

RETHINKING ELECTRICITY RESTRUCTURING

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The American experiment in electric utility restructuring is generally seen around the world as providing a cautionary tale regarding the limits of deregulation in the energy sector. The recent big policy and political disasters in electricity have occurred in those states that have introduced market forces partially: the California meltdown and the Northeast blackout, and proponents of electricity deregulation have been rather silent ever since. Today, there is no consensus among politicians or academics regarding how this industry ought to be organized or how it might best be regulated.

Finding our way out of this morass requires a reconsideration of how we got to this dismal point in our regulatory journey. Doing so suggests a surprising series of conclusions about what has gone wrong and where to go from here.

The Old Regime Versus the New

Throughout most of the 20th century, the electricity sector in the United States was characterized by balkanized regional and state supply systems with significant barriers to trade between them. By the early 1990s, the balkanized systems had large discrepancies in both prices and costs between states. Large consumers of electricity located in high cost states demanded policy changes to reduce electricity prices.¹

The policy response has been the national deregulation of the interstate wholesale market to allow generators access to transmission systems owned by others. Some high-cost states have gone further and encouraged vertical disintegration to separate ownership of generators from ownership of transmission and distribution systems. Some states have also implemented retail

¹ For an overview of the old regulatory regime and the events that prompted consideration of wide-ranging reforms, see Peter Van Doren, "The Deregulation of the Electricity Industry: A Primer," Policy Analysis no. 320, Cato Institute, October 6, 1998 (<http://www.cato.org/pubs/pas/pa-320.pdf>).

choice programs to allow consumers and generators to contract directly using transmission and distribution systems owned by others to transmit the electricity.²

The low-cost states have responded by resisting those policy changes and attempting to maintain the vertically integrated, state-regulated, balkanized system for two reasons. First, while costs could conceivably be lower if market forces were introduced, the costs in “traditional” states have been acceptable to consumers even without the use of market forces largely because the low-cost states avoided two high-cost strategies undertaken by other states: nuclear power and expensive long-term contracts undertaken at the behest of the Public Utilities Regulatory Policy Act of 1978 (PURPA).³

Second, the California meltdown and the Northeast blackout have drastically reduced politicians’ appetite for electricity regulatory reform. To average voters and the politicians that listen to them, change away from the traditional, regulated, vertically integrated, balkanized, state-based electricity regime is associated with bad outcomes because the states that introduced the most wide-ranging regulatory changes also experienced the most problems over the last several years.

Accordingly, restructuring has been an uneven process. While some competition was introduced on interstate electricity systems, the old regulatory regime (characterized by cost-of-

² For a review of state policies with regards to electricity regulation, see U.S. Energy Information Administration, “Status of State Electric Industry Restructuring Activity – as of February 2003,” http://www.eia.doe.gov/cneaf/electricity/chg_str/regmap.html.

³ PURPA in part required electric utility companies to purchase power generated by independent producers at a price equal to “avoided costs,” defined as the cost that the regulated utility would have had to incur if it had generated the same amount of electricity. The purpose of that provision of PURPA was to stimulate the development of alternatives to fossil fuels for electricity generation, which was expected to become terribly expensive in the decades to come. The details of PURPA implementation were left to the 50 states given that they were the political entities that actually regulated electricity rates. In short, each state set a price to reflect its regulators’ best estimate of what “avoided costs” would be in the future and required utilities to sign contracts with any/all independent electricity producers who offered power at that price. The upshot is that states that established high prices for avoided costs under PURPA (most notably, California and New York) saddled utilities with costly obligations that served to increase retail prices relative to the states that established lower avoided cost estimates under PURPA.

service rate making, local monopoly, and close state regulatory supervision over operations) still exists in many states.

The Case for Restructuring

So what, in theory, are we supposed to get out of restructuring? From the standpoint of economic efficiency, there were two major problems associated with the old system.

First, because investment in capital received a guaranteed return, total generation investment was excessive and skewed toward capital-intensive facilities. Couple that with the one-time enthusiasm for nuclear power (once thought of as a progressive energy source that would be “too cheap to meter”) and the growing hostility to coal-fired generation and it’s no surprise that some states moved strongly toward nuclear power, whose costs, for the most part, ended up being much higher than anticipated.⁴ Introduction of market forces into the generation side of electricity markets would eliminate the bias for capital-intensive projects by introducing uncertainty about returns.

Second, prices for electricity did not serve their usual role of signaling to consumers the marginal costs of additional consumption. Instead, they served solely as a device to recover costs. Thus electricity prices were wrong all the time. They were too low on peak and too high off peak. Market forces, it was hoped, would introduce marginal-cost pricing and as a result

⁴ It is not clear whether nuclear power was imprudent from the start or was made excessively costly by federal safety regulation (in the form of the Nuclear Regulatory Commission). In 1975 Resources for the Future projected that the total costs of nuclear plants in 1985-88 would be cheaper than the total costs of equivalent coal plants. See William Spangar Peirce, *Economics of the Energy Industries* (Westport, Connecticut: Praeger Publishers, 1996), pp. 216-217. A set of costly nuclear plants came on line during the early 1980s and electricity rates rose 60% from 1978 to 1982. See Caleb Solomon, "As Competition Roils Electric Utilities, They Look to New Mexico," *The Wall Street Journal* May 9, 1994, p. A1. By 1990 nuclear plants had total costs that were about double those for coal plants (Peirce, p. 216). Not all nuclear plants are more expensive than coal-fired plants. Peirce reports (pp. 217-218) that the least expensive nuclear plants have total costs lower than the cheapest coal plants but that at every other point in their respective distributions, nuclear plants are more expensive

reduce peak demand, increase off-peak demand,⁵ and reduce the needless political fighting (most notably, the eternal fight over more supply versus less demand) that inevitably arises in electricity markets because of the absence of prices as a signaling device.

Thus restructuring was supposed to discipline the cost of generation and introduce the use of price signals to allocate electricity rather than just recover costs. Restructuring has forced investors to worry about the cost of generation, but it has not introduced real-time pricing. In addition, average voters and the politicians that listen to them associate markets in electricity with bad outcomes and regulation with good outcomes. Accordingly, anyone who believes market forces ought to play a larger role in electricity has to argue convincingly that:

- the California meltdown and the Northeast blackout were not the result of market forces;
- the low costs of the states still under the old regulatory regime are not the result of regulation; and
- gains to trade (efficiency improvements) not possible in the regulated status quo would take place in a truly deregulated world.

The California Story

During 2000-01 a large supply reduction in hydropower and weather-related demand increases (a hot summer and very cold winter) increased electricity and natural gas prices in California. Those price increases were exacerbated by the regulation of nitrogen oxide emissions in the Los Angeles basin, some design features of the California auction bidding system, and retail price controls.

⁵ In 1996, if implemented, full utilization of conventional steam-electric "baseload" facilities off peak would have resulted result in a 25.5 percent increase in power production and a similar percentage decrease in price. See Michael T. Maloney, Robert E. McCormick, and Raymond D. Sauer, "Customer Choice, Consumer Value: An Analysis of Retail Competition In America's Electric Industry," Washington, DC: Citizens For A Sound Economy Foundation, 1996, p. 32.

The price controls were particularly harmful in that they encouraged generators to price high because there would be no reduction in demand as a consequence of their pricing behavior. Moreover, retail price controls prevented utilities from passing on their higher costs to consumers, which caused the utilities to suffer a financial meltdown. Generators, in turn, increased prices to take the possibility of not being paid into account. From November 2000 on, the California story is a financial meltdown story: wholesale prices had a large credit-risk component.⁶

The central intellectual lesson from California is not that market forces have been tried and failed, but rather that partial deregulation (wholesale deregulation combined with rigid retail prices) is an extremely dangerous institutional design. The practical lesson that regulators have drawn, however, is the need to procure reserves through non-market forces rather than peak prices, which cause customers (voters) to revolt. Essentially this returns us to the world before restructuring, whose main economic defect was excess generation capacity. Thus the differences between the restructured world and the old regulated world are smaller than they would appear.

The Blackout Story

From our perspective, the August 14th, 2003 blackout illustrates the difficulty of managing externalities on the grid. While markets per se were not responsible for the blackout, the shift over the last 30 years from a world consisting of balkanized vertically integrated utilities to independent power producers and vertically disintegrated power service providers has increased the number of players whose behavior has to be coordinated to maintain satisfactory operation of the North American Transmission System.

⁶ For a more thorough discussion of the crisis, see Jerry Taylor and Peter Van Doren, "California's Electricity Crisis: What's Going On, Who's to Blame, and What to Do," Policy Analysis 406, Cato Institute, July 3, 2001.

While blackouts occurred in the old regime as well, it's certainly true that – with greater interconnectivity between service territories – the chances of cascading blackouts might well be enhanced by the introduction of restructuring as it is currently conceived.

About Those Low-Cost States

While economists advocated markets for electricity to promote the use of prices as real-time allocation signals, the political support for restructuring stemmed from the possibility of transmitting low-cost power from states like Kentucky (4.3 cents per kWh in 2002) to New York (11.3 cents per kWh in 2002).⁷ The only problem is that the low-cost states are low-cost largely because they did not change very much from the 1965 balkanized, regulated, limited-trade, non-market status quo. Some never abandoned the use of coal in the production of electricity while others had continued access to cheap hydropower. None aggressively implemented long-term fixed-price PURPA independent power contracts.

Moreover, traditional rate regulation *appears* to benefit consumers through the use of weighted average pricing for electricity.⁸ Why this is so – and why it is but a mirage – requires a quick review of some economic fundamentals.

In a free market, the market prices of commodities are determined by the most expensive source of supply necessary to meet demand.⁹ In an unregulated electricity market, then, marginal sources of electricity – such as high cost generators typically in operation only during the peak-demand periods – would need to earn at least a normal return. This implies that those facilities

⁷ U.S. Department of Energy, Energy Information Administration, *Electric Power Annual 2002*, figure 7.4, p. 43.

⁸ Weighted average pricing entails adding-up the cost of each unit of electricity from all generators in a service area and charging consumers the average cost of power from those generators.

⁹ Simply restated, when a supply curve is upward sloping and the corresponding demand curve is downward sloping (as it is in the electricity market), the intersection of the two curves establishes the price. Suppliers to the left of the intersection point on that curve (that is, lower-cost suppliers) will charge what the market will bear, not the sum of their

with lower costs whose supply is limited (such as old coal-fired units exempt from plant-specific emission controls under the 1970 and 1977 Clean Air Act amendments) and hydropower facilities (whose supply can't be expanded) would receive large profits in an unregulated market.

Rate regulation by the states, however, currently suppresses those profits. Consumers are charged a weighted average of generator costs rather than the market price, which would be at least the marginal cost of the most costly unit necessary to meet demand.

Thus in a free market, the proportion of electricity produced by coal or hydropower *would not* affect prices if neither is the marginal source of power. But in regulated electricity markets, cheap infra-marginal power *does* lower electricity prices to consumers because prices are weighted averages of producer costs rather than marginal costs of the most expensive producer. Thus regulation would seem to play a role in the low-cost of electricity in those states that maintain the old regulatory regime.

Because Kentucky's low prices reflect average rather than marginal costs, the gains to connecting Kentucky with New York via improved transmission are illusory. The expanded Kentucky output would probably have costs greater than 4.3 cents per kWh because the main source of low prices is cheap infra-marginal coal generation whose supply can't be expanded because it is the result of old sources (under the Clean Air Act) whose supply cannot be expanded by definition.

If natural gas is the fuel source for increases in electricity output everywhere and coal is infra-marginal, then prices would not vary across states in an unregulated market because the price of gas-fired output would set the market price everywhere. If we are correct, this implies that gains to trade not occurring under the current balkanized system are much smaller than many believe.

production costs plus a normal profit.

Accordingly, *the fight between the old regime and a restructured regime* (that is, the case for a transmission-intense versus balkanized system) *is a fight about wealth rather than efficiency*. This is why low-cost states in the U.S. are very resistant to a national integrated electricity market – it would allow their electricity to go to the highest bidders rather than to those who happen to reside within an electric utility’s current service territory. Because there is a relatively fixed supply of this low-cost electricity, mandatory open access involves wealth redistribution as much as and maybe even more so than efficiency gains.

Efficiency Gains

In regulated markets, it is usually quite easy for economists to demonstrate that consumers do not benefit from regulation. To be sure, weighted-average pricing under regulation redistributes from off-peak users to on-peak but unlike many other markets, electricity markets have characteristics that are difficult to manage through property rights and contracts, and thus regulation has at least the possibility of a plausible rationale.

For example, the alternating current (AC) grid is a "commons." That is, the physical reality of the grid does not coincide with current private property rights nor the 50-state regulatory schemes that govern the grid. Power added by any generator on an AC transmission system follows all paths, favoring those with least resistance rather than the shortest distance between generator and customer. Thus bilateral contracts between any willing seller and buyer of electricity affect all other buyers and sellers within each interconnected system in ways that are not captured by prices, the textbook definition of externality. The proper way to manage those externalities is the subject of great dispute.

In addition, transmission additions confer benefits across all generators and consumers on

the grid and thus have public-good characteristics.¹⁰ The development of property rights and prices that internalize those characteristics is very difficult.

Traditionally, the commons problem was addressed through monopoly-franchise vertical integration. Trade between vertically integrated utilities was never very large and was governed by barter arrangements rather than markets. And where trade was extensive, voluntary arrangements such as the Pennsylvania-New Jersey-Maryland transmission pool (“PJM”) arose to manage the flows across separately owned transmission systems through contract. Thus historically, the “commons” characteristics of the grid did not create large externality issues.

But since the Energy Policy Act of 1992 and orders 888 and 889 from the Federal Energy Regulatory Commission (FERC) – which facilitated the development of widespread trading on the grid particularly by non vertically integrated merchant generators – the mismatch between the physical reality of the grid and its current governance structure have become an important problem.

Solving the Public Goods Problem

What are the possible solutions to the public good nature of the transmission system? The most commonly discussed possibility is aggressive regulation by the Federal Energy Regulatory Commission through mandatory utility participation in regional transmission organizations (which would be responsible for long-term management of the electricity grid under its authority and deciding whether transmission, generation, or demand-side management would be the best solution to any particular supply problem) and a standard market design for the industry (including provisions to ensure adequate generation capacity is available) to eliminate the discrepancy between

¹⁰ Douglas Hale, Thomas Overbye, and Thomas Leckey, “Competition Requires Transmission Capacity: The Case of the U.S. Northeast,” *Regulation* 23(2 2000): 40-45. The authors use optimal power flow analysis to demonstrate that

the commons nature of the transmission system and the current fragmented system that governs it.¹¹

The problem with this solution is that it employs lots of lawyers to create a half market that leaves retail state-level regulation intact. It also confuses rather than clarifies incentives in the governance of transmission by separating ownership from control.¹²

Nobel laureate economist Vernon Smith believes that private solutions are possible.¹³ He argues that new transmission is a “club good” that facilitates the ability of generators to get their product to market. Consortia of generators could fund new investment and, in turn, get rights to inject or take power from the system in proportion to their financial contributions. If existing generators lose money because the new transmission investment alters their ability to sell power, so be it.

MIT economist Paul Joskow, however, is skeptical:

Transmission investment decisions do not immediately strike me as being ideally suited to relying entirely on the invisible hand. Transmission investments are lumpy, characterized by economies of scale and can have physical impacts throughout the network. The combination of imperfectly defined property rights, economies of scale and long-lived sunk costs for transmission investments, and imperfect competition in the supply of generating services can lead to either underinvestment or overinvestment at particular points on the network if we rely entirely on market forces.¹⁴

Given the inability of investors to capture the full benefits of their investment, won't investment in transmission capacity always prove suboptimal as Joskow suggests?

small additions to the grid in Northeast would lower prices for consumers across several states.

¹¹ For an explanation of the particulars envisioned, see Thomas Lenard, “FERC’s New Regulatory Agenda,” *Regulation* 25:3, Fall 2002, pp. 36-41 (<http://www.cato.org/pubs/regulation/regv25n3/v25n3-9.pdf>).

¹² Robert J. Michaels, “Can Nonprofit Transmission Be Independent?” *Regulation* 23 (3, 2000): 61-66.

¹³ Stephen J. Rassenti and Vernon L. Smith, “Deregulating Electric Power: Market Design Issues and Experiments,” in Hung-po Chao and Hillard Huntington, eds., *Designing Competitive Electricity Markets* (Boston: Kluwer Academic Publishers, 1998), pp. 105-120.

¹⁴ Paul L. Joskow, “Restructuring, Competition and Regulatory Reform in the U.S. Electricity Sector,” in Chao and Huntington, p. 24.

An institution drawn from petroleum economics, the unitization contract, illuminates the conceptual solution as well as the difficulty of its implementation. In some settings petroleum producers face a problem analogous to the “commons” nature of the AC transmission system because surface property rights often do not coincide with the geological characteristics of petroleum reservoirs. This discrepancy creates incentives to drill and pump fast before other surface owners do the same because no one represents the interests of the entire oil field.

A unitization contract is a set of payoffs to all existing surface owners that induces them to give up their production autonomy. It is a genuine pareto improvement if operation of the reservoir by one operator produces so much more revenue in present value that it compensates all existing owners to give up their rights and still leaves a surplus.¹⁵

Many tough questions, however, remain. Is there a set of payoffs to all existing players in electricity transmission (including state regulatory regimes and incumbent utilities) that would induce them to go away and turn over operation of their systems to a welfare-maximizing operator in return for a contractually determined share of the increased profits? What plan would the welfare-optimizing operator implement? Is the plan achievable through private action or are transaction costs prohibitively high? And, if they are high, is coercion by FERC likely to achieve the same outcome?

The most pertinent question, however, is whether the unexploited gains to trade are large enough to allow payoffs to all existing players in electricity transmission and still leave a surplus. Research by Hale et al. suggests that they may well be case in the eastern part of the United States at least, where it was found that several small transmission investments reduce peak power prices in

¹⁵ Gary D. Libecap and James L. Smith, “Regulatory Remedies to the Common Pool: The Limits to Oil Field Unitization,” *The Energy Journal* 22 (1, 2001): 1-26.

the summer across several states.¹⁶ It would appear that the gains to consumers far exceed the costs of the investments – the textbook definition of unexploited gains to trade – and yet the links have not been built because no one represents the beneficiaries across numerous state and utility boundaries.

But to the extent that the price differences across states represent weighted-average rather than marginal-cost differences, potential gains to trade are reduced. Accordingly, Hale et al.'s findings are of only limited use.

The other important source of efficiency gains is real time pricing. According to Maloney, McCormick, and Sauer the gains are large. But mandatory open access and restructuring have so far not involved the use of real-time pricing.

Back to the Future?

If the efficiency gains from mandatory open access are smaller than advertised and the costs created by the regulatory apparatus necessary to achieve them are large, then what should we do? We suggest that we go either forward or backward but not stay in mandatory open access limbo. Either we should fully deregulate generation, transmission, and distribution and allow all arrangements to be determined by contract,¹⁷ or we should go backwards to the rate-regulated world of vertical integration, no merchant generators, and very limited trade.

To execute the forward transition, Congress should simply rule that state regulation of the electricity business is an unconstitutional interference with interstate commerce – a precedent established when the Congress preempted state trucking regulation.¹⁸ Congress would then remove

¹⁶ See note 11.

¹⁷ Richard Gordon, "Don't Restructure Electricity: Deregulate," *Cato Journal* 20:3, Winter 2001, pp. 327-358.

¹⁸ Paul Teske, Samuel Best, and Michael Mintrom, *Deregulating Freight Transportation* (Washington, D. C.: American Enterprise Institute, 1995).

any legal barriers to vertical reintegration of the industry and any requirement that grid owners open their wires to parties under regulated terms and conditions. Service territories, however, would no longer be protected and barriers to entry would be eliminated.

Unfortunately such a proposal would be politically unpopular given the widespread fear that unrestrained local power monopolies would “gouge” both commercial and residential consumers even though the scholarly evidence does not suggest that regulation has constrained prices below monopoly levels.¹⁹ Accordingly, a second-best answer might be to go backwards: to accept the regulatory oversight of electric power companies (oversight that would include the traditional policing of utility prices and investment decisions) in return for management of the transmission commons through vertical integration.

The problems associated with regulation are fewer today than they were thirty or forty years ago because incentive-based (IB) regulation has replaced traditional rate-of-return (ROR) regulation.²⁰ Under IB regulation owners have an incentive to cut rather than increase costs and thus would not have the same incentive to have an excessively large generation investment (i.e. nuclear plants).

One way to get the advantages of the old regime while still allowing more electricity trade between service territories is to promote the more extensive use of direct current DC transmission links between AC systems that have one owner and thus no externalities. DC links end the

¹⁹ See, for instance, George Stigler & Claire Friedland, “What Can Regulators Regulate?” *Journal of Law & Economics* 5, October 1962, pp. 1-16; Harold Demsetz, “Why Regulate Utilities?” *Journal of Law & Economics* 11, 1968, pp. 55-65; Richard Posner, “Natural Monopoly & Its Regulation,” *Stanford Law Journal*, February 1969, pp. 548-643; Thomas Gale Moore, “The Effectiveness of Regulation of Electric Utility Prices,” *Southern Economic Journal* 36:4, April 1970, pp. 365-375; Michael Crew & Paul Kleindorfer, “Governance Costs of Rate-of-Return Regulation,” *Zeitschrift für die gesamte Staatswissenschaft (ZgS)* 141, 1985, pp. 104-123; and Michael Denning & Walter Mead, “New Evidence on Benefits and Costs of Public Utility Rate Regulation,” in *Competition in Electricity: New Markets & New Structures*, James Plummer & Susan Troppmann, eds. (Palo Alto: QED Research, Inc., 1990), pp. 21-40.

²⁰ Shimon Awerbuch, Leonard Hyman, and Andrew Vesey, *Unlocking the Benefits of Restructuring: A Blueprint for Transmission* (Vienna, Virginia: Public Utilities Reports Incorporated, 1999).

commons problem because the electricity flows would not effect third parties on the grid.²¹

Smaller AC systems with DC connections between them cost more, but such a design reduces externalities and management requirements. George Loehr, a member of the New York State Reliability Council, estimates that it would cost \$7-8 billion to break up the eastern interconnection into 10 smaller interconnections linked by DC lines.²²

Conclusion

We do not expect full genuine deregulation to happen in the foreseeable future. But we do expect that the case for restructuring as it is currently conceived (mandatory open access) will continue to come under increasing political and economic stress. Market-oriented analysts should thus consider going backwards to regulated, vertical integrated balkanized companies rather than support mandatory open access.

²¹ Lori A. Burkhart, "Blackouts? Never Again (But . . .)," *Public Utilities Fortnightly* (October 1, 2003): 30.

²² *Ibid.*