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White Paper

Electricity Supply Organization: Which End Is Up?

Instead of creating a top-down hierarchy for overseeing bulk power markets, the creation of four RTOs may end up inadvertently creating a smaller, decentralized generation structure. Will the new form fit its intended function, and how will it react to technological evolution within the industry?

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Since the FERC's July 2001 order to form four large RTOs, chaos has returned to the short-term planning and management of the nation's electricity supplies. If form follows function, then no doubt this sequence is proper: introduce chaos in revising the heretofore evolving institutional structures to follow in the wake of the fractious operating and pricing experience of last year in California. But in this case, does the form fit the function(s), and in the long run, will it aid or bias the sensible technological evolution of the industry?

To quote former President Ronald Reagan, "there they go again." In this case "they" are the Federal Energy Regulatory Commission and what they've done is attempt to forge major revisions in the institutional structure for providing electricity in the United States. The FERC's initial foray was in supporting the Public Utility Regulatory Policy Act of 1978 and, more recently, through Order 888 and the Regional Transmission Organization order of 2001. The general sweep of these actions moves from facilitating a demonstration that independent power producers might be able to build electric generating stations that are competitive in cost and reliability with utility-built units to Order 888, which urged all regions of the country to establish (1) competitive wholesale power markets, (2) independent entities for overseeing those markets and (3) the management of transmission in a reliable, open-access manner. The June, 2001 RTO order mandates much larger regional markets (five or six for the entire country) and equally large independent transmissions planning and operating organizations.

This sequence of actions has been consistent with a twenty-five year vision of introducing ever more competition into wholesale electricity markets, a prospect that I heartily support. What has been absent from all of these actions, however, is the establishment of the physical means to make these regional markets a reality: the necessary incentives and public-decision making authority to motivate, approve and site electric transmission capacity expansion in response to the laws of supply and demand.

In 1975, the biggest problem of providing reliable electricity to New York City was the inadequate transmission capacity linking upstate (and Connecticut and New Jersey) to the city. Twenty-five years later, the same bottlenecks remain. They persist for two reasons: (1) existing utilities don't feel they have adequate financial incentives to construct new facilities, and (2) the traumatic, drawn-out and frequently inconclusive process of gaining public approvals for upgrading or building new transmission lines adds to the financial disincentives in (1). If utilities having some degree of public approbation see the risks as too great and the returns as too meager, certainly unregulated entrepreneurs will be even more gun-shy about undertaking these projects.

Thus far, congressional and FERC actions in the competitive electric arena reminds me of the movie, *Field of Dreams*. If government establishes the ideal institutional structure for a competitive electricity market then "they will come," that is, someone will find a way to build the interstate transmission grid that is essential for making those regional markets a reality. Is that a realistic presumption? I think not. As an example, even though the United States had a highly competitive automobile and gasoline industry in 1945, it took a federal law and massive federal funding to construct the nation's interstate highway system. Therefore, isn't it reasonable to expect that a similar massive federal intervention may be required to make the dreamed-of national power grid a reality? By contrast, we seem to be on the course of reinforcing a hodge-podge of state, local and private toll roads, with the FERC merely attempting to establish some broad regional planning, coordinated operating and consistent regional pricing rules through its 2001 order. Can the establishment of large institutional shells (the RTOs) bring about the needed facilities; can function follow form?

Perhaps, but it's tough to tell which should come first. Matching the function and form (institutional structure) so that they are of compatible size, nature and motivation will help a great deal. Looking at size, it's clear that a multi-state transmission planning entity like the proposed RTOs is warranted because of economies of scale in electricity transmission and the need for parallel paths to provide redundancy. It is also clear that common market structures and standardized products are desirable at a regional, if not a national level. After all, by analogy, we have one currency, nationwide security markets, and uniform standards for most commodities across the entire nation (the plugs in all appliances fit all electrical outlets, at least throughout the United States). But those nationwide securities markets also have essentially the same low transaction costs, regardless of whether the trade is between a seller in Boston and a buyer in either New York or San Francisco. By comparison, an electric generator in Baltimore wanting to sell to a buyer in Boston, may simply not be able to get the power there physically because of inadequate transmission line capacity, or the "toll" for transport may be prohibitive because of line congestion. While the creation of a regional transmission planning authority can highlight a problem and propose solutions, and although the establishment of a regional market with consistent market-clearing and congestion-management tools can emphasize the opportunities of enhancing transmission capacity through the substantial price difference across congested transmission interfaces, both of these steps are merely prerequisites for an efficient regional electric market. Little additional power will flow from Baltimore to Boston, and effectively there will still be separate markets in Baltimore, New York and New England during most periods unless someone actually builds the line. So far, there have been few volunteers.

There are two ways to define the geographical scope of a market. The first way is in terms of transportation limitations, where each market is bounded by physical and economic barriers that limit suppliers' access to a market. This is how existing electricity markets are segmented. The second way is to identify trading opportunities (cost-of-production differences). But this approach requires a longer-run view, since frequently, low-cost transportation routes must be established. For example, in the United States the West Coast markets didn't open to the East until after completion of the Panama Canal and the transcontinental railroads, and those transportation improvements were completed only as a result of massive government investments and subsidies.

An additional consideration is that no one has ever reliably operated a power grid the size of the FERC-proposed amalgamation of New England (ISO-NE), New York (NYISO), and Pennsylvania, New Jersey and Maryland (PJM), and so the presumption is that operation would begin with the three existing broad control areas, each of which relies heavily on smaller utility-run sub-areas for detailed operation. As transmission links are strengthened, efforts would be undertaken to integrate operations automatically. However, a cautionary note needs to be sounded on the operational side: complexity science suggests that as the number of firm interconnections increases, the probability of large cascading failures (a major, regional blackout) also increases, even though average system reliability may improve. These reliability concerns are amplified by the September 11, 2001 terrorist attacks, since decentralized systems are generally more robust and resilient in the face of simultaneous, coordinated assaults than are tightly coupled, centrally controlled networks. In fact, one step leading to regional cooperation, but in an ongoing decentralized operating and control framework, would be to have the ISOs use each other's control centers as back-up facilities in cases of emergency.

Initially, the only truly regional activity that makes sense (function coinciding with form) for the Northeast RTO is transmission planning, coordinated redundancy and the establishment of market standards. In the process, these market standards should be viewed as transitional, since none of the electric markets tried so far in the United States are really decentralized, two-sided markets. Instead, we have variations of the former centrally-planned economies that were run by the power pools and utilities, except that generator offers have been substituted for utility cost curves.

But so far, none of these markets have effective demand-side bidding, only New York has a fairly viable set of markets for reserves, and in no case have important economic decisions been decentralized, with optimization left to suppliers (such as whether or not to start up a large nuclear base-load unit that must then operate for 10 consecutive days in order to be economical). This is one of the greatest risks associated with forming the supersized RTOs too rapidly: the amount of experimentation with alternative market structures will decline because there are fewer markets in which to experiment. In a dynamic world (or one where our knowledge and experience is limited), a rush to standardization may be counterproductive.

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At least in the transition period, therefore, it appears that some hybrid organizational structure may be desirable, both to operate the system through a hierarchy of control area responsibilities, and to oversee the market structure and operations. In that way experiments can continue to be conducted in RTO sub-areas without placing the entire RTO at risk in terms of reliability and efficient market management. Until many of the major transmission bottlenecks are eliminated, the RTO will be forced to recognize the existence of many sub-markets within its region. Economic efficiency and reliability cannot be otherwise served.

How will transmission bottlenecks be eliminated (i.e., trading opportunities facilitated)? In a rational world, either a federal agency would build them, like the Army Corps of Engineers constructs and maintains the country's water-borne system of transport, or massive federal subsidies would be provided to RTOs to have their member utilities strengthen those lines, just as the interstate highway system was constructed. But even then, given the power of the public to object to particular sites and routes, and their increased organizational skill in blocking nearly every recent infrastructure venture in major urban areas, any resolution is likely to be long and drawn-out, even if rights of eminent domain are granted to RTOs. It is doubtful that the public will exists to implement any of these transmission-enhancing

activities on a widespread basis. One area where some progress may be possible is in utilities' existing transmission rights-of-way (preferably with underground direct current cables) but the costs are appreciable and must be warranted by the trading opportunities.

More likely, what will happen is that few transmission lines will be strengthened, the substantial price gaps across bottlenecks will rise, and the suppliers and traders who have been the primary advocates of forming large RTOs will continue to be frustrated. The consequence may well be tremendous spurs to develop efficient, small generation that can be installed in local neighborhoods or even in individual businesses and homes (so-called distributed generation), which raises a large set of additional organizational questions that are not dealt with in the FERC RTO order. In fact the rules and regulations covering interconnection, operation, and market incentives for small-scale generation connected into a utility's low-voltage distribution system must focus on individual utilities that are currently regulated by state agencies, not the FERC.

Furthermore, were the installation of distributed generation to become widespread, it is not clear that the distribution system design and operating know-how exists to provide economic and reliable service. And so while the notion of personal generators appeals to many because it increases a sense of autonomy and independence (except, of course, if all of those distributed, unless the cost of spare generating capacity falls to the level of desktop computers, redundancy through connection to a utility distribution system will still be required for reliable electric service. In fact this "need" for a strengthened, more actively managed local distribution system may be an opportunity.

Do we need a comprehensive local corner store for all utility services? A unique characteristic of water, sewer, electricity, gas and telecommunication services is that the product is delivered directly – in most cases instantaneously upon demand – to a customer's premises through a separate physical connection from a local network of facilities. It's as if the local corner store delivered the requested bundle of goods directly to every customer. The big difference with utility services is that there is a separate vendor and unique delivery mechanism for nearly every service. What these services have in common are the poles and trenches that the wires, cables, conduit and pipes share along the streets and roadways, but each service is usually provided by a separate entity.

That's the American way: greater independence and less coordination! As many aspects of these utility-type infrastructure services are being deregulated, the economic mechanisms for coordinating the local delivery of these services may be further diminished without institutional restructuring. There is a job for government in the emerging, deregulated environment, but it may be in the form of greatly restructured government agencies and local delivery companies. If competition and the threat of entry are left to substitute for traditional economic regulation, what is left for the regulator to do? Certainly the local distribution networks – whether they be gas, water pipes or sewage systems, basic exchange telecommunication service or local electricity distribution – are all natural monopolies within the city streets and local distribution corridors. Where competition makes the most sense is among generators of electricity, long-distance telephone service and entertainment program providers, not in the local delivery service, except where wireless can compete with cable and fiber. Furthermore, as the gateways to the customers, these local networks must be left open equally to all service providers, including self-generation and TV programming, if competition is to be effective.

At first glance, operating these local network services does not seem particularly exciting. Individually they are much like other mundane, but essential, municipal services like streets and pipes. When taken together, however, these basic network services do provide the essential infrastructure that shapes much of contemporary society. Are there efficiencies to be achieved (i.e., lower costs), if a single entity provides all of these services together? Are there benefits from having a single person climb the same pole or dig the same ditch to service all of the wires and cables they support? Will such an integrated delivery mechanism better serve customer choice and competition at the wholesale level?

If the current technological horserace between large-scale generation and transmission vs. locally distributed electric generation (that has been unleashed by the FERC through the deregulation of wholesale electric markets) inevitably leads to the widespread adoption of distributed generation because of siting problems, then the local distribution system will become ever more important. This, in turn, vests more of the regulatory authority back in the hands of state and local governments. Certainly, distributed generation solves the "not-in-my-backyard" problem; each household gets to decide if it wants to deal with the environmental insult created by having a generator in its own backyard in order to have reliable, low-cost electricity. And the extent to which generation technology can be shared with others will depend on the political will of local jurisdictions to provide and maintain that "corner store" – a far cry from multistate RTOs.

So the tension is between autonomy and security, and which institutional structure best serves these human aspirations. Advocates of choice through widespread regional markets think in terms of the traditional large-scale facility, but choice can also be offered by multiple vendors of small-scale distributed generation, and the institutional structures required to support these alternatives are quite different. So, in the quest for greater reliability and security, there is a trade-off between providing greater regional coordination and increasing susceptibility to occasional catastrophic, widespread failure.

Since we cannot foretell what the future will hold technologically – indeed, a dominant benefit of markets is the way in which they can free up alternate paths to technological development – what is essential is to maintain a highly flexible set of organizational structures to facilitate the evolution of the electric industry and its markets. Since we begin with fairly large-scale, centralized supply technologies, initial oversight at the level of existing ISOs is certainly warranted, but the primary thrust of larger entities should be to facilitate transmission construction as well as to distill and disseminate the best operating and market-structure practices while alternatives are being explored among the various ISOs. To the extent that jurisdictional squabbles at the ISO or state borders impede power transfer, the Commerce Clause of the Constitution can be invoked to tear those barriers down, just as the anti-trust laws must be enforced to avoid self-dealing across borders. ■

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Leonard S. Hyman also has written about the market's responses to regulatory pressure in his white paper "The Best Laid Schemes," found in this book and on the Web at: http://hyman.UtilitiesProject.com.