SYMPOSIUM ARTICLES

"STEEL IN THE GROUND": GREENING THE GRID WITH THE iUTILITY

BY

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As the United States addresses climate change through carbon reduction strategies, it must focus on the two major parts of our energy portfolio—oil and electricity. Electricity is a central focus because over one-half of all electricity generated is derived from coal-burning power plants, which are notoriously dirty. Other cleaner and renewable sources of electricity, such as wind and solar power, are available. However, over the last hundred years, the electricity industry has been constructed to serve large-scale, centralized and capital-intensive coal and nuclear plants.

There are good economic reasons for building large power plants. Economies of scale can keep consumer costs down as well as reap profits for utility shareholders. Unfortunately, large coal plants also produce the carbon dioxide that contributes to global warming. A further misfortune is that the infrastructure for transmitting and distributing large scale electricity favors precisely those coal plants that have become problematic. In short, any climate change strategy must reform the electricity infrastructure so that more environmentally sensitive resources can come online and contribute to our nation's electricity needs.

The green electricity grid, then, plays an important role in refashioning our energy future. The green grid can increase our use of clean and renewable resources, reduce carbon emissions, increase the use of smart technologies, and contribute to energy security. In order to achieve these goals, the electricity industry and its regulation must

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be changed significantly, as this Article advocates. Further, the Article argues that the new regulation of the electricity industry can become the model for the next generation of government regulation more generally as the old style of command and control regulation gives way to technological innovation and new forms of shared governance among industry and its consumers, as well as regulators.

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I. INTRODUCTION

> However, even as we talk about ever increasing congestion on the current system and the need for rapid deployment of renewables, there is little, if any, steel in the ground.[1]

The *Greening the Grid* conference was both timely and important. The electricity grid is the infrastructure of the industry in both real and in symbolic ways. As we move into our energy future anticipating a greater reliance on alternative and renewable forms of energy, a greater independence from imported oil, and a reduction of carbon emissions, we need to transform the electricity grid, as well as the electric industry,[2] in several significant ways. A modernized, or smart, grid will be more efficient and reliable, will help reduce carbon emissions, and will promote national security. Grid investment will be aimed at achieving technological advances and serving new sources of energy. The new electric industry will broaden its focus from simply selling electricity to providing an array of energy services and products. Moreover, the government response to the challenges posed by the need for grid transformation symbolizes a new generation of regulation—Regulation 3G.

II. INTRODUCTION TO GRID MODERNIZATION

There are three reasons for improving the existing electric grid. First, although the growth of the electricity industry has slowed, the demand for electricity will continue to rise into the future and the existing grid needs expansion and upgrades. Over the last sixty years, the growth in demand for electricity has slowed appreciably. The post-World War II annual increase in electricity production of approximately 9% has declined as the infrastructure has been constructed and as the country has realized gains in efficiency.[3] Since 2000, annual growth has fallen to 1.1% with the projection falling lower to approximately 1%.[4] The Electric Power Research Institute further estimates that through energy efficiency programs electricity growth from 2008 through 2030 can be reduced to between 0.83% to 0.68%.[5] Even at those reduced levels, from 2007 to 2030, electricity demand is expected to increase 26%.[6]

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1 *Electrical Transmission Grid: Hearing Before the S. Comm. on Energy and Natural Resources*, 110th Cong. 85 (July 31, 2008) (statement of Susan Tomasky, President, American Electrical Power Transmission).

2 *See generally* Jeff Guldner & Meghan Grabel, *Dealing with Change: The Long-Term Challenge for the Electric Industry*, NAT. RESOURCES & ENV'T, Summer 2008, at 3, 3–8.

3 ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2009, at 71 (2009), *available at* http://www.eia.doe.gov/oiaf/aeo/pdf/0383(2009).pdf.

4 *Id.*

5 ELEC. POWER RESEARCH INST., ASSESSMENT OF ACHIEVABLE POTENTIAL FROM ENERGY EFFICIENCY AND DEMAND RESPONSE PROGRAMS IN THE UNITED STATES (2010–2030), at 7 (2009), *available at* http://mydocs.epri.com/docs/public/000000000001018363.pdf.

6 ENERGY INFO. ADMIN., *supra* note 3, at 71. Note that due to the increased cost of adding energy efficiency and demand response, there is no dollar-for-dollar reduction in required investment. *See generally id.* at 45. Still, the cost of investment will decline about 15%. *Id.*

The base case for increased demand is that by 2030 the United States will need an additional 214 gigawatts (GW) of electricity at a cost of $697 billion.[7] That estimated demand with its attendant costs could be reduced by between 38% to 48% by using energy efficiency and demand response programs.[8] To satisfy increased demand, we will continue to rely on traditional energy sources such as coal because of their abundance, and we are witnessing an increased interest in commercial nuclear power.[9] Both of these traditional sources are already connected to an aging power grid in need of modernization. Most recently, the North American Electric Reliability Corporation estimated that over the next ten years, the United States will need 1700 more circuit miles of transmission lines to maintain reliability and to integrate new resources.[10] To maximize gains in efficiency and integrate renewable resources, the projected costs for investment in needed transmission and distribution range between $1.5 and $2.0 trillion.[11]

The second reason for investing in the electricity grid is efficiency. The smart grid can be broken down into two major components—smart transmission and smart distribution. Both components promise an increase in energy and economic efficiency. The smart transmission segment of the grid is comprised of a superhighway, which will deliver wholesale power across 765 kilovolt (kV) extra high voltage (EHV) transmission lines.[12] These lines increase energy efficiency, as one EHV line can transmit as much power as six existing 345 kV lines and can reduce the transmission line footprint by a factor of nearly four to one.[13] Additionally, smart grid

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7 MARC W. CHUPKA ET AL., TRANSFORMING AMERICA'S POWER INDUSTRY: THE INVESTMENT CHALLENGE 2010–2030, at vi (2008), *available at* http://www.brattle.com/_documents/UploadLibrary/Upload725.pdf.

8 *Id.* at 19.

9 There are currently 24 nuclear units in some phase of planning and licensing. *See* NUCLEAR ENERGY INST., NEW NUCLEAR PLANT STATUS, *available at* http://www.nei.org/filefolder/New_Nuclear_Plant_Status.xls; *see also* OFFICE OF NUCLEAR ENERGY, U.S. DEP'T OF ENERGY, FISCAL YEAR 2009: NUCLEAR ENERGY PERFORMANCE PLAN 3 (2009), *available at* http://nuclear.gov/pdfFiles/NEPerformancePlanFY09.pdf; MASS. INST. OF TECH., THE FUTURE OF NUCLEAR POWER: AN INTERDISCIPLINARY MIT STUDY, at ix–x (2003), *available at* http://web.mit.edu/nuclearpower/pdf/nuclearpower-full.pdf.

10 N. AM. ELEC. RELIABILITY CORP., 2008 LONG-TERM RELIABILITY ASSESSMENT: 2008–2017, at 15–17 (2008), *available at* http://www.nerc.com/files/LTRA_2008_v1.2.pdf.

11 CHUPKA ET AL., *supra* note 7, at vi ("By 2030, the electric utility industry will need to make a total infrastructure investment of $1.5 trillion to $2.0 trillion."). *See generally* SPENCER ABRAHAM, U.S. DEP'T OF ENERGY, NATIONAL TRANSMISSION GRID STUDY 19, 24 (2002), *available at* http://www.pi.energy.gov/documents/TransmissionGrid.pdf (describing how making the U.S. electricity transmission system more efficient will save money).

12 *See* ROB GRAMLICH ET AL., AM. WIND ENERGY ASS'N & SOLAR ENERGY INDUS. ASS'N, GREEN POWER SUPERHIGHWAYS: BUILDING A PATH TO AMERICA'S CLEAN ENERGY FUTURE 7–8 (2009), *available at* http://www.awea.org/GreenPowerSuperhighways.pdf; SUSAN F. TIERNEY, A 21ST CENTURY "INTERSTATE ELECTRIC HIGHWAY SYSTEM"—CONNECTING CONSUMERS AND DOMESTIC CLEAN POWER SUPPLIES 33–34 (2008), *available at* http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Tierney_21st_Century_Transmission.pdf.

13 *See, e.g.*, PowerPoint: Mike Heyeck, Vice President, Am. Elec. Power, AEP's I-765 Proposal and the Future of America's Transmission Grid, Presentation at Modernizing the Grid Southeast Regional Summit 17 (Aug. 11, 2006), *available at* http://www.netl.doe.gov/moderngrid/docs/Heyeck.pdf.

investments will not only increase energy efficiency, they will also improve reliability as well as reduce congestion.[14]

The other, and equally important, component of the smart grid involves smart distribution of electricity to end users. Today, distribution is a one-way street with electricity moving from the local utility to the customer, and with the utility reading meters for the sole purpose of billing the customer for consumption. Today's electric distribution system is hardly different from Edison's first system at the end of the nineteenth century.[15] Smart distribution will provide better information about the price and use of electricity to both parties. Consumers can then use electricity at the lowest costs to them, and producers can acquire information about stress on their load and system. In short, a smarter grid will facilitate demand response programming, more accurate price signals, and real-time pricing, which, in turn, will enable producers and consumers to capture more surplus, thus increasing efficiency.

The smart grid will require investment in both segments and will require the development of communications technologies throughout the electricity system from producers to end users. Communications technologies are necessary to coordinate regional transmission operations, send supply and demand signals between and among consumers and producers, indicate stresses on the grid, provide information about weather patterns for variable sources such as wind and solar power, and generally fine tune price signals to improve the electricity market as a whole. This portion of the smart grid has been referred to as "transactive," meaning that the grid network is the platform connecting producers and consumers for the purpose not only of conveying information and improving reliability, but also facilitating purchase and sale transactions at lower cost.[16]

Third, the grid can play an important role in reducing carbon emissions by expanding the grid's connections to alternative and renewable resources. An integral part of this segment of the grid must incorporate feeder lines to resources such as solar and wind, which are generally not located near the

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14 *See, e.g.*, Charles River Assocs. Int'l, *CRA International Consultants Study High Voltage Transmission in the Southwest Power Pool*, BUS. WIRE, Nov. 17, 2008, http://www.crai.com/News/listingdetails.aspx?id=9236 (last visited Nov. 14, 2009); GRAMLICH ET AL., *supra* note 12, at 8 ("As a result, a 765-kV grid overlay could reduce U.S. peak load electricity losses by 10 GW or more, the equivalent output of 20 typical 500 [megawatt (MW)] coal-fired power plants, and reduce annual CO_2 emissions by 16 million tons.").

15 *See generally* TIERNEY, *supra* note 12, at 1–2 (asserting that the electrical system was built by the author's generation's fathers and grandfathers).

16 *See* PowerPoint: Lynne Kiesling, Smart Policies for a Smart Grid: Enabling a Consumer-Oriented Transactive Network, Presentation at the Harvard Electricity Policy Group Meeting 3–5 (Mar. 12, 2009), *available at* http://www.hks.harvard.edu/hepg/Papers/2009/Lynne_Kiesling_March09.pdf. *See generally* PowerPoint: Bernie Neenan, Technical Executive, Elec. Power Research Inst., Smart Policies for a SmartGrid (Or, the Other Way Around), Presentation at the Harvard Electricity Policy Group 54th Plenary Session 4–5 (Mar. 12–13, 2009), *available at* http://www.hks.harvard.edu/hepg/Papers/2009/Bernie_Neenan_March09.pdf (describing how investing in both energy producers and consumers will increase system efficiency).

existing transmission corridors.[17] Technological changes can improve efficiency and, to the extent that electricity is generated from renewable resources, those new sources must be connected to a modernized grid.[18] The Department of Energy (DOE), for example, reports that the nation can achieve 20% wind energy by 2030 only if the transmission grid is improved.[19] Additionally, it is estimated that there are over 4000 MW of large solar power plants scheduled for construction over the next five years that will also need access to the grid.[20]

The development of the smart grid is not taking place in a vacuum. The last few years have witnessed an uptick in utility investment in transmission and distribution.[21] Most recently, federal modernization efforts are underway and those efforts will need to be coordinated both regionally and locally.[22] Pursuant to the Energy Independence and Security Act of 2007 (EISA),[23] the DOE was given the authority to engage in smart grid planning.[24] On March 3, 2009, DOE announced their intention to issue funding opportunities for smart grid demonstration projects.[25] This notice was part of the American Recovery and Reinvestment Act,[26] which provides at least $11 billion for

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17 *See, e.g.*, *Transmission Infrastructure: Hearing Before the S. Comm. on Energy and Natural Resources*, 111th Cong. 58–59 (Mar. 12, 2009) (statement of Reid Detchon, Energy Future Coalition); ENERGY FUTURE COAL., THE NATIONAL CLEAN ENERGY SMART GRID: AN ECONOMIC, ENVIRONMENTAL, AND NATIONAL SECURITY IMPERATIVE 1 (2009). The Edison Electric Institute, an association of power providers, estimates current investments in solar and wind transmission projects at $21 billion. *See* EDISON ELEC. INST., TRANSMISSION PROJECTS: SUPPORTING RENEWABLE RESOURCES, at iv (2009).

18 *See, e.g.*, N. AM. ELEC. RELIABILITY CORP., SPECIAL REPORT: ELECTRIC INDUSTRY CONCERNS ON THE RELIABILITY OF CLIMATE CHANGE INITIATIVES 4–5 (2008), *available at* http://www.nerc.com/files/2008-Climate-Initiatives-Report.pdf ("As demand-side resources become an increasingly significant component of the resource mix, effective integration and verification of these resources will be vital to maintaining reliability. . . . If implemented effectively, climate change initiatives can result in improvements to reliability in North America, bringing new generation technologies to fruition, diversifying the fuel mix, strengthening the transmission system, and encouraging the development of the smart grid.").

19 U.S. DEP'T OF ENERGY, 20% WIND ENERGY BY 2030: INCREASING WIND ENERGY'S CONTRIBUTION TO U.S. ELECTRICITY SUPPLY 11 (2008), *available at* http://www1.eere.energy.gov/windandhydro/pdfs/41869.pdf. A recent study indicates that, currently, almost 300,000 MW of wind projects exist, which is more than sufficient capacity to satisfy the 2030 goal. GRAMLICH ET AL., *supra* note 12, at 6.

20 GRAMLICH ET AL., *supra* note 12, at 5. This report also notes that the solar industry can create 440,000 jobs and $325 billion in economic development over the next eight years. *Id.* at 6.

21 EDISON ELEC. INST., EEI SURVEY OF TRANSMISSION INVESTMENT: HISTORICAL AND PLANNED CAPITAL EXPENDITURES (1999–2008), at 1 (2005), *available at* http://www.eei.org/ourissues/ElectricityTransmission/Documents/Trans_Survey_Web.pdf (noting the reversal of a historic trend of underinvestment).

22 Energy Independence and Security Act of 2007, 42 U.S.C. §§ 17381–17382 (Supp. I 2007).

23 *Id.* §§ 17001–17386.

24 *Id.* § 17384.

25 *See* NAT'L ENERGY TECH. LAB., U.S. DEP'T OF ENERGY, NOTICE OF INTENT TO ISSUE FUNDING OPPORTUNITY ANNOUNCEMENT NO.: DE-FOA-0000036 (2009), *available at* http://www.asertti.org/newsletter/2009-03-24/FOA_SmartGrid.pdf.

26 American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115.

smart grid investments.[27] Another solicitation for the grid is expected under EISA.[28] Additionally, Congress is currently debating the American Clean Energy and Security Act, which addresses climate change and also provides support for the smart grid through smart grid advancement and transmission planning.[29] Assuming that federal research, development, demonstration, deployment, and decommissioning efforts are fruitful, the existing regulatory scheme will leave a large role for state regulators. Nevertheless, the regulatory roles at all levels of government must be reevaluated and, where necessary, changed so that smart technologies can optimize their potential for efficiency and carbon reduction.

III. INDUSTRY OVERVIEW

The development of the electric industry can be broken down into four historic periods.[30] From September 4, 1882, until 1935, the electric industry went from local and competitive to state regulated and then became a major interstate and federally regulated industry.[31] Next, the period from 1935 to 1965 was the Golden Age of electricity; utilities expanded production at a constant and predictable rate, as consumers' utilities bills stayed flat or declined, and as the country experienced the growth of a vibrant and strong

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27 Under the Act, $11 billion is specified for the grid and over $10 billion is specified for energy efficiency in transmission and reliability. *See* THE WHITE HOUSE, AMERICAN RECOVERY AND REINVESTMENT ACT: MOVING AMERICA TOWARD A CLEAN ENERGY FUTURE 1 (2009), *available at* http://www.whitehouse.gov/assets/documents/Recovery_Act_Energy_2-17.pdf.

28 Energy Independence and Security Act of 2007, Pub. L. No. 110-140, § 1301, 121 Stat. 1783, 1783–84; *see also* Smart Grid Policy; Notice Requesting Supplemental Comments, 74 Fed. Reg. 23,810, 23,810 (May 19, 2009).

29 American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. §§ 141–146 (2009) (enacting smart grid advancement); *id.* § 151 (enacting transmission planning). For further discussion of this bill, see *infra* Part V.B.4.

30 *See generally* LEONARD S. HYMAN ET AL., AMERICA'S ELECTRIC UTILITIES: PAST, PRESENT AND FUTURE 111, 115 (8th ed. 2005) (stating that the electric industry developed its structure over decades); PAUL JOSKOW, TECH. POLICY INST., CHALLENGES FOR CREATING A COMPREHENSIVE NATIONAL ELECTRICITY POLICY 7–11 (2008), *available at* http://www.hks.harvard.edu/hepg/Papers/Joskow_Natl_Energy_Policy.pdf (describing modern efforts to reform the electric power sector, beginning in the 1980s and continuing through the California energy crisis); Lester Lave et al., *Deregulation/Restructuring Part I: Reregulation Will Not Fix the Problems*, ELECTRICITY J., Oct. 2007, at 9, 10, 20–21 (describing transition of electric industry from no regulation to state regulation to deregulation). A similar analysis was recently published regarding the financial industry. *See* THOMAS PHILIPPON & ARIELL RESHEF, WAGES AND HUMAN CAPITAL IN THE U.S. FINANCIAL INDUSTRY: 1906–2006, at 5 (2008), *available at* http://pages.stern.nyu.edu/~tphilipp/papers/pr_rev15.pdf (noting the presence of excessive rents in 1930 and from the mid-1990s to 2006).

31 *See* HYMAN ET AL., *supra* note 30, at 123, 131 (discussing competition and local regulation during the early years of electricity); *see also* STEPHEN G. BREYER & PAUL W. MACAVOY, ENERGY REGULATION BY THE FEDERAL POWER COMMISSION 90–91 (1974) (noting the transfer of control from local franchising to state regulatory boards between 1905 and 1920 and discussing the increased federal regulation in 1935 under the Public Utility Holding Company Act, which gave the Federal Power Commission authority to regulate prices across state borders). For a discussion of New Deal regulation of locally controlled energy companies, see HYMAN ET AL., *supra* note 30, at 147.

economy.[32] After 1965, until the present, the industry has gone through convulsions trying to reform but has met with little success.[33] Today, we find ourselves in the fourth period of the industry's historic development as the industry and its regulators respond to the challenges of climate change.

When thinking about greening the grid, it is important to recognize that electricity regulation as it largely exists today is roughly a century old and has significantly contributed to the problems we now face.[34] We can better understand those problems by briefly examining the upheaval and difficulties in the industry since the mid-1960s. In approximately 1965, the marginal cost of electricity began to exceed its average cost—an economic phenomenon that affected consumers and producers alike.[35] From an industry standpoint, it appeared that a technological plateau had been reached, as economies of scale did not continue to be realized.[36] While utilities continued to invest in new plants, those plants (especially nuclear plants) were more expensive to build and contributed to excess capacity that, in turn, raised the price of electricity.[37] From a consumer's standpoint, the price rise meant that rates would neither continue to stay flat nor decline as they had for decades.[38] As a further consequence, the electricity industry became more politicized both in the federally regulated wholesale market and in the state regulated retail market.[39]

The post-1965 era for the electricity industry was troubling. Plants not only cost more, but also in the 1970s, all energy firms confronted higher costs and the electricity industry seemed particularly hard hit as nuclear plants were cancelled or converted.[40] Congress wrestled with oil independence by trying to encourage utilities to switch to coal even as they recognized the adverse environmental effects of doing so.[41] In addition, in the mid-1970s, initially through the efforts of President Carter, Congress began to "deregulate" all network industries including energy industries such as oil, natural gas, and electricity, but the electricity industry resisted and continues to resist significant change.[42] Still, as a result of federal legislation, experience demonstrated that efficiency gains were possible in the electric industry because of the presence of new producers who could generate

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32 *See* HYMAN ET AL., *supra* note 30, at 151.

33 *See* JOSKOW, *supra* note 30, at 2.

34 *See* HYMAN ET AL., *supra* note 30, at 130 (indicating state regulation began in the late 1800s); Joseph P. Tomain, *The Past and Future of Electricity Regulation*, 32 ENVTL. L. 435, 449–50 (2002) (describing the rise of regulation and its attendant failures).

35 *See generally* Tomain, *supra* note 34, at 450 (discussing the reasons for increased costs).

36 *See* WILLIAM T. GORMLEY, JR., THE POLITICS OF PUBLIC UTILITY REGULATION 8 (1983).

37 *See* HYMAN ET AL., *supra* note 30, at 167.

38 *See generally* GORMLEY, *supra* note 36, at 8, 12 (explaining rising utility costs resulted in higher consumer rates).

39 *See generally id.* at 6–7, 9, 34–35 (describing increasing conflict in electricity regulation at all levels of government).

40 JOSEPH P. TOMAIN, NUCLEAR POWER TRANSFORMATION 2–3, 22, 92 (1987).

41 *See generally id.* at 20–22 (describing the Arab oil embargo and the resulting turn to coal).

42 PAUL L. JOSKOW, DEREGULATION 5, 33–34 (2009), *available at* http://econ-www.mit.edu/files/3875 (forming the basis of the American Enterprise Institute Center for Regulatory and Market Studies 2009 Distinguished Lecture).

lower-cost electricity if only they could get their product to market.[43] Thus, policymakers and regulators were well aware of the significant and underlying changes in the electricity industry, and over the last three decades or more, state and federal regulators have been trying to restructure the industry so that old expensive and traditional utility electricity can be either supplemented or replaced by cheaper, renewable, and alternative electricity sources.[44] The inability of new and alternative producers to enter the market was a direct consequence of the century-old scheme of regulation, which not only shaped but supported the sales of low-cost, dirty electricity by traditionally structured utilities.[45]

As the electric industry moved from a local competitive industry to a federally regulated one, the firms within that industry, relying on the traditional form of regulation, developed their own corporate structure.[46] In brief, both state and federal regulations encouraged electricity firms to integrate vertically.[47] Firms were granted government-backed monopoly status through what is known as the regulatory compact, which will be discussed in more detail below.[48] In reliance on that compact, firms undertook a service obligation within an exclusive territory.[49] Utilities were given the incentives to sell as much electricity as they could and had an obligation to serve their local customers. The government would protect that service territory and would effectively ensure that privately-operated firms would earn a reasonable return on their capital investment.[50] In other words, the more generation that the utility built, the more it earned for its shareholders. It also meant that the utility could invest in transmission and distribution, privately owning those wires, and earn returns on those investments while avoiding competition.

The consequences of this regulatory design should be apparent—electricity costs rose once the infrastructure was built, local customers were preferred because profits are made within the service territory, the grid and its interconnections were jealously guarded because they were privately owned by the vertically-integrated firms, utilities served as many customers as they could at the lowest cost, and the cheapest and most abundant

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43 Public Utility Regulatory Policies Act of 1978, Pub. L. No. 95-617, 92 Stat. 3117 (codified as amended in scattered sections of 15, 16, 26, 42, and 43 U.S.C.). For a historical review of the electricity industry, see Sidney A. Shapiro & Joseph P. Tomain, *Rethinking Reform of Electricity Markets*, 40 WAKE FOREST L. REV. 497, 502–06 (2005); Joseph P. Tomain, *Networkindustries.gov.reg*, 48 U. KAN. L. REV. 829, 832–34 (2000); Tomain, *supra* note 34, at 437–38, 444, 449–53.

44 *See* Tomain, *supra* note 34, at 451, 467–68.

45 *See generally id.* at 464–65, 469 (describing the historical dominance of traditional fuels and the small percentage of renewable energy sources used today).

46 *See generally* SIDNEY A. SHAPIRO & JOSEPH P. TOMAIN, REGULATORY LAW AND POLICY: CASES AND MATERIALS 105–06, 139–40 (3d ed. 2003) (discussing the new approach the government took in regulating the electric industry and its effects).

47 *Id.* at 139–40.

48 *See infra* Part IV.B.

49 Paul L. Joskow, *Lessons Learned from Electricity Market Liberalization*, ENERGY J., Mar. 2008, at 9, 10–11.

50 *See, e.g.*, SHAPIRO & TOMAIN, *supra* note 46, at 106.

natural resources were used first to generate electricity.[51] Today, dirty fossil fuels and expensive nuclear power account for greater than ninety percent of the electricity that is generated, while the renewable resources of solar and wind power account for less than one percent.[52] The regulatory structure, then, rewarded traditional, vertically-integrated, privately-owned utilities for building fossil fuel plants rather than investing in alternative or renewable resources. Further, the entrenched regulatory design has directly and negatively affected grid modernization because full access to the grid has not been achieved despite federal and state efforts to "deregulate" wholesale and retail electricity markets.[53] This failure is directly attributable to the regulatory incentives favoring privately-owned distribution and transmission facilities that allowed traditional utilities to maintain control, thus protecting their shareholders and not encouraging competitors.

We currently, then, find ourselves in a new era of electricity production, consumption, and regulation. Today, particularly in light of the challenges of climate change, we can no longer afford to do business as usual. Instead, the electricity industry, the firms within it, and its regulators must rethink not only the nature of the utilities' business but also how that business is regulated. By focusing on the future of the electricity grid, we can address both changes in the utilities business and changes in utility regulation. This Article will look at the emerging utility, what I refer to as the iUtility,[54] and will examine how that utility should be regulated in light of the emergence of the smart grid.

IV. THE TRADITIONAL UTILITY AND ITS REGULATION

The electricity industry has been met with difficult times. The restructuring efforts over the last decades have not been successful and are being retrenched.[55] The "too cheap to meter" electricity from nuclear plants was never achieved[56] and, while there are new entrants in the generation sector, it has been difficult to bring that new electricity to market and even more difficult to promote price competition at the retail level.[57] Each of those problems is compounded by concerns about climate change and

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51 *See generally id.* at 141–42 (discussing the economic and political reasons for the regulatory failure, as well as the responses to the failure).

52 ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, ANNUAL ENERGY REVIEW 2007, at 8 fig.1.3, 224 fig.8.2a, 278 fig.10.1 (2008), *available at* http://tonto.eia.doe.gov/FTPROOT/multifuel/038407.pdf.

53 *See* SHAPIRO & TOMAIN, *supra* note 46, at 142.

54 *See* Joseph P. Tomain, *Building the iUtility*, PUB. UTIL. FORT., Aug. 2008, at 28, 29.

55 *See, e.g.*, Joskow, *supra* note 49, at 10.

56 There is one qualification to this statement. Nuclear plants were more expensive to construct than anticipated and no new plant has come online since 1996, though construction on that plant began in 1973. Nuclear power, however, has been a growing share of the generated electricity due to the ability of a nuclear plant to reach higher capacity and relatively low operating costs after the sunk costs of construction have been reached. *See, e.g.*, PAUL L. JOSKOW & JOHN E. PARSONS, THE ECONOMIC FUTURE OF NUCLEAR POWER 3, 5 (2009), *available at* http://econ-www.mit.edu/files/3984.

57 *See generally* Lave et al., *supra* note 30, at 9–10 (discussing the lack of competition in the electricity market).

carbon dioxide emissions.[58] The contours of the solutions to these problems are generally known—we will continue to need electricity and yet that electricity must be more efficiently and more cleanly generated and delivered.

The major barrier to reform exists by virtue of a traditional energy policy, which has witnessed the development of an electricity industry grown dependent on the regulatory regime that rewards it for doing what was intended to do—sell electricity.[59] This single, focused mission served the country well for most of the twentieth century. Our economy was healthy and expanding, the electricity infrastructure was constructed and reliable, and electricity was abundant and cheap.[60] One group of economists estimates that by 1970, the real price of electricity was 2.5% of the cost of what Edison charged his first customers.[61] However, the era of cheap electricity is over, as electricity prices rose 50% between 1970 and 1975 [62] and continue to rise, though not as dramatically.[63]

The $300 billion a year electric industry was built and regulated to provide abundant, available, and affordable electricity.[64] To ensure that electricity is available at the flip of a switch, the country relied on private, investor-owned utilities (IOUs), which have served the country well.[65] IOUs and privately owned "non-utility" operators constitute roughly 80% of the generating capacity in the country.[66] The remaining 20% is comprised of federal, state, and local agencies, and rural electric cooperatives.[67] Reliance on private ownership is, of course, consistent with our capitalist political economy and, to our benefit for most of the century, we generally perceived a positive correlation between energy production and consumption and economic growth.[68] The more energy we consumed, the healthier our economy, and privately owned utilities served this need quite well and were supported through government regulation. Today, it is necessary for us to question the assumption about a long-term positive correlation between the traditional pattern of energy consumption and economic growth. Today, reliance on the traditional utility and its regulation is misplaced and must be radically restructured.

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58 HYMAN ET AL., *supra* note 30, at 49; JOSKOW, *supra* note 30, at 13.

59 *See generally* Lave et al., *supra* note 30, at 11–12.

60 *Id.* at 10.

61 *Id.*

62 *Id.*

63 *See* GREGORY BASHEDA ET AL., WHY ARE ELECTRICITY PRICES INCREASING?: AN INDUSTRY-WIDE PERSPECTIVE 1–7 (2006), *available at* http://www.eei.org/ourissues/finance/Documents/Brattle_Report.pdf.

64 *Id.* at 1.

65 Electric Energy Market Competition Task Force; Notice Requesting Comments on Draft Report to Congress on Competition in the Wholesale and Retail Markets for Electric Energy, 71 Fed. Reg. 34,083, 34,087 (June 13, 2006).

66 HYMAN ET AL., *supra* note 30, at 99–100.

67 *Id.* at 100; *see also* ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, ELECTRIC POWER ANNUAL 2007, at 12 tbl.ES1 (2009), *available at* http://www.eia.doe.gov/cneaf/electricity/epa/epa.pdf; EDISON ELEC. INST., KEY FACTS ABOUT THE ELECTRIC POWER INDUSTRY 4 (2007), *available at* http://www.docstoc.com/docs/2313874/Key-Facts-about-the-Electric-Power-Industry.

68 *See generally* EDISON ELEC. INST., *supra* note 67, at 2 (illustrating the correlation between U.S. economic growth and electricity growth).

Traditional utility regulation is based on two complementary ideas—the economic idea of natural monopoly, and the regulatory idea of a contract between government and industry in the name of the public interest, which is often referred to as the regulatory compact.[69] Together these ideas enabled the industry to grow, to nationalize, and to produce cheap electricity for most of the twentieth century.[70] The problem with this combination of ideas is that they have reached the end of their useful lives, as we are experiencing unwanted consequences of high-priced, dirty electricity. Further, traditional utility regulation constructed an industry that became increasingly costly to maintain, hampered new entrants, disadvantaged alternative and renewable energy resources and energy efficiency, and resisted change.[71]

A. Natural Monopoly

Industry consolidation in the early decades of the twentieth century revealed a central fact about the electricity industry—it constituted a natural monopoly.[72] Monopolies are economically perverse, as prices are set above competitive levels.[73] Under monopoly conditions, consumers suffer losses that they would not suffer in competitive markets; cheaper producers and new entrants are prevented from putting their products into the market, and society does not maximize its use of its resources.[74] Left unchecked, electric monopolies could, and did, set prices above, and reduced supply below, competitive levels while causing inefficient social losses.[75]

Economic theory posits that some industries are *naturally* inclined to exhibit monopoly characteristics and that these industries, when properly regulated, can operate efficiently, avoiding the market distortions of the exercise of monopoly power.[76] According to that theory, because a single provider can provide its services cheaper than multiple providers, it is more efficient for a natural monopolist to occupy a market.[77] A single provider can achieve greater economies of scale since the cost of production declines over the range of production, and since multiple providers with multiple facilities are simply wasteful.[78] Judge Posner's description of a cable television grid applies with equal force to the electricity grid:

> The cost of the cable grid appears to be the biggest cost of a cable television system and to be largely invariant to the number of subscribers the system has. . . . [O]nce the grid is in place . . . the cost of adding another

69 HYMAN ET AL., *supra* note 30, at 111; SHAPIRO & TOMAIN, *supra* note 46, at 105–06.
70 *See, e.g.*, HYMAN ET AL., *supra* note 30, at 131, 133, 151, 157.
71 *See id.* at 164, 167.
72 *Id.* at 127–29.
73 SHAPIRO & TOMAIN, *supra* note 46, at 102.
74 *See, e.g.*, *id.* at 102.
75 *Id.*
76 *Id.* at 101, 105.
77 *See id.* at 102.
78 ALFRED E. KAHN, THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS 119 (1988).

> subscriber probably is small. If so, the average cost of cable television would be minimized by having a single company in any given geographical area.[79]

Another way to conceive of the problem is to imagine competing electric utilities laying competing sets of transmission and distribution lines throughout the country. Clearly, a single power line from a single producer is more efficient than wasteful duplication by multiple utilities.

The justification for the regulation of natural monopolies can be traced back to the English common law and is based on two principles.[80] The first justification is the economic argument about efficiency.[81] The second justification is that regulation should support those products or services "affected with the public interest."[82] Water, natural gas, electricity, some forms of telecommunications, and rail lines are all examples of services and products that have been deemed to be 1) in the public interest, and 2) natural monopolies and, thus, candidates for government regulation.[83] The economic sins of monopoly power are that prices are set at super-competitive levels, quantity is reduced below competitive demand, and social losses are experienced as consumers are, in effect, denied a product at the competitive prices they are willing to pay.[84] How, then, should government respond to this market failure?

B. The Regulatory Compact

The government response to the market imperfection of natural monopoly in the electricity industry was to regulate it through price and profit controls.[85] Ironically, perhaps, regulation came in the form of a government imposed and supported monopoly. Simply, a private monopoly was replaced by a government one.[86] The aim of the government monopoly was to set prices at competitive levels and to ensure electricity would be available to all customers, thus avoiding the economic sins of monopoly power. These goals were accomplished through the process known as rate making—to be discussed shortly—and rate making was the key component of the regulatory compact between government and industry.

Judge Kenneth Starr provides a good description of the regulatory compact:

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79 Omega Satellite Prods. Co. v. Indianapolis, 694 F.2d 119, 126 (7th Cir. 1982).

80 *See generally* Aditya Bamzai, Comment, *The Wasteful Duplication Thesis in Natural Monopoly Regulation*, 71 U. CHI. L. REV. 1525, 1529 (2004) (discussing the development of common law rules created to constrain monopolies granted by the British Crown).

81 *Id.* at 1530.

82 *See* Munn v. Illinois, 94 U.S. 113, 127 (1876) (quoting Lord Matthew Hale, *De Portibus Maris*, *reprinted in* 1 A COLLECTION OF TRACTS RELATIVE TO THE LAW OF ENGLAND 72, 78 (Francis Hargrave ed., 1787) (c. 1670)).

83 *See generally* SHAPIRO & TOMAIN, *supra* note 46, at 101.

84 *See, e.g.*, *id.* at 103.

85 *See* HYMAN ET AL., *supra* note 30, at 111 (describing regulatory goals of utility regulation).

86 *Id.*

> The utility business represents a compact of sorts; a monopoly on service in a particular geographical area (coupled with state-conferred rights of eminent domain or condemnation) is granted to the utility in exchange for a regime of intensive regulation, including price regulation, quite alien to the free market. Each party to the compact gets something in the bargain. As a general rule, utility investors are provided a level of stability in earnings and value less likely to be attained in the unregulated or moderately regulated sector; in turn, ratepayers are afforded universal, non-discriminatory service and protection from monopolistic profits through political control over an economic enterprise.[87]

Thus, the compact is based on a quid pro quo. Privately owned utilities are subjected to government price and cost controls in exchange for which the utility undertakes a service obligation within a specified territory. Under the compact, consumers avoid monopolistic prices and are entitled to receive electric service. The utility earns the revenue necessary to serve that territory, without the interference of competition, as long they operate prudently.

The compact worked well for decades as both producers and consumers benefitted from this arrangement.[88] Producers made a profit and, as utilities continued to enjoy economies of scale, consumer prices fell.[89] In addition, public utility commissions were generally sleepy and noncontroversial places.[90] Utility regulation fell below the political radar screen because prices stayed flat or declined and because the industry continued to expand to the enjoyment of utility shareholders.[91] Things changed for all parties when utility prices rose precipitously in the 1970s.[92]

These two ideas—natural monopoly and the regulatory compact—helped create the industry as we know it today. While we can be comfortable in saying that the electricity industry supported economic growth for most of the twentieth century, we can also say that it supported a very capital-intensive and fossil fuel-dominated industry. We can further say that at the tail end of the last century the industry became economically cumbersome.

Once traditional utilities reached their economies of scale, prices began to rise and, as noted above, there were new entrants waiting in the wings to put cheaper electricity on the market.[93] Additionally, our energy policy began looking to the desirability of alternative and renewable resources to produce cleaner electricity.[94] Further, gains in energy efficiency could be realized while also addressing climate change and rising electricity prices. In short, alternatives to traditional coal-burning power plants were available.

87 Jersey Cent. Power & Light Co. v. Fed. Energy Regulatory Comm'n, 810 F.2d 1168, 1189 (D.C. Cir. 1987) (citation omitted).

88 *See* JAMES C. BONBRIGHT ET AL., PRINCIPLES OF PUBLIC UTILITY RATES 19 (2d ed. 1988) (noting the decreasing costs of generation and distribution for utilities operating as a natural monopoly).

89 Shapiro & Tomain, *supra* note 43, at 512–13.

90 *See, e.g.*, Tomain, *supra* note 34, at 450 (discussing the later transformation of public utility commissions due to political and economic pressures).

91 *See* Shapiro & Tomain, *supra* note 43, at 513.

92 *Id.*

93 Tomain, *supra* note 34, at 437–38.

94 *See* BARBARA PRAETORIUS ET AL., INNOVATION FOR SUSTAINABLE ELECTRICITY SYSTEMS: EXPLORING THE DYNAMICS OF ENERGY TRANSITIONS 228 (2009).

Unfortunately, the old model of electricity regulation, and the industry that it spawned, constituted a high barrier to reform and progress. In no small part, the barrier has been strengthened as a result of a rate-making process which favored the traditional utility. We need new thinking about rate making. Before this Article turns to the new regulatory compact, this Part will examine how traditional rate making entrenched dirty energy.

C. Traditional Rate Making

Rate making is the device that drives the regulatory compact; the fundamental idea is to create a mechanism which sets prices at efficient, competitive levels. Rate making is intended to mimic the market with the primary objective of allowing a private utility to operate as a competitive business, which means it must be profitable enough to attract capital investment.[95] Rate making serves other objectives as well. Regulation was intended to make electricity universally available, reliable, and abundant.[96] Rate making was also intended to allow controls over demand and to establish certain relationships among customer classes.[97] Nevertheless, providing a return on investment to utilities and maintaining abundant electricity dominated the traditional reasons for rate making.[98]

Today, we can question whether or not those rate-making objectives should continue to dominate. While we may agree that utilities should earn a return on their investments, should they be encouraged to continue to make investments in dirty power plants? Should they be rewarded at the expense of new entrants? Should the traditional formula confront the demand for environmental protection and promote more efficient electricity and energy markets? Most particularly for the purposes of this symposium, should utilities now earn a return on smart grid investments?

To better understand how rate making has distorted markets and has contributed to pollution we must briefly examine the rate making formula: $R = O + (V - d)r$. The formula is simple enough. R represents the utility's revenue requirement—that is, the amount of money the utility needs to stay in business. O represents the utility's prudently incurred expenses. In short, ratepayers reimburse the utility for its expenditures dollar for dollar. The utility's rate base is represented by $(V - d)$, which stands for the *value* of a

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95 SHAPIRO & TOMAIN, *supra* note 46, at 108–09.

96 The leading treatises on rate regulation are BONBRIGHT ET AL., *supra* note 88, and CHARLES F. PHILIPS, JR., THE REGULATION OF PUBLIC UTILITIES: THEORY AND PRACTICE 163–94 (2d ed. 1988). Both treatises recognize that rate making can be used for economic purposes such as correcting monopoly behavior. *See, e.g.*, BONBRIGHT ET AL., *supra* note 88, at 33–35; PHILIPS, *supra*, at 43–44. They also recognize that rate making can be used to achieve "social" purposes such as income transfers to protect the poor. *See, e.g.*, BONBRIGHT ET AL., *supra* note 88, at 165–67; PHILIPS, *supra*, at 425–28. Below, I consider changes to the rate-making formula in order to curb carbon emissions, and promote the use of energy efficiency and renewable resources. *See infra* Part V. Are those objectives economic, social, or mixed?

97 SHAPIRO & TOMAIN, *supra* note 46, at 108–09.

98 *See, e.g.*, SCOTT HEMPLING, NAT'L REGULATORY RESEARCH INST., MULTI-UTILITY ISSUES AT A GLANCE 4 (2009), *available at* http://www.nrri.org/pubs/multiutility/NRRI_multi_utility_issues_mar09-04.pdf.

utility's capital investment minus *depreciation*, which is returned to the utility as expenses. Finally, *r* represents the rate of return on the rate base.[99]

A moment's reflection should reveal the incentives contained in this traditional formula. A for-profit utility earns nothing on its expenditures. It does, however, earn a reasonable rate of return based on comparative risks in similar industries for all the money it invests in capital projects such as plants and transmission lines.[100] Consequently, utility management can best serve shareholders by investing as much money as it can in capital projects—even as distinct from labor or service expenditures.[101] In the past, a continuing pattern of such investment became suboptimal because it led to both excess capacity, which meant higher cost electricity, and lower quality service, especially in infrastructure.[102] The industry needs significant investment in transmission and distribution to keep service reliable, thus avoiding blackouts and brownouts.

A further refinement on the rate-making process involves how a utility's costs are billed to customers. Those costs can be broken down into three basic categories: energy, customer, and demand costs. Energy costs generally are charged according to the amount of energy consumed by an individual customer.[103] The energy costs are variable with the customer; however, most consumers do not pay the true variable cost of electricity, as will be explained below.[104] Customer costs are also variable and they constitute the costs the utility incurs for billing, meter reading, accounting, and the like.[105] The demand costs constitute the fixed costs of a utility's plant and include those operating expenses which do not vary with the cost of producing power.[106]

What is less obvious in the description of these costs is that the rate structure can be designed such that one class of users can effectively subsidize other classes. Utility customers can be divided into three groups: industrial, commercial, and residential. The charges to serve a large industrial customer, for example, are significantly lower per kilowatt sale then the cost of serving an individual residential consumer.[107] Utility

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99 SHAPIRO & TOMAIN, *supra* note 46, at 109.

100 *See id.* at 111–12; Tomain, *supra* note 34, at 445.

101 This preference for capital investment is known as the Averch-Johnson Effect, or "A-J Effect," named for two economists. *See generally* Harvey Averch & Leland L. Johnson, *Behavior of the Firm Under Regulatory Constraint*, 52 AM. ECON. REV. 1052, 1052 (1962) (discussing the Averch-Johnson economic principle to maximize profit for monopoly utilities).

102 SHAPIRO & TOMAIN, *supra* note 46, at 114.

103 *See* ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, RESIDENTIAL ELECTRICITY PRICES: A CONSUMER'S GUIDE (2008), *available at* http://www.eia.doe.gov/bookshelf/brochures/rep/Printer_friendly.pdf.

104 *See infra* notes 107–08 and accompanying text.

105 HYMAN ET AL., *supra* note 30, at 292; SHAPIRO & TOMAIN, *supra* note 46, at 113. *See generally* Conn. Office of Consumer Counsel, Understanding Your Electric Bill, http://www.ct.gov/occ/cwp/view.asp?a=1411&q=420512&occNav=%7C40423%7C (last visited Nov. 15, 2009); Pac. Power, Understanding Your Electric Costs, http://www.pacificpower.net/Article/Article43274.html (last visited Nov. 15, 2009).

106 *See* HYMAN ET AL., *supra* note 30, at 292.

107 SHAPIRO & TOMAIN, *supra* note 46, at 113.

commissions interested in maintaining relatively low rates for residential consumers, then, can impose a slightly higher customer charge on the industrial consumer, thereby cross-subsidizing residential users. Similarly, all classes of consumers might subsidize low-income consumers through what is sometimes referred to as lifeline rates, which are below the actual cost of electricity service.[108]

Therefore, the rate formula can aim for economic efficiency rather than monopoly power. The formula can also foster certain social policies, which we all might agree are laudable. Social policies, however, may come at the cost of economic efficiency. Inefficiency in electric rates appears not only as a result of cross subsidization of customer classes but also in the rate design itself. For many years utilities sold electricity through a rate design known as the declining block rate.[109] Let's assume that a customer uses 900 kilowatt hours (kWh) of electricity in a month. Let's further assume that the average cost for the 900 kWh is $0.10/kWh. Under the declining block rate, the utility will charge consumers $0.11 for the first 300 kWh, $0.10/kWh for the next 300 kWh, and $0.09/kWh for the last 300 kWh. The utility thus earns its average cost of $0.10/kWh, but the consumer has an incentive to consume all 900 kWh in order to achieve that average cost when their true demand may be less than 900 kWh. The price signal created by the declining block rate tells customers to consume the full 900 kWh. The declining block is also known as the promotional rate because it encourages consumption.[110] Consumption, of course, can be discouraged by a different rate structure, such as inverted rates, through which electricity rates rise as more electricity is consumed.[111]

From the utility's perspective, the declining block rate structure was very attractive. The utility could include its demand costs and fixed expenses in the early blocks, and would include its variable customer costs and energy costs in the later blocks. Recall that the rate formula already contained a capital investment incentive, and this method of rate collection complemented it nicely by allowing utilities to recover their investment with the early purchases of electricity. During the so-called golden age of electricity, especially from the end of World War II to the mid-1960s, customers were not particularly concerned about these incentives, nor about their rate of consumption, because electricity costs were fairly low and rates did not increase proportionately to the economy.[112] Once electricity prices began to increase, however, a rate structure that promoted consumption was clearly seen as inefficient.[113] Nevertheless, the entire industry had been based upon

108 *Id.* at 114.

109 *See id.* at 113.

110 *See, e.g.*, David Nichols, *The Role of Regulators: Energy Efficiency*, 18 PACE ENVTL. L. REV. 295, 300 (2001).

111 *See* Ahmad Faruqui, *Inclining Toward Efficiency*, PUB. UTIL. FORT., Aug. 2008, at 22, 22–24 (2008); *see also infra* notes 190–92 and accompanying text (discussing inverted block rates).

112 *See* HYMAN ET AL., *supra* note 30, at 163–64; Joseph P. Tomain, *Electricity Restructuring: A Case Study in Government Regulation*, 33 TULSA L.J. 827, 833 (1998).

113 *See* Shapiro & Tomain, *supra* note 43, at 509.

the idea that increased consumption is directly aligned with increased economic prosperity—thus promotional rates stayed on the books.[114]

Today, we can no longer afford promotional rates and instead must approach the true rate of electricity as closely as possible. Economic theory supports the idea that the true price of electricity should be charged to customers.[115] Known as marginal cost pricing in the literature discussing the true price of electricity,[116] the simple idea is that average costs distort the price signals sent to customers and, therefore, distort demand. If, however, customers pay the cost of producing the next unit of electricity—in other words, pay its marginal costs—then they would receive accurate price signals and could change their demand accordingly.[117] In other words, as the cost of electricity rises, consumers can consume less.

The attraction of marginal cost pricing for rate setting has been long known. Then a Wisconsin Public Service Commissioner, and now a United States Court of Appeals judge, Richard Cudahy made the point forcefully in 1974:

> Our decision in this vintage proceeding marks a new and constructive departure in the establishments of rates—one which gives adequate emphasis to the formulation of the prices themselves as distinguished from related aggregates such as revenue requirement or return. . . .
>
> . . . .
>
> The instant case in its later phases, however, primarily concerns the structure or design of prices and the relationship of such structure to demand, to the efficient allocation of resources, to wasteful uses of resources, to conservation, to environmental protection, to revenue erosion and also to more conventional (albeit vital) concerns such as revenue requirement.[118]

In essence, if the rate is set at marginal cost, then as those prices and rates increase, demand will decrease.[119] A note of warning is appropriate. The reforms discussed in this Article and generally among regulators and policy makers are likely to increase electricity prices at least in the short

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114 *See id.* at 503–12 (describing the regulatory history of public utilities).

115 *See generally* KAHN, *supra* note 78, at 65 (detailing economic theory in the context of public utility regulation).

116 *See, e.g.*, *id.* at 65.

117 *See* SEVERIN BORENSTEIN, THE TROUBLE WITH ELECTRICITY MARKETS (AND SOME SOLUTIONS) 10–15 (2001), *available at* http://www.ucei.berkeley.edu/PDF/pwp081.pdf (discussing real time pricing as more efficient in light of the market manipulation in California in 2000).

118 Madison Gas & Elec. Co., [1974] 5 Pub. Util. Rep. 4th (PUR) 28, 50 (Wis. Pub. Serv. Comm'n Aug. 8, 1974) (Cudahy, Comm'r, concurring).

119 The rate of decrease in demand for every rise in price is known as the price elasticity of demand. PAUL A. SAMUELSON, ECONOMICS 359–60, 361 fig.20.1 (8th ed. 1970). Some products, like water or blood for transfusions, are relatively inelastic, which means that as prices rise, demand does not drop off at the same rate. *See id.* at 359–61, 376. For many years it was believed that electricity tended to be inelastic. *See* HYMAN ET AL., *supra* note 30, at 83. Recent studies, however, demonstrate that electricity has more demand elasticity than once believed. *See* discussion *infra* notes 228–30 and accompanying text.

term.[120] The argument about marginal costs is that the pain of higher costs must be absorbed to get the electricity market working more efficiently for consumers and producers alike in the mid- to long-term.

D. The Electricity Future

Electricity's future is uncertain for many reasons. Most prominent among the reasons for the uncertainty is the future of electricity prices. Future prices present a good news and bad news scenario. The bad news is that electricity prices are likely to rise in response to the increased cost of coal imposed by regulations to reduce carbon dioxide emissions from power plants.[121] The "good" news is that without incurring these costs there will be no new energy policy.[122] A carbon charge, whether in the form of a cap-and-trade program or a carbon tax, is the necessary transformative event leading to a cleaner and more independent energy future. Without a carbon charge, U.S. energy policy will be business as usual. Further, efforts to promote renewable resources, improve the grid, and encourage energy efficiency are all likely to have associated costs.

There is another economic dimension to the problem of dirty electricity. A cleaner environment is a classic public good that private actors—here coal-burning utilities—will not provide absent government intervention.[123] A smart energy policy should "internalize the costs of the externalities,"[124] thus incorporating the social costs of pollution into the price of electricity to make the market work efficiently.

Certainly in the mid- to long-term, there are several opportunities for savings. Utilities can no longer see themselves as only in the electricity business and they must begin to redesign their business plans. Tomorrow's utility, the utility of the future,[125] must be in the business of providing a vast array of energy products and services including the "sale" of energy

120 *See generally* ELEC. POWER RESEARCH INST., PRICE ELASTICITY OF DEMAND FOR ELECTRICITY: A PRIMER AND SYNTHESIS 2 (2008), *available at* http://my.epri.com/portal/server.pt?Abstract_id=000000000001016264 (follow "Download" hyperlink) [hereinafter PRICE ELASTICITY PRIMER] (showing that a variety of electricity customers adapt to changes in pricing models).

121 *See, e.g.*, Kate Galbraith & Felicity Barringer, *Planning a Colossal Shift on Pollutants*, N.Y. TIMES, Mar. 24, 2009, at A16.

122 *See id.*

123 *See generally* Timothy J. Muris, *Economics and Consumer Protection*, 60 ANTITRUST L.J. 103 (1991) (discussing the general role of governments in regulated markets).

124 *See, e.g.*, Christopher G. Bond, *Shedding New Light on the Economics of Electric Restructuring: Are Retail Markets for Electricity the Answer to Rising Energy Costs?*, 33 CONN. L. REV. 1311, 1346 (2001).

125 *See, e.g.*, WILL MCNAMARA & MATTHEW SMITH, DUKE ENERGY'S UTILITY OF THE FUTURE: DEVELOPING A SMART GRID REGULATORY STRATEGY ACROSS MULTI-STATE JURISDICTIONS 2 (2007), *available at* http://www.gridwiseac.org/pdfs/forum_papers/155_paper_final.pdf (detailing one utility's efforts to modernize their business model); *see also* ITRON, THE UTILITY OF THE FUTURE: REACHING NEW HEIGHTS 24 (2003), *available at* http://www.narucmeetings.org/Presentations/elec_busi_itron_s06.pdf (providing a roadmap for utilities converting to intelligent use of meter data); KEMA, CONFERENCE WHITE PAPER: "UTILITY OF THE FUTURE" (2008), *available at* http://www.kema.com:80/Images/Utility%20of%20the%20future%20white%20paper.pdf [hereinafter KEMA WHITE PAPER] (addressing challenges of converting electric power utilities to new business models).

efficiency. The transformation of the traditional utility from a business that represented the hard-wired, heavy black rotary dial telephone of the past to a smart utility business more resembling the iPhone will require investments in technology and innovation.[126] Further, regulations must support and encourage the new business model by supporting and encouraging those investments.

The iUtility of the future should not look like the utility of the past. While we will continue to generate electricity from coal and nuclear power, the industry must be weaned from them in favor of new ways of producing electricity. To a very significant degree, energy-efficient technologies are available and market ready,[127] while the same cannot be said with equal confidence for clean coal projects at scale[128] or for a nuclear power renaissance.[129]

Reform is possible in the electric industry and can roughly follow the reform model of the natural gas industry.[130] Regardless of the model, grid investment is necessary. Investment in the smart grid—an electricity grid that is technologically sophisticated, allows for real-time communication

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126 *See* KEMA WHITE PAPER, *supra* note 125.

127 *See* AMORY B. LOVINS ET AL., SMALL IS PROFITABLE: THE HIDDEN ECONOMIC BENEFITS OF MAKING ELECTRICAL RESOURCES THE RIGHT SIZE, at xv (2002); AMORY B. LOVINS ET AL., WINNING THE OIL ENDGAME: INNOVATION FOR PROFITS, JOBS, AND SECURITY 103–22 (2004).

128 *See, e.g.*, MASS. INST. OF TECH., THE FUTURE OF COAL: OPTIONS FOR A CARBON-CONSTRAINED WORLD 70 (2007), *available at* http://web.mit.edu/coal/The_Future_of_Coal.pdf.

129 *See* JOSKOW & PARSONS, *supra* note 56, at 21. Joskow and Parsons argue that nuclear power is notably costlier than either natural gas or coal produced electricity if there are no carbon charges on either coal or natural gas. *Id.* at 22 ("Absent the imposition of explicit or implicit prices on CO_2 emissions and given the current expected costs of building and operating alternative generating technologies, it does not appear that a large nuclear 'renaissance' will occur based primarily on the economic competitiveness of new nuclear power plants compared to alternative fossil-fueled base load generating technologies."); *see also* YANGBO DU & JOHN E. PARSONS, MASS. INST. OF TECH. CTR. FOR ENERGY & ENVTL. POLICY RESEARCH, UPDATE ON THE COST OF NUCLEAR POWER 2–3 (2009), *available at* http://web.mit.edu/ceepr/www/publications/workingpapers/2009-004.pdf (calculating a doubling in the overnight costs of nuclear power since 2003); LISBETH GRONLUND ET AL., UNION OF CONCERNED SCIENTISTS, NUCLEAR POWER IN A WARMING WORLD: ASSESSING THE RISKS, ADDRESSING THE CHALLENGES 2 (2007), *available at* http://www.ucsusa.org/assets/documents/nuclear_power/nuclear-power-in-a-warming-world.pdf (noting nuclear power's continuing safety and security risks); AMORY B. LOVINS ET AL., NUCLEAR POWER: CLIMATE FIX OR FOLLY? 1 (2008), *available at* http://rmi.org/images/PDFs/Energy/E0901_NuclPwrClimFixFolly1i09.pdf (arguing that nuclear power is too costly); AMORY B. LOVINS & IMRAN SHEIKH, THE NUCLEAR ILLUSION 3 (2008), *available at* http://rmi.org/images/PDFs/Energy/E08-01_AmbioNuclIlusion.pdf.

130 *See* JOSKOW, *supra* note 42, at 27 ("The basic reform model for regulated industries [with competitive and natural monopoly segments] has been (a) to separate (structurally or functionally) the potentially competitive segments from the monopoly/oligopoly network segments that would be regulated, (b) to remove price and entry regulation from the competitive segments, (c) to unbundle the sale of regulated network service from competitive services, (d) to establish transparent prices for access to and use of the network, and (e) to allow end-users . . . to choose their suppliers of competitive services and have them arrange to have it 'shipped' to them over an open access network with a regulated cap on the prices for providing transportation service."); *see also* Joel F. Zipp, *Amending the Federal Power Act: A Key Step Toward an "Energy Security and Supply Act of 2009" for the New Administration*, ELECTRICITY J., Dec. 2008, at 6, 7.

between and among consumers and producers, transmits electricity more efficiently, and is able to harness electricity produced from renewable resources—is an essential component of our future energy policy. In order to realize the gains to be made from a smart electricity grid, not only must utilities change their business model, but regulators must renegotiate the regulatory compact. In particular, one of the renegotiated terms must involve the implementation of a new rate design that addresses the defects of the traditional model. The old model was designed chiefly to provide a reliable revenue stream to the utility. With an expanding economy, that revenue stream enabled the utility to continue to grow and realize economies of scale, which meant that customers would not experience price increases.[131]

The traditional model of utility regulation must be replaced with a smarter version—the iUtility. Where the old model encouraged consumption,[132] the new model must encourage conservation. Where the old model fostered economic inefficiency,[133] the new model must foster the efficient use of electricity. Where the old model was content with capital-intensive, centralized power production,[134] the new model must promote distributed, small-scale power production. Where the old model was satisfied with burning dirty fossil fuels,[135] the new model must expand the development, production, and consumption of alternative and renewable resources. Much of these gains can be realized through a renegotiated regulatory compact.

V. THE NEW REGULATORY COMPACT AND THE IUTILITY

Transforming the electric industry is a monumental task. To date, while reform efforts have been ongoing for thirty years, they have stalled as a result of a series of setbacks, including the collapse of Enron, the California electricity crisis, and the August 2003 blackout.[136] As the industry confronts climate change, there may well be something of a silver lining with these stalled efforts. Now, transformation efforts will require a broad range of activities as well as a realignment of jurisdictional responsibilities. Regulators must confront RPS standards, the need for renewable feeder connections,[137] cap-and-trade obligations, grid modernization and expansion, the need for new demand response and energy efficiency studies, and the development of common energy efficiency and advanced metering

131 *See generally* Shapiro & Tomain, *supra* note 43, at 505–06.
132 *Id.* at 509.
133 *Id.*
134 *Id.* at 505–06.
135 *Id.* at 516.
136 Joseph P. Tomain, *Lost in the Flood*, 23 PACE ENVTL. L. REV. 219, 230 (2005) (reviewing THE LAW OF ENERGY FOR SUSTAINABLE DEVELOPMENT (Adrian J. Bradbrook et al. eds., 2005), and COMPENDIUM OF SUSTAINABLE DEVELOPMENT (Richard L. Ottinger et al. eds., 2005)).
137 *See* Bruce Radford, *The Queue Quandary*, PUB. UTIL. FORT., Mar. 2008, at 28, 29.

infrastructure (AMI) standards.[138] Additionally, new lines of federal-state jurisdictional authority will need to be developed. The realignment will require significant planning[139] and coordination, as well as significant amounts of public education,[140] and the smart grid will be the centerpiece of these reforms.

The smart grid promises both energy efficiency and clean energy benefits. Smart energy proponents argue that investments can yield valuable economic returns as well as improved security.[141] While it is economically wise and sound from a policy perspective to promote and develop a smart grid, barriers remain. The largest barrier resides in the traditional regulatory structure that was constructed to serve traditional investor-owned utilities (IOUs). Jurisdiction over IOUs was bifurcated between state and federal regulators.[142] While federal regulators paid attention to wholesale interstate sales, state regulators focused their attention on local distribution.[143] Regardless, the regulatory compact provided IOUs with an opportunity to earn revenue sufficient to serve local customers.[144] The investment incentives were narrowly focused to serve an IOU's specific customer base within the utility's service territory and, understandably, they were not designed to benefit competitors in other regions or states.[145] This preference for local service affected transmission investments as well.[146] Utility transmission investments were narrowly focused to benefit the IOU and its customers; investments were made for short-term returns of about five years; and longer investments were seen as imprudent, thus resulting in underinvestment for years.[147]

Another barrier against moving into the energy future is the chicken and the egg problem involved with developing wind and solar power projects and connecting them to the grid.[148] Transmission investors need to know they have a source of energy before they build transmission or distribution lines, and solar and wind producers need to know they have access to a transmission system.[149] A regulatory scheme limited to serving

138 *See* Scott M. Gawlicki, *AMI Standards—A Work in Progress*, PUB. UTIL. FORT., Sept. 2008, at 68, 69.

139 *See* BRACKEN HENDRICKS, CTR. FOR AM. PROGRESS, WIRED FOR PROGRESS: BUILDING A NATIONAL CLEAN-ENERGY SMART GRID 40–48 (2009), *available at* http://www.americanprogress.org/issues/2009/02/pdf/electricity_grid.pdf.

140 *See, e.g.*, Michael T. Burr et al., *Special Report: Selling the Smart Grid*, PUB. UTIL. FORT., Apr. 2008, at 42.

141 *See* THE ELEC. ADVISORY COMM., SMART GRID: ENABLER OF THE NEW ENERGY ECONOMY 1–2 (2008), *available at* http://www.oe.energy.gov/DocumentsandMedia/final-smart-grid-report.pdf.

142 *See* TIMOTHY J. BRENNAN ET AL., ALTERNATING CURRENTS: ELECTRICITY MARKETS AND PUBLIC POLICY 27 (2002).

143 *Id.*

144 *See* RENEWABLE ENERGY TRANSMISSION CO., THE U.S. ELECTRIC TRANSMISSION GRID: ESSENTIAL INFRASTRUCTURE IN NEED OF COMPREHENSIVE LEGISLATION 29 (2009), *available at* http://www.renewabletrans.com/retcopaper1.pdf.

145 HENDRICKS, *supra* note 139, at 24.

146 RENEWABLE ENERGY TRANSMISSION CO., *supra* note 144, at 7.

147 GRAMLICH ET AL., *supra* note 12, at 16.

148 *See, e.g.*, HENDRICKS, *supra* note 139, at 22. One approach to address this mismatch is to provide solar and wind providers with firm, long-term transmission rights. *See, e.g.*, *id.* at 25–26.

149 *E.g.*, *id.* at 22.

local needs has served its purpose. State regulators must not be in a position to either veto interstate transmission projects or allow local utilities to become free riders on the smart grid.

Traditional electricity policy was wedded to the idea that economic growth increased with increased energy production and consumption.[150] Climate change challenges test that assumption and require us to think about the reduction of carbon emissions. The change in priorities from power production to environmental protection is significant. Instead of treating low-cost electricity as a desirable public good, the public good that regulators must now seek to promote is clean air and a healthy environment. Furthermore, future electricity policy, including smart grid investments, must better address interconnectivity, more sophisticated monitoring and control technologies, and new clean energy power production.[151]

A future electric policy requires new assumptions. First, we can continue to assume that consumers prefer affordable and reliable energy without a significant change in lifestyle. Next, we can assume a preference for affordable clean electricity and for energy efficiency. Third, we can assume that private investment will continue to seek market opportunities and capture opportunity costs for the provision of new services and products. Fourth, we can assume that less market-oriented regulation is preferable to heavy-handed command-and-control regulations. Additionally, we must assume that every policy has its costs and trade-offs.[152] Investing in clean coal technologies or nuclear power to generate electricity is an example of such a trade-off.[153] Finally, we must assume that inaction is unacceptable.

From those assumptions, we can begin to renegotiate a regulatory compact with three key elements. First, the new rate formula must promote competition and market-based rates instead of entrenching firms and rewarding them for inefficient capital investments. Second, the new compact must recognize that significant market imperfections occur where energy and environment converge. However, it is not the case that energy and the environment are mutually exclusive—instead, it is the case that in the convergence lies market opportunities.[154] Third, environmentally responsive regulation should promote innovation, new technologies, and new markets. In short, government has a role to play in designing a future electricity policy, but its role should be as facilitator and market stimulator rather than as an energy czar. The choice is no longer between the environment or the economy. Properly designed and progressive electricity regulations could deliver a healthier environment and a healthier economy.

The traditional rate formula was centered on the idea that the local utility could serve its customers and reward shareholders through the sale of

150 *See id.* at 2–3.

151 *Id.* at 2.

152 John P. Holdren, *The Energy Innovation Imperative: Addressing Oil Dependence, Climate Change, and Other 21st Century Energy Challenges*, INNOVATIONS, Spring 2006, at 4.

153 *See id.* at 5.

154 *See, e.g.*, TIERNEY, *supra* note 12, at 7.

electricity.[155] The new compact need not do away with a formula that provides the local utility with its revenue requirement. However, the local utility must now see itself in the business of selling efficient and clean energy services and products either in a broader geographic market or to a wider customer base. The new utility's service obligation should be refocused from providing electricity to local customers to participating in a dynamic market space of clean and efficient energy.

The model for the new utility, the iUtility, looks at the new business models developed by such enterprises as eBay, Amazon, Dell, Wikipedia, and any number of social networks.[156] The iUtility should resemble the iPhone rather than its landline predecessor. The traditional utility was a capital intensive, centralized monopoly connected to a large regional or national grid and had a single mission.[157] The iUtility, by contrast, is less centralized, encourages more consumer choice among products and services at various prices, is more competitive, and is continually looking at innovation.[158] Where the traditional monopoly enjoyed its monopoly status free from competition, the successful iUtility will thrive in a competitive and innovative environment. The iUtility will require a smart grid, and together the new utility and the modern grid will transform the electricity business and its regulation: "Instead of being proprietary, monopolistic, and large-scale, energy could become interchangeable, competitive, and personal. Moreover, intelligent generation could fundamentally shift the business model of energy companies from commodity sellers to value-added service providers."[159]

The reward structure for the iUtility, through a renegotiated rate formula, will be based upon "energy" sales instead of sales of electricity to customers. The iUtility can sell, as examples, energy efficiency services such as audits or energy planning, energy efficient products such as appliances, green energy from renewables such as solar and wind power, and energy efficiency through either conservation or increased usage through technical improvements. The problem for the iUtility should be apparent. The traditional utility earned revenue based upon the gross volume of its

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155 *See, e.g.*, HEMPLING, *supra* note 98, at 4.

156 *See, e.g.*, DON TAPSCOTT & ANTHONY D. WILLIAMS, WIKINOMICS: HOW MASS COLLABORATION CHANGES EVERYTHING 189 (2006). A shorthand way of distinguishing the traditional utility from the iUtility is the distinction between "push" and "pull" systems. In a push system, such as the U.S. automobile industry, firms "know" their demand, centralize distribution, and attempt to improve efficiencies, among other attributes, as the way to accumulate profits. *See, e.g.*, John Seely Brown & John Hagel III, *From Push to Pull: The Next Frontier of Innovation*, MCKINSEY Q., Aug. 2005, at 83, 83–84, *available at* http://www.johnseelybrown.com/pushpull.pdf. A pull system, by way of contrast, such as those listed above, are uncertain of demand, construct platforms to deliver in real time, and concentrate on regular innovation, among other attributes, for market share and profits. *See id.* at 84–85.

157 *See* John J. Marhoefer, *Intelligent Generation: The Smart Way to Build the Smart Grid*, NATURAL RES. & ENV'T, Summer 2008, at 19, 20.

158 *See, e.g.*, KEMA, SET A COURSE FOR THE FUTURE (2008), *available at* http://www.kema.com:80/Images/U%20of%20F%20Brochure%203-13-08%20%20rgb%20lr.pdf ("Energy generation and storage will become more decentralized, controlled, and delivered at the micro-grid level, enabling greater efficiency in fuel conversion and delivery, as well as conformance to increased renewable regulations and emerging environmental social responsibility.").

159 Marhoefer, *supra* note 157, at 21.

electricity sales.[160] The iUtility will earn its revenue, at least in part, by reduced electricity sales through either increased efficiencies or conservation. How, then, should the new regulatory compact and the rate structure in it be designed to keep the utility in business if electricity sales will be declining?

The new regulatory compact can be broken down into two key components. The first component involves particular charges and obligations that the iUtility will incur in order to deliver a wider variety of energy services and products. These new obligations will be directed to investment in smarter and cleaner energy resources and will move away from traditional dirty energy. The second component of the regulatory compact will involve new rate designs that promote conservation, energy efficiency, and smart consumption instead of encouraging both consumption and capital expansion in traditional energy resources. To be sure, the demand for electricity will continue, and new plants will need to be built. Regulators now, however, will be given a broader array of policies and tools with which to enter a new energy future.

Before we review the renegotiated regulatory compact, another note of caution, reminiscent of the enthusiasm for nuclear power in the late 1950s and early 1960s, must be struck. During the promotional years of commercial nuclear power, the comment was made that commercial nuclear power would be "too cheap to meter" because the cost of nuclear fuel was significantly below the cost of coal oil or natural gas.[161] That prophecy never became true, as construction costs escalated beyond any reasonable estimates.[162] Today, we hope for economic gains in energy efficiency and a better environment through renewable resources, but we must fully consider costs and risks in setting estimates and in imposing new obligations and new rate designs.[163]

The costs and risks of a new regulatory compact must take into account a realistic assessment of supply-side needs not only from new resources, but from traditional ones as well. Additionally, just as the nation is designing a set of uniform reliability standards[164] and renewable portfolio standards,[165] it should also develop uniform metrics and protocols for energy efficiency that can be applied across regions and across utilities.[166] Standards will need to be developed to evaluate and report energy and capacity savings of energy efficiency programs. Additionally, standards must be developed to identify and quantify net greenhouse gas (GHG) emission reductions, accurate

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160 *See*, *e.g.*, Energy Info. Admin., Electric Power Industry Overview 2007, http://www.eia.doe.gov/cneaf/electricity/page/prim2/toc2.html (last visited Nov. 15, 2009).

161 TOMAIN, *supra* note 40, at 8.

162 *See generally id.* at 10 (pointing out that the cost of overruns for nine turnkey plants ordered in 1963 ran between $800 million and $1 billion).

163 *See* ELEC. CONSUMERS RES. COUNCIL, UTILITY ENERGY EFFICIENCY PROGRAMS: TOO CHEAP TO METER? 1 (2008), *available at* http://www.elcon.org/Documents/112608/UtilityEEPrograms-TooCheaptoMeter-Nov%2026,08.pdf.

164 *See* N. Am. Elec. Reliability Corp., Reliability Standards for the Bulk Electric Systems in North America, http://www.nerc.com/page.php?cid=2|20 (last visited Nov. 15, 2009).

165 *See, e.g.*, American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 101 (2009).

166 ELEC. CONSUMERS RES. COUNCIL, *supra* note 163, at 2.

estimates of avoided costs, as well as make allowance for any increasing consumption due to savings in energy costs.[167]

Finally, we must be clear about the costs and risk to the iUtility. Declining sales, of course, mean declining revenues that present a risk to the utility. Those risks can be offset with new services and products. Nevertheless, risks remain. In addition, because growth in consumption will continue, we will continue to require new sources of supply, which are likely to come from traditional sources of nuclear power and coal. The regulatory compact must be sensitive to encouraging smart energy, while not paralyzing traditional sources. Utilities will then require not only the capture of revenue, but will need to maintain cash flow as well as return on investment.[168] The new regulatory compact, then, must address revenue, return, and stability as it stimulates innovation, opens new markets, and invites new actors to the energy future. Thus the new compact will impose new obligations on the iUtility and will necessitate a new application of the rate formula.

A. Smart Energy Obligations

Under the terms of the renegotiated regulatory compact, the iUtility will continue to have its rates set by regulators under a differently applied rate formula. However, instead of selling electricity, the iUtility will sell energy services and products either in a protected geographic market or to a protected set of customers. The rate formula will provide the iUtility with the necessary revenue to promote environmental protection while keeping rates just, reasonable, and nondiscriminatory. Renewable portfolio standards (RPSs), renewable energy credits (RECs), disclosure requirements, surcharges, and decoupling are examples of the new terms that are likely to be in the new compact as regulators impose new obligations on electric utilities.[169]

It is clear that utility investments in renewable and alternative resources can be stimulated through federal financial incentives such as 1) production tax credits, 2) investment tax credits, 3) a more stable and reliable timeline for both types of credits, and 4) loan guarantee programs for green energy investments.[170] State regulation can also assist in green

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167 Under standard economic theory, as prices decline, consumption will increase. *See, e.g.*, FRANK GOTTRON, ENERGY EFFICIENCY AND THE REBOUND EFFECT: DOES INCREASING EFFICIENCY DECREASE DEMAND? 1–2 (2001). Energy efficiency programs are intended to reduce prices, but they are also intended to promote conservation. Nevertheless, as electricity prices decline, there will be some increase in consumption, which is sometimes referred to as the rebound effect or the takeback effect. ELEC. CONSUMERS RES. COUNCIL, *supra* note 163, at 5.

168 *See generally* NAT'L ACTION PLAN FOR ENERGY EFFICIENCY LEADERSHIP GROUP, ALIGNING UTILITY INCENTIVES WITH INVESTMENT IN ENERGY EFFICIENCY 4-1, *available at* http://www.epa.gov/RDEE/documents/incentives.pdf [hereinafter ALIGNING UTILITY INCENTIVES] (discussing the costs incurred by utilities).

169 *See generally id.* at 4-1, 4-9, 5-1 (discussing surcharges, renewable portfolio standards, and decoupling); ED HOLT & LORI BIRD, NAT'L RENEWABLE ENERGY LAB., EMERGING MARKETS FOR RENEWABLE ENERGY CERTIFICATES: OPPORTUNITIES AND CHALLENGES 1 (2005), *available at* http://www.nrel.gov/docs/fy05osti/37388.pdf (discussing renewable energy credits).

170 Michael T. Burr, *Seeing Green: Renewables Attract Utility Investment Dollars*, PUB. UTIL. FORT., May 2009, at 28.

investment by including those investments in the rate base, as will be explored below.[171] Additionally, states may have to rethink their recent unbundling policies so that a utility can invest in generation, transmission and distribution,[172] energy efficiency programs, and distributed generation[173] toward the end of becoming a full service energy provider.

1. RPS

Under RPS requirements, the iUtility is required to provide a specific percentage of its electricity from renewable energy sources such as wind, solar, or bio-energy. The obligation is on the utility to purchase the power in the market, thus reducing its dependence on fossil fuel generated electricity while stimulating new markets. The two essential variables of these policies involve the percent of electricity that is to be distributed from renewable resources and the nomination of which resources satisfy the RPS requirement. To date, twenty-eight states and the District of Columbia have renewable electricity standards that encourage the use of renewable and alternative energy resources, stimulate new markets, create new jobs, and support new technologies.[174] Collectively, the state policies apply to roughly 40% of the United States electricity load and it has been projected that an RPS of 20% by 2020 could have the effect of increasing total renewable energy capacity to 180,000 megawatts.[175] Most recently, federal legislation has been introduced to achieve 16.5% production from a combination of energy efficiency savings and renewable energy by 2020.[176]

2. RECs

RPS programs may also involve a system of RECs, which are tradable carbon emission permits.[177] RECs can be traded either voluntarily by firms or can be traded in markets established by regulation.[178] A utility can purchase RECs on the market to satisfy their RPS obligation.[179] In order to assure that retailers are motivated to meet state goals, penalties are also imposed, which are often in a greater degree than the cost of the renewable energy credit.[180]

171 *See infra* Part V.E.

172 If utilities are not required to divest generation and transmission operations, they should be functionally separate to avoid self-dealing.

173 *See* Burr, *supra* note 170, at 30.

174 PEW CTR. ON GLOBAL CLIMATE CHANGE, RENEWABLE AND ALTERNATIVE ENERGY PORTFOLIO STANDARDS 1 (2009), *available at* http://www.pewclimate.org/sites/default/modules/usmap/pdf.php?file=5907.

175 Union of Concerned Scientists, Experts Agree: Renewable Electricity Standards Are a Key Driver of New Renewable Energy, http://www.ucsusa.org/clean_energy/solutions/renewable_energy_solutions/experts-agree-renewable.html (last visited Nov. 15, 2009).

176 American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. § 101(a) (2009).

177 HOLT & BIRD, *supra* note 169, at 1.

178 *Id.*

179 *Id.* at 2.

180 *See id.* at 20 tbl.1.

3. Disclosure

Disclosure requirements obligate the iUtility to provide information to its customers and investors about its fuel sources and about its carbon and other GHG emissions profile. Disclosure sets uniform standards to allow consumers to price and compare the resource mix and the energy characteristics of their electricity purchases.[181] Today, over half of the electricity customers in the United States are subject to disclosure requirements.[182] Through disclosure, customers are provided with information, have increased product choice, and can improve their energy efficiency.[183]

4. Surcharges

In addition to including expenses and capital investments in the rate formula, PUCs will consider adding an additional charge—an energy surcharge—onto customer bills to enable iUtilities to recover expenditures in energy efficiency programs and other applications sometimes referred to as "negawatts."[184] To the extent that a utility can assist with the installation of energy efficiency products or energy savings from complying with building codes, the iUtility could recapture those costs through the surcharge.

Another form of surcharge is known as the lost revenue adjustment. To the extent that utilities are required to implement either energy efficiency programs or obtain a certain percentage of their power from renewable resources, it is possible that a utility will lose profits because of lost sales. To compensate a utility for participating in such programs, a regulator can award a lost revenue adjustment.[185] The purpose of the adjustment is to cover a utility's fixed costs, which are otherwise lost due to these programs.[186] The advantage to such an adjustment is that the utility is indifferent to its investment between traditional electricity and either efficiency or renewable resources. The downside to such adjustments, however, is that they are notoriously difficult to calculate, can overcompensate the utility, and can reward underperforming programs.[187]

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181 L.A. BIRD, NAT'L RENEWABLE ENERGY LAB., UNDERSTANDING THE ENVIRONMENTAL IMPACTS OF ELECTRICITY: PRODUCT LABELING AND CERTIFICATION 1 (2003), *available at* http://www.nrel.gov/docs/fy03osti/33475.pdf.

182 *See, e.g.*, *id.* at 1, 6 tbl.1.

183 *Id.* at 1.

184 *See, e.g.*, Amory Lovins & Chris Lotspeich, *Energy Surprises for the 21st Century*, 53 J. INT'L AFF. 191, 194 (1999); PowerPoint: Amory B. Lovins, Chief Executive Officer, Rocky Mountain Inst., Keynote Address to Australia's First National Energy Efficiency Conference: Designing a Sustainable Energy Future: Integrating Megawatts with Diverse Supplies at Least Cost (Nov. 13, 2003) (on file with Environmental Law).

185 *See* NAT'L ACTION PLAN FOR ENERGY EFFICIENCY LEADERSHIP GROUP, THE NATIONAL ACTION PLAN FOR ENERGY EFFICIENCY REPORT 2-6 (2006), *available at* http://www.epa.gov/cleanenergy/documents/napee/napee_report.pdf [hereinafter NATIONAL ACTION PLAN].

186 *Id.*

187 *Id.* at 2-6 tbl.2-1; *see also* ALIGNING UTILITY INCENTIVES, *supra* note 168, at 5-11 tbl.5-5.

B. Smart Rate Designs

Rate design is the method through which the iUtility recovers its revenue. As noted above, several purposes, in addition to revenue recovery, can be achieved through properly designed rates. Today, iUtility regulators, both at the federal and state levels, can design policies to promote energy efficiency and clean energy, discourage dirty electricity, and stimulate technological investments.[188] As utilities are required to expand their energy services and products, they are also going to be asked to reduce their rate of growth; reducing growth could have the effect of hampering sales, which, under the traditional formula, means a reduction in revenue. New rate designs, therefore, must provide enough revenue to attract capital so that the iUtility can satisfy its service obligation, meet the social objectives set by the regulators, and, thus, encourage the traditional utility to reformulate its business plan by transforming itself into the iUtility.

Thus, any new rate design must balance several interests, including rate stability[189] for customers and the utilities, proper incentives for smart energy, and accurate price signals for optimum efficiency and investment. No single rate design is likely to accomplish all of these ambitious goals. Nevertheless, the traditional rate design has outlived its useful life and must be replaced. Next, the Article outlines various rate designs currently being considered to achieve efficiency as well as smart electricity.

1. Inverted Block Rates

A simple fix to the problem of the declining block rate, which promoted consumption, is to invert the rates and make electricity more expensive as consumption increases. Inverted block rates are relatively easy to construct and understand.[190] When the initial blocks are set below the anticipated marginal cost they can protect low income users, who are price-sensitive to energy costs, while passing more fixed costs on to larger consumers. Yet, while inverted rates achieve conservation, there is no built-in incentive to either invest in energy efficiency programming or new technologies.[191] Additionally, this rate structure will reduce consumption, but it does not necessarily reduce consumption during peak hours when the electricity load is most expensive.[192]

The inverted block rate design could be constructed to be revenue neutral while still sending signals to consumers that they should reduce demand. The simplest design would be a two-tiered rate structure, in which the first tier falls below the revenue baseline and the second tier falls above the baseline. The utility receives its revenue requirement and consumers are

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188 *See generally* Joskow, *supra* note 49, at 28–30 (discussing policies related to electricity transmission systems and retail market design and retail competition programs).

189 *See* ALIGNING UTILITY INCENTIVES, *supra* note 168, at 3-1 to -2.

190 *See* NATIONAL ACTION PLAN, *supra* note 185, at 5-5.

191 *See* Faruqui, *supra* note 111, at 24.

192 Ahmad Faruqui & Ryan Hledik, *Transition to Dynamic Pricing: A Step-by-Step Approach to Intelligent Rate Design*, PUB. UTIL. FORT., Mar. 2009, at 26, 27–28.

urged to conserve electricity. This design can advance demand-side management programs favored by regulators, but it is unlikely to advance more ambitious clean energy goals.[193]

2. Decoupling

A dramatic break from the traditional rate formula is generically known as decoupling. The central idea is to decouple a utility's revenue from its electricity sales.[194] The iUtility's revenue will be earned from gross sales of energy, including energy efficiency. This is a radical departure for the old way of doing utility business. The traditional IOU made its money from greater electricity sales made possible by greater investment in capital plant and associated facilities, such as transmission and distribution wires.[195] The iUtility will invest in a wider variety of products, facilities, and services.

One decoupling approach is referred to as a straight fixed variable rate design (SFV).[196] This design locates all of the utilities fixed costs into a fixed component of a consumer's utility bill.[197] The fixed costs of plant and other facilities as well as the fixed costs of capital, labor, and the like will be set for each customer in a class.[198] In effect, the iUtility's fixed costs are decoupled from the volume of electricity sales. Variable costs, such as fuel, short-term capital, or purchased power, will be a variable charge to the customer. In this way, customers should receive more accurate price signals about the actual cost of electricity being consumed and then they should be able to adjust demand accordingly. Further, this form of rate design, also known as dynamic pricing, is projected to result in significant savings because more accurate signals will reduce peak demand, thus reducing the sales of high cost electricity.[199]

The idea behind decoupling is to remove the sales incentive while encouraging investments in energy efficiency, renewable resources,

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193 Ren Orans et al., *Inclining for the Climate: GHG Reduction via Residential Electricity Ratemaking*, PUB. UTIL. FORT., May 2009, at 40, 42–43. Section 529 of the Energy Independence and Security Act of 2007 requires the Federal Energy Regulatory Commission (FERC) to conduct a national assessment of demand response efforts. 42 U.S.C. § 8279(a) (Supp. I 2007). The report was due June 19, 2009. *See id.*; *see also* PowerPoint: Ray Palmer, Office of Energy Mkt. Regulation, Fed. Energy Regulatory Comm'n, Presentation to the National Association of Regulatory Utility Commissioners and the Federal Energy Regulatory Commission Demand Response Collaborative: Status Report on FERC National Assessment of Demand Response (Feb. 15, 2009), *available at* http://www.narucmeetings.org/Presentations/DR%20Collaborative%20Ray%20Palmer.pdf.

194 *See* WAYNE SHIRLEY ET AL., REVENUE DECOUPLING: STANDARDS AND CRITERIA 4 (2008), *available at* http://www.raponline.org/Pubs/MN-RAP_Decoupling_Rpt_6-2008.pdf.

195 *See* Michael J. Beck & William Klun, *IOUs Under Pressure*, PUB. UTIL. FORT., June 2009, at 36, 37.

196 DAVID MAGNUS BOONIN, NAT'L REGULATORY RESEARCH INST., A RATE DESIGN TO ENCOURAGE ENERGY EFFICIENCY AND REDUCE REVENUE REQUIREMENTS 1 (2008), *available at* http://nrri.org/pubs/electricity/rate_des_energy_eff_SVF_REEF_jul08--08.pdf.

197 *Id.* at 2.

198 *Id.*

199 Faruqui, *supra* note 111, at 23 ("Dynamic pricing lowers peak-period demands and avoids expensive peaking capacity . . . . One recent study quantified at $31 billion the national savings that would accrue from just a 5-percent reduction in peak demand.").

distributed generation, and smart technology investments.[200] The purpose of the design is to allow the utility to recover its fixed costs, thus not affecting net income. In addition, properly designed, decoupled rate designs can reward the utility for its investment in smart energy programs.[201]

Decoupled rates are not unproblematic. First, in designing a decoupled rate, the regulator must make a choice between allowing the recovery of revenue per customer or setting a net revenue requirement and apportioning it among all customers.[202] Under a revenue per customer design, the utility will lose income as it loses customers. A net revenue design, however, will raise rates for remaining customers as others depart the system.[203] In addition, decoupling requires accurate forecasts, and to the extent that the forecasts are unreliable and require frequent adjustments, rate stability suffers.

3. Straight Fixed Variable Rate and Feebate

The SFV rate design alone may not provide the most accurate price signals for two reasons. First, this rate design relies on short-term marginal costs rather than the more economically reliable long-term incremental, or marginal, costs.[204] Second, the design concentrates on that part of a customer's bill involving fixed costs. To improve the price signal, utilities can make another charge, referred to as a revenue-neutral energy efficiency feebate (REEF).[205] The core idea behind REEF is that a baseline electricity charge will be set.[206] Those customers who conserve electricity by using it off-peak will receive a rebate and those customers who use more costly peak electricity will pay a higher fee.[207] The fees and rebates offset each other and can induce certain behavior, including energy efficiency and conservation, which could reduce coal generation and should reduce grid congestion and other grid stress.[208] The iUtility will see no financial effect

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200 *See* NATIONAL ACTION PLAN, *supra* note 185, at 2-2 to -3.

201 *Id.* at 2-6.

202 A key element in any decoupling involves setting revenue targets and adjusting those targets over the course of a period of time, such as the year, to "true up" the charges to customers. *Id.* at 2–4.

203 *See id.* ("Rates would vary up or down reflecting a balancing account for total authorized revenue requirements and actual revenues from electricity or gas consumed by customers.").

204 BOONIN, *supra* note 196, at 1–2. Regarding long-term incremental cost rates, see KAHN, *supra* note 78, at 75–77. *See also* SEVERIN BORENSTEIN, THE LONG-RUN EFFICIENCY OF REAL-TIME ELECTRICITY PRICING 1 (2005), *available at* http://repositories.cdlib.org/cgi/viewcontent.cgi?article=1036&context=ucei/csem (noting that the economic model of long-run real time pricing demonstrates significant economic benefits for large users and may also reveal economic benefits for small users depending on their demand elasticity).

205 BOONIN, *supra* note 196, at 9–10.

206 *See id.* at 10.

207 *Id.*

208 To function properly, smart meters will be necessary, and the REEF must be continuously adjusted along a known time frame with the information readily and easily available to customers. *See generally* Rick Morgan, *Rethinking 'Dumb' Rates: Achieving the Smart Grid's Potential Requires a Revolution in Electricity Pricing*, PUB. UTIL. FORT., Mar. 2009,

because the charges and rebates will equal each other. Consumers, however, will see their bills increase or decrease depending upon their consumption of electricity. Through such a rate scheme, all of the iUtility's fixed costs are recovered while its variable costs, most importantly the energy costs, will vary according to the demand made by customers. The iUtility will then earn revenues upon which it can rely and customers can use electricity more efficiently. Without too much difficulty, then, the SFV rate structure can maintain the iUtility's revenue requirement and, with the appropriate REEF adjustment, can facilitate efficient consumer choices as long as the baseline is regularly monitored and adjusted.

In order to achieve both outcomes, we must further examine the incentive structure behind this rate design and must first recall that under the traditional rate formula the utility was rewarded for its capital investment.[209] In any rate structure, a return on investment is needed to attract capital;[210] this is also the case for the iUtility. The problem, of course, is that we do not want to encourage capital investment in dirty energy. Instead, the desire is to reward capital investment in clean and renewable energy sources. Consequently, any return on investment should be structured to enhance both efficiency and new renewable technologies.

One mechanism for achieving those ends would be to reward the iUtility with a higher return on clean investments, a lower return on dirty ones, or both. With the SFV rate, the utility should always recover its prudently incurred fixed costs and, therefore, its financial risks are lessened. In exchange for the reduced risk, the iUtility should receive a lower return on equity. Nevertheless, one problem with this design is that such incentive rates of return may be costly to consumers.[211]

Regardless of which items will be included in the rate formula, a choice must be made as to whether or not the item should be carried as an expense or included in the rate base. If the iUtility expenses are prudently incurred, both consumers and the utility should be indifferent as to which items are carried as expenses—the utility receives a dollar-for-dollar return and the customer receives equally valued services. In addition, the utility receives immediate recovery and the accounting is straightforward. The utility and shareholders would prefer to have items carried in the rate base so that they can earn a return on that investment. To the extent that the iUtility is moving away from traditional supply-side investments to smart supply-side

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at 34. The SFV rate design is a form of dynamic pricing that depends on an advanced (or smart) metering infrastructure which can be described as the following:

> AMI typically includes: 1) interval meters, capable of recording customer consumption at least hourly; 2) an integrated two-way communications network that can transmit variable price signals to the consumer and detailed customer usage data to the distribution utility; and 3) a sophisticated data management and billing system that keeps track of multiple rates and time periods.

Id. at 35.

209 SHAPIRO & TOMAIN, *supra* note 46, at 110.

210 *Id.*

211 Int'l Telecomm. Union, OFTA Virtual Training Centre: Price Regulation—FAQ, http://www.itu-coe.ofta.gov.hk/vtm/price/faq/q2.htm (last visited Nov. 15, 2009).

investments, rate base treatment for renewable and efficient products makes sense. Further, to the extent that amortization periods are routine, a certain level of stability should occur.[212] On the downside, however, is the fact that many energy efficiency investments will not be made in tangible assets and evaluation becomes problematic.[213] Further, to the extent that energy efficiency is perceived as an investment, rate base treatment may overcompensate the utility.[214]

Perhaps the most perplexing problem involves cost allocation for smart grid investments. Ratepayers in one section of the country should not pay a disproportionate amount. Ultimately, the responsibility for cost allocation may devolve to the Federal Energy Regulatory Commission (FERC). The federal regulator will then be charged with allocating the costs of smart grid projects throughout the interconnection based on load.[215] The justification for such allocation is that the entire grid should be more reliable and will provide access to clean energy to serve large regions of the country.[216]

New rate designs have the potential of increasing consumer cost for several reasons. First, marginal cost pricing will likely raise costs.[217] Second, to the extent that customers will be subject to renewable portfolio standards, their costs are likely to rise.[218] Additionally, smart meter requirements and smart grid expenditures will raise rates.[219] Finally, energy efficiency expenditures for appliances or for utility efficiencies will also raise rates.[220] We can safely assume that rates will rise in the near term. Yet the hope is that through these expenditures savings will eventually be realized. The realization of savings, however, will only come about to the extent that demand is responsive to price increases.

A hidden assumption in designing incentive rates to capture efficiencies and promote green power is that consumers have accurate information and

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212 ALIGNING UTILITY INCENTIVES, *supra* note 168, at 4-8 tbl.4-4.

213 *Id.* at 4-7.

214 *Id.* at 4-8 tbl.4-4.

215 *But see* Jonathan Schneider, *Paying for the Green Grid*, PUB. UTIL. FORT., Apr. 2009, at 56, 58 ("The proposed socialization of the cost of an interconnection-wide transmission build-out would be an unnecessary and counter-productive step."). The question is whether to roll-in new investment in system-wide rates, *see, e.g.*, S. Cal. Edison Co., 121 F.E.R.C. ¶ 61,168, at 61,753–56 (2007), or whether the costs should be apportioned to the project developers. Schneider argues that if investments in a new grid to serve wind and solar locales are rolled-in and system-wide, then investments in other, more efficient options and existing utility investments in similar projects are "inequitable." Schneider, *supra*, at 59. This is clearly a client-based, narrow argument. Rolled-in rates accomplish the following: 1) project sponsors receive their return, and 2) customers receive the electricity for which they paid.

216 HENDRICKS, *supra* note 139, at 43.

217 Heather Green, *The Static over Smart Grids*, BUS. WK., Apr. 13, 2009, at 48–49.

218 Mary Ann Ralls, *Congress Got It Right: There's No Need to Mandate Renewable Portfolio Standards*, 27 ENERGY L.J. 451, 453 (2006).

219 *See generally* HENDRICKS, *supra* note 139, at 31 (discussing the cost of system-wide implementation of smart grid technology).

220 *See* Rebecca Smith, *Less Demand, Same Great Revenue*, WALL ST. J., Feb. 9, 2009, at R9.

that they have responsive demand elasticities.[221] In other words, a solid understanding of price elasticity of demand is the necessary variable for rate designs that will impose additional costs at least in the short term.

Consumers will respond to rising prices. What is more important, however, is the rate of that response. The rate of response is known as the price elasticity of demand.[222] Perfect, or unitary, elasticity results in a one percent decrease in demand for every one percent rise in price.[223] Historically, electricity has not been known as very price elastic.[224] Instead, consumers continue to consume electricity as price rises.[225] However, recent studies indicate that consumers are beginning to show increasing elasticity.[226] We must be careful here not to claim too much in terms of elasticity. Different classes of customers will have different demand elasticities. Large industrial consumers, for example, are able to respond more quickly and flexibly to price increases than residential consumers because large industrial consumers have more bargaining power and they are often capable of switching to cheaper fuels.[227]

Nevertheless, the recent studies do indicate pricing elasticity for residential consumers. The Brattle Group estimates that short-run residential price elasticities due to price changes can be as low as -0.01 and as high as -0.39, while long-run elasticities due to equipment changes can range between -0.03 and -1.17.[228] One study by the Electric Power Research Institute indicates that short-run price elasticity ranges from -0.2 to -0.6, while long run elasticities range from between -0.7 to -1.4 with a mean of -0.9.[229] And an earlier study by the RAND Corporation examined thirty years of data and estimated residential price elasticity at between -0.2 and -0.32.[230]

The SFV rate structure can be used to encourage smart grid investments because fixed costs will be returned to the iUtility and, where incentive rates apply, the iUtility will be rewarded with a higher return and consumers will exercise greater control over their electricity purchases.

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221 *See* Morgan, *supra* note 208, at 35 ("Overall, dynamic pricing produces a measurable decrease in peak load, and customers usually save energy while reducing their bills. . . . Customer response is typically in the range of 12 to 20 percent of peak.").

222 Richard J. Pierce, Jr., *How Will the California Debacle Affect Energy Deregulation?*, 54 ADMIN. L. REV. 389, 397 (2002).

223 PAUL A. SAMUELSON, ECONOMICS 360 (8th ed. 1970).

224 BONBRIGHT ET AL., *supra* note 88, at 32.

225 *Id.*

226 PRICE ELASTICITY PRIMER, *supra* note 120, at iii.

227 *Id.* at 5–6.

228 Faruqui, *supra* note 111, at 24–26.

229 PRICE ELASTICITY PRIMER, *supra* note 120, at iii, 20 ("A compelling conclusion is that a wide variety of consumers exhibit price response when provided an opportunity to do so."). *See generally* PowerPoint: Sanem I. Sergici & Ahmad Faruqui, The Brattle Group, Presentation at the Massachusetts Department of Public Utilities Smart Grid Information Session: Experimental Design Considerations in Evaluating the Smart Grid (Dec. 15, 2008), *available at* http://www.brattle.com/_documents/uploadlibrary/upload733.pdf (finding consumer demand response from 17 dynamic pricing models).

230 MARK A. BERNSTEIN & JAMES GRIFFIN, REGIONAL DIFFERENCES IN THE PRICE-ELASTICITY OF DEMAND FOR ENERGY 18 (2005), *available at* http://www.rand.org/pubs/technical_reports/2005/RAND_TR292.pdf.

Through the use of REEF, the long-term marginal costs can be used instead of historic embedded costs that will lead to more accurate price signals.[231] The combined SFV and REEF rate design thus relies on marginal costs, is revenue neutral, and can sharpen price signals to consumers.[232] Efficiency investments, costs of carbon emissions, technology investments, and the like can be accounted for and structured in ways that were not possible under the traditional rate formula.[233] It should be noted that the REEF can be applied to either the energy or demand components as well as be targeted to on-peak or off-peak usage depending on the objective of the price signal.[234]

4. Incentive Rates and the Smart Grid

As distinct from the existing transmission and distribution system, the term smart grid will refer to a technologically sophisticated communications system between and among users and producers that will provide accurate information about supply, demand, and reliability.[235] More accurate supply and demand information, in turn, will enable producers to anticipate peaking and will allow consumers to adjust demand in response to prices. The smart grid is also necessary for connecting new sources of alternative and renewable energy, such as wind and solar power, to the traditional system. To bring the smart grid online, public and private investments are necessary, and federal efforts are now being undertaken.[236]

FERC has been charged with the responsibility to improve the grid,[237] including the responsibility to establish incentive rate treatment for new grid

231 Another rate adjustment is to eliminate the "hedge premium." Faruqui & Hledik, *supra* note 192, at 26, 33, 37; Morgan, *supra* note 208, at 36–37 ("The . . . 'hedge premium' reflects the costs of guaranteeing a flat rate around the clock."). The hedge premium, calculated to be approximately 15% or more, was an additional charge included in the customer's bill as a way of reducing price volatility due to heavy usage, awkward weather patterns, and the like. Faruqui & Hledik, *supra* note 192, at 37. Further, because income is decoupled from sales, the iUtility should be indifferent to efficiency-enhancing investments in smart grids, smart meters, advanced metering infrastructure, and the like.

232 PowerPoint: David Magnus Boonin, Dir., Elec. Research & Policy, Nat'l Regulatory Research Inst., Presentation to the Public Utilities Commission of Ohio Workshop on Feebates: Revenue Neutral Energy Efficiency Feebates 5 (Sept. 17, 2008), *available at* http://nrri.org/pubs/electricity/Energy_Efficiency_Feebates_9-08.pdf.

233 *See, e.g.*, Faruqui & Hledik, *supra* note 192, at 27.

234 *See, e.g.*, *id.* at 27–28.

235 *See* KIESLING, *supra* note 16, at 3–4; ENERGY FUTURE COAL., *supra* note 17, at 1.

236 *See, e.g.*, Guldner & Grabel, *supra* note 2, at 4–5.

237 Federal Power Act, 16 U.S.C. § 824p (2006). One area of concern for moving forward with an improved transmission grid involves siting authority. Historically, states have exercised significant jurisdiction over the siting of transmission and distribution lines. Piedmont Envtl. Council v. FERC, 558 F.3d 304, 310 (4th Cir. 2009). The Energy Policy Act of 2005 amended the Federal Power Act to give FERC siting authority. *Id.* That grant of power, however, may not be as broad a grant of authority as might be necessary. In *Piedmont Environmental Council*, the court ruled that FERC lacked authority to permit the construction of an electrical transmission facility in an area designated as a national interest corridor when the state had denied a permit for that facility. *Id.* at 309–10. Federal siting authority may well be necessary for the full and effective realization of the smart grid, especially regarding connections with renewable

investments and including new and renewable sources, reduction of transmission congestion, and improved reliability.[238] Pursuant to that charge, FERC adopted Order Number 679-A, which allows FERC to approve incentive-based rates, including a higher return on equity, 100% of prudently incurred construction work in progress (CWIP) in the rate base, recovery of 100% of prudently operated transmission costs in the event of cancellation, as well as any other incentives that are determined to be just and reasonable and not unduly discriminatory or preferential.[239]

FERC has begun approving such rate structures[240] with a variety of incentives and, while it is too early to tell if the incentive rate structure is efficient and effective, it appears that FERC has been generous even in light of already increasing infrastructure investments.[241] The chief culprit of overgenerous incentives that can contribute to an overinvestment in infrastructure is adding a higher rate of return onto such projects.[242] While higher returns will certainly invite capital investment, utilities already have a service obligation and must invest in transmission to satisfy that obligation. Routinely adding higher rates of return for large construction projects will significantly impact consumers by expanding the rate base, creating an incentive for inflated cost estimates and overruns, and creating an incentive for higher rates of return more generally.[243] It may well be the case that other incentives, such as 100% CWIP or cancellation protection, can provide an incentive for investment through the reduction of construction risk for the iUtility.

The smart grid will require remaking the physical and corporate structure of the existing grid as well as its regulation. Currently, the grid has more than 520 owners that constitute local monopolies that plug into the free major grid systems in the United States.[244] As noted, the traditional federal and state division of regulatory authority has enabled IOUs to rely on

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resources. *See, e.g.*, Bruce W. Radford, *Federalizing the Grid: Renewable Mandates Will Shift Power to FERC but Pose Problems for RTOs*, PUB. UTIL. FORT., Apr. 2009, at 20, 20.

238 Energy Policy Act of 2005, Pub. L. No. 109-58, § 1241, 119 Stat. 594, 961 (adding § 219 to the Federal Power Act, 16 U.S.C. §§ 791–825r (2006)).

239 18 C.F.R. § 35.35 (2008).

240 *See, e.g.*, PacifiCorp, 125 F.E.R.C. ¶ 61,076, at 61,450 (2008) (approving 2% additional return, 100% of CWIP into the rate base, and 100% of prudently incurred costs associated with cancellation or abandonment not as a result of utility's activities to various projects); Xcel Energy Services, 121 F.E.R.C. ¶ 61,284, at 62,496–97 (2007) (describing similar orders for various projects).

241 *See* Scott H. Strauss & Jeffrey A. Schwartz, *Transmission Incentive Overhaul*, PUB. UTIL. FORT., Feb. 2009, at 32, 34–35 (arguing that FERC has been too generous with its incentive rates especially in regard to the return on equity add-ons and noting that "[t]here is no evidence that transmission construction has been impeded because the baseline ROEs applied to completed projects in rate base are too low, or that baseline ROEs will be insufficient to encourage new transmission investment once other risks are addressed by other incentives").

242 *Id.* at 35.

243 *Id.* at 34–35.

244 RENEWABLE ENERGY TRANSMISSION CO., *supra* note 144, at 7. The United States grid is roughly divided between the East, the West, and Texas, which is served by the Electric Reliability Council of Texas. *See* U.S. Dep't of Energy, Overview of the Electric Grid, http://sites.energetics.com/gridworks/grid.html (last visited Nov. 15, 2009).

regulation to support and reward retail distribution.[245] Private ownership in the transmission and distribution segment created a set of economic discontinuities that do not follow the physical laws of electricity, nor do they follow the smart grid needs of the future.[246] If the country is to realize gains to be made from investment in the smart grid, then the federal role must increase. That role will include an independent transmission system operator, greater siting authority, and uniform transmission and reliability rules, as well as investment incentives and other financial support.[247]

Currently, Congress is debating the American Clean Energy and Security Act of 2009.[248] The bill addresses the smart grid in two significant ways. First, the bill proposes that utilities develop a peak demand reduction plan to meet certain goals to be established.[249] The plan can satisfy the established goals by directly reducing demand through energy efficiency measures such as response programming, smarter appliances, smarter storage or distribution, distributed generation, or by assuring a minimum of distributed solar electric generation.[250] For the most part, the bill looks to cooperative federalism, rather than federal preemption, to achieve these goals.[251] Secondly, the bill promotes a policy of regional grid planning to facilitate the deployment of renewable and other zero-carbon energy sources.[252] Transmission planning should attempt to increase technological innovation while improving reliability, reducing congestion, and providing security.[253] The studies will be undertaken by regional planning entities in coordination with the states as well as each other and with FERC.[254]

C. iUtility Products and Services

Central to maximizing the gains from the smart grid will be the redesign of the business of the traditional IOU into the iUtility. The iUtility will offer a greater array of products and services than the traditional IOU. The iUtility will offer electricity from traditional energy sources and from green sources, and the iUtility will offer to sell energy efficiency as a product. The key insight is that the iUtility is in the energy business, not the electricity business. A sample of products follows. An iUtility can sell any or all of such products and services. The regulatory structure, then, should facilitate the

245 U.S. Dep't of Energy, *supra* note 244.

246 RENEWABLE ENERGY TRANSMISSION CO., *supra* note 144, at 6–9, 14.

247 *See generally id.* at 19–21, 40 (evaluating the current transmission grid and recommending legislation for the future); Zipp, *supra* note 130, at 7–8.

248 H.R. 2454, 111th Cong. (as passed by House, June 26, 2009).

249 *Id.* § 144(d).

250 *Id.* § 151; *see also* Pac. Nw. Nat'l Lab., Department of Energy Putting Power in the Hands of Consumers Through Technology, http://www.pnl.gov/topstory.asp?id=285 (last visited Nov. 15, 2009) (demonstrating how consumers use smart appliances to reduce energy consumption).

251 *See, e.g.*, H.R. 2454 § 144 (observing states' roles in establishing peak demand reduction goals).

252 *Id.* § 151(b).

253 *Id.*

254 *Id.*

sales and investments in products and services that contribute to greater efficiency and increased carbon reductions.

1. Green Electricity

Green power is a product through which utilities offer customers the option of buying clean power at a premium.[255] Consumers can choose to purchase an amount of power that would be generated from a renewable energy technology, for which they will pay a premium or a flat fee.[256] In this way, green pricing programs can create markets for clean energy technologies. Another version of green pricing comes where the utility can offer an opportunity for customers to make contributions to support the development of alternative or renewable energy sources.[257] About 25% of the nation's utilities have been offering, and more than half of the country's electricity consumers have the option of purchasing, this product.[258] Recently, DOE's National Renewable Energy Laboratory reported that over 500,000 customers are participating in such programs and that in 2006 green power sales exceeded 3.5 billion kWh.[259]

2. Energy Efficiency

Energy efficiency is the most economically advantageous method for saving energy—reducing energy bills overall, reducing demand for fossil fuels, and stabilizing the energy system.[260] Energy efficiency gains in buildings, appliances, and cars are there to be made and in this regard, then, energy efficiency must be treated as a resource. A recent report states that the results from existing energy savings programs, if extrapolated throughout the country, could yield annual energy savings of $20 billion and net social benefits of more than $250 billion over the next ten to fifteen years.[261] Additionally, such programs could defer the need for 20,000 MW, or forty new 500 MW power plants, while reducing United States emissions by more than 200

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255 LORI BIRD ET AL., NAT'L RENEWABLE ENERGY LAB., GREEN POWER MARKETING IN THE UNITED STATES: A STATUS REPORT 1 (11th ed. 2008).

256 *Id.* at 9.

257 *Id.* at 1.

258 *Id.* at 1–3. Recently, utilities have been able to reduce their premiums. *See, e.g.*, Press Release, Green Mountain Power, GMP Reduces Renewable Energy Premium for Customers by 25% (Apr. 10, 2009), http://www.greenmountainpower.com/about/news.html?news_id=20870&year=2009&month=4 (last visited Nov. 15, 2009); *see also* NC GreenPower, Become a Renewable Energy Generator, http://www.ncgreenpower.org/resources (last visited Nov. 15, 2009) (announcing a change in premiums for new solar photovoltaic agreements).

259 Press Release, Nat'l Renewable Energy Lab., U.S. Dep't of Energy, NREL Ranks Leading Utility Green Power Programs (Apr. 3, 2007), http://www.nrel.gov/news/press/2007/506.html (last visited Nov. 15, 2009).

260 NATIONAL ACTION PLAN, *supra* note 185, at ES-1.

261 *Id.* at ES-5.

million tons of carbon dioxide.[262] The report also notes that these goals are not being achieved due to barriers that include traditional utility regulation.[263]

It is also the case that energy efficiency is not a new concept. Indeed, when prices rise, the market signals the need for energy efficiency, and regulators have looked to utilities to invest in efficiency with cost savings, in part, inuring to the benefit of customers.[264] There are two notable problems with energy efficiency programs. First, unless electricity prices are stable and predictable, there is little incentive to invest in energy efficiency devices or renewable power when the payout or return on investment is uncertain. Second, as a business, energy efficiency programs must be scalable and scalability has not been rapidly forthcoming in this arena.[265]

3. PED—Personal Energy Device

The iUtility can resemble its namesake, the iPhone, in one particular. Imagine a device, a personal energy device (PED), or a software application, which provides personal energy information. The device tells you the gas mileage on your car, the amount of energy lost in your home, the current prices of gasoline and electricity, alternative energy suppliers and products, energy efficiency tips, and any other environmental and energy information you desire. The iUtility could provide the information, sell the device, service the plan, and retrieve, compile, and synthesize customer information for its own business planning. The better coordination of demand and supply information facilitates purchasing and planning and will also increase the efficient use of energy and the resources used to produce it.[266] The iUtility will not only offer new products, but its business model will require it to offer new services such as those that follow.

4. The iEfficiency Utility

The nature of an electric utility can be dramatically reconceived. Efficiency Vermont is a unique "efficiency utility" and is the first of its kind in the United States; it is a public utility charged with helping state residents save energy and protect the environment through energy efficiency gains.[267] It was

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262 *Id.*; *see also* AMORY B. LOVINS, ENERGY END-USE EFFICIENCY 1, 11 (2005), *available at* http://rmi.org/images/PDFs/Energy/E05-16_EnergyEndUseEff.pdf.

263 *See* Edward H. Comer, *Transforming the Role of Energy Efficiency*, NAT. RESOURCES & ENV'T, Summer 2008, at 34, 36.

264 *See id.* at 35.

265 *See* Steve Mitnick, *Making Efficiency Cool: A New Business Plan for Capturing Big Savings*, PUB. UTIL. FORT., Apr. 2009, at 34, 35.

266 *See, e.g.*, THOMAS L. FRIEDMAN, HOT, FLAT, AND CROWDED: WHY WE NEED A GREEN REVOLUTION—AND HOW IT CAN RENEW AMERICA 227 (2008).

267 For a review of state efficiency planning activities, see NATIONAL ACTION PLAN, *supra* note 185, at 6-4 tbl.6-1.

created by the Vermont Public Service Board and is operated by a nonprofit service organization called Vermont Energy Investment Corporation.[268]

The efficiency utility is funded by an energy efficiency charge (EEC) on consumers' electric bills.[269] Early reports indicate that the EEC has caused little or no increase in monthly electricity bills for most customers.[270] Essentially, Efficiency Vermont provides technical assistance and financial incentives to customers to help reduce energy costs through energy efficient equipment and lighting, as well as energy efficient approaches to construction and renovation. Efficiency Vermont reports that during 2006 there was a $5.9 million reduction in retail energy costs with nearly half of those costs coming from over 685 businesses.[271] The report also notes that a net lifetime economic value for activities of 2006 could be in excess of $45 million with total costs at roughly $28 million, for a net benefit to the economy of $16 million.[272]

5. Energy Hedging

The iUtility is an integrated energy provider. To survive, the iUtility must have a comprehensive understanding of its energy portfolio including the most efficient mix of energy resources, including negawatts, energy efficiency, energy futures, and carbon reduction strategies[273] to 1) produce the electricity and other energy products and services that it will sell, 2) at the lowest cost, and 3) with the highest return. Further, the iUtility will guide its investments in energy products as a key segment of its investment portfolio. Part of this investment strategy can include hedging with energy and other energy-sensitive commodities, other securities, or with investment-grade paper and interest swaps.[274] The iUtility will, then, become an energy trader and investment manager[275] and will have developed an important service to be sold in the market to all energy users. The iUtility that is successful in designing such an energy portfolio will have developed expertise and will have created a valuable intellectual property that itself

268 EFFICIENCY VT., 2007 ENERGY EFFICIENCY UTILITY AND EFFICIENCY VERMONT FINANCIAL RESULTS AND SPENDING REPORT (2007), *available at* http://www.efficiencyvermont.com/stella/filelib/2007_FinancialSpendingReport_FINAL.pdf.

269 *Id.*

270 *See* EFFICIENCY VT., 2006 RESULTS SUMMARY (2006), *available at* http://efficiencyvermont.com/stella/filelib/2006%20Summary%20Report%20FINAL.pdf.

271 EFFICIENCY VT., EFFICIENCY VERMONT 2006: EXECUTIVE SUMMARY, *available at* http://efficiencyvermont.com/stella/filelib/AR06ExecSummRevised_Final_forweb.pdf.

272 *Id.*

273 Revis James et al., *The Power to Reduce CO_2 Emissions: The Full Portfolio*, PUB. UTIL. FORT., Oct. 2007, at 60, 60.

274 *See generally* Stephen Maloney, *When the Price Is Right: How to Measure Hedging Effectiveness and Regulatory Policy*, PUB. UTIL. FORT., Oct. 2007, at 24, 24 (describing how hedging programs "promise protection against energy-market price spikes"); Terry Pratt et al., *Rating the New Risks: How Trading Hazards Affect Enterprise Risk Management at Utilities*, PUB. UTIL. FORT., June 2007, at 28, 34–35 (describing methods for controlling risk).

275 *See* Maloney, *supra* note 274, at 24, 26; Pratt et al., *supra* note 274, at 28; *see also* Timothy P. Gardner & James C. Hendrickson, *Carbon Wargames: U.S. Utilities Gain Strategic Insights by Playing Out a Carbon-Constraint Scenario*, PUB. UTIL. FORT., Dec. 2007, at 46, 48–51.

can be sold as a service. The iUtility, then, can offer this service to customers to help them plan their future energy investments hedged against other financial investments.

6. Energy Audits

The iUtility that best manages its diversified energy portfolio and its energy investments could also provide energy advice as an iUtility service. The iUtility can perform energy audits for its customers and then advise businesses, governments, and consumers about how best to realize energy savings, what energy mix is most valuable, how buildings can be constructed with the highest degree of energy efficiency, and which products are most efficient. Additionally, the iUtility could advise those same customers about the range of options for putting together energy portfolios.

VI. REGULATION 3G

The smart grid becomes both central and symbolic to the future of the electricity industry and its regulation. From the perspective of the business of the iUtility, the utility of the future must broaden its business model from concentrating on electricity sales to engaging in the business of selling a variety of energy products and services, including energy efficiency and electricity generated from alternative resources and to local, decentralized distribution. From the perspective of the regulator, the old regulatory compact must now be dramatically renegotiated. Where the old compact encouraged the development of vertically integrated utilities selling electricity in a guaranteed service territory,[276] the new compact must support innovation, investment in new technologies, a reduced dependence on the volume of sales in favor of customer service, and the recognition that the utility business, from wholesale through retail, must be more competitive in the long run.

Importantly, both federal and state regulators must acknowledge the limitations of monopoly IOUs that concentrated on providing local electricity sales.[277] The iUtility must be seen as a regional actor who participates in, rather than controls, regional transmission and distribution. Regardless of whether or not the IOU actually "owns" the wires, they must not have control of price setting authority over the wires. More importantly, investment incentives must be structured to maintain and modernize the entire grid, rather than allow state regulators and local IOUs to have veto power over their regional obligations and financial contributions.

In the short run, utilities will be hybrid organizations. At the wholesale level, utilities will be competitive and the possibility exists for competition among retail suppliers. In the distribution and transmission segments of the industry, however, utilities will continue to exhibit natural monopoly characteristics requiring regulation. It is time to conclude that the federalism

276 JOSKOW, *supra* note 30, at 7–8.
277 *Id.*

experiment of having dual federal and state regulation divided between wholesale and retail operations must be replaced.[278] The restructuring efforts during the last three decades attempting to open access to new suppliers have not succeeded. Utilities and regulators are also reconsidering whether or not requiring separation of distribution and transmission from generation was exactly the right direction for the industry. The general consensus is that reregulating by returning to traditional utility regulation is the wrong direction.[279] Instead, we must actively consider doing away with the bright line of federal or wholesale and state or retail regulation in favor of a more national and comprehensive plan.[280] The need for uniform, more efficient regulation for efficiency standards, renewable energy portfolio requirements, transmission and distribution siting, and cost allocation for green grid investments supports a greater federal role in our electricity future.

There is evidence that the generation segment is competitive and that the transmission segments are not.[281] Consequently, future regulation of electricity should concentrate on coordinating transmission and distribution to serve several economic and environmental goals. The smart grid will have features different than those of the traditional transmission and distribution system. The smart grid will involve more interactive communications technologies as well as access to alternative and renewable resources in addition to the traditional resources. Because the smart grid will, in most instances, cross state lines, the old form of state retail regulation of transmission and distribution is an impediment to an improved, more efficient grid. The most significant impediment is cost allocation. State regulators focus on local customers and are unlikely to allocate out of state transmission and distribution costs.[282] Instead, their refusal to allocate such cost to local customers can doom a project. Going forward, it will be necessary to allocate across state lines the costs of smart grid investments. This interstate commerce alone will necessitate federal regulation.

The electricity industry and its regulators can learn a lesson from natural gas regulation. Historically, the old Federal Power Commission (FPC) regulated wholesale sales of natural gas in interstate commerce and, until 1954, left wellhead and retail regulation to the states.[283] The lack of jurisdiction over wellhead regulation simply allowed high-cost gas prices to be passed through to customers.[284] In 1954, the Supreme Court ruled that the FPC did have wellhead jurisdiction but the ruling greatly harmed the

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278 *Id.* at 8–9.

279 *Id.* at 10.

280 *See, e.g.*, JOSKOW, *supra* note 30, at 7–12; *see also* L. LYNNE KIELSING, DEREGULATION, INNOVATION AND MARKET LIBERALIZATION: ELECTRICITY REGULATION IN A CONTINUALLY EVOLVING ENVIRONMENT 161–63 (2009).

281 Joskow, *supra* note 49, at 9, 22.

282 *See* PAUL L. JOSKOW, INCENTIVE REGULATION IN THEORY AND PRACTICE: ELECTRICITY DISTRIBUTION AND TRANSMISSION NETWORKS 4–5 (2005); PowerPoint: Laura Nelson, Policy Strategist, Idaho Pub. Util. Comm'n, Presentation at the National Association of Regulatory Utility Commissioners Meeting: Transmission Cost Allocation Principles for the Western States (July 25, 2005), *available at* http://www.narucmeetings.org/Presentations/NelsonPresentationl.pdf.

283 *See, e.g.*, Natural Gas Act, Pub. L. 75-688, § 1(b), 52 Stat. 821, 821 (1938).

284 *See, e.g.*, Fed. Power Comm'n v. Hope Natural Gas Co., 320 U.S. 591, 594 (1944).

industry.[285] Procedurally, the new jurisdiction literally shut down the Federal Power Commission's individual adjudicatory hearings for individual rate cases.[286] Further negative consequences ensued as a dual natural gas market was created followed by a domestic natural gas shortage.[287] In the early years of the distorted natural gas market, it was thought that regional[288] and then national rates[289] could solve the problem, but those interstate rates underpriced the resource because natural gas rates were set by historic average costs instead of market prices. Natural gas producers, then, had an incentive to keep gas off of the interstate market and to try to sell the gas on only intrastate markets, thus causing a shortage. The chief promise of the smart grid is that information will be readily and reliably available so that price signals will be accurate for producers and consumers alike. In other words, regional or national rates can be set without the distortions experienced by natural gas rate making thirty and forty years ago.[290]

The traditional form of federal or state and wholesale or retail regulation must recognize the new reality of the smart infrastructure, which can only efficiently operate with open access and with efficient, nondiscriminatory pricing. There is no good reason to continue a fifty state regime when a single entity should be responsible for allocating the costs of generation and transmission. As Paul Joskow writes, that agency should have the following attributes:

> [G]ood information about the costs, service equality and comparative performance of the firms supplying regulated network services, the authority to enforce regulatory requirements, and an expert staff to use this information and authority to regulate effectively the prices charged by distribution and transmission companies and the terms and conditions of access to these networks by wholesale and retail suppliers of power . . . .[291]

FERC will become the primary jurisdictional authority, although there is no reason that regional entities such as regional transmission organizations or federal power markets cannot play major roles in this

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285 *See* Phillips Petroleum Co. v. Fed. Power Comm'n, 347 U.S. 672, 682 (1954).

286 *See* JAMES M. LANDIS, REPORT ON REGULATORY AGENCIES TO THE PRESIDENT-ELECT 6 (1960), *available at* http://www.sechistorical.org/collection/papers/1960/1960_1221_Landis_report.pdf ("In the Federal Power Commission the backlog of pending cases in 1959 was almost four times as great as in 1957. Only last September that Commission announced that it would take 13 years with its present staff to clear up its pending [2313] producer rate cases pending as of July 1, 1960, and that with the contemplated 6500 cases that would be filed during that 13 year period it could not become current until 2043 A.D even if its staff were tripled.").

287 *See* BREYER & MACAVOY, *supra* note 31, at 73; PAUL W. MACAVOY, THE NATURAL GAS MARKET: SIXTY YEARS OF REGULATION AND DEREGULATION 43 (2000); ARLON R. TUSSING & CONNIE C. BARLOW, THE NATURAL GAS INDUSTRY: EVOLUTION, STRUCTURE, AND ECONOMICS 59 (1984); Stephen Breyer & Paul W. MacAvoy, *The Natural Gas Shortage and the Regulation of Natural Gas Producers*, 86 HARV. L. REV. 941, 960 (1973).

288 *See* Wisconsin v. Fed. Power Comm'n, 373 U.S. 294, 299 (1963); *In re* Permian Basin Area Rate Cases, 390 U.S. 747, 758–63 (1968).

289 *See* Shell Oil Co. v. Fed. Power Comm'n, 520 F.2d 1061, 1066 (5th Cir. 1975).

290 MACAVOY, *supra* note 287, at 14.

291 Joskow, *supra* note 49, at 13.

regulation. FERC, or its designee, will also have to assume responsibility for streamlining the siting of transmission facilities so that the smart grid can be effectively constructed. Access to siting and properly allocated transmission rates will smooth out the access problems that have plagued the industry for decades now.[292] Further, there is no good reason that independent transmission companies cannot turn a profit with these sorts of regulatory problems addressed. Independent transmission companies can realize gains through the use of incentive rates and they can operate to reduce congestion and increase reliability.[293]

The iUtility and its regulation constitute an example of the third generation of government regulation. The first generation can be seen as efforts to correct economic market failures through economic regulation such as price setting, as exemplified by grain storage and railroad rates.[294] This form of regulation, from the creation of the Interstate Commerce Commission through the New Deal, attempted to respond to market imperfections and to stabilize the economy. Post World War II, as the economy expanded and thrived, the country confronted a series of social problems from civil rights and women's rights to consumer and environmental protection.[295] The second generation of regulation can be characterized as social regulation, which is distinct from economic regulation and focused on the health safety and welfare of our citizens and the environment.[296] Social regulation, like economic regulation before it, was based upon a model of market failure.[297] The third generation of government regulation ("Regulation 3G") must move in another direction and address both economic and social problems. The smart grid, especially in the era of climate change, exemplifies the need for that move.

In the first instance, our electricity future must address economic problems such as access and reliability, as well as social problems such as environmental protection. Next, the old scheme of regulation and its support of fossil fuel industries must give way to smart technologies and clean resources. Third, the economic and regulatory playing fields must be leveled while promoting new entrants and new market actors.

The market failure model achieved gains and experienced costs.[298] Regardless of whether we perceive the previous forms of regulations as successful or not, it is time for dramatic reform beyond the third way[299] and beyond reinventing government.[300] The market imperfection model narrowly

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292 *See generally* U.S. DEP'T OF ENERGY, "GRID 2030": A NATIONAL VISION FOR ELECTRICITY'S SECOND 100 YEARS 5 (2003), *available at* http://www.oe.energy.gov/DocumentsandMedia/Electric_Vision_Document.pdf.

293 Joskow, *supra* note 49, at 16.

294 SHAPIRO & TOMAIN, *supra* note 46, at 7–8.

295 *Id.* at 16–17.

296 *Id.*

297 *See, e.g.*, KAHN, *supra* note 78, at 328; *see also* STEPHEN BREYER, REGULATION AND ITS REFORM 1, 7 (1982).

298 Joskow, *supra* note 49, at 11.

299 *See, e.g.*, ANTHONY GIDDENS, THE THIRD WAY: THE RENEWAL OF SOCIAL DEMOCRACY 129 (1998).

300 *See generally* DAVID OSBORNE & TED GAEBLER, REINVENTING GOVERNMENT: HOW THE ENTREPRENEURIAL SPIRIT IS TRANSFORMING THE PUBLIC SECTOR (1993); ALBERT GORE, FROM RED

focused on solving and identifying problems such as securities fraud, environmental degradation, and the like.[301] The structural response to such problems was to create an agency to solve them.[302] Again, we can be agnostic as to whether or not that structure produces net benefits. We cannot, however, be agnostic about the problems engendered by that model. The market imperfection model, quite simply, created silos in which regulatory agencies not only followed the tasks assigned to them, but the agencies became susceptible to political and interest group influences.[303] In the process, the agencies helped entrench incumbents and made access costly or prohibitive for new entrants.[304] It is arguable, for example, whether airline deregulation had overall net benefits. It is not arguable that few new entrants are left competing in that market.[305]

The new form of regulation is based on a different set of objectives and values. Most fundamentally, regulation must redefine the nature of the public good. In the field of energy, for example, no longer is the public good to be regulated simply the provision of an adequate supply of reasonably priced electricity; instead, the public good is clean and efficient energy including electricity. Regulation 3G should not only protect markets, it should encourage new entrants as well as competition. Regulation 3G should level the playing field between incumbents and new entrants, while facilitating innovation and the development, adoption, and adaptation of new technologies. Regulation should be seen as collaborative, competitive, participatory, and facilitative, rather than as the government "owning" a problem or a market or an industry and then regulating from the top down.

Regulation 3G should be seen not only as providing benefits that outweigh costs, but as generating "profits" broadly defined. Regulators will set benchmarks or outcomes and regulatees will be required to achieve those goals or risk losing any support that comes from the regulation. Regulators should see themselves as dynamic policy analysts and problem solvers, not necessarily expert in any specific market or industry, but expert in solving the underlying problems common to multiple industries and firms. A regulator should be expert in solving network problems, not promoting the telecommunications industry by way of example. Most importantly, regulations should be tested against the established outcomes or

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TAPE TO RESULTS: CREATING A GOVERNMENT THAT WORKS BETTER AND COSTS LESS (1993) (explaining various approaches of how to reinvent government).

301 *See* BARRY BOZEMAN, PUBLIC VALUES AND PUBLIC INTEREST: COUNTERBALANCING ECONOMIC INDIVIDUALISM 60 (2007).

302 *See generally* FRED BOSSELMAN ET AL., ENERGY, ECONOMICS AND THE ENVIRONMENT 18–20 (2d ed. 2006).

303 *See* JAMES Q. WILSON, BUREAUCRACY: WHAT GOVERNMENT AGENCIES DO AND WHY THEY DO IT 329–30 (1989).

304 *See, e.g.*, Ashley C. Brown & Jim Rossi, Siting Transmission Lines in a Changed Milieu: Evolving Notions of the "Public Interest" in Balancing State and Regional Considerations 16 (Aug. 3, 2009) (discussion draft), *available at* http://www.nrel.gov/analysis/pdfs/rossi_brown.pdf (observing how state siting regulations over transmission lines have preserved monopoly power and formed a barrier to new energy generating plants).

305 *See, e.g.*, Michael E. Levine, *Why Weren't the Airlines Reregulated?*, 23 YALE J. REG. 269, 279 (2006).

benchmarks. If they are not achieved, then the regulations should be changed or eliminated.

The third generation of government regulation should be creative, flexible, and willing to abandon projects that do not work. One test can be whether or not the new form of regulation has stimulated innovation or new technologies or has yielded benefits in excess of benchmarks.[306] Regulators will no longer look only to traditional regulatees but will attempt to bring together actors from various firms and industries to collaboratively address problems and generate new solutions.[307] Research and development will be central to the success of Regulation 3G and regulators will not only have their eye on the future but will also have their eyes on the future of globalization and world participation.

VII. CONCLUSION

Regulation 3G affects the development of the smart grid in many ways. The smart grid requires innovation, collaboration, and technological investment. It promises efficiency, reliability, and smoother working electricity markets. It also promises to transform the industry from sellers of electricity to providers of energy services and products. Regulation 3G also promises to revamp the old regulatory structure into one that is more flexible, market based, and less prone to capture. To be sure, Regulation 3G will have its own cycle of gains and losses. Nevertheless, the core idea behind the regulation is to reduce the command-and-control method of the past with the intent of delivering public goods more effectively and efficiently. In short, Regulation 3G should enable the electric industry to put more steel in the ground.

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306 *See, e.g.*, BARBARA PRAETORIOUS ET AL., INNOVATION FOR SUSTAINABLE ELECTRICITY SYSTEMS: EXPLORING THE DYNAMICS OF ENERGY TRANSITIONS 215 (2009); SUZANNE SCOTCHMER, INNOVATION AND INCENTIVES 162 (2004); DAVID J. HESS, ALTERNATIVE PATHWAYS IN SCIENCE AND INDUSTRY: ACTIVISM, INNOVATION, AND THE ENVIRONMENT IN AN ERA OF GLOBALIZATION 82 (2007); CHARLES WEISS & WILLIAM B. BONVILLIAN, STRUCTURING AN ENERGY TECHNOLOGY REVOLUTION 11 (2009); LAURA DIAZ ANADON ET AL., TACKLING U.S. ENERGY CHALLENGES AND OPPORTUNITIES: PRELIMINARY POLICY RECOMMENDATIONS FOR ENHANCING ENERGY INNOVATION IN THE UNITED STATES 17 (2009), *available at* http://belfercenter.ksg.harvard.edu/files/ERD3_Energy_Report_Final.pdf.

307 *See, e.g.*, Douglas A. Kysar & James Salzman, *Foreword: Making Sense of Information for Environmental Protection*, 86 TEX. L. REV. 1347, 1360 (2008). One way of describing this dynamic process is as a series of feedback loops.