

PRICE TESTS FOR MARKET POWER ANALYSIS OF NATURAL GAS STORAGE PROVIDERS

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Synopsis: The Energy Policy Act of 2005 stimulates investment in natural gas storage facilities by allowing the Federal Energy Regulatory Commission (FERC) to grant market-based rates without a market power analysis, provided that customers are protected. The FERC incorporated this directive and its parallel efforts into Order No. 678, which expands the product market and allows conditional market-based rates for new facilities without a showing of a lack of market power. The FERC’s market power framework (embodied in its 1996 Policy Statement and Order No. 678) requires alternatives to have comparable availability, price, and quality. While price is central, the FERC commonly approves market-based rates without a price test, as rigorous price tests are problematic. The lack of a price test, however, weakens applications for market-based rates. To strengthen applications, we develop three price tests, borrowing from the FERC’s market power framework for oil pipelines. Viable price tests also improve the FERC’s identification of market power, and possibly allow firms previously unable to show a lack of market power to do so, thus avoiding the conditions required to protect customers absent such a showing.

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I. INTRODUCTION

The U.S. Congress passed the Energy Policy Act of 2005 to, among many other things, stimulate investment in natural gas storage facilities with market-based rates.¹ Specifically, it added section 4(f) to the Natural Gas Act, which allows the Federal Energy Regulatory Commission (FERC) to grant market-based rates for new investment (placed in service subsequent to passage of the act) even if the storage provider cannot demonstrate a lack of market power.² Three conditions are required, however: the FERC must determine that (1) the investment is in the public interest, (2) market-based rates are necessary for the investment where it is needed, and (3) customers are protected from market power.³

The FERC incorporated this directive, along with its independent efforts to stimulate investment in storage with market-based rates, into Order No. 678.⁴ In section IV A of that order, the FERC modified its traditional market power analysis by expanding the product market as set out in its 1996 Policy Statement, adding pipeline capacity, local production, and LNG supplies.⁵ In section IV B, the FERC modified its regulations based on section 4(f) to allow firms that cannot or do not show that they lack market power to nevertheless receive market-based rates for new investment, if they meet the three conditions.⁶ The FERC interpreted “new investment” as applying to new or existing storage facilities.⁷

The FERC’s market power framework, embodied in its 1996 Policy Statement and Order No. 678, involves defining the product and geographic markets, conducting a concentration analysis, and evaluating potential competition and other factors. An applicant must show the alternatives included in the analysis are “good” alternatives, that is, they have comparable availability, price, and quality.⁸ While price tests are integral to the FERC’s market power analysis, it has granted market-based rates to applicants without such a showing,

1. Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594.

2. Order No. 678, *Rate Regulation of Certain Natural Gas Storage Facilities*, F.E.R.C. STATS. & REGS. ¶ 31,220 at PP 2, 102, 71 Fed. Reg. 36,611 (2006); *order on clarification and reh’g*, Order No. 678-A, 117 F.E.R.C. ¶ 61,190 (2006) [hereinafter Order No. 678].

3. Order No. 678, *supra* note 2, at P 2.

4. *Id.* at P 1.

5. *Id.* at P 11 (citing *Alternatives to Traditional Cost-of-Service Ratemaking for Natural Gas Pipelines and Regulation of Negotiated Transportation Services of Natural Gas Pipelines*, 74 F.E.R.C. ¶ 61,076 (1996) [hereinafter Policy Statement], *reh’g and clarification denied*, 75 F.E.R.C. ¶ 61,024 (1996), *petitions denied and dismissed*, Burlington Res. Oil & Gas Co. v. FERC, 172 F.3d 918 (D.C. Cir. 1998)).

6. FERC introduced earlier restructuring with Order Nos. 436 and 500, which decoupled storage from transportation, and with Order No. 636, which instituted open access for natural gas pipelines. See generally Order No. 436, *Regulation of Natural Gas Pipelines After Partial Wellhead Decontrol*, [Regs. Preambles 1982-1985] F.E.R.C. STATS. & REGS. 30,665 (1985), 50 Fed. Reg. 42,408 (1985) (to be codified at 18 C.F.R. pts. 2, 157, 250, 284, 375, 381); Order No. 500, *Regulation of Natural Gas Pipelines After Partial Wellhead Decontrol*, [Regs. Preambles 1986-1990] F.E.R.C. STATS. & REGS. 30,761 (1987), 52 Fed. Reg. 30,334 (1987) (to be codified at 18 C.F.R. pts. 2, 284); Order No. 636, *Pipeline Service Obligations and Revisions to Regulations Governing Self-Implementing Transportation Under Part 284 of FERC’s Regulations; and Regulation of Natural Gas After Partial Wellhead Decontrol*, F.E.R.C. STATS. & REGS. 30,939 (1992), 57 Fed. Reg. 13,267 (1992) (to be codified at 18 C.F.R. pt. 284). See also Paul L. Joskow, *Natural Gas: From Shortages to Abundance in the United States*, 103 AM. ECON. REV. 338-43 (2013), for a recent discussion of these regulatory developments.

7. Order No. 678, *supra* note 2, at P 115.

8. *Id.* at P 47.

especially when applications are not contested.⁹ More to the point, the FERC has deemed alternatives good without a price test, setting aside whether the alternatives collectively are sufficient to show a lack of market power. But parties may contest the identification of good alternatives on any of the three (or other) grounds: availability, price, and quality.¹⁰ The lack of a price test thus weakens applications for market-based rates. This recently happened in *ANR Storage Company*, where the FERC rejected market-based rates, as ANR Storage failed to show that it lacked market power.¹¹

Having a viable price test to identify good alternatives has several benefits. First, since the FERC requires that good alternatives be comparable in terms of availability, price, and quality, a price test thus fills in a gap in the market power analysis. And without a price test to identify good alternatives, an application for market-based rates is vulnerable to the simple challenge that it lacks a price test. But by better demonstrating that an alternative is comparable, an application is strengthened. This is most critical in close cases that are likely to be contested.

Second, a viable price test improves the accuracy of the FERC's market power framework by more accurately identifying good alternatives. One of its motivations for expanding the product market is to have a more accurate measure of market power. This helps "ensure that market-based rates are not denied because of an overly narrow definition of the relevant market."¹² Price tests also help the FERC improve the tradeoff between protecting customers by monitoring versus by expanding investment. A market-power analysis with a price test better enables the FERC to determine when an applicant is subject to competition, which also helps it to know when it can rely on that competition—rather than on costly conditions and litigation—to ensure just and reasonable rates. As the FERC noted, unnecessary conditions to address market power could decrease investment, ultimately harming consumers.¹³

Third, since market power varies by firm, a viable price test might allow some borderline applicants for market-based rates under section 4(f) to instead apply under a traditional market-power analysis. While the FERC will grant market-based rates without a showing of a lack of market power under 4(f), applicants must instead show that the investment is in the public interest, that the market-based rates are necessary for investment where it is needed, and that customers are protected from market power.¹⁴ For example, the applicant must ensure that existing customers do not suffer increased costs, increased risk, or decreased quality. If existing customers are under cost-of-service rates, the applicant must

9. Most applicants also had small market shares. *Id.* at P 91. See e.g., for example, *WPS-ESI Gas Storage, LLC*, 108 F.E.R.C. ¶ 61,061 (2004); Notice of Petition for Rate Approval, *Michigan Consolidated Gas Co.*, 74 Fed. Reg. 2585 (2009); and *UGI Storage Company*, 133 F.E.R.C. ¶ 61,073 (2010).

10. Order No. 678, *supra* note 2, at PP 47-48.

11. Opinion No. 538, *ANR Storage Company*, 153 F.E.R.C. ¶ 61,052 (2015). This was the first storage case to be litigated. The parties did not challenge ANR Storage for lack of a price test until the FERC Trial Staff raised the issue. Even while ultimately rejecting ANR Storage's application for market-based rates, the FERC nevertheless allowed many good alternatives without price tests (which were not done in the case), though they were insufficient to show a lack of market power.

12. Order No. 678, *supra* note 2, at P 1.

13. *Id.* at P 134.

14. *Id.* at P 187.

separately account for costs, services, and commitments for the cost-of-service and market-based rate customers. The applicant must also show that it will not withhold capacity.¹⁵ In addition to having to adopt such conditions, each condition may be challenged, potentially adding to litigation and other costs. Borderline applications, strengthened by a price test, might thus survive a market power analysis, avoiding the 4(f) approach and its conditions and litigation costs.¹⁶

Turning to the proposed price tests, as noted, rigorous price tests, inclusive of transportation costs, to identify good storage alternatives have not been done in market-based rate applications for natural gas storage. An important reason is that they are difficult to conduct, as natural gas storage customers (for example, natural gas-fired generators and local distribution companies) are geographically dispersed. Hence, no unique location exists at which to standardize the price test, making price comparisons of alternatives difficult. That is, the potentially unique transportation costs for each customer to access a given storage alternative means that a good alternative for one customer might not be a good alternative for another customer. This complicates the identification of good alternatives, the interpretation of the concentration measures, and so then too the market power analysis. The FERC recognizes the difficulties caused by the industry structure for implementing a price test, as it has not required a specific price test,¹⁷ and describes a good alternative as being a reasonable substitute for the applicant.¹⁸ It does, nevertheless, require that “at least some effort must be made to comply with the price test.”¹⁹

Towards this end, we develop three price tests to identify good alternatives for natural gas storage by borrowing from the FERC’s market power framework for oil pipelines, embodied in Order No. 572, where such price tests are commonly used.²⁰ We thus review Order No. 572, as this lays out the spatial problems involved in a rigorous price test that reflects transportation costs. Oil pipelines involve similar, though more limited, spatial considerations than for natural gas storage. While the rigorous price tests developed for oil pipelines do not seem feasible when directly applied to natural gas storage, we develop three approximations based on those price tests that explicitly introduce price into the analysis. This sharpens the test for good alternatives relative to one excluding prices.

Having a menu of price tests to choose from is useful in another way. Because the FERC has not adopted a particular price test for identifying good alternatives, there is flexibility in how prices can be used to demonstrate that alternatives are in fact good alternatives.²¹ The price tests developed here vary in how they address the spatial problems and incorporate prices, and so vary in how

15. *Id.* at PP 156, 165.

16. Of course, a choice must be made whether to seek market-based rates under a traditional market power analysis or under section 4(f), each with its own set of costs and benefits. One cost of the traditional approach is the risk of FERC rejection, only to be followed by the 4(f) approach, a worst-case scenario.

17. 153 F.E.R.C. ¶ 61,052 at PP 4, 135.

18. *Id.* at PP 60, 139.

19. *Id.* at P 160.

20. Order No. 572, *Market-Based Ratemaking for Oil Pipelines*, [Reg. Preambles 1991-1996] F.E.R.C. STATS. & REGS. ¶ 31,007 (1994) (to be codified at 18 C.F.R. pt. 348).

21. Order No. 678, *supra* note 2, at PP 40-48.

well they approximate price tests used for oil pipelines. Given how topology varies across the country, one price test may be better suited to an applicant's circumstances than another price test. An application is also strengthened if more than one price test shows a lack of market power.

II. GAS AND OIL MARKET POWER FRAMEWORKS

The FERC's market power framework for natural gas storage is described in its 1996 Policy Statement and in Order No. 678, and parallels that in the Department of Justice and Federal Trade Commission's Merger Guidelines.²² A critical element of this framework is a price test to evaluate good alternatives, where Order No. 678 defines a "good alternative" as "one that is available soon enough, has a price that is low enough, and has a quality high enough to permit customers to substitute the alternative for the applicant's service."²³

A price test for natural gas storage is complicated, however, by the fact that there is no natural way to standardize the price comparisons of storage alternatives for the storage customers. The problem is that customers are at various locations with unique transportation paths and costs to access the alternatives.

To guide the development of a feasible price test for storage alternatives, the FERC's market power framework for oil pipelines, set out in Order No. 572, is used as a starting point.²⁴ While the FERC did not mandate a particular price test in Order No. 572, it suggested that a delivered price test and a netback price test serve as good starting points. Several have been developed for oil pipelines along these lines.²⁵ Insights gained from the delivered price and netback price tests are then applied to develop price tests to identify good alternatives to natural gas storage providers.

The application of the FERC's market power framework for oil pipelines to natural gas storage is reasonable because the goals and processes are very similar. Both the Interstate Commerce Act of 1887 (ICA) and the Natural Gas Act of 1938 (NGA) mandate that oil pipeline and natural gas customers be protected from market power by having just and reasonable rates.²⁶ The FERC's market power framework for oil and natural gas storage also have the same steps, and are patterned after the Merger Guidelines. And, specifically, the identification of good alternatives is the same in both frameworks: alternatives must be comparable in terms of availability, price, and quality.

A. Order No. 678

The FERC's market power framework for natural gas storage providers seeking market-based rate authority, set out in Order No. 678, involves five steps:

22. See generally Policy Statement, *supra* note 5; Order No. 678, *supra* note 2, at P 59; see also U.S. DEP'T OF JUSTICE AND FED. TRADE COMM'N, HORIZONTAL MERGER GUIDELINES (2010), available at <https://www.justice.gov/sites/default/files/atr/legacy/2010/08/19/hmg-2010.pdf>.

23. Order No. 678, *supra* note 2, at P 40.

24. See generally Order No. 572, *supra* note 20.

25. Order No. 572, *supra* note 20, at 31,189.

26. ICC Termination Act of 1995, H.R. 2539, 104th Cong. §15501 (1995); Natural Gas Act of 1938, 15 U.S.C. § 717c (2000).

1. Product market definition (Statement B);
2. Geographic market definition (Statement A);
 - a. Identify applicant facilities and services (Statement C);
 - b. Identify good alternatives to the applicant (Statement D);
3. Market concentration analysis (Statement G);
4. Identify potential competition (Statement E); and
5. Identify other factors (Statement H).

The first two steps lay the analytical foundation by defining the product and market participants.²⁷ The third step examines measures of the applicant's market power. The last two steps examine factors that might alter the interpretation of the market power measures. In addition to exercising market power, the FERC is concerned about whether an applicant for market-based rate authority can "discriminate unduly in terms of price or conditions."²⁸ The following sections examine these components of the market power analysis in some detail.

1. The Product Market

In general, the product market represents the set of products that compete with the product for which the applicant seeks market-based rate authority. For natural gas storage, Order No. 678 expanded the set of products from that defined in the 1996 Policy Statement, adding pipeline capacity, local production, and LNG supplies to storage providers.²⁹

2. The Geographic Market

The geographic market is a region that encompasses the relevant alternatives for a given natural gas storage provider. The geographic market definition serves two purposes. First, it defines the region where the market participants interact with the applicant, providing a general focus to the analysis. Second, and more critically, it leads to the set of good alternatives to be included in the concentration analysis, and thus to measures of market power:

Before the [FERC] can conclude that a seller cannot exercise market power it must either: (1) find that there is a lack of market power because customers have sufficient "good alternatives," or (2) mitigate the market power (i.e. permit market-based pricing only if specified conditions are met that prevent the exercise of market power).³⁰

Market power is the ability to profitably increase price above the competitive level for a significant period.³¹ As noted, and consistent with this definition, a "good alternative" is one such that, if the applicant increases its tariff (price) by a small, but significant, non-transitory increase in price (SSNIP), its customers can

27. Order No. 678, *supra* note 2. The product market (Statement B) is listed before the geographic market (Statement A) as defining the product for which market-based rates are sought seems naturally done before defining the region in which the product is sold.

28. *Id.* at P 29.

29. *Id.* at P 25.

30. *Id.* at P 29.

31. See, e.g., William M. Landes & Richard A. Posner, *Market Power in Antitrust Cases*, 94 HARV. L. REV. 937-96 (1981); see also *0.1 Purpose and Underlying Policy Assumptions of the Guidelines*, DEP'T OF JUSTICE, <http://www.justice.gov/atr/01-purpose-and-underlying-policy-assumptions-guidelines> (last updated June 25, 2015).

economically shift their business to the alternative.³² By allowing the customers to economically substitute away from the applicant, good alternatives help limit the applicant's ability to profitably increase its price (i.e., limit its market power).

While the condition that a good alternative is to be priced comparably appears straightforward, implementing a price test is problematic for natural gas storage alternatives. The logistics of natural gas storage is such that there is no natural way to standardize the alternatives, to allow prices to be measured at a given location and so be meaningfully compared. Local production stands out as an exception to this problem, however, as it is directly comparable to the applicant: receiving natural gas via the applicant or via local production involves receiving gas from the same location.

3. The Concentration Analysis

The concentration analysis examines market power through market concentration. The more concentrated the market, the more likely it is that large players have market power, alone or together. The FERC examines market shares and the Herfindahl-Hirschman Index (HHI, defined as the sum of the squared market shares, multiplied by 10,000) for a preliminary assessment of the applicant's market power along these two dimensions.

The FERC considers 1,800 a general HHI threshold: below 1,800, the market is considered relatively unconcentrated, warranting less FERC scrutiny of market shares and other factors, and conversely for values above 1,800.³³ If the HHI exceeds 1,800, but the applicant's market share is small, then it is making a small contribution to the HHI, and so the market concentration is due to other sellers. Hence, a small applicant market share can overcome market power concerns that arise with a high HHI.

4. Potential Competition & Other Factors

Finally, after the preliminary concentration analysis, potential competition and other factors are considered. Other considerations that might alter the preliminary market power findings, based on market shares and the HHI, are potential competition, affiliate relationships, and other factors that affect market power. For example, whether large alternatives have cost-of-service rates (and could not collude on price) or market-based-rates (and could potentially collude on price) also affects an applicant's market power. Buyer market power (of large retail distribution companies) and existing contracts between the applicant and its customers might also affect the applicant's market power.

B. Order No. 572

The corresponding market power framework for oil pipelines is set out in Order No. 572. Comparing Order Nos. 678 and 572 is instructive, as price tests

32. See generally section 1.11 for a discussion of using the SSNIP to define the product market. *1.11 General Standards*, DEP'T OF JUSTICE, <http://www.justice.gov/atr/11-product-market-definition> (last updated June 25, 2015).

33. Order No. 678 *supra* note 2, at P 51. The FERC did not provide a corresponding market share threshold in the Policy Statement or in Order No. 678.

to identify good alternates for oil pipelines are routinely done.³⁴ Thus, the market power framework for oil pipelines sheds light on how feasible price tests for natural gas storage might be developed.

The market power framework for oil pipelines involves the same five steps as for natural gas storage: product market definition, geographic market definition, market concentration analysis, and analyses of potential competition and other factors. Since market power might be exercised in the origin market or in the destination market served by a pipeline, both markets must be examined for market power.³⁵ While Order No. 572 does not require a specific price test for a market power analysis, it suggests a netback price test (for the origin market) and a delivered price test (for the destination market) as starting points.³⁶ These tests standardize price by measuring the prices of alternatives with respect to the origin market or the destination market. We focus on the netback price test (the delivered price test is symmetric), where alternatives available to shippers at the origin of the pipeline are examined, for example, a refinery considering where to sell gasoline.³⁷ A netback analysis identifies good alternatives by comparing the price the shipper receives for a barrel of gasoline delivered to various markets, net of transportation costs. Specifically, the netback price is defined as the price a shipper receives per barrel of gasoline, measured at the origin market: the truck terminal rack price (price where the gasoline is sold) less transportation costs (tariffs) from the origin to the terminal.

Since the competition facing the applicant pipeline in an origin market takes several forms (typically, alternative pipelines, local consumption, and waterborne transportation), netback prices are necessary to meaningfully compare alternative ways of selling gasoline. If alternatives serve the *same* market, then netback price differences across alternative pipelines equal the tariff differences, because the delivered price at the market is the same. An analysis of tariffs alone, in this limited case, does allow for a meaningful comparison of alternatives. If transportation alternatives serve *different* markets (the general case), however, tariff comparisons are meaningless, as tariff differences are combined with product price differences across markets.

To see this, consider a refinery deciding where to ship a barrel of gasoline, facing the following prices (per barrel): a pipeline with a \$2 tariff serving a market with \$104 gasoline versus a pipeline with a \$1 tariff serving a market with \$100 gasoline. The refinery would prefer the expensive pipeline, since it would net

34. See, e.g., *Shell Pipeline Co. L.P.*, 103 F.E.R.C. ¶ 61,236 (2003); *Sunoco Pipeline L.P.*, 118 F.E.R.C. ¶ 61,266 (2007); *Enter. TE Prod. Pipeline Co., LLC*, 139 F.E.R.C. ¶ 61,099 (2012).

35. In general, pipelines have multiple origination and destination locations, and a market power analysis is conducted at each location for which market-based rate authority is sought.

36. Order No. 572, *supra* note 20, at 31,189.

37. The delivered price test is symmetric in the sense that prices are also standardized with respect to a particular location, here at the destination market. The analysis focuses on alternatives available to end users in the destination market. For example, the county may be taken as a proxy for end users (gas stations), with the price of gasoline from the applicant and alternatives measured by adding trucking cost, from the terminal to the county center, to the terminal rack price. This standardizes all prices with respect to a given location, the county, allowing alternatives to be meaningfully compared with the applicant in terms of price to identify counties likely served by the applicant and the good alternatives to the applicant in those counties.

\$102 (= \$104 – \$2) rather than \$99 (= \$100 – \$1), other things equal. Thus, unlike the tariff comparison, the netback price comparison yields the proper conclusion.

Netback prices are then used to identify good alternatives as follows. The applicant's tariff is increased by a SSNIP, for example, 15%. The increased tariff is subtracted from the delivered (terminal rack) price to yield the threshold netback price a refinery would earn when shipping over the applicant's pipeline (given the tariff increase). A good alternative is one that offers the refinery a netback price at least as large as the applicant's threshold price. The alternatives are considered good in that they offer the refinery an attractive price relative to the applicant under the threshold price increase.³⁸

Parenthetically, shippers have the incentive to sell where the netback is highest, implying that netbacks should be equal across markets. Several factors, however, can prevent netback prices from equalizing. For example, physical constraints and contracts may prevent sufficient adjustment to changing market conditions. Moreover, the way in which netback prices are calculated, such as with an annual average, can mask changing circumstances. For example, the expected (future) netback price (on which decisions are based) is unlikely to equal the historic average netback price (on which the analysis is based). Many products, e.g., diesel fuel, gasoline, and jet fuel, are also involved in a shipper's decisions, as refineries can alter the mix of refined products produced from a barrel of crude oil, whereas the empirical analysis has tended to focus on one product, for example, the most common one (clear, unbranded gasoline). Nevertheless, a refinery would give considerable weight to the price it would earn on a barrel of gasoline, net of transportation costs.

III. NATURAL GAS STORAGE PRICE TESTS

A. *Price Test Problems*

The problem that emerges when implementing a price test as suggested in the 1996 Policy Statement and in Order No. 678 derives from the lack of a natural way to standardize price for identifying good alternatives which, in turn, derives from the locational dispersion of customers. Rather than all customers being at a unique origin, as for an oil pipeline, natural gas storage customers are distributed across the geographic market, which eliminates the standardization made possible by the customers being at a unique location. Being at a unique location allows meaningful price comparisons, and implies that an alternative deemed good (or bad) is good (or bad) for all customers. Being at different locations, in contrast, implies that a good alternative for one customer may not be a good alternative for a customer located elsewhere, as transportation costs to the alternative differ by customer. Unlike for oil pipelines, where an alternative is judged good or bad for all customers, therefore, an alternative may be judged good for some customers and bad for other customers. This complicates the interpretation of the market shares and HHI, the core of the market power analysis.

38. See generally David W. Savitski, *Market Power Analysis for Oil Pipelines Facing Excess Demand*, 34 ENERGY ECON. 955-60 (2012), for an example of the identification of good alternatives in the Philadelphia origin market.

To see this problem, consider first the netback price test as applied to oil pipelines. Figure 1 presents the first of two diagrams illustrating why netback prices facilitate comparisons for oil pipelines, and how they need to be modified for natural gas storage. Continuing with the above netback price example, assume a single customer (A, a refinery) has access to two pipelines over which to distribute gasoline, with tariffs (per barrel) of \$1 over Pipeline 1 and \$2 over Pipeline 2. The tariffs suggest that the refinery would prefer Pipeline 1 to Pipeline 2 yet, as noted, that is not necessarily the case. The problem is that the price of the product is excluded. If we further assume that the price of gasoline in Destination 1 is \$100 and in Destination 2 is \$104, we get the opposite result. That is, the refinery would net \$99 (= \$100 – \$1) on sales to Destination 1 versus \$102 (= \$104 – \$2) on sales to Destination 2. The correct answer is that the refinery would prefer the expensive alternative pipeline, as it yields higher revenue net of transportation costs.

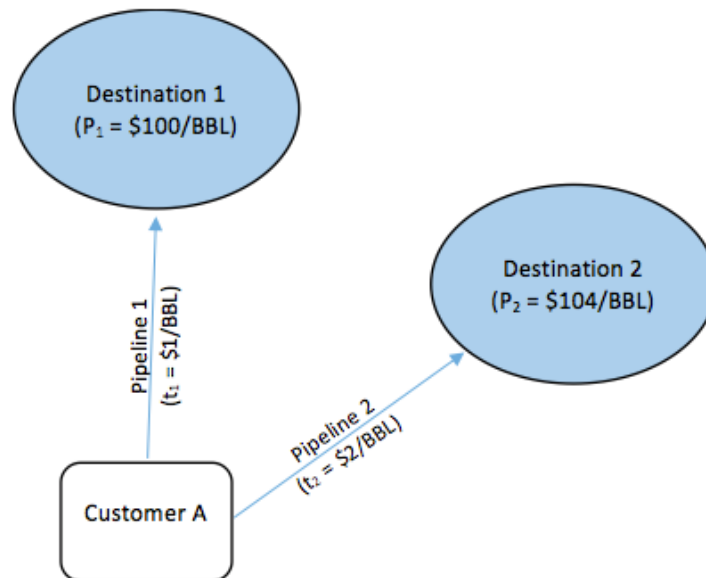


Figure 1. Comparing Oil Pipeline Tariffs Versus Netback Prices.

The problem that emerges when applying this framework to natural gas storage is that we lose the natural geographic location at which alternatives are evaluated. In Figure 1, for example, the economics of the two transportation alternatives are evaluated in terms of customer A, located at the pipeline origin. Whether the pipelines serve the same or different destinations, are of the same or different lengths, does not matter. Furthermore, the netback price associated with local consumption is simply the product price at the origin, and presents no difficulty for comparison. The economically relevant information is thus incorporated into the net price received at the origin.

When comparing alternatives for natural gas storage, in contrast, instead of having multiple customers at the origin market as in Figure 1, we have multiple customers at various locations. The combination of multiple customer locations and multiple storage locations eliminates the natural standardization point.

Figure 2 illustrates the problem by adding two customers (B and C), two destinations (Storage 3 and 4), and six pipelines, to Figure 1. Customer A continues with the same two alternatives, customer B has four alternatives, and customer C has two. The critical point for market power analysis of natural gas storage is that each customer is at a different location and faces a different transportation path and price to get to each alternative.

If we apply a standard netback test, as we would do in Figure 1 for oil pipelines, to a market power analysis of Storage 1 in Figure 2, we would assess the good alternatives to the customers using Storage 1 if it increases its storage price by a SSNIP. Following the pipeline approach, this increased price (the threshold price) would be compared with that of the alternatives, and alternatives offering storage (net of transportation costs) at prices no greater than the applicant's threshold storage price are deemed good alternatives.

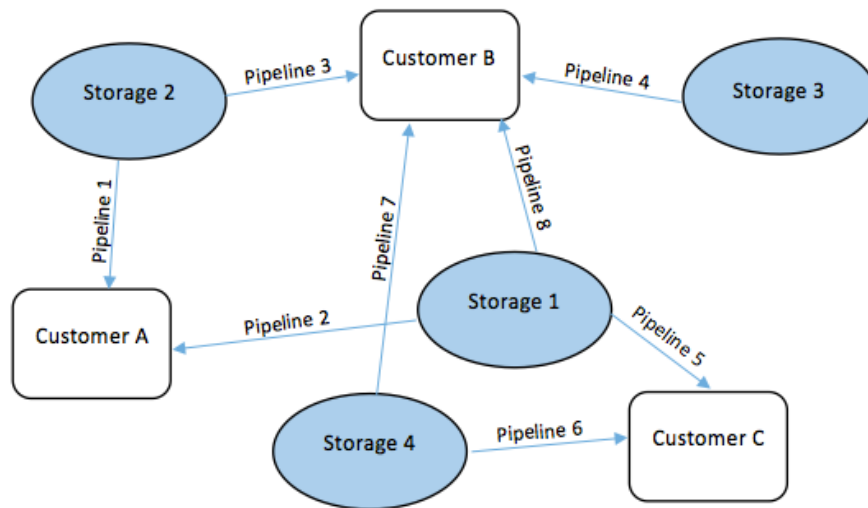


Figure 2. Multiple Origins and Destinations.

But with storage, each customer has a (potentially) unique set of transportation tariffs to access a given storage alternative, given the unique locations of the customers. The unique transportation tariffs, in turn, mean that a given alternative, for example, Storage 2 in Figure 2, might be a good alternative for customer A but not for customer B. Even more extreme, customer C is not connected to Storage 2, and so for that customer the alternative cannot be good.

As noted, this spatial problem does not apply to local production.³⁹ Since local production is, by definition, local, applying a price test is straightforward. In the simplest case, where this production is assumed adjacent to the applicant, we simply compare the two ways to buy natural gas: storage or production. A key element is that production capacity is below peak demand, with the difference met by off-peak gas being stored and withdrawn during peak times. (In general, if production capacity exceeds peak demand, there would be no need for storage.) Hence, the two relevant costs for a customer to compare are: (1) storage: buy summer gas, inject it, store it, and withdraw it; versus (2) production: buy winter gas. The winter gas price is then compared to the summer gas price plus storage cost. Since these are in principle observable, the test is straightforward to carry out.

But for the storage alternatives, the geographical dispersion of customers means that the interpretation of the market concentration measures is now problematic. In an oil pipeline analysis, each alternative is uniquely good or bad for all customers, and so all customers are equally protected against the exercise of market power. The good alternatives, uniquely identified, are then included in the concentration analysis to develop market shares and the HHI. But with a natural gas storage analysis, each alternative may not be uniquely good or bad for all customers, for example, Storage 2 for Customer C, and so all customers are not equally protected against the exercise of market power. This makes the market shares and the HHI less accurate indicators of market power for natural gas storage than for oil pipelines. The problem, then, is how to evaluate alternatives that are not uniquely good or bad for all customers.

B. Proposed Price Tests

We now modify the netback analysis used for oil pipelines to develop three price tests applicable to natural gas storage. Summarizing, the netback analysis involves a price test in which the prices of the applicant and the alternatives are standardized based on the unique customer location (at the oil pipeline origin). For example, the price of a barrel of gasoline, net of transportation charges to the various destination markets, standardizes the sale price to any destination (over any alternative) as of the refinery. The standardized netback price of each alternative is then compared with the applicant's netback price, where its tariff is increased by a SSNIP, to identify the good alternatives. Specifically, alternatives offering a netback price at least as large as the applicant's (with its tariff increased by the SSNIP) are considered good alternatives and included in the concentration analysis which, along with consideration of other factors, completes the market power analysis.

Directly applying this approach to natural gas storage providers fails, as noted, because customers are also at different locations, eliminating customer location as a unique reference. The three price tests represent three ways to address the standardization problem caused when both alternatives and customers

39. "Local" is with respect to the storage provider. Another complication is that local production with respect to a given customer would be more convenient and thus could be considered a good alternative *for that customer*. But non-local production suffers the same problem as alternative storage providers re transportation costs unique to each customer.

are at different locations, and how to apply the SSNIP test, given the chosen price standardization, to identify good alternatives.

1. A Netback Price Test for Each Customer

The first price test involves conducting a separate market power analysis for each customer. This resolves the price standardization problem by repeatedly applying the netback analysis to each customer (and thus with respect to a unique customer location). While this resolves the standardization problem, it introduces potential problems with the number of price tests involved and the fact that multiple tests can yield mixed results. These problems, in turn, can be solved by narrowing the set of customers considered or by allowing market-based rates on a subset of customers.

In the example illustrated in Figure 2, we would conduct separate market power analyses of the applicant with respect to customers A, B, and C. Because multiple tests are performed, interpreting the results is more complex than for oil pipelines, which involves a single price test for the applicant. Several analytical simplifications can be used to manage this complexity.

One complication is that a price test for each customer could be burdensome if there are many customers. For example, suppose that a storage provider has 20 customers. If each customer can buy natural gas at five locations and, instead of transporting it to the applicant's storage, can transport it to five other storage locations, there could be on the order of 500 relevant price test combinations. To complicate matters, natural gas pipelines are "contract carriers" under the Natural Gas Act (which allows them to set rates for each customer individually) whereas oil pipelines are "common carriers" under Interstate Commerce Act (which requires them to set a single rate (or quantity discounts) for all customers). The problem with multiple price tests is thus exacerbated by the fact that each pipeline used to access alternative storage providers can have myriad tariffs.⁴⁰

To make the analysis manageable, we could apply this price test from the perspective of representative customers, chosen to reflect the experiences of all customers. For example, five locations could be chosen like the dots on the "five" side of a die, with the applicant at the center, to which a SSNIP test would be applied to identify good alternatives. The concentration analysis would be conducted with respect to each representative customer, with a conclusion rendered regarding market power over each representative customer. The results would then be applied to actual customers in the corresponding regions.

A second complication is that a multi-test approach might not yield a unique answer. Three types of outcomes are possible: (1) all tests show market power, (2) all tests show no market power, or (3) the tests show mixed results. The first two outcomes present clear results. The third (mixed) outcome requires further analysis, as a given alternative is good for some customers but not for others, and the question is how to interpret the results. This might be resolved by considering the results more closely, perhaps by weighting the individual customer results. Alternatively, customers may be separated into two classes, the one subject to

40. A conservative approach from the customers' perspective would be to use the highest tariff on file with the FERC.

market power remaining under cost-of-service rates and the other under market-based rates.

A third complication is that subjectivity in the choice of the representative customers (regions) might be introduced. Applicants adopting this price test should thus anticipate challenges to the choices as unduly favoring the applicant. The expected challenges can be pre-empted, however, by including careful reasoning behind the choices and by conducting a sensitivity analysis that shows that the results do not change significantly (so as to alter the conclusions) under plausible alternative sets of representative customers. Including other price tests could also strengthen the sensitivity analysis (if they all show a lack of market power).

2. Close Physical Connection with SSNIP Applied to Storage

The second price test resolves the standardization problem by relying on a close physical connection (direct or indirect, once-removed, pipeline connections) to define the potential storage alternatives.⁴¹ This standardizes storage alternatives with respect to the applicant, in the sense that pipeline access to the alternatives is implicitly presumed competitive. The SSNIP test is then applied to the set of potential storage alternatives, focusing on storage prices alone, to identify the good alternatives to be included in the concentration analysis.

Specifically, the second price test involves defining the potential good storage alternatives based on them having a direct or indirect (once removed) pipeline connection with the applicant's storage facility. This solves the spatial problem in that all of the applicant's customers are physically connected to each of the applicant's alternatives. The limited direct and indirect pipeline network is implicitly presumed competitive, and that only storage prices matter.

The storage alternatives are then evaluated based on storage prices alone, ignoring the transportation cost from the customers' perspective.⁴² That is, the applicant's storage price is increased by a SSNIP and all alternatives whose storage prices are no greater than the threshold price would be considered good alternatives (for all customers).

3. Close Physical Connection with SSNIP Applied to Profit

The third price test resolves the standardization problem also by relying on a close physical connection (direct or indirect, once-removed, pipeline connections) to define potential storage alternatives. It differs from the second price test in that the SSNIP test is applied to estimate the profitability of a tariff increase. That is, rather than use the SSNIP test to identify good alternatives to be included in the concentration analysis, the third price test involves inferring market power from the impact of a tariff increase on profit.

Specifically, starting from the set of alternatives directly or indirectly connected to the applicant, the third price test examines how profitable a SSNIP

41. As with a price test, the FERC has not adopted a one-pipe or two-pipe test to define the geographic market (within which are contained the potential set of good alternatives). *See, e.g.*, 153 F.E.R.C. ¶ 61,052 at P 135.

42. More accurately, it presumes that the pipeline network is competitively priced within a one-pipe or two-pipe interconnected region, so that storage costs are the dominant factor.

is based on the extent to which the applicant's customers leave as a result of the SSNIP. (Long-term service agreements that prevent customers from leaving while subjecting them to market-based rates would be an important other factor to consider in any analysis, arguing against market-based rate authority, at least for the subset of affected customers.) That is, if we know or estimate price and quantity before and after the SSNIP, we can compare the total revenue before and after. If total revenue increases, profit would as well (as cost would have decreased as a result of decreased sales). If the SSNIP is unprofitable, that would suggest a lack of market power. This solves the spatial problem by focusing on the applicant's profit, and thus implicitly considers transportation costs.

The third price test is, in some ways, akin to the Merger Guidelines hypothetical monopolist test. That test examines whether a price increase *by all firms* in a tentative market is collectively profitable. If profit falls, the market is expanded to include the next best alternative (as the set of tentative firms is losing sufficient sales, indicating that other firms are effectively competing in the market, and thus the tentative market definition is too small), and the test is repeated. This continues until the price increase is profitable, with the corresponding set of firms then defining the market. The third proposed price test differs from the hypothetical monopolist test, however, in that only the applicant is raising its price (it is a unilateral price test).

IV. CONCLUSION

In Order No. 678, the FERC expands the use of market-based rates to stimulate investment in natural gas storage facilities in two ways. First, it expands the product market to more accurately reflect the competition facing an applicant for market-based rates. Second, it allows firms that cannot or do not show that they lack market power to nevertheless receive market-based rates for new investment, provided that customers are protected.

The FERC requires an applicant for market-based rates to show that the alternatives included in its traditional market power analysis meet tests of availability, price, and quality, to make them effective substitutes for the applicant's service if it raises its price significantly. While price tests are integral to the FERC's market power analysis, it has granted market-based rates to applicants without them, especially when applications are uncontested. Even when contested, as in ANR Storage, the FERC still accepts some alternatives as good without a price test (though not necessarily enough alternatives to demonstrate a lack of market power). But parties may contest an application on the grounds that it does not contain a price test (and on other grounds), hindering the granting of market-based rates.

To sharpen and strengthen a market power analysis, we developed three price tests based on those used in oil pipeline market power analyses. Price tests improve the accuracy of market power analysis compared with not having them, allowing the FERC to better decide when to rely on market-based rates to stimulate investment while protecting customers. And given that the FERC has not mandated a specific price test, having multiple tests can make a stronger showing, or one better tailored to the specific circumstances of the applicant. More rigorous price tests also improve the likelihood that some firms that would otherwise seek market-based rates under section 4(f) could instead provide a successful market-

based rate application, and thus avoid the costly conditions required under the 4(f) presumption of market power.

The three proposed price tests are on par with a netback analysis in difficulty, with some simpler and some more complicated. The first test involves replicating the price tests done for oil pipelines for each customer or for each of a subset of customers. It is more complicated, in that it involves conducting and interpreting multiple netback price tests. The second test is the simplest of the three to apply, as the assumption of competitive transportation reduces the price analyses to comparing storage prices alone. This makes the SSNIP test straightforward to apply. The third price test differs from the second in the SSNIP test applied. Since estimates of demand elasticity are required to estimate the impact on profit, this test is more speculative than the others.

As noted, the FERC has not adopted a specific price test for oil pipelines and for natural gas storage. The reason is that a market power analysis is very fact specific and can be very idiosyncratic. The FERC is not unique in being cautious, as the DOJ/FTC Merger Guidelines offer a similar caution:

Although the Guidelines should improve the predictability of the Agency's merger enforcement policy, *it is not possible to remove the exercise of judgment* from the evaluation of mergers under the antitrust laws. Because the specific standards set forth in the Guidelines must be applied to a broad range of possible factual circumstances, *mechanical application of those standards may provide misleading answers* to the economic questions raised under the antitrust laws.⁴³

The three proposed price tests thus represent a small step towards a viable price test that the FERC might one day adopt.

Finally, the price tests developed here use approximations to the rigorous price tests used in oil pipeline market power analyses, as the spatial conditions are more complex for natural gas storage than for oil pipelines. The price tests may be evaluated over time by observing storage providers receiving market-based rates to see if customers have filed complaints at the FERC, and thus possibly be subject to market power. The price tests can then be evaluated in light of how well they performed. For example, the complainants can be examined for how well their circumstances fit into the assumptions used in the price tests. This would suggest improvements to the price tests to reflect such circumstances.

More formally, each alternative is evaluated on a 0-1 basis in the FERC's market power analysis: either it is a good alternative (for all customers) and included in the concentration analysis, or it is discarded. This 0-1 basis does not always hold for natural gas storage alternatives, where each alternative can be good for a different set of customers. Further research could thus examine whether the formal market power framework can be extended to the case where alternatives vary by customer in how well they substitute for the applicant. And, in particular, examine these implications for the market shares and the HHI as indicators of market power for natural gas storage providers.

43. Section 0 of the Merger Guidelines. *0. Purpose, Underlying Policy Assumptions and Overview*, DEP'T OF JUSTICE, <http://www.justice.gov/atr/0-purpose-underlying-policy-assumptions-and-overview> (last updated June 25, 2015) (emphasis added).