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GRIDLOCK ON THE ROAD TO RENEWABLE ENERGY DEVELOPMENT: A DISCUSSION ABOUT THE OPPORTUNITIES & RISKS PRESENTED BY THE MODERNIZATION REQUIREMENTS OF THE ELECTRICITY TRANSMISSION NETWORK

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I. INTRODUCTION

In November 2006, the American Council On Renewable Energy ("ACORE"), along with the Renewable Energy and Energy Efficiency Caucuses of the United States Senate and House of Representatives, convened the national policy conference, "Renewable Energy in America: Phase II Market Forecasts and Policy Requirements" ("Phase II").[1] Several speakers at Phase II argued that continued private sector financing of renewable energy projects will substantially depend on the expansion of the electrical transmission network. The argument follows this logic: developing renewable energy to the point that it can power America's growing energy needs will require substantial investment from private sector investors. These investors will hesitate to invest money unless they are confident that they will be able to profit by selling the energy on a national market. Unfortunately, the current network of transmission facilities "faces serious technological challenges in each major part of the electricity value chain, from power production to power delivery and end-use."[2] The difficulties involved in transporting energy from where it is produced to where it is needed reduce incentives to invest in renewable energy. Investors fear that these projects may not be profitable because of transmission congestion.

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[1] ACORE, *Renewable Energy in America: Phase II Market Forecasts and Policy Requirements,* http://acore.org/programs/06policy.php (last visited Feb. 4, 2007) [hereinafter *Phase II Program*]. This conference occurs annually. ACORE, "a 501(c)(3) non-profit organization in Washington, D.C., is focused on accelerating the adoption of renewable energy technologies into the mainstream of American society through work in convening, information publishing and communications." ACORE, *ACORE Info Sheet*, Feb. 22, 2005, http://acore.org/download/ACORE%20Info%20Sheet_2.22.05.pdf (last visited Feb. 4, 2007). "With a focus on trade, finance and policy, ACORE promotes all renewable energy options for the production of electricity, hydrogen, fuels, and end-use energy including: solar energy, wind power, hydro power, geothermal energy, ocean energy, biomass energy and biofuels, [and] waste energy and fuels." *Id.* To effectuate its mission statement and scope, ACORE organizes several regularly-meeting committees and hosts three annual convening events in Las Vegas, on Wall Street, and on Capital Hill: 1) Power-Gen Renewable Energy and Fuels Trade Show, "a joint venture with PennWell Communications [and an] all renewable energy conference and exhibition [that] draws attendees from equipment suppliers as well as customers from the energy, power generation, distributed energy, green power marketing, renewable fuels, and transportation industries"; 2) Renewable Energy Finance Forum, "a joint venture with Euromoney Institutional Investor [that] brings together leaders of the finance industry to discuss . . . venture capital, debt and equity markets, project finance, and public sector finance"; and 3) Renewable Energy in America: Phase II, "a high level, two-day policy conference presented in partnership with the Alliance to Save Energy ("ASE") addressing key issues facing the renewable energy and energy efficiency communities. Participants include leaders from government, industry, finance, and nonprofit organizations." *Id.* According to ACORE, Phase II is the period between 2000-2025 where renewable energy technologies will be put to use, as opposed to Phase 1 which took place from 1975-2000 and consisted of over $15 billion of mostly federally funded research, development, and demonstration of successful renewable energy programs. *Phase II Program, supra* note 2.

As of June 16, 2006, the Senate Renewable Energy and Energy Efficiency Caucus had 36 members with a mission "to increase awareness of the various forms of renewable energy and energy efficiency technologies in the United States. As a bipartisan group of Senators representing all parts of the country, it does not take positions on any issues or legislation." Environmental and Energy Study Institute, *Energy and Climate: Caucuses,* http://www.eesi.org/programs/energyandclimate/senatecaucusenergy.htm (last visited Oct. 12, 2007). As of July 13, 2006, the House Renewable Energy and Energy Efficiency Caucus had 221 members. *Id.*

[2] Clark W. Gellings & Steve Hoffman, *The Top 10 Utility Tech Challenges: Innovation Must Play a Key Role in Each Company*, 8/1/06 PUB. UTILITIES FORT. 46, 46 (2006).

While this situation somewhat resembles a "which came first, the chicken or the egg?" dilemma, it is apparent that at some point, new transmission facilities will need to be built and existing facilities will need to be upgraded if renewable energy is going to become a major source of power in America. This paper explores the problem and solution while operating under the main premise that it should be a national priority to do whatever it takes to optimize the domestic production of energy from clean, renewable resources. Particularly, the transmission network should be upgraded. Furthermore, because "industries need investment to get going,"[3] this development must be supported by a combination of private sector investment and federal and state government incentives and investment.

In Part II, this article provides a brief survey of the current state of renewable energy industries. Part III then examines the transmission network congestion issue in general and how it relates to enhancing the use of renewable energy. Part IV presents the legal and political framework for developing and expanding the transmission network. Part V concludes.

II. THE RENEWABLE ENERGY INDUSTRY IS GROWING TO MEET AMERICA'S ENERGY NEEDS

We live in an energy intensive time and place, and the decisions we make about what types of energy we use and how we use it "[exert] the most profound and long-lasting impact on the environment."[4] Consuming electricity everyday for all tasks comes naturally to us and rarely evokes deep thought about where the energy comes from or how it got into our hands.[5] Yet, harnessing the power of energy is a relatively new aspect of human existence, as noted by renowned energy expert Professor Steve Ferry:

> [I]f human history were stretched along a mile, energy capture would only occur in the final foot of this mile. In the final two inches of these 5280 feet, prime movers

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[3] Apollo Alliance, *Clean Energy, Good Jobs, a Secure Future*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, 54 (ACORE 2007). Some argue that it is not the government's place to support industry development. This argument does not account for the fact that "catalytic funding from government in one form or another helped to create the oil and gas industry, the nuclear industry, the auto industry, the gas industry, and the Internet. So scaling the renewable power and fuels industries is going to take the right mix of investment, mandates private sector leadership, and tax incentives." *Id.* In general, one must recognize that there is no such thing as a free market for energy, and there probably never will be. For an *extremely* through examination of energy tax policies at the federal level, see Gilbert E. Metcalf, *Federal Tax Policy Towards Energy* (National Bureau of Econ. Research, Working Paper No. 12568, 2006) http://www.nber.org/papers/w12568.pdf. *See also* Everett Britt, *Renewable Electric Generation 2004: Incentives, Obligations, and Concerns*, 19 NAT. RESOURCES & ENV'T 34 (2005) (discussing topics such as the production tax credit, renewable portfolio standards, net metering, green pricing, and others). This is a highly researched topic and much has been done to the tax code since the Energy Policy Act of 2005 was passed. All of the effects are not yet known.

[4] Steven Ferrey, *Power Future*, 15 DUKE ENVTL. L. & POL'Y F. 261, 261 (2005). For a historical examination of America's energy choices, *see generally* David E. Nye, CONSUMING POWER: A SOCIAL HISTORY OF AMERICAN ENERGIES (MIT Press) (1999).

[5] For a general overview of how the electric transmission system works, see Public Service Commission of Wisconsin, *Electric Transmission Lines: Electricity—From Power Plants to Consumers*, http://psc.wi.gov/thelibrary/publications/electric/electric09.pdf (last visited Mar. 31, 2007).

> were invented to exploit the chemical energy in fossil fuels to produce steam for industrial, heating, and transportation tasks, thereby displacing the medieval windmill and creating the industrial age. Only in the final one inch, oil and electricity are harnessed. The energy that seems a staple of our existence is really quite new.[6]

The market for energy affects almost every other market, and is itself extremely complicated. According to the Department of Energy's ("DOE") Energy Information Administration ("EIA"), "[t]rends in energy supply and demand are affected by many factors that are difficult to predict, such as energy prices, U.S. economic growth, advances in technologies, changes in weather patterns, and future public policy decisions."[7] Recently, energy markets have gradually changed in response to factors such as,

> higher energy prices that have been experienced since 2000, the greater influence of developing countries on world-wide energy requirements, recently enacted legislation and regulations in the United States, and changing public perceptions of issues related to the use of alternative fuels, emissions of air pollutants and greenhouse gases, and the acceptability of various energy technologies, among others.[8]

One such change in the energy markets is the development of the renewable energy industry. The major sources of renewable energy are solar energy, wind power, hydropower, geothermal energy, ocean energy, biomass energy and biofuels, and waste energy and fuels.[9]

The federal government directly endorses and promotes the development of renewable energy through the National Renewable Energy Laboratory ("NREL"), which is part of the DOE's Office of Energy Efficiency and Renewable Energy ("EERE").[10] NREL "develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals."[11] NREL accomplishes its mission by "accelerating the research path from

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[6] Ferrey, *supra* note 5, at 262-263. Ferrey's article provides an eloquent and extensive conversation about the history of our society's use of energy and how it has shaped our civilization.

[7] Energy Information Administration, *Annual Energy Outlook 2007 with Projections to 2030* (2007), http://www.eia.doe.gov/oiaf/aeo/pdf/0383(2007).pdf at 2 (last visited Mar. 31, 2007).

[8] *Id.*

[9] NREL, *Renewable Energy Basics*, http://www.nrel.gov/learning/re_basics.html (last visited Feb. 4, 2007). *See also ACORE Info Sheet, supra* note 2.

[10] NREL, *NREL Overview,* http://www.nrel.gov/overview (last visited Feb. 4, 2007). EERE has a historical role in "leading Federal applied science in emerging technologies . . . [and] is taking aggressive steps to catalyze the rapid commercialization and deployment of critical energy advances through innovative partnerships and collaboration with lenders and investment groups, the States, and industry leaders. [EERE seeks] to help enable and accelerate market transformation toward the use of more efficient and cleaner technologies." Alexander Karsner, *Testimony of Alexander Karsner, Assistant Secretary Office of Energy Efficiency and Renewable Energy, Before the Subcommittee on Energy and Water Development, Committee on Appropriations, U.S. House of Representatives*, Mar. 20, 2007, http://www1.eere.energy.gov/office_eere/congressional_test_032007_house.html (last visited Feb. 4, 2007) [hereinafter *Karsner Testimony*].

[11] *Id.*

scientific innovations to market-viable alternative energy solutions."[12] These technologies are also endorsed and supported by individual industry trade associations, as well as organizations that support the renewable energy industry as a whole, such as ACORE.[13]

The growth of the renewable energy sector is being facilitated by six key market drivers: 1) significant and real growth in energy demand; 2) climate change; 3) environmental benefits; 4) energy costs; 5) rural economics; and 6) energy security.[14] The demand for energy in the United States has increased over twenty-five percent since 1980.[15] Currently about eighty-five percent of the total energy consumed in America comes from fossil fuels: *i.e.* oil, coal, and natural gas.[16] But it is questionable whether the future needs can safely and securely be met with these sources. "[Assuming] that all current laws, regulations, and standards remain as currently enacted," rising electricity demands will require "nearly 300 gigawatts of new generating capacity [by 2030.]"[17] And while fossil fuels have provided "plentiful, relatively inexpensive energy [and have] been the backbone of much of modern America's economic prosperity . . . [they] are showing increasing signs of strain and instability, and the consequences of our energy choices on the natural environment are becoming more apparent."[18]

Perhaps the most attention-getting environmental consequence of our energy choices is climate change, the second major market driver for renewable energy. Climate change is becoming more evident as "[f]aster and faster, year after year for two centuries, human beings have been transferring carbon to the atmosphere from below the surface of the earth."[19] Each year about seven billion tons of carbon are extracted out of the earth's surface in the form of coal, oil, and natural gas, almost

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[12] *Id.*

[13] *ACORE Info Sheet*, *supra* note 2.

[14] Alec Dreyer, CEO of Horizon Wind Energy, Keynote Speech at the Power-Gen Renewable Energy and Fuels Tradeshow 2007 (Mar. 7, 2007) (written transcript not available).

[15] Government Accountability Office, *Testimony Before the Subcommittee on Energy Resources, Committee on Government Reform, House of Representatives: Meeting Energy Demand in the 21st Century*, Mar. 16, 2005, http://www.gao.gov/new.items/d05414t.pdf at 1-2 [hereinafter *GAO testimony*]. In 2003, the energy demand "amounted to the equivalent to about 790 billion gallons of gasoline, or roughly 2,800 gallons for every man, woman, and child in the country." *Id.* at 1.

[16] United States Department of Energy, *Fossil Fuels*, http://www.energy.gov/energysources/fossilfuels.htm (last visited Mar. 15, 2007).

[17] Energy Information Administration, *Long-Term Energy Projections from the Annual Energy Outlook 2007*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, 15-16 (ACORE 2007). A watt is one joule (unit of energy) per second, and a gigawatt is 10^9 watts.

[18] *GAO Testimony*, *supra* note 16, at 1.

[19] Robert H. Socolow & Stephen W. Pacala, *A Plan to Keep Carbon in Check*, SCI. AM., Sept. 2006 at 50. Socolow and Pacala lead the Carbon Mitigation Initiative at Princeton University, where Socolow is a mechanical engineering professor specializing in "energy-efficient technology, global carbon management and carbon sequestration," and Pacala is an ecology professor investigating the "interaction of the biosphere, atmosphere, and hydrosphere on global scales, with an emphasis on the carbon cycle." *Id.* at 53. The EPA notes that "[t]he term climate change is often used interchangeably with the term global warming." However, the National Academy of Sciences has recently reported that "climate change" is the more appropriate term "because it helps convey that there are other changes in addition to rising temperatures." U.S. Environmental Protection Agency, *Climate Change: Basic Information*, http://www.epa.gov/climatechange/basicinfo.html (last visited Mar. 15, 2007).

all of which is burned to release carbon dioxide, or CO_2, into the atmosphere.[20] CO_2, of course, is one of the greenhouse gases ("GHGs") in the earth's atmosphere that retains the solar heat necessary to keep the planet hospitable for life as we know it. In simple terms, too many GHGs cause too much heat retention, which has come to be known as global warming.

The question of whether human activity is leading to climate change is settled in the scientific community. The Intergovernmental Panel on Climate Change concluded in February 2007 that "[g]lobal atmospheric concentrations of CO_2, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years . . ."[21] Most climate scientists are in agreement that such high concentrations of GHGs, particularly CO_2, in the atmosphere are likely to trigger "major, irreversible climate changes, such as the disappearance of the Greenland ice cap."[22]

Fortunately, there are ways to substantially reduce GHG emissions and perhaps reduce the damaging effects of climate change in the future. Much can be achieved with better energy conservation and further "developing renewable energy sources that generate little or no carbon."[23] It is important to note that all energy production negatively affects the environment in some way. Renewable energy sources also have the potential to cause harm associated with unsustainable harvesting of biofuels, landscape changes with solar and wind energy production, and impacts on wildlife from hydropower. However, these potential harms are manageable with proper planning, and there is great opportunity now to determine the best way to use these renewable energy technologies.

Renewable sources of energy provide other environmental benefits, which are another major market driver. Renewable energy sources are "constantly replenished and will never run out,"[24] as opposed to non-renewable fossil fuels that "draw on finite resources that will eventually dwindle, becoming too expensive or too environmentally damaging to retrieve."[25] In addition to the GHG issue, other air pollution that is associated with the burning of fossil fuels can lead to the "acute problems of smog, acid precipitation, particulates, and air toxins."[26] In urban areas that suffer from these problems the most, the demand for environmentally friendly electricity generation is growing.[27] Non-urban areas also desire clean energy, and renewable energy technologies can satisfy this need.

Energy costs are another market driver for renewable energy technologies, as

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20 Socolow & Pacala, *supra* note 20, at 50.

21 Intergovernmental Panel on Climate Change, *Climate Change 2007: The Physical Science Basics—Summary for Policy Makers*, Feb. 2007, http://ipcc-wg1.ucar.edu/wg1/docs/WG1AR4_SPM_Approved_05Feb.pdf, at 2.

22 Socolow & Pacala, *supra* note 20, at 50.

23 Daniel M. Kamen, *The Rise of Renewable Energy*, SCI. AM., Sept. 2006 at 85.

24 NREL, *Renewable Energy Basics, supra* note 10.

25 *Id.*

26 Karl R. Rabago, *A Strategy for Developing Stationary Biodiesel Generation*, 36 CUMB. L. REV. 461, 463 (2006).

27 *Id.* at 464.

"[o]ver the past two years world oil prices have increased significantly relative to historical levels. Crude oil prices, which hovered in the $15-25 per barrel range from the mid-1980s until 2002, have been above $40 since February 2005."[28] These price increases have significantly accelerated world-wide investment in clean and renewable energy sources, which have more than doubled in the last three years—from $27.6 billion in 2004 to $70.9 billion in 2006.[29] The investment in 2006 was broad, taking the form of "$7.1 [billion] in early stage venture capital and private equity investments, $10.3 [billion] in public market fundraisings, . . . $27.9 billion in asset financing for major projects . . . [and] $29.5 [billion] that changed hands in mergers and buy-outs."[30] There is likely to be much more investment in the renewable energy industry because "the U.S. is among the leaders in several technologies that could revolutionize the energy industry in the medium-to-long term."[31] There is no shortage of interest in developing renewable energy, and America has the tools to accomplish this, as evidenced by "America's outstanding research universities, its network of early-stage incubators, its ready supply of venture capital, and its culture of entrepreneurship." [32] The rising costs of energy are motivating the use of such tools.

Rural economic development is also driving the market for renewable energy. Expansion of renewable energy resources has the potential to provide a new steady, reliable, and predictable crop, tax revenue, and job creation in high-tech and other sought after opportunities.[33] There are great opportunities for farmers, ranchers, and forests owners to "produce biomass feedstocks and turn wood, plant residues, processing byproducts and animal wastes into value-added energy feedstocks and bio based products. They can generate electricity by harnessing wind [and] solar energy [and] capturing [and] converting biogas emissions. And they can dramatically increase the production of liquid transportation fuels."[34] The federal government realizes this rural economic

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[28] The White House National Economic Council, *Advanced Energy Initiative,* http://www.whitehouse.gov/stateoftheunion/2006/energy/index.html at 2 (last visited Feb. 4, 2007). This price does not include the cost of environmental externalities or government subsidies, thus, the true costs of fossil fuel energy is much higher than this. *See* Lester R. Brown, PLAN B 2.0: RESCUING A PLANET UNDER STRESS AND A CIVILIZATION IN TROUBLE 15-17, 77-78, (Earth Policy Institute 2006) (discussing the true cost of fossil fuels); *see also* Brian J. Finegan, THE FEDERAL SUBSIDY BEAST: THE RISE OF A SUPREME POWER IN A ONCE GREAT DEMOCRACY 149-183 (Alary Press 2000) (detailing Federal subsidies related to natural resources); Energy Information Administration, *Federal Financial Interventions and Subsidies in Energy Markets 1999: Primary Energy*, Sept. 1999 (analyzing and providing a history of the types of subsidies and other market interventions related to energy).

[29] New Energy Finance, *Clean Energy Investment: Written Testimony to the United States Committee on Energy & Natural Resources on the Financing of Renewable Energy and Low-Carbon Technology*, March 7, 2007, http://www.newenergyfinance.com/NEF/HTML/Press/NEF_WrittenTestimonytoUSSenate_2007-03-07.pdf at 2 (last visited Feb. 4, 2007).

[30] *Id.*

[31] *Id.* at 1.

[32] *Id.*

[33] Dreyer, *supra* note 15.

[34] 25x'25, *25x'25 Action Plan: Charting America's Future*, http://www.25x25.org (follow link to "Action Plan") at 12 (last visited Feb. 4, 2007). The 25x'25 organization has an ambitious, optimistic, and achievable vision: "By the year 2025, America's farms, ranches, and forests will provide 25 percent of the total energy consumed in the United States, while continuing to produce safe, abundant, and affordable food, feed, and fiber." *Id at 2.* The 25x'25 plan was the result of a gathering of farm

development potential and delegated power to the Department of Agriculture ("USDA") in the 2002 Farm Bill "to make loans, loan guarantees, and grants to farmers, ranchers and rural small businesses to purchase renewable energy systems and make energy efficiency improvements."[35] Between 2003 and 2006, Congress spent nearly $23 million on this USDA program to "help farmers, ranchers and rural small businesses reduce energy costs and consumption" and help the nation meet its energy needs and create new sources of income, new jobs, and new uses for agricultural products and wastes.[36] Interestingly, the renewable energy industry has been shown to "generate . . . more jobs per megawatt of power installed, per unit of energy produced, and per dollar of investment, than the fossil fuel-based energy sector."[37] Job creation is important to all parts of the country, not just rural areas, so this finding is likely to further increase arguments in favor of developing this sector.

The sixth major market driver for renewable energy is energy security, as all

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and forestry leaders from across the United States in 2004. 25x'25, *What it Would Mean to Reach the Goal*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, 60 (ACORE 2007) [hereinafter *25x'25 Outlook*]. In response to the question "[h]ow much of our nation's energy supply could come from renewable natural resources in the foreseeable future?," and considering the post-911 landscape with a critical eye, they realized that "[c]ompetition for new energy sources was intensifying, with rapidly growing economies in India and China changing global energy demands and trade flows." *Id.* The 25x'25 initiative was independently analyzed by the RAND Corporation, which simulated 1500 scenarios with various assumptions regarding fossil fuel technology and prices. *Id.* In December 2006, RAND issued a statement that they are revising the study due to some "inadvertent errors in the treatment of existing subsidies for biofuels and the availability of existing hydropower capacity in the computer code, as well as some other details relating to how the renewable requirement is met and at what cost." RAND Corporation, *RAND to Review Renewable Energy Study and Will Issue Corrected Version*, http://www.rand.org/news/press.06/12.05b.html (last visited Feb. 4, 2007). Some of the key findings from the original study remain unaffected: "[1)] 25x'25 results in a one billion ton reduction in carbon dioxide emissions—a 15 percent reduction in the total projected U.S. contribution to global warming. That's two-thirds of the growth predicted to occur over the next twenty years. It brings emissions in the electricity sector back to 2004 levels by 2025; and [2)] Projected petroleum consumption falls by 10 percent, or 2.5 million barrels per day. That's as much as the U.S. now imports from Saudi Arabia and Venezuela combined." *25x'25 Outlook*, *supra* note 35, at 61. The 25x'25 plan is endorsed by more than 400 organizations. 25x'25, *Endorsements*, http://25x25.org (follow link to endorsements) (last visited March 28, 2007).

[35] USDA Rural Development, *What is the Section 9006 Program?*, http://www.rurdev.usda.gov /rbs/farmbill/what_is.html (last visited March 25, 2007). The final rule for this program was published on July 18, 2005 in 7 CFR Part 4280, *available at* http://www.rurdev.usda.gov/rbs/farmbill/ section9006rule.pdf.

[36] *Id.*

[37] Daniel M. Kammen, Kamal Kapadia, & Matthias Fripp, *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?* RAEL Report, University of California, Berkeley, 2004 at 3, *available at* http://socrates.berkeley.edu/~rael/papers.html. Growth in the renewable energy industry is "likely to shift [energy sector jobs] from mining and related services towards manufacturing, construction, and agriculture . . . . This shift would benefit sectors of the economy suffering from very high unemployment. The shift from fossil fuels to renewables will inevitably cause some job losses in the fossil fuel industry, although "the losers are likely to be far outnumbered by the winners." *Id.* (internal citation omitted). Furthermore, the fact that there will be some losers does not mean that the case for renewables is weakened, for "perpetuating a region's dependence on polluting industries with low and steadily declining employment rates is bound to negatively affect that region's development in the long run. This would be especially tragic when we have the option to switch to supporting the growth of a sustainable new sector, which will generate substantial employment." *Id.* at 15. The people and communities that lose jobs to renewables can be compensated by re-training programs designed to keep the pain from the economic transition into a minimum. *Id.*

sources of renewable energy can be "homegrown—produced, built, and managed by Americans."[38] Energy security is defined as "having energy services when they are needed, under acceptable terms and conditions, and without fear of unexpected interruption."[39] The strongest argument for renewable energy in security terms is that increased use of renewable energy, especially biofuels for transportation, can help reduce the need to import oil. This is no minor point because many people have expressed deep concern that "America's dependence on imported oil is undermining the country's national security by tying the U.S. economy to unstable and undemocratic nations, thus increasing the risk of military conflict in political hotspots around the globe."[40] As the relationship between the oil market and international politics is ripe with conflict, reducing our dependence on imported oil provides an excellent opportunity for Americans.

Also important to energy security is the rising global demand for oil which threatens the sufficiency of available supply and has contributed to increasing oil prices to record highs. This is a direct threat to the security of the American economy because "every oil price spike over the past 30 years has led to an economic recession in the United States [and] such price spikes will become more frequent as global competition for remaining oil supplies intensifies."[41] The best way to overcome these energy security threats would be to reduce our need to import by producing our own energy. Aside from the financial benefits to our trade imbalance, this would enable America "to make diplomatic and security decisions based on American interests and values rather than the relentless need to protect access to oil . . . . [And] in many areas of the world, the U.S. diplomatic hand would be greatly strengthened if energy imports were going down rather than up."[42]

Clearly there are plenty of reasons and much evidence that the renewable energy market is growing. The last section introduced the market drivers for the renewable energy industry as a whole — growth in energy demand, climate change, environmental benefits, energy costs, rural economics, and energy security. The following section will provide a brief "industry snapshot" for each of the major renewable energy technologies in the United States.[43] This section

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[38] Dreyer, *supra* note 15.

[39] Rabago, *supra* note 27, at 464.

[40] The Worldwatch Institute, *American Energy: The Renewable Path to Energy Security*, Sept. 2006 at 8, http://images1.americanprogress.org/il80web20037/americanenergynow/AmericanEnergy.pdf (last visited March 25, 2007).

[41] *Id.*

[42] *Id.*

[43] This industry outlook mainly focuses on American industry. It is valuable to note that Asian and European markets have led the growth of renewable energy technologies "thanks to strong and enduring policies that their legislatures adopted in the 1990s [to create] steadily growing markets for renewable technologies, fueling the development of robust new manufacturing industries." Worldwatch Institute, *Worldwatch Institute Outlook*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, at 51 (ACORE 2007) [hereinafter *WWI Outlook*]. America must create its own strong, consistent, and sustainable polices at the state and federal levels if it is to "achieve the nation's full potential for renewable energy" as "U.S. renewable energy polices over the last two decades have been an uneven and ever-changing patchwork . . . [that] have deterred investors . . ." *Id.* at 52. Political support for renewables is growing, fortunately, with several states and local governments implementing renewable portfolio standards and similar supportive policies. For example, "California already gets 31 percent of its

intentionally avoids detailing specific projects or corporations for fairness purposes. Instead, the snapshots focus on the general state of the industry and will show that now is the time to further invest in the development of renewable energy resources. It is also intended to enable an effective discussion as to why the renewable energy industry needs the enhanced support of an upgraded electrical transmission network.[44]

A. The State of Wind Energy

Wind energy generation around the world has more than tripled since 2000, and the United States was the world leader in installations of wind energy in 2005.[45] Wind energy is cost-competitive with electricity from other sources, and in the best sites, costs have decreased from forty cents per kilowatt hour ("kWh") in 1981 to about four-six cents per kWh today.[46] The American Wind Energy Association ("AWEA") believes that supplying twenty percent of the United States' electricity demand with wind energy by 2030 is a feasible and affordable goal that will require increasing the capacity from today's 10.5 gigawatts in operation to 350 gigawatts by 2030.[47] This may seem like a large jump, but the wind resources in the United States are excellent, and these 350 gigawatts are already available at a price of less than nine cents per kWh *before* including any cost reductions that come from policy support such as tax credits.[48] At this price,

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electricity from renewable resources . . . Texas, whose history is closely identified with the oil industry, now has the country's fastest growing wind energy business . . . [a]nd Iowa now produces so much ethanol that if it were all consumed in state, it would meet half of Iowa's gasoline requirements." *Id.* at 52.

[44] At this juncture it is important to note that there are other inputs to the electric system besides transmission, including "different types of generators, distribution facilities, and end-use products." Western Governor's Association Clean and Diversified Energy Initiative, *Report of the Transmission Task Force*, May 2006, *available at* http://www.westgov.org/wga/initiatives/cdeac/TransmissionReport-final.pdf (last visited March 25, 2007) [hereinafter *CDEAC Report*]. In addition, "investment in demand side management and distributed generation" reduce the amount of capacity that is required from the electrical system and therefore reduce the need to increase the transmission investment (and reducing the need to produce more energy). *Id.* Demand-side management changes the amount of electricity consumed through energy efficiency or the timing of electric consumption through demand response. *Id.* at 11. Energy efficiency is attained when "the consumer [can] utilize less electricity to attain the same level of services from such tasks as lighting the home or office, operating appliances, and running electrical equipment." *Id.* "Demand response investments decrease consumption of electricity during peak hours and shift consumption to off-peak periods to decrease the use of expensive peak load generation." *Id.* This can be accomplished with "energy management control systems . . . [that] switch electrical equipment on or off to reduce peak loads," and such systems can be located off-site and controlled by local utility companies. *Id.* Distributed generation is another way to reduce the electricity required and "denotes small, modular electricity generators sited close to customer loads that are interconnected to the existing grid." *Id.* Distributed generation is an excellent use for renewable energy sources that when placed strategically "can be used to defer or eliminate the need for new transmission and distribution line upgrades that would be needed for large centralized generation sources" (like large scale wind). *Id.*

[45] *WWI Outlook, supra* note 44, at 51.

[46] National Renewable Energy Laboratory, *The Outlook for Technology Innovation to Advance Renewable Energy*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, at 12 (ACORE 2007) [hereinafter *NREL Outlook*].

[47] AWEA, *Wind Energy's Contribution to the Nation's Future Energy Supply, in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA at 27 (ACORE 2007) [hereinafter *AWEA Outlook*].

[48] *Id.*

wind is cost competitive with coal, nuclear, and gas generation, and AWEA expects the price to come down even further to 6.5 cents per kWh as the technology improves performance and reduces cost.[49] NREL is also conducting research that will improve the "performance and reliability of utility-class turbines" and enable the expansion of wind power development on-shore and off-shore.[50]

According to AWEA, the barriers to wind energy development and reduced cost are regulatory, not physical.[51] Wind turbine materials and manufacturing capacity are already available, and the cost increases that are associated with exchange rates and raw material price increases affect coal, nuclear, and gas generation as well as wind.[52] Thus, what is holding wind back is the need for such regulatory changes as "operating the power system in a coordinated fashion across a large area, building transmission to serve multiple needs, eliminating artificial 'pancaked' transmission rates that limit bulk power transfers, and operating a continuous real-time energy market for buying and selling energy excesses and shortages."[53] The DOE agrees that "grid modernization, expansion, and integration" is necessary for wind to develop to the point where it can supply twenty percent of the nation's electricity.[54] The reality is that "many good wind resources are located in areas remote from electric load." NREL has stated categorically that the "challenge for wind energy today is transmission."[55] Constructing new transmission lines is a must for the further development of wind energy.

B. The State of Solar Energy

Even though solar energy is "America's most abundant renewable energy resource," it only represents 1/30 of one percent of all electricity generation.[56] Fortunately, there is much room for growth: "[T]he solar energy that falls on roads

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[49] *Id.* AWEA states that the costs forecasted "include the cost of building new transmission lines to move the wind power to customers, and the cost of "balancing" wind energy to demand with dispatchable generators." *Id.*

[50] *NREL Outlook*, *supra* note 47, at 13. NREL believes that since "much of the U.S. population lives near the coasts and the wind blows steadier and stronger across the ocean," off-shore development has significant advantages. *Id.*

[51] *AWEA Outlook*, *supra* note 48, at 27. "The regulatory process required for transmission construction may take years longer than the process of constructing a wind generation project" itself. Britt, *supra* note 4, at 38.

[52] *AWEA Outlook*, *supra* note 48, at 27.

[53] *Id.* Rate pancaking is the "practice of imposing separate fees by multiple transmission owners . . . which can easily double the cost of power purchases involving long distance transmission." *CDEAC Report*, *supra* note 45, at 24. Alternatives to rate pancaking include: 1) "postage stamp rates" developed by regional transmission organizations where a single, uniform, average rate is charged across all utilities in the system; and 2) the "license plate approach whereby rates for service increase across zones in the transmission system." *Id.* Elimination of rate pancaking may significantly reduce costs for transmission customers. *Id.*

[54] *Karsner Testimony*, *supra* note 11.

[55] *NREL Outlook, supra* note 47, at 12.

[56] Solar Energy Industries Association, *Outlook for Solar Energy*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA at 30 (ACORE 2007) [hereinafter *SEIA Outlook*].

in the United States each year contains roughly as much energy content as all the fossil fuel consumed in the world during that same year."[57] Using a conservative forty percent growth rate through 2016 as a forecast, the Solar Energy Industries Association ("SEIA"), estimates that solar can deliver significant benefits to the United States, such as the ability to power 7.4 million new homes by adding thirty gigawatts of new peak electricity capacity. [58] According to SEIA, installing rooftop solar capabilities on only ten percent of American rooftops would provide 700 gigawatts of power, and there is a potential for 200 gigawatts of generating capacity available in the geographically viable sites for concentrating solar power.[59]

The three most prominent types of solar power technologies are solar photovoltaic cells ("solar PV"), concentrating solar power ("CSP"), and solar water heating.[60] The solar cell industry is fast growing and profitable.[61] According to NREL, R&D into solar PV has been extremely successful, and over the last twenty years the cost of electricity generated with solar PV has decreased from several dollars per kWh to less than twenty-five cents per kWh.[62] From 1992 to 2004 the costs dropped fifty-eight percent in response to scaled up production, reduced costs, "better manufacturing techniques, higher efficiency PV devices and new solar nanomaterials."[63] Until 2005, the global solar PV installation market was experiencing a five year compound annual growth rate of forty-four percent, but the rates slowed to less than twenty percent growth per year due to a temporary bottleneck in the supply of polysilicon, which is used in the manufacturing of about ninety-four percent of all solar PV panels today. [64] This obstruction is likely to open up in 2010, the year that SEIA expects to see the global supply for polysilicon triple in response to the demand for solar power, and thus the growth rate will increase.[65]

The CSP industry reached its own milestone in 2006 when two parabolic

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[57] Ferrey, *supra* note 5, at 293. "In fact, no nation on earth uses more energy than the energy content contained in the sunlight that strikes its existing buildings every day." *Id.*

[58] *SEIA Outlook*, *supra* note 57, at 32. This addition would replace the need for 1.7 trillion cubic feet of natural gas, thus eliminating the need to build new liquefied natural gas terminals and reducing imports by ten percent. *Id.* The benefits are even greater under a 67 percent growth rate until 2016 scenario, which is what Germany has shown to be achievable and sustainable (and Germany has solar resources similar to that of Alaska): "[1)] Add 110 GW of new peak electricity capacity to the grid, enough electricity to power twenty-eight million homes; [2)] displace 4.5 trillion cubic feet of natural gas, eliminating the need for all new liquefied natural gas (LNG) terminals, and reducing gas imports by 40 percent; [3)] Create 260,000 jobs; [and 4)] Save consumers over $110 billion in energy costs." *Id.*

[59] *Id.* at 30.

[60] For a description of these technologies, see Solar Energy Industries Association, *Energy Types,* http://www.seia.org/solartypes.php (last visited Apr. 2, 2007).

[61] *WWI Outlook*, *supra* note 44, at 51.

[62] *NREL Outlook, supra* note 47, at 12.

[63] *Id.* Future R&D on the part of NREL and industry includes exploration of nano-structured materials and "efforts to increase solar cell efficiencies by using multiple layers of semiconductors," which are expected to bring the costs down ever further to perhaps 4 or 6 cents per kWh by 2025. *Id.*

[64] *SEIA Outlook*, *supra* note 57, at 30.

[65] *Id.*

trough plants were built to provide sixty-five megawatts of generating capacity. [66] While the solar water heating market showed little growth and averaged about six thousand installations a year between 1998 and 2005, it is expected to grow by fifty percent in 2006 and 2007 due to federal tax credits.[67] To increase the power of solar energy, SEIA advocates "aggressive federal and state policy leadership [so] solar can become a significant source of new generating capacity in a relatively short timeframe."[68] For this to happen there must be stable market polices that will result in "an aggressive ramp-up by domestic manufacturers and installers," such as extension of the federal investment tax credit for residential and commercial installations and an increase in the residential tax credit for PV.[69]

C. The State of Biomass and Biofuels

Biomass is "the most viable renewable option for producing liquid transportation fuels in the near term."[70] The label "biomass" is given to "any fuel derived from organic matter and not from fossil fuels, including forest and agricultural products and wastes, animal waste, and municipal solid waste."[71] This definition includes biodiesel and both grain-based and cellulosic ethanol. Biodiesel describes "a diesel fuel replacement that is made from agricultural fats and oils and meets a specific commercial fuel definition and specification."[72] Ethanol is "high octane, clean burning motor fuel" and is considered a biofuel when produced from the biomass feedstocks listed above.[73]

The biodiesel industry has been growing slowly and steadily for many years, but it has grown exponentially in the last two—in 2004 there were approximately 25 million gallons sold, in 2005 there were 75 million gallons sold, and sales in 2006 exceeded 150 million gallons.[74] The industry's capital investment is growing as well: there were only twenty-two biodiesel plants in 2004 whereas there are eighty-five plants now with sixty-five more in construction and thirteen existing plants with expansion plans.[75] This growth can be partially attributed to the tax policies that encourage biodiesel's market position, such as the blenders' tax credits, the small agri-biodiesel producer credit, and the expansion of infrastructure

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[66] *Id*. at 31.

[67] *Id*.

[68] *Id*. at 30.

[69] *Id*.

[70] *Karsner Testimony*, *supra* note 11.

[71] United States Combined Heat & Power Association, *The Outlook for Biomass Power Generation*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, at 42 (ACORE 2007) [hereinafter *USCHPA Outlook*].

[72] National Biodiesel Board, *Renewable Energy in America—Biodiesel Industry Outlook*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA at 46 (ACORE 2007) [hereinafter *NBB Outlook*]. The biodiesel oilseed crop is about half soybeans, and the other half is vegetable oils and animal fats. *Id.*

[73] Renewable Fuels Association, *Developments in the U.S. Ethanol Industry*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, at 49-50 (ACORE 2007) [hereinafter *RFA Outlook*].

[74] *NBB Outlook*, *supra* note 73, at 46.

[75] *Id.*

credits to include wholesale and distribution infrastructure.[76]

The ethanol industry has been booming since the passage of the Energy Policy Act of 2005 ("EPAct"). As of January 2007, there were "109 biorefineries located in 19 different states with the capacity to process almost 2 billion bushels of grain into more than 5.2 billion gallons of high octane, clean burning motor fuel and 9 million metric tons of livestock and poultry feed."[77] There are also fifty-three more ethanol refineries under construction, as well as seven major expansions, which will contribute another 4.2 billion gallons.[78] In 2006, ethanol represented less than four percent of the motor fuel consumed in America, but because it is blended into forty-six percent of the gasoline consumed, it is growing in importance to the motor fuel supply.[79] By 2008, over 8 billion gallons per year of ethanol are expected to be produced, although this growth will be moderated by the market forces of corn, natural gas, and stainless steel prices,[80] three of ethanol's main ingredients.

Most of the ethanol produced to date has come from grain processing, but in the future the desirable source will be from other feedstocks such as cellulosic materials.[81] Cellulosic ethanol is not being commercially produced yet, but there are many companies—mostly current producers of grain-based ethanol—that are working towards this commercialization.[82] NREL clearly advocates the use of cellulosic ethanol to meet the national goal of making biofuels thirty percent of the nation's transportation fuel supply by 2030.[83] DOE-sponsored research has resulted in effective technologies that can biochemically treat cellulosic biomass from forest residues, agricultural residues, and energy crops to break them down to their component sugars, which are then fermented to produce biofuels like ethanol.[84] For example, the DOE's Idaho National Laboratory was given a 2007 R&D award "for its work with Xtreme Xylanase, an enzyme produced by bacteria found in the hot, acidic waters of Yellowstone National Park."[85] This enzyme's metabolic versatility could make the production of cellulosic ethanol more efficient

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[76] *NBB Outlook*, *supra* note 73, at 47. Policies that are needed to sustain consistent growth in the long term include: 1) "development of an alternative diesel standard that incorporates biodiesel and is established at a realistic level"; 2) extension of the production incentives from the 2002 Farm Bill that expired in July 2006; and 3) increasing research. *Id.* at 47-48. *See also USCHPA Outlook*, *supra* note 72, at 42 (showing that the biomass power generation growth has slowed due to the stop-start nature of production tax credits and incentives that hinder confidence in long-term investment decisions that are ideal to develop projects).

[77] *RFA Outlook*, *supra* note 74, at 49.

[78] *Id.*

[79] *Id.* Ethanol's expansion is actually outpacing increases in gasoline consumption today. *Id.*

[80] *Id.*

[81] *Id.* at 50. Cellulose is the hard-to-break down part of organic plant matter; it tends to be indigestible for humans.

[82] *Id.*

[83] *NREL Outlook*, *supra* note 47, at 13. This objective is "clearly achievable" with "continued growth in grain-based ethanol expected to reach fourteen to fifteen billion gallons by 2025, and [with] anticipated commercialization of cellulose ethanol over time." *RFA Outlook*, *supra* note 74, at 50.

[84] *NREL Outlook*, *supra* note 47, at 13. The biomass can also be thermochemically treated to produce syngas (synthetic gas), which can be further processed into biofuels and products. *Id.*

[85] *Karsner Testimony*, *supra* note 11.

and economical, thanks to its ability to "break down cellulose and hemicellulose over a broad range of temperatures and acidic pH conditions."[86]

In January 2007, cellulosic ethanol cost about $2.50 per gallon.[87] In order for the price to come down to a competitive level, progress must continue to be made in "[r]educing the cost of enzymes used to help break down the cellulosic material, producing better fermenting organisms, [and] finding cheaper ways to harvest and transport the biomass feedstock."[88] EERE employs cost-sharing with industry and is focused on making cellulosic ethanol cost competitive by 2012,[89] and NREL believes that a price level of $1.07 per gallon would be competitive with corn ethanol.[90]

NREL is also working to enhance the development of comprehensive biorefineries.[91] The concept of a biorefinery is similar to that of a petroleum refinery, which produces fuels as well as other derivative chemicals used in plastics, pharmaceuticals, fibers, and other products.[92] These biorefineries have great potential to produce both grain-based and cellulosic ethanol in "co-located" grain and cellulosic biorefineries. In fact, "there is not an ethanol refinery in production today that does not have a very aggressive cellulose ethanol research program," and these biorefinery facilities will "ultimately exponentially expand potential ethanol supplies."[93] Currently, most biofuels produced in rural areas of the United States are shipped to more densely populated areas through the truck and rail system, so future growth will require "an expanded network of pipelines, rail lines, pumps, ports, and transmission lines."[94]

D. The State of Geothermal Energy

Geothermal energy is economically viable and cost effective, and it is already "used to produce significant amounts of base-load electricity."[95] Examples of new geothermal technology include co-production in oil and gas areas that have large quantities of hot water, such as the Gulf Coast and Alaska; drilling for deeper, low permeability geothermal resources, which are available over much of the United States; and direct use through geothermal heat pumps.[96] In 2005, 1.6 billion kWh, or 0.37 percent of all electricity consumed in the United States, was

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[86] *Id.*

[87] *NREL Outlook*, *supra* note 47, at 14.

[88] *Id.*

[89] *Karsner Testimony*, *supra* note 11.

[90] *NREL Outlook*, *supra* note 47.

[91] *Id.*

[92] *Id.*

[93] *RFA Outlook*, *supra* note 74, at 50.

[94] *25x'25 Outlook, supra* note 35, at 21.

[95] *NREL Outlook*, *supra* note 47, at 13.

[96] Geothermal Energy Association, *The Outlook for Geothermal Energy in the United States*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, at 38 (ACORE 2007) [hereinafter *GEA Outlook*]. According to the EPA, "geothermal heat pumps are among the most energy and cost-efficient heating and cooling systems available today." *Id.* at 39.

provided by geothermal energy[97] and the industry is rapidly growing. According to the Geothermal Energy Association ("GEA"), there are sixty-two new projects under development across the United States that will provide an additional eighteen billion kWh of electricity—enough for 1.8 million households—annually.[98] The cost of geothermal energy has decreased fifty percent from twenty years ago and is currently about five to seven cents per kWh.[99] NREL's current research efforts "are aimed at reducing up-front resource discovery risk and reducing costs through innovative drilling techniques and advanced technologies for power plant and reservoir engineering."[100]

With approximately 22,000 megawatts ("MW") of power potential in identified locations, and potentially more than 100,000 MW in unidentified resource bases,[101] the United States is poised to continue being the world leader in geothermal energy production.[102] Specifically, identified hydrothermal resources can provide 15,000 MW with new discoveries estimated to provide 5,000 MW; co-production and distributed generation should provide between 10,000 and 70,000 MW; deep geothermal resources can potentially provide 10,000 MW; direct use will expand to 4,200 MW; and the energy produced from geothermal heat pumps will offset the use of 8400 MW.[103] With sustained support, geothermal resources can provide a major portion of America's energy needs by 2025.[104]

E. The State of Hydro Power

Today, hydro power contributes about 75,000 MW of renewable capacity, representing about nine percent of the total electricity capacity in the United States and seventy-five percent of the renewable energy production.[105] Using conservative estimates, the National Hydropower Association ("NHA") forecasts that there is a potential for water power to provide an additional 23,000 MW by 2025, which is comparable to the wind industry's growth.[106] These capacity expansions will require about forty million dollars per year in investments and will "provide quick, reliable load following capability as well as seasonal capacity. . . . [This will enhance] the performance of other renewable energy sources by providing balance for time of day performance or the intermittent nature of the

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[97] *Id.* at 38.

[98] *Id.*

[99] *NREL Outlook*, *supra* note 47, at 13.

[100] *Id.*

[101] *GEA Outlook*, *supra* note 97, at 38.

[102] *Id.*

[103] *Id.* at 40.

[104] *Id.* Sustained support will be necessary—there are high risks and comparatively high up-front capital costs involved in geothermal technologies, and it is important to continue investing in new research to avoid the use of expensive and intrusive drilling. *Id.* at 41.

[105] National Hydropower Association, *The Outlook for Waterpower Development from 2006 to 2025*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, at 33 (ACORE 2007) [hereinafter *NHA Outlook*].

[106] *Id.*

energy source, such as wind."[107]

In addition to the hydropower on land, there is also great power in the oceans. Ocean energy technologies include the use of ocean currents, offshore wind created by currents, ocean thermal energy conversion ("OTEC"), wave energy, and tide energy.[108] The "energy has been demonstrated to be collectible, economical, distributable, environmentally benign, and available 24 hours a day, all year long."[109] Oceans cover seventy percent of the surface of the earth, and thus the market is international in scope, meaning that the "U.S. economy will benefit by providing ocean energy technology worldwide."[110]

All of the renewable energy technologies just described, excluding large and already established hydropower, contribute about two percent of the total electricity supplied in the United States.[111] The Electric Power Research Institute ("EPRI"), which is "the official research arm of America's power utilities,"[112] estimates that by 2020 these renewables will contribute three to four percent, *assuming* that current energy polices, such as the twenty-three state plans to implement renewable portfolio standards ("RPS"), stay in place.[113] However, policies change. And there are several proposals being discussed at the state and federal levels that will put a price on CO_2, which would substantially increase the role of renewable energy. [114] If CO_2 prices were combined with high-natural gas prices, renewables may contribute thirteen percent to the total electricity supply by 2020, and up to thirty-three percent in 2050.[115]

Clearly the clean and renewable energy business is growing and there is much potential for investment and profit. However, the exact path that the renewable energy market will follow is not so clear. Some analysts worry that the excitement and investment is reminiscent of the dotcom era bubble, which of course "busted," and they wonder if will be a similar bust in this industry.[116] They often point to the rise and fall of renewables in the late 1970s and early 1980s, when renewables were popular after the oil shocks but declined in priority when oil prices fell back down.[117] Indeed, as oil prices are one of the market drivers, it

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[107] *Id.* at 34.

[108] Ocean Energy Council, *Presentation on Ocean Energy*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, at 36 (ACORE 2007) [hereinafter *OEC* Outlook].

[109] *Id.*

[110] *Id.* at 37. Currently Europe, Australia, New Zealand, and many Asian countries are leading the industry in developing and implementing ocean energy, although "private U.S. firms are making rapid progress." *Id.*

[111] Electric Power Research Institute, *The Role of Renewable Energy in a Sustainable Electric Generation Portfolio*, *in* THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, at 18 (ACORE 2007) [hereinafter *EPRI Outlook*].

[112] *Building the Energy Internet,* THE ECONOMIST, Mar. 13, 2004, at 24.

[113] *EPRI Outlook, supra* note 112, at 18. An RPS "requires electricity sellers and/or buyers to maintain a predetermined percentage of designated and defined clean energy resources in their wholesale supply mix . . . [these RPS] set a requirement and challenge market participants to satisfy it in any, and the most efficient, manner possible." Ferrey, *supra* note 5, at 285.

[114] *EPRI Outlook, supra* note 112, at 18.

[115] *Id.*

[116] *Tilting at Windmills*, THE ECONOMIST, Nov. 18, 2006 at 71-73.

[117] *Id.* at 73.

is generally conceded by those in the renewable energy industry that "oil-prices below $50 a barrel would undermine the momentum of clean energy."[118]

However, there is growing—and strong—political support for renewable development among corporate America, state and local leadership, and the federal government. Congress gave a "vote of confidence in the energy efficiency and renewable energy programs" with the FY 2007 budget allocation to the EERE,[119] and President Bush announced in 2006 that "America is addicted to oil" and discussed decreasing gasoline consumption, and he reiterated this issue in 2007 when he stated, "[i]t is in our vital interest to diversify America's energy supply" and advocated solar and wind energy and the use of biofuels.[120]

The financial and technological obstacles are challenges that can be overcome. Large industries never develop overnight, and there are many reasons

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[118] *Id.*

[119] *Karsner Testimony*, *supra* note 11.

[120] President Bush made the statement that "America is addicted to oil" in his 2006 State of the Union Address. President George W. Bush, *State of the Union Address by the President*, January 31, 2006, *available at* http://www.whitehouse.gov/stateoftheunion/2006/. He made the statement about diversifying America's energy supply in his 2007 State of the Union Address. President George W. Bush, *President Delivers State of the Union Address*, Jan. 23, 2007, *available at* http://www.whitehouse.gov/news/releases/2007/01/20070123-2.html. In addition, the Democrats' victory in the 2006 election caused several changes in Congress' environmental stance: 1) a Democratic wind energy consultant defeated a Republican oil industry ally in one race; 2) Sen. Barbara Boxer took over as Chair of the Senate Environmental Committee. Boxer is a strong advocate of action on climate change, while her predecessor Sen. Jim Inhofe is infamous for saying that global warming is the "greatest hoax ever perpetrated on the American people;" 3) the House passed a bill that would eliminate oil production tax breaks and penalize firms that refused to renegotiate the "absurdly generous" government contracts and use the proceeds to fund renewable energy projects; 4) Speaker of the House Nancy Pelosi is setting up a committee to address global warming and America's foreign fuel dependence; and 5) several emissions cap-and-trade schemes have been proposed in the Senate and some have support of Presidential candidates. *Waking Up and Catching Up*, THE ECONOMIST, Jan. 27, 2007 at 22-23. The Republican Party is increasingly changing its environmental stance as well, mostly because of national security issues: 1) fiscal hawks worry that there may be negative impacts on the dollar because of growing oil imports; 2) military types worry that a catastrophic global warming event may lead to global conflict over dwindling resources; 3) neoconservatives worry about being dependent on oil imports from openly hostile nations in the Middle East and Latin America; 4) evangelical Christians are taking the stance that there is a duty to protect the environment as part of stewarding God's creation and therefore global warming is a moral issue; and 5) there is a fear that Republicans will lose the support of moderate middle-class voters "who dislike urban sprawl and unfettered oil-drilling." *Id.* at 23. Even the big businesses that will be most affected by new regulations are starting to embrace the changes: 1) Exxon Mobil admitted that their products are contributing to their problem of global warming, about which they used to be fiercely skeptical; 2) 4/5 of utility executives recently polled expected mandatory emissions caps within a decade; 3) ten major companies including Alcoa, DuPont, and Caterpillar have called for a federal cap-and-trade emissions system as quickly as possible to give predictability for long term, interstate investments; and 4) many big firms see emissions caps as opportunities, such as GE which is encouraging use of "ecomagination." *Id.* Finally, states are leading without waiting for Congress: 1) California's legislature has "taken on carmakers, electricity companies, and the EPA . . . [and] its politicians vie to out-green one another," resulting in the Global Warming Solutions Act, which will employ a cap-and-trade system, mandatory renewable portfolios for utilities, and decoupling utility company profits from amount of electricity sold; 2) nine north-eastern states have developed a cap-and-trade scheme to reduce emissions from power generation; 3) ten states are emulating California's strict vehicle GHG emissions standards; and 4) Midwestern states are supporting ethanol in the name of the farmers that grow the corn. *Id.* at 24. At the local level, almost 400 cities have established GHG emissions reductions plans and many cities buy fuel-efficient vehicles for their fleets. *Id.* What these state, local, business, and Congressional actions are showing is that renewable and clean energy is in high demand in America, and the financial hesitancy is worth overcoming.

to be supportive of the renewable energy industry as a whole. Overall, the national security interest in reducing America's dependence on foreign oil, the environmental issue of climate change as a result of GHG emissions, and the ability to stimulate rural economic development are all strong incentives to continue to improve renewable energy technologies. Indeed, this article started with the premise that the United States needs more renewable energy, and now the argument has come back to what it will take to facilitate that development. One of the requirements is a strong electricity transmission network, and the following section will discuss how it works and what needs to be done to make it work for renewables.

III. THE CURRENT STATE OF THE ELECTRIC TRANSMISSION NETWORK: GRIDLOCK & INADEQUACY

"The electric power industry is the most asset-intensive industry in the world" and the United States has over 350 billion dollars of value associated with transmission and distribution ("T&D") alone.[121] The electric grid developed gradually and started out with many small, individual "generation" centers that were directly connected to a "load" center.[122] These individual centers connected together as the number of customers increased, and as demand continued to grow, engineers developed larger generation plants to benefit from "greater economies of scale [and] improved fuel-to-energy conversion efficiencies."[123] However, these same customers wanted the generation plants to be located away from urban areas because of pollution concerns, so the engineers had to design T&D networks to bring the electricity to the population centers.[124] As these grids conglomerated together, the result was what "has been described as the largest machine ever built."[125]

Today, the American "[T&D] systems are widely dispersed with over 650,000 miles of transmission lines, 5,600,000 miles of distribution lines, and over 60,000 substations . . . connecting the generation stations to the consumer."[126] However, most of the grids are still using 1950s era technology,[127] and only one

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[121] Gellings & Hoffman, *supra* note 3, at 47.

[122] John Boyes & Dave Menicucci, *Energy Storage: The Emerging Nucleus*, DISTRIBUTED ENERGY, Jan/Feb 2007, at 16.

[123] *Id.*

[124] *Id.* In the past, generation and transmission planning was combined, whereas today generation and transmission is functionally separated by the restructuring of electric utility committees. *CDEAC Report*, *supra* note 45, at 15.

[125] Boyes & Menicucci, *supra* note 123, at 16. These interconnections led to a huge utility industry which is a major part of the American economy, and given its roots of local monopolies, "tends to be vertically integrated and highly regulated [and] features larger-scale generation and high-voltage transmission with mid- and low-voltage distribution." *Id.* at 16-17. A vertically integrated "utility is responsible for all aspects of generation, transmission, distribution and customer service businesses, with the common goal of reliably meeting customer demands at stable and reasonable rates." F. F. Wu, F. L. Zheng, & F. S. Wen, *Transmission Investment & Expansion Planning in a Restructured Electricity Market*, ENERGY, May/June 2006, at 956.

[126] Boyes & Menicucci, *supra* note 123, at 17.

[127] *Building the Energy Internet, supra* note 113, at 24.

percent of the revenues are reinvested in research and development.[128] Thus, T&D is "the source of nearly all electricity disruptions and outages," which are becoming much more common and expensive.[129] In 1999, "outages and other significant power fluctuations cost the United States nearly $30 billion."[130] In the blackouts of 2001, Silicon Valley alone lost $75 million per day, and the State of California's economy lost $2.3 billion in production cutbacks and lost wages, $21.8 billion in reduced gross state output, and $4.6 billion in reduced household income.[131] Then in the summer of 2003, fifty million customers in the Midwest, New York, and Mid-Atlantic regions lost power for up to a day because of transmission capacity problems associated with summer weather, resulting in about $6 billion in losses to business alone.[132] Experts in the electric power industry do not consider these blackouts to be flukes; they see them as "harbingers of worse to come."[133]

Furthermore, there is a growing national security concern regarding the threat of sabotage, because a single or several well-planned attacks on the T&D systems could shut down entire regions.[134] "In an age of terrorism, enhanced protection for critical electric infrastructure is . . . required"[135] because "we are dependent on electricity for almost every aspect of daily life [and] the transmission grid, due to its interconnected properties and overstressed condition, is vulnerable to an intentional attack."[136]

It is incredibly clear that the American T&D network is aging and investing in its upgrade is one of the most pressing needs of the electricity industry.[137]

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[128] *Id.* at 26. This is less than any other big industry. *Id.*

[129] Boyes & Menicucci, *supra* note 123, at 17.

[130] Ferrey, *supra* note 5, at 277.

[131] *Id.*

[132] *Id.*

[133] *Building the Energy Internet, supra* note 113, at 24. Robert Schainkler of the Electric Power Research Group was quoted as saying: "Trees or terrorists, the power grid will go down again!" *Id.*

[134] Boyes & Menicucci, *supra* note 123, at 18. For example, in December 2003, six transmission line towers in the Nevada desert were found to have been unbolted, leading some to think that this was an attempt to sabotage the energy system and disrupt supply. *Id.*

[135] Steven J. Eagle, *Securing a Reliable Electricity Grid: A New Era in Transmission Siting Regulation?*, 73 TENN. L. REV. 1, 2 (2005). Imagine the horrors of this potential scenario: "A single nuclear weapon exploded at high altitude . . . would create a magnetic field that would radiate back down to earth creating currents that would cascade through major U.S. electrical infrastructure, rendering it inoperable. The immediate flux of gamma rays would create electrons trapped in the Earth's magnetic field giving rise to an oscillating electric current, creating an electromagnetic pulse which could wipe out the electric power infrastructure, telecommunications and other dependent infrastructures." Ferrey, *supra* note 5, at 274.

[136] Eagle, *supra* note 136, at 8. In addition to physical attack, many parts of the transmission computer system were "developed without concern for cyber security" and make "the grid vulnerable to malicious cyber events . . . [such as] the manipulation of data, software or hardware for the purpose of deliberately disrupting the systems that control and support the generation and delivery of electric power." *Id*. at 9.

[137] Gellings & Hoffman, *supra* note 3, at 47. Karl R. Rabago stated his view of the problem quite emphatically: "The electricity system in the United States . . . is a large, central station-dominated, one-way electron delivery system with relatively little intelligence, little or no cybernetic function, concentrated market power, retail monopolies, and very little choice or control by ultimate customers." Rabago, *supra* note 27, at 461.

According to an Edison Electric Institute member survey, investor-owned utilities and stand-alone transmission companies expect to spend about $18.5 billion between 2006 and 2008 on their grids.[138] The federal government is aware of this problem and is working towards its solution.[139] When Congress passed and President George W. Bush signed EPAct, they set forth three clear policy goals for the federal electricity policy: 1) promote competition in wholesale power markets; 2) strengthen the Federal Energy Regulatory Commission's ("FERC") regulatory authority to help prevent market manipulation and market power abuse; and 3) reinforce the energy infrastructure, particularly the interstate transmission grid.[140] The following section discusses one of the two tasks assigned in EPAct to address the energy infrastructure, the DOE's 2006 National Electric Transmission Congestion Study.[141]

A. The 2006 National Electric Transmission Congestion Study

Section 1221(a) of EPAct added Section 216 to the Federal Power Act ("FPA") and instructed the Secretary of Energy to conduct a study of electric transmission congestion.[142] This study was expected to "open a dialogue with stakeholders in areas of the Nation where congestion is a matter of concern, focusing on ways in which these problems might be alleviated."[143] Following the

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[138] Edison Electric Institute, *Rising Electricity Costs: A Challenge for Consumers, Regulators, and Utilities*, May 2006, *available at* http://www.eei.org/industry_issues/electricity_policy/state_and_local_policies/rising_electricity_costs/rising_electricity_costs.pdf.

[139] Interestingly, April 23-24, 2007 is the first Grid Week, "a major industry event focused on grid modernization" that is being supported by the DOE and plans to "identify, align, and facilitate partnership opportunities for resolution of key technical, economic, and societal issues as related to building a modern 21st century electricity grid." National Grid Week 2007, *Advancing Grid Modernization: A National Agenda*, http://www.gridweek.com/2007/default.asp (last visited Mar. 31, 2007). Secretary of Energy Samuel W. Bodman is scheduled to speak about the current state of the grid. *Id.*

[140] FERC Chairman Joseph T. Kelliher, *Open Commission Meeting Statement—C-1: Regulations for Filing Applications for Permits to Site Transmission Facilities*, June 15, 2006, http://www.ferc.gov/press-room/statements-speeches/kelliher/2006/06-15-06-kelliher-C-1.pdf (last visited March 25, 2007) [hereinafter *FERC's June 15 statement*]. "FERC is charged with ensuring just and reasonable prices for power in interstate commerce . . . [and] for almost a decade FERC has been attempting to create competitive wholesale electricity markets by opening the Nation's electricity transmission grid to competing generators, by promoting regional transmission markets, and by encouraging investment in transmission capability." Energy Information Administration, *Electricity Transmission in a Restructured Industry: Data Needs For Public Policy Analysis,* Dec. 2004 at 3, *available at* http://tonto.eia.doe.gov/FTPROOT/electricity/0639.pdf [hereinafter *EIA's Data Needs Report*]. If FERC's "policy initiatives succeed . . . the transmission grid would become a network of superhighways for markets, seamlessly moving power across the country to reduce costs and improve reliability. FERC would then be in a position to use markets as the primary means of deciding whether wholesale prices are 'just and reasonable.'" *Id.*

[141] The other task was completed when FERC issued Regulations for Filing Applications for Permits to Site Interstate Electric Transmission Facilities. These regulations are discussed *infra* in notes 247-271 and accompanying text.

[142] United States Department of Energy, *National Electric Transmission Congestion Study*, Aug. 2006 at vii, *available at* http://www.oe.energy.gov/DocumentsandMedia/Congestion_Study_2006-9MB.pdf [hereinafter *2006 Congestion Study*].

[143] FERC, *Regulations for Filing Applications for Permits to Site Interstate Electric Transmission Facilities,* Order No. 689, 71 Fed. Reg. 69440 (Nov. 16, 2006), at 5 [hereinafter *Order No. 689*].

study, the Department of Energy ("DOE") was required to issue a report which may "designate any geographic area experiencing electric energy transmission capacity constraints or congestion that adversely affects consumers as a national interest electric transmission corridor" ("National Corridor").[144] In making such designations, Section 216(a)(4) of the FPA allows the Secretary to consider whether,

> (A) the economic vitality and development of the corridor, or the end markets served by the corridor, may be constrained by lack of adequate or reasonably priced electricity; (B)(i) economic growth in the corridor, or the end markets served by the corridor, may be jeopardized by reliance on limited sources of energy; and (ii) a diversification of supply is warranted; (C) the energy independence of the United States would be served by the designation; (D) the designation would be in the interest of national energy policy; and (E) the designation would enhance national defense and homeland security.[145]

In general, the DOE was asked to decide where the transmission network was lacking in capacity such that it became a national issue. In fulfilling its statutory mandate, the DOE worked with regional transmission planning groups and organizations, states, and electricity companies and issued its "National Electric Transmission Congestion Study" in August 2006 ("2006 Congestion Study").[146] The following section details the process and findings of the 2006 Congestion Study to present a framework for analysis of why renewable energy will benefit from a better transmission network.

The 2006 Congestion Study is reported to be "the largest, most comprehensive and detailed body of information assembled to date on [transmission congestion]" and it "builds upon the prior work of virtually every major transmission planning organization in North America."[147] It is introduced with a discussion of how power is distributed along the grid and the meanings of the standard industry terminology of "loads," "transmission path," "transformer," "transmission constraint," and "transmission congestion."[148] Loads are customers in a given geographic area, and grid operators serve loads in real time with "output from the lowest cost combination of generation and demand-side resources then available."[149] A transmission path is "a complex of related electric transmission

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[144] *2006 Congestion Study*, *supra* note 143, at vii.

[145] *Id.* at 74 (citing § 216 of the Federal Power Act in the appendix).

[146] *Id*. at vii.

[147] *Id.* at 64. For this reason, this article does not focus attention on analyses prior to 2006, including the DOE's 2002 National Transmission Grid Study. United States Department of Energy, *National Transmission Grid Study,* May 2002, *available at* http://www.pi.energy.gov/documents/TransmissionGrid.pdf [Hereinafter *2002 Grid Study*]. The 2002 Grid Study used an electric system simulation tool and assessed transmission congestion. *Id.* The 2006 Congestion Study states that while several findings of the 2002 Grid Study were reconfirmed in the 2006 Congestion Study, two important differences preclude their direct comparison: 1) the results from the 2002 Grid Study are over four years old and many of the severe problems have been addressed and are no longer relevant to the 2006 Congestion study; and 2) the modeling tools in the 2006 Congestion Study are more precisely focused on specific constraints and congestion areas. *2006 Congestion Study*, *supra* note 143, at 2.

[148] *2006 Congestion Study*, *supra* note 143, at 3-6.

[149] *Id.* at 5.

lines and facilities that connect one or more generation sources to a load center."[150] Flow along the transmission path is "*controlled operationally* by limiting the amount of power allowed to flow through [the] transformer,"[151] which is "an electrical device for changing the voltage of alternating current."[152]

The flow along the path can suffer from a "transmission constraint," which is either a piece of equipment that physically limits electricity flows or an operational reliability limit.[153] "[E]lectricity cannot be easily stored or rerouted, [so] supply must instantaneously match demand on a second-by-second real-time basis."[154] Transmission constraints can prevent this real-time delivery, requiring the system operator to respond by either: 1) "re-dispatching" generation by reducing generation on one side of the constraint to increase output on the generator on the other side; 2) cutting wholesale transactions that were planned to reduce the cost of meeting energy demand; or 3) reducing electricity deliveries.[155] Basically, "[d]ispatch and control systems must have the legal and practical ability to control a product [that is] moving at the speed of light" and "there may be a matter of just a few seconds that electronic and manual grid operation has to respond to a major power destabilization in order to protect the quality of service."[156]

Transmission constraints can lead to "transmission congestion . . . when output from low-cost generation is available but cannot be delivered safely to loads due to transmission constraints."[157] Another way to look at constraints and congestion is to visualize electrons flowing along all available transmission paths once they enter the grid, and when one hits a part of the system that is narrowly channeled, a bottleneck forms.[158] Transmission congestion can vary on an hour-to-hour or day-by-day basis depending on ambient temperature, load and generation distribution across the grid, and the way the electricity flows due to this distribution.[159]

Transmission congestion has a monetary cost when the grid operators must use energy from more expensive generation sources to get around the source of congestion.[160] Some congestion costs are not large enough to justify the expense

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150 *Id.*

151 *Id*. (emphasis in original).

152 *Id.* at 69. The transformers usually do not operate at full capacity because reliability rules limit allowable loading to ensure the reliability of the grid in case of unforeseen events. For example, if one or more key facilities in the transmission path fails suddenly, "the ensuing instantaneous re- routing of power across the remaining elements of the path could cause an overload and lead to a forced outage for the entire path, or worse." *Id.* at 6. The reliability rules require holding the level of flow to a transformer to an amount that will keep the system operating safely. *Id.*

153 *Id.* at 1.

154 Ferrey, *supra* note 5, at 275.

155 *2006 Congestion Study, supra* note 143, at 3.

156 Ferrey, *supra* note 5, at 278.

157 *2006 Congestion Study, supra* note 143, at 5.

158 Eagle, *supra* note 136, at 12.

159 *2006 Congestion Study*, *supra* note 143, at 3.

160 *Id.* These costs will vary according to: 1) changes in customer demand; 2) availability of output from various generation sources; 3) cost of generation fuels; and 4) availability of transmission capacity. *Id.* at viii.

that it would take to alleviate them.[161] However, in areas where the costs are high, millions of dollars could be saved and grid reliability can be improved through "some combination of new transmission construction, new generation close to a major load, and demand-side management."[162] The purpose of the 2006 Congestion Study was to identify areas that are experiencing *significant* congestion,[163] and this was done by employing the following three methods: 1) reviewing available historical information and previous transmission-related studies; 2) estimating future economic congestion using simulation modeling; and 3) comparing the historical methods with the simulation findings.[164]

The American electric grid "has evolved into three large interconnection regions,"[165] and the 2006 Congestion Study analyzed two, the Western Connection and the Eastern Connection.[166] The Western Connection includes most of Montana, all of Wyoming, Colorado, and New Mexico and the mainland states to the west, as well as small parts of northwest Texas, southwest South Dakota, a minor portion of northwest Mexico, and the Canadian Provinces of British Columbia and Alberta.[167] The Eastern Connection includes the states to the East of the Western Connection and the Canadian Provinces of Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, and Nova Scotia.[168] Now that the basic structure of the 2006 Congestion Study has been described, the following section provides a description of the results as well as the recommendations that were made and future actions that were suggested.

The results of the congestion modeling for the Eastern and Western Connections were used to identify three different types of areas: 1) Critical Congestion Areas; 2) Congestion Areas of Concern; and 3) Conditional Constraint Areas.[169] The Critical Congestion Areas have severe current or projected

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161 *Id.*

162 *Id.*

163 *Id.* at 4.

164 *Id.* at 9. Most of the recent regional transmission studies reviewed were transmission expansion plans and reliability assessments. *Id.* The simulations used 2008 as a base year and modeled with "simulation tools that use optimal power flow modeling on a decoupled network system…to minimize production costs across the grid while delivering all needed power from generators to loads in each hour of the model year." *Id.* Each model also incorporated average system line losses, conducted internal reliability assessments, and calculated the cost of congestion across the grid. *Id.* Several economic assumptions were also made, including the forecasted fuel prices and fixed availability of renewable generation and energy efficiency programs. *Id.* at 10-12.

165 Boyes & Menicucci, *supra* note 123, at 16.

166 *2006 Congestion Study*, *supra* note 143, at 1.

167 *Id.* at vii (figure ES-1: Map of North American Electric Reliability Council Interconnections).

168 *Id.* The statute directed DOE to not assess a third connection, the Electric Reliability Council of Texas ("ERCOT"), or congestion and constraints outside the United States, other than including Canadian electricity generation, transmission, demand, and cross-border flows into the modeling to account for the highly integrated nature of the wholesale markets and electricity grids. *Id.* at 1. Although the 2006 Congestion Study does not specify why ERCOT is excluded, it may be because there are few interconnections. National Wind Coordinating Committee, *Transmission Update,* Apr/May 2006, *available at* http://www.nationalwind.org/publications/transmission/updates/200604.pdf. The low number of interconnections may be due to the fact that the "ERCOT region covers 75 percent of the Texas land area and 85 percent of the load." *CDEAC Report*, *supra* note 45, at 78.

169 *2006 Congestion Study*, *supra* note 143, at 2. Both the Western and Eastern Regions were

congestion such that it is "critically important to remedy existing or growing congestion problems. . ."[170] The Congestion Areas of Concern have existing or emerging large-scale congestion problems, but more analysis is needed to determine the magnitude of the problem and whether transmission expansion would be relevant.[171] Conditional Constraint Areas exist where "significant congestion *would* result *if* large amounts of new generation resources were to be developed *without* simultaneous development of associated transmission capacity."[172] These areas are particularly important to the discussion that is central

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subdivided and the transmission constraints were identified accordingly. The *2006 Congestion Study* provides maps of the constraints, and for informational purposes, a list follows.

The Eastern Region was broken into six smaller regions: New England, New York, PJM (eastern Pennsylvania, New Jersey, much of Maryland, Delaware, and the District of Columbia), Midwest Independent System Operator ("MISO"), Southwest Power Pool ("SPP"), and the SERC Reliability Corporation ("SERC"). *Id.* at 21-24. In the New England region, there were six identified constraints: 1) New Brunswick to Maine; 2) Maine-New Hampshire Interface; 3) Boston Import; 4) Southern New England East-West Flows; 5) Southwest Connecticut; 6) Northwestern Vermont from New Hampshire. *Id.* at 21-22. In the New York region, there were seven identified constraints: 1) Moses South Interface; 2) Dysinger East Interface; 3) West Central Interface; 4) Central East and Total East Interface; 5) UPNY-Commonwealth Edison ("ComEd") Interface; 6) Westchester to New York City; and 7) Westchester to Long Island. *Id.* at 22. In the PJM region, twelve constraints were identified: 1) From Allegheny Power System to Potomac Electric Power Company ("PEPCO") and Dominion; 2) The Western Interface and Central Interfaces of "Classic PJM" (it has recently expanded in territory); 3) The Eastern Interface of "Classic PJM"; 4) Branchburg Transformer; 5) PJM to New York City; 6) American Electric Power and First Energy to Allegany Power System ("APS") Transformers; 7) Lines connecting ComEd to American Electric Power (AEP) along Lake Michigan (these lines also limit flows in the MISO region); 8) Homer City Transformer; 9) Erie East to Erie; 10) Kanawha to Mt. Funk; 11) North Carolina to Southern Virginia; and 12) Constraints into Delmarva Peninsula. *Id.* at 22-23. The MISO region contains 14 identified constraints: 1) Michigan to Ontario; 2) Manitoba to Minnesota and N. Dakota; 3) Minnesota to Wisconsin (limits current flows and wind and coal development in the upper Midwest); 4) NIPS system impacts from ComEd to AEP flows; 5) First Energy to APS; 6) Upper Peninsula of MI into Wisconsin; 7) Into Wisconsin from Illinois and Iowa; 8) west Nebraska to west Kansas; 9) Louisville Gas & Electric ("LGE") system; 10) inside Wisconsin; 11) Miami Fort; 12) Illinois to Kentucky; 13) Western North Dakota to Eastern North Dakota (low cost coal and wind development cited in MISO Midwest Transmission Expansion Plan (MTEP) 2005); and 14) Iowa and Southern Minnesota (low cost coal and wind development cited in Iowa-Southern Minnesota Exploratory Study, 2005). *Id.* at 23. The Southwest Power Pool region had seven identified constraints: 1) Elk City Transformer; 2) Redbud-Arcadia; 3) Valliant-Lydia and Pittsburg-Seminole; 4) Ft. Smith Transformer; 5) Iatan-Stranger Creek; 6) Nebraska to Kansas; and 7) Kansas Panhandle wind development. *Id.* at 24. The SERC Reliability Corporation region has twelve identified constraints: 1) Southeast Missouri to Northeast Arkansas; 2) Central Arkansas to Southern Arkansas; 3) Ft. Smith; 4) Southeast Louisiana to Western Louisiana; 5) Flow into New Orleans; 6) McAdams Autotransformer; 7) Volunteer transformer Bank and Sullivan Transformer Bank (now upgraded); 8) Cumberland-Davidson and Johnsonville-Davidson; 9) Tennessee to Georgia; 10) Southeast into Florida; 11) Eastern South Carolina; and 12) Atlanta. *Id.* at 24-25.

The Western Connection was not broken into subregions in the same way as the Eastern Interconnection as the modeling used "significantly larger nodes covering wider geographical spans with much larger generation and load weightings." *Id.* at 31. Over 67 paths were identified and are displayed in the document's maps. *Id.* at 31-32. There were 10 paths that were identified to be most congested: 1) Arizona to Southern Nevada and Southern California; 2) North and Eastern Arizona; 3) in the Rocky Mountains, the Bridger West line from Wyoming to Utah; 4) Montana to Washington and Oregon; 5) Colorado to Utah; 6) Colorado to New Mexico; 7) Utah to Northern and Central Nevada; 8) The Pacific Northwest south to California; 9) Pacific Northwest flows northward to Canada; and 10) in Southern California, from the Imperial Irrigation District to Southern California Edison. *Id.* at 24-25.

170 *Id.* at 2.

171 *Id.*

172 *Id.* (emphases added).

to this article: if renewable energy projects are built in these Conditional Constraint Areas, they will need to have new transmission lines built with them to support the new generation.

Within this framework, the DOE identified areas that merited further federal attention by focusing on factors such as the size of the affected population, the likely impacts of transmission problems on the areas' electric reliability, diversity of supply, and economic vitality and growth.[173] Two Critical Congestion Areas were identified: 1) the Atlantic coastal area from Metropolitan New York southward through northern Virginia; and 2) southern California.[174] Four Congestion Areas of Concern were identified: 1) New England; 2) the Phoenix-Tucson area; 3) the San Francisco Bay area; and 4) the Seattle-Portland area.[175] In the category of Conditional Congestion Areas, the DOE notes five areas of principle federal interest: 1) Montana-Wyoming; 2) Dakotas-Minnesota; 3) Kansas-Oklahoma; 4) Illinois, Indiana and Upper Appalachia; and 5) the Southeast.[176]

The 2006 Congestion Study clearly communicates that the reliability and capacity of transmission networks across the Nation must be developed and strengthened for the safety and security of the American people. For instance, the Metropolitan New York to Mid-Atlantic Critical Congestion Area,

> includes the Nation's capital and the world's leading financial and communication centers, and many other facilities critical to national security and defense . . . [and the] inability of the grid to sustain reliable, affordable electricity deliveries to the area would compromise the safety and well-being of the Nation [and] the millions who live and work in the region.[177]

In addition, southern California contains two-thirds of the residents of California, which "is the sixth largest economy in the world" and "contains important economic, manufacturing, military and communications centers [which is] an infrastructure that affects the economic health of the U.S. and the world."[178] The congestion problems in the Seattle-Portland area are likely to continue to worsen and they "represent a growing reliability problem for grid operators, and an emerging economics problem for the Northwest region."[179] The San Francisco Bay Area is home to "important technology, financial and medical institutions [but] has very little local generation and . . . needs new transmission and generation to improve reliability and reduce the local delivered cost of electricity."[180] What the 2006 Congestion Study has shown is that the entire

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[173] *Id.* at 39.

[174] *Id.*

[175] *Id.* at 40.

[176] *Id.*

[177] *Id.* at 41.

[178] *Id.* at 45.

[179] *Id.* at 47.

[180] *Id.* at 48. Each of the areas identified in the 2006 Congestion Study will be monitored by the DOE, which will publish annual progress reports on finding and implementing solutions. This first report is set to be released on August 8, 2007. *Id.* at 63. The DOE expects that regional organizations will continue to make progress on their specific issues; thus the 2007 progress reports should also serve

Nation is either currently suffering or faces threats from unreliable energy transmission. Clearly this is no simple problem.

The DOE provides several interesting recommendations and discussions about mending the transmission congestion concerns in all the identified areas.[181] However, the crux of this article is about the transmission development as a critical factor in renewable energy development. Thus, the remainder of this section will focus on the parts of the 2006 Congestion Study that relate to this topic, as opposed to going into great detail about the other aspects of the assessments. The most relevant discussion is based around the Conditional Constraint Areas, which are those that have great potential for new generation but need "simultaneous development of associated transmission capacity" to prevent significant congestion.[182] While not stated explicitly, this is referring to areas of the country that can serve as generation sources of wind, solar, biomass, geothermal, and hydropower but that are not currently capable of supporting the additional strain on the T&D network.

The DOE clearly supports "[s]ignificant investments in new backbone transmission . . . to enable the commercial success of such generation development projects" that will facilitate the supply of energy to urban load areas from remote areas.[183] The 2006 Congestion Study stopped short of stating exactly where and when new generation development would cause transmission congestion, but stated with confidence that, "the grid as built today cannot sustain major development and use of [new generation sources] . . . and that the associated transmission requirements must be addressed in combination with the planning of the new generation facilities."[184] The DOE also asserts that "additional transmission capacity would be able to both deliver the new generation and support other flows as well, often reducing overall delivered energy costs and improving reliability elsewhere in the Interconnection."[185] These conclusions show that the DOE supports the development of new transmission lines to encourage the development of renewable energy in America.

The 2006 Congestion Study also stated that the Secretary of Energy may designate any of these Conditional Constraint Areas as a National Corridor if it is appropriate based on the following considerations: 1) clear regional or multi-state commitment to developing substantial new generation resources in the area; 2) strong commercial interest in such development from the companies that would be developing them and the load centers that would be purchasing the output; 3) availability of sufficient analysis on the amount and approximate locations of required new transmission facilities; and 4) the overall public benefit is sufficiently large to merit designation as a National Corridor.[186] According to DOE officials, a draft issue of the proposed designations is scheduled to be released in the spring of

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to determine whether or not continued federal monitoring and attention is necessary. *Id.*

[181] *Id.* at 39-57.

[182] *Id.* at 2.

[183] *Id.* at 49.

[184] *Id.* at 50.

[185] *Id.*

[186] *Id.* at 50-51. At the time this article was written, these designations had not yet been made.

2007, and after comments and responses are received, official National Corridors may or may not be designated.[187]

B. Western Governor's Association Report of the Transmission Task Force

The federal government is not alone in formally assessing the inadequacies of the electric transmission network and its impact on new sources of clean and renewable energy. The Western Governor's Association ("WGA") formed the Clean and Diversified Energy Advisory Committee ("CDEAC") in 2004 from people in "industry, business, academia, government, and environmental groups" to focus on implementing three major objectives: 1) bring 30,000 new MW of clean energy online in the West by 2015; 2) increase energy efficiency twenty percent by the year 2020; and 3) meet transmission needs for the next twenty-five years.[188]

In pursuance of these objectives the "Report of the Transmission Task Force" ("CDEAC Report") was released in May 2006.[189] The CDEAC Report stated that bringing new, clean, and diversified generation to market would require building new lines and improving existing transmission grids.[190] CDEAC concluded that this expansion could feasibly meet their stated clean energy goals,[191] and it acknowledged that "[d]etermining the adequacy of transmission must be the product of an on-going process that regularly reassesses uncertainties such as the economics of alternative generation technologies, fuel costs, the preferred location for generation, changes in demand and energy growth rates, and new transmission technologies."[192] This acknowledgment is particularly relevant for renewable energy development because most of the generation sources have either not yet been built or are not connected to a grid. Accordingly, it is important for industry leaders and regulators to plan ahead when developing new sources of generation: "It is critical to concurrently plan for expansion of the transmission grid. Whether we are talking about wind, biomass, geothermal, or solar, plans for new generation facilities must include plans for developing sufficient transmission lines."[193]

Both the DOE and the CDEAC have pointed out the weakness of the existing transmission network. Investment in transmission declined from 1975 until 1998,

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[187] Interview with Dave Hill, General Counsel for the DOE, Mar. 23, 2007 (no transcript available); interview with Jeff Wright, Project Manager for FERC Office of Energy Projects, Mar. 30, 2007 (no transcript available).

[188] Western Governors' Association, The Potential for Clean Energy in the West, THE OUTLOOK ON RENEWABLE ENERGY IN AMERICA, at 25 (ACORE 2007) [hereinafter *WGA Outlook*]. "The [WGA] represents the governors of 19 states and three U.S. Flag Pacific Islands. The WGA addresses important policy and governance issues in the West and advances the role of Western states with the federal government." *Id.*

[189] *CDEAC Report*, *supra* note 45, at 10.

[190] *Id.* at 5.

[191] *Id.* at 5-6.

[192] *Id.* at 10.

[193] *WGA Outlook, supra* note 189, at 26.

and in 2003 the investment was still below that of 1975 levels.[194] Clearly, "[t]he need for more electric transmission is real."[195] However, the involvement of the federal government will be limited in solving the inadequacies of the interstate transmission network,[196] so regional organizations and states, as well as the private sector, will need to focus on "congestion, access, increased utilization and expansion planning/permitting."[197] Part IV of this article will delve into the procedures that need to be followed to implement such improvements.

IV. IMPROVE THE TRANSMISSION NETWORK TO STIMULATE RENEWABLE ENERGY DEVELOPMENT

The transmission of high-voltage electricity is a highly regulated system and one that is considered a natural monopoly because of the reality that,

> [w]ithout a grid operator to balance power supply and demand at all times, maintain voltage, and ensure that lines are not overloaded, the grid could not operate. The operator accomplishes this by such means as requiring generators to adjust their output to protect the system, opening and closing circuits, and limiting net imports. The grid operator, therefore, has enormous influence over the availability and price of transmission. This power is neither tempered by competition from other

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[194] Lori A. Burkhart, *Transmission Investment: Do Incentives Hold the Key?*, 26 FORT. SPARK 3 (2006).

[195] *Id.* at 1.

[196] In fact, the DOE announced in the 2006 Congestion Study that it "expects that regional transmission planning organizations will take the lead in working with stakeholders and industry transmission experts to develop solutions to the congestion problems identified…in their respective areas." *2006 Congestion Study*, *supra* note 143, at 63. However, the DOE does intend to "support these planning efforts, including convening meetings of working groups and working with the Federal Energy Regulatory Commission and congestion area stakeholders to facilitate agreements about cost allocation and cost recovery for transmission projects, demand-side solutions, and other subjects." *Id.* The 2006 Congestion Study also outlined additional concerns that should be considered in future national, regional, and multi-regional studies. *Id.* at 64. To strengthen regional planning efforts, the DOE suggests: 1) the West continuing with its identification of congestion and reliability problems, but extending it to include independent (*i.e.* non-corporate) assessments; 2) inter-regional analyses of critical problems in the Northeast and Midwest, instead of the current analyses that stop at regional boundaries; 3) a publicly accessible regional analysis for the entire Southeast produced by the Florida Reliability Coordinating Council, Florida regulators, stakeholders, and SERC. *Id.* at 64. To refine congestion metrics, the DOE welcomes further dialogue regarding the establishment of a standard metric to measure congestion and its impacts, as opposed to having to develop metrics for each study. *Id.* at 65. For data collection and improvements, the DOE plans on working with the EIA, FERC, FERC, and other industry officials to determine whether data collection requirements should be modified to allow for the availability of systematic data on existing and planned transmission facilities and investments. *Id.* In a discussion on granularity versus aggregation, the DOE notes that the Western Interconnection analyses could benefit from developing a more detailed set of models and data to better understand the "nuances of congestion, reliability and cost variations occurring within the zones connected by the West's 67 major transmission paths." *Id.* Finally, the DOE noted that there should be improvements in the modeling to deal with such problems as: 1) current DC models do not address voltage problems, which require a separate AC model; 2) marginal losses, as opposed to simpler-to-simulate average losses, are not effectively modeled, even though they more closely parallel actual system physics; 3) the complex relationship between contingencies and congestion based on reliability limits imposed to withstand such contingencies is not fully understood. *Id.* The DOE intends to address these problems before conducting the next congestions study. *Id.*

[197] *CDEAC Report*, *supra* note 45, at 18.

networks nor influenced by the threat that most users might leave the grid.[198]

There have been many efforts to bring more competition into the transmission industry through initiatives that have come to be known as "restructuring," and because of these initiatives, "the industry has seen a huge increase in the number of independent generators seeking transmission services."[199] But as discussed in the 2006 Congestion Study, the electric grid may not be prepared to handle all the growth in electricity demand without investment in its modernization.[200] Creating a modern and efficient transmission system will require a coherent strategy that encourages new ideas and opportunities to come forward instead of allowing planning processes to bar entry of new transmission projects.[201] New ideas, projects, and technologies must emerge to work within the framework established by FERC and regional transmission organizations ("RTOs").[202] The following sections will discuss how this modernization can be accomplished, starting with an overview of how to improve existing transmission lines and then moving into a discussion on building new lines.

A. The Existing Electricity Transmission Network Should Be Upgraded

Building new transmission lines is necessary to meet America's growing energy needs with renewable sources of clean energy, but it is equally important to improve the transfer capabilities of the currently existing power lines. These improvements can be accomplished with new technology to increase power flow. There are many new technological improvements that are being developed that "may lead to changes in transmission systems over the next twenty five years."[203] While these technologies are promising, they have their faults as well. This section will discuss some of the proposed improvements and why they may or may not lead to sufficient investments in the grid upgrade effort.

Much is being said about high temperature superconducting ("HTS") cables

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198 *EIA's Data Needs Report*, *supra* note 141, at 1.

199 *Id.* For more information on restructuring, see Energy Information Administration, *Electric Power Industry Restructuring Fact Sheet*, http://www.eia.doe.gov/cneaf/electricity/page/fact_sheets/restructuring.html (last visited Apr. 2, 2007).

200 This realization was first published by the DOE in the 2002 Grid Study. *EIA's Data Needs Report*, *supra* note 141, at 9.

201 Ed Krapels, *Barriers to Transmission Superhighways*, 144 No. 5 PUB. UTIL. FORT. 36, 37 (2006).

202 *Id.*

203 *CDEAC Report*, *supra* note 45, at 11. There are other innovations that can be applied to the electrical system as a whole to reduce the need to build new transmission lines including: 1) new information technology that can act as a "'nervous system' that integrates distributed resources, passive grid generation, transmission, and new types of active grid technologies"; 2) "management of end-use resources in factories, commercial buildings, and residential facilities"; 3) advanced meter technology that can "support advanced billing and create schedule options that are used to promote demand response and collaborative operation of customer-owned distributed generation"; 4) new retail and wholesale market operations software that can "link and integrate distributed resources and demand response to manage peak demands and provide ancillary services:"; and 5) grid friendly appliance technology that can be "installed into air conditioners, electric heaters, heat pumps, washers, dryers, dishwashers, and water heaters" to "automatically detect and respond to frequency disturbances on the grid . . . to reduce the demand for electricity." *Id.* at 13-14.

that have "low resistance and capability to carry more current than standard wires of the same size" and therefore would allow more power to flow along existing lines.[204] However, to reach this level of superconductivity, a refrigeration system is needed, which would involve higher fixed and variable costs.[205] Another factor holding up HTS technology is that HTS cables are currently only practical for short distance applications, which effectively limits their use in the western states that generally need long distance transmission.[206] Ultra high voltage lines can also increase the power that is transmitted, but the negative consequences may not be worth it—they "generate stronger electromagnetic fields, and produce much more reactive power," which must be managed.[207]

Energy storage is a major issue with transmission constraint on the existing grid, and one that, if addressed properly, will reduce the amount of new lines that are needed by improving the functioning of the current system. Aside from water in large dams, electricity cannot be stored efficiently so "grid operators must match supply and demand at all times to prevent blackouts."[208] The reliability and security of the grid would be transformed by the ability to store energy across the grid enabling the grid operators to release it when needed.[209] Energy storage devices such as "pumped hydro storage, compressed air energy, superconducting magnetic energy storage, flywheels, and batteries" can increase the flexibility to use lower cost energy during off-peak hours.[210] However, these methods are very expensive and to date, only pumped hydro storage has been commercially viable.[211]

Another attention-getting storage option involves hydrogen, which can be used as a medium to store energy when it, and oxygen, are produced by running an electric current through water, a process known as electrolysis.[212] To exemplify hydrogen's contribution to the energy grid's resources, the example of wind power is useful. "[W]ind power . . . is wasted [when] the wind blows when the grid does not need, or cannot safely take, all that power." [213] If the excess electric power created by the turbine were instead used to create hydrogen, the hydrogen "could later be converted back to electricity in a fuel cell, to be sold when needed."[214] Hydrogen can be used in this manner to capture energy from renewable sources,

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[204] *Id.* at 11.

[205] *Id.* at 11-12.

[206] *Id*. An alternative to the long-distance transmission lines that are required in many parts of the country are high-voltage direct current ("HVDC") lines, which "can be used to link asynchronous systems, and applied to long distance transmission in the air, underground, or in water." *Id.* at 12. There are several thousand miles of HVDC lines in North America. *Id.* There is a cost disadvantage with HVDC as there are "additional costs of converting from AC to DC and then back to AC." *Id.*

[207] *Id*. "Reactive power consumption is proportional to the square of the current . . . [so] doubling the current [quadruples] the reactive power consumption," and this consumption "must be managed by adding reactive compensating devices." *Id.*

[208] *Building the Energy Internet, supra* note 113, at 25.

[209] *Id.*

[210] *CDEAC Report*, *supra* note 45, at 13.

[211] *Id.*

[212] *Building the Energy Internet, supra* note 113, at 25.

[213] *Id.*

[214] *Id.*

including those that are not yet connected to the grid, as well as from fossil fuels. But even though the potential is exciting, there are "[m]any complex challenges [that] must be overcome . . . before a hydrogen-fueled future can become a reality." [215]

The various technologies recently introduced have great potential to help upgrade the existing transmission network by increasing the amount of power that can be transferred without having to build new lines. However, no technology will successfully add capability to the grid unless the implementation is carefully analyzed and planned with respect to the interconnected nature of the grid.[216] These improvements must be a part of an integrated strategy with the cooperation of all those who operate a portion of that interconnected grid system. To facilitate such cooperation, there is a desire to create what has been termed "the smart grid of the future - a web-enabled, digitally controlled, intelligent delivery system . . . [that links] [m]illions of generation and storage points, both remote and locally distributed, from many different energy sources."[217] This smart grid, however, will require new transmission line construction, which will be discussed in the following section.

B. There is a Need to Develop New Transmission Lines

It was never out of the ordinary for utility companies to build new transmission lines.[218] What is different today is that the rules have changed. Changes to the structure of the energy market, related to the so-called restructuring and deregulation of recent decades, as well as to the rules governing the siting of new lines, have altered the previous ways of planning to construct new transmission lines. This section will discuss the legal and policy framework for how the decisions are made about siting and building new lines.

1. Preliminary Issue of Pricing

Before a new line is constructed, someone or some group must decide that they have an incentive to construct. Some of the rules affecting the way energy is priced may hinder incentives to invest in upgrading or building new lines, however. The electricity market is operated under a system of tariffs and charges that relate to "the privilege of being connected to the grid" and enable the utility to maintain safety, stability, and power quality.[219] There are two basic types of tariff regimes: Type I, the Open Access Transmission Tariff ("OATT") rules under FERC Order 888; and Type II, the FERC Standard Market Design Tariff

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[215] Joan Ogden, *High Hopes for Hydrogen*, SCI. AM., Sept. 2006, at 94. While a thorough analysis of hydrogen technology is beyond the scope of this article, the inquiry can be satisfied by referring to Ogden.

[216] *CDEAC Report*, *supra* note 45, at 13.

[217] Rabago, *supra* note 27, at 471.

[218] *2006 Congestion Study*, *supra* note 143, at 6.

[219] Rabago, *supra* note 27, at 473.

("SMD").[220]

Type I tariffs make up about forty percent of the electricity sales in the country and "provide transmission service either as Network service or Point-to-Point service."[221] Point-to-point service goes from a designated generation point to a designated receiving point[222] and has been attributed to "exacerba[ting] the transmission shortage"[223] by preventing full use of the excess capacity on existing transmission systems.[224] For instance, if there are disturbances in the transmission or generation, customers with point-by-point service are "subject to curtailment and cannot avail [themselves] of the portfolios of network resources available to Network Service customers."[225] With network service, the customers are not locked into one designated path because the "grid operator finds the most efficient way to move energy and capacity services from one area to another without designating exactly which of the thousands of lines it controls will be used for that purpose."[226]

For customers with point-to-point transmission service, there are two types of physical transmission rights that are available: firm service, which "provides a nearly unconditional amount of transmission service to transmission customers for specified terms," and non-firm service, which is "reserved and scheduled on an as-available basis and can be curtailed and interrupted under certain conditions . . . [and] cannot be contracted for longer than one year."[227] Non-firm service does not promote new generation, like wind or solar farms, since most project financiers require that generators have at least twenty years of guaranteed access to the

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220 Darrell Blakeway & Carol Brotman White, *Tapping the Power of Wind: FERC Initiatives to Facilitate Transmission of Wind Power,* 26 ENERGY L.J. 393, 409 (2005) (provides detailed discussion of suggested improvements to the long-term firm versus short-term non-firm pricing structures). Type I tariffs are "used by transmission providers in the West (except for California), lower Midwest, and Southeast," whereas Type II tariffs "are used in the mid-Atlantic, Northeast, Midwest, Texas, and California." *Id.* at 419-20.

221 *Id.* at 419.

222 *Id.* at 419-20.

223 Eagle, *supra* note 136, at 5.

224 *CDEAC Report*, *supra* note 45, at 22 (discussing Order 888, Promoting Wholesale Competition Through Open Access Non-discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities, 75 FERC 61,080 (Apr. 24, 1996)). Order 888 was issued "with the dual purpose of remedying undue discrimination in access to monopoly owned transmission system and promoting competition in wholesale electricity markets." *Id.* at 20.

225 Blakeway & White, *supra* note 221, at 420.

226 Krapels, *supra* note 202, at 40. The issue of point-to-point versus network transmission services is extremely important when trying plan the incorporation of new transmission lines into the existing transmission network because it must be decided whether "these new lines [should] be seen as point-to-point in purpose or . . . be integrated into the overall 'network.'" *Id.* The point-by-point pricing system is problematic when "some transmission lines are in greater demand than others and have become congested . . . [because the utility] cannot charge a higher price for the use of these congested lines than for the use of other lines the utility owns." Eagle, *supra* note 136, at 5. In general, it is better to minimize point-to-point pricing and apply network transmission, but rules for this issue still need to be developed. Krapels, *supra* note 202, at 40. The transmission projects between New York, New England, and PJM are actively developing such a rule. *Id.*

227 *CDEAC Report*, *supra* note 45, at 20. A condition that might curtail service in the short-term non-firm situation is whenever it is necessary to met the needs of the long-term firm customers. Blakeway & White, *supra* note 221, at 409.

transmission before they will invest.[228] Unfortunately, with the other pricing system of firm service, "service is allocated on a sequential, first-come, first-served basis," so transmission customers who want to build new sources of transmission and connect them to the grid must "take their place in the transmission service queue." What results from Type I point-to-point pricing is that the development of clean, renewable sources of energy is halted because financiers do not want to take on the risk of losing access to the grid with non-firm service, or not even being able to get on the grid with firm service. Since forty percent of the country uses Type I pricing, this issue is significant and needs to be examined further by those in charge of setting prices.

The other pricing system is Type II SMD tariffs. Here, "all resources are 'pooled' in a common market and "[a] central system operator dispatches generators and transmission facilities over a relatively large geographic area."[229] Transmission rights are seen as financial rights, as opposed to the physical rights assigned in Type I, and if there are imbalances in delivery, they are "settled financially in spot markets."[230] Thus, with Type II tariffs, customers are not subject to curtailment if there is congestion between their main points of generation and receipt because they can pay the system operator to dispatch service from another generation site, usually on the customer's side of the congestion point.[231] Type II tariffs are considered to be "vastly superior" [232] to Type I tariffs for development of new sources of clean, renewable energy.[233]

Once the decision has been made that a new transmission line should be built, the next step is getting permission to actually build it. The following section delves into the issues that characterize the process of choosing the site where new construction projects will take place.

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[228] *CDEAC Report*, *supra* note 45, at 21.

[229] Blakeway & White, *supra* note 221, at 420.

[230] *Id.*

[231] *Id.*

[232] *Id.*

[233] Perhaps due to the complicated nature of connecting new projects to the grid, across the country, there has been a "discernable trend toward smaller size" generators and those that can be embedded closer to the load site. Rabago, *supra* note 27, at 463. Smaller units are characterized by quicker construction, quicker returns, reduced risk, and reduced energy demand, and these are benefits that stimulate competitive capital investment. *Id.* In 2005, FERC issued Order No. 2006, the Standard Rule for Small Generator Interconnection, to create "standard procedures for the interconnection of generators no larger than 20 megawatts." FERC, *Press Release: Commission Issues Standard Rule for Small Generation Interconnection; Action will Facilitate Needed Infrastructure Development,* May 12, 2005, http://www.ferc.gov/news/news-releases/2005/2005-2/05-12-05.asp (last visited Sept. 5, 2007) [hereinafter *FERC Small Generator Press Release*]. This rule required that utility companies under FERC jurisdiction make amendments to OATT issued under Order No. 888 that would "offer non-discriminatory, standardized interconnection service for small generators." *Id.* It was intended to "remove . . . unfair barriers to entry for small generators by reducing costs and time." Blakeway & White, *supra* note 221, at 414.

2. *Siting and Permitting New Transmission: FERC and Regional Rules*

Obtaining permission to construct new transmission lines can be a highly contentious process. There is an extensive combination of obstacles that must be overcome, "including public opposition; environmental, topographic, and geographic constraints; interagency coordination problems; and local, state, and federal regulatory barriers to permitting, investment, and/or construction."[234] Adding to these complexities is the fact that transmission lines often cross through several states and are regulated by several agencies. The "deregulation of the electricity industry and the transition to competitive markets have further complicated transmission, ownership, financing, and management."[235] Traditionally, states were solely responsible for siting and permitting transmission lines, but now the authority is not so clear. Recently FERC has been encouraging the development of regional transmission organizations ("RTOs"), *i.e.*, "larger units of transmission planning and management."[236] And, as previously discussed, EPAct gave authority to the DOE to designate National Corridors and use federal authority to site and permit new transmission lines.[237]

While no clear-cut siting rules have been established on a regional basis, organizations of governors from several states have worked together to develop frameworks to deal with such issues. For example, in June, 2004, the Western Governors' Association ("WGA") developed the "Transmission Permitting Protocol [("WGA Protocol")] to enable federal, state, and provincial permitting agencies to collaborate in the review of proposed interstate transmission lines."[238] However, there have been no new interstate transmission lines proposed since 2004, so the WGA Protocol has not yet been used.[239]

If it were to be used, the WGA Protocol would require, among other things: 1) the designation of a project team composed of representatives of affected states to review the proposed project and share information; 2) the project team to create unbinding evaluations of the proposal; 3) the appropriate federal land management

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[234] Shalini P.Vajjhala & Paul S. Fischbeck, *Quantifying Siting Difficult: A Case Study of US Transmission Line Siting*, ENERGY POLICY, Jan. 2007 at 650.

[235] *Id.* at 651

[236] *Id.* at 652.

[237] *2006 Congestion Study*, *supra* note 143, at vii.

[238] *CDEAC Report*, *supra* note 45, at 50. *See also* WGA, *Report on the Implementation of the WGA Transmission Permitting Protocol*, June 2004, *available at* http://www.westgov.org/wieb/electric/Transmission%20Protocol/transprot6-15rpt.pdf. The WGA Protocol was created as part of the implementation plan for the 2001 Memorandum of Understanding between the DOE, Department of Interior, Department of Agriculture, Council on Environmental Quality, and the WGA Regarding Energy Development and Conservation in the Western United States. *Protocol Among the Western Governors' Association, The U.S. Department of Interior, The U.S. Department of Agriculture, The U.S. Department of Energy, and The Council on Environmental Quality Governing the Siting and Permitting of Interstate Electric Transmission Lines in the Western United States*, June 23, 2002, *available at* http://www.westgov.org/wieb/electric/Transmission%20Protocol/9-5wtp.pdf [hereinafter *WGA Protocol*]. The governors of Alaska, Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming, as well as the Premier of Alberta, Canada and the DOE, DOI, USDA, and CEQ all signed the WGA Protocol. *CDEAC Report*, *supra* note 45, at 50.

[239] *Id.*

agencies to be invited to participate on the project team; 4) the project team to establish procedures that encourage joint activities, record keeping, and timelines; 5) the project team to develop procedures for a "consolidated Environmental Review"; 6) the project team to act as a clearing house for information requested from federal agencies and project developers; 7) the project team to make all non-proprietary and non-privileged information available to the public and accessible via the Internet; and 8) the project team to develop procedures to handle disagreements.[240] In 2005, the Midwest Governors Association ("MGA") developed a similar framework: the Midwest Governors' Electric Transmission Protocol ("MGA Protocol").[241] The MGA Protocol was created in recognition that transmission development has failed to keep pace with energy demand and that a "robust electric transmission grid is essential to deliver low-cost and renewable power to customers."[242]

These types of regional siting organizations can be very helpful, especially because of their contributions to solving the "[c]onflicts [that] inevitably arise when many state and federal agencies must independently authorize the construction of an interstate transmission line."[243] If done appropriately, integrating the decision making process can remedy the delays and added expenses that arise from "[t]he sheer number of decision-makers, disparate priorities, and varying standards [that] create these disagreements."[244] These regional agreements between governors are not necessarily pre-emptive over the states' traditional siting authority, so there is no guarantee that the siting process for a particular project will go smoothly and cooperatively. States must issue the permit and, therefore, will have the final say in most cases.

In some instances, however, some of the state siting and permitting rules and procedures will be partially pre-empted by federal transmission siting provisions contained in EPAct. These provisions signaled congressional recognition that "a robust transmission grid" is necessary to ensure reliability in competitive markets and that some federal authority was needed to reduce barriers to developing major transmission projects.[245] Section 1221 of EPAct amended Section 216(b)(1) of the FPA[246] to give FERC the authority to create rules for issuing construction permits for interstate transmission facilities in areas designated by the DOE as National Interest Electric Transmission Corridors ("National Corridors").[247] While the 2006

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[240] *WGA Protocol*, *supra* note 239, at 3-5.

[241] Midwest Governors Association, *Midwestern Governors Cooperate to Promote Electric Transmission Investment,* July 16, 2005, http://misostates.org/MGATransmissionPROTOCOL NewsRelease.pdf (last visited Sept. 5, 2007). Signatories to the MGA Protocol were Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and the Premier of Manitoba, Canada. *Id.*

[242] *Id.*

[243] Eagle, *supra* note 136, at 45.

[244] *Id.*

[245] *FERC's June 15th Statement, supra* note 141, at 1. For a discussion on the problems with siting rules *before* the FERC rule was created, see generally Eagle, *supra* note 136.

[246] Section 216(b) of the FPA gives FERC the authority to "issue permits to construct or modify electric transmission facilities in a National Corridor under certain circumstances." *Order No. 689*, *supra* note 144.

[247] FERC, *Commission Finalizes Electric Transmission Siting Rule*, Nov. 16, 2006,

Congestion Study presented several regions that *may eventually* be designated as National Corridors, [248] FERC began the rule making process in advance of the designation so they would be prepared. These regulations became effective on February 2, 2007.[249]

With an eye towards respecting state authority, Section 216(b)(1) allows FERC to issue permits to construct or modify electric transmission facilities if FERC finds that one of the following situations exists:

> (1) a State in which such facilities are located does not have the authority to approve the siting of the facilities or to consider the interstate benefits expected to be achieved by the construction or modification of the facilities; (2) the applicant is a transmitting utility but does not qualify to apply for siting approval in the State because the applicant does not serve end-use customers in the State; or (3) the State commission or entity with siting authority withholds approval of the facilities for more than a year after an application is filed or one year after the designation of the relevant national interest electric transmission corridor, whichever is later, or the State conditions the construction or modification of the facilities in such a manner that the proposal will not significantly reduce transmission congestion in interstate commerce or is not economically feasible.[250]

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http://www.ferc.gov/news/news-releases/2006/2006-4/11-16-06-c-2.pdf (last visited Sept. 5, 2007) [hereinafter *FERC Siting Rule News Release*]. FERC is limited to issuing permits to projects that are in DOE-designated national interest corridors, but Chairmen Kelliher wanted to have these regulations established by the time the national corridors were designated to ensure timely proceeding. *Id.*

[248] The DOE chose to first issue a draft designation document to present areas that are being *considered* for National Corridor designation. Interviews with Dave Hill & Jeff Right, *supra* note 188. As of September 2007, two draft designations had been made to address two Critical Congestion Areas: the Mid-Atlantic Area National Corridor and the Southwest Area National Corridor. DOE Office of Electricity Delivery & Energy Reliability, *National Corridors*, http://nietc.anl.gov/nationalcorridor/index.cfm (last visited Sept. 5, 2007). The Mid-Atlantic Area National Corridor "includes some or all counties in DE, OH, MD, NJ, NY, PA, VA, WV, and DC," and the Southwest Area National Corridor "includes seven counties in Southern California, three counties in western Arizona, and one county in southern Nevada." *Id.* The public comment period for these draft designations ended on July 6, 2007, and the DOE is carefully reviewing the comments and will make recommendations to the Secretary of Energy. *Id.* "Although no deadline has been set for a final decision, the Department is acting expeditiously in this matter." *Id.* It is wise for the DOE to not proceed too hastily in designating such national corridors. The implications of this designation give traditional state authority over to the federal government, and this reallocation of authority should be managed with great care. And as the WGA has stated, "[i]t is very difficult to accurately anticipate the rate of load growth and the location of new generation decades in advance, which is what corridor designation seeks to achieve." *CDEAC Report*, *supra* note 45, at 51.

[249] *FERC Siting Rule News Release*, *supra* note 248. The Western Interstate Energy Board and Committee on Regional Electric Power Corporation and the Western Governor's Association requested that FERC wait to issue their regulations until the DOE acted and designated National Corridors. *Order No. 689*, *supra* note 144, at 6. However, FERC chose not to delay issuing Order No. 689 because FPA § 216(c)(2) required FERC to issue rules relating to the application and permitting process only, so there was no need to wait for the DOE to actually designate National Corridors. *Id.* Other organizations requested that FERC further define "National Corridor," but FERC declined to do so because EPAct specifically assigned the DOE with that responsibility. *Id.*

[250] *Order No. 689*, *supra* note 144, at 2-3. *See also FERC Siting Rule News Release*, *supra* note 248. The "final rule addresses comments received from 51 entities in response to the June 16, 2006 notice of proposed rule making [and] largely affirms the approach outlined in the proposed rule." *Id.* The biggest change is that while the proposed rule would have required a state applicant to wait until one year after the state proceeding was initiated before applying to FERC, it would have allowed a prefiling that could overlap with the state application. *Id.* States were concerned that there would be overlap between the state and FERC siting process, and although the FPA specifically allowed for this,

Thus, the siting authority granted to FERC is supplemental to the siting authority of the states.[251] FERC Chairman Joseph T. Kelliher stated that the final electric transmission siting rule ("Order No. 689") was "very respectful of state authority"[252] and that he expected that "states will continue to site the vast bulk of transmission projects."[253] The acknowledgement of state authority is likely to help FERC gain the support of state governors. It is the policy position of the National Governors' Association that "governors oppose preemption of traditional state and local authority over siting of electricity transmission networks . . . [but] are willing to engage in a dialogue with the federal government and industry to [improve competition and reliability] in a manner that does not intrude upon traditional state and local authority."[254]

FERC did not establish specific criteria to determine whether or not a state had authority to approve the siting of transmission facilities, choosing instead to undertake this analysis on a case-by-case basis.[255] In addition, FERC will consider information that the applicant presented to the state, but must also conduct its own independent review as required by the National Energy Policy Act ("NEPA"). Furthermore, FERC requires that permits will only be issued if the proposed facility:

> (1) will be used for the transmission of electric energy in interstate commerce; (2) is consistent with the public interest; (3) will significantly reduce transmission congestion in interstate commerce and protect or benefit consumers; (4) is consistent with sound national energy policy and will enhance energy independence; and (5) will maximize, to the extent reasonable and economical, the transmission capabilities of existing towers or structures.[256]

FERC chose to "adopt an approach that is more fully respectful of State jurisdiction" and the final rule allows for "one full year to process an application without any intervening Federal proceedings." *Order No. 689*, *supra* note 144, at 12-13. The comments surrounding FERC's jurisdiction over applications that first went to the states are discussed fully in *Order No. 689*.

[251] *FERC Siting Rule News Release*, *supra* note 248. This approach to supplement, rather than supplant, state law was completely opposite from the approach Congress took sixty years ago when it provided for exclusive and preemptive federal siting of natural gas pipelines. *FERC's June 15th Statement*, *supra* note 141. FERC has sited more than 8,000 miles of natural gas pipelines in the last five years. *Id.*

[252] The FPA does not give FERC "the power to regulate purely intrastate generating facilities or transmission siting . . . [but] the Supreme Court has interpreted the FERC's exclusive and non-delegable jurisdiction over interstate transactions to include intrastate wholesale transactions on transmission lines connected to an interstate grid." Eagle, *supra* note 136, at 34-35. Therefore, the FERC rule did not necessarily need to be so respectful of state authority to satisfy constitutional requirements, but in issuing the final rule FERC decided that this must be an important factor.

[253] *FERC Siting Rule News Release, supra* note 248.

[254] National Governors' Association, *Policy Position: Comprehensive National Energy and Electricity Policy*, July 20, 2005, at 2, *available at* http://www.nga.org (follow link to "Policy Positions"). FERC is also prohibited from issuing permits for facilities that are within a state that is party to an interstate compact that establishes a regional transmission siting agency, unless there is disagreement between the members and the DOE makes certain findings. *Order No. 689*, *supra* note 144, at 3. The regional transmission siting agency, if it exists, must "have power to review, certify, and permit siting of transmission facilities" to be immune from FERC pre-emption. *CDEAC Report*, *supra* note 45, at 50.

[255] *Order No. 689*, *supra* note 144, at 20.

[256] *Id.* at 3. The requirement that the facilities be used in interstate commerce greatly affects

These guidelines are valuable tools, yet vague and open the discussion to much debate. When reviewing a proposed project to determine whether it satisfies these five criteria, FERC will use a case-by-case balancing test, conduct an independent environmental impact analysis as required by NEPA, and look to alternatives that will maximize the use of existing transmission facilities, including non-transmission line alternatives.[257] These alternatives will be examined to determine their respective impacts on the environment and what, if any, mitigation measures are needed to lessen these impacts.[258] FERC will examine the proposed facility to investigate how it will affect the reliability of the existing transmission system, whether it reduces transmission congestion as identified in the 2006 Congestion Study, and how it will protect or benefit consumers.[259] Order No. 689 greatly limits the types of projects that will be sited with federal authority.

Order No. 689 also affords a multitude of reasonable opportunities for the gathering of comments and recommendations from each state where the applying facility is or will be located, each affected federal agency and Native American tribe, private property owners, and other interested persons.[260] This is effectuated by the rule that requires the applicant to take responsibility for developing a Project Participation Plan, which requires conducting appropriate outreach and providing accurate and timely information to all interested stakeholders.[261] FERC will follow the Project Participation Plan's progress and evaluate the entire record of the proceeding to give full consideration to the adverse impacts the proposed facility might have on landowners and local communities.[262] Using a flexible balancing process, FERC will determine whether to impose appropriate conditions to ensure that the benefits of the project outweigh the harms and is consistent with Congress' goals in enacting FPA Section 216 and preventing unnecessary environmental disruptions and the exercise of eminent domain.[263] However,

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development in the western states, for "the federal government is the largest land owner in the West and almost every long distance transmission line in the Western Interconnection and in Alaska will cross federal lands." *CDEAC Report*, *supra* note 45, at 50.

257 *Order No. 689*, *supra* note 144, at 23-24. Many interested stakeholders submitted comments regarding how FERC would find that the proposed facility met these five requirements. *Id.* at 21-26. These comments tended to request that FERC "adopt an exclusive list of factors or construct a bright-line test to determine whether a project meets all the statutory criteria." *Id.* at *23.* FERC stated that it is too difficult to do this and such a list or test would not be flexible enough to account for all the different interests involved. *Id.* Thus, FERC will "consider all relevant factors presented on a case-by-case basis and balance the public benefits against the potential adverse consequences" when reviewing a proposed project. *Id.* at 23-24.

258 *Order No. 689*, *supra* note 144, at 24.

259 *Id*. There are other reasons to develop transmission besides reducing congestion, such as "enhancing market competition and mitigating market power abuse." Wu, Zheng, & Wen, *supra* note 126, at 963.

260 *Order No. 689*, *supra* note 144, at 26. Comments regarding the notice and opportunity to comment that is afforded to affected landowners and other stakeholders are discussed in *Order No. 689* at 28-39.

261 *Id.* at 26-27.

262 *Id.* at 24.

263 *Id.* This is important because "applicants that obtain federal permits for transmission will also gain authority to utilize eminent domain powers to obtain right-of-way across federal land." *CDEAC Report*, *supra* note 45, at 50. The DOE has been authorized to exercise eminent domain since 1938, so this power is nothing new or controversial. Dave Hill Interview, *supra* note 188. For an interesting

because there have been no applications yet, these provisions have not been tested. Currently, FERC is focusing on explaining how the rule will work when it finally is implemented.

In fulfilling this commitment, FERC has already convened several regional workshops for stakeholders.[264] The Office of Energy Projects ("OEP") hosted these regional workshops during February and March 2007 in Chicago, Boston, Atlanta, Portland, and Phoenix.[265] The content of the workshops revolved around describing the origin of the rule, the issues that were raised, and the process that was approved in Order No. 689.[266] Some of the issues discussed at the workshops were raised by state siting authorities who wanted to be involved in all projects that FERC got involved in from the very beginning of the process and who did not want to see projects that they denied get approved by FERC.[267] In response, OEP emphasized that it was important for project developers to work with the states as much as possible because once the siting and permitting process is complete, safety and oversight reverts to state authority.[268]

The federal government recognizes the magnitude of the shift of some siting authority to FERC, and the resulting rules have clearly limited the reach of FERC to National Corridors that meet more specific requirements. This article does not go into detail about specific state siting rules. However, it is important to discuss some of issues associated with the fact that enhancing development of renewable energy will require the construction of new transmission lines that do not cross state lines and are not designated as National Corridors. In these cases, it will be left to state and local authority to implement the necessary upgrades.

While state and "local officials may be best situated to balance local economic, environmental, and similar needs . . . [m]any state siting boards . . . are not authorized to consider interstate benefits" when making their siting decisions.[269] This problem is compounded by the fact that "local and state decisionmaking bodies naturally attempt to internalize the gains resulting from their decisions and externalize the corresponding costs," which can lead to a "lack of responsibility and concern for regional and national transmission needs."[270] This might mean delaying construction if another state will receive the benefits of it, especially if the non-siting state receives more benefits than the siting state. Even when the state or local decision makers *do* understand the regional and

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discussion on eminent domain as it relates to transmission lines, see Geoffrey K. Turnball, *Delegating Eminent Domain Powers to Private Firms: Land Use and Efficiency Implications,* Urban and Regional Analysis Group, Georgia State University Andrews School of Policy Studies, Aug. 2006, *available at* http://aysps.gsu.edu/urag/workingpapers/2006/URAG_Wp_06-01.pdf.

264 *FERC Siting Rule News Release, supra* note 248.

265 FERC, *Notice of Workshops on the Electric Transmission Siting Rule*, Jan. 26, 2007, http://www.ferc.gov/EventCalendar/Files/20070129184300-workshops.pdf (last visited Sept. 5, 2007).

266 *Id.*

267 Interview with Jeff Wright, *supra* note 188. One situation where states might try to block infrastructure upgrades and new development is where allowing them "would facilitate the export of their low-cost power to higher-cost markets and states . . . [which] could increase the ultimate cost of power to low-cost power states." Ferrey, *supra* note 5, at 278-279.

268 Interview with Jeff Wright, *supra* note 188.

269 Eagle, *supra* note 136, at 24.

270 *Id.*

national implications, they are often faced with opposition from their constituents who suffer from NIMBYism, the infamous "not in my backyard" syndrome.[271]

NIMBYism is not necessarily invalid, though. Recalling the development of the transmission network in its earlier stages, pollution and environmental concerns led residents to demand that generation sources be moved out of urban areas.[272] Now that urban populations are growing and there is a decrease in available isolated land, developing infrastructure closer to existing populations is becoming more necessary but gaining more opposition.[273] These concerns are real and will have definite impacts on the future of the electrical grid and its corresponding relationship to renewable energy sources, thus the following section will discuss property and environmental issues related to new transmission construction.

C. Environmental and Property Issues Related to Transmission Construction

When choosing where to build a transmission line, the "[a]ttributes of the natural environment, the characteristics of the local public, and the regulatory standards along prospective routes all have the potential to significantly increase the cost of [the] project, lengthen the timeline of implementation, and perhaps most importantly, undermine the certainty of project completion."[274] Some environmental issues include physical conditions such as soil, bedrock, forest cover, rivers, protected habitats and parks, and these will dictate the structural and mechanical limits, costs and viability of the project design.[275] These physical conditions cannot be avoided if the generation stations and load centers are in fixed locations,[276] and local, state, and federal agencies almost always have regulations related to developing in environmentally sensitive areas.

Taking all of these factors into consideration before the planning process begins is wise and allows tradeoffs eith public involvement, thus increasing the likelihood that the project will succeed. For instance, the public will most definitely be concerned with such issues as property values, aesthetics, electromagnetic fields, equity and fairness of location, just compensation for easements granted with eminent domain, and the underlying justification for needing to build the line in the first place.[277] Regarding eminent domain, the

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[271] *Id.* at 25. "NIMBYism is a problem when small costs to a small group of vocal residents prevent the siting of infrastructure that provides large benefits to a large group of people." *Id.* at 44. Shifting authority to a federal or regional siting body would reduce the effects of NIMBYism because these bodies would be "less likely to bow to narrow local interests." *Id.*

[272] To review this discussion, *see supra* note 123 and accompanying text.

[273] Eagle, *supra* note 136, at 25.

[274] Vajjhala & Fischbeck, *supra* note 235, at 663.

[275] *Id.*

[276] *Id.* at 664.

[277] *Id.* at 664. Opposition to the underlying reason for building the line could be centered on the need to reduce energy demand instead of building more generation and transmission sources. This would be especially relevant if the transmission line was going to serve the generation of new, dirty energy as opposed to clean and renewable sources of energy. However, there has been public opposition to wind farms due to their visual impacts on the landscape, so renewable energy

construction of new transmission lines will inevitably require crossing private land, requiring builders to either negotiate the purchase of easements or be granted authority by the government to exercise eminent domain.[278]

As previously discussed, FERC grants eminent domain power to projects that it permits, but each state will have its own rules. While state governments are allowed to implement stronger protections against eminent domain, the Supreme Court ruling in *Kelo v. City of New London* set the minimum requirement that economic development is a public purpose that allows the exercise of eminent domain under the Fifth Amendment Takings Clause.[279] Building a new transmission line to provide more affordable and reliable electricity to citizens in one or more states has definite economic purposes and would most likely qualify as a public use under *Kelo*, so a property owner would be hard-pressed to argue that FERC or the state siting authority was conducting an illegal taking.[280]

The legal framework for constructing transmission lines is set by the federal government, regional agreements between state governments, and individual state and local laws and regulations. The overarching policy is that there is a need to improve the transmission and distribution of electricity, as well as a need to cooperate with all interested stakeholders to make these decisions wisely. It is likely that from this point on, new transmission construction will be heavily scrutinized yet encouraged as a way to make America stronger.

V. CONCLUDING THOUGHTS

This article has made it clear that federal, regional, state, local, and energy industry leaders are all aware of and concerned about the inadequate state of the electric transmission grid, and everyone that has spoken tends to say the same thing—more lines need to be built and existing lines need to be updated. At the same time, our country is seeing the interest in, and necessity of, further developing sources of clean and renewable energy to supply our increasing energy demands and mitigate environmental damage. Without adequate infrastructure to distribute the energy, the financial incentives to invest in renewable energy projects are reduced. The sitting and permission rules and procedures at the federal and regional levels are in place to facilitate this development, so what is holding the construction back? The question seems to be about who should be responsible for the costs of the transmission upgrade—should it be the utilities themselves, the taxpayers who use the energy, or the generators who are requesting

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development is not immune. Regardless of what source the energy comes from, it is a better choice to involve the public from the beginning of the process.

278 For more on eminent domain, *see supra* note 264 and accompanying text.

279 *Kelo v. City of New London*, 545 U.S. 469, 485 (2005).

280 For more information about states' exercise of eminent domain for transmission construction, see *Eminent Domain: Review of the Electric Power Company's Location of Transmission Line for Which Condemnation is Sought*, 19 A.L.R. 4th 1026 (2007) (collecting and discussing "the state and federal cases in which the courts have considered the extent to which a determination by an electric power company of the location of a transmission line for which condemnation is sought is subject to review, either by courts or by appropriate administrative bodies."). *See also* Eagle, *supra* note 136, at 13-24 (focusing on state governments and showing of need and public use for eminent domain purposes).

connection to the grid?

The answer is "all of the above." This problem is of such a large magnitude that it demands a continental effort. It is in the best interest of America to have an up-to-date, state-of-the art transmission network. The responsibility to effectuate this enormous task falls on everyone, and attempting to assign the costs to one entity or group will cause the project to go nowhere. Instead, there should be a combined effort. End-users should reduce their consumption of energy to reduce the demand on the grid, generators should develop cleaner sources of renewable energy, transmission operators should support this growth by upgrading the grid, and governments should do their part to incentivize this development. Seeing progress in improving the transmission network will translate into more confidence for private investors that want to invest in renewable energy, which is an absolute imperative to the health and well-being of the environment and economy.