

CHAPTER 1

Introduction

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Of the infrastructure network industries in the United States, surface transportation has proceeded the greatest distance from public utility-style price regulation to day-to-day market-determined pricing. Railroad, airline, and trucking services were subjected to regulatory reform in the 1980s in which price controls administered by the Interstate Commerce Commission and Civil Aeronautics Board by and large were eliminated by congressional legislation, as were these agencies themselves. But regulatory agency controls of pricing and contract service offerings of the natural gas pipeline companies, while proceeding down the deregulatory pathway did not make it the 90 percent plus to open markets of the others.

Regulation in the early 1980s, had the three dozen large pipelines buying gas at the wellhead or separating plant from oil and gas producers in short and long term contracts, to be delivered in a merchant gas plus transportation package service to line hubs outside of the major population centers for gas industrial use or retail distribution by the local gas utilities. The links between entry hubs and delivery hubs at which wholesale transactions took place in the package traversed the country, at first from the older Texas and Louisiana fields to Boston, Chicago, Minneapolis, San Francisco, and then from new gas fields in Western Canada or the Rocky Mountains to these same exit hubs. At that point, the field price had been decontrolled under the Natural Gas Policy Act of 1978; and bid prices were on gas for long term contracts, and were rolled into the regulated transportation charge to comprise a merchant price at the exit hub. The charge was based on the historical costs of building the pipeline, plus costs of capital and operations, split between a reservation charge for space and a delivery charge for gas at the end of the link. The links were built at different times, and new fields were developed as demand expanded, so there was extensive overlap of the networks of different companies with different gas and delivery charges.

Looking at a national pipeline map, one would not likely discover large differences between hub-link-hub layouts

and those for the airlines, or even the trucking companies. At the major cities, there were delivery terminals — and transfer terminals — for more than two or three service suppliers less than seven or eight such suppliers. This number and the rate of entry of potential suppliers made a case for deregulation — for prices not set by agency review of historical costs but in competitive interplay of numerous sources of service. That case was not made in the congressional reviews that set out the reform proposals for gas transportation. The agency itself — the Federal Energy Regulatory Commission — through public notice and hearings produced a rulemaking (Order 636 in 1992) that constituted partial deregulation.

There were more than a dozen major changes required in the transactions, ownership and interactions of service suppliers in Order 636. The pipeline was required to separate its purchases/sales of gas from its provision of transportation, and to treat an exchange of transport with others on an equal-service basis. All shippers were to be provided with offers of firm, interruptible, and secondary market (space already leased to others) service on an equal basis. This service array was to be provided at “market hubs”, where pipelines overlapped, on electronic bulletin boards which also would contain the data of spot market prices and quantities of natural gas.

But pipeline transportation rates were not fully decontrolled, as were airline fares or trucking rates. In “bidweek” auctions, space offerings of lines were put up for lease. The rates for “firm” service that committed space ahead for various periods were to be regulated on a straight fixed variable basis, the “fixed” charge for reserving space was to cover historical plant costs and the “variable” charge was to equal operating costs on the line. On interruptible sales of space, the bidweek (variable) price could not exceed the average of these two regulated rates. On secondary sales, where a shipper puts its firm contract space back on the market, this new system let the market price prevail.

Other parts of Order 636 had to do with release of the newly liberated pipelines from public utility style obligations to serve as a supplier of last resort, or from requirements for non-discrimination in receiving or passing on gas to other pipelines at intermediate hubs.

This FERC order was a new blend of controls with market discipline, in a new set of pricing rules. It called for the agency to set specific prices, rather than to limit earnings to historical fixed costs. If there were ten transactions, only the two part prices on the two new contracts for commitment of space ahead were required to be limited, or capped, on the average cost per unit space. All the other eight space commitments, made on an

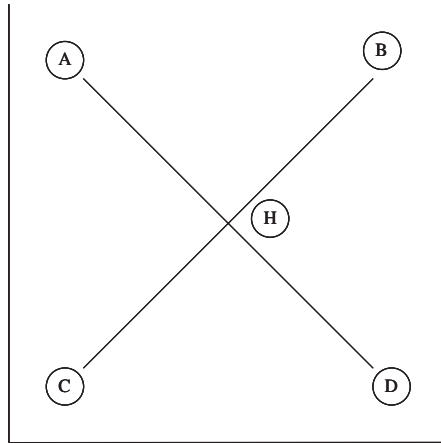
interruptible or second provider basis, were not subject to that cap but were at higher or lower prices set by market conditions.

The intention was to change market structures, not set new pricing rules, so that the market would set prices competitively. In the Commission's words, "this rule requires significant alterations in the structure of interstate pipeline services...[and] will therefore reflect and finally complete the evolution to competition...so that all natural gas suppliers, including the pipeline as merchant, will compete for gas purchasers on an equal footing¹". What was before the rulemaking a single company with multiplicity of lines, each with its own set of wellhead contracts for a gas volume for transport to a separate city gate, was to become a collection of lines from wellheads to a hub where there were other companies with duplicative lines. Unbundling was to break down integrated node-link systems into segments with duplicate links between shared nodes. That would replace one buyer, the pipeline, at the wellhead with multiple buyers (if not at that wellhead, then at intermediate nodes).

See the illustration in Fig. 1.1. Nodes in the first pipeline network consist of field entry node *A* and city gate exit node *D*; nodes in the second pipeline are field entry node

¹FERC [Docket RM91-11-000] 56PR38372, pp. 7–8

Figure 1.1.



B and city gate exit *C*. Before Order 636, lines *AD* and *BC* were the only buyers in their respective wellhead markets, and hub *H* was no more than an intersection point of the two exclusive links; after 636, the agency's intention was that *BC*, or brokers with space on *BC*, could buy gas at *A*, have it transported to *H* on *AD*, then transfer it at *H* for delivery at *C*. There would be a multiplicity of gas buyers at each entry node, and for space to the nearest gathering hub. There also would be a multiplicity of sellers at exit nodes given open access to space from the last exchange hub.

With more than a dozen years of post-636 experience, the basic question is whether the performance of the gas transportation industry has changed to produce the results that would constitute such "structural reform". Has the replacement of price regulated merchant gas plus

transportation on long term contracts with this fragmented spot markets for line space made price behavior more competitive?

This book seeks to provide an analytical response to that question. While the question itself barely takes a line, that response takes volumes because market structure, changed as indicated, and prices set in a new complex of markets, have added numerous strategic dimensions to pipeline behavior. It has been necessary to radically change market definitions; certainly the well-head gas entry markets for line space have broadened as a result of unbundling. We have attempted in Chapter 2, to determine whether there has been in the past order 636 period the emergence of one national market, in which all separate entry hubs are alternatives, or of a set of many regional markets. It has proved to be critical for analysis further on of pricing to determine whether the service provision of the Northeastern pipelines has become integrated with those of the Midwest and West coast pipelines. The determination to the best of our abilities has been intensely empirical.

Within these regional markets, the spot gas prices on the electronic bulletin boards have proved to be a new source of key information on the competitiveness of transportation charges. We have undertaken a project to document differences between entry and exit hub spot prices (“basis

differentials”), to provide the foundation for an inference as to which types of oligopoly strategies have prevailed between these pipelines. Simple inspection indicates that in numerous entry hub locations, and almost all exit hub locations, three or four of the large incumbent pipeline network systems after order 636 provided alternative line space access. Perfect competition with line prices equal to marginal costs cannot prevail. But then there is the critical issue of whether these separate service corporations have been able to collectively control bidweek transport price setting in cartel-like fashion (with stable shares), or have at the other extreme suffered both off peak price collapses (along with on peak regulated price caps) of the type designated Bertrand Oligopoly. Nickolay Moshkin in Chapter 3 develops new econometric procedures for determining an answer based on the first few post-636 years experience.

This new pricing information, from new types of transactions, on its face does not appear to be different from the earlier pricing results of regulated transactions. From 1980 to the early 1990s as markets adjusted to phased deregulation of wellhead prices on long term contracts from the Natural Gas Policy Act of 1978, wellhead prices in constant dollars increased from \$1.00 mBtu (1978) to \$2.50 mBtu (1983) and then went down to slightly more than

\$1.00 mBtu (in 1990–1991).² From the mid-1990s to 2003, the first phase of partial deregulation of gas transportation under FERC Order 636, wellhead prices for spot gas increased from the \$1.50 mBtu level to \$6.50 mBtu in current dollars, or to half that in comparable constant dollars.³ After declining to \$2.25, the spot average price increased to in excess of \$4.00 mBtu. In common, there have been extremely large increases and decreases in the wellhead price, even with basic changes in the structure of market transactions.

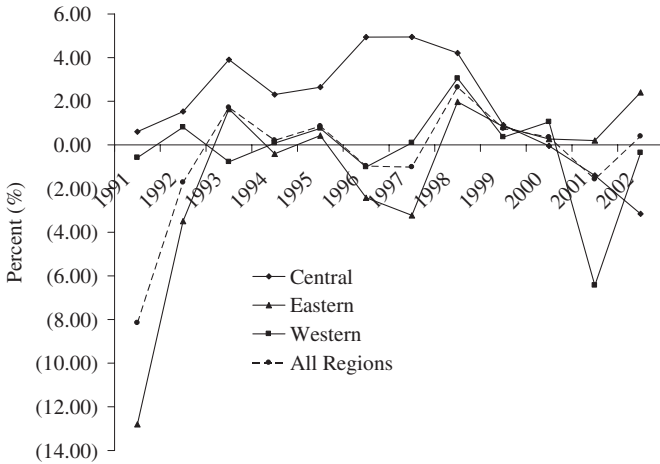
More penetrating analysis is required, centered on the performance of those companies subject to new deregulation requirements for common carriage service, and to divestiture of their gas contracts, and for specific caps on firm contracts for line space. To begin, we ask whether the major incumbent pipelines have fared well post-636; if Order 636 intended to make transportation more competitive then post-636 profitability should have been less, on the assumption that less-than-perfect pre-636 regulation failed to control the pipelines in ways that achieved elimination of monopoly profits.

²As in Fig. 1.2 of MacAvoy, P.W. (2000). *The Natural Gas Market—Sixty Years of Regulation and Deregulation*, Yale University Press, New Haven, p. 6.

³See sources for the analysis of price spikes in Chapter 4.

Our preliminary test is to estimate rates of return on pipeline investments, exclusive of those returns required to recover previous investments and to compensate continuing investors for the use of these funds. The excess of the realized rate of return over these required rates comprises EVA, the “economic value added” or excess profitability of post-636 operations. Based on the reported financial statements to the Security and Exchange Commission and Form Two Reports on gas financials of 31 pipelines, most generated no EVA through the 1990s. The exception was the pipeline systems in the Midwest, with between 2 and 5 percent returns in excess of the costs of capital from year to year over the period from 1992 to 1999. Pipeline systems on the East and West coast in some years realized 1 percent, but in other years were from 3 to 4 percent negative EVA. All the pipeline companies in the 31 observation samples were short returns necessary to cover the costs of capital in the early 2000s, when wellhead gas prices doubled. Again, there seems to be no pattern in keeping with the hypothesis that partial deregulation targeted at the pipelines had a pro-competitive effect on their earning performance. In the more recent years, that performance most likely fell short of what could be expected from long-term operations in competitive, not to mention monopoly markets.

Figure 1.2. EVA (Selected Companies) Using Market Values for WACC Calculation



In the following chapters, we undertake more specific tests of performance designed to provide the basis for assessment of the effects of FERC deregulation initiatives. Chapter 2, based on research undertaken for this project by Vadim Marmer and Dmitry Shapiro, while they were doctoral candidates in Yale's Economics Department, seeks to set sub-national boundaries on markets for pipelines space by utilizing econometric measures of the extent of co-integration. Chapter 3 develops an econometric model of these markets to estimate parameters required for an assessment of whether the post-636 pipeline pricing was characterized by cartel, Cournot, or Bertrand behavior (a revised chapter from Nickolay Moshkin's Yale Doctoral

dissertation). Chapter 4 describes the large and relatively frequent spikes in the basis differentials between spot gas entry and exit hubs on these pipelines, a phenomenon unique to the Eastern and Western sub-national pipeline service markets; this research, developed by Paul MacAvoy with the Olin Fellows in the MBA program at the Yale School of Management, indicates significant shortfall in pipeline capacity in the Eastern and West markets, with price controls passing on to gas brokers the profit gains from the spikes. Chapter 5 contains an analysis of shifts of storage volumes after Order 636 towards the producing region for reasons that are surprising at first, but after consideration of secondary effects from earlier Congressional initiatives are quite consistent with the movement to reduce regulation. The last chapter raises questions as to the long run effects on gas supply and demand, and with a national econometric model of MacAvoy's updated by Vadim Marmer it is found that the post-636 behavior on both sides of the (model) market are more responsive to outside impacts from oil prices.