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Mission, Structure, and Governance in Future Electric Markets: Some Observations

In the language of competition economics, there are three modern energy markets: transport fuels, electricity, and the production of heat and cooling. While there are important changes occurring in all three value chains—notably, the first signs of serious alternatives to oil in the transport markets[1]—the greatest turmoil is occurring in the energy sector. Both competition and regulatory policy will play very substantial roles in determining the industry's future structure and performance as it evolves in response to current challenges.

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[1] Recent developments in biodiesel, ethanol, hydrogen, and propane fuels indicate growing potential to reduce oil use in transport markets. Domestic production of biodiesel has increased substantially during the past decade, and advances in storage technology are increasing the value of hydrogen-powered vehicles. For the most recent achievements in alternative and advanced fuels, see U.S. Dep't of Energy, *Alternative Fuels & Advanced Vehicles Data Center*, ENERGY EFFICIENCY & RENEWABLE ENERGY, http://www.afdc.energy.gov/afdc/fuels/biodiesel.html (last updated Dec. 28, 2010). Steady improvements in electric vehicle technology hold greater promise for reducing greenhouse gas emissions in the transport sector. The National Research Council projects a "maximum practical" fleet penetration of plug-in hybrid vehicles of thirteen percent by 2030 with a "more probable" penetration of less than five percent by the same time. NAT'L RESEARCH COUNCIL OF THE NAT'L ACADEMIES, TRANSITIONS TO ALTERNATIVE TRANSPORTATION TECHNOLOGIES—PLUG-IN HYBRID ELECTRIC VEHICLES (2010).

Historically, electric market reform has been viewed through the lens of generation deregulation.[2] Because energy production occurs in three vertical stages, and jurisdiction over these stages is split between the states and the federal government, deregulation has proceeded regionally in the wholesale generation markets via federal rules and sporadically in retail markets across the fifty states. Transmission and distribution continue to be comprehensively regulated. This mosaic has produced a mixed record of successes and failures, with little or no political will to make deregulation a uniform national policy.[3]

One could spend many days decomposing the various reasons why retail electric competition has not worked well, but such a backward-looking exercise is largely of only academic value.[4] In this postmillennial era, there are new forces at work that introduce changes much larger than deregulation ever wrought and that are much more important to national policy. Regulators and other stakeholders must turn their attention to the enormous new change drivers and the development of appropriate forms of market governance to manage a very different future power industry.

The first of the three giant drivers at work is global climate change. To mitigate the adverse impacts of higher greenhouse gas concentrations on human health, the environment, and the economy, the power sector will have to invest close to one trillion dollars before

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[2] Paul L. Joskow, *Regulatory Failure, Regulatory Reform, and Structural Change in the Electrical Power Industry*, 1989 BROOKINGS PAPERS ON ECON. ACTIVITY 125 (1989) (providing an excellent overview of electric market reform); *see also* CHARLES J. CICCHETTI & COLIN M. LONG, RESTRUCTURING ELECTRICITY MARKETS: A WORLD PERSPECTIVE POST CALIFORNIA AND ENRON (2003); PAUL J. JOSKOW & RICHARD SCHMALENSEE, MARKETS FOR POWER: AN ANALYSIS OF ELECTRIC UTILITY DEREGULATION (1983). For a more complete listing of literature discussing studies of wholesale and retail competition, see PETER FOX-PENNER, SMART POWER: CLIMATE CHANGE, THE SMART GRID, AND THE FUTURE OF ELECTRIC UTILITIES, at app. C (2010) [hereinafter PETER FOX-PENNER, SMART POWER]; Peter Fox-Penner, A New Book on the Transformation of the Energy Industry, SMART POWER, http://www.smartpowerbook.com (last visited Feb. 12, 2010) (reviews, commentary, and more).

[3] For current information on electric competition, see COMPETE COALITION, http://www.competecoalition.com (last visited Feb. 12, 2009). For a map of electricity restructuring by state, see U.S. Energy Info. Admin., *Status of Electricity Restructuring by State*, U.S. DEP'T OF ENERGY, http://www.eia.doe.gov/cneaf/electricity/page/restructuring/restructure_elect.html (last visited Feb. 12, 2009).

[4] See PETER FOX-PENNER, SMART POWER, *supra* note 2.

2030 to build low-carbon power sources and corresponding power lines to connect them.[5]

These investments are driven not by the ordinary course of supply and demand but by an essential public imperative. As the National Academy of Sciences recently observed, many of the technologies needed to decarbonize electricity generation are more expensive than traditional sources and carry much more technological and financial risk.[6] It is not unusual for today's power executives to describe a coal plant that features carbon capture and sequestration or a new nuclear plant as a "bet-the-company strategy"—and there are many more exotic new generation sources at various stages of development.[7]

Because public policies, and not price signals, are driving electricity generation investment toward clean, innovative resources, it is irrational to think that a vertically deintegrated, competitive generation market would naturally cause this to occur—especially in the absence of strong carbon price signals, which are largely absent in the United States. Instead, we need just the opposite: a generation sector that builds publicly mandated technologies with tacit or explicit assurances that these investments will not be undercut by competitors who sell cheaper, dirtier power. Despite the increasingly important need for a price on carbon emissions, we think this will happen only with a substantial degree of intervention in the generation sector, especially in the form of vertical integration or contracts.

All this suggests that there is an essential connection between the vertical industry structure, competition policies, and public interest imperatives that will dominate the generating sector's activities. Evaluating industry structure and competition questions without considering the public policy mandates affecting the sector is unrealistic and unwise.

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[5] MARC W. CHUPKA ET AL., TRANSFORMING AMERICA'S POWER INDUSTRY: THE INVESTMENT CHALLENGE 2010–2030 (2008), *available at* http://www.eei.org/ourissues/finance/Documents/Transforming_Americas_Power_Industry.pdf; *see also* NAT'L ACAD. OF SCIENCES, AMERICA'S ENERGY FUTURE: TECHNOLOGY AND TRANSFORMATION (2009); INT'L ENERGY AGENCY, ENERGY TECHNOLOGY PERSPECTIVES 2008: SCENARIOS AND STRATEGIES TO 2050 (2008).

[6] NAT'L ACAD. OF SCIENCES ET AL., ELECTRICITY FROM RENEWABLE RESOURCES: STATUS, PROSPECTS, AND IMPEDIMENTS 133-80 (2010).

[7] At the same time, it should be noted that several low-carbon power sources are more expensive but not usually risky, namely power from wind, solar, and natural gas. *See id.* It is no surprise that nearly all capacity additions today are from these resources.

The second great transformative agent disrupting the power sector today is the smart grid (SG). The SG is the application of digital control, sensoring, and communications technologies to the power grid. These technologies will enable utilities to monitor, analyze, control, and repair the grid much more efficiently than ever before, all while enabling new business and regulatory models that will facilitate the transition to a low-carbon power industry.[8]

Currently, many SG technologies that are not visible to consumers are being gradually, but steadily, deployed. Consumers will experience these technologies only via benefits they will never be able to trace to the technologies, such as shorter periods of power outages or voltage fluctuations. These "invisible" SG technologies will help utilities manage their systems with greater efficiency and reliability, much as sensors and digital diagnostic technologies are helping most nonutility businesses squeeze more productivity out of their assets.

The real transformation brought about by the SG, however, comes from the more visible aspects of these technologies. The SG will make customers aware of their own power use in real time, appliance by appliance, and allow them to program the timing of these appliances to use power during cheaper time periods. They will also be able to generate and store their own energy, sell it back to the grid, and interact with the grid using vastly more sophisticated service arrangements than we use today.

In basic economic terms, this means that electricity markets will finally have a use-specific, short-run demand curve in place of today's very slow-acting, long-run demand curve. Until now, consumer reaction to higher electricity prices occurred only after months or even years, as prices in monthly bills have gradually impacted power users via new investments and behavior shifts. With the SG, however, hourly power prices will impact hourly power use. Innovative ways to price and sell power, as well as power-saving practices and technologies, will proliferate.[9]

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[8] LITOS STRATEGIC COMMC'N, U.S. DEP'T OF ENERGY, THE SMART GRID: AN INTRODUCTION, *available at* http://www.oe.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages(1).pdf; Peter Fox-Penner, *Smart Power Business Models for a Smarter Grid*, SMART GRID NEWS.COM (June 8, 2010), http://www.smartgridnews.com/artman/publish/Business_Strategy/Smart-Power-Business-Models-for-a-Smarter-Grid-2489.html.

[9] Ahmad Faruqui et al., *The Power of Dynamic Pricing*, 22 ELECTRICITY J. 3, Apr. 2009, at 42, [pincite]; *see also* AHMAD FARUQUI & LISA WOOD, QUANTIFYING THE BENEFITS OF DYNAMIC PRICING IN THE MASS MARKET (2008), *available at*

The blossoming of the market for power control is likely to ultimately create a second wind for vertical deintegration and retail power deregulation. An avalanche of firms, from tiny startups to the mighty Googles and IBMs of the world, want to sell energy and services to customers who have SG technologies, displacing traditional power companies at the end of the electricity supply chain. Structurally speaking, this occurs most logically if retail electricity sales are deregulated.[10]

In a nutshell, what we have today is a collision between public mandates that promote active or tacit vertical integration alongside a disruptive technological change that is prompting new calls for retail deintegration and deregulation. Two tremendously powerful and equally valid opposing forces are at work, and the electricity utility industry is squarely in the crosshairs.

No one claims to know, with any certainty, how this tension will play out. The most likely outcome may be a shift toward greater deintegration and deregulation, as this would be consistent with the impact of modern information technology on many vertically integrated industries. However, it would be unwise to place any large bets on that outcome—vertical integration has proven to be quite resilient in the network industries, especially among power and water utilities, and this may well continue.

One thing, however, is abundantly clear: our institutions of electricity regulation are flatly under-equipped to manage this tension and the industry's overall transition. U.S. electricity regulation was designed a century ago to encourage a build-out of the grid for the purpose of establishing scale economies and therefore low-cost commodity power. Today's regulatory environment resembles a patchwork quilt that veers between parochial state politics and the national interest, largely omitting the correct locus of planning and

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http://www.eei.org/ourissues/electricitydistribution/Documents/quantifying_benefits_final_append.pdf; AHMAD FARUQUI ET AL., BRATTLE GROUP, THE POWER OF FIVE PERCENT: HOW DYNAMIC PRICING CAN SAVE $35 BILLION IN ELECTRICITY COSTS (2007), *available at* http://www.ecoalign.com/system/files/Project+Energy+Code+02+Feb2009+vf.pdf.

[10] L. LYNNE KIESLING, PROJECT ENERGY CODE: MARKETS, TECHNOLOGY AND INSTITUTIONS: INCREASING ENERGY EFFICIENCY THROUGH DECENTRALIZED COORDINATION (2009), *available at* http://www.ecoalign.com/system/files/Project+Energy+Code+02+Feb2009+vf.pdf; Lynne Kiesling, Dep't of Econ. & Kellogg Sch. of Mgmt., Northwestern Univ., Network Economics: Electricity and Smart Grid Technology (May 18, 2007), *available at* http://www.silicon-flatirons.org/documents/conferences/2008.05.17-203/Kiesling.pdf.

governance, which is the multistate region. Current regulatory law, regulator core competencies, and many embedded incentives are all wrong for the industry's coming era.

This is an argument for neither removing nor expanding regulation, as neither has much chance of occurring. Rather, it is an argument for retooling regulation extensively, just as we are starting to do in the financial sector. Like its financial cousin, electricity regulation was born in an era of very different technologies and policy needs. Electricity regulatory reform is made even more difficult by the fact that states have retained the majority of regulatory power over two-thirds of the industry while the final third is government- or customer-owned and often exempt from all state and federal policies. In addition, the power grid handles the most essential of our infrastructure functions and, by many accounts, is highly vulnerable to cyber attacks and privacy concerns.[11]

We cannot fault the current administration for inactivity in energy policy making, as a tremendous amount has been accomplished since President Obama took office. Moreover, the current administration has an understanding of many of these issues and a desire to improve related policies. However, the existing system is anchored far too deeply in law, culture, and business models to change without strong and sustained leadership.

The future of the power industry is destined for extensive change—there is no stopping it. We need not wait for a crisis analogous to the financial crash of 2008 to force an upgrading of regulation to align with the imperatives of our era. As Churchill once noted, most democracies can be counted on to do the right thing only after they have exhausted all the other options. In this case we should be proactive enough to begin changing utility regulation to align with emerging technologies, new business structures, and the next century's national and global policy imperatives now, before we are left without any choice but to act in haste.

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[11] *See, e.g.*, RICHARD A. CLARKE & ROBERT K. KNAKE, CYBER WAR: THE NEXT THREAT TO NATIONAL SECURITY AND WHAT TO DO ABOUT IT 98 (2010); SMART GRID SECURITY BLOG, http://smartgridsecurity.blogspot.com (last visited Feb. 12, 2009).