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DISTRIBUTED RENEWABLE GENERATION: THE TRIFECTA OF ENERGY SOLUTIONS TO CURB CARBON EMISSIONS, REDUCE POLLUTANTS, AND EMPOWER RATEPAYERS

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I. INTRODUCTION

Averting the disastrous consequences of global climate change will require the United States, and the world, to radically restructure its electricity generation and delivery system.[1] Currently, the combustion of fossil fuels constitutes 73% of electricity generation in the United States.[2] Electricity generation accounts for 34% of U.S. greenhouse gas (GHG) emissions and cost American consumers and businesses $344 billion in 2007.[3] While reducing GHG

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1. *Greenhouse Gases, Climate Change, & Energy*, U.S. ENERGY INFO. ADMIN., http://www.eia.doe.gov/oiaf/1605/ggccebro/chapter1.html (last visited Jan. 26, 2011) [hereinafter *Greenhouse Gases, Climate Change, & Energy*] (discussing electrical generation and contribution to climate change).

2. *Electricity Overview*, PEW CENTER ON GLOBAL CLIMATE CHANGE, http://www.pewclimate.org/technology/overview/electricity (last visited Jan. 26, 2011) (citing high level of electricity generated by fossil fuels).

3. *See id.* (providing statistics related to U.S. electricity generation); *see also* Jason Alexander et al., *An Overview of Global Greenhouse Gas Emissions and Emissions Reduction Scenarios for the Future*, EUR. PARLIAMENT POL'Y DEPARTMENT: ECON. & SCI. POL'Y, 9 (Feb. 2008), http://www.europarl.europa.eu/activities/committees/studies/download.do?file=19411 (noting that global electricity generation accounts for approximately same proportion of global GHG emissions); *Electric Power Annual 2009*, U.S. ENERGY INFO. ADMIN., http://www.eia.doe.gov/cneaf/electricity/epa/epaxlfilees1.pdf (last visited Jan. 27, 2011) (noting cost of electricity generation to American consumers).

emissions to safe levels will require many policy changes, one essential component is the expansion of clean, renewable sources of energy to replace fossil fuel energy sources presently used for electricity production.[4]

In the United States, and throughout the world, electric transmission lines do not currently have sufficient capacity to accommodate a vast expansion and distribution of renewable energy.[5] Increasing transmission infrastructure, while necessary, should be minimized for aesthetic, economic, and environmental reasons.[6] Transmission lines are expensive to build, and procuring right-of-ways can be time-consuming and costly.[7] In addition, the lines often bisect ecosystems, disrupt wildlife migrations, and destroy the natural beauty of wilderness areas.[8] Many of the best renewable energy sources reside in the most scenic and ecologically important places in the United States, such as the Mojave Desert.[9]

If developing renewable resources is essential for saving ecosystems from damage caused by GHG emissions, but the transmission lines required for transporting the electricity from renewable sources also damage ecosystems, are we faced with a choice between the lesser of two evils?[10] One elegant solution to the transmission problem is distributed renewable generation (DRG).[11] DRG is the generation of electricity on-site or near the location where the electricity is consumed.[12] Examples of DRG include solar photovoltaic

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4. *Renewable Energy*, U.S. DEP'T OF ENERGY, http://www.eere.energy.gov/topics/renewable_energy.html (last visited Jan. 27, 2011) (listing various forms of renewable energy).

5. Norma Love, *Transmission Limits Hamper Renewable Energy Plans*, USA TODAY, Mar. 9, 2008, http://www.usatoday.com/money/industries/energy/2008-03-09-renewableenergy_N.htm (discussing insufficient transmission lines for renewable energy expansion).

6. *Id.* (explaining how individuals want renewable energy plants far from their residences).

7. *Id.* (describing time-consuming process of receiving approval for renewable energy plants and transmission lines in addition to expenses).

8. *Id.* (identifying necessity of placing renewable energy plants far from civilization and consequential need for transmission lines to bring power to homes).

9. Ina Jaffe, *A Renewable Energy Debate Heats up in the Mojave*, NPR, Apr. 23, 2010, http://www.npr.org/templates/story/story.php?storyId=126173547 (discussing prevalence of renewable energy sources in Mojave Desert).

10. *See* Love, *supra* note 5 (reporting conflict between saving environment through renewable energy and need for transmission lines traversing areas away from civilization).

11. *Distributed Renewable Generation*, STANDARD RENEWABLE ENERGY, http://www.sre3.com/knowledgeCenter.do?pageId=knowledgecenterdistributedrenewablegeneration (last visited Jan. 27, 2011) [hereinafter *Distributed Renewable Generation*] (providing definition of DRG).

12. *Id.* (explaining concept of DRG).

cells on rooftops; methane capture and conversion at livestock facilities; and locally produced, small-scale wind and geothermal energy capture.[13]

Because the electricity is consumed where it is generated, transmission lines to accommodate DRG either are already in place or need only cover short distances.[14] Transmission and distribution lines still need to be upgraded with superior communication and feedback technologies to accommodate DRG, but these upgrades do not require more space.[15] Given the almost unfathomable scaling of renewables necessary to make deep cuts to GHG emissions, some transmission lines will still be necessary to solve the spatial mismatch between the location of renewable resources and the location of electricity demand, but DRG has the potential to dramatically reduce the number and length of new transmission lines needed for the renewable energy revolution.[16] Notably, DRG minimizes the need for additional transmission infrastructure and siting.[17]

The benefits of DRG extend far beyond reducing the need for new transmission lines.[18] Additional benefits include cost savings for electricity consumers; back-up or supplementary power that reduces the need for more power plants; and decreases in energy loss from long-range transmission.[19] The following paper describes the reasons why more renewable generation is necessary; assesses federal and state policies for encouraging DRG; makes recommendations to reach environmental goals and benefit residential ratepayers; and addresses utilities' concerns about expanding DRG.[20]

13. *Renewable Energy Production Incentive*, U.S. DEP'T OF ENERGY, http://www.epa.gov/lmop/publications-tools/funding-guide/federal-resources/energy.html (last visited Jan. 27, 2011) (listing sources of renewable energy).

14. *See Distributed Renewable Generation*, *supra* note 11 (offering benefits of DRG in relation to transmission lines).

15. *Id.* (discussing technological improvements).

16. *Id.* (discussing overall reduction of transmission lines due to location of DRG).

17. *See Renewable Distributed Distribution Energy Collaborative*, CAL. PUB. UTIL. COMM'N, http://www.cpuc.ca.gov/PUC/energy/Renewables/Re-DEC.htm (last visited Jan. 27, 2011) (explaining usefulness of DRG in minimizing transmission infrastructure). The California Public Utilities Commission estimates that to reach a 33% renewable portfolio standard (RPS), the high distributed generation scenario minimizes the need for new transmission while adding 15,000 megawatts (MW) of distributed solar photovoltaic. *Id.*

18. *See Distributed Renewable Generation*, *supra* note 11 (discussing overall reduction of transmission lines due to DRG location).

19. *Id.* (relating various benefits of DRG).

20. For a discussion of reasons why more renewable generation is necessary, see *infra* Section II. For an assessment of federal and state policies regarding DRG,

II. "BUSINESS AS USUAL" WILL DESTROY LIVING AS USUAL

Human-driven change to the global climate presents one of the greatest challenges and risks facing the world today.[21] Two degrees Celsius is the maximum temperature increase the planet can tolerate before the consequences for humans and the environment will become calamitous and irreversible.[22] Reducing GHG emissions by 50-85% by 2050 will likely stabilize GHG atmospheric concentrations and limit global temperature increases to two degrees Celsius.[23]Polluting industries argue that the data are too uncertain and the solution too expensive to pursue, but this argument undervalues the cost of inaction.[24] The narrow band of uncertainty in the data and projections varies only by how dire the consequences will be, not whether they will occur.[25] Furthermore, the costs to restructure the economy, mitigate damage from climate change, and adapt to a changed environment will only rise in the future.[26]

Known or likely consequences of climate change, such as decreased crop production; decreased fresh water supplies; damaged coastlines; extreme flood and fire damage; and harms to ecosystems and human health, are observable and will become increasingly expensive to address.[27] There is also the possibility of unknown consequences caused by unidentified reverberations and feedback mechanisms that may make climate change even worse than pre-

see *infra* Sections III, IV, and V. For a rebuttal of utilities' concerns about DRG expansion, see *infra* Section VI. For recommendations on reaching environmental goals and benefiting residential ratepayers, see *infra* Section VII.

21. *See Greenhouse Gases, Climate Change, & Energy*, *supra* note 1 (discussing power generation and contribution to climate change).

22. *See Climate Change 2007: Synthesis Report*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 51, 53-54, 67 (Nov. 2007), http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf [hereinafter *Climate Change 2007: Synthesis Report*] (revealing global consequences of slight temperature increases).

23. *Id.* (noting effects of reduction in GHG emissions on global temperature). This calculation could be optimistic or overstated, but it is the best scientific estimate currently available. *Id.*

24. Anne Minard, *Global Warming Inaction More Costly Than Solutions?*, NAT'L GEOGRAPHIC NEWS, Sept. 24, 2007, http://news.nationalgeographic.com/news/2007/09/070924-global-warming.html (arguing that regardless of whether global warming is real, preemptive measures should be taken).

25. *See Climate Change 2007: Synthesis Report*, *supra* note 22 (acknowledging uncertainties in findings).

26. *See* Minard, *supra* note 24 (describing potential effects of climate change).

27. *Global Warming Effects Map*, NAT'L GEOGRAPHIC, http://environment.nationalgeographic.com/environment/global-warming/gw-impacts-interactive/ (last visited Jan. 27, 2011) (delineating consequences of climate change worldwide).

dicted.[28] An ounce of prevention may have been worth a pound of the cure decades ago, but because "the data are too uncertain" arguments previously prevailed, now the costs of shifting our economy are only dwarfed by the rising costs of doing nothing—for every year we delay, the costs will continue to climb.[29] The energy choices already made are too expensive, the status quo too harmful, and the real risks too high for business as usual to continue.[30]

For example, coal extraction and coal-fired power plants have tremendous consequences beyond carbon emissions.[31] The National Academy of Sciences estimated that the damage to human health, crops, forestry, and recreation from SO_2, NO_x, and particulate matter from coal-generated electricity cost society $62 billion in 2005.[32] Coal-fired power plants, which have caused increased incidence of asthma and other respiratory illnesses, account for most of these costs.[33] Such estimates do not even include damage from pollutants other than SO_2, NO_x, and particulate matter emitted during coal extraction and generation, nor do the estimates account for the external costs of coal mining and extraction.[34] For instance, coal plants spew lead and mercury into the ambient air and water bodies.[35] Moreover, most of the solid waste created by coal plants, including ash and sludge from the smokestack scrubber, is disposed of in unlined, unmonitored onsite landfills.[36] This solid waste contains many toxic substances, including arsenic, mercury, chromium, lead, and cadmium, which have contaminated drinking water sup-

28. *See* Minard, *supra* note 24 (explaining how scientists are still studying effects of global warming).

29. *Id.* (discussing costs of delay).

30. *Id.* (emphasizing urgency of situation).

31. NATIONAL RESEARCH COUNCIL, COMMITTEE ON HEALTH, ENVIRONMENTAL, AND OTHER EXTERNAL COSTS AND BENEFITS OF ENERGY PRODUCTION AND CONSUMPTION, *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use* 4-7 (The National Academies Press 2010) [hereinafter NATIONAL RESEARCH COUNCIL] (discussing consequences from coal power plants aside from carbon emissions).

32. *See id.* at 6-7 (estimating damages and costs of coal-generated electricity).

33. *Id.* at 5 (discussing sources of cost increases).

34. *Id.* at 6, 78 (mentioning harmful consequences of coal-generated electricity excluded from societal cost estimates).

35. Steven Gilbert, *Coal Ash: Truly Hazardous*, THE SALT LAKE TRIB., Nov. 18, 2010, http://www.sltrib.com/sltrib/opinion/50680917-82/coal-ash-epa-waste.html.csp (discussing hazardous compounds in coal ash).

36. *The Costs of Coal*, UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/clean_energy/technology_and_impacts/impacts/the-costs-of-coal.html (last visited Jan. 27, 2011) (depicting coal-generated electricity's effect on global warming); *see also Environmental Impacts of Coal Power: Wastes Generated*, UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/clean_energy/coalvswind/c02d.html (last visited Jan. 27, 2011) [hereinafter *Environmental Impacts of Coal Power*] (explaining coal plant waste disposal processes).

plies and caused damage to human organs and nervous systems, greatly increasing cancer risks.[37]

The enormous damage to ecosystems from mountaintop mining and coal extraction compounds the high, externalized costs of coal.[38] Even if carbon capture and sequestration materialize on a grand scale, there is still no such thing as "clean coal."[39] Even if reducing pollution from other sectors of the economy could wholly address climate change, burning coal to produce electricity would still be a costly and undesirable option.[40] Thus, transitioning towards renewable, cleaner sources of electricity will provide greater energy security, energy price stabilization, and decreased air and water pollution, in addition to mitigating current and future harms from climate change.[41]

Siting renewables still draws some resistance due to concerns related to aesthetic taste, noise pollution, and wildlife preservation.[42] Renewable resources also are not technically carbon-free for their full lifecycles because manufacturing renewable energy equipment, such as solar panels, wind turbines, and geothermal pumps, is energy-intensive.[43] The negative attributes of renewable power generation, however, still pale in comparison to the detriments of traditional fossil fuel combustion.[44] Although distributed generation presents some challenges, DRG provides the benefits of renewable resources, can be easier and cheaper to site, and has a lower

37. *See* Charles Duhigg, *Clean Water Laws Are Neglected, at a Cost in Suffering*, N.Y. TIMES, Sept. 12, 2009, http://www.nytimes.com/2009/09/13/us/13water.html (suggesting various human health risks from toxic waste); *see also Environmental Impacts of Coal Power*, *supra* note 36 (illuminating various ill-effects of waste to human health).

38. David A. Fahrenthold, *Scientists Say Mountaintop Mining Should Be Stopped*, WASH. POST, Jan. 8, 2010, http://www.washingtonpost.com/wp-dyn/content/article/2010/01/07/AR2010010702530.html (discussing additional environmental impacts from coal mining).

39. Bryan Walsh, *Exposing the Myth of Clean Coal Power*, TIME, Jan. 10, 2009, http://www.time.com/time/health/article/0,8599,1870599,00.html (arguing that there is no such thing as clean coal).

40. *Id.* (discussing expense and other problems associated with coal usage).

41. *See Distributed Renewable Generation*, *supra* note 11 (offering benefits of renewable energy).

42. *See* Love, *supra* note 5 (discussing reasons for opposition to renewable energy siting).

43. World Res. Inst., *What is a Carbon Footprint?*, SAFECLIMATE.NET, http://www.safeclimate.net/calculator/what_is_cf.php (last visited Jan. 27, 2011) (explaining concept of carbon footprint).

44. *See* Minard, *supra* note 24 (discussing how taking steps now towards stemming global warming can go long way).

carbon footprint for installation and operation than concentrated renewable generation, such as large solar or wind farms.[45]

The status quo for electricity production is a zero sum game—revenues to polluting industries come at the expense of downwind and downstream public health.[46] Restructuring the economy towards a greater reliance on renewable resources will still power the economy and provide revenue to new industries, while also protecting the public, the environment, and the planet as we know it.[47] If consumers of non-renewable energy could become producers of renewable energy, this transformation would dramatically hasten the transition to clean energy.[48] DRG provides the vehicle to drive this bargain.[49]

III. NET METERING PROVIDES A SIGNIFICANT INCENTIVE FOR SMALL-SCALE DRG

Most electricity customers need incentives or financing to install renewable generation at their homes or businesses due to large upfront capital costs.[50] Under a net metering policy, utilities provide credit, or cash payment under "net billing," to a customer-generator for any electricity produced in excess of consumption.[51] Most state statutes define a net-metered system as "intended to offset part or all of the customer-generator's electricity requirements."[52] Net metering policies vary, but a common example would be that of a residential ratepayer who generates 120 kilowatt-hours (kWh) in a month, but only uses 100 kWh.[53] In this case, the

45. *See Distributed Renewable Generation, supra* note 11 (offering benefits of DRG).

46. *See* Minard, *supra* note 24 (relating economic and environmental reasons for taking action).

47. *See Distributed Renewable Generation, supra* note 11 (describing benefits of renewable energy).

48. *See* Minard, *supra* note 24 (discussing advantages of consumers becoming renewable energy producers).

49. *See Distributed Renewable Generation, supra* note 11 (noting DRG's potential role in societal transition to clean energy).

50. Matthew L. Wald, *Cost Works Against Alternative and Renewable Energy Sources in Time of Recession*, N.Y. TIMES, Mar. 28, 2009, http://www.nytimes.com/2009/03/29/business/energy-environment/29renew.html (identifying expense of renewable energy technology).

51. *Net Metering*, THE SOLAR GUIDE, http://www.thesolarguide.com/energy-intro/net-metering.aspx (last visited Jan. 27, 2011) [hereinafter *Net Metering*] (explaining how net metering works).

52. *Incentives/Policies for Renewables & Efficiency*, Database of State Incentives for Renewables & Efficiency, http://www.dsireusa.org/incentives/index.cfm (last visited Jan. 27, 2011) (describing intent of state statutes regarding net metering).

53. *Id.* (listing different state statutes providing for net metering).

meter would run backwards, and the utility would credit the ratepayer 20 kWh usable on a future billing cycle until the end of the year, at which time any unused credits would expire.[54] Under some programs, the ratepayer would receive a cash payment for the excess credits at the end of the year.[55] While some states mandate net metering, others ban the practice entirely, and a host of policies exist in between these two extremes.[56]

Net metering is one of the most important incentives for electricity consumers to install DRG.[57] Increasing adoption of DRG through well-crafted net metering programs will accomplish many policy goals simultaneously.[58] The primary benefits include lowering electric bills; decreasing transmission and distribution costs; decreasing the need for new transmission capital; bringing renewable sources on-grid quickly; reducing environmental impacts of concentrated energy infrastructure; conserving water; and decreasing GHG emissions.[59]

Net metering is a key driver of solar installation in particular.[60] As shown by the graphs below, most of the solar photovoltaic (PV) installations in the United States are non-residential systems connected to the grid, although residential systems outpower utility-run solar farms.[61] While non-residential systems produced more power than residential systems because the former are much larger, residential systems account for 90% of the number of installations in recent years.[62]

54. *See Net Metering, supra* note 51 (providing example of how to reach net bill or value).

55. *Id.* (explaining how some net metering programs actually pay customer-generators for excess credits).

56. *See Net Metering Map*, DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/documents/SummaryMaps/Net_Metering_map.ppt#256 (last visited Jan. 27, 2011) (depicting diverse net metering policies nationwide).

57. *See* Wald, *supra* note 50 (discussing expense of renewable energy).

58. *See Distributed Renewable Generation, supra* note 11 (explaining policy goals achievable through greater DRG prevalence).

59. *Id.* (listing primary benefits of DRG adoptions).

60. *See Net Metering, supra* note 51 (noting benefits of net metering).

61. *2009 Updates and Trends*, INTERSTATE RENEWABLE ENERGY COUNCIL, 11-12 (Oct. 26, 2009), http://irecusa.org/wp-content/uploads/2009/10/IREC-2009-Annual-ReportFinal.pdf [hereinafter *2009 Updates and Trends*] (showing various non-residential PV systems).

62. *Id.* at 15 (qualifying relationship between residential and non-residential systems).

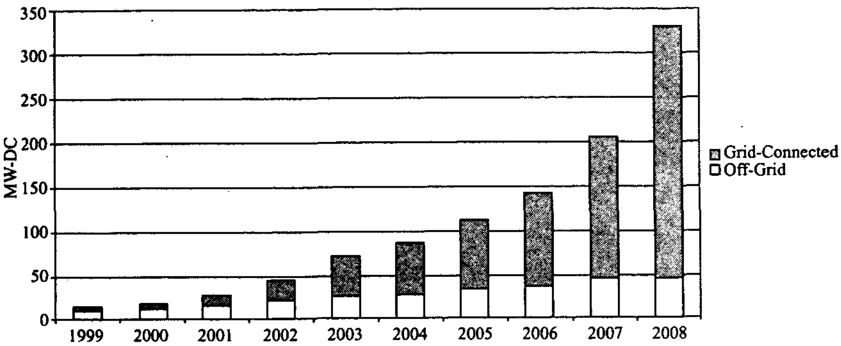

FIG. 1: CAPACITY OF ANNUAL U.S. PHOTOVOLTAIC INSTALLATIONS (1999-2008)

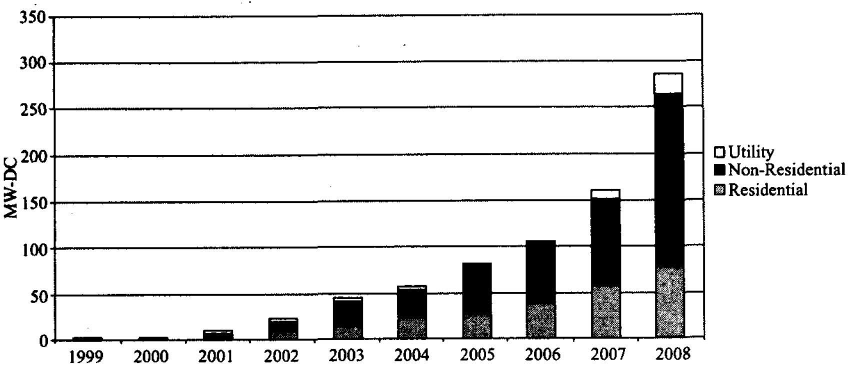

FIG. 2: ANNUAL INSTALLED PHOTOVOLTAIC CAPACITY BY SECTOR (1999-2008)

The National Association of Regulatory Utility Commissioners (NARUC) supports expanding DRG and notes numerous public benefits. These benefits include cost control; improvements to the efficiency and reliability of the distribution system; increased competition in transmission and distribution-constrained regions; reduced total electric generation costs; enhanced customer choice; increased output from sunk costs such as transmission and distribution equipment; environmental benefits; and increased speed of new power production.[63] Benefits of DRG for all stakeholders include peak demand reduction and reduced transmission and distri-

63. Garry Brown, Chairman, N.Y. State Pub. Serv. Comm'n, Testimony before U.S. Senate Subcomm. on Energy: Net Metering, Interconnection Standards, and Distributed Generation 3 (May 7, 2009), *available at* http://energy.senate.gov/public/_files/090505NARUCBrownTestimonyFINAL.doc [hereinafter Brown Testimony] (listing public benefits of distributed generation applications and technologies).

bution line loads and losses.[64] NARUC also recognizes that net metering provides "a direct, inexpensive, and easily-administered mechanism for encouraging the customer installation of small-scale renewable energy facilities."[65] Net metering reimburses customer-generators for the value of all or most of the power produced without the huge expense of batteries for storage.[66] Accordingly, NARUC has worked with the Federal Energy Regulatory Commission (FERC) and individual state public utility commissions (PUCs) to improve interconnection standards and remove barriers to entry for DRG, with significant success in the past few years.[67]

Commercial and industrial user benefits from DRG and net metering are potentially even greater than benefits for residential consumers. In North Carolina, for example, biomass from animal waste and landfills are plentiful sources of renewable energy due to the state's large number of hog farms and other livestock industries. North Carolina tried launching a "Swine Farm Methane Capture Pilot Program" that was set to bring forty-eight farms online to produce electricity in 2010, but no projects are yet up and running due to the economic downturn and insufficient resources.[68] Despite such setbacks, the potential payoffs of methane capture are enormous, particularly for North Carolina.[69] For one, some experts predict methane capture will become cheaper than new coal or nuclear plants.[70] Furthermore, rate and energy security benefits

64. *Id.* (discussing technological and economic benefits to electricity system).

65. *Id.* at 5 (describing incentives provided by net metering).

66. Christopher Cook, Managing Director, Sunworks, LLC, Testimony before U.S. Senate Subcomm. on Energy: Net Metering and Interconnection Standards 2 (May 7, 2009), *available at* http://energy.senate.gov/public/_files/ChrisCook Testimony.pdf [hereinafter Cook Testimony] (discussing options when excess energy is produced).

67. Brown Testimony, *supra* note 63, at 3-4 (discussing progress made following implementation of interconnection standards).

68. *Methane Capture Pilot Program*, N.C. DIVISION OF SOIL & WATER CONSERVATION, http://portal.ncdenr.org/web/swc/methanecapturepilotprogram (last visited Feb. 9, 2011) (noting that farm methane projects are not yet online); *see also Report to the Environmental Review Commission and Joint Legislative Utility Review Committee January 2010*, N.C. UTIL. COMMISSION, 3 (Jan. 2010), http://www.ncuc.commerce.state.nc.us/reports/MCPP_Joint_Report_2010.pdf (identifying reasons for setbacks in farm methane program).

69. Alex Hobbs, Presentation before Environmental and Economic Benefits of Capturing Swine Manure Methane Workshop: NC Distributed Generation Interconnection and Net Metering 6 (Sept. 18, 2008), *available at* http://www.epa.gov/agstar/documents/workshop08-1/hobbs.pdf [hereinafter Hobbs Presentation] (discussing economic impact of methane capture).

70. *Id.* (discussing rate impact estimate).

will remain in state and strengthen rural communities.[71] Importantly, methane capture will also help mitigate pollution from the hog and poultry industries, improve air and water quality, and reduce greenhouse gas emissions by millions of tons per year.[72]

Combined heat and power (CHP) plants are a variation of distributed generation that reduces GHGs and energy use by capturing and reusing energy from heat that would otherwise be lost.[73] Because industries using CHP are likely to still need energy from the grid, favorable interconnection standards and net metering policies are critical incentives for CHP retrofits and adoption.[74] The variety of potential sources makes CHP an attractive form of distributed generation. The U.S. Department of Energy has supported over 350 CHP projects, including locations such as farms, prisons, residential developments, schools, industrial plants, and commercial buildings.[75]

Net metering policies that favor DRG also provide benefits to government policy makers and regulators. Many state and local governments, especially in the Colorado River Basin, suffer from large-scale water shortages and face permitting fights for power generation and transmission.[76] DRG mitigates the need for governments to take on either of these thorny issues.[77] DRG reduces the need for new transmission lines by generating power where it is consumed and connecting to existing infrastructure. Coal and nuclear plants and many large-scale renewable plants consume huge amounts of water as part of their operation.[78] In contrast, the most likely candidates for DRG are solar PV, wind, and geothermal

71. *See generally* Hobbs, *supra* note 69 (discussing economic impact of methane capture).

72. *Id.* (noting environmental impact of methane capture).

73. *Combined Heat and Power (CHP)*, GREENPEACE UK, http://www.greenpeace.org.uk/climate/solutions/combined-heat-and-power-chp (last visited Jan. 27, 2011) (discussing efficiency of combined heat and power plants).

74. Cook Testimony, *supra* note 66, at 8-9 (discussing growing need for interconnection rules).

75. *Combined Heat and Power Projects*, U.S. DEPARTMENT OF ENERGY, http://www1.eere.energy.gov/industry/distributedenergy/chp_projects.html (last visited Feb. 9, 2011) (identifying Department of Energy-sponsored projects).

76. Todd Woody, *Alternative Energy Projects Stumble on a Need for Water*, N.Y TIMES, Sept. 29, 2009, http://www.nytimes.com/2009/09/30/business/energy-environment/30water.html?_r=1 (identifying public divide over water shortages and government involvement).

77. *Id.* (discussing water efficiency of various technologies).

78. Woody, *supra* note 76 (summarizing water usage at various forms of power plants). Concentrated solar projects, biofuel refineries, coal scrubbers, coal plant cooling operations, solar thermal (with wet cooling), and nuclear plants are all water-intensive technologies. *Id.*

power, which require relatively small amounts of water.[79] Thus, DRG reduces the strain on overtaxed water supplies compared with other sources of power.

IV. THE CURRENT REGULATORY ENVIRONMENT FOR DRG VARIES GREATLY BY STATE

In 2007, for the first time, new renewable (non-hydro) capacity outpaced new fossil fuel capacity.[80] The federal government has become increasingly receptive to calls for renewable generation, and new policies favor its development.[81] DRG facilities usually fall outside of FERC jurisdiction, however, because FERC does not generally cover local distribution facilities.[82] Federal law, through the Public Utility Regulatory Policies Act (PURPA), requires utilities to allow any independent power producer that is a "qualified facility" (QF) to be interconnected with the grid, and utilities must purchase any excess electricity QFs generate.[83] Individual customers are not considered QFs under PURPA.[84] Through net metering programs, however, many states have required utilities to accept power from small-scale residential, community, or commercial customer-generator systems, such as wind and solar PV, and credit this power against the customer-generator's utility bill.[85]

Net metering rules are generally subject to state or local jurisdiction unless the generator sells electricity on the wholesale market, which triggers FERC jurisdiction.[86] FERC considers a transaction "wholesale" if the generator produces more energy than

79. *Id.* (discussing less efficient technologies which use less water); *see also Electric Power Annual*, U.S. ENERGY INFO. ADMIN., Jan. 4, 2010, http://www.eia.doe.gov/cneaf/electricity/epa/epa_sum.html [hereinafter *Electric Power Annual*] (describing different types of DRG technologies).

80. *Electric Power Annual*, *supra* note 79 (describing current trends in energy usage).

81. *Energy Efficiency*, U.S. DEP'T OF ENERGY, http://www.energy.gov/energyefficiency/index.htm (last visited Jan. 27, 2011) (explaining Department's commitment to renewable energy and energy efficiency).

82. Kevin A. Kelly, Director, Div. of Policy Dev., Office of Energy Policy & Innovation, Fed. Energy Regulatory Comm'n, Testimony before U.S. Senate Subcomm. on Energy 1, 4 (May 7, 2009), *available at* http://energy.senate.gov/public/_files/KevinKellyTestimonyFinal.pdf [hereinafter Kelly Testimony] (explaining how FERC interpreted FPA to limit number of local distribution facilities that could obtain generator interconnections).

83. *Id.* at 7 (describing qualified facility interconnections system).

84. *What is a Qualifying Facility?*, FED. ENERGY REG. COMM'N., http://www.ferc.gov/industries/electric/gen-info/qual-fac/what-is.asp (last visited Jan. 27, 2011) (defining qualifying facilities).

85. Kelly Testimony, *supra* note 82, at 5-6 (discussing state requirements imposed through net metering programs).

86. *Id.* at 5 (describing jurisdictional issues surrounding net metering).

it needs and sells excess energy to a utility over the applicable billing period.[87] For generators who make net sales on the wholesale market, the generator must comply with Federal Power Act (FPA) requirements for wholesalers, unless it is a QF under PURPA.[88] If a generator qualifies as a QF, it must follow the requirements of PURPA.[89] If an electric utility purchases a QF's total output, the terms of interconnection are within state authority. On the other hand, if a QF reserves the right to sell or sells any of the QF's output to an additional entity, FERC exercises authority over the rates, terms, and conditions of the QF's interconnection.[90] Net metering customers using distributed generation must seek to connect to distribution lines (generally outside of FERC jurisdiction) and must apply to the state public utility commission or the local utility.[91]

Forty-three states and the District of Columbia have net metering policies in place, the most recent of which is Alaska.[92] Many of these state laws address the treatment of net excess generation and renewable energy credit (REC) ownership of community- and third-party-owned DRG systems.[93] Some states require utilities to pay individual customer-producers at market retail rate for the excess power they produce. By purchasing excess electricity production and providing backup power for customers' DRG systems, customer-generators are able to use the electric grid as a battery that stores excess capacity.

States are free to institute net metering policies independent of PURPA's QF regime and "avoided cost" price mandate for selling electricity back to the grid. California's net metering law, for example, does not refer to PURPA and independently establishes customer-generators as a new class of customers eligible for net metering, regardless of PURPA's requirements.[94] New York and

87. *Id.* at 5-6 (discussing precedent set by FERC's decision in MidAmerican Energy Co., 94 FERC ¶ 61,340 at 62,263 (2001)).

88. *Id.* at 6 (distinguishing between FPA and PURPA coverage).

89. *Id.* (stating that PURPA governs qualified facilities).

90. Kelly Testimony, *supra* note 82, at 7 (discussing federal regulations' preemption of state laws when qualified facilities are involved).

91. *See id.* at 6 (noting that Department of Energy defines "distributed generation" as "electric generation feeding into the distribution grid instead of the transmission grid").

92. *2010 Updates & Trends*, INTERSTATE RENEWABLE ENERGY COUNCIL, 8 (Oct. 11, 2010), http://irecusa.org/wp-content/uploads/2010/10/IREC-Annual-Trends-Report-10-1-10_web.pdf [hereinafter *2010 Updates & Trends*] (setting forth national net metering trends).

93. *Id.* (noting elements of existing state net metering policies)

94. *See generally Cal. Pub. Util. Code. § 2827* (West 2011) (evidencing states' ability to avoid PUPRA requirements).

many western states, including California, Montana, Nevada, Oregon, Utah, and Washington, all enacted net metering legislatively.[95] Other states have enacted net metering by regulatory commission. Even if a state enacts net metering under PURPA, no money changes hands between customer-generators when the utility issues customers "credits" for excess generation beyond their usage. This non-monetary exchange of electricity does not implicate PURPA's "avoided cost" mandate, so states have flexibility to determine the rate at which utilities must reimburse consumers for net excess generation.

Most states have a renewable portfolio standard (RPS), and state policies vary on the interplay among the RPS, distributed generation, and net metering. The most favorable policy towards DRG would require utilities to meet a high RPS (20% +); give utilities extra credit for DRG towards meeting its RPS; require utilities to pay the retail rate for excess electricity delivered through net metering; and develop consumer-friendly education and financing to adopt DRG. No state has all four of these policy incentives, but many states, nonetheless, have strong enough incentives to encourage rapid deployment of DRG. Washington, Virginia, Utah, and Delaware offer increased credit towards RPS mandates for solar or customer-sited renewable energy.[96] A few states, however, such as Alabama, still allow electric utilities to impose exit fees on industrial customers who transition to generating their own power, which actively discourages DRG and CHP.[97]

Nearly all states impose caps on DRG as a percentage of a utility's total sales. Under a cap, a utility need not bring additional DRG on-grid if it already accepts power from customers in a designated proportion to the cap. As DRG becomes more popular, some states, such as California, are running up against the cap.[98] In or-

95. Nelson P. Holmberg, *Distributed Generation Gives Utilities Reason to Consider Net Metering*, TRANSMISSION & DISTRIBUTION WORLD (June 30, 2004), http://tdworld.com/news/distributed-generation-net-metering (listing states that have opted for legislative implementation of net metering).

96. *See Freeing the Grid*, NETWORK FOR NEW ENERGY CHOICES, 94-99 (Oct. 2008), http://www.newenergychoices.org/uploads/FreeingTheGrid2008_report.pdf [hereinafter *Freeing the Grid*] (detailing state incentives for customer-generated renewable energy).

97. Irene Kowalczyk, Director of Energy Policy & Supply, MeadWestvaco Corp., Testimony before U.S. Senate Subcomm. on Energy 8 (May 7, 2009), *available at* http://www.ieca-us.com/documents/MWVIECACHPWrittenTestimonyMay72009Senate.pdf [hereinafter Kowalczyk Testimony] (discussing state policies that discourage self-generating).

98. Jennifer Kho, *Solar Showdown Looms in California*, N.Y. TIMES GREEN BLOG (June 9, 2009, 1:17 PM), http://green.blogs.nytimes.com/2009/06/09/solar-

der to prevent a solar installation slow-down, California negotiated that Pacific Gas & Electric (PG&E) temporarily increase its DRG cap 1% above the current 2.5% limit until new legislation raises the cap.[99] Ohio recently removed its 1% cap, thus requiring utilities to accept any new qualified DRG from customers.[100] Meanwhile, New York caps the amount of DRG that utilities must accept at 1.3% of each utility's peak load.[101] Opponents to increasing DRG caps argue that more net metering could reduce the stability of the grid and raise costs for other customers who are not generating their own power.[102] Section VI, *infra*, addresses this concern.

Reimbursement policies for net excess generation vary. New York requires utilities to credit residential and farm customers for all excess generation during a twelve-month period at the market or wholesale rate.[103] Similarly, Ohio's four major electric utilities are required to refund customer-generators for any remaining credits at the end of the year.[104] Some states leave reimbursement rates up to the utility or do not require reimbursement at all beyond the non-monetary credits provided during a twelve-month billing cycle.

Several publicly-owned utilities strongly encourage DRG. For example, two utilities in Washington state, Clark Public Utilities and Snohomish County PUD, buy excess electricity from DRG at the full retail rate. Sacramento Municipal Utility District (SMUD) also buys solar power from its customers at the full retail rate.[105] SMUD's "PV Pioneer Program" was an early leader in net metering, installing nearly 600 systems on customers' roofs. Under the innovative program that began in 1993, SMUD purchased, installed, owned, and operated 2 to 4 kilowatt (kW) solar PV systems on volunteer

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showdown-looms-in-california (reporting concerns that give rise as DRG practices expand).

99. *PG&E Net Metering Cap to be Raised*, RENEWABLE ENERGY WORLD.COM (Oct. 29, 2009), http://www.renewableenergyworld.com/rea/news/article/2009/10/pg-e-net-metering-cap-to-be-raised (discussing California's method for increasing cap requirements).

100. *See* Office of the Ohio Consumers' Counsel, *Consumers' Fact Sheet: Renewable Energy Sources Net Metering* 2 (2010), http://www.pickocc.org/publications/renewable_energy/Net_Metering_Basics.pdf [hereinafter Office of the Ohio Consumers' Counsel] (discussing Ohio's method for avoiding cap requirements).

101. *See* Brown Testimony, *supra* note 63, at 7 (summarizing New York's capping procedure).

102. *See* Kho, *supra* note 98 (illuminating counterarguments to increasing cap).

103. *See* Brown Testimony, *supra* note 63, at 7 (describing utility generation credits for residential and farm customers).

104. *See* Office of the Ohio Consumers' Counsel, *supra* note 100, at 2 (mentioning Ohio customer-generators' credit refund).

105. *See* Holmberg, *supra* note 95 (detailing SMUD system of refund).

customers' roofs. Today, SMUD customers purchase their own PV systems and reap the savings themselves, taking advantage of SMUD's volume purchases, which reduces customers' costs.

V. SEVERAL REGULATORY BARRIERS REMAIN

Although forty-three states and D.C. have a net metering policy in place, these policies vary widely in their effectiveness. In its annual report, the Interstate Renewable Energy Council (IREC) rates only thirteen states as an "A," with the rest needing varying levels of improvement.[106] Common barriers include small system size limits, tight caps on aggregate capacity, inadequate payment to customer-generators, poor interconnection standards, and net metering bans.[107]

NET METERING GRADES PER "FREEING THE GRID 2009"
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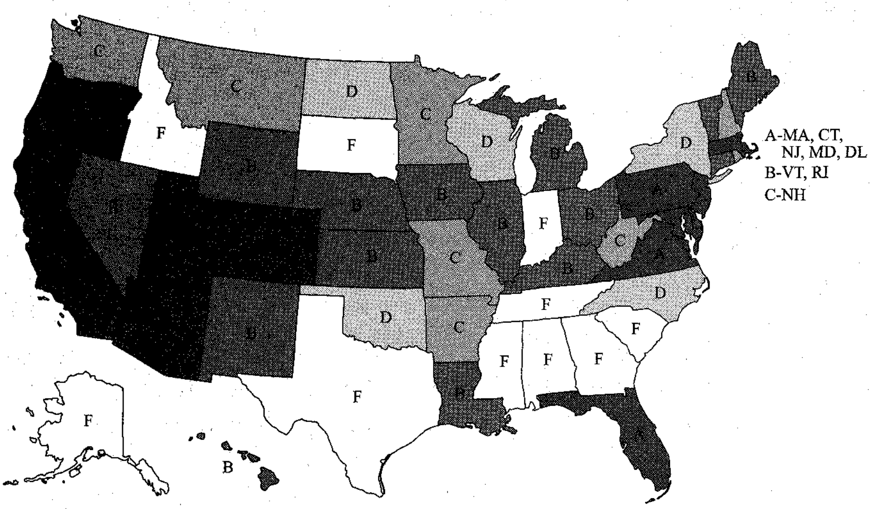

In the spring of 2009, the Texas Legislature introduced HB 1243, which would have provided a minimum repayment for net metering of at least 80% of the retail price. While this reimbursement level is much less generous than many states, it was still too great a lift to overcome utility resistance.[108] The Association of Electric Companies of Texas urged the Texas Legislature to adopt a

106. *See 2009 Updates and Trends*, *supra* note 61, at 24-25 (stating that 2010 grades have not been finalized as of October 18, 2010).

107. *Id.* (listing common barriers to effectiveness of net metering policies).

108. *See Go Solar: Make Utilities Give Consumers a Fair Price for Surplus Electricity*, ENV'T TEX. BLOG (May 9, 2009, 3:08 PM), http://www.environmenttexas.org/

net billing model under which customers would pay for transmission and distribution costs of all the power they took off the grid, even if they offset some of that usage, and utility companies would compensate customers at full market value for their surplus power.[109] TXU and Reliant, two investor-owned utilities, also urged the legislature to adopt amendments that would have credited customer-generated electricity at wholesale rates and limited the size and scope of net metering to 10 kW residential systems (excluding school, community, retail, and commercial systems). Texas ended up forgoing any legislation on net metering in 2009.

In contrast to Texas, Massachusetts recently extended reimbursement at retail rates to customer-generators with projects up to two megawatts.[110] Previously, customer-generators in Massachusetts could only sell excess power at wholesale rates for projects up to 60 kW. In addition, Massachusetts extended coverage under its net metering program to town and state facilities. Massachusetts's program expansion reflects overall trends of state net metering policies over the last few years.

State policies continue to evolve in this area, mostly towards more favorable net metering policies and interconnection standards, but there is still a long way to go before building DRG is economically viable throughout the country.[111] State or utility-level barriers to DRG often include burdensome interconnection requirements that result in the unfair treatment of non-utility distributed generation, bundled distribution service tariffs, additional fees, and ambiguous jurisdictional authority.[112] While directly addressing such barriers should be a priority as well, strong net metering policies strengthen DRG's position as a worthwhile investment for residential, commercial, and industrial electricity consumers. Uncertainty in reimbursement, restrictions on system size, and administrative burdens and fees undermine efforts to increase DRG.

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blog/home/go-solar-make-utilities-give-consumers-a-fair-price-for-surplus-electricity (discussing resistance to HB 1243 by electric companies TXU and Reliant).

109. *See Net Metering as Basis for Surplus Power Compensation*, ASS'N OF ELECTRIC COMPANIES OF TEX., INC. (Mar. 2009), http://www.aect.net/documents/2009/20090323_81_HB1643_NetMetering.pdf (recommending adoption of new net billing model for Texas).

110. *See* Steve LeBlanc, *Mass. Homeowners Can Now Sell Back Electricity*, SEATTLE TIMES, Nov. 30, 2009, http://seattletimes.nwsource.com/html/businesstechnology/2010391471_apusrenewableenergymassachusetts.html (contrasting Texas and Massachusetts retail rates).

111. *See generally 2010 Updates & Trends*, *supra* note 92 (highlighting progress made in various states).

112. Brown Testimony, *supra* note 63, at 4 (describing unfairness of state and utility-level barriers to DRG).

VI. ADDRESSING STAKEHOLDERS' CONCERNS

Despite the benefits of DRG and net metering expressed in Section II, *supra*, some states still resist both. This resistance is due in large part to investor-owned utilities' (IOUs) fears of losing revenues from net metering policies. In order to move forward, various policy adjustments may garner IOUs' favor, or at least neutrality. In addition, there is concern that allowing net metering will favor customer-generators to the detriment of other customer classes. Addressing this concern is important both as a matter of good policy and public perception.

A. Public- and Investor-Owned Utilities

Some investor-owned utilities oppose net metering on the belief that small-scale production will cut into their revenues, and integrating numerous small systems will impose significant costs. Other utilities have embraced net metering voluntarily, however, due to benefits including cost avoidance of new power generation; increases in the reliability of the grid; and infusion of power at peak times when utility generation costs are highest. Net metering is an easier sell to public utilities that do not aim to make a profit for shareholders and, therefore, have less to lose if DRG nets less short-term revenue.

Regulatory frameworks vary greatly among states. The general practice of utility ratemaking consists of the utility presenting its capital, operating, and maintenance costs and a set return on these expenditures to the state PUC for approval. If IOUs do not recover capital outlays through volume sales, they become "stranded costs" for the IOUs, which cannot be recovered without raising rates or fees. Changing an IOU's volume of sales between rate cases affects its expected profit and shareholder returns. Thus, IOUs are particularly sensitive to policies, such as net metering or energy efficiency programs, which could potentially decrease their sales volumes.

Even though decreasing volume may not in the long-run impose costs on the utility, in the short-run, consumer gains may come from the utility's losses because the rates were set based on a projected volume that did not include the new policy change. Ratemaking sets up a loose contract: X sales at Y price. Consumer savings are the result of lower consumption, which slices into the utilities' expected revenues. In states that allow this procedure, IOUs are likely to request a "true-up" for lost volumes in between rate cases, which would result in higher electric bills for non-DRG customers and reduced savings for DRG customers. At the next ratemaking, the utility can revise and lower expectations for volume sales, as well as account for the benefits of avoided costs of new generation.[113] In the end, all costs are variable.

Although electric utilities' revenues have decreased since the recent recession began, costs have also sharply declined. Capacity margins have eased and utilities have avoided pricey peak demand as electricity sales volumes have dipped. In addition, power plant construction costs have fallen.[114] Despite utilities' concerns, most electric utilities have opted for relatively few rate cases since the recession hit, indicating that a full accounting may not reflect the losses that industry trade groups allegedly fear. Price adjustment mechanisms, such as true-ups, rate cases, and numerous price adjustments triggered by changes in costs, remain at utilities' disposal when they experience real losses. Overall industry statistics for IOUs remain strikingly strong, however, with healthy profit margins and reliable dividends even during the depressed economy and lower volume sales in 2009.[115]

As noted earlier, forty-three states and D.C. employ net metering, and states have found various ways of addressing the challenges presented by net metering. One successful adjustment has been to ramp up DRG slowly, capping it at 1% until its effects are demonstrated in a particular market. As utilities incorporate DRG (and renewable energy generally) into their generation and distribution projections, DRG becomes an integrated part of doing business and increasing generating capacity. Such has been the case in Ohio,

113. Some utilities and policymakers favor "revenue decoupling" as a solution to volume reductions due to increased energy efficiency. States where decoupling has been adopted, however, have generally seen rate increases, and most pilot programs are still under review. Under decoupling, ratepayers face the risk of being charged twice: once for the cost of the utility's lost revenues and again for the cost of installing DRG or improvements in efficiency that create the energy savings. Ratemaking provides a more holistic view of avoided operating costs, fixed or sunk costs, losses actually attributable to policy changes, and other savings, such as peak load reduction and avoided costs of new plants.

114. *Power Plant Construction Costs Fall, Index Shows*, POWER-GEN WORLDWIDE (June 23, 2009), http://www.powergenworldwide.com/index/display/articledisplay/365028/articles/power-engineering/industry-news-2/2009/06/power-plant-construction-costs-fall-index-shows.html (citing decrease in power plant construction costs).

115. *See Henry Fund Research: Electric Utilities*, U. OF IOWA SCH. OF MGMT., 1 (Feb. 10, 2010), http://tippie.uiowa.edu/henry/reports10/electric_utilities.pdf (identifying index profit margin at 9.2% and dividend yield at 4.4%); *see also Revenue and Expense Statistics for Major U.S. Investor-Owned Electric Utilities*, U.S. ENERGY INFO. ADMIN., http://www.eia.doe.gov/cneaf/electricity/epa/epat8p1.html (last visited Feb. 9, 2011) (identifying net operating revenues and sales for major IOUs).

New York, and California. As DRG makes up a significant percentage of generation, new problems may arise, but most states have not reached this plateau.

Regardless of whether utility companies credit or reimburse net excess generation at retail or wholesale rates, they will never have to pay more for DRG than the price at which they would be able to resell it to another customer. DRG will eventually become just another source of generation, and a gentle ramp up will allow IOUs time to integrate it into their generation planning. PURPA's generous "avoided cost" formula to reimburse independent generators did not bankrupt utilities, and, indeed, made the generation market more competitive. For non-integrated utilities in deregulated markets, cheaper generation can both improve utility revenues and deflate customer rates. If there is a national cap on carbon emissions, future benefits of DRG for utilities will also include reducing the need to purchase carbon emission credits and avoiding the additional costs of new power plants.

B. Evaluating Costs and Benefits for Customers Who are Not Customer-generators

Although customer-generators can reap large benefits from net metering, there is a legitimate concern that some of their savings may be at the expense of other customers who do not generate their own power. Because customer-generators still use the grid but only pay for power in excess of their generation, all else being equal, utility revenues will decrease unless rates are increased. IOUs express concern that customer-generators who receive retail-rate reimbursement for net generation are receiving more than they put into the grid because customer-generators underpay for the fixed costs associated with transmission and distribution.[116] In the summer of 2009, Xcel Energy asked Colorado to assess a new fee on solar installations in order to compensate for solar customer-generators' avoidance of fixed costs; the proposal was met with fierce opposition, to which Xcel relented.[117] The external benefits of DRG are nevertheless significant and can actually result in cus-

116. *See* Russell Gold, *Meter Reader: Wading in the Controversial Net Metering Debate*, WALL ST. J. ENVTL. CAP. BLOG (Aug. 20, 2009, 12:39 PM), http://blogs.wsj.com/environmentalcapital/2009/08/20/meter-reader-wading-into-the-controversial-net-metering-debate/ (stating position of Edison Electric Institute).

117. *Id.* (describing downfall of Xcel Energy fee proposal for solar customer generators).

tomer-generators earning a personal benefit *and* subsidizing other customers.[118]

In the case of solar customer-generators in particular, DRG provides external benefits because it reduces peak demand; improves grid efficiency and reliability; avoids transmission and distribution grid capital investments; and avoids costly overcapacity of unpredictable power generation needs.[119] If solar customer-generators were to store their excess power by using batteries instead of the grid, other customers would be far worse off because power would be stored during times of peak usage and then used during off-peak hours. Distributed generation of geothermal and wind power also defers transmission and distribution expansion and has the potential to accommodate plug-in electric vehicles and other new technologies that can use electricity during off-peak times.

Increasing DRG is cheaper for the utility than building a new power plant because much of the costs for DRG are borne by customer-generators, and utilities can sell customer-generators' excess power to other customers. If the utility is buying power from customer-generators in a low-rate state and selling it to a high-rate state, the utility earns additional revenue from DRG customers, which subsidizes non-generator customers in the service area. If the utility can sell the power purchased from the customer-generator for at least the same price as it paid the customer-generator, then the cost to the utility is (at most) the cost of transmission and distribution. Segregating transmission and distribution costs from per-kWh usage rates is a common tactic for utilities to protect against unfairly burdening other customer classes that could result from DRG. This accounting method requires proper oversight, however, because utilities could abuse it to discourage DRG by overstating fixed or transmission costs and understating avoided costs.

If the theoretical concern that DRG will result in cost-shifting among ratepayer classes comes to fruition, and net metering results in real losses to customers who are not generators, then price adjustments can be made to discount customer-generated power. This solution has not yet been, and is unlikely to become, necessary. The best way to address this concern is to start with a low cap for DRG, raise the cap over time, and provide universal access to DRG through rent-to-own programs, community purchase programs,

118. Cook Testimony, *supra* note 66, at 2-3 (advocating external benefits of DRG).

119. *Id.* (describing further benefits of DRG).

and low- and no-interest financing, so that all ratepayers can benefit from the savings from DRG.

VII. RECOMMENDATIONS

A. Actions for All Levels of Government: Federal, State, and Local

Federal, state, and local governments should install DRG for government facilities and buildings. DRG provides governments with long-term financial benefits, long-range planning certainty, and energy bill savings. Government procurement of DRG will also serve to expand the commercial market for DRG, supplying additional support to DRG technologies. Federal, state, and local governments should offer incentives for customers to install DRG. Local governments should also bundle renewable technology purchases and insulation services to benefit their localities by making DRG more affordable for residents of their districts. SMUD's rent-to-own solar program has been highly successful, and SMUD and power co-ops have been able to offer very affordable home systems by using the power of buying in bulk to obtain a large discount on equipment and installation.

B. Actions for FERC

In light of revisions to PURPA under the Energy Policy Act of 2005, utilities have found it easier to discriminate against small co-generators, such as CHP plants. Membership in a Regional Transmission Organization (RTO) or Independent System Operator (ISO) exempts utilities from mandatory purchase obligations under PURPA.[120] Utilities only earn a return on generation they build themselves, so it is in their interest to favor their own generation and reserve transmission capacity for their own future generation instead of selling the capacity to competitors. FERC should strengthen enforcement to prevent such discrimination.

Some state interconnection rules create barriers to small and renewable generators, discouraging residential and business customers from generating their own power by creating extra costs and administrative hassles.[121] FERC should alter its Order No. 2006 interconnection rule requiring co-generators to prove "deliverability" to load and, instead, adopt a minimum interconnection stan-

120. Kowalczyk Testimony, *supra* note 97, at 5 (recounting that membership in RTO exempts utilities from mandatory purchase obligations).

121. Cook Testimony, *supra* note 66, at 9 (discussing need for uniformity among FERC's rules).

dard.[122] If given new federal authority, FERC should institute a federal standard to smooth interconnection with DRG. Even without new legislation, FERC could encourage the adoption of model rules, such as those written by the IREC,[123] that minimize barriers to DRG development.[124] Under such a scenario, states would still be free to go beyond the minimum standards.

C. Actions for Congress

Congress should institute minimum federal standards for net metering to set a floor of protection for customer-generators. Nondiscrimination, streamlined requirements, and "full credit" for all kilowatt-hours produced would remove the hurdles some utilities and states have placed before would-be customer-generators. Net metering that uses non-monetary transactions to credit kilowatt-hours and does not reimburse the customer-generator for net excess generation is certainly more administratively efficient and palatable to IOUs. However, customer-generators should not be forced to give their net excess generation to the utility for free when the utility resells the power at market rate. Revenue streams to customer-generators for net excess generation are an important incentive for DRG, and the federal government should require that customer-generators receive just compensation for the excess power they place on the grid. State PUCs can further delineate "full credit" and "just compensation" on a utility-by-utility basis, but Congress should mandate the standard that customer-generators must receive at the maximum value for excess generation that does not burden other customer classes.

Restricting QFs by size no longer makes sense given that technology has evolved to allow customers to become small producers themselves and avoid capital transmission costs. Utilities are required to purchase power from QFs of larger than 40 kW (unless the QFs have access to a competitive market under PURPA section 210(m), as amended), but Congress should amend this requirement to apply to smaller customer-generators as well. Compensation for customer-generators should be set at the "just

122. Kowalczyk Testimony, *supra* note 97, at 5 (advocating alteration of FERC Order).

123. *See, e.g.*, *Model Interconnection Procedures, 2009 Edition*, INTERSTATE RENEWABLE ENERGY COUNSEL (2009), http://irecusa.org/wp-content/uploads/2009/11/IREC-IC-Model-Final-Nov-8-2009-1.pdf (promoting best practices and important advances in interconnection procedures).

124. Cook Testimony, *supra* note 66, at 6 (highlighting importance of uniform FERC rules).

compensation" standard outlined above to provide states and utilities some flexibility in price setting for micro-generation (i.e. generation under 40 kW). Renewable generation should be encouraged at all levels for environmental, security, and price stability reasons. The same rationale applies to both small customer-generators and larger independent generators: competition in power generation brings down prices. As is done in all states with net metering, customer-generators should be required to provide adequate notice to the utility and follow interconnection rules so that utilities and local distribution companies can prepare for additional flows to the grid with minimal hassle and cost.

With the exception of the Electric Reliability Council of Texas, transmission and distribution systems are connected across state lines. As electricity grids and markets have modernized and become increasingly interstate, Congress should grant FERC more authority over what used to be isolated and purely regional markets. Congress should also statutorily specify or delegate to FERC the authority to speed up timelines for interconnection approval, cap fees for interconnection, standardize application and agreement forms, and mandate minimum interconnection standards for IOUs, as FERC already requires for public utilities under sections 202(b), 205, 206, and 210 of the FPA.[125] States and PUCs should not allow utilities to shut out generation competition from customer-generators.

One reason some states do not provide cash payment for net excess generation may be because they want to avoid FERC jurisdiction and fees associated with cash payments to customer-generators. Generators selling to the wholesale market must pay a tariff for interconnection under FERC jurisdiction, and customer-generators avoid this tariff by giving the energy back to the utility instead of receiving cash payment. Congress could easily exempt customer-generators under a certain size, however, if it chose to recognize the benefits of DRG and a distinction between small-scale customer-generators and "merchant generators." In order to avoid FERC jurisdiction, some states also credit customers' net excess generation

125. *See* Jason B. Keyes, Keyes & Fox LLP, Presentation before USEA/USAID Workshop: Best Practices in Interconnection of Distributed Generation (Sept. 2, 2009), *available at* http://www.usea.org/programs/EUPP/GCRE_September_2009/GCRE_Presentations/GCR_Workshop_Presentations_Wednesday_September-2-2009/IREC_USEA_presentation_Sep-2-2009-Keyes.pdf (contemplating acceptable practices for interconnection); *see also*, Kelly Testimony, *supra* note 82, at 2.

Baker-Branstetter: Distributed Renewable Generation: The Trifecta of Energy Solution

at the utility's unbundled generation rate.[126] Other states, such as New York and Ohio, already provide customer-generators with cash refunds. Congress should exempt customer-generators from interconnection tariffs imposed on independent generators to remove any legal gray area for net billing.

Federal interconnection standards minimize discrimination against new generators, expedite the process for new generators, and ensure safety and reliability.[127] The FPA largely exempts local distribution companies (LDCs) from FERC authority unless the LDC also sells energy in the wholesale market.[128] While FERC has tried to harmonize state and federal interconnection practices and expressed its "hope" that states would model their interconnection rules after the federal model, many states have not followed FERC's lead.[129] Some states (or utilities, if state regulators are silent) have instituted restrictive requirements such as additional insurance requirements; redundant external disconnection switches; unmanageable application forms; unreasonable limits on the size of generator to be connected; high fees; long delays in approval; and low payments or credits for excess power returned to the grid.[130] The federal government should limit these abusive and anti-competitive practices and provide a fair playing field for DRG against traditional sources and owners of electricity services.

126. *See, e.g., FirstEnergy Corp. v. Pub. Utils. Comm'n of Ohio,* 768 N.E.2d 648, 653 (Ohio 2002) (holding that customers who were net generators were not entitled to credit from electric utility at unbundled generation rate). Initially, the Public Utilities Commission of Ohio required utilities to credit customer net excess generation at the utility's full retail rate before the Ohio Supreme Court decided this exchange was illegal. *Id.* at 651.

127. Kelly Testimony, *supra* note 82, at 4 (analyzing benefits from federal interconnection standards).

128. *Id.* at 4-5 (citing FERC Order No. 2006 and *NARUC v. FERC,* 475 F.2d 1299 (D.C. Cir. 2007) (generalizing about exemption of LDCs from FERC authority).

129. *See* Brown Testimony, *supra* note 63, at 4 (discussing FERC's desire to standardize interconnection rules); *see also* Kelly Testimony, *supra* note 82, at 5 (expressing FERC's attempt to harmonize state and federal interconnection practices); *see also Freeing the Grid, supra* note 96, at 93 (arguing for harmonization of state practices).

130. *See id.* at 85 (detailing restrictive requirements instituted by states and utilities).

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D. Actions for States

1. *Provide DRG Extra Credit Towards Renewable Portfolio Standards*

Currently, states have the most authority to improve net metering policies, and many of them have made improvements in recent years. States should encourage utilities to meet RPS by providing extra credit for DRG within the RPS formula. In states with an RPS or renewable electricity standard requirement, giving double credit (or at least more than 100%) for DRG towards meeting the RPS rewards utilities with a large supply of DRG in their service area.[131] For example, Washington state gives double credit for DRG, and its utilities offer generous incentives for DRG as a result.[132]

Because of California's strong RPS requirement and solar incentives for utilities and customers, Southern California Edison (SCE) provides a cash incentive per watt for installing electricity-generating equipment under its self-generation incentive program. The California Energy Commission's Renewable Energy Buydown Program provides similar incentives for small, renewable self-generation units.[133] In addition, SCE offers a solar incentive program that pays a lump sum or monthly payment for installed solar systems based on expected generation. This subsidy resembles renting the customer's roof because the customer does not bear any risk for the amount of energy his or her system produces, nor does the customer benefit beyond the fixed payment agreed to by contract. While fixed payment contracts assure customer-generators a set return on their investments, these contracts do not insulate customer-generators from future price spikes like maintaining ownership over the power they produce would. Providing customers a choice of risk and return options enhances customer alternatives and helps diversify the utility's portfolio.

Another incentive for utilities to, at least, stop fighting net metering would be to reward the utility for DRG even if it does not build the capacity itself. For example, if a utility normally earns an 8% return on capital investments, state PUCs could decide it would receive 2% for new expenditures on DRG within its service area. This policy would incentivize utilities to encourage DRG and quan-

131. *See Freeing the Grid, supra* note 96, 94-99 (ranking state policies for net metering and interconnection standards).

132. *Id.* (depicting variations in state DRG policies).

133. *See Customer Generation*, SOUTHERN CAL. EDISON, http://www.sce.com/customergeneration/customer-generation.htm (last visited Jan. 27, 2011) (discussing benefits of California's energy policies).

tify the costs and benefits to other customers. Any additional cost from DRG is overwhelmed by the savings to other customers because the utility is only receiving a 2% return on increased capacity instead of building new generation facilities and charging an additional 8% on top of that. If customer-generators produce 600 kW of power, which preempts the need for a new power plant, other customers save the cost of the power plant and the 8% profit margin, and instead only pay 2% of the capital investment made by customer-generators in the service area. This arrangement equitably distributes benefits from DRG while encouraging customer-generators to install DRG. Alternatively, utilities could continue to earn the expected rate of return for DRG that they assist in financing under a "borrowed" roof or amortized small-scale generator system. Creating opportunities for customer-generators and utilities to act as partners in increasing DRG is important for utility buy-in.

2. *Customer-generator Credits and Reimbursement for Net Excess Generation*

Net metering that credits consumers at a 1:1 ratio for energy produced and credited is administratively pleasing and even-handed. Reimbursement at more than 100% retail (e.g. avoided marginal cost under PURPA) would still leave the utilities enough breathing room to avoid rate hikes, but the 1:1 ratio is a fair compromise and easy to both understand and calculate. Tiered or real-time pricing can complicate even the 1:1 ratio, however. Solar power is generated when demand is highest, and crediting solar customer-generators at real-time prices would be an added incentive for solar power. Wind power, on the other hand, is most productive at night, when demand and corresponding prices are lowest. Therefore, a crediting or reimbursement program relying on real-time pricing would dramatically favor solar over wind for DRG. Wind power has received more federal subsidies than solar power in recent years,[134] so additional subsidies for solar may not be a bad idea, but favoring one technology over another is generally undesirable.

Most net metering policies credit a customer's next bill if the customer generates more power than he or she consumes, and, when the customer's remaining credits are eliminated at the end of

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134. *See How Much Does the Federal Government Spend on Energy-specific Subsidies and Support?*, U.S. ENERGY INFO. ADMIN. (Sept. 8, 2008), http://tonto.eia.doe.gov/energy_in_brief/energy_subsidies.cfm (discussing federal government's favoritism towards wind power).

twelve months, the customer starts the next year with zero credits.[135] Net billing, a policy under which customers would receive a cash payment for excess generation accumulated after twelve months, allows customers to earn a return beyond cutting their energy bills to zero. Net billing's administrative burden and financial cost to utilities makes net billing an undesirable option for many utilities. It is unfair, however, for utilities to usurp excess energy from a customer-generator for free and then resell it to other customers at full retail rate. Transferring customer-generators' power to the utility without compensation discriminates against customer-generators as opposed to independent generators. While customer-generators are presumably not "in the business" of selling power to utility companies, this does not mean that they should be forced to give away excess generation without compensation.

Clear state rules that provide fair reimbursement for net excess generation are highly desirable for long-term investment planning in DRG. Utilities should reimburse customer-generators for net excess generation at the end of the year through a net billing arrangement, and the *minimum* reimbursement rate should be the average cost of electricity for the utility during that year. The average cost option is still inferior to reimbursement at the retail rate, but each PUC should analyze the rate structure of the individual utility to determine a fair reimbursement price because utility purchasing arrangements vary widely. Most utilities buy electricity in long-term contracts, not in the spot market, and average price is a well-understood parameter. Some utilities are more generous and reimburse for net excess generation at the retail rate. Retail rates are transparent, easy to identify, and track a customer-generator's actual savings from avoided purchases from the grid. After adequately accounting for avoided costs attributable to DRG, states should mandate retail reimbursement where feasible and when it would not burden other consumer classes.

VIII. CONCLUSION

If designed correctly, net metering policies can increase distributed renewable generation and provide a win for the environment, electricity customers, state and federal regulators, and utilities. Reasonable reimbursement for net excess generation and a streamlined interconnection process will improve residential, commercial, and industrial investments in DRG. In return, ex-

135. Credits offset energy consumption, but do not offset fixed costs, such as customer charges or other flat fees.

panded DRG will avoid the costs of new transmission lines, power plants, development of distant renewable resources, and line losses, as well as empower electricity consumers to develop renewable energy on their own instead of waiting for it down the line.