PV Benefit & Cost Studies*, ELEC. INNOVATION LAB (2013).

67. *Id.* at 43; Lori Bird et al., *Regulatory Considerations Associated with the Expanded Adoption of Distributed Solar*, NREL (Nov. 2013), <http://www.nrel.gov/docs/fy14osti/60613.pdf>.

68. STEVEN FERREY, ENVIRONMENTAL LAW 582 (Wolters Kluwer Aspen, 6th ed. 2013).

69. For a discussion of RPS, see STEVEN FERREY, LAW OF INDEPENDENT POWER § 10.109 (Reuters-Thomson West, 37th ed. 2015); Steven Ferrey, Chad Laurent & Cameron Ferrey, *Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers*, 20 DUKE ENV'T'L L. & POL'Y J. 125, 144–58 (2010).

FIGURE 5: COUNTRIES WITH RENEWABLE POLICIES BY TYPE—2010–2014



Power Policies

- FIT
- Tendering
- RPS/Quota
- Net Metering

Heating and Cooling Policies

- Heat Obligation

Transport Policies

- Biofuel Blend Mandate

Power Policies

- FIT
- Tendering
- RPS/Quota
- Net Metering

Heating and Cooling Policies

- Heat Obligation

Transport Policies

- Biofuel Blend Mandate

The number of feed-in tariffs has expanded dramatically during the past several years from just a few policies concentrated primarily in Europe in the 2000s (see Figure 6) to over 60 FIT policies in jurisdictions around the world (See Figure 7).⁷⁰ As of 2013, the majority of feed-in tariffs are now concentrated in developing countries.⁷¹

FIGURE 6



70. RENEWABLES 2013 GLOBAL STATUS REPORT, REN 21, 116 (2013), available at http://www.ren21.net/portals/0/documents/resources/gsr/2013/gsr2013_lowres.pdf.

71. *Id.*

FIGURE 7



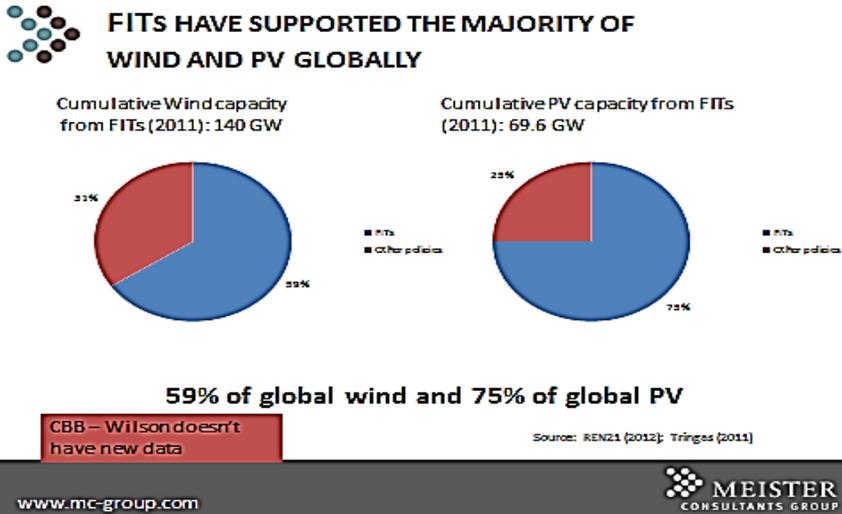
A feed-in tariff is a regulatory requirement imposed by some nations or states on their regulated utilities to purchase on a wholesale basis certain designated types of independent power generation, typically from renewable resources or combined heat and power (“CHP”) units, at prices well in excess of the market value of that wholesale power.⁷² The regulated utilities are forced to “buy high” in terms of other electric power available in the market.⁷³ FiTs administratively torque the economics of the operating power market in favor of the sellers of certain government-designated renewable or CHP power, not adhering to accepted rate-making precedent to minimize prudent utility-incurred costs.⁷⁴ Costs of a FiT are passed on to captive consumers by the utilities.⁷⁵ FiTs are successful in encouraging development of new wind and solar renewable energy facilities, as illustrated in Figure 8.

72. STEVEN FERREY, *THE LAW OF INDEPENDENT POWER* § 10:134 (Reuters-Thomson West, 37th ed. 2015).

73. Electric power in the Northeast has been available at an average price during the past years of \$0.05/kWh or less. See generally *Electricity*, U.S. ENERGY INFO. ADMIN., Dec. 6, 2013, <http://www.eia.gov/electricity/annual/pdf/epa.pdf> (providing the annual statistics for each state’s average cost to the ultimate consumer for electric power). The Vermont FiTs for power of this value were set for wind of < 15 kW at \$0.20/kWh, for wind > 15 kW at \$0.125/kWh, and for solar generation at \$0.30/kWh. *Id.*

74. STEVEN FERREY, *THE LAW OF INDEPENDENT POWER* § 5:9 (Reuters-Thomson West, 37th ed. 2015).

75. *Id.* § 10:134.

FIGURE 8⁷⁶

B. Internationally

1. German and Spain FiTs cause Fits

Europe is the progenitor of the FiT, with Germany and Spain the leading countries in using FiTs to achieve solar photovoltaic development and wind project development.⁷⁷ Spain encouraged dramatic amounts of wind power and photovoltaic power.⁷⁸ Its FiT was successful in quickly mobilizing significant and dramatic increases in the use of renewable energy: from less than 1% of total energy supply in Spain in 1990 to 24.7% in 2009, and 54% in 2013,⁷⁹ overrunning the national target for of 400 Mw of photovoltaic production by 1000% by 2011.⁸⁰ The German FiTs were an extremely effective means to a renewable power end, rising from 3.4% renewable generation in Germany in 1990 to 23.5% in 2012.⁸¹

76. IEA, PROSUMER, *supra* note 41.

77. Lincoln Davies & Kirsten Allen, *Feed-In Tariffs in Turmoil*, 116 W. VA. L. REV. 937, 940 (2014).

78. *Id.* at 980.

79. *Id.* at 979.

80. *Id.* at 980.

81. *Id.* at 960.

However, the cost at which these benefits were purchased was unsustainable. This “success” on attracting new entrants would be true of any program where financial windfalls are given away to participants. The above-market cost of these FiTs is passed on to ratepayers as €6.24 cents/Kwh *Umlage* or upcharge in 2014 at a value of €20 billion annually, which has caused German retail utility rates to almost double for all consumers since 2000.⁸² When Spain abrogated FiT contracts, litigation charging a retroactive application of unconstitutional law resulted.⁸³

2. Cost Implications

One commenter has noted that “many advocates of alternative energy . . . heap acclaim on feed-in tariffs, with one observer declaring them simply ‘fabulous.’”⁸⁴ “The line of scholars, analysts, and advocates rushing to say that feed-in tariffs are better [than other mechanisms] is not a short one.”⁸⁵ However, FiTs have not been seamless, in practice. Problems associated with FiTs have been:⁸⁶

- The long-term expense of FiTs
- Windfall profits realized by project developers
- Inequity between well-off citizens compared to lower-income citizens

In the leading countries, the cost of FiTs has exceeded expectations. In Germany, starting in 1990, the FiT morphed from a modestly designed program for PV power paying €8.52cents/Kwh, into a program by 2000 paying €50.62 cents/Kwh for a twenty-year period of delivery of renewable power.⁸⁷ These rates were deemed to be excessive and did not employ any competitive market process to select the tariff rate.⁸⁸ Nonetheless, the price for German PV power in 2004 was increased to €57.4 cents/Kwh.⁸⁹

Because of concern about excessive payments to renewable energy project under the FiT, in 2009, the PV rate was lowered to €43.01

82. *Id.* at 962.

83. *Id.* at 979

84. *Id.* at 939.

85. *Id.*

86. *Id.* at 940.

87. *Id.* at 948–49.

88. *Id.* at 950.

89. *Id.* at 952.

cents/Kwh, and additional retractions for future projects occurred in 2010,⁹⁰ and by 2011 the rate for rooftop solar was reduced to €28.74 cents/Kwh.⁹¹ By 2012, it had been reduced for PV power to €13.5 cents/Kwh for future eligible renewable energy facilities.⁹²

Consequences result for utility customers. Household electricity prices are as much as four times higher in Germany as in the U.S.⁹³ The world's fourth-largest economy, Germany, has experienced average electricity prices for companies jumping 60% over the past five years because of costs passed along as part of government subsidies of renewable energy producers passed on to rate payers; prices are now more than double those than anywhere in the U.S.⁹⁴ The primary beneficiaries of the German *Energiewende* are investors in wind and solar installations.

Although the wholesale spot market price for energy in Germany for a kilowatt-hour of electricity is €3.2 cents/Kwh, even now under the drastically reduced average guaranteed price for renewable wholesale power by the German government is €17 cents/Kwh, 500% the real value of the wholesale power.⁹⁵ German utilities recently increased the surcharge levied on consumers to fund more renewables by 18% to €6.24cents per Kwh. German households now have the third-highest power bills in Europe.⁹⁶ The renewable energy surcharge to subsidize distributed power levied on German households and businesses has nearly tripled in four years since 2010 and now accounts for about 18% of a German household's total electric bill, or approximately €24 billion a year.⁹⁷ Certain large trade-sensitive industries are exempt from the charge, which saves about €5 billion annually for them by shifting that amount of expenses to other German electricity rate payers.⁹⁸

90. *Id.* at 955–56.

91. *Id.* at 958.

92. *Id.*

93. Than, *supra* note 43.

94. Matthew Karnitschnig, *Germany's Expensive Gamble on Renewable Energy*, WALL STREET J., Aug. 26, 2014, available at <http://online.wsj.com/articles/germanys-expensive-gamble-on-renewable-energy-1409106602>. About 35% of Europe's electricity is projected to come from renewable sources by 2020, while Germany has goals of 40%–45% of its electricity from renewable sources, rising to at least 80% by 2050. *Id.*

95. The German FIT rate for residential generators is currently €0.131/kWh; the average retail electricity rate in Germany is ~€0.29/kWh.

96. Rob Wile, *Europe's Renewable Energy Push Has Completely Backfired, And Electricity Bills Are Skyrocketing*, Nov. 6, 2013, <http://www.businessinsider.com/europes-soaring-energy-prices-2013-11#ixzz374NkncXq>.

97. *Id.* Almost 75% of Germany's small- and medium-size industrial businesses say rising energy costs are a major risk, according to a recent survey by PricewaterhouseCoopers and the Federation of German Industry.

98. *Id.* About 2,000 of Germany's heavy industrial users are exempt from paying the surcharge

Spain fared even worse. Spain was the second largest generator of renewable energy in Europe by virtue of its FiT.⁹⁹ The FiT started in 1980 at €36 cents/Kwh for small solar projects,¹⁰⁰ rose to €36 cents/Kwh in 1994,¹⁰¹ and in 2004 had increased to 575% more than the average price of electricity.¹⁰² The projects were guaranteed these payments for up to 40 years.¹⁰³ The Japanese FIT also is a high value.¹⁰⁴

The high FITs provided and their costs to the utility system were unsustainable during the recession, and rates were reduced in 2008.¹⁰⁵ Spain reneged on contracts and reconfigured its FiT; the rate was slashed to €13/Kwh.¹⁰⁶ In 2010, with a tariff debt from the FiT program of €26 billion, contracts were abrogated by the utility, rates reduced, and the number of hours that the rate applied were reduced *post facto*.¹⁰⁷ Unsuccessful litigation resulted, charging that the changes were illegally retroactive; the European Commission criticized Spain's radical change in policy as a threat to foreign investment in the E.U.¹⁰⁸ Additional radical cuts and abrogation of existing contracts occurred in 2013.¹⁰⁹

In Spain, the cost of FiTs was a dramatic expense to the utility, at the same time that Spanish utilities were limited to increase retail utility prices no more than 2% annually.¹¹⁰ With utilities forced to “buy high” at FiT rates, and “sell low” at constrained retail rates, it was a prescription for disaster. The government was forced to guarantee the utilities' securitized debts largely resulting from the FiT expenses.¹¹¹ In Spain, the government has not yet determined how it will pay for the accrued €26 billion debt related to its cross-subsidies of certain renewable distributed generation.¹¹² “Ultimately consumers and taxpayers will have to shoulder the cost,

until at least 2017. The E.U. proposes to scrutinize whether the exemption is an unfair trade support.

99. Lincoln Davies & Kirsten Allen, *Feed-In Tariffs in Turmoil*, 116 W. VA. L. REV. 937, 967 (2014).

100. *Id.* at 968–69.

101. *Id.* at 969.

102. *Id.* 973–74.

103. *Id.* at 976.

104. The FIT in Japan for systems below 10 kW is ¥36.0 (US\$0.35); the average residential rate in Japan is under \$0.30/kWh.

105. *Id.*

106. *Id.* n.296.

107. *Id.* at 976–77.

108. *Id.* n.254.

109. *Id.* at 979.

110. *Id.* at 981.

111. *Id.* n.288.

112. Andrés Cala, *Renewable Energy in Spain Is Taking a Beating*, N.Y. TIMES, Oct. 8, 2013, http://www.nytimes.com/2013/10/09/business/energy-environment/renewable-energy-in-spain-is-taking-a-beating.html?pagewanted=all&_r=0.

through power bills or government budgets. . . . Around 55,000 families have mortgaged their life savings and assets to invest in small solar farms in the countryside—with the guarantee of government-backed returns.”¹¹³

Neither the Spanish or German FiT programs utilized market forces to determine an accurate, or competitively determined, tariff for renewable wholesale power that the utilities were compelled to purchase. Now, both countries are attempting to force existing renewable energy projects into market-tethered tariffs rather than their originally-promised administratively determined tariffs.¹¹⁴ Between 2009 and 2012, Germany and Spain made yearly retractions and retrenchments in their FiT policies to attempt to discourage the robust renewable power adoption that they were designed to cause, to contain fast-spiraling costs, and each year each country’s officials were so off the mark that their actions only accelerated costs and the depth of obligation.¹¹⁵

The German FiT changes were prospective and did not disturb existing renewable energy contracts and commitments; Spain made its changes retroactive to existing commitments, violating what many countries consider fundamental legal principles to not interfere with prior contracts. Each of these retrenchments can be viewed as either a necessary modification when massive cost overruns were evident, or testament to the inability of each to achieve a cost-effective transition to renewable energy. German FiTs now fluctuate monthly.¹¹⁶ This evidenced the inability of regulators in two of the most sophisticated and successful countries to accurately set the correct tariff or effectively utilize market tools to mitigate other administrative errors.

There are external costs associated with integration of renewable power in Germany and Spain. The requirement in Germany to move new amounts of solar and wind power resulted in additional socialized costs imposed on all ratepayers more than 1000 times greater in 2012 compared to 2008 for grid modification, with additional projections of an additional €10 -42.5 billion required in the next 15 years for additional grid expansion to accommodate movement of power from growing distributed generation.¹¹⁷ The German press labelled the German FiT program

113. *Id.* Often, their loans have been underwritten by relatives and friends who can also be at risk for the debt. Banks could end up repossessing worthless assets and properties, in an already depressed Spanish economy.

114. Lincoln Davies & Kirsten Allen, *Feed-In Tariffs in Turmoil*, 116 W. VA. L. REV. 937, 1001 (2014).

115. *Id.*

116. *Id.*

117. *Id.* at 965.

“reckless,” a “disaster,” and a “defective . . . game plan.”¹¹⁸ Subsidies have recently been cut in Belgium, Germany, Greece, Italy, Spain and the United Kingdom.¹¹⁹

C. U.S. FiTs

1. Constitutionality

In the U.S. electric power system, the costs of state wholesale power generation incentives are not incurred by the utilities, but ultimately are passed on to its customer rate-payers, often through pre-approved adjustment clauses.¹²⁰ FiTs are unconstitutional when employed by any of the 47 electrically interconnected continental U.S. states. The Federal Power Act § 205-6¹²¹ empower FERC exclusively to regulate rates for the interstate and wholesale sale and transmission of electricity.¹²² FERC case law exerts exclusive jurisdiction over the “transmission of electric energy in interstate commerce,” over the “sale of electric energy at wholesale in interstate commerce,” and over “all facilities for such transmission or sale of electric energy.”¹²³

118. *Id.*

119. Steve Goreham, *Lessons from Europe: Recipe for a High-Cost Energy System*, COMMUNITIES DIGITAL NEWS, May 26, 2015, available at <http://www.commdiginews.com/business-2/economic-politics/lessons-from-europe-recipe-for-a-high-cost-energy-system-42285/#J4cCDwfZY4RoXb6x.99>.

120. For more on automatic adjustment clauses used in rate making, see Frank Graves et al., *Electric Utility Automatic Adjustment Clauses: Benefits and Design Considerations*, EDISON ELEC. INST., Nov. 2006, available at http://www.eei.org/issuesandpolicy/stateregulation/Documents/adjustment_clauses.pdf.

121. 16 U.S.C. §§ 824d, 824e. (2006).

122. Pub. Util. Dist. No. 1 of Snohomish Cnty. Wash. v. FERC, 471 F.3d 1053, 1058 (9th Cir. 2006), *aff'd in part, rev'd in part sub nom.* Morgan Stanley Capital Grp., Inc. v. Pub. Util. Dist. No. 1 of Snohomish Cnty. Wash., 554 U.S. 527 (2008).

123. 16 U.S.C. §USC 4(b); See, e.g., Pa. Power & Light Co., 23 FERC P 61006, at 61018, *reh'g denied*, 23 FERC P 61325 (1983); S. Co. Serv. Inc., 37 FERC P 61256, at 61652 (1986); Fla. Power & Light Co., 40 FERC P 61045, at 61120-21, *reh'g denied*, 41 FERC P 61153, at 61382 (1987); Houlton Water Co. v. Me. Pub. Serv. Co., 60 FERC P 61141, at 61515 (1992); N. Indiana Pub. Serv. Co., 66 FERC P 61213, at 61488 (1994); Conn. Light & Power Co., 70 FERC P 61012, at 61030, *reconsid. denied*, 71 FERC P 61035 (1995); Cent. Vt. Pub. Serv. Corp., 84 FERC P 61194, at 61973-75 (1998); Progress Energy, Inc., 97 FERC P 61141, at 61628 (2001); Armstrong Energy P'ship Ltd., LLP, 99 FERC P 61024, at 61104 (2002); Niagara Mohawk Power Corp., 100 FERC P 61019, at p. 17 (2002); Barton Vill. Inc. v. Citizens Util. Co., 100 FERC P 61244, at 12 (2002); Va. Elec. & Power Co., 103 FERC P 61109, at 6 (2003); Southern California Edison Co., 106 FERC P 61183, at 14, 19 (2004); Midwest Indep. Transmission Sys. Operator, Inc., 106 FERC P 61337, at p. 14 and n.17 (2004); Entergy Serv. Inc., 120 FERC P 61020, at (2007); *Aquila Merch. Serv. Inc.*, 125 FERC P 61175, at 17 (2008).

The U.S. Supreme Court has held that Congress meant to draw a “bright line,” easily ascertained and not requiring case-by-case analysis, between state and federal jurisdiction.¹²⁴ When a transaction is subject to exclusive federal FERC jurisdiction and regulation, state regulation is preempted as a matter of federal law and the U.S. Constitution’s Supremacy Clause, according to a long-standing and consistent line of rulings by the U.S. Supreme Court.¹²⁵ The rates, terms, and provisions of any wholesale sale or transmission of electricity in interstate commerce are exclusively within federal jurisdiction and control, not state authority, under the Federal Power Act, according to U.S. Supreme Court precedent.¹²⁶ “FERC has exclusive authority to set and to determine the reasonableness of wholesale rates.”¹²⁷ The Federal Power Act defines “sale at wholesale” as any sale to any person for resale.¹²⁸

The Congress in the Federal Power Act “adopt[ed] the test developed in the *Attleboro* line [of cases] which denied state power to regulate a sale ‘at wholesale to local distributing companies’ and allowed state regulation of a sale at ‘local retail rates to ultimate consumers.’”¹²⁹ Wholesale rates for sales in interstate commerce are wholly beyond any state authority.¹³⁰ If states impose a rate in excess of avoided cost by either “law or policy,” with avoided cost being the only wholesale power sale rate that states can set as delegates of federal authority, the “contracts will be considered to be void *ab initio*.”¹³¹ The rates, terms, and provisions of any wholesale sale, or transmission of electricity in interstate commerce, are exclusively within federal jurisdiction and control, not state authority, pursuant to the

124. *Fed. Power Comm’n v. S. Cal. Edison Co.*, 376 U.S. 205, 215–16 (1964).

125. *New Eng. Power Co. v. N.H.*, 455 U.S. 331 (1982). The Supreme Court overturned an order of the New Hampshire Public Utilities Commission which restrained within the state, for the financial advantage of in-state ratepayers, low-cost hydroelectric energy produced within the state: “Our cases consistently have held that the Commerce Clause of the Constitution precludes a state from mandating that its residents be given a preferred right of access, over out-of-state consumers, to natural resources located within its borders or to the products derived therefrom.” *Id.* at 338. *See also* *Mont.—Dakota Co. v. Pub. Serv. Comm’n*, 341 U.S. 246, 251 (1951); *Nantahala Power & Light Co. v. Thornburg*, 476 U.S. 953 (1986); *Miss. Power & Light Co. v. Miss. ex rel. Moore*, 487 U.S. 354 (1988); *Entergy La. Inc. v. La. Pub. Serv. Comm’n*, 539 U.S. 39 (2003).

126. *New Eng. Power Co.*, 455 U.S. at 340.

127. *Miss. Power & Light Co.*, 487 U.S. at 371 (“FERC has exclusive authority to determine the reasonableness of wholesale rates.”); *accord* *Pub. Util. Dist. No. 1 of Snohomish Cnty. Wash.*, 471 F.3d 1066, *aff’d in part, rev’d in part sub nom. Morgan Stanley Capital Group, Inc.*, 554 U.S. at 527.

128. Federal Power Act § 201(d), 16 U.S.C. § 824d (“‘sale of electric energy at wholesale’ . . . means a sale of electric energy to any person for resale.”).

129. *Fed. Power Comm’n*, 376 U.S. at 214.

130. *Indep. Energy Producers Ass’n v. Cal. Pub. Utils. Comm’n*, 36 F.3d 848 (9th Cir. 1994); *Order on Petitions for Enforcement Action Pursuant to Section 210(h) of PURPA, S. Cal. Edison Co., San Diego Gas & Elec. Co.*, 70 FERC P 61215 (1995).

131. *Conn. Light & Power Co.*, 70 FERC P at 61029-30.

Federal Power Act:¹³² “FERC has exclusive authority to determine the reasonableness of wholesale rates.”¹³³

There has been litigation in numerous states, including New Jersey, Maryland, Minnesota and Vermont regarding the “bright line” between state and federal electric power regulation.¹³⁴

- A successful constitutional challenge upheld by the 3rd Circuit in 2013 to New Jersey’s in-state energy facility preferences¹³⁵

132. *New Eng. Power Co.*, 455 U.S. at 340.

133. *Miss. Power & Light Co.*, 487 U.S. at 371; accord *Pub. Util. Dist. No. 1 of Snohomish Cnty. Wash.*, 471 F.3d 1066, *aff’d in part, rev’d in part sub nom.* Morgan Stanley Capital Group, Inc., 554 U.S. at 527.

134. For an article concluding that the Maryland RPS program and others that similarly facially discriminate against interstate commerce are likely unconstitutional in violation of the dormant Commerce Clause, see Anne Havemann, Comment, *Surviving the Commerce Clause: How Maryland Can Square Its Renewable Energy Laws with the Federal Constitution*, 71 MD. L. REV. 848, 851 (2012). Rader and Hempling argued that courts will not apply strict scrutiny to an RPS that bases eligibility on a generator’s ability to produce benefits for a state rather than the geographic origin of the electricity. See Nancy Rader & Scott Hempling, *The Renewables Portfolio Standard: A Practical Guide*, NAT’L ASS’N of REGULATORY UTILITY COMM’N (last visited Oct. 8, 2015), <http://www.naruc.org/Publications/rps.pdf>. Recent court decisions, however, do not support that argument: stating a basis in the statute other than what a court determines to be the actual purpose or effect of a statute does not allow a state to avoid facial discrimination, strict scrutiny, or a finding of a violation of the dormant Commerce Clause. See *Gade v. Nat’l Solid Wastes Mgmt. Ass’n*, 505 U.S. 88, 105 (1992) (“In assessing the impact of a state law on the federal scheme, we have refused to rely solely on the legislature’s professed purpose and have looked as well to the effects of the law.”); *Entergy Nuclear Vt. Yankee, LLC v. Shumlin*, 733 F.3d 393, 393 (2d Cir. 2013); *Norris v. Lumbermen’s Mut. Cas. Co.*, 881 F.2d 1144, 1150 (1st Cir. 1989).

135. See *PPL Energyplus, LLC v. Hanna*, 977 F. Supp. 2d 372 (D. N.J. 2013), *aff’d.*, *PPL Energyplus, LLC v. Solomon*, 766 F.3d 241(3d Cir. 2014) (finding the New Jersey regulation a violation of the Constitution’s Supremacy Clause). In 2011, New Jersey enacted legislation to encourage the acquisition by utilities of the output of 2000 Mw of new in-state power projects. See Mary Powers, *PJM Generators File Complaint with FERC Seeking Relief from NJ In-State Generation Law*, ELEC. UTIL. WK., Feb. 7, 2011, at 11. New Jersey faced a pending lawsuit by several existing independent power generators asserting that the state law was in violation of the Constitution’s Commerce Clause—because it was predicated on in-state “favoritism” and was a “blatant and explicit effort to promote the construction of new generation facilities in New Jersey”—and alleging discrimination in the statute’s ordering utilities to sign long-term contracts only with in-state generation facilities participating in multistate PJM ISO capacity. See Hannah Northey, *Utilities Challenge N.J. Law While Preparing to Reap Its Benefits*, ENVTL. & ENERGY PUBL’N, Mar. 2, 2011, <http://www.eenews.net/public/Greenwire/2011/03/02/4>. In response, in 2011, FERC amended the PJM ISO rules to prevent New Jersey state law from attempting to encourage construction of in-state power generation by, in part, causing New Jersey to bid power into the PJM system at suppressed prices in order to win capacity right auctions. See Mary Powers, *Rebuffed by FERC Ruling, New Jersey BPU Plans to Look Again at How to Attract New Generation*, ELEC. UTIL. WK., May 23, 2011, at 4, 6 (noting that FERC, on April 12, 2011, eliminated a PJM rule that allowed a prior exemption for projects to make minimum offer prices when tempered by state energy programs).

- A successful constitutional challenge upheld by the 4th Circuit in 2013 to Maryland's in-state energy facility preferences, now pending on appeal before the Supreme Court¹³⁶
- A successful challenge upheld by the 2nd Circuit in 2013 to Vermont's alleged attempt to discriminate against interstate power options for an in-state generation facility¹³⁷

2. FITs in California

Despite a series of lawsuits and articles in both the technical and trade press,¹³⁸ advocates for renewable power are still urging states to adopt FITs in the U.S, even though courts have determined that they are unconstitutional when adopted at the state level in the U.S.:

“Feed-in tariffs are the alternative to net-metering and their time has come. FITs have been likened to PURPA on steroids and they are as American as apple pie. It was a crude feed-in tariff that launched renewable energy in California during the early 1980s. In that program, you could connect your biomass, wind, or solar plant to

136. See PPL Energyplus, LLC et al. v. Nazarian, 974 F.Supp.2d 790 (D. Md. 2013), *aff'd*, PPL EnergyPlus, LLC v. Nazaria, 753 F.3d 467 (4th Cir. 2014) (finding the Maryland regulation a violation of the Constitution's Supremacy Clause); PPL Energyplus, LLC et al. v. Hughes, ___ U.S. ___ (argued and pending 2016)

137. Entergy Nuclear Vt. Yankee, LLC v. Shumlin, 838 F. Supp. 2d 183, 236 (D. Vt. 2012) (reasoning that “states are ‘without power to prevent privately owned articles of trade from being shipped and sold in interstate commerce on the ground that they are required to satisfy local demands or because they are needed by the people of the State’” and holding that the state’s regulation in question was a “protectionist regulation’ violating the Commerce Clause” (quoting *New Eng. Power Co.*, 455 U.S. at 338–39 (1982))), *aff'd in part, rev'd in part*, Entergy Nuclear Vt. Yankee, LLC v. Shumlin, 733 F.3d 393 (2d Cir. 2013). The trial court found the regulation unconstitutional and issued an injunction “enjoin[ing] Defendants from conditioning Vermont Yankee’s continued operation on the existence of a below-market PPA with Vermont utilities.” *Id.* at 239. The Second Circuit did not disagree with the substantive decision on the dormant Commerce Clause but procedurally held that this issue was not yet ripe for review until plaintiffs actually entered into such a forced PPA with the state. See *Entergy Nuclear Vt. Yankee, LLC*, 733 F.3d at 433–34.

138. See Steven Ferrey, *Goblets of Fire: State Programs on Global Warming and the Constitution*, 35 *ECOLOGY L.Q.* 835 (2008); Steven Ferrey, et al., *Fire and Ice: World Renewable Energy and Carbon Control Mechanisms Confront Constitutional Barriers*, 20 *DUKE ENVTL L. & POL'Y* 125 (2010); Brian Potts, *Regulating Greenhouse Gas “Leakage”: How California Can Evade the Impending Constitutional Attacks*, 19 *ELEC. J.* 43, 44 (2006) (“because of these two constitutional issues, courts are likely to strike down many or all of their proposals”); Steven Ferrey et al., *FiT in the U.S.A.*, 148 *NO.6 PUB. UTIL. FORT.* 60 (2010); Steven Ferrey, *Shaping American Power: Federal Preemption and Technological Change*, 11 *VA. ENVTL. L.J.* 47 (1991); Steven Ferrey, *Follow the Money! Article I and Article VI Constitutional Barriers to Renewable Energy in the U.S. Future*, 17 *VA. J.L. & TECH.* 89 (2012).

the grid, get paid a fixed-price for ten years, and then get paid a floating price for another twenty. And it worked—spectacularly.”¹³⁹

What is not mentioned in promotional materials and articles is that the federal courts and FERC separately struck down such FiTs in California before those 20 years were up.¹⁴⁰ And having been legally reprimanded by both the 9th Circuit Court of Appeals and FERC in the mid-1990s,¹⁴¹ California tried again to reinstitute a FiT regulatory action fifteen years later. After California enacted a feed-in-tariff requiring state utilities to make wholesale power purchases at well in excess of wholesale rates for power and in excess of avoided costs, there was a challenge at the Federal Energy Regulatory Commission as to whether this violated the Federal Power Act and the Supremacy Clause of the U.S. Constitution.

California argued that its environmental purpose for regulation should make it exempt from preemption in setting above-market wholesale feed-in renewable tariff rates for cogeneration facilities of less than 20 Mw and that environmental costs could be considered to inflate avoided costs.¹⁴² The affected utilities and others countered that first, federal law does not allow state regulation of wholesale sales to achieve state environmental goals, second, federal preemption cannot be avoided based on an environmental purpose of the preempted state regulation, and finally, states may not under the guise of environmental regulation adopt an economic regulation that requires purchases of electricity at a wholesale price outside the framework of the Federal Power Act, or if acting under PURPA, at a price that exceeds avoided cost.¹⁴³

FERC did not agree with California’s state FiT, and held that wholesale generators can receive no more than system-wide avoided cost for power sales: “even if a QF has been exempted pursuant to the Commission’s regulations from the ratemaking provisions of the Federal Power Act, a state still cannot impose a ratemaking regime inconsistent with the requirements of PURPA and this Commission’s regulations—i.e., a state cannot impose rates in excess of avoided cost.”¹⁴⁴ FERC rejected all of

139. Paul Gipe, *Time to Break Free of Net Metering; We Need a ‘FiT’ Policy for Renewable Energy to Soar*, NAT’L GEOGRAPHIC, Dec. 26, 2013, <http://energyblog.nationalgeographic.com/2013/12/26/break-free-net-metering/>.

140. *Indep. Energy Prod. Ass’n v. Cal. Pub. Util. Comm’n*, 36 F.3d 848, 853 (9th Cir. 1994); *S. Cal. Edison Co.*, 70 FERC P 61, 215 (1995).

141. *Id.* *Indep. Energy Prod. Ass’n*, 36 F.3d at 853; *S. Cal. Edison Co.*, 70 FERC P at 215. *Id.*

142. FERC Order on Petitions for Declaratory Order, *In re: Cal. Pub. Util. Comm’n*, 132 FERC P 61,047 (2010).

143. *Id.*

144. *Id.*

California's arguments regarding environmental rationales for wholesale rates in excess of limits under federal law or as set by FERC,¹⁴⁵ when California made unsuccessful and somewhat unusual assertions in its legal defense that:¹⁴⁶

- Past constitutional principles in California precedent no longer apply to it because California's innovative purpose was to target global warming
- Ordering its utilities to *offer* to buy power at illegally impermissible rates is not the same as ordering them to actually buy that power

The California Attorney General argued that mandating that regulated utilities only "offer" to purchase wholesale power at substantially above wholesale market rates, is different than a requirement to actually "purchase" the sold power.¹⁴⁷ FERC held that this argument was unpersuasive.¹⁴⁸ It held that its authority under the Federal Power Act includes the exclusive jurisdiction to regulate the rates, terms and conditions of sales for resale of electric energy in interstate commerce.¹⁴⁹

California argued that its environmentally beneficial purposes should make it exempt from preemption in setting non-market-conforming wholesale rates for a state FiT.¹⁵⁰ FERC found that no ancillary state purpose justifies a state's requiring purchases of electricity at inflated wholesale prices,¹⁵¹ and renewable wholesale generators could receive no more than fair wholesale market prices under federal law.¹⁵² FERC reiterated that only the federal government can regulate commerce between the states, and California cannot attempt to regulate commerce outside its borders.¹⁵³

145. *Id.*

146. *See* FERC Order Granting Clarification and Dismissing Rehearing, *In re* Cal. Pub. Util. Comm'n, 133 FERC 61,059 (2010).

147. *Id.* at p. 72.

148. *Id.*

149. 16 U.S.C. §§ 824, 824d, 824e (2006); e.g., *Miss. Power & Light Co. v. Miss. ex rel. Moore*, 487 U.S. 354 (1988).

150. Cal. Pub. Util. Comm'n, 132 FERC P 61,047.

151. *Id.* ¶¶ 17–18. FERC rejected all of California's arguments regarding generic environmental rationales for wholesale rates in excess of limits under federal law or set by FERC. *Id.*

152. FERC Order Granting Clarification and Dismissing Rehearing, *In re* Cal. Pub. Utils. Comm'n, 133 FERC. P 61,059 (2010).

153. *Id.*

3. Costs

State retail electricity regulatory commissions are required by law to fairly and equitably allocate investments and expenses of regulated utilities. This is their ultimate regulatory responsibility. Public utility law tracks the legal obligation to allocate costs and benefits of electricity service in a manner that is “fair and equitable,” “not unduly preferential,” “just and reasonable,” and “non-discriminatory” among consumers.¹⁵⁴ Regulatory scrutiny is intended to ensure that the only costs passed on to retail rates are “necessary and prudent.”¹⁵⁵ The rate charged to one group should not impose a cost burden derived from a different pricing policy of another group.¹⁵⁶

Electricity rates must reflect the reasonable cost of production and the translation of total cost to “just and reasonable.”¹⁵⁷ The allocation of rates among customer classes must be made based on the principles of tracking and reflecting costs of serving each reasonably distinct class of customers.¹⁵⁸ Each specific rate to consumers must be “just and reasonable.”¹⁵⁹ A nearly universal obligation imposed by federal and state laws on public utilities is the obligation to furnish service and to charge rates that will avoid undue or unjust discrimination among customers.¹⁶⁰ These principles are embedded in rate decisions of both FERC¹⁶¹ and state regulatory commissions¹⁶² and are reinforced when courts review the application of these principles by regulatory agencies.¹⁶³

Administratively-set FiT prices for power, whether in California or Oregon, have traditionally been too high, obligating utility customers to pay higher rates for decades of long-term contracts. In 2011, Oregon

154. EPA’s Clean Power Plan: States’ Tools for Reducing Costs and Increasing Benefits to Consumers, ANALYSIS GROUP (July 2014), available at http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_epa_clean_power_plan_report.pdf.

155. *Midwestern Gas Transmission Co.*, 36 F.P.C. 61, 70 (1966), *aff’d sub nom.* *Midwestern Gas Transmission Co. v. Fed. Power Comm’n*, 388 F.2d 444 (7th Cir. 1968).

156. JAMES C. BONBRIGHT ET AL., *PRINCIPLES OF PUBLIC UTILITY RATES* 568 (2d ed. 1988).

157. 16 U.S.C. § 824d(e) (2012).

158. *See Ala. Elec. Coop., Inc. v. FERC*, 684 F.2d 20, 27 (D.C. Cir. 1982) (“[I]t has come to be well established that electrical rates should be based on the costs of providing service to the utility’s customers, plus a just and fair return on equity.”).

159. 16 U.S.C. § 824d(a).

160. JAMES C. BONBRIGHT ET AL., *PRINCIPLES OF PUBLIC UTILITY RATES* 515 (2d ed. 1988). If an electric plant is operating near full capacity, higher charges for on-peak versus off-peak would actually be required to avoid discrimination. *Id.* at 528.

161. *Ala. Elec. Coop., Inc.*, 684 F.2d at 27.

162. Mich. Comp. Laws Serv. § 460.557(3)–(4) (LexisNexis 2010); *see also* Tex. Util. Code Ann. § 36.003(a)–(c) (West 2007).

163. *Ala. Elec. Coop., Inc.*, 684 F.2d at 27.

lowered the price paid under its solar FiT for the third time in its one year of existence, reducing it from its original 65 cents/Kwh to 37.4 cents/Kwh.¹⁶⁴ Each of the prior iterations at higher prices was oversubscribed within less than 10 minutes of its availability, even though each time the tariff was lowered 10-20% from the prior available price.¹⁶⁵ While Oregon officials claimed they were looking for the “sweet spot,” the unsweet spots of each of the former tariff iterations are forced into the bills of rate paying customers—essentially everyone else—for the successive 15 years. In an international dimension, as set forth above, Germany slashed its initial feed-in tariffs in several stages to approximately half their values 7 years before.¹⁶⁶

IV. THE ALTERNATIVE REGULATORY MECHANISMS FOR SUSTAINABLE POWER: NET METERING AND RPS

Net metering and renewable portfolio standards are the most utilized regulatory mechanisms in the U.S. to promote renewable energy. California, for example, has adopted both legal techniques, after being told for the third time in 2010 and 2011 that it was acting illegally in setting wholesale renewable power prices at inflated FiT levels. As a comparison internationally, Denmark net metering only allows excess from one hour to be applied to the next hour. Net metering at above the retail rate is implemented in Ontario, Canada.¹⁶⁷

A. Net Metering

1. The Legal Mechanism

Net metering has been the most used renewable energy incentive in the United States. FiTs are the most widely employed renewable energy policy in Europe and increasingly, the rest of the world.¹⁶⁸ Approximately

164. Pam Russel, *Oregon Reduces Solar Feed-In Tariff for Third Time, Looking for ‘Sweet Spot’ Price*, ELEC. UTIL. WEEK, Aug. 8, 2011, at 7.

165. *Id.*

166. See, for example, regarding Germany decrease in tariff, David Hopwood & Paula Mints, *Epia: Market Installed 7.2 Gw of Solar Pv in 2009*, RENEWABLE ENERGY FOCUS, <http://www.renewableenergyfocus.com/view/12286/epia-market-installed-72-gw-of-solar-pv-in-2009/>.

167. The FIT in Canada is set at CAD\$ ~\$0.33-\$0.40/kWh for 20-year contracts; the average residential retail rate in Ontario is approximately CAD\$ 0.14/kWh.

168. See Wilson Rickerson & Robert C. Grace, *The Debate over Fixed Price Incentives for Renewable Electricity in Europe and the United States: Fallout and Future Directions*, HEINRICH BÖLL FOUNDATION, Feb. 2007, available at http://www.ontario-sea.org/storage/27/1941_rickerson_grace_final.pdf.

60 countries, including 18 European Union countries, Brazil, Indonesia, Israel, South Korea, Nicaragua, Norway, Sri Lanka, Switzerland and Turkey all used FiTs to promote and support renewable energy.¹⁶⁹

Under net metering, allowed in some form in 43 U.S. states, when the customer purchases and uses electricity from the distribution company, the meter runs forward; when more electricity is produced from the facility than is consumed by the customer, the excess is sent to the electricity grid, running the meter in reverse direction and reversing the net accounting of power flow.¹⁷⁰ By turning the meter backwards, and because only a single rate applies to a single meter, net metering effectively compensates the generator at the full retail rate (which includes that approximately two-thirds of the retail bill is attributable to transmission, distribution, and taxes) for transferring just the wholesale energy commodity in reverse to the utility—the power itself.¹⁷¹ A recent federal adjudicatory order casts uncertainty on the legality of some forms of net metering.¹⁷²

In essence, net metering customers receive for that power an amount that could be above the utility's avoided cost, and reflects distribution investments made by the utility, not the QF. Net metering is not designed to allocate the fair or equitable price based on ratemaking law; it is a random price generally equal to the retail price, which has no direct relationship to the value of wholesale power traded in the market. Although established by state regulatory commission, the net metering rate is wholly divorced from ratemaking law and principles. It ignores that the net metering customer uses the distribution grid twice (power going and coming) and the rate supposes that the net metering customer does not use the grid at all. Net metering is more an accounting convention applied to trading power than it is a legal commodity sale according to case decisions, and it typically is applicable by state law and order to renewable sources of distributed power on the customer's side of the retail utility meter.¹⁷³ The potential for generation of system electric power by rooftop

169. *Id.*

170. See *Glossary*, DATABASE ST. INCENTIVES FOR RENEWABLES & EFFICIENCY, <http://www.dsireusa.org/glossary/>. (“When a customer’s generation exceeds the customer’s use, electricity from the customer flows back to the grid, offsetting electricity consumed by the customer at a different time during the same billing cycle.”)

171. *Id.* (“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).

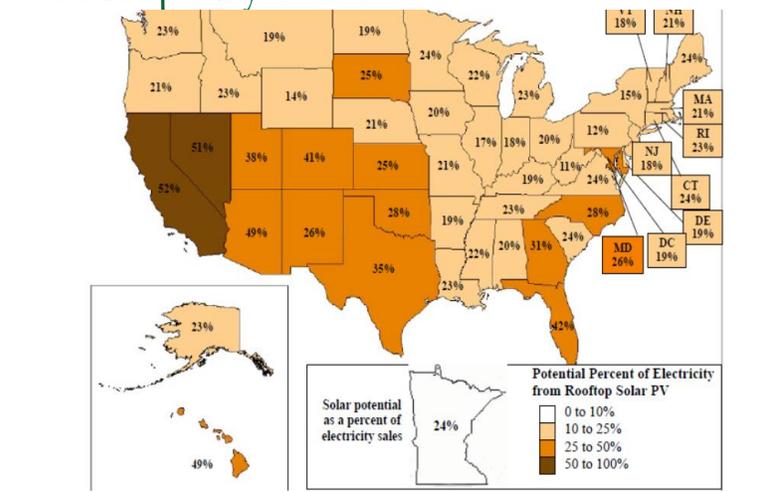
172. Re: Sun Edison, 129 FERC ¶ 61,146 para. 18 (Nov. 19, 2009).

173. Steven Ferrey, *Virtual ‘Nets’ and Law: Power Navigates the Supremacy Clause*, 24 *GEO. INT’L ENVTL. L. REV.* 267, 273 (2012); see also *Glossary*, DATABASE ST. INCENTIVES FOR

PV units in each state is shown in Figure 9. The potential is greatest in California.

FIGURE 9

Potential % of Electricity from PV Rooftops by State



2. Costs

A 2014 report concluded that net metering in California¹⁷⁴

- produces excessively large subsidies for typical residential rooftop solar PV facilities
- cross-subsidies are paid by other residential customers

RENEWABLES & EFFICIENCY, <http://www.dsireusa.org/glossary/> (providing a definition of “net metering”).

174. *Net Energy Metering*, EDISON FOUNDATION, Sept. 2014, available at http://www.edisonfoundation.net/iei/documents/IEI_NEM_Subsidy_Issues_FINAL.pdf. The current net metering subsidy is calculated to be more than \$20,000 for a modest rooftop solar PV project that costs about \$14,500. *Id.* at 18. Most of these large subsidies go to the solar leasing companies in 2013.

- most of the burdened customers are less affluent than the rooftop solar PV customers
- the subsidy is substantially larger than the 30% federal tax credit
- An alternative arrangement which would require all rooftop solar PV customers to buy all of their consumed energy under the existing retail tariffs and separately sell all of their onsite generation to their distribution utilities at the utilities' avoided costs.¹⁷⁵

State utilities wanted stricter limits on the size of net metering units: San Diego Gas & Electric Company alleged that net metering provided an “unfair and unsustainable subsidy” of approximately \$34 from each other customer to net metering customers.¹⁷⁶ A study for the California Public Utilities Commission estimates that by 2020 approximately \$1.1 billion would be shifted annually to support net metering customers under the existing scheme.¹⁷⁷ The California Public Utility Commission reported that by 2020, net metering could cost non-solar electricity customers \$370-\$1.1 billion per year.¹⁷⁸ It documented that most homeowners with distributed solar systems had an average household income about twice that as the average household.¹⁷⁹ California has preserved net metering for now, but AB 327 directed the state’s Public Utility Commission to come up with a new program by 2017 that ensures non-solar customers do not bear an unfair burden.¹⁸⁰

Both National Grid and Northeast Utilities, the parent company of NStar, the utility which owns Boston Edison Company, submitted testimony supporting the goals of the Massachusetts solar program but raising concerns about its costs. National Grid’s Ian Springsteel, the utility’s director of regulatory strategy, submitted testimony saying the price supports for solar “are set at very high levels relative to the revenues necessary to incentivize solar installations.”¹⁸¹ “National Grid estimated

175. *Id.*

176. Lisa Weinzimer, *Consumer and Solar Groups Pan SDG&E’s Planned Surcharge, Saying It May Be Illegal*, ELEC. UTIL. WEEK, Nov. 21, 2011, at 18.

177. *California Net Energy Metering Ratepayer Impacts Evaluation*, ENERGY + ENVTL. ECON., INC., Oct. 28, 2013, at 6.

178. Than, *supra* note 43.

179. *Id.* Of \$91,000 as compared to California’s state average of \$54,000.

180. *Id.*

181. Bruce Mohl, *The Back Story: Green Energy Concerns*, COMMONWEALTH MAGAZINE, Aug. 8, 2013.

the cost of \$3.95/month per residential customer to pay for the Massachusetts RPS program, expected to rise by \$1/month by 2015.”¹⁸² National Grid estimated that net metering costs will more than double between summer 2013 and the end of the year (\$0.09/month to \$0.23/Month), and then more than triple again by the end of 2014(\$0.93/month).¹⁸³ This currently represents 5.4% of the typical residential customer bill, before all the projected increases.¹⁸⁴ This indicates the slope of the trend line on net metering costs on individual bills. National Grid estimated publicly that the separate net metering cost more than doubled between summer 2013 and the end of 2013, and will more than triple from the 2014 amount again by the end of 2015. \$4.04 monthly is the cost of the two green energy mandates, which represents 5.4% of the typical Grid customer’s monthly bill of \$74.38/month, not including the state energy efficiency mandates which cost the typical customer another \$4.70 a month.¹⁸⁵

The manager of power planning and supply for Northeast Utilities stated that solar subsidies at their current levels burden “ratepayers with unnecessary costs while overcompensating solar project owners for reasonable development costs that should more appropriately be borne by the project owners themselves.”¹⁸⁶ The vice president for regulatory affairs at TransCanada, which sells electricity in New England, raised concerns about rising costs at a recent State House hearing on solar. “He said after the hearing that commercial/industrial electricity prices in Massachusetts, which are currently fifth-highest in the nation, could rise to number 2 behind Hawaii in coming years due to clean energy mandates.”¹⁸⁷ Utility companies in California estimate that net metering may mean as much as \$1.4 billion a year in lost revenue, which will have to be added to the bills of non-net-metering customers.¹⁸⁸

182. *Id.*

183. *Id.*

184. *Id.*

185. *Id.*

186. Letter from Northeast Utilities to Massachusetts DOER, Apr. 8, 2013, *available at* <http://www.mass.gov/eea/docs/doer/rps-aps/northeast-utilities-jeffrey-s-waltman.pdf>.

187. Bruce Mohl, *Green Energy Costs Raising Concerns*, COMMONWEALTH MAGAZINE, Aug. 8, 2013, *available at* <http://www.commonwealthmagazine.org/Voices/Back-Story/2013/Summer/004-Green-energy-costs-raising-concerns.aspx>

188. Diane Cardwell, *On Rooftops, a Rival for Utilities*, N.Y. TIMES, July 26, 2013, http://www.nytimes.com/2013/07/27/business/energy-environment/utilities-confront-fresh-threat-do-it-yourself-power.html?_r=0.

3. Net Metering Energy Storage—The Missing Link for Power

Unlike all other forms of energy, moving electrons cannot be efficiently stored as electricity for more than a second, before they are lost as waste heat.¹⁸⁹ Therefore, the supply of electricity must match the demand for electricity over the centralized utility grid on an instantaneous, constant, real-time and ongoing basis, or else the electric system shuts down or expensive equipment is damaged.¹⁹⁰ Either too much or too little power causes system instability on a second-by-second basis.¹⁹¹ Stability issues can be caused when PV inverters trip off because of grid voltage or frequency fluctuations.¹⁹²

The critical missing link is storage of electricity. We do not have any means to store electricity *per se*. Instead, as a substitute, we convert electricity either into chemical energy in batteries,¹⁹³ stored physical energy potential energy in compressed air or greater elevated reservoir capacity in hydroelectric pumped storage facilities, active physical energy in flywheel revolution, or thermal storage as heat.¹⁹⁴ Pumped storage constitutes 95% of the storage utilized in the United States, and dominates storage of electric energy potential worldwide. See Figure 10.¹⁹⁵

189. FERREY, ENVIRONMENTAL LAW, *supra* note 68, at 568.

190. *Power Blackout Risks*, CRO FORUM, available at https://www.allianz.com/v_1339677769000/media/responsibility/documents/position_paper_power_blackout_risks.pdf; see also FERREY, ENVIRONMENTAL LAW, *supra* note 68, at 568.

191. *Power Blackout Risks*, *supra* note 190.

192. *Id.* at 54.

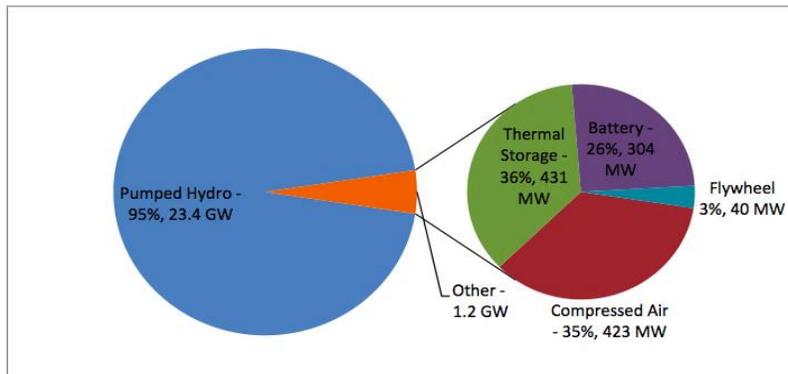
193. IEA, PROSUMER, *supra* note 41, at 33. Battery storage has emerged as the key link for more deployment of intermittent sources of renewable energy such as solar and wind. Lithium-ion and lead-acid batteries may or may not change electric technology in the near future by providing economic storage of intermittent power, although the storage costs are still quite high. Prices for lithium-ion batteries are projected to fall from \$700/kWh in 2013 to \$300/kWh in 2020-2025. The economics of grid defection: When and where distributed solar generation plus storage competes with traditional utility service. *California Energy Commission*, CEC-500-2011-047, <http://www.energy.ca.gov/2011publications/CEC-500-2011-047/CEC-500-2011-047.pdf>.

194. See FERREY, LAW OF INDEPENDENT POWER, *supra* note 69, § 2.21.

195. Grid Energy Storage, DOE (2013), available at <http://energy.gov/sites/prod/files/2013/12/f5/Grid%20Energy%20Storage%20December%202013.pdf>.

FIGURE 10

Figure 1 – Rated Power of US Grid Storage projects (includes announced projects)



a. The Physics of Power Intermittency, Cycling and Grid Stability

The U.S. Department of Energy calculated that approximately 20% wind power can be accommodated on the grid, about the amount of backup reserve margin in regional power systems, without requiring additional storage or other mechanisms to accommodate intermittency.¹⁹⁶ Studies conducted by National Renewable Energy Laboratory (“NREL”) have shown that more than one-third of the electricity in the western United States could come from wind and solar power without installing significant amounts of backup power or new interstate transmission lines.¹⁹⁷ Adding more sustainable resources could negatively affect grid reliability.

According to the National Energy Resource Council (“NERC”), which is responsible for maintaining US grid reliability, regulating and sequestering carbon emissions will compromise grid reliability and require up to half of the electricity produced by electric power generators.¹⁹⁸ NERC has been concerned that the renewable production standards

196. J. DeCesaro et al., *Wind Energy and Power system Operations: A Review of Wind Integration Studies to Date*, ELEC. J., Dec. 2009, at 34. Wind, being at off-peak times in many locations, will tend to displace typical coal base-load power, while solar PV units will tend to displace typical on-peak gas-fired peaking generation units. *Id.*

197. *Wind Systems Integration—Western Wind and Solar Integration Study*, NREL, <http://www.nrel.gov/wind/systemsintegration/wwsis.html> (last visited Feb. 4, 2012).

198. *Public Utilities Fear That Ghg Cuts Might Threaten Electricity Supply, Reliability*, July 28, 2008, <http://www.cleanenergyreport.com> (last visited Feb. 4, 2012).

(“RPS”) in two-thirds of U.S. states and four Canadian provinces could cause early substitution of traditional coal-fired power with renewable power, and simultaneously decrease grid reliability.¹⁹⁹ Studies have estimated the cost of power disturbances across all business sectors in the U.S. at between \$104 and \$164 billion a year as a result of outages and another \$15 to \$24 billion due to degradation of power quality phenomena.²⁰⁰ The cost of a massive blackout is estimated to be about \$10 billion per event.²⁰¹

Intermittent wind and solar renewable resources cannot supply reliable base load power, as they demonstrate a relatively low availability factor in the 10–40% range of hours during a week or month.²⁰² Wind generators have plant effective capacity factors of 20–30%. This will affect the dispatch and operation of other power generation resources.

Even at 20% wind penetration in a grid, there could be a 33–50% decline in the running of combined cycle fossil-fuel generation units, and it is unclear whether these units could run profitably at these levels, or would exit the market.²⁰³ Coal-fired units typically are large (because of coal being a less dense fossil fuel) and must operate at at least 45–50% or greater of their design capacities.²⁰⁴ If coal-fired power plants are forced to cycle on and off more, it will result in significantly higher operation and maintenance expenses, increased heat rate, which is a proxy for inefficiency, increased start-up costs and a shorter life of the unit.²⁰⁵

One analysis of coal-plant cycling against intermittent renewable power’s hourly variations found that emissions during cycling were 8% higher for sulfur dioxide and 10% higher for nitrogen oxides than emissions of the same compounds during constant operation.²⁰⁶ Moreover, while generators spin to increase their temperatures to their design values, the power that these units produce may or may not be used by the grid,

199. *Id.*

200. *The Cost of Power Disturbances to Industrial and Digital Economy Companies*, EPRI, Mar. 18, 2013, available at <http://www.epri.com/abstracts/Pages/ProductAbstract.aspx?ProductId=00000003002000476>.

201. U.S.-Canada Power System Outage Task Force, *Final Report on the August 14, 2003 Blackout in the United States and Canada*, Apr. 2004, available at http://www.demandresponsepartners.com/files/papers/blackoutfinal_web.pdf.

202. See LAW OF INDEPENDENT POWER, *supra* note 69, § 2:11 (noting inability of intermittent sources to serve as base-load resource).

203. J. Nicholas Puga, *The Importance of Combined Cycle Generating Plants in Integrating Large Levels of Wind Power Generation*, 23 ELEC. J. 33 (Aug.–Sept. 2010).

204. *Id.*

205. *Id.*

206. *Id.* at 38.

thus incurring power “uplift” costs to the grid.²⁰⁷ While the more modern coal plants have the ability to ramp up and down more flexibly than older units, they do not have the flexibility to match the real-time variability to match fluctuations in wind power availability to keep the grid constantly supplied.²⁰⁸

Even though they are better able to cycle up and down than coal plants, natural gas combined cycle turbine facilities, which can be modified to increase by up to 50% their start-up times to accommodate pressure and temperature transients of their steam turbines and readiness of their heat recovery steam generators, still may not be able to follow the intermittency of greater renewable power in the grid.²⁰⁹ If they can be adapted to do so, these gas combined cycle units will experience higher heat rates, less efficient operation, greater maintenance and unavailability.²¹⁰ European data illustrates that there has been a shift from traditional coal unit operation to more operation of gas combined cycle units since the regulation of CO₂ emissions.²¹¹ This has resulted in an increase in these units’ O&M costs, more frequent outages, and less availability.²¹²

An analysis of coal plant cycling up and down to match intermittent wind or other renewable power hourly variations found that emissions increased by 8% more SO₂ and 10% more NO_x than at constant operation.²¹³ “If the ambitious levels of renewable generation (mainly wind) established by RPS mandates are to be successfully integrated into electricity markets, policymakers and regulators will have to make sure that fast up- and down-ramping generation resources are available as operating reserves to the grid operator.”²¹⁴

b. International Grid Stability Issues

By 2007, Spain recognized that grid insecurity caused by the intermittent nature of solar and wind generation were limited in eligibility for grid capacity guarantee payments, yet the FiT increased to E58

207. *Id.*

208. *Id.* at 37.

209. *Id.* at 38–39, 42.

210. *Id.* at 42.

211. Edward W. Platt & Richard B. Jones, *The Impact of Carbon Trading on Performance: What Europe’s Experience can Teach North American Generators*, POWER (Jan. 2010).

212. *Id.*

213. *See supra* note 207.

214. *Id.* at 42; *see also* Adrienne M. Ohler & Kristi Radusewicz, *Indirect Impacts in Illinois from a Renewable Portfolio Standard*, 23 ELEC. J. 65 (2010).

cents/Kwh for solar PV projects.²¹⁵ These experiences illustrate significant externalities that are associated with renewable energy expansion. First, grid modifications, upgraded circuits and transformers, and expansion of the transmission and distribution infrastructure, are necessary for renewables, but not otherwise required at anywhere near this degree.²¹⁶ In Germany, this already resulted in an additional €1 billion of cost, with tens of billions more of investment required.²¹⁷ Second, there is a need for installation on the system of more quick-start spinning reserve to respond to the constant intermittency of solar and wind generation and provide load-following generation.²¹⁸ Twenty power companies, including Germany's biggest utilities, are now paid for agreeing to add or cut electricity within seconds to keep the power system stable. The cost of this power generator cycling doubled in a year, in an 800 million euro (\$1.1 billion) balancing market.²¹⁹ There are five times as many potential disruptions due to grid instability caused in significant part by more intermittent generation, as four years before, raising the risk of blackouts.²²⁰

Adding a significant intermittent DG component, even if load demand characteristics do not change, increases the need for spinning reserve, increases the amount of fuel consumed to spin that reserve, and consequently increases the system out-of-pocket fuel and other marginal costs incurred to maintain unchanged, consistent system reliability.²²¹ There are real costs associated with necessary greater amounts of spinning reserve and back-up power, which impose additional costs on maintenance of system reliability which were not there before.²²²

215. Lincoln Davies & Kirsten Allen, *Feed-In Tariffs in Turmoil*, 116 W. VA. L.R. 937, 975 (2014).

216. *Id.* at 1002.

217. *Id.*

218. *Id.*

219. Julia Mengewein, *German Push for Renewable Power Outlet Doubles Utilities Joining Balancing Market*, BLOOMBERG BNA ENERGY & CLIMATE REPORT, July 25, 2014.

220. *Id.* One grid operator requiring balancing adjusts of generation 1,009 times in 2013 to stabilize the grid, 209 times in 2010. In Germany's balancing market auctions, winning bidders have been paid as much as 13,922 euros (\$18,700) to pledge set aside one megawatt for balancing services provided on notice of 15 minutes, 5 minutes or 30 seconds.

221. *See supra* Part IV.A.3.a.

222. *Id.*

B. Renewable Portfolio Standards (RPS)

1. Creation of 'Virtual' Credits

A resource portfolio standard or requirement ("RPS") requires certain electricity sellers and buyers to maintain evidence of a predetermined percentage of designated clean resources in their wholesale electric supply mixes.²²³ Independent generators of renewable power then make direct sales of their renewable energy credits ("RECs") to retail suppliers of power, which are required by RPS laws to purchase enough RECs each year to equal the required percentage of power generation set by the state regulatory authority. RPS programs have been characterized as a form of "backdoor" renewable subsidies.²²⁴

Twenty-nine U.S. states and the District of Columbia have RPS.²²⁵ It is estimated that 45% of the 4,300 MW of wind power installed in the U.S. between 2001-2004 was motivated by state renewable portfolio standards, while an additional 15% of these installations were motivated by state renewable energy trust funds and subsidies.²²⁶ The current RPS standards are projected to add 76,750 MW of additional renewable generation by 2025.²²⁷

223. The resources such as renewables, DSM, or high efficiency fossil combustion, as defined by a particular state, would be included in the company's overall resource portfolio. Portfolio requirements can be applied to electricity sellers, such as generation companies and vertically integrated utilities as a condition of continued market access. 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.

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

225. See *Renewable Portfolio Standard Policies*, DSIREUSA.ORG, Mar. 2013, http://www.dsireusa.org/documents/summarymaps/RPS_map.pdf.

226. Ryan Wiser & Mark Bolinger, *Balancing Cost and Risk: The Treatment of Renewable Energy in Western Utility Resource Plans*, Elec. J., Aug. 10, 2005, available at <http://escholarship.org/uc/item/37p4j85p>.

227. Brad Plumer, *The Biggest Fight over Renewable Energy Is Now in the States*, WASH. POST, Mar. 25, 2013, available at <https://www.washingtonpost.com/news/wonk/wp/2013/03/25/the-biggest-fights-over-renewable-energy-are-now-happening-in-the-states/>.

2. Navigating Legal Barriers to Leakage in the U.S.

A major practical and policy issue²²⁸ is the so-called “leakage” into a state or country of external unregulated and less-costly power.²²⁹ In the U.S., state laws that attempt to arrest leakage by regulatory measures that differentially treat the energy commerce of out-of-state businesses can also violate the Commerce Clause of the Constitution.²³⁰ These laws can assume the form of added fees or taxes and charges on out-of-state goods.²³¹ States are prohibited from attaching restrictions to any goods that they import from other states: “States and localities may not attach restrictions to . . . imports in order to control commerce in other States.”²³² States cannot regulate in ways where the practical effect is to control conduct in other states.²³³

A state cannot regulate in favor of, or require use of, its own in-state energy resources even for a small percentage of total use,²³⁴ nor can it, by regulation, harbor energy-related resources originating in the state.²³⁵ The use of in-state fuels cannot be required by a state even to satisfy federal Clean Air Act requirements.²³⁶ Income tax credits cannot be given by a state only to in-state producers of fuel additives.²³⁷ The Supreme Court

228. Cap and Trade Program Design Options Report of the Cap and Trade Subgroup of the Climate Action Team: Final Report, available at http://www.climatechange.ca.gov/climate_action_team/reports/2006-03-27_CAP_AND_TRADE.pdf.

229. See RGGI Emissions Leakage Multi-State Staff Working Group, *Potential Emissions Leakage and RGGI: Evaluating Market Dynamics, Monitoring Options and Possible Mitigation Mechanisms*, Mar. 14, 2007, available at http://www.rggi.org/docs/il_report_final_3_14_07.pdf. States such as New Jersey, New York, Maryland and New Delaware are bordered by states that are not signatories to RGGI and do historically produce a large of volume of electricity from coal-fueled power plants. Similarly, California imports power from 11 states, including a large amount of coal-fired power. See California Energy Commission, *2006 Gross System Electricity Production*, available at https://www.energy.ca.gov/electricity/gross_system_power.html (showing California imports approximately 10% of its total electricity from out of state coal plants).

230. See, e.g., *Healy v. Beer Institute, Inc.*, 491 U.S. 324, 326–27, 343 (1989) (striking requirement that the price of beer was not higher than that charged out-of-state).

231. See, e.g., *Chemical Waste Mgmt. Inc. v. Hunt*, 504 U.S. 334, 336–37 (1992) (invalidating an Alabama law imposing an extra fee on imported hazardous waste).

232. *C & A Carbone, Inc. v. Clarkstown*, 511 U.S. 383, 393 (1994).

233. *Healy*, 491 U.S. at 336; *Carbone*, 511 U.S. at 393.

234. *Wyoming v. Oklahoma*, 502 U.S. 437, 454–56 (1992). The Oklahoma statute overturned involved only a 10% allocation of the market to in-state producers. As a result of the statute, the market changed in response from use of almost all out-of-state coal to “the utilities purchased [in-state] Oklahoma coal in amounts ranging from 3.4% to 7.4% of their annual needs, with a necessarily corresponding reduction in purchases of Wyoming coal.” See also *Alliance for Clean Coal v. Craig*, 840 F. Supp. 554, 560 (N.D. Ill. 1993).

235. *New England Power Co. v. New Hampshire*, 455 U.S. 331, 339 (1982).

236. *Alliance for Clean Coal v. Miller*, 44 F.3d 591, 596–97 (7th Cir. 1995).

237. *New Energy Co. of Indiana v. Limbach*, 486 U.S. 269, 271, 278–80 (1988).

consistently has required that the regulation of power by the states must not discriminate regarding the origin of power or the ultimate impact that may discourage its flow in interstate commerce.²³⁸

[We] consistently have held that the Commerce Clause of the Constitution precludes a state from mandating that its residents be given a preferred right of access, over out-of-state consumers, to natural resources located within its borders or to the products derived therefrom. [A] State is without power to prevent privately owned articles of trade from being shipped and sold in interstate commerce on the ground that they are required to satisfy local demands or because they are needed by the people of the State.²³⁹

Recent federal court opinions construing state electricity regulation have scrupulously followed this doctrine:

[A state is ‘without power to prevent privately owned articles of trade from being shipped and sold in interstate commerce on the ground that they are required to satisfy local demands or because they are needed by the people of the State (quoting *Philadelphia v. New Jersey* at 627, quoting *Foster Fountain Packing Co.*, at 10).²⁴⁰

Most recently, Judge Richard Posner, writing for the Seventh Circuit Court of Appeals in a unanimous decision, affirmed the Federal Energy Regulatory Commission’s approval of the Midwest Independent Service Operator’s (“MISO”)²⁴¹ proportionate customer utility allocation of transmission costs for high-voltage transmission lines to move renewable wind power to populated areas.²⁴² For the authority for its holding on the respective jurisdiction of state and federal government to regulate electricity, the opinion relied on a 2012 law review article by this author.²⁴³ The decision, in *dicta*, declared unconstitutional a state’s

238. *New England Power Co. v. New Hampshire*, 455 U.S. 331 (1982) (overturning as a violation of the dormant Commerce Clause an order of the state Public Utilities Commission that restrained within the state for the financial advantage of in-state ratepayers, renewable power produced within the state).

239. *Id.*

240. *Entergy Nuclear Vermont Yankee, LLC v. Shumlin*, *supra* note 134, slip op. at 83–84.

241. MISO’s service area extends from the Canadian border, east to Michigan and parts of Indiana, south to northern Missouri, and west to eastern areas of Montana. MISO ENERGY, <https://www.misoenergy.org/Pages/Home.aspx>.

242. *Illinois Commerce Com’n. v. Federal Regulatory Com’n*, 721 F.3d 764 (7th Cir. 2013). MISO allocated the costs of the transmission projects among all of the utilities who draw power from the MISO grid in proportion to each utilities’ overall volume of usage; FERC approved MISO’s rate design, which led some states to initiate court appeal.

243. *Id.* at 776.

limiting state renewable portfolio standards to in-state generation, as a violation of the Commerce Clause “Michigan cannot, without violating the commerce clause of Article I of the Constitution, discriminate against out-of-state renewable energy.”²⁴⁴ Justice Scalia, concurring in the majority prior opinion in *West Lynn Creamery*, submitted that, “subsidies for in-state industry . . . would clearly be invalid under any formulation of the Court’s guiding principle” for “dormant” Commerce Clause cases.²⁴⁵

The dormant Commerce Clause prohibits actions that are facially discriminatory against interstate commerce.²⁴⁶ A regulation that “evinces” discriminatory purpose against interstate commerce “or unambiguously discriminates in its effect . . . almost always is ‘invalid per se.’”²⁴⁷ All objects of interstate trade merit Commerce Clause protection, which particularly includes electric energy in interstate commerce according to the Supreme Court²⁴⁸:

[I]t is difficult to conceive of a more basic element of interstate commerce than electric energy, a product used in virtually every home and every commercial or manufacturing facility. No State relies solely on its own resources in this respect.²⁴⁹

Renewable portfolio standards at the state level do not raise constitutional Supremacy Clause issues, but the design of some state programs raise dormant Commerce Clause issues.²⁵⁰ There are a number of the twenty-nine states with RPS that have incorporated credit multipliers, geographic restrictions, or preferences to promote in-state/in-region generation of power, to the exclusion of external power, in the following percentages:

244. *Id.* Michigan actually initiated the issue of in-state electric power discrimination in its RPS program as a demonstration that out-of-state power transmitted to it was not recognized as of the same value as in-state electricity, therefore Michigan should not pay a share of power line tariffs transmitting power from out of state that did not have equal recognition and benefit. Instead of supporting its position, this assertion caused Judge Posner to respond to this assertion, even though it was not the tariff issue before the Court. *Id.*

245. *West Lynn Creamery, Inc. v. Healy*, 512 U.S. 186, 208 (Scalia, J., concurring).

246. *Department of Revenue v. Davis*, 553 U.S. 328, 338 (2008) (quoting *Oregon Waste Systems, Inc v. Department of Environmental Quality of Ore.*, 511 U.S. 93, 99 (1994)).

247. *Brown & Williamson Tobacco Corp. v. Pataki*, 320 F.3d 200, 209 (2d Cir. 2003) (quoting *Nat’l Elec. Mfrs. Ass’n v. Sorrell*, 272 F.3d 104, 108 (2d Cir. 2001)).

248. *See New York v. F.E.R.C.*, 535 U.S. 1, 16 (2002) (“[T]ransmissions on the interconnected national grids constitute transmissions in interstate commerce.”).

249. *F.E.R.C. v. Mississippi*, 456 U.S. 742, 757 (1982).

250. *See supra* Part II.C.

- Eight of the twenty-nine RPS states, or 27%, have REC multipliers for in-state generation: Arizona,²⁵¹ Colorado,²⁵² Delaware,²⁵³ Maine,²⁵⁴ Michigan,²⁵⁵ Missouri,²⁵⁶ Nevada,²⁵⁷ and Washington.²⁵⁸
- Four of the RPS states, or 14%, including two states that also provide for a geographically discriminatory REC multiplier, have either a requirement or preference for in-state generation: California,²⁵⁹ Colorado,²⁶⁰ North Carolina,²⁶¹ and Ohio.²⁶²
- Four of the twenty-nine RPS states, or 14%, give program preferences to the use of in-state manufactured products or in-state labor forces: Arizona,²⁶³ Delaware,²⁶⁴ Michigan,²⁶⁵ and Montana.²⁶⁶
- Eleven of the twenty-nine RPS states, representing 38% of RPS states, have a requirement for in-region, rather than in-state, geographic location of generation to create RECs, including one of the states that also has in-state multipliers and one with an in-state preference: Connecticut,²⁶⁷ Illinois,²⁶⁸ Maine,²⁶⁹ Maryland,²⁷⁰ Massachusetts,²⁷¹ New Hampshire,²⁷²

251. ARIZ. ADMIN. CODE § R14-2-1806(D)–(E) (2009).

252. COLO. REV. STAT. § 40-2-124(c)(V)(A)–(D), (c)(IX), (d) (2013).

253. DEL. CODE ANN. tit. 26, § 356(a)(1), (d)–(e) (2012).

254. ME. REV. STAT. tit. 35-A, § 3605 (2010).

255. MICH. COMP. LAWS SERV. § 460.1039(1) (LexisNexis 2010).

256. MO. ANN. STAT. § 393.1030(1) (West 2013).

257. NEV. REV. STAT. ANN. § 704.7822 (LexisNexis 2011).

258. WASH. ADMIN. CODE § 194-37-110(1)(d)(i)–(iii) (2015).

259. *California Incentives/Policies for Renewables Efficiency, Database St. Incentives for Renewables & Efficiency*, DSIRE, http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA25R&re=1&ee=1 (last updated Oct. 30, 2013) (explaining that a maximum of 25% of RPS compliance can be achieved through the use of tradable renewable energy credits; therefore, the remainder of the RPS compliance must be attained through in-state power sales).

260. COLO. REV. STAT. § 40-2-124(e)(II)–(III) (2013).

261. N.C. GEN. STAT. ANN. § 62-133.8(b)(2)(e) (West 2012).

262. OHIO REV. CODE ANN. § 4928.64(B)(3) (LexisNexis 2012).

263. ARIZ. ADMIN. CODE § R14-2-1806(D)–(E) (2007).

264. DEL. CODE ANN. tit. 26, § 351(b)–(c) (2009).

265. MICH. COMP. LAWS SERV. § 460.1001(2)(a)–(d) (LexisNexis 2010).

266. MONT. CODE ANN. § 69-3-2005(3)(a) (2013).

267. CONN. GEN. STAT. ANN. § 16-245a(b) (West 2013).

268. 20 ILL. COMP. STAT. ANN. 3855/1-56(b) (West 2013).

269. 65-407-311 ME. CODE R. § 6 (LexisNexis 2011).

270. MD. CODE REGS. 20.61.03(D) (2011).

271. MASS. ANN. LAWS ch. 25A, § 11F(a) (LexisNexis 2013).

272. N.H. REV. STAT. ANN. § 362-F:6(I) (LexisNexis 2011).

North Carolina, Ohio,²⁷³ Oregon,²⁷⁴ Pennsylvania,²⁷⁵ and Rhode Island.²⁷⁶

- Eleven of the twenty-nine states, or 38%, have an in-state requirement for certain distributed power.²⁷⁷
- Four of the twenty-nine states, or 14%, have a benefit for an in-state capital component or labor.²⁷⁸
- Some states have multiple multipliers and preferences.²⁷⁹
- Only seven of the twenty-nine states, or 24%, have no geographic preferences in their laws.²⁸⁰

There was successful litigation alleging that Massachusetts' renewable energy tradable energy credits under capped incentives violated the Constitution.²⁸¹ The program was successfully challenged on Constitutional grounds in 2010 by TransCanada Corporation, the owner of a Maine wind project.²⁸² The suit alleged that Massachusetts' limitation on eligible solar Renewable Energy Credits ("SRECs"), as well as issuance of long-term power purchase contracts only to Massachusetts companies, both discriminated against out-of-state renewable energy projects in violation of the dormant Commerce Clause of the U.S. Constitution.²⁸³ After stating that it had confidence in its position, Massachusetts immediately settled the litigation so as to avoid a court decision, providing that TransCanada would be eligible for these programs.²⁸⁴

273. OHIO REV. CODE ANN. § 4928.64(C)(5) (LexisNexis 2012).

274. OR. REV. STAT. § 469A.135(1)(a), (2) (2011).

275. 73 PA. STAT. ANN. § 1648.4 (West 2008).

276. R.I. GEN. LAWS § 39-26-4(d) (2012).

277. Steven Ferrey, *Threading the Constitutional Needle with Care: The Commerce Clause Threat to the New Infrastructure of Renewable Power*, 7 TEX. J. OIL GAS & ENERGY L. 59, 75–77 (2012) (noting that resource eligibility in state RPS programs has expanded beyond traditional renewables).

278. Steven Ferrey, *Alternative Energy in a Spaghetti Western: Clint Eastwood Confronts State Renewable Energy Policy*, 32 UTAH ENVTL. L. REV. 279, 292 (2012) (listing Arizona, Delaware, Michigan, and Montana as having this in-state benefit).

279. *Id.* at 291–92.

280. *Id.* at 292.

281. *TransCanada Power Mktg., Ltd. v. Bowles et al.*, No. 4:10-cv-40070-FDS (D. Mass. Apr. 16, 2010), available at <http://www.ohiogreenstrategies.com/documents/transcanada.pdf>. E. Ailworth, *State Looking to Settle Suit over Law on Clean Energy*, BOSTON GLOBE, May 27, 2010, available at http://www.boston.com/business/articles/2010/05/27/lawsuit_hits_mass_law_promoting_local_energy_providers/.

282. *Id.*

283. *Id.*

284. See *Massachusetts Dept. of Energy Resources, Partial Settlement Agreement with*

A 2013 decision of the federal court held that a statute banning the import of foreign coal or coal-produced power into Minnesota or the construction of new plants that would burn external coal was unconstitutional²⁸⁵:

Such a scenario is “just the kind of competing and interlocking local economic regulation that the Commerce Clause was meant to preclude.” Healy, 491 U.S. at 337²⁸⁶ . . . “any attempt directly to assert extraterritorial jurisdiction over persons or property would offend sister States and exceed the inherent limits of State’s power.”²⁸⁷

3. Costs

a. U.S. Costs

The price impact of RPS-mandated renewable energy projects has been estimated to range between a 0.1% increase in retail rates (in Maine, Maryland, New Jersey, and New York) to up to 1.1% retail rate impact in Massachusetts.²⁸⁸ In a 2004 ruling, an Administrative Law Judge of the New York Public Service Commission, concluded that this renewable portfolio standard would raise residential rates by 1.8%, commercial rates by 2% and industrial rates by 2.4%. It would cut statewide emissions of NOx by 6.8%, sulfur dioxide by 5.9%, and CO₂ by 7.7%.²⁸⁹ New Jersey utility ratepayers already have paid \$388 million in rebates and other financial incentives for programs to promote solar panels, wind projects,

TransCanada, MASS.GOV, available at <http://www.mass.gov/Eoeea/docs/doer/renewables/solar/Settlement-Agreement.pdf>.

285. *North Dakota v. Heydinger*, 2014 WL 1612331, 1 (D. Mn. Apr. 18, 2014). Exemptions were made for the proposed Excelsior Energy integrated gasification combined cycle (IGCC) plant in northern Minnesota, the Big Stone II coal plant in South Dakota, and the Maple Grove-based Great River Energy’s Spiritwood Station plant in North Dakota. Minn. Stat. § 216B.1694, subd. 1 (2008).

286. *Heydinger*, 15 F. Supp. 3d at 918.

287. *Id.* at 911 (citing *Edgar v. MITE Corp.*, 457 U.S. 624, 642 (1982)). North Dakota and representatives of its coal industry also sued Minnesota on Article VI grounds alleging it imposes Constitutional violations when it affects the wholesale price and transmission of power within exclusive federal authority regarding wholesale electricity pricing, which the court did not need to reach, having already found the statute unconstitutional. *Id.* at 916.

288. Ryan Wisser et al., *The Experience with Renewable Portfolio Standards in the United States*, 8 ELEC. J. 20, at Fig. 4 (2007). An impact of not more than approximately 1% is forecast to be the cost of this implementation.

289. *N.Y. ALJ Recommends Renewable Standard Reaching 25% by 2013, with Old Hydro*, ELEC. UTIL. WEEK, June 7, 2004, at 7. The ruling also envisions a trading system of renewable energy credits.

and other renewable energy initiatives.²⁹⁰ The New Jersey Division of Rate Counsel head asked for a more transparent pricing scheme.²⁹¹

In 2014, Ohio became the first state to freeze its RPS program, negating the annual legislated increase in RPS requirements for two years.²⁹² The RPS requirement remained, but did not advance as originally legislated. This did not repeal the Ohio RPS program, but retarded its inclining curve of greater renewable energy credit purchase by utilities for two years.

b. International Costs

Figure 11 illustrates the results of different electric generation policies. The U.S. has achieved the lowest retail prices for power of any of the major nations. Prices in the U.S. are below those of France, which generates three-quarters of its power from low-cost nuclear power, and less than half the price of electricity in Germany, where there are significant technology cross-subsidies built into retail rates through FiTs, at well beyond the wholesale price of power. These added costs are passed on to rate payers. Spain now pays almost 1% of its GDP in subsidies for renewables power, which is more than it spends on higher education.²⁹³

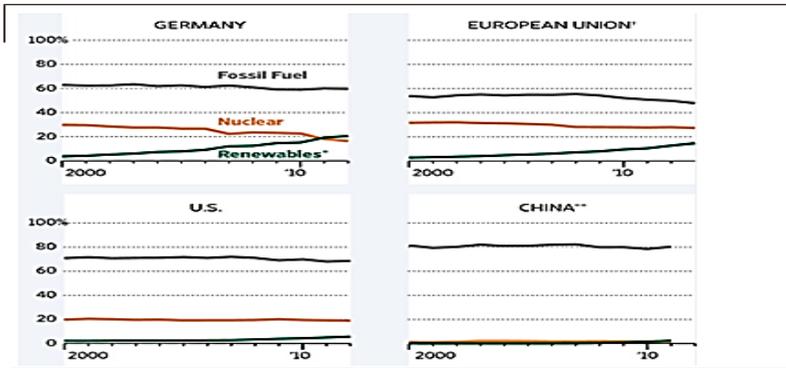
290. Tom Johnson, *What Does It Really Cost Utility Customers to Subsidize Clean Energy?*, N.J. SPOTLIGHT, Oct. 8, 2013, available at <http://www.njspotlight.com/stories/13/10/07/what-does-it-really-cost-utility-customers-to-subsidize-clean-energy/>. This does not include to more recent market-based solar program funded by subsidies on customer utility bills, which in 2012 raised \$309 million. “We don’t know exactly what the cost is,” conceded New Jersey Division of Rate Counsel Director Stefanie Brand, who has been a proponent of bringing more transparency to the process. “It’s good for the public to know what they are paying.” *Id.*

291. *Id.*

292. Tom Knox, *The Freeze Is on—Kasich Signs S.B. 310, Halts Renewable and Energy-Efficiency Standards*, COLUMBUS BUS. FIRST, June 13, 2014, <http://www.bizjournals.com/columbus/news/2014/06/13/the-freeze-is-on-kasich-signs-s-b-310-halts.html>. In June 2014, Ohio enacted Senate Bill 310 to freeze for two years renewable energy and energy efficiency cross-subsidies, making Ohio the first state to back off its RPS. *Id.* As a result, Ohio’s renewable energy mandate will remain at 2.5% and its energy efficiency standard at 4.2% compared to 2009 levels for the next two years. *Id.* A legislative committee will review the standards enacted in 2008, which provide that 25% of the electricity sold by Ohio utilities must be generated from alternative energy sources. *Id.* Half of that must come from renewables like wind power, solar must account for at least 0.5% of the renewables load, and utilities must slash customers’ power usage by 22% in the same time frame. *Id.*

293. *Id.*

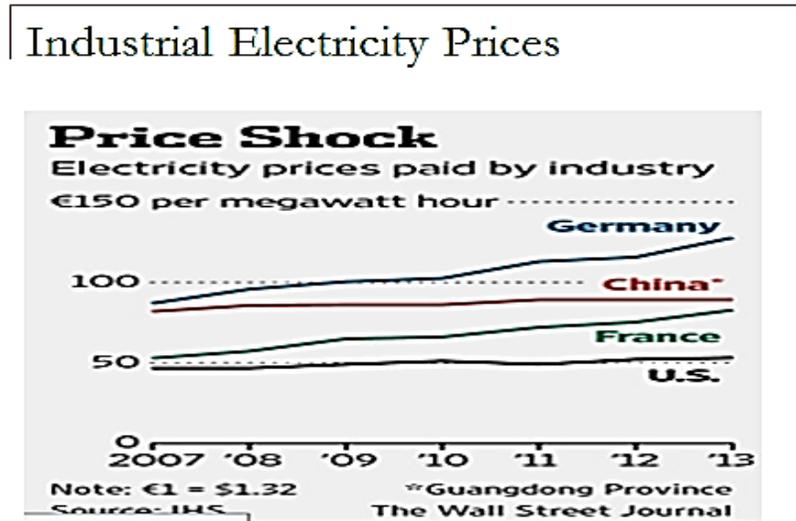
FIGURE 11: AVERAGE RETAIL ELECTRICITY PRICES IN EUROPE, CHINA, AND U.S., 1999–2012



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Figure 12 illustrates comparative retail electricity prices for industrial companies in respective international countries.

FIGURE 12: AVERAGE INDUSTRIAL RETAIL ELECTRICITY PRICES IN EUROPE, CHINA, AND U.S., 1999–2012



V. HOW INTERNATIONAL LEVERS OF POWER MUST BE ACTIVATED

A. *One Regulatory Size Does Not Fit All*

The power technology to arrest climate change exists;²⁹⁴ it is the legal and regulatory mechanisms to successfully deploy sufficient new clean technologies that are lacking. In redressing climate change and global warming, one size, legally, has not proven to fit all. The most used mechanism in the European Union and internationally to promote quick implementation of renewable power is feed-in tariffs. However, under the U.S. constitutional system and the Federal Power Act, the 48 continental states have no power to enact feed-in tariffs. Such federalist forms of government characterize several other large and established countries, including Germany, Canada, Australia, Switzerland, India, Brazil, Malaysia, Mexico, and Nigeria.

The alternative mechanisms most used by 29 states in the United States and some other countries to support sustainable energy development are RPS, and, in 43 states, net metering. However, many countries have no effective mechanism to promote renewable power. Consequently, renewable energy use is less significant in percentage terms than it was 200 years ago.

In 1800, the world obtained 94% of its energy from renewable sources.²⁹⁵ That figure has been declining consistently since. 13.12% of the world's energy came from renewable power in 1971,²⁹⁶ forty years later in 2011, renewable power's share was 12.99%.²⁹⁷ In the United States, renewable energy accounted for 9.3% of energy production in 1949, and is projected to rise to 10.8% by 2040. In China, renewable energy production dropped from 40% in 1971 to 11% in the present day.²⁹⁸

While the leading renewable energy technologies have made substantial percentage gains, their slice of the total energy pie is still modest. In 1990, wind produced 0.0038% of the world's energy; it now

294. Andrea Vittorio, *Countries Could Double Global Share*, *supra* note 8.

295. Bjørn Lomborg, *Green Energy Needs to be Cheaper, So Let's Invest in R&D Instead of Subsidies*, available at http://www.slate.com/articles/health_and_science/project_syndicate/2013/08/green_energy_subsidies_for_solar_and_wind_power_aren_t_helping_let_s_invest.html; see also Todd Woody, *The Next Big Innovation in Renewable Energy Won't Be Technological, It Will be Financial*, THE ATLANTIC MONTHLY, Nov. 11 2013, available at <http://www.theatlantic.com/technology/archive/2013/11/the-next-big-innovation-in-renewable-energy-wont-be-technological/281345/>.

296. *Id.* 1971 is the first year that the IEA reported global statistics.

297. *Id.*

298. *Id.*

produces 0.29%.²⁹⁹ Solar photovoltaic electric power production was close to 0% in 1990; it is now 0.04%.³⁰⁰ Europe now achieves 1% of its energy production from wind power, a smaller percentage than before European industrialization.³⁰¹ The U.K. gained its maximum amount of total energy at 2.5% from wind power in 1804, while it is less than 1% today.³⁰²

Each of these mechanisms must be employed sensibly, or face its own legal issues. RPS, net metering, and FiTs each cross-subsidize one group of consumers by imposing the total program subsidy costs on other groups of the utility's consumers, and there can be an impact on utilities. While employing assertive FiTs, EU utilities have suffered vast losses in asset valuation, with their market capitalization having fallen by over E500 billion over the last five years.³⁰³ In May 2014, Barclays downgraded all high-grade bonds issued by the entire American electric utility sector because they "believe that a confluence of declining cost trends in distributed solar photovoltaic (PV) power generation and residential-scale power storage is likely to disrupt the status quo."³⁰⁴ It is expected that these trends will reduce the profitability and credit-worthiness of utilities with increased deployment of renewable energy.³⁰⁵

In Europe, utility cash flows have been decreased from reduced operating hours for conventional plants.³⁰⁶ Utilities in Europe are also reported to be actively seeking partnerships with institutional investors to whom they might unload sustainable energy assets from their balance sheets.³⁰⁷

299. *Id.*

300. *Id.*

301. *Id.*

302. *Id.*

303. *How to Lose Half a Trillion Euros*, THE ECONOMIST, Oct. 12, 2014, available at <http://www.economist.com/news/briefing/21587782-europes-electricity-providers-face-existential-threat-how-lose-half-trillion-euros>.

304. Michael Aneiro, *Barclays Downgrades Electric Utility Bonds, Sees Viable Solar Competition*, BARRON'S, May 23, 2014, available at <http://blogs.barrons.com/incomeinvesting/2014/05/23/barclays-downgrades-electric-utility-bonds-sees-viable-solar-competition/>.

305. *International Energy Agency, Medium Term Renewables Outlook*, IEA, Paris, 2014.

306. *Id.*

307. Christoph Steitz, *Interview—E.ON Bets on Investor Help for Wind Power Push*, REUTERS, Aug. 26, 2014, available at <http://uk.reuters.com/article/2014/08/26/e-on-renewables-idUKL5N0QW1D420140826>. Fossil fuel assets have been characterized as having "the potential to become stranded due to a range of environment-related factors—from climate or other environmental regulations, developments in clean energy technology, resource constraints, evolving social norms and litigation." Ben Caldecott et al., *Summary of Proceedings, Stranded Assets Forum, Waddesdon Manor*, STRANDED ASSETS PROGRAMME, Mar. 2014, available at www.smithschool.ox.ac.uk/research/stranded-assets/.

B. Developing Policy for Developing Nations

Does this widespread adoption of renewable energy requirements in the E.U. and in two-thirds of U.S. states translate to similar action in the majority of developing countries? As set forth above, only about 40% of world carbon emissions are covered by those nations affected by the Kyoto Protocol. And it did not cover those major nations which constitute the fastest growing contribution to world carbon emissions—China, India, Indonesia, Brazil, etc. While the 2015 Paris COP-21 agreement includes all nations in a general commitment to reduce global warming emissions, it imposes no specific commitment on any nation and even the general commitment remains unenforceable. Neither of China, India, or Indonesia has a carbon policy to regulate the release of CO₂ from the deployment of such coal reserves yet. The necessary international limits on CO₂ emissions do not exist in developing countries.

This is the critical missing link. Climate warming cannot be controlled unless all significant carbon emitters in the world are appropriately and proportionately controlled. China is a particular example. China has now surpassed the United States as the largest CO₂ emitter in the world. By 2010, China had the highest emissions in the world per unit of gross national product (“GNP”) by a factor more than double that of any other nation. In 2005 China’s energy consumption per unit of GDP was just more than three times the level of the United States, more than five times that of Germany and eight times that of Japan.³⁰⁸ Projections estimate that by 2030, China’s GHG emissions will quadruple and Asia alone will emit 60 per cent of the world’s carbon emissions.³⁰⁹

While China is developing some renewable power, it adds yearly 40 times more new coal capacity than new wind power capacity.³¹⁰ In 2007, China built more new coal-fired power plants than Britain, the seat of the coal-fired industrial revolution, built in its entire history.³¹¹ At the end of 2012, there were 363 coal-fired plants with a combined generating

308. *Energy Consumption per Unit of Gdp Continues to Fall*, CHINA DAILY, July 15, 2007, available at http://www.chinadaily.com.cn/business/2008-07/15/content_6847891.htm.

309. D.E. Cooper, *The Kyoto Protocol and China: Global Warming’s Sleeping Giant*, 11 GEO. INT’L ENVTL. L. REV. 401, 405 (1999).

310. *Id.*

311. See Roger Harrabin, *China Building More Power Plants*, BBC NEWS, June 19, 2007, <http://news.bbc.co.uk/1/hi/asia-pacific/6769743.stm>; Mark Clayton, *Global Boom in Coal Power and Emissions*, CHRISTIAN SCI. MONITOR, Mar. 22, 2007, <http://www.csmonitor.com/2007/0322/p01s04-wogi.htm>.

capacity of 557,938 Mw proposed to be built in China.³¹² The intensity of China's growth is unprecedented in any other developing country in the world,³¹³ with a growth rate of GDP at more than 10% for the last three decades.³¹⁴

China is the world's largest producer and consumer of coal, accounting for almost as much coal as the rest of the world combined.³¹⁵ China accounted for 46% of global coal consumption five years ago.³¹⁶ According to the International Energy Agency, electricity generation accounted for 44% of CO₂ emissions in 2010.³¹⁷ China and India harbor around one-quarter of the world's coal reserves and are deploying them rapidly to fire electric power plants.³¹⁸ India has targeted 100,000 MW in new capacity over the next ten years.³¹⁹ China is installing 1000 MW of coal power generation each week. By the year 2030, coal-fired power in India and China will add 3000 million extra tons of CO₂ to the atmosphere every year.³²⁰ Therefore, the *additional* CO₂ emissions from the China and India electric power sectors alone will constitute approximately 10% of all world CO₂ emissions from all sources.³²¹

Coal consumption in Asia is more than triple the coal consumption in the U.S. and the E.U. combined. China is currently installing 1 GW of coal power generation each week and predictions are that by the year 2030,

312. Ailun Yang & Yiyun Cui, *Global Coal Risk Assessment: Data Analysis and Market Research*, WORLD RESOURCE INSTITUTE, Nov. 2012, available at http://www.wri.org/sites/default/files/pdf/global_coal_risk_assessment.pdf [hereinafter "Global Coal Risk Assessment: Data Analysis and Market Research"].

313. Li Meixian, *China's Compliance with Wto Requirements Will Improve the Efficiency and Effective Implementation of Environmental Laws in China*, 18 TEMP. INT'L & COMP. L.J. 155 (Spring 2004).

314. Michael Schuman, *The Real Reason to Worry About China*, TIME, Apr. 28, 2013 available at <http://business.time.com/2013/04/28/the-real-reason-to-worry-about-china/>.

315. Andrea Vittorio, *Limiting Global Warming 'Almost Impossible' Without Limits on Coal in China, Report Says*, BLOOMBERG BNA ENERGY AND CLIMATE REPORT (discussing U.S. Energy Information Administration data).

316. Yang & Cui, *supra* note 312.

317. RICHARD BARON ET AL., POLICY OPTIONS FOR LOW CARBON POWER GENERATION IN CHINA (2012).

318. Lord Ronald Oxburgh, *Capturing the Moment*, PARLIAMENTARY MONITOR, July 21, 2006.

319. *India Country Analysis Brief*, U.S. DEP'T OF ENERGY (2010), <http://www.eia.doe.gov/cabs/india.html>.

320. Ray Purdy, *The Legal Implications Of Carbon Capture And Storage Under The Sea*, 7 SUSTAINABLE DEV. L. & POL'Y 1, Fall 2006, at 23 (citing House of Commons Science and Technology Committee, Meeting UK Energy and Climate Needs: The Role of Carbon Capture and Storage; First Report of Session 2005–06; Volume 1; HC 578-I; Stationary Office Ltd. (2006)).

321. *Id.* at 23.

coal-fired power in India and China will add 3 billion extra tons of CO₂ to the atmosphere every year.³²²

China's demand for electricity will rise 46% by 2020 and double by 2030, according to the International Energy Agency.³²³ China currently depends on coal for two-thirds of its energy, more than any other Group of 20 country except South Africa.³²⁴ In order to avoid shortages and satisfy demand, China would have to increase capacity to approximately 40 GW annually.³²⁵ The recent agreement between China and the U.S. to cap China CO₂ emissions by 2030 would require China to produce either 67 times more nuclear energy than the country is forecast to have at the end of 2014 or 30 times more solar.³²⁶

Countries' recent pledges to fight climate change by cutting their carbon dioxide emissions are unlikely to affect global increases in coal use and emissions. According to the International Energy Agency, global demand still makes coal the fastest-growing fossil fuel and will rise 2.1% annually, driven mainly by China, India and other expanding Asian economies.³²⁷ It will be "almost impossible" for the world to limit global warming to 2° Celsius (3.6° Fahrenheit) unless China puts limits on its coal consumption within the next decade.³²⁸ In China, renewables' share in energy production dropped from 40% in 1971 to 11% today; in 2035, it will likely be just 9%, according to one observer.³²⁹ More than 15% of Chinese wind power was idled in the first half of 2015 because the Chinese grid cannot carry the power.³³⁰

However, for an industry as capital-intensive as electricity production, the levers of finance always matter. The World Bank, the US Export-Import Bank, the European Bank for Reconstruction and Development and

322. *Id.*

323. Feifei Shen & Iain Wilson, *Nuclear Power: China Will Need to Build 1,000 Nuclear Plants to Meet Emissions Reduction Target*, BNA ENERGY & CLIMATE REPORT, Nov. 21, 2014.

324. *Id.*

325. Boon-Siew Yeoh & Rajesh Rajaraman, *Electricity in China: The Latest Reforms*, 17 ELEC. J. 3 (Apr. 2004), available at https://www.researchgate.net/publication/222385326_Electricity_in_China_The_Latest_Reforms.

326. Shen, *supra* note 330.

327. Rick Mitchel, *IEA Says Climate Pledges Won't Halt Global Growth in Coal Demand to 2019*, BLOOMBERG BNA ENV'T REP., Dec. 15, 2014. India, averaging 5% annual coal demand growth, should pass the U.S. as the world's second-biggest coal consumer by 2019; China, the world's biggest producer and importer of coal, has coal demand increase by 2.6%, or 100 million tons, per year to 2019. *Id.* See Rick Mitchel, *IEA Says Climate Pledges Won't Halt Global Growth in Coal Demand to 2019*, BLOOMBERG BNA ENV'T REP, Dec. 15, 2014.

328. Vittorio, *supra* note 315.

329. Lomborg, *supra* note 295.

330. Feifei Shen, *More Idled Wind Turbines in China as Capacity Grows*, BLOOMBERG BNA ENERGY & CLIMATE REPORT, July 2015.

the European Investment Bank have severely limited financing for new coal power projects;³³¹ the Dutch bank Rabobank has ceased lending to unconventional gas projects.³³² “The World Bank in 2013 announced that it would provide money for greenfield coal-fired power stations “only in rare circumstances,” such as where countries have no feasible alternative to coal and lack financing for coal power, or where projects will incorporate carbon capture and storage.”³³³ President Obama ordered a bar on U.S. Export-Import Bank funding of overseas coal-fired power plants in developing nations unless they capture and store their carbon dioxide.³³⁴

However, both developed and developing country institutions of government are ‘sticky.’ The Obama order on the Export-Import Bank was overturned in a U.S. Senate vote 64–29 in July 2015, which vote would bar the U.S. Export-Import Bank from denying an application for financing based on the source of energy used for the project.³³⁵ India, the world’s third most significant emitter of carbon, offered to make sharper cuts in emissions only if rich nations paid it to do so.³³⁶ “Richer nations need to provide \$400 billion to \$2 trillion a year to the developing world by 2050 to help cut greenhouse gases and fight climate change, according to a study by the London School of Economics.”³³⁷ This would be 4–20 times the level pledged by developing countries by 2020, and it still has not been raised.

331. See generally John McGarrity, *Update—EU Finance Arm Curbs Loans to Coal-Fired Power Plants*, REUTERS, July 24, 2013, <http://www.reuters.com/article/2013/07/24/eu-coal-finance-idUSL6NOFU32R20130724>; see also Alex Morales & Marc Roca, *EBRD Scraps Most Financing for Coal Plants*, BLOOMBERG, Dec. 10, 2013, <http://www.bloomberg.com/news/articles/2013-12-10/ebird-scraps-most-financing-for-coal-power-plants>.

332. *Rabobank Bans Loans to Shale Gas and Tar Sands*, CLIMATE SPECTATOR, July 10, 2013, available at <http://www.businessspectator.com.au/news/2013/7/10/energy-markets/rabobank-bans-loans-shale-gas-and-tar-sands>.

333. Murray Griffin, *Australian Energy Efficiency Plan Criticizes World Bank Stance on Coal-Fired Power*, BLOOMBERG BNA ENERGY AND CLIMATE REPORT, Apr. 8, 2015, at 1.

334. Michael D. Shear, *U.S. Says It Won't Back New International Coal-Fired Power Plants*, N.Y. TIMES, Oct. 29, 2013, available at http://www.nytimes.com/2013/10/30/us/us-says-it-wont-back-new-international-coal-fired-power-plants.html?_R=0.

335. See Dean Scott, *Hurdles Seen in Reversing Overseas Coal Ban*, BLOOMBERG BNA ENERGY & CLIMATE REPORT, July 28, 2015, at 1.

336. Uni Krishnan, *India Tells Developed World it will Impose more cuts in Exchange for Cash, Technology*, BLOOMBERG BNA ENERGY & CLIMATE REPORT, Mar. 26, 2015. India’s Environment Minister Prakash Javadekar stated that he may present the world with a choice ahead of the December Kyoto Protocol Conference of the Parties with the proposition that “the world has to decide what they want . . . Every climate action has a cost. I can’t make my poor pay for somebody who has polluted the world.” Uni Krishnan, *India Tells Developed World It Will Impose More Cuts in Exchange for Cash, Technology*, BLOOMBERG BNA ENERGY & CLIMATE REPORT, Mar. 26, 2015, at 1.

337. Alex Morales, *At Least \$400 Billion in Climate Aid Needed for Developing Nations a Year, Study Says*, BLOOMBERG BNA ENERGY & CLIMATE REPORT, Mar. 16, 2015.

C. *The Limits of Current International Regulatory Reach*

Limiting global warming to no more than a 2° Centigrade increase from pre-Industrial Revolution levels will require stabilizing carbon dioxide concentrations in the atmosphere to no more than 450 parts per million (ppm).³³⁸ A decade ago, chief NASA climatologist James Hansen gave the world less than a decade to significantly slow or halt the increase of GHG emissions.³³⁹ Furthermore, Hansen suggests that even a 450 ppm limit would not be sufficient; he forecasts a scenario in which we will exceed the tipping point of runaway global warming once the atmospheric concentration of CO₂ exceeds 400 to 425 ppm.³⁴⁰ The world in 2014 surpassed 400 ppm with levels mounting each additional year. At 450 ppm, Hansen contends there will be no glacial or polar ice left on the planet.³⁴¹

Merely waiting until 2018 to stop the “growth of greenhouse gas emissions” could make it near impossible to avoid catastrophic effects of warming.³⁴² According to Dr. John Holdren, Director of the White House Office of Science and Technology Policy, if U.S. greenhouse emissions somehow were able to plateau in 2015, we would already have reduced our chances of avoiding climate catastrophes by 50%.³⁴³ In 2009, the United Nations forecast the seriousness of coming “tipping points . . . that will alter regional and global environmental balances . . . irreversible within the time span of our current civilization.”³⁴⁴

However, the international legal infrastructure will not get the world there from current international policy. There is no provision in the Kyoto Protocol or its Paris 2015 COP-21 reminted agreement to ensure compliance of any nation that fails to achieve its reductions or violates any provision of the Protocol.³⁴⁵ The Protocol is voluntary and

338. See FERREY, ENVIRONMENTAL LAW, *supra* note 68, at 242. At such modest levels, the degree of warming is not expected to result in radical loss of ice sheet, sea level rise, and shift of agricultural areas. *Id.*

339. See, e.g., James Hansen, *The Threat to the Planet*, N.Y. REV. BOOKS, July 13, 2006, at 9, available at www.nybooks.com/articles/19131.

340. Dean Scott, *NASA Scientist Recalls 1988 Testimony by Seeking Phaseout of Coal-Fired Plants*, 39 BNA ENV'T REP. 1273 (2008).

341. *Id.*

342. Robin Chase, *Get Real on Global Warming Goals*, BOSTON GLOBE, Apr. 22, 2008, at A15.

343. *Id.*

344. 2009 U.N. Env't'l. Programme Y.B. 21 U.N. Doc. UNEP/GC.25/INF/2, at 1, available at <http://www.unep.org/yearbook/2009>.

345. IPCC, Third Assessment Report: Climate Change 2001 (2001) available at http://www.grida.no/publications/other/ipcc_tar/.

unenforceable.³⁴⁶ This lack of international enforcement was a major shortcoming at the Copenhagen COP conference, and was seen by China, India, and other developing countries, as a major victory for their position supporting continuing a lack of international compliance mechanisms affecting them.³⁴⁷ It is of note that U.S. courts do not recognize COP decisions as part of U.S. law nor as precedents that must be followed by the U.S. Environmental Protection Agency.³⁴⁸

Even if all developed countries could achieve a Herculean reduction of 80% of their GHG emissions by 2050, this would not achieve Kyoto Protocol or 2015 Paris COP-21 climate change goals without similar vigorous participation by developing countries.³⁴⁹ By regulating less than 40 of the 193 world countries that signed the Kyoto Protocol, Annex I affects only 20% of all countries, which emit much less than half of world carbon emissions.³⁵⁰ Less than half is not enough.

The international infrastructure for climate change has not evolved significantly in the past seven years of effort. During the mid-year G8 international summit in 2009, India and China again rejected the suggestion of any enforceable controls on their rapidly inflating carbon emissions.³⁵¹ The Copenhagen Conference of the Parties (COP-15) in 2009 tried to set an ambitious global climate change agreement for the post-2012 period, without success,³⁵² Neither the COP-16 in 2010 in Cancun, Mexico, nor any subsequent COP including COP-20 in Lima, Peru in December 2014, nor the recent COP-21 in Paris, France, fared better.

346. The Kyoto Protocol has no compulsory mechanism to enforce any restriction or penalty against any signatory country that fails to achieve its carbon quota. *See generally Kyoto Protocol to the U.N. Framework Convention on Climate Change*, Dec. 11, 1997, 2303 U.N.T.S. 148 (1998) (lacking enforcement mechanisms).

347. *See generally* David Hunter, *Implications of the Copenhagen Accord for Global Climate Governance*, 10 SUSTAINABLE DEV. LAW & POL'Y 2, 4 (Winter 2010).

348. *Id.* at 6.

349. Mohamed T. El-Ashry, *An Overview of this Issue: Framework for a Post-Kyoto Climate Change Agreement*, 8 AM. U. SUSTAINABLE DEV. L. & POL'Y 2 (2008).

350. *See Status of Ratification of the Kyoto Protocol*, *supra* note 33; *see Green House Gas Data*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE, http://unfccc.int/ghg_data/ghg_data_unfccc/items/4146.php.

351. James Kirkup, *G8 Summit: China and India Reject G8 Calls for Climate Targets*, TELEGRAPH, July 8, 2009, <http://i.telegraph.co.uk/news/worldnews/g8/5780617/G8-summit-China-and-India-reject-G8-calls-for-climate-targets.html>; *see also* Quirin Schiermeier, *G8 Leaders Fail to Agree on Carbon Cuts Before 2050*, NATURE NEWS, July 9, 2009, <http://www.nature.com/news/2009/090709/full/news.2009.660.html>.

352. Ian McGregor, *Disenfranchisement of Countries and Civil Society at COP-15 in Copenhagen*, GLOBAL ENV'T POL. (Feb. 2011) at 3, 4. The Copenhagen Conference only produced a thirteen paragraph "political accord" which was not an official product of the meeting, but only "noted" by the Conference because of lack of a consensus among world nations.

In the next five years, there will be a massive investment in electrification of developing nations.³⁵³ Once installed, those power facilities will remain in place, often for forty years and in many cases longer.³⁵⁴ According to Rajendra Pachauri, International Panel on Climate Change Chairman, “What we do in the next two to three years will determine our future.”³⁵⁵ The choices in energy technology made now certainly will be the signature of the world carbon footprint for the remainder of this century.³⁵⁶

If the world is to confront this challenge, the technology is present and the levers of international power are accessible. Unlike fossil fuels, renewable resources are widely disseminated across the globe. While many developing nations have no significant fossil fuel reserves of oil, coal or natural gas, every nation has significant renewable energy in some form, such as hydropower, sunlight, wind, agricultural biomass waste, wood, or ocean wave power. Renewable energy can provide opportunities for poverty alleviation, supply energy, and enhance energy security by relying on domestic resources.³⁵⁷ Regardless of whether RPS, net metering or FiTs are employed, the future of international climate change will be measured on the degree of participation of all nations. This is now a challenge not of technology, but of the resilience of international law and administration. The levers of power must be manipulated more intelligently internationally to avoid the “tipping point.”

353. Michael Wara, *Measuring the Clean Development Mechanism's Performance and Potential*, 55 UCLA L. REV. 1759, 1790–91 (2008).

354. See House of Commons Science and Technology Comm., *supra* note 320.

355. See *2020 Climate Leadership Campaign*, STATE OF THE WORLD, <http://www.worldforum.org/climate-change.htm>.

356. See generally Bill McKibben, *How Close to Catastrophe?*, N.Y. REV. BOOKS, Nov. 16, 2006, available at <http://www.nybooks.com/articles/19596><http://www.nybooks.com/articles/19596> (quoting NASA's James Hansen on the necessity of a radical carbon transformation by 2015).

357. El-Ashry, *supra* note 349, at 3.