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DRAFT

**Bilateral Negotiation Model of the Electric Utility Industry
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There are three basic issues to answer in deciding whether to proceed with the "Electricity is Similar" or "Electricity is Different" model of open access in electricity.

1. Is the goal of open access transmission to allow a broader range of buyers and sellers to negotiate transactions (using the transmission network to effectuate these trades) or to maximize operating efficiency? How should these goals be balanced?
2. How different is electricity from gas or telephone service or other formerly bundled essential services?
3. Which model allows for early and incremental experiments in which further data in the frequency of congestion problems and the adequacy of various approaches to congestion problems can be resolved? Given the current regulatory framework, which model lends itself most easily to early implementation?

The paper will start with the goals which should drive regulatory reform in the electric utility industry.

I. What is the goal of reform?

The premise of this paper is that the goal of electric regulatory reform is to allow a broader array of buyers and sellers to participated in the workable competitive sectors of this market. For working purposes we shall adopt the general schema proposed by Hogan ¹ which suggests that while dispatch (Poolco), transmission (Gridco) and distribution (Lineco) are natural monopolies and must remain regulated (at some level of government), the remaining services could be deregulated:

- Fuel purchasing (Fuelco)
- Generation and sales of generation (Genco, Sellco)
- Brokering of contracts (Brokeco)
- Purchasing of power (Buyco)

Where this paper departs from the Hogan model is in the operation of the short term cash market. In gas and in telecommunications, the open access model was for the pipeline or

¹William W. Hogan, "A Competitive Electricity Market Model", Working Draft prepared for the Harvard Electricity Policy Group, October 9, 1993, p. 38.

telephone company to offer transport or transmission service on a comparable basis as it provided for its own bundled services. The Hogan proposal argues that operating characteristics of the electric system are so different that a regulated entity (Poolco) must act as the "market maker" in short term cash transactions. Thus, in essence, the former employees of the regulated utility will now define the ground rules for how the cash market in electricity will operate. In essence, the Hogan model suggests that engineering considerations are so dominant that engineering efficiency should be the guide for how the short term market should be organized.

In contrast, the thesis of this paper is that whatever operating efficiency gains are available from a centralized (regulated) market are more than offset by the commercial efficiency losses associated with the failure to let market participants define the terms and conditions of the cash market. Only through bilateral negotiations will "the market" discover the best way for the cash "spot" market to evolve. Basic issues- such as the length of transactions, credit terms (or credit support for cash transactions), pricing mechanisms, reliability of service, and "load following" services- have yet to be defined by the commercial participants in the electric market.

The premise of the Hogan proposal is that the regulators and the regulated Poolco can adequately define a standardized contract for the "spot" or cash market. Bilateral arrangements for long term contracts can then be negotiated which build on this underlying and regulated cash market. In essence, the debate is over whatever "operating efficiency" or "commercial efficiency" should be the guidepost for regulatory reform in the electric industry.

II. How Different is Electricity from Gas?

In comparing natural gas open access to potential future states of the electric industry, two factors are most commonly raised to identify differences.

- 1) The time factor for system operation and reliability is much shorter for electricity than for gas.
- 2) The system congestion problems (or a "loop flow" problems) are more commonplace and difficult to solve in electricity than in gas.

In contrast, the advocates of similarity point to three factors to support their contention that electric industry changes can be modeled after the natural gas transmission unbundling:

- 1) Participation by a wide range of parties in "inventing" the short term cash market for gas created a broader range of products and services than would have evolved if the pipeline had retained the role of short term "market maker".
- 2) In gas, the ten year transition to open access required changes in operation of natural gas control and in the role of gas control. The sequential learning model may be very applicable to the electric model as well.

- 3) The greater availability of real time data on the electric side may facilitate the transition to open access.

Each of these arguments will be addressed in turn.

A. Differences

1. The time window to react is faster for electricity than for gas, but the time factor can be overstated.
 - The Electric System can overload in 5-10 minutes (sometimes milliseconds, but the computer usually handles those things automatically)
 - On the Gas Side
 - A loop system, like Houston Pipeline, can "overload" in 30-60 minutes in certain areas.
 - A long line (like Transco) can take 4-7 hours to overload.

But Electric System also has "Tools" to re-stabilize the system which are faster and closer to market than the gas system's.

- To stabilize load, the electric system can call on spinning reserve, or circuit breakers (instantaneous) or start up a peaker (15 minutes).
- In contrast, the gas system has slower tools to stabilize the system.
 - Supply Area "Tools"
 - Salt Dome Storage (.5 - 2 hours)
 - Reservoir Storage (4-8 hours)
 - Incremental Gas (4-24 hours)
 - Shut off interruptible Markets (4-24 hours)
 - Fallback to relief valves or regulators when pressures rise or fall too much (close to instantaneous).

2. System Congestion Problems

While much has been made of congestion issues on the electric grid, natural gas pipelines also experience congestion (or "bottleneck") issues. It is not uncommon for natural gas supply bottlenecks to develop where in the gathering lines or supply laterals designed to transport gas from the wellhead to major mainline "trunks" turn out to be undersized relative to available deliverability. In certain areas of the country (such as the Rockies), these bottlenecks appear seasonally, when physical gas flows shift to meet winter peaking requirements. Finally, some natural gas pipelines, such as Consolidated Natural Gas (in the Northeast) or United Gas Pipeline (in the Gulf Coast/Louisiana area) have grid-like characteristics analogous to electric grids. In these systems, supplies must be received at certain points on the system in order for redeliveries to occur at other points. For example, on the Northern Natural Gas system (a midwest pipeline supplied both out of Canada in the North and the Hugoton field in Kansas to the South), a certain volume of deliveries must be received from the North on a cold winter's day for the pipeline to be able to serve certain north-end markets. Over the decade (1983-1993) that open access transportation was negotiated, various rules and procedures evolved to allow allocation of capacity and nomination and scheduling procedures to allow these more complex systems to operate under open access. Table I and Figure 1 illustrate the typical rules which have developed to solve these operating problems for grid-like pipelines.

Advocates of the "electricity is different" school of thought argue that the frequency of congestion, the changes in which points are constrained, and the lack of equivalency of power at points on the grid make the electric system too complex and fast-paced to adopt the iterative scheduling and nomination practices used on the gas transmission side. Yet there has been little quantitative description of the frequency and magnitude of these congestion and nonlinearity problems.

On the gas side, the decade long evolution of the set of nomination, scheduling, and capacity allocation procedures allowed the regulators and the market participants to separate fact from perception. The negotiation process between the shippers, regulators, and electric dispatch function of Poolco can -if properly structured- lead to a similar separation. In addition, the transition to open access occurs gradually, with third party transmission being nominated and scheduled alongside the traditional "bundled" merchant function. In this model, it is assumed that bilateral trades can be made in the spot market and that electric dispatch need only step in "at the margin" to provide the equivalent of "no notice transmission" to solve congestion and system reliability concerns. In this fashion, we can discover empirically how big the congestion problem really is. However, if we begin with the model of a centralized spot market with the regulated dispatch function (Poolco) operating as "market maker", we will never know if the bilateral negotiation process could have solved the operational problems the engineers raise today.

B. Similarities

1. The Breadth of Products and Services

A complete "open access" system facilitates a broader array of products and services than a more narrowly defined open access system. In the Gas System, open access has made it possible for entities other than the regulated pipeline merchant to:

- own and operate storage.
- contract for markets to agree to peak day or peak hour interruptions (to provide peaking "supplies" to their parties).
- aggregate supplies and swing them from pipeline to pipeline to match contractual commitments.

Pipeline to pipeline gas movements were much less efficient when the gas control of each pipeline protected revenues on their system by managing interconnecting gas flows.

In addition, pricing has become more efficient between pipelines as locational basis trading has emerged.

In the ideal "New Electric System", greater efficiencies will be gained if third party marketers (as well as the existing electric companies) could offer a wide range of physical delivery services tailor-made to the customer's needs. Thus, in an open access electric environment, a variety of players could

- Own or contract for spinning reserve
- Own or contract for peakers

- Have contracts with markets to automatically (or with notice) divert electricity during peak times.

The question is, with a regulated and centralized dispatch, whether the full range of physical (as opposed to financial) products and services could emerge.

2. Changes in Central Dispatch

- The transition to open access requires changes in how gas control or central dispatch operates. These changes naturally lead the "system operator" to feel that system resources may be out of control since so many more parties are involved in transactions. Where previously, gas control or system dispatch decided which resources should be used when, under open access, the task shifts to managing the actions of others.
- Natural gas operations personnel used to argue that open access could not retain reliability of service for natural gas consumers. Over time, however, large amounts of experience with interruptible transportation and increasing experience with conversion to firm transportation allowed the invention of rules and procedures which make open access workable.
- The chief difficulty on the natural gas side was the absence of real time information about whose gas was flowing at any given point in time. Without such data, it was difficult for the pipeline to determine whose sales to cut off (when insufficient supply has in the pipeline) or whose suppliers to cut off (when excess supply was entering the line). The solution has been to create economic incentives (in the form of balancing penalties) to give each shipper the individual incentive to operate their supply/demand balance within the operating tolerances of the pipeline. As natural gas pipelines have increased their capability to provide accurate information to shippers about the flowing quantities of receipts and deliveries, this problem has reduced in significance over time.
- In addition, on the gas side, the pipelines have certain controls still available (operational flow order they can issue to shippers) or services (like "no notice service"). Pipelines are required to offer a no-notice firm transportation service, wherein parties are allowed to take, or not take, volumes from the pipeline on a non-scheduled basis.

3. Availability of Computerized Data

In contrast, on the electric side, real time data is already available to dispatchers and the electric system is more highly computerized. In many ways, this computerization will make the transition to open access somewhat less problematic.

As on the gas side, it will be important for the electric dispatcher to make available information about operating characteristics of the system on an "open access basis" - not just preferentially to the affiliated (or formerly affiliated) Genco. For example, if a new industrial facility is being sited, the system dispatch studies on how the system will need to be modified to serve this load should be available to all "shippers" on the system.

The role of the dispatcher in an open access world is to schedule the physical deals which have been agreed to commercially by the end-user and the supplier. This is in contrast to the current arrangement in power pools in which the dispatcher takes load demands from the end-user and the supply bids (or stacking orders set by an estimated marginal cost of running the unit) and decides which units to dispatch. To reflect the bilateral nature of commercial transactions, each "seller" into the system could provide their own "stacking order" of steps which could be automatically taken by the computer when decision time frames are too fast for human interaction. This is analogous to what central dispatch does today, except that the decision-making (and creativity) with respect to the potential steps is more broadly dispersed.

Because today, large industrial facilities already communicate with central dispatch about expected load changes, there is the rudimentary basis for a nomination and scheduling system on the electric side. This system will have to be formalized to reflect open-access requirements so that both the traditional generators and the new entrants will have a level playing field.

III. Early Implementation

In a practical sense, we need not resolve the issue of the best "end state" for Poolco if the initial steps towards unbundling the electric system can be agreed upon. In both models, procedures for allocating long term rights to firm transmission capacity must be developed. In both models, dispatch (or Poolco) must offer open access nondiscriminatory service to both the existing generators and sellers and to new entrants. The advantage of the "Gas Model" is that states and FERC could begin the process of defining nomination and scheduling procedures for both short and long term transactions under the current state/federal regulatory regime. In contrast, the "Electricity is Different" requires new regional (or federal) regulatory regimes to regulate "Poolco". In addition, as more transactions occur under these new "open access" regimes, new entrants, operations personnel and the regulators will develop a base of experience to determine whether the congestion and time problems can be resolved without resort to a centralized, regulated cash market.

IV. Conclusion

In summary, while congestion and time constraints may be more significant in electric open access than in natural gas, the benefits of allowing the market to develop under a system of bilateral negotiation outweighs the potential for operational inefficiencies. The lesson from the natural gas experience is that nomination and scheduling procedures can be developed which solve these operational concerns. Indeed operational concerns which

initially seem too difficult and complex to solve, are in fact solvable, as experience and sequential problem solving put these issues into proper perspective. Finally, the fact that open access transmission initially is introduced alongside of the more traditional operations gives some "cushion" to the problem solving process.

(see Figure 1)

1. Determine critical pipeline design parameters and/or critical points on the system.
2. Establish necessary minimum and maximum volume levels at such points required to meet contracted firm transportation obligations of the system.
3. For illustrative purposes, provide shippers with a base level (i.e. design volume minimum level) allocation as a reference point for beginning the iterative process.
4. Accept nominations from shippers for desired volume capacity at various points on the system, allowing parties to trade or aggregate their base level entitlements if they choose.
5. From 1st level of nominations, determine what points have been over-nominated and pro-rate those to available capacity, identify any deficiency remaining at critical points.
6. Establish remaining criteria for 2nd level of nominations; receive such from shippers.
7. Continue iterative process until capacity and points nominated fit within system design capabilities.

TABLE I

Iterative Allocation Principle for Grid-type Pipeline
(see Figure 1)

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Capacity (Mwhrs/day)

Firm transportation
Contract obligation

BASE CASE



critical pt #1
critical pt #2
critical pt #3

Nominations Iteration #1

Firm transportation
Contract obligation



critical pt #1 (over-nominated)
critical pt #2
critical pt #3
Points #11 #12 #13
#14 #15

Result: Pro-rated

Points #11 and #12 Acceptable
Point #13 Accepted
Still short of desired Qty.

#14 and #15 Rejected

Figure 1

