Evaluation of Capacity Release Transactions in the Natural Gas Industry

by

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Abstract

The purpose of this paper is to analyze capacity release transactions in the natural gas industry and to state some preliminary conclusions about how the capacity release market is functioning. Given FERC's attempt to enhance market efficiency through the capacity release mechanism, we analyze the development of capacity release from approximately April 1993 through the middle of February 1994. We examine the prices for released capacity and their corresponding terms on two natural gas pipelines, Tennessee Gas Pipeline and El Paso Natural Gas Pipeline.

After we explain the capacity release market and identify the factors influencing capacity release prices, we attempt to quantify the importance of these factors through cross-section regression analysis. We perform separate regression analyses for each of the pipelines recognizing the differences in the California and Northeast markets. We then pool the data to test the hypothesis that the markets are operating in a sufficiently similar manner to validate an integrated-markets understanding of capacity release. Finally we suggest some areas of future study and ways to improve upon our analysis if given sufficient time and resources.

The results of our analysis suggest that the market for released capacity that is subject to bidding (i.e. capacity that is posted on electronic bulletin boards for prospective replacement shippers to bid on), is thin. For the two pipelines we analyzed, there appears to be limited competition for capacity release. The price is therefore not being bid up beyond the minimum rate specified by the releasing shipper. Thus, the relevant question in the bidding market segment is how releasing shippers are determining the minimum rate. Our results suggest a trial-and-error method on the part of firm shippers in the concentrated California market, where firm shippers have lowered their required minimum rates over time. Nonetheless, there are prearranged deals that earn the maximum rate. This suggests that when capacity is scarce, parties are prearranging for capacity release at the maximum value, leaving the residual capacity, with little demand, open to bidding.

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I. Introduction

In April of 1992, the Federal Energy Regulatory Commission (FERC) issued Order No. 636 requiring a comprehensive restructuring of the natural gas industry. Order No. 636 is the latest step in the commission's attempt to introduce more competition into the natural gas industry. The order mandates the unbundling of pipelines' gas sales and transportation services, forcing pipelines into "arms-length" transactions with shippers and producers of natural gas. The concepts embodied in Order No. 636 were designed to allow buyers to purchase gas from sellers with fair and equal access to pipeline transportation.

A major component of Order No. 636 is the creation of a capacity reallocation program, called capacity release. Under this order, shippers with firm capacity rights on a pipeline can release unneeded capacity for sale through the pipeline. The pipeline is required to post all relevant information about the release on its electronic bulletin board (ebb), giving interested parties the opportunity to bid on the released capacity. The pipeline must act as a neutral party when evaluating bids and reassigning capacity. The bidder with the highest "value" bid wins the bidding competition and becomes the acquiring shipper.

If firm transportation agreements between pipelines and end users are considered the "primary market" for acquiring capacity then capacity release transactions can be considered a "secondary market" mechanism. Pipelines are not usually a seller or a buyer in the release transaction.

FERC began approving pipeline compliance filings, including capacity release implementation, in 1993 with all pipelines to be approved and operating under Order No. 636 by November 1, 1993.

A well functioning capacity release market is a key element to FERC's and the natural gas industry's intentions for more competitive and efficient natural gas delivery. Since firm shippers of natural gas pay for the fixed costs of transportation, capacity release could more efficiently distribute costs and mitigate rate increases to firm gas customers.

Given the importance of a well-functioning capacity release mechanism for all industry participants, it is important to understand how well this mechanism is functioning. In this paper, we hope to provide some initial insights into the capacity release market in order to help the industry, regulators, and customers establish well-informed positions and strategies regarding capacity release.

We examine capacity release transactions on Tennessee Gas Pipeline and El Paso Natural Gas Pipeline, identifying important determinants of capacity release value through economic reasoning and regression analysis. We find that capacity release transactions can be segmented into two markets: 1) prearranged capacity release deals that command the maximum rate or are for less than thirty days and therefore not subjected to bidding competition and 2) capacity release postings, prearranged or not, that are subject to bidding competition. We find little evidence of active bidding competition in our analysis of the second segment of the market. The demand for released capacity on both Tennessee and El Paso is thin relative to the volume of capacity being released for bidding. Therefore, the minimum rate specified by the releasing shipper is largely determining the value for this capacity. On the other hand, parties are still prearranging capacity release at the maximum rate despite the fact that they can acquire seemingly fungible capacity in the bidding segment of the market for substantially less cost. One explanation is that when capacity is scarce, parties are prearranging for valuable capacity[1], leaving the residual capacity with little demand for the bidding portion of the market.

Our findings bring into question the rationale for setting a price ceiling (the maximum tariff rate) on capacity release transactions. Capacity prearranged at the maximum is apparently much more valuable to replacement shippers than is reflected by the tariff rate. This artificial constraint on the market is forcing valuable capacity to be

[1] Valuable capacity, as used here, refers to capacity that is in demand. To a first order, this is capacity that is released into the market when incremental capacity is scarce. Once this capacity is acquired by replacement shippers, the residual capacity is of little value since capacity is no longer scarce. Although capacity on a pipeline is fungible, there can be other attributes, such as term and recallablility, besides the order in which capacity is released, that determines value.

acquired at 100 percent, while the residual capacity earns substantially less than 100 percent. If the price ceiling were lifted, released capacity could be bid up to its true market value. Residual capacity would continue to earn only a portion of the maximum, but firm shippers, namely LDCs, would be compensated for the fixed costs of carrying firm capacity by reaping the market value (likely to be above the maximum tariff rate) for releasing scarce, valuable capacity.

In section II of the thesis, we present some background on natural gas regulation leading up to Order No. 636 and capacity release, and outline some impacts of capacity release on interested parties. In section III, we hypothesize on the determinants of capacity release prices and provide some economic rationale for our reasoning. In section IV, V, and VI, we perform regression analysis and explain key results for Tennessee Gas Pipeline, El Paso Natural Gas Pipeline, and a pooled data set from the two pipelines, respectively. In section VII, we conclude the thesis with some general observation about our research and suggest areas for improvement and future study.

II. Background

IIa. Growing Demand for Natural Gas Necessitates an Efficient Market

The Energy Information Administration recently projected that gas use in the United States, estimated at 19 trillion cubic feet (Tcf) for 1992, will expand 30% by 2010, mostly as a fuel for electric power generation.[2] Increasing reliance on natural gas requires that regulators ensure that the markets for this commodity product are as efficient as possible. Over the last 15 years, industry participants have witnessed a transition from strict regulation to increasing competition. This change covers the entire flow path from the source at the wellhead to end-use at the burner tip. Increasing competition however has

[2]Foster Natural Gas Report, February 17, 1994

complicated many of the strategic choices that industry participants face. Some factors causing the increasing complexity include: development of successful derivative markets for natural gas, the integration of the North American markets, and the expansion of pipeline services. Created by regulatory edict, capacity release is an important component of the new and changing natural gas industry; it is also the most recent market mechanism that industry participants face.

IIb. Changing Regulation in the Natural Gas Industry

Any explanation of capacity release transactions must begin with an overview of the regulation that created the mechanism. Indeed, one has to go back to the beginning of natural gas regulation in order to comprehend the process and outcome that resulted in capacity release. Unlike railroads and even oil pipelines, natural gas pipelines were not designated as common carriers. In recent years, with Order No. 436 and Order No. 636, the Federal Energy Regulatory Commission (FERC), who has regulatory oversight of interstate pipelines, has been transforming natural gas pipelines into common carriers. In 1992, the FERC, in an attempt to complete the transformation of pipelines into common carriers, issued Order 636. Order 636 revolutionized the natural gas industry by mandating that pipelines unbundle their services to end users of natural gas. End users include residential and commercial customers who are served by local distribution companies, electric utilities who burn gas to generate electricity, and industrial users.

Natural Gas Policy

To gain a better understanding of the forces of regulatory change culminating in Order No. 636, it is useful to look at natural gas policy beginning with the Natural Gas Act of 1938. The NGA granted authority to the Federal Power Commission (FPC) to regulate interstate pipelines and control prices charged to distribution utilities and end users. The act did not cover wellhead prices, but was instead concerned with backward vertical integration

by pipelines into gas production and regional access by users to the new and relatively cheap fuel. As the gas industry grew, there were struggles between consumer states and producer states over the distributive benefits as producer states imposed export taxes and controls on gas to gain an increased share of growing revenues.[3] This led to legal action in 1954 in which the Supreme Court in *Phillips Petroleum Co. v. State of Wisconsin* gave the FPC the responsibility to regulate producers and the wellhead price of gas. As a result of the *Phillips Decision,* the FPC adopted price ceilings at the wellhead which inadvertently deterred drilling for replacements and subsequently lead to shortages. These shortages did not become readily apparent to the general public until the 1970s.[4]

The imposed price ceilings prevented producers from investing in further exploration and production, thus restricting supply and creating shortages of natural gas. In the 1970s, shortages were exacerbated by the oil price shocks and a regulatory structure that placed no controls on gas produced and sold within a state, both of which increased the demand for natural gas.

In an attempt to correct the vast disparity between the price of natural gas and the potential market value, Congress enacted the Natural Gas Policy Act in 1978. The act was intended to raise the overall level of gas prices by phasing in decontrol over a number of gas classifications. "New gas" (post 1977) was to be gradually decontrolled to market levels through 1985. "Old gas" (pre 1977) on the interstate market would be controlled until exhausted, while "old gas" from intrastate would be decontrolled through a phase in. Finally, "high cost gas" (unconventional gas and gas from wells deeper than 15,000 feet) was deregulated.[5] While the NGPA was successful in ending natural gas shortages, the price of decontrolled gas was driven extremely high by vigorous competition among the pipelines for "new gas". Pipelines could afford the high price of decontrolled gas as long

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[3]Jacoby and Wright, "The Gordian Knot of Natural Gas Prices.", The Deregulation of Natural Gas, American Enterprise Institute, 1983, p. 127

[4] Pierce, The Natural Gas Regulation Handbook, Executive Enterprises Publications Co., NY, 1980

[5]Abott and Watson, "Pitfalls on the Road to Decontrol: Lessons from the Natural Gas Policy Act of 1978", The Deregulation of Natural Gas, American Enterprise Institute, 1983, p. 55

as the average price of gas to the customer, from rolling in low cost gas, did not exceed parity with oil. While the high cost of gas could be largely passed through to residential and small commercial users, declining oil prices in the mid-eighties meant fuel switching by industrial customers. Declining industrial demand forced producers to shut in production. "Take or Pay" provisions, which obligated a pipeline to pay for specified quantities of gas even if not taken, created the anomaly of shutting in low-cost gas. Many pipelines found it more economical to eschew low-cost gas and to take high-cost gas for which they had contracted and had to pay for anyway.[6] This problem gave rise to the innovation and regulatory reform that would diminish the merchant function of natural gas pipelines.

Declining oil prices and weakening demand placed financial stress on pipelines and encouraged them to expand their transportation role. In 1985, FERC issued Order No. 436 which allowed individual pipelines to choose between providing nondiscriminatory transportation for all customers or remaining a private carrier. FERC Order No. 451 and wellhead decontrol in 1989 continued to reduce the pipeline merchant function by moving wellhead prices toward market levels, further impeding pipelines from satisfying above-market contracts for high-cost gas.[7] To complete the process begun with Order No. 436, FERC issued Order No. 636 in April 1992. Its goal: to create an environment where buyers have direct and equitable access to numerous sellers.

FERC Order No. 636

Order No. 636 essentially removes the merchant function of pipelines, forcing them into arms-length transactions with shippers and purchasers for transportation and storage services. In the post 636 world, buyers will be able to purchase gas from sellers with fair and equal access to transportation.

Order No. 636 was issued on April 8, 1992 requiring a comprehensive

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[6]Kalt and Schuller, "Introduction: Natural Gas Policy in Turmoil, Drawing the Line on Natural Gas Reulation, Energy and Environmental Policy Center, Harvard University, 1987, p. 5
[7]ibid, p. 7

restructuring of natural gas pipeline service. The major changes in the order include:

- **Mandatory unbundling** of pipeline sales and transportation services from the commodity cost of gas without an exception for small customers. This essentially means that pipelines can no longer sell natural gas to an end-user with transportation costs "rolled-in".
- **Blanket sales certificates** authorizing pipelines to make sales at market-based rates to unregulated sellers. FERC has jurisdiction of all interstate sales of natural gas and regulates the interstate price of gas. This provision allows firms to avoid the regulation of price by FERC without having to petition for permission for market-based rates with each individual sale.
- A requirement that pipelines offer a **"no-notice" firm transportation service.** No-notice service allows a shipper to utilize dedicated transportation on short notice up to his or her maximum daily quantity as specified in the no-notice agreement. It is similar in function to natural gas storage.
- **Open access** transportation services equal in quality regardless of the gas seller.
  - A definition of transportation that includes storage thereby subjecting storage services to open access regulation.
  - A requirement that downstream shippers have access to upstream transportation.
- Establishment of a **capacity reallocation program**, to replace existing capacity brokering programs, under which firm shippers can release unneeded capacity for sale through the pipeline after posting all relevant information on its electronic bulletin board. This provision creates a secondary market for firm transportation capacity, and is the topic for this paper.
- Adoption of a **straight fixed variable (SFV) rate design**, and a finding that existing modified fixed variable (MFV) rates are unjust and unreasonable. Under MFV some fixed costs were allocated to the commodity charge. Under SFV, all fixed costs are placed in the demand charge. The fixed costs of pipeline capacity are paid by all

firm shippers who hold firm transportation rights on the pipeline regardless of how often a particular shipper utilizes his or her firm transportation.

- A mechanism to **recover transition costs**. This provision is designed to ease the transition for utilities and pipelines by allowing them to pass on the additional costs incurred in adapting to Order No. 636. Cost increases due to switching to SFV of more than 10% to any customer are to be phased in over a four year period.
- **Pregranted abandonment** for all interruptible and short-term (one year or less) firm transportation services, while permitting this practice in long-term services only when the customer does not exercise the right of first refusal to match the price and term offered by another bidder. The pipeline is essentially given limited flexibility to choose not to serve a customer.

On July 30, 1992, FERC approved Order No. 636-A largely denying rehearing of Order No. 636. However, responding in part to the concerns of small volume customers, the order included the following modifications:

- Encourages pipelines to expand the small customer class eligible to receive special, one-part volumetric rates to include customers up to 10,000 Mcf/day.
- Requires pipelines to maintain their one-part volumetric rates, computed at the existing imputed load factor, for unbundled transportation service provided to small customers. This is opposed to the original provision in Order No. 636 which required increases resulting from the switch to SFV be phased in over four years for customers who would experience greater than a 10% rate increase.
- Requires pipelines to offer to sell gas to small customers at a cost based rate for one year after the date of compliance with 636.
- Requires pipelines to recover 10% of transition costs (i.e. costs incurred to comply with Order No. 636) through interruptible transportation rates rather than totally

through firm transportation customers. The 10% cost shift does not affect the ability of pipelines to recover 100% of prudently incurred transition costs.

- Exempts releases of capacity for periods up to one calendar month from bidding requirements.
- Retains SFV rate design method, but directs pipelines to develop mechanisms to address cost shifts from high load factor to low load factor customers as a result of the switch from MFV.

The changes in Order No. 636-A had little impact on the overall direction of Order No. 636. Small customers were able to gain mitigation from the operational and cost impacts of the original order. The exemption from bidding for capacity release deals of under thirty days was likely the most significant implication of Order No. 636-A. This allows parties to prearrange deals for less than thirty days; however the rollover of these deals is prohibited. A large number of capacity release deals have been done under the thirty-day exemption. This suggests that parties are taking advantage of the thirty day exemption in order to avoid the burdensome regulation of posting deals on pipeline electronic bulletin boards. On November 11, 1992, FERC approved Order No. 636-B which denied rehearing of Order 636-A. Since no changes were made to the existing regulation, Order No. 636-B signaled the end of the rule making process.

IIc. Capacity Release: An Example

An example of a capacity release transaction will assist the reader in understanding capacity release as a market mechanism. In a typical transaction, an owner of firm transportation on a pipeline determines that not all of that capacity will be utilized over a given period of time. The owner can access the electronic bulletin board of the pipeline on which he/she purchased the firm transportation rights and post some of that capacity for release. This owner, referred to as the releasing shipper, has

already determined the following:

- the quantity of capacity to be released,
- the period of the release,
- the receipt and delivery zones over which the release covers,
- the minimum bid rate that the owner will accept,
- whether or not the release is recallable,
- and, an evaluation method for determining the winning bid.

The owner's release request is posted on the pipeline's ebb for a known period of time for bidding. The release includes the identity of releasing shipper. The time period for bidding is determined by the period of the release itself; releases over three months on most pipelines are given longer periods for bidding than releases under three months. Most releases are for a calendar month; however, multi-year releases can and do occur.

Bidders for capacity release postings must be prequalified by the pipeline and must be logged on to that pipeline's ebb; there is currently no service which offers potential buyers access and bidding capability to all North American pipelines.[8] During bidding, the identity of each bidder is kept anonymous to other bidders; only the bid values are posted. After reviewing the bids, the pipeline impartially determines the winning bid by calculating the most valuable bid using the criteria established or chosen by the releasing shipper. The pipeline then notifies the releasing shipper of the winner and awards the capacity to that winner. If there were no bids for a given release, then the releasing shipper retains rights to the capacity.

While capacity release deals are usually initiated by the seller, they can be triggered by interested buyers. Any qualified party that desires to acquire capacity on a certain pipeline can make a posting on that pipeline's ebb. In this case, a potential acquirer or replacement shipper discloses name, term, quantity, and the maximum rate

[8]A number of firms are planning to offer on-line services capable of monitoring capacity release transations for multiple pipelines.

this shipper will pay for the service.

The following is an actual release transaction from the Tennessee Gas Pipeline.

Firm Shipper Posts

name:	Columbia Gas of Kentucky
quantity:	10,000 (Dth / day)
term:	10/1/93 - 10/31/93
receipt and delivery zones:	Receipt Zone 1, Delivery Zone 3
minimum bid:	$1.24 (Dth / month)
recall rights:	none
evaluation method:	default

Prospective Replacement Shipper Bids

name:	Superior Natural
term:	10/1/93 - 10/31/93
quantity:	10,000 (Dth / day)
bid:	$1.25 (Dth / month)

IId. Impacts of Capacity Release on the Natural Gas Industry

Table 1 summarizes various participants' positions.

TABLE 1: How Industry Participants View Capacity Release

Industry Participant	Position Regarding Capacity Release
LDC Groups: Associated Gas Distributors and United Distribution Companies	Want ability to negotiate deals within capacity release framework. Feel capacity release is not currently competitive with interruptible transportation.
Pipeline Companies	Claim that 90/10 sharing of IT revenues is unfair.. A pipeline receiving only 10% of IT sales is insufficient reward for marketing IT against capacity release or other pipeline capacity.
FERC	Prevent LDCs from obtaining substantial market power with respective to capacity release in their region. Encourage incremental changes to release program before adding completely separate secondary market mechanisms to improve utilization and lower LDCs firm transportation costs.
Natural Gas Marketers	Have opportunity and risks to rebundle capacity for resale to industrial users.
Industrials and Independent Power Producers	View capacity release as an alternative to pipeline in acquiring transportation at reasonable rates.
State Public Utility Commissions	Mitigate firm transportation costs of LDCs and pass these savings to captive ratepayers.

Before Order No. 636, LDCs typically could purchase both the physical commodity (i.e. gas) and the transportation of that commodity from a pipeline. In addition, because LDCs were charged with the responsibility of reliable service to its captive customers, they were obligated under regulatory oversight to purchase enough firm transportation to satisfy their peak demand. Operational reliability lay primarily with the pipelines; in exchange for guaranteeing supply of gas, interstate pipelines were compensated with a regulated profitable merchant function in this regulated market.[9] Pipelines negotiated independently to buy gas from producers and to sell gas to end users.

Reliability of Supply Shifts from Pipelines to LDCs

As a result of Order No. 636, LDCs and other end users must negotiate directly with producers or gas marketers for gas supply. Thus, operational responsibility for end users has shifted from pipelines to LDCs. The question of the cost of maintaining traditional levels of reliability looms for state public utility commissions who oversee LDCs. These regulators will expect LDCs to maintain service reliability to captive firm customers at traditionally high levels.[10] At the same time, they also would like LDCs to pursue opportunities to reduce their fixed costs. LDCs could reduce their firm transportation costs by successfully selling capacity on the newly-created secondary market. LDCs have an opportunity to minimize their firm transportation costs and pass these reductions to their ratepayers. Therefore the success rate of the secondary market will largely determine the cost reduction that LDCs can achieve.

FERC Wants to Balance LDC Cost Mitigation with the Potential for Discrimination

Since its implementation deadline of November 1, 1993, the FERC has been receiving feedback from industry participants. There is general agreement that the capacity

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[9] Esposito and Delroccili, "Gas Capacity Release: Opportunity or Pitfall?", Fortnightly, December 1, 1993. p. 25

[10] Ibid, Fortnightly, December 1, 1993

release program needs to be reviewed; in the words of FERC Commissioner Donald F. Santa, Jr. "there is no doubt the Commission will review the Order No. 636 capacity release program".[11] However, the FERC feels that a full calendar year needs to transpire before any changes can be made. Calls to revamp this program have already come from several quarters, he said, including NARUC's Executive Committee, the Department of Energy's "Domestic Oil and Gas Initiative" released last December, and the Associated Gas Distributors and United Gas Distribution Companies in a joint petition for a rulemaking filed in late December.[12]

One option advocated by LDCs includes adjusting or removing the price cap or maximum reservation rate on capacity release transactions as set by the pipeline. Another proposal is to allow capacity holders to market their capacity without the hassle of posting on a pipeline's ebb. While some have argued that concerns over undue discrimination when a pipeline is selling capacity will not exist when the capacity holder is the reseller, Santa was uncertain whether LDCs and other capacity holders could be said to lack market power. As evidence for his viewpoint, he cites Southern California Gas Co. which controls nearly 29% of the total capacity into California and an even greater share on specific pipelines.[13] Moreover, Santa asked

> With respect to any metropolitan area, won't the LDC be the holder of most all of the capacity into that market? If the Commission authorized capacity holders to market their capacity directly, would not this just be trading the pipeline monopolist at the citygate for the LDC monopolist behind the citygate? And wouldn't LDCs too have reasons to discriminate in the allocation of the capacity they hold?[14]

Alternatively, the FERC would like to consider "incremental fixes" that would get the job done, or adopt creative ways to make the system work better within the current framework. For Santa and others at the FERC, the task is "to find the balance between the

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[11] Foster Natural Gas Report February 17, 1994, Pg. 5
[12]Foster Natural Gas Report February 17, 1994, Pg. 5
[13]Southern California Gas controls nearly 70% of firm capacity on Transwestern Pipeline, one of the three major pipelines serving California
[14]Foster Natural Gas Report, February 17, 1994

competing goals of maximizing the ability to police undue discrimination and maximizing LDC opportunities to mitigate cost shifts due to [the new] Straight Fixed Variable rate design".[15]

III. Determinants of Price for Released Capacity

We believe there are a number of important variables that are playing a part in determining prices for released capacity. Under varying assumptions about market efficiency, each of the suggested factors may play a correspondingly greater or smaller role. Economic logic suggests the following factors will influence the price obtained for released capacity:

- The releasing shipper's experience in and knowledge of the capacity release market.
- The replacement shipper's experience in and knowledge of the capacity release market.
- The concentration of releasing shippers on a particular pipeline.
- The season in which the capacity will be reassigned to the replacement shipper.
- The distance over which the capacity release is effective.
- The length of time over which the capacity release is effective.
- The volume of the capacity release.
- The degree of capacity utilization on the pipeline on which the release takes place.
- The minimum rate specified in the posting of the released capacity.
- Whether the deal was prearranged or not.
- Whether the deal contains recall rights or not.
- The amount of bidding activity for any particular capacity release posting.
- The discounted interruptible transportation rate on the pipeline on which the release takes place.

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[15]Foster Natural Gas Report, February 17, 1994

The releasing and replacement shippers' experience in and knowledge of the capacity release market.

The issue of the releasing shipper's and the replacement shipper's experience levels in the capacity release market is twofold. First, one may suspect that there is a learning curve effect associated with the capacity release market. Time and resources must be devoted to understanding a particular pipeline electronic bulletin board, evaluating capacity needs and value, and, in the case of prearranging deals, recognizing potential interested parties and marketing to them. A releasing shipper that has completed a relatively large number of capacity release deals and has committed substantial resources to the capacity release effort may be able to get a higher price for their released capacity than a less experienced shipper by prearranging a deal or by releasing capacity at times and in increments that are more attractive to potential replacement shippers. Likewise, an inexperienced replacement shipper may bid high for released capacity if he has not yet recognized the competitive dynamics of the market or has incomplete knowledge when valuing the capacity.

The second issue associated with the experience levels of the participants in the capacity release market has to do with access. In mandating the use of electronic bulletin boards and bidding for released capacity, the FERC intended to create a secondary market for capacity that would be open-access. Indeed, the regulation requires capacity release transactions of over thirty days to take place without regard to the identity of the parties. Nonetheless, deals over thirty days can be prearranged by parties. If the prearrangement is for the maximum rate, then other bidders are effectively shut out since one can not bid over the maximum rate. Similarly, prearranged deals under the maximum rate and over thirty days in length, allow the prearranged replacement shipper the opportunity to match the highest bid.

The concentration of releasing shippers on a particular pipeline.

The number of releasing shippers on a pipeline will vary depending on the concentration of firm shippers on the pipeline. A pipeline serving the Northeast region of the United States typically has a large number of small local distribution companies as firm shippers, while a pipeline that serves the California market has a small number of very large firm shippers. The potential for the some form of collusive behavior is greater in markets that are highly concentrated. In markets with few releasing shippers, it may be possible to constrain releasing activities to ensure that capacity is released at a higher value. Even if collusive behavior is not present, it may be easier for releasing shippers to recognize the releasing activities of other firm shippers and to alter their release patterns to achieve higher values for released capacity in concentrated markets.

The season in which the capacity will be reassigned to the replacement shipper.

The idea that seasonality will have an effect on the price for released capacity is derived from the seasonality of the underlying natural gas commodity. Because a large portion of natural gas demand is associated with heating requirements, the winter months in the United States are, in general, the months of highest gas demand. Regions in United States that have low heating loads do not display this seasonality. In fact, in Western regions of the country with high air-conditioning loads, natural gas demand rises in the summer. Since natural gas transportation capacity is essentially fixed at any one point in time, times of high natural gas demand are associated with high capacity utilization. The scarcity of interruptible natural gas transportation at times of high demand corresponds with the relatively high value associated with its use. Just as interruptible transportation becomes more scarce during the winter and generally commands a higher price, so too should released firm capacity become more scarce and command a higher price.

It is instructive to look at what occurs at the extreme of the seasonality effect. In the

extreme case, the points of highest natural gas demand result in no released capacity as all firm transportation is being used by the original assignees. So while there are many parties willing to pay the maximum rate for any bit of capacity that they can possibly acquire, there is no capacity available. No prices will be observed during this high demand period. When natural gas demand slackens, shippers with excess capacity will release it, but if the lower natural gas demand corresponds exactly with the amount of capacity being released then there will be no bidders for the capacity and the released capacity will not be worth anything. While the market obviously does not match capacity and demand so closely, a market operating close to these assumptions may yield prices for released capacity that are relatively low when capacity is available.

The distance over which the capacity release in effective.

The further the distance covered by the capacity release the more likely the capacity will be constrained, thus increasing the value of the release relative to an equivalent release covering a shorter distance. This seems sensible for two reasons. First, capacity extending to the producer region is necessary for a party arranging supply from the producer region. Thus, capacity extending to the supply source should be more valuable. Second, there tends to be less pipeline capacity relative to demand in the regions furthest from the producer area. The restricted supply of pipeline capacity should increase the value of incremental capacity. While this is certainly true for New England, large consuming market areas such as California and the Mid-West have extensive pipeline infrastructures which suggest that the first factor, producer access, may have a much stronger influence in these markets than restricted supply.

The length of time over which the capacity release is effective.

The length of time over which the capacity is released should have a positive impact on value. Longer deals can be more valuable since they reduce the risk of not being

able to acquire transportation by locking in firm transportation for the duration of the release. While it is not necessarily the case that longer deals will be more valuable than shorter deals, it seems unlikely that a given volume of capacity would command a lower price if released for a longer term since a replacement shipper can choose to use the capacity for the shorter duration. On the other hand, one can easily see why a capacity release for the entire five months of winter could be more valuable than releasing the capacity in monthly succession over the five winter months.

The volume of the capacity release.

The volume of the capacity release should have a positive effect on the price per unit as well. Released capacity can often be re-released, giving the replacement shipper an option to use and release the capacity in some proportion. Thus, there is a potential to create more value with larger volumes of released capacity than smaller volumes.

The degree of capacity utilization on the pipeline on which the release takes place.

The capacity utilization of the pipeline on which the release take place should have an important effect on the price of released capacity. Higher utilization of the pipeline suggests more competition for incremental capacity. Higher demand for capacity will push up both the price of interruptible transportation and released capacity. Therefore, pipeline's with higher load factors should display higher prices for released capacity.

The minimum rate specified in the posting of the released capacity.

When a releasing shipper posts capacity on an electronic bulletin board, that shipper can specify a minimum acceptable bid. A bid must be at least as high as the specified minimum to be considered valid. The minimum may or may not have an important effect on the ultimate price for capacity. When there are few parties interested in released

capacity, the minimum may determine the price of released capacity since there is only a small threat of a bidding competition. In a market with many bidders, however, the minimum rate may have little to do with the ultimate price, especially if the minimum is much lower than the value of the capacity to the bidders. It seems likely that the minimum bid specified by the releasing shipper should indeed be lower than the value to a replacement shipper, since the releasing shipper apparently does not intend to use the capacity and the replacement shipper apparently does.

Whether the deal was prearranged or not.

There are two kinds of prearranged deals: those subject to bidding and those not subject to bidding. Deals that are prearranged for capacity release under thirty days are not subject to bidding according to the FERC regulation. Since the regulation also prohibits bids higher than the maximum rate specified for the firm transportation in the pipeline tariff filing, any prearranged deal that is for the maximum rate is effectively a done deal and is not subject to bidding. All other prearranged deals are open to bidding through the pipeline's electronic bulletin board. In this thesis, the data are limited to deals that are open to bidding, although our conclusions will consider the impact of prearranged deals not subject to bidding. It should be expected that prearranged capacity release deals that are subject to bidding will command higher prices than non prearranged deals, all else equal. This appears logical since the rate established in the prearranged deal effectively sets the minimum rate for all subsequent bidders. Furthermore, prearranged deals, by definition, require at least two parties to recognize the value of the released capacity to the replacement shipper, the releasing shipper and the replacement shipper. Ostensibly, a releasing shipper will not make the effort to prearrange a deal if he can get the same rate by just posting the capacity. At the same time, there is a probability that capacity releases that are simply posted without any prearrangement will not be bid on. In a thin market, a bidder may be able to bid below the capacity's value if he senses that no other bids are likely, knowing

that he can always bid again at a higher rate if necessary. Thus, it seems likely that prearranged deals that are subject to bidding will still command a higher rate than deals that are not prearranged.

Whether the deal contains recall rights or not.

Releases of capacity may be subject to recall under terms specified by the releasing shipper. Releases made with recall right terms should have less value than deals without recall rights. The concept is really analogous to firm versus interruptible capacity. Because the releasing shipper has the option to call away the capacity from the replacement shipper, the capacity must be worth less to the replacement shipper. The difference in the rates between recall and non-recall deals, all else equal, should reflect the value the replacement shipper would be willing to pay in order to cancel the releasing shipper's option to call back the capacity. Of course, this value is dependent on the probability that the capacity would be recalled, which is dependent on numerous factors including the season in which the capacity is released, the capacity constraints of the releasing shipper, and the substitutable options of the replacement shipper in the event of recall. For example, if the probability of recalling capacity is very small in the summer, one would suspect that capacity released in the summer with no recall rights would obtain little if any premium over capacity released with recall rights.

Whether the deal is a re-release of previously released capacity.

Capacity acquired through a capacity release transaction may be re-released to another replacement shipper. A replacement shipper would be willing to re-release the acquired capacity to another party who valued the capacity more than the replacement shipper. All else equal, a higher price would be expected for re-released capacity. However, there may be circumstances when a replacement shipper has acquired capacity that, for some reason, is subsequently not needed. Under such an instance, the capacity

could be re-released for less value than it was originally released for.

The amount of bidding activity for any particular capacity release posting.

The amount of bidding activity in general is an indication of how thick the capacity release market is. While a thin market may pose some market inefficiencies and result in rates for released capacity that are inconsistent with what economic logic would dictate in a well-functioning market, at some point the market should reach a participation level that would result in conditions sufficient for efficiency. Therefore, one may witness divergent prices for released capacity due to little market participation. As participation increases in the capacity release market, prices for similar capacity releases should converge.

The amount of bidding activity on any particular capacity release posting should be positively related to the price obtained for the capacity. As more parties vie for the same piece of capacity, its price will be bid up. Since bids are largely evaluated on a net present value basis, it is possible that a lower bid could actually win if it represented more capacity or a longer duration than a bid with a higher price. But if all else is constant, the only way to be awarded the capacity is to bid a higher price than all subsequent bid prices. Therefore, for any specific capacity release deal, the more bidders the higher the ultimate price should be.

The discounted interruptible transportation rate on the pipeline on which the capacity is being released.

In many cases, interruptible transportation is a direct substitute for capacity release. If a company is looking to ship gas on an interruptible basis, they could potentially use the capacity release market to obtain the necessary transportation. Indeed, for capacity release deals of short duration (i.e. one month) and with recall rights, the discounted interruptible rate on the pipeline is essentially a price ceiling over which the released capacity rate is unlikely to rise. While pipelines file tariff rates for interruptible transportation, these rates

are often discounted by the pipeline to generate business. In effect, the pipeline could simply sell the capacity to the interested shipper at the discounted interruptible rate. That is, all interested shippers would realize that they could obtain the capacity in the interruptible market if they collectively eschewed the capacity release market. Assuming that all parties are confirmed profit maximizers, there would be no cases of a rate above the discounted interruptible rate. Of course, in reality parties have interests which may lead them to make decisions that do not reflect profit maximization in the short run. Moreover, there may be less than perfect information in the market that may lead some parties to pay higher prices for capacity. Because a party may anticipate constraints in the interruptible market over longer periods of time, capacity release deals, even with recall rights, may command a premium over the interruptible transportation. Similarly, capacity release deals that do not have recall provisions are likely to achieve a premium over interruptible transportation.

IV. Analysis of Transactions on Tennessee Gas Pipeline

IVa. Tennessee Pipeline Capacity Release Implementation

Each pipeline is required by the FERC to detail the terms and conditions of capacity release transactions in their tariff filing. There are a number of items that a releasing shipper must specify when posting capacity on Tennessee's electronic bulletin board, TENN-SPEED 2. These include:

1. Releasing shipper's name.
2. Transportation quantity to be released including any minimum acceptable level.
3. Commencement date of release and term of release including any minimum acceptable term.

4. Receipt points and delivery points for released service and the amount of firm capacity to be released at each point.
5. The reservation and/or usage rates charges and surcharges for released service including any minimum acceptable rates.
6. Whether the transportation rights are subject to recall by the releasing shipper.
7. Whether contingent bids will be accepted for evaluation.
8. Whether the release is contingent on Releasing Shipper's ability to release capacity on another pipeline.
9. Whether Prearranged Bidding is allowed. This is the case where releasing shipper has made prior arrangements with a bidder to release the transportation rights. If this is the case then the following must also be disclosed:
    - Identity of the prearranged bidder
    - Evidence that bidder meets creditworthiness check or provides a guarantee to transporter of all financial obligations of replacement shipper.
    - Term and rates to which the bidder has agreed.

A shipper that desires to acquire rights to (firm) transportation through the capacity release mechanism can also make a posting on Tennessee's TENN-SPEED 2 system. In such a replacement shipper request, the shipper discloses quite similar information that a Releasing Shipper does. Not only name, term, quantity, but also the maximum rate this shipper will pay for the service. Most release transactions, however, are initiated by a releasing shipper's posting.

Not all releases have to be posted for competitive bidding. Specifically releases less than 30 days do not have to be posted if the releasing shipper accepts liability for charges on released capacity or replacement shipper enters into a separate transportation service agreement with transporter (i.e. Tennessee). Separately, competitive bidding

for a release of any term will not be required if the prearranged bidder agrees to pay the transporter's maximum applicable rate and has agreed to all other conditions stated in the release request.

Bidders must be prequalified or place a cash deposit with Tennessee. During the actual bid period, bids are assigned a bid number to hide the identity of the bidder. Regarding multiple bidding, a bidder submitting a new bid for the same capacity release request effects the withdrawal of the previous bid. New bids must be at a higher rate relative to previous bid.

Following the bidding period the transporter determines the successful bidder by applying the releasing shipper's economic value standard (which was already approved) or shall evaluate bids according to highest present value calculation. Specifically the PV equals,

$$\text{Present Value} = \frac{\text{Bid Rate (\$/Dth)} * \text{Bid Total Quantity (Dth)}}{(1 + i)^N}$$

where:

i is the monthly interest rate of the current maximum yield on 5 year U.S. Government Treasury notes.

N is the lessor of the term of the release or 60 months.

Applicable deadlines are specified in Table 2 below.[16]

[16]Source: Tennessee Natural Gas Pipeline Tariff Filing with the FERC, August 1993.

Table 2: Bidding Rules on Tennessee Pipeline

Applicable Deadline	Depends on Length of Release Request	Resulting Deadline
Minimum Bid Period	if less than 30 days	4 business hours beginning no later than 8 am and ending no later than 8 am on day prior to date of release
	if greater than 30 days but less than 3 months	1 business day
	greater than 3 months	5 business days
Closure of Bidding	if less than 30 days	closes before 11:00 AM CST one business day before release date
	if greater than 30 days but less than 3 months	closes 48 hours prior to nomination of assigned service
	greater than 3 months	closes the fifth (5th) business day prior to nomination of assigned service
Prearranged Bidder's "Window" to match a higher bid	if less than 30 days	1 hour
	if greater than 30 days but less than 3 months	8 hours
	greater than 3 months	24 hours

IVb. Tennessee Pipeline Model Specification and Data

The model specification below attempts to explain the rate for released capacity as a percentage of the maximum firm transportation rate as specified in the Tennessee pipeline tariff filing with the FERC:

$$\%\mathbf{MAX} = a + b1\mathbf{NRELEASE} + b2\mathbf{NWBIDS} + b3\mathbf{WINTER} + b4\mathbf{NZONES} + b5\mathbf{DAYS} + b6\mathbf{VOLUME} + b7\mathbf{MINRATE} + b8\mathbf{PREARR} + b9\mathbf{RECALL} + b10\mathbf{SEQUENCE}$$

Dependent Variable

%MAX = Capacity Release Rate as a Percentage of the Maximum Tariff Rate.[17]

Independent Variables

The percentage of the maximum rate is hypothesized to be a function of the variables described in the previous section. Limitations in the availability of the pipeline data required minor innovations in specifying the variables. The variables in the regression equation specification are defined as follows:

NRELEASE: The number of releases posted by the releasing shipper on Tennessee pipeline. The number includes only those deals that were subject to bidding.

NWBIDS: The number of winning bids for released capacity by the releasee on Tennessee pipeline. The number excludes deals that were prearranged and not subject to bidding.

[17]In our discussion we use the words "rate", "price" and "price per unit" interchangably.

WINTER: A zero/one winter dummy variable. The variable is one when the capacity release deal is for the months between November and March exclusively.

NZONES: The number of zones that the capacity release incorporates. The minimum is one and the maximum is seven (see the description of pipeline zones in the previous section). Because the released capacity can begin at either zone zero, zone one, or both of these zones, the zones are weighted (quantity into zone zero / total quantity + delivery zone) to arrive at the total number of zones the released capacity incorporates.

DAYS: The number of days for which the capacity is released.

TVOLUME: The total volume awarded to the releasee.

MINRATE: The minimum rate specified by the releasing shipper that a potential releasee can bid, represented as a percentage of the maximum rate.

PREARR: A zero/one dummy variable to record if the deal was prearranged. The variable is one of the deal was prearranged.

RECALL: A zero/one dummy variable to distinguish deals that have recall rights associated with the capacity release. The variable is one if the deal includes recall rights.

SEQUENCE: The sequence number of the bid for the bidder who was awarded the released capacity. Because subsequent bids must be higher, sequence measures the bidding activity for any release.

Two variables that were previously noted to be potentially important determinants of the price for released capacity are notably absent from the regression equation specification, the pipeline's discounted interruptible transportation rate and the pipeline's load factor. It was not possible to obtain an indication of the discounted interruptible transportation rates with any accuracy because of competitive sensitivity. Tennessee specifically declined to furnish this information to us. Rather than applying the tariff rates for Tennessee interruptible transportation, which could prove misleading depending on the extent of the discounting at any particular time, we chose to leave out the variable for the initial estimation. The load factor does not explain capacity release prices on any specific pipeline, but is important in explaining prices across pipelines, and is therefore left out of our specification for Tennessee pipeline.

We were provided with a history of capacity release postings and awards on Tennessee pipeline from September 1993 through the beginning of January 1994. Of the 179 capacity release postings, 99 were awarded and thus reassigned to the bidder with the highest bid. We had complete information for the model specification for 76 of the 99 awarded capacity releases. The 76 capacity release deals that represent the data set for our analysis were all subject to bidding (see the appendix for a hard copy of the data).

IVc. Key Results of the Tennessee Pipeline Capacity Release Analysis

Using Ordinary Least Squares (OLS) to estimate the equation specified in the above section we come up with some unexpected results. The column labeled OLS in Table 3 displays the coefficients, T-statistics, and R-squared for the variables used in the estimation. With an R-squared of .865, the regression model appears to do a relatively good job of explaining the prices witnessed for released capacity on Tennessee pipeline. However, on closer inspection it becomes apparent that MINRATE, the releasing shipper's specified minimum rate as a percentage of the maximum rate, is explaining the vast majority

of price ultimately achieved for released capacity. With one exception, all the other variables in the equation are insignificant within a 95 percent confidence interval. The one exception is SEQUENCE which represents where the winning bid was in the sequence of all bids for the specified released capacity. This result may suggest a thin market, but before we attempt to draw any conclusions from this result, we need to examine the model's results more closely.

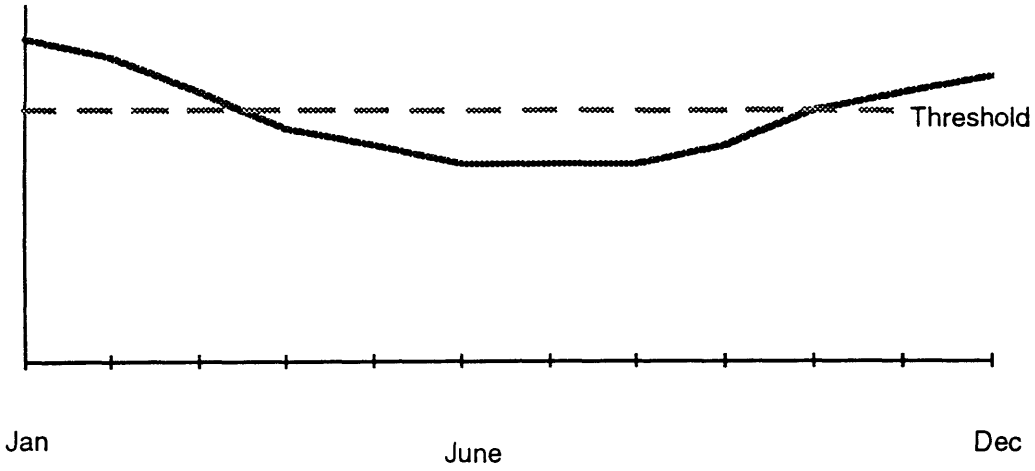
Table 3: Regression Results for Tennessee Pipeline Analysis

	Regression	OLS	OLS2	LOGIT	LOGIT2	OLS3	OLSMIN
	Dependent Variable	%MAX	%MAX	%MAX	%MAX	%MAX	MINRATE
	Sorting	None	None	None	None	None	None
C	*coefficient*	0.0295		-2.6094	-2.7898	0.0302	0.1513
	(T-stat)	(1.12)		(-13.94)	(-30.16)	(1.16)	(3.16)
NRELEASE Releasing Shipper Activity		-0.0013		-0.0013		-0.001	0.0027
		(-1.05)		(-0.15)		(-0.76)	(0.92)
NWBIDS Acquiring Shipper Activity		0.0005		0.004		0.0013	
		(0.21)		(0.23)		(0.52)	
WINTER Winter Dummy Variable		-0.0047		-0.0773			0.0336
		(-0.36)		(-0.83)			(1.08)
NZONES Zones, Distance		-0.005		-0.0193		-0.0055	-0.0047
		(-0.98)		(-0.52)		(-1.09)	(-0.38)
DAYS Period of Release in Days		-0.00001		0.0002		-0.00002	-7E-06
		(-0.06)		(0.15)		(-0.10)	(-0.02)
TVOLUME Volume in MMBtu		0.000001		0.000007		0.000001	0.00002
		(-1.13)		(-0.89)		(-1.34)	(0.19)
MINRATE Minimum Bid as % of Max		1.0458	1.0185	6.7389	6.7395	1.0471	
		(18.86)	(37.35)	(17.04)	(19.01)	(19.32)	
PREARR Prearranged (dummy var.)		.0025		-0.1042		0.0035	-0.0037
		(0.13)		(-0.78)		(0.19)	(-0.08)
RECALL Recall Rights (dummy var.)		-0.00008		-0.0081		0.0018	0.0201
		(-0.01)		(-0.09)		(0.14)	(0.69)
SEQUENCE Bidding Activity		0.0082	0.0083	0.0294	0.0562	0.0077	
		(2.97)	(5.6)	(2.51)	(4.19)	(2.81)	
WINTER2 Winter Dummy Variable						-0.0176	
						(-1.35)	
Number of Observations		76	76	76	76	76	76
R-squared		0.8652	0.8543	0.8418	0.8337	0.8686	0.06432

Under the original hypothesis, we expected to see a positive sign for both NRELEASE and NWBIDS. In the analysis, NRELEASE is negative while NWBIDS is positive with both seeming to play little or no role in defining the price of released capacity. The unimportance of these variables is not all that surprising and likely has more to do with our limitations in defining NRELEASE and NWBIDS as opposed to any definitive proof that the participating firms' activities and experience have no impact in the market.

The insignificance and negative sign of WINTER, however, is surprising. We believed that there would be a clear premium on released capacity in the winter when pipeline capacity is typically constrained. Our results suggest that capacity is either not constrained over our definition of the winter season or the demand for released capacity is thin. In other words, despite high capacity utilization there are few parties vying for incremental capacity. Figure 1 displays a hypothetical capacity utilization curve for pipeline extending from the Gulf Coast to the Northeast. One would suspect a strong seasonality effect with high utilization of the pipeline in the colder months than in the warmer months, leading to the u-shaped curve seen in Exhibit 1. There are two questions to ask. What are the magnitudes of capacity utilization associated with the u-shaped curve and at what point on the utilization curve is a threshold reached where released capacity commands a premium? The second question is not only dependent on capacity utilization but also on the level of demand for non-firm capacity.

Exhibit 1



Given the capacity utilization on Tennessee pipeline, we can redefine the threshold at which point released capacity earns a seasonality premium. To do this within the regression analysis, we define a new variable WINTER2 to replace WINTER. Where WINTER is 1 if the capacity release takes place during the months of November through March exclusively, WINTER2 is 1 for deals occurring in December through February exclusively. The initial regression equation is estimated, replacing WINTER with WINTER2. The results are presented in Table 3 under the column labeled OLS3. The WINTER2 variable is still negative, and actually more significant. One possible conclusion is that the market for released capacity subject to bidding is too thin to command a premium during times of high capacity utilization on the pipeline. Still another possibility for the counterintuitive result may be that our data does not represent enough of an annual coverage to accurately estimate any seasonality impact.

In the OLS estimation, the NZONES, DAYS, and TVOLUME coefficients are not significantly different from zero, suggesting that the number of zones which the capacity incorporates, the number of days of release, and the total volume awarded do not have an

impact on the price of released capacity. Prearrangement (PREARR) and recall rights (RECALL) are also not significantly different from zero, although the coefficients display the intuitively correct signs. Again, this may be the result of too few observations in the data set to establish clear relationships. The dominance of MINRATE and the significance of SEQUENCE in the regression analysis coupled with the insignificance of the other factors, however, signal the possibility of a thin market that is not functioning according expectations.

With a coefficient of 1.045, the minimum rate specified by the releasing shipper (MINRATE) appears to be dictating the rate at which the capacity is ultimately awarded. As the competition for any particular released capacity increases, the rate for the capacity is incrementally bid up from the minimum rate specified, hence the positive sign and significance of SEQUENCE. Since any bidder can bid on a piece of released capacity as many times as he chooses as long as each subsequent bid is higher than the last, a rational strategy would be to bid the minimum rate, watch the bulletin board to see if other parties are bidding on the capacity, and bid just above the highest bid before the closing of the bidding period. Of course, a bidder will not place a bid that results in paying more for the capacity than it is worth. In a well-functioning market with many participants vying for the same capacity, the rate for the capacity should be bid up to the point where the party who values the capacity most bids just enough to acquire the capacity over the party who has the next highest valuation. In a market with few participants relative to the volume of fungible capacity released, the same principles hold but the value of the capacity will be quite low since bidders can attempt to acquire capacity by bidding on other releases rather than bidding up any particular capacity release. The OLS2 column in Table 3 is a simplified version of the thin market hypothesis. Indeed, it appears that the two variable model consisting of MINRATE and SEQUENCE is a more realistic model for explaining the Tennessee pipeline capacity release rates than the more detailed model.

Knowing that MINRATE is largely determining the ultimate price for released

capacity, it could be helpful to specify how firm shippers are setting the minimum acceptable rate for a capacity release deal. In an attempt to measure the impacts on the setting of MINRATE, we make MINRATE the decision variable and regress some of the independent variables on it. We drop NWBIDS, TVOLUME, and SEQUENCE from the right hand side, since these variables can not be predetermined before the setting of the minimum acceptable bid rate. The results of the regression on MINRATE are presented in the OLSMIN column in Table 3. The low r-squared and t-stats suggest the specification is not a very good one. It is readily apparent that important determinants of MINRATE are missing from the specification, including a direct measure of the scarcity of capacity in the market. It should also be noted that the releasing shipper is, to some extent, simultaneously setting all the right hand side variables with MINRATE. Given the data limitations and number of observations, we leave an improved specification of MINRATE for future research. As the reader will see in the following section, we achieve significantly better results with the MINRATE specification with El Paso's data.

The conclusions of our analysis suggest that there are few parties interested in the released capacity posted on Tennessee's bulletin board, and subsequently the capacity is commanding a relatively small fraction of the maximum rate. This conclusion does not extend to all capacity released on Tennessee pipeline. There are some capacity release deals that have been prearranged for the maximum rate that are not represented in our data. This suggests that when capacity is valuable, shippers are prearranging at the maximum rate. Indeed, released capacity may be worth more than the maximum rate to prospective replacement shippers. The price cap at the tariff rate prohibits interested parties from competing for capacity valued above the maximum rate. Capacity valued above the maximum rate is assigned on a first-come-first-serve basis at the maximum rate. This provides an incentive for valuable capacity to be prearranged at the maximum rate. The released capacity that is witnessed in our data set may be the residual capacity left over after all the valuable capacity has been reassigned through prearrangement. If the price for

released capacity were not capped at the tariff rate, we could see bidding that would reflect competition for valuable capacity and rates well above the corresponding tariff.

IVd. LOGIT Model Specification for Tennessee Pipeline

Our specification for the dependent variable results in values between zero and one. Taking this information into account, a LOGIT specification can be used to increase the efficiency of the estimation. A LOGIT specification restricts the estimated dependent variable between the values of zero and one.

The LOGIT specification is represented as:

$$\ln (Pi / 1 - Pi) = a + bXi$$

where Pi equals the rate for the released capacity as a percentage of the maximum rate.

The LOGIT specification has the following properties:

1. As P ranges from zero to one, ln (Pi / 1 - Pi) ranges from negative infinity to infinity.
2. ln (Pi / 1 - Pi) is linear in x, but the probabilities are not.
3. B measures the change in ln (Pi / 1- Pi) for a unit change in Xi.

We were able to use the LOGIT model because all values of the dependent variable were greater than zero but less than one. The results of the LOGIT estimation are presented in Table 3. The column labeled LOGIT displays the results of the estimation including the independent variables NRELEASE through SEQUENCE. The LOGIT2 column show the results of the thin market hypothesis estimation. Both columns suggest that there is little value to the LOGIT specification in helping to explain capacity release rates. We suspect

that the LOGIT specification does not improve the estimation either because there are too few observations or because we are working with individual rather than group observations.[18]

V. Analysis of Transactions on El Paso Natural Gas Pipeline

Va. El Paso Natural Gas Pipeline Capacity Release Implementation

A releasing shipper must post a notice on El Paso's electronic bulletin board to release firm capacity. The notice must reveal the following information:

1. Releasing shipper's name and the individual authorizing the capacity release.
2. The maximum and minimum (if desired) daily transportation quantity the firm shipper wants to release.
3. The delivery point(s) at which firm capacity will be released and the amount of firm capacity at each point.
4. Whether the deal will be subject to recall, and if so, the terms under which capacity can be recalled.
5. The requested date and term of the release.
6. Whether the releasing shipper is willing to consider a shorter time for release, and if so, the minimum term.
7. Whether the bidder desires the bid in dollars or as a percentage of the maximum reservation rate.
8. The maximum reservation charge for the capacity being released and whether the releasing shipper is willing to consider releasing capacity at a lower rate.

[18]Pindyck and Rubinfeld, Econometric Models and Economic Forecasts, 3rd Edition, p.260

9. Whether Option 1, Option 2, Option 3, or Option 4 shall be used to determine the highest bidder. If Option 3 (releasing shipper's criteria) is chosen the criteria by which the bids are to be evaluated must be revealed. If Option 1 is chosen, the weights for each factor must be revealed.
10. The method by which ties will be broken.
11. If the shipper elects to have El Paso actively market the capacity for a fee.
12. The duration of the bidding period if longer than specified in the table below.
13. The date and time of the posting.
14. Whether the releasing shipper is willing to accept contingent bids.
15. Whether the releasing shipper's notice will contain minimum conditions or that minimum conditions have been revealed to El Paso but not in the posting.

The releasing shipper must also deliver a notice to El Paso via the electronic bulletin board of a prearranged release. The notice must specify if the prearranged release is for the maximum applicable reservation rate and whether the releasing shipper is seeking bids to compete with the prearranged bid on non-rate terms. A prearranged bid under thirty days is not subject to bidding competition. Therefore, a releasing shipper can avoid the competitive bidding process by 1) prearranging a bid for the maximum reservation rate or 2) prearranging a capacity release for less than one month.

A bid may be submitted on El Paso's electronic bulletin board any time during the open bidding period for the capacity. Each bid must include the following information:

1. Bidding shipper's name and the individual responsible for authorizing the bid.
2. The term of the proposed acquisition.
3. The rate the bidder is willing to pay. The rate can not be lower than the minimum specified by the releasing shipper or greater than the maximum applicable tariff rate.

4. The volume desired and minimum acceptable volume.

5. Whether the bidding shipper is an affiliate of the releasing shipper.

6. Whether the bid is contingent and the contingency which must be satisfied.

A party can also post a notice on El Paso' bulletin board offering to purchase capacity. The party must furnish at least the party's name and contact person, the term of the proposed purchase, the maximum rate the party is willing to pay, the volume desired, and the delivery points.

If there are multiple bids for a capacity release and the bids are lower than the maximum allowable rate and higher than the minimum specified rate then the winning bidder will be established by one of four options. However, if the capacity release was prearranged, the prearranged acquiring shipper has the option to match the highest bid and acquire the capacity. If the releasing shipper does not specify a valuation option the default is Option 1 with all three factors getting equal weight. If bids from two or more bidding shippers result in bids of equal score, the acquiring shipper(s) shall be determined by the tie breaking method designated by the releasing shipper, and if none is specified, by a lottery.

Option 1: Weighted Composite Bid Calculation

	Releasing Shipper's Assigned Weight (a)	Releasing Shipper's Maximum Bid (b)	Actual Bid (c)	Actual Bid Weighting (c/b * a)
1) volume				
2) term				
3) charge				

Actual Weighted Composite Bid: _____%

Option 2: Net Present Value Calculation

$$\text{Present Value} = (\text{Bid Rate}) \times \left[\frac{1 - (1 + i)^{-n}}{i} \right] \times (\text{Volume})$$

where: **n** is the term of the agreement in months.

i is the interest rate per month using the current commission rate.

Option 3: Releasing Shipper's Criteria

The criteria must be objectively stated, applicable to all potential bidders and non-discriminatory.

Option 4: First Come/First Serve

Capacity will be awarded on a first-come/first-serve basis as bids are received up to the maximum capacity specified in the notice of the release.

Open seasons and matching periods for bidding on released capacity are dependent on the length of the term of the capacity release and the winning bid valuation method. Table 4 below summarizes applicable bidding periods and deadlines.

Table 4: Bidding Rules on El Paso Pipeline

Applicable Deadline	Length of Release Request and Option	Resulting Deadline
Minimum Bid Period	if less than 30 days Option 4	1 business day at least 2 business days prior to day of release
	Option 1 or 2	1 business day at least 2 business days prior to day of release, unless prearranged then 3 days prior to release
	Option 3	1 business day at least 3 business days prior to day of release
	if greater than 30 days but less than 3 months	5 business days starting at least 9 business days prior to day of release, unless prearranged then 12 days prior to release
	greater than 3 months but less than 1 year	10 business days starting at least 14 business days prior to day of release, unless prearranged then 19 days prior to release
	greater than 1 year	20 business days starting at least 24 business days prior to day of release, unless prearranged then 34 days prior to release
Prearranged Bidder's "Window" to match a higher bid	if less than 30 days	1 business day
	if greater than 30 days but less than 3 months	3 business days
	greater than 3 months but less than 1 year	5 business days
	greater than 1 year	10 business days

Vb. El Paso Natural Gas Pipeline Model Specifications and Data

As with the Tennessee Gas Pipeline specification, the El Paso model specification attempts to explain the rate for released capacity as a percentage of the maximum rate. The maximum rate is the firm transportation tariff for the capacity as specified in El Paso's tariff filing with FERC. Refer back to Equation 1, the Tennessee Pipeline model specification, for a description of the variables and form of the model. The two following variables, not present in the Tennessee model specification, were added for EL Paso:

RERELEASE: A zero/one dummy variable to indicate if the capacity release was a re-release of capacity that was acquired in the capacity release market. The variable is one if the deal was a re-release.

BIDFORM: A zero/one dummy variable to indicate if the bid was made in percentage or dollar terms. The variable is one if the deal was in dollars.

The variables NRELEASE through RECALL (excluding WINTER) and WINTER2 were included in the Tennessee pipeline model specification and their inclusion here follows a similar rationale. The variable SEQUENCE in the Tennessee specification represented the sequence number of the winning bid relative to the other bids for the specific capacity release. On the El Paso pipeline there are no instances of multiple bids for individual capacity releases! SEQUENCE is therefore left out of the EL Paso specification. In the El Paso specification RERELEASE represents the release tier of the deal, i.e. is the released capacity being re-released. BIDFORM indicates the bid method, dollar or percentage terms. While an economic explanation for the importance of BIDFORM is not readily apparent, there may be some psychological reasons why the different bid methods

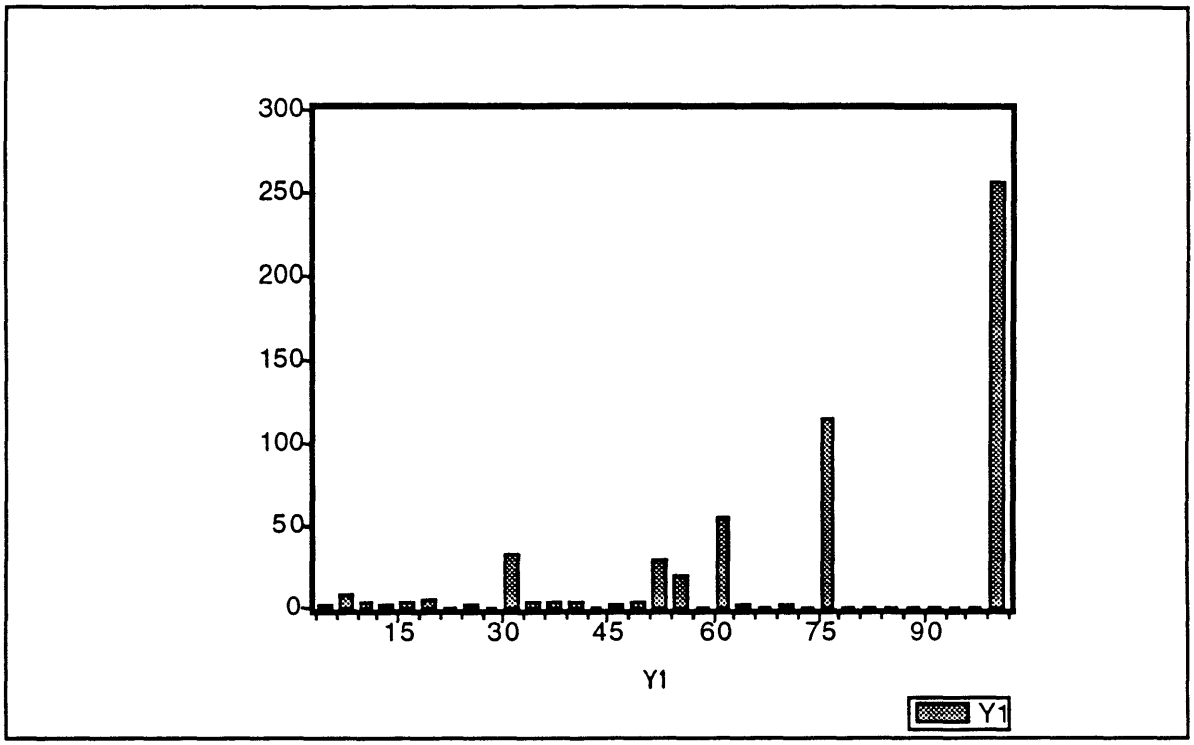
would result in significantly different prices for released capacity.

We were provided with a history of capacity release postings and awards on El Paso pipeline from April 1993 through mid-February 1994. Of the 1,150 capacity release postings, 548 were awarded, that is the capacity was reassigned to the bidder. We had complete information for the model specification for all 548 awarded capacity releases. Of the 548 capacity release deals, 292 were subject to bidding competition. The remaining 256 observations were either prearranged at the maximum rate (91 percent) or specifically specified that no less than the maximum tariff rate would be considered. The 292 observations represent the data set for our analysis (see the Appendix for a hard copy of the data).

Vc. Key Results of the El Paso Pipeline Capacity Release Analysis

A quick overview of all capacity release transactions completed on El Paso can be obtained by considering Exhibit 2, which is a histogram of %MAX, the final clearing prices for the transactions. This histogram shows that many releases on El Paso are clearing at a few discrete prices. Since releasing shippers can specify a minimum rate as a percent of the maximum reservation rate and since acquiring shippers do not face bidding competition, then deals seems to be going for the minimum rate specified. Without the threat of another bidder winning the release with a slightly higher bid, a rational bidder would bid at the minimum rate specified by the releasing shipper. As the histogram reveals, a large proportion of the capacity release deals are clearing at 100%.

Exhibit 2: A Histogram of Normalized Prices for Capacity Release Transactions on El Paso Natural Gas Pipeline



For our initial regression, we performed Ordinary Least Squares on the specification detailed in the previous section. The results, displayed in the first column of Table 5, reveal a significant deviation in MINRATE from our analysis of Tennessee Gas pipeline.

However, MINRATE, the minimum rate as specified by the releasing shipper, is significantly negative, contrary to economic logic. This result forces us to reconsider our model specification or at least find a subset of the original data which the model more completely and intuitively explains.

Upon further inspection of the raw data and through discussions with El Paso, we identified MINRATE itself as the key discriminator. We found that when we sorted the original 568 transactions into two subsets, one where MINRATE equals zero and another where MINRATE is greater than zero, the results are much more rational.

For the subset of transactions where MINRATE equals zero, we learned that many releasors who did NOT specify a minimum bid rate were actually considering only bids at the maximum reservation rate.[19] By only considering bids at 100% of the maximum reservation rate, these releasors were bypassing the bidding mechanism altogether. From the releasor's viewpoint, either the releases requiring the maximum reservation rate went for 100% or expired without any bids. Economic intuition suggests three explanations which are not necessarily independent: (1) releasors value these releases more than those releases which they did bother to specify a bidding floor below 100%, (2) releasors did not have a significant motivation to sell a high percentage of the releases they post, and (3) the releasors, primarily LDCs in California, are colluding. Interestingly, 91.4% of these 256 transactions were prearranged.

[19]Discussion with Sally Turley interpreting Section 28.4 (h) of El Paso Natural Gas Company's capacity release tariff filing with the FERC. (4/7/94)

For the subset of transactions where releasors did specify a minimum reservation rate (MINRATE>0), the regression of %MAX is dominated by MINRATE as seen in column 2 of Table 4. The dependence of %MAX on MINRATE is evident; essentially the minimum rate is determining the final release rate. The strength of this dependence prevents an easy assessment on other , more subtle, determinants of %MAX.

Since the minimum rate is essentially the market price for the capacity, the real question is what independent variables are determining the minimum rate specification in the posting. To determine this, we regressed MINRATE on the other applicable independent variables to explain what is driving the minimum rate specification. We did not include NWBIDS because an acquiring shipper's activity can not influence, a priori, a releasing shipper's determination of the minimum rate. We similarly did not include SEQUENCE or WINTER2. As with the Tennessee specification, the regression is susceptible to criticisms of simultaneity and variable omission. Nonetheless, the results of this regression, in column 3 of Table 4, agree with our hypotheses about the significance of certain determinants for the price for released capacity:

- NRELEASE is positive and significant, possibly suggesting either a slight learning effect or evidence of market power.
- WINTER2 is negative suggesting that releases in winter have lower minimum rates
- releases covering longer distances have more value (NZONES)
- period and volume have no significant effect (DAYS, TVOLUME)
- prearranged deals, only 37% of this subset, have no significant effect (PREARR)
- releases with recall rights have less value than those without recall rights (RECALL).

Because many of the releases are from a concentrated group of LDCs in California;

we wondered how they in particular went about setting the minimum reservation rate. How did the setting of minimum rates vary over time? Did LDCs set high rates initially and then readjust downward? To determine whether this was the case we ranked **all** the release postings not prearranged for 100% by the minimum rate specified and then compared this to when the release was offered.[20] The correlation between minimum rate and date offered, -0.782, supports the theory that releasors lowered their minimum rates with time. The minimum rate was likely lowered over time in order to raise the percentage of postings that actually attracted a bidder during a period of surplus-capacity in this region of the country. This correlation suggests a trial and error method by the releasing shippers who were attempting to determine the "correct" market price for their releases.

[20]As a proxy for the exact date, we used the offer number, which increases with time.

Table 5: Regression Results for El Paso Pipeline

	Data Source	El Paso	El Paso	El Paso
	Dependent Variable	%MAX	%MAX	MINRATE
	Sorting	None	MINRATE non-zero	MINRATE non-zero
C	*coefficient (T-stat)*	44.9419 (3.89)	2.6696 (4.11)	-10.7371 (-1.29)
NRELEASE Releasing Shipper Activity		0.0246 (6.05)	-0.0006 (-2.63)	0.0175 (4.23)
NWBIDS Acquiring Shipper Activity		0.1253 (5.90)	0.0010 (0.60)	-
NZONES Zones (Distance)		5.3456 (1.89)	-0.4728 (-3.01)	16.9137 (7.97)
DAYS Period of Release in Days		0.0033 (1.492)	-0.0001 (-0.63)	0.0038 (1.92)
TVOLUME Volume in MMBtu		1.552E-07 (0.01)	-3.039E-07 (-0.35)	0.00002 (1.87)
MINRATE Minimum Bid as % of Max		-0.2582 (-8.93)	0.9942 (291.53)	-
PREARR Prearranged (dummy var.)		11.4108 (6.52)	-0.04834 (-0.49)	0.6634 (0.35)
RECALL Recall Rights (dummy var.)		-1.8824 (-0.63)	-0.6974 (-4.07)	-7.0346 (-2.15)
WINTER2 Winter Dummy Variable		-15.374 (-9.22)	-0.1283 (-0.95)	-19.867 (-9.47)
RERELEASE Re-release (dummy var.)		9.4744 (2.65)	-0.2639 (-1.27)	-
BIDFORM Bid in $ (dummy var.)		-47.7083 (-7.02)	0.3323 (0.89)	-
Number of Observations		548	292	292
R-squared		0.6353	0.9986	0.5058

VI. Pooled Data

VIa. Pooled Model Specifications and Data

As with the each individual pipeline specification, the pooled model specification attempts to explain the rate for released capacity as a percentage of the maximum rate. The maximum rate is the firm transportation tariff for the capacity as specified in the respective pipeline's tariff filing with FERC. Refer to Equation 1 and the description of the variables in the section on the Tennessee pipeline model specifications and data.

The pooled specification includes the variables NRELEASE through RECALL and WINTER2. The variables SEQUENCE, BIDFORM, and RERELEASE are excluded from the pooled model specification since they are exclusive to either El Paso Pipeline or Tennessee Pipeline. When the data are pooled, there are a total of 368 observations, 76 observations from Tennessee and 292 from El Paso. The regression results for the pooling analysis are shown in Table 6.

Table 6: Comparing Two Regressions with Pooling

	Data Source	Tennessee	El Paso	Pooled
	Dependent Variable	%MAX	%MAX	%MAX
	Sorting	None	MINRATE non-zero	-
C	*coefficient*	5.1072	3.2194	5.2299
	(T-stat)	(1.96)	(7.32)	(6.98)
NRELEASE Releasing Shipper Activity		-0.0960	-0.0005	-0.0015
		(-0.72)	(-2.42)	(-2.21)
NWBIDS Acquiring Shipper Activity		0.2304	0.0010	-0.0002
		(0.89)	(0.56)	(-0.05)
NZONES Zones (Distance)		-0.6407	-0.6014	-0.5488
		(-1.21)	(-4.86)	(-2.81)
DAYS Period of Release in Days		0.0339	-0.0001	-0.0000
		(2.12)	(-0.55)	(-0.08)
TVOLUME Volume in MMBtu		-0.0001	-1.936E-07	-6.617E-07
		(-0.95)	(-0.22)	(-0.23)
MINRATE Minimum Bid as % of Max		0.9967	0.9929	0.9712
		(18.54)	(308.69)	(120.47)
PREARR Prearranged (dummy var.)		-0.5789	-0.0267	-0.4428
		(-0.31)	(-0.27)	(-1.54)
RECALL Recall Rights (dummy var.)		-0.5581	-0.7349	-0.8012
		(-0.42)	(-4.212)	(-2.04)
WINTER2 Winter Dummy Variable		-2.2621	-0.1701	-0.9706
		(-1.67)	(-1.31)	(-2.94)
Number of Observations		76	292	368
Sum of squared residuals		1604.304	160.4110	2154.488
R-squared		0.852566	0.998612	0.989819

IVb. The Chow Test: Comparing the Two Regressions

A popular method of testing for differences between two regressions is the Chow test.[21] To perform the Chow test, we run the above regression specification with the Tennessee pipeline data, El Paso pipeline data, and the pooled data obtaining the following residual sum of squares (RSS) from the regressions:

RSS for pooled data - RSSp = 2154.488, df = 358,

RSS for Tennessee data - RSSt = 1604.304, df = 66,

RSS for El Paso data - RSSe = 160.41, df = 282.

The computed F is given by:

$$\frac{[\ RSSp - RSSt - RSSe]\ /\ k}{[\ RSSt + RSSe]\ /\ (N1 + N2 - 2k)} = 7.6863\ ,\ df = 10\ ,\ 348$$

The computed F (7.6863) exceeds the critical F (2.32) at 99 percent probability. We reject the hypothesis that the regressions are the same. Thus, the data should not be pooled. The rejection of the F-test can be explained intuitively by the divergence in the way the two markets are functioning. The rate for released capacity on Tennessee is determined by the minimum bid specified by the releasing shipper and the bidding activity for the capacity. Bidding competition for any particular piece of released capacity on Tennessee forces the rate higher. On El Paso, however, there are no multiple bids for any specific piece of released capacity. Thus bidding competition is apparently absent in El Paso's market. The strong summer peak in the California market relative to the weak summer demand in the Northeast also differentiate the two

[21] Developed by Gregory C. Chow (1960), the test is based on the assumptions that the disturbances are distributed normally with zero mean and constant variance and that the disturbances of the two regressions are independently distributed.

markets.

Although we can not draw conclusions from the pooled regression analysis, in the following section we discuss some general conclusions about the capacity release market based on our analysis of the two pipelines and suggest areas for future research.

VII. Overall Conclusions and Suggestions for Further Research

Conclusions

When we began this thesis project, our hope was to shed some light on how secondary capacity prices were being set in the nascent capacity release market. Because of time and data limitations, we have been restricted to examining only a small fraction of the whole market, namely capacity release transactions on Tennessee Gas Pipeline and El Paso Natural Gas Pipeline. Our insights into how these two markets are functioning, however, may provide some insights into the aggregate capacity release market. Based on the results of our analysis for Tennessee and El Paso, we find:

- Little evidence of bidding competition in the competitive portion of the capacity release market (capacity release for a term of more than 30 days and if prearranged, then prearranged for a value less than the maximum rate).

- Therefore, the minimum bid specified by the releasing shipper in the capacity release posting is largely determining the price at which the capacity is ultimately awarded.

- The following variables are playing a significant role in the setting of the minimum rate in the El Paso capacity release market:
  - Releasing Shipper's activity,
  - Distance,
  - Recall rights, and
  - Seasonality.

  While releasing shipper activity and distance positively influenced minimum rates, recall rights and seasonality negatively influenced minimum rates.

- Parties are still prearranging for capacity release at 100 percent of the maximum rate and thus avoiding bidding competition. This suggests that when parties anticipate scarcity in pipeline capacity they are prearranging for "valuable" capacity.

- In highly concentrated markets, such as California, where a small number of firm shippers hold a large portion of the available pipeline capacity, it appears to be easier for releasing shippers to recognize each others' actions in the capacity release market. In setting the minimum rates for released capacity on El Paso, these shippers collectively started high and lowered the minimum rates over time.

Suggestions for Future Research

While the analysis and conclusions in the paper are insightful, we recognize the timing of this study was not optimal in terms of a maturity of the capacity release market and the availability of quality data. At least one complete year of capacity release data would be necessary to explain the seasonality effects on the price for released capacity. In addition, a full year of data would smooth out some of the learning and "immaturity" of the first few months of operation that we likely witnessed in our data. It would also be helpful to look at a larger representation of the pipeline

industry and a greater diversity of regional markets. Fortunately, starting in June of this year, the FERC will require pipeline companies to make available standardized downloadable information from their electronic bulletin boards.

Additional improvements in the data should include an expansion of the variables we examined in this thesis. Namely, the discounted interruptible transportation rates and variations in load factor should be present in the analysis. Since interruptible transportation is a substitute to short term capacity release, the discounted IT rate should have an important limiting impact on the price for released capacity of short duration. Furthermore, a more direct measure than seasonality should be included to measure the impact of scarcity on the price for released capacity. While pipelines will be reluctant to release this sensitive information, it would worthwhile to investigate a way to accurately represent these effects in future regression analyses.

Finally, the fact that some capacity release deals are commanding 100 percent of the maximum tariff rate suggests that some released capacity could be acquiring a price above this imposed price ceiling. It may be instructive to pool prearranged deals at 100 percent with the competitive portion of the market and apply a TOBIT estimation to try to explain the aggregate market. The TOBIT estimation would take into account the fact that prices are being capped at 100 percent of the maximum tariff rate.

Despite the shortcomings of our analysis, the approach presented in this thesis should help to identify the economic and policy issues of the capacity release market. It should be relatively straightforward to take the fundamental concepts discussed in this paper and structure a more complete analysis.

Glossary[22]

We offer explanations of the terms below to assist the reader who does not have a prior working knowledge of the natural gas industry.

Acquiring Shipper:

In a capacity release transaction, the shipper who has been awarded firm capacity on a specific pipeline.

Bundled Services:

Pipeline services offered in combination such as the commodity cost (the gas itself) and the transportation cost. Under FERC Order 636, interstate pipelines were asked to separate out their cost structure on an unbundled (single rate for single service) basis.

Burner Tip:

Any of the various end-use points for natural gas: a residential range, commercial water heater, or an industrial steam generator.

Capacity Assignment:

The ability to reassign capacity to another entity.

Capacity Brokering:

The method of assigning the right to receive firm transportation service before Order 636's mandate for a capacity release program.

Commodity Cost:

The charge for the physical product (i.e. gas itself) actually taken by the shipper.

Dekatherm (Dth):

A method of measuring natural gas by its heat content and not its volume. A unit of heat equal to 1 million British thermal units (BTUs) or 1 MMBTU.

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[22]We acknowledge the course materials of the Natural Gas Training and Education Association (NGTE) of Houston, TX as an aid in developing consistent definitions.

Demand Charge:

A fixed charge for transportation service based on the customer's estimated peak hourly, daily, or monthly gas usage.

Federal Energy Regulatory Commission (FERC):

The Federal agency having jurisdiction over interstate sales of natural gas; FERC is the successor to the Federal Power Commission (FPC).

Firm Capacity, Firm Transportation:

Gas transportation service, the reservation of space on a pipeline, which is not subject to prior claim by another customer or class of service. The highest quality service that can be offered to customers.

Electronic Bulletin Board (EBB):

The electronic "market" for pipeline services including nominations; capacity release is a recent but major addition to pipeline ebbs.

Interruptible Transportation:

Natural gas transportation or sales service that receives a lower priority than firm service.

Interstate Pipeline:

An entity that transports gas produced in one state for consumption in any other state; a pipeline that is subject to FERC regulation.

Intrastate Pipeline:

An entity that transports gas produced in one state for consumption only in that same state; a pipeline that is not subject to FERC regulation.

Local Distribution Company (LDC):

The entity charged with servicing the residential commercial and industrial gas needs of a region in exchange for state-level regulatory oversight. For example, Southern California Gas serves the needs of Southern California including Los Angeles. Commercial and industrial entities have the option to bypass the LDCs rates by contracting for gas directly and using the LDC as a transporter.

Maximum Tariff or Reservation Rate:

The maximum rate that any party can charge for firm capacity on a particular pipeline; this rate, usually expressed in $/volume, is stated in the pipeline's FERC Gas Tariff. Given a particular pipeline, maximum rates generally increase with distance.

Modified Fixed Variable (MFV):

The Pre-636 pipeline rate design. Under the MFV rate design, certain fixed costs that the pipeline incurs (costs associated with the pipeline's return on equity and associated income taxes) are included in the pipeline's volumetric charge (i.e. a variable charge), while all other fixed costs are recovered in the demand charge.

Nominations:

In this context, the amount of gas a shipper expects to transport on a particular pipeline.

Prearrangement:

In a capacity release transaction, an agreement between a releasing shipper and an acquiring shipper which occurs before the releasing shipper posts the release on the pipeline EBB. For releases under 30 days, prearrangement is a method to avoid bidding competition for posted capacity.

Releasing Shipper:

In a capacity release transaction, the shipper posting firm capacity for sale on a specific pipeline.

Replacement Shipper:

Same as Acquiring Shipper. See above.

Straight Fixed Variable:

The Post-636 pipeline rate design. Under the SFV rate design, all fixed costs that the pipeline incurs are recovered in the demand charge.

Wellhead:

The source of natural gas.

%MAX	NRELEASE	NWBID	WINTER	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	SEQUENCE	WINTER2
25	2	9	0	1.28	31	3,693	0	0	0	2	0
19	2	9	0	1.28	304	3,693	0	0	0	22	0
11	2	1	0	5.35	27	5,808	11	0	1	1	0
19	1	9	0	6.00	29	3,500	19	1	1	1	0
8	2	9	0	2.35	31	1,000	0	0	0	9	0
9	2	1	0	3.00	31	10,000	9	1	0	4	0
14	3	2	0	3.00	30	5,000	14	0	0	4	0
13	3	1	0	3.00	31	5,000	13	1	0	2	0
18	3	4	0	3.00	31	10,000	7	0	0	8	0
98	14	3	0	3.56	16	6,356	82	0	1	1	0
24	14	5	1	3.00	30	20,900	24	0	1	6	0
20	14	3	1	3.00	27	10,000	15	0	0	1	0
15	14	1	1	3.00	27	5,000	15	0	0	2	0
15	14	9	1	3.00	27	2,081	15	0	0	3	0
15	14	5	1	3.00	27	25,000	15	0	0	4	0
26	14	3	1	3.00	31	15,175	26	0	0	2	1
26	14	4	1	3.00	31	3,500	26	0	0	1	1
26	14	9	1	3.00	31	3,000	26	0	0	5	1
26	14	4	1	3.00	31	2,485	26	0	0	4	1
27	14	5	1	3.00	31	17,000	27	0	1	1	1
18	14	7	1	3.00	8	3,000	18	0	1	1	1
22	14	5	1	3.50	30	8,000	22	0	1	2	1
22	14	9	1	3.00	26	5,000	22	0	1	1	1
18	14	4	1	3.00	20	526	18	0	1	1	1
27	14	5	0	3.00	31	6,928	27	0	1	3	0
12	14	7	1	3.00	21	831	12	0	1	1	1
18	14	7	1	3.00	20	2,500	18	0	1	1	1
16	6	3	1	5.00	30	10,000	8	0	1	6	0
11	6	5	1	5.00	30	10,000	8	0	1	4	0
18	6	9	1	5.00	31	10,000	17	0	1	2	1

APPENDIX: Tennessee Capacity Release Regression Data

%MAX	NRELEASE	NWBID	WINTER	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	SEQUENCE	WINTER2
19	6	3	1	4.00	31	3,000	19	0	1	1	1
19	6	7	1	4.00	31	2,000	19	0	1	1	1
17	6	7	1	5.00	31	2,000	17	0	1	1	1
18	1	9	1	4.00	26	1,000	18	0	0	1	0
18	1	2	1	4.00	26	3,000	18	0	0	2	0
20	1	4	1	4.00	26	2,610	18	0	0	3	0
23	2	3	1	3.00	24	2,000	22	0	0	1	1
22	2	3	1	3.00	23	2,000	22	0	0	1	1
22	5	2	0	3.00	30	5,000	22	0	0	3	0
43	5	4	1	3.05	29	2,600	43	0	1	1	0
14	5	9	1	3.09	24	2,225	14	0	1	2	0
22	5	3	1	3.08	31	4,825	22	0	1	1	1
22	5	4	1	3.05	31	2,885	22	0	1	2	1
9	4	3	0	5.47	1	15,747	9	1	0	1	0
10	4	3	0	4.61	1	14,253	10	1	0	1	0
21	10	7	1	5.18	29	3,392	14	0	1	4	0
21	10	9	1	5.41	30	15,891	20	0	1	1	1
28	10	5	0	6.00	181	1,300	28	1	0	1	0
16	10	5	1	5.36	31	5,000	16	0	1	1	1
16	10	5	1	5.36	31	8,000	16	0	1	2	1
16	10	3	1	4.55	29	10,369	16	0	1	3	0
16	10	5	1	4.55	29	5,000	16	1	1	4	1
6	10	9	1	4.79	29	8,414	6	1	1	3	1
20	10	5	1	5.00	31	5,000	17	1	1	3	1
19	10	9	1	4.33	31	10,300	18	0	1	1	1
20	7	1	0	4.08	29	10,000	19	0	0	3	0
17	7	1	0	4.00	21	5,000	11	0	1	1	0
15	7	3	0	4.00	21	2,674	11	0	1	2	0
11	7	4	0	4.00	21	4,000	11	0	1	1	0
11	7	4	0	4.00	21	1,000	11	0	1	1	0

APPENDIX: Tennessee Capacity Release Regression Data

%MAX	NRELEASE	NWBID	WINTER	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	SEQUENCE	WINTER2
13	7	3	0	4.00	21	4,665	11	0	1	1	0
12	1	4	0	1.00	29	5,000	12	0	0	1	0
11	2	7	0	4.69	29	5,000	8	0	0	11	0
42	2	4	1	4.00	23	1,575	42	0	0	1	1
27	1	5	1	4.00	26	5,000	24	0	0	3	1
12	2	4	0	1.00	30	5,000	12	0	0	1	0
35	2	5	1	1.00	25	10,000	35	0	1	1	0
12	3	9	1	3.00	25	3,020	11	0	1	2	1
23	3	9	1	3.00	30	3,020	11	0	1	2	1
23	2	4	0	2.00	29	4,114	23	0	1	2	0
21	2	5	0	1.00	29	28,300	21	0	1	1	0
33	2	2	1	2.00	29	2,000	11	0	0	6	0
41	2	4	1	1.00	30	2,000	36	0	1	2	1
38	1	5	1	5.00	90	1,700	38	0	1	2	0
38	2	2	1	5.35	87	595	26	1	0	4	0
34	2	2	1	5.34	87	892	26	1	0	3	0

APPENDIX: Tennessee Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
50	6	18	4	28	2,596	50	0	0	0	1	0
50	6	18	4	2	2,596	50	0	0	0	1	0
9	3	3	3	28	762	9	1	1	0	0	1
9	3	3	3	29	773	9	1	1	0	0	1
7	3	3	3	29	20,600	6	1	1	0	0	1
40	13	21	4	8	2,000	40	0	0	1	1	0
40	5	26	3	1	1,200	40	1	1	1	0	0
40	5	26	3	27	1,200	40	1	1	1	0	0
35	5	26	3	20	1,400	35	1	1	1	0	0
5	5	26	3	29	4,001	5	1	1	0	0	1
70	2	7	4	29	6,500	70	1	0	0	1	0
75	20	4	4	4,200	4,003	75	1	0	0	0	0
75	20	4	4	730	4,003	75	1	0	0	0	0
75	20	4	4	730	4,003	75	1	0	0	0	0
75	20	4	4	4,200	4,003	75	1	0	0	0	0
75	20	4	4	4,200	5,004	75	1	0	0	0	0
75	20	4	4	730	5,004	75	1	0	0	0	0
75	20	4	4	30	4,003	75	1	0	0	0	0
75	20	4	4	30	5,004	75	1	0	0	0	0
75	20	4	4	30	4,003	75	1	0	0	0	0
75	20	4	4	30	5,004	75	1	0	0	0	0
75	20	4	4	30	4,003	75	1	0	0	0	0
75	20	4	4	30	4,003	75	1	0	0	0	0
30	331	26	4	27	15,450	30	1	1	1	0	0
100	331	42	4	28	3,660	0	1	0	1	0	0
30	331	99	4	4	17,100	30	0	1	1	0	0
30	331	99	4	1	33,269	30	0	0	1	0	0
100	331	102	4	28	9,655	100	1	0	1	0	0
52	331	99	4	6	154,500	52	0	1	1	0	0
30	331	99	4	28	389,999	30	0	1	1	0	0
100	331	34	4	28	6,420	100	1	0	1	0	0
52	331	99	4	5	103,000	52	0	1	1	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
52	331	99	4	7	309,000	52	0	1	1	0	0
100	331	42	4	31	3,747	0	1	0	1	0	0
60	331	99	4	1	206,000	60	1	0	1	0	0
60	331	99	4	5	148,320	60	0	0	1	0	0
60	331	99	4	1	150,380	60	0	0	1	0	0
100	331	102	4	31	9,319	0	1	0	1	0	0
60	331	99	4	1	92,700	60	0	0	1	0	0
100	331	34	4	31	6,480	0	1	0	1	0	0
55	331	99	4	31	61,800	55	0	1	1	0	0
55	331	18	4	31	475	55	0	1	1	0	0
60	331	99	4	31	61,800	60	0	0	1	0	0
60	331	18	4	31	475	60	0	0	1	0	0
60	331	99	4	1	90,640	60	0	0	1	0	0
60	331	99	4	1	90,640	60	0	0	1	0	0
60	331	5	4	30	150	60	0	0	1	0	0
100	331	102	4	31	8,902	100	1	0	1	0	0
100	331	42	4	31	3,973	100	1	0	1	0	0
60	331	99	4	1	103,000	60	0	0	0	0	0
60	331	99	4	2	242,050	60	0	0	0	0	0
60	331	99	4	1	51,500	60	0	0	0	0	0
100	331	34	4	31	6,770	0	1	0	1	0	0
60	331	99	4	1	66,950	60	0	0	0	0	0
55	331	99	4	31	139,050	55	0	1	1	0	0
55	331	18	4	31	475	55	0	1	1	0	0
60	331	99	4	31	139,050	60	0	0	1	0	0
60	331	18	4	31	475	60	0	0	1	0	0
60	331	99	4	1	159,650	60	1	0	0	0	0
60	331	99	4	1	262,650	60	1	0	0	0	0
60	331	99	4	1	120,510	60	0	0	0	0	0
60	331	99	4	2	105,060	60	0	0	0	0	0
60	331	99	4	1	60,770	60	0	0	0	0	0
60	331	99	4	1	60,770	60	0	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
60	331	18	4	1	347	60	0	0	0	0	0
60	331	99	4	1	84,460	60	0	0	0	0	0
60	331	99	4	1	25,750	60	1	0	0	0	0
100	331	99	4	1	72,100	100	1	0	0	0	0
60	331	99	4	1	72,100	60	0	0	0	0	0
60	331	99	4	1	72,100	60	1	0	0	0	0
60	331	99	4	1	38,110	60	1	0	0	0	0
60	331	99	4	2	162,740	60	0	0	0	0	0
100	331	99	4	1	162,740	100	1	0	0	0	0
60	331	18	4	28	402	60	0	0	0	0	0
60	331	18	4	1	362	60	0	0	0	0	0
100	331	99	4	3	33,990	0	1	0	0	0	0
100	331	99	4	1	146,260	0	1	0	0	0	0
100	331	99	4	1	166,860	0	1	0	0	0	0
60	331	18	4	30	4,120	60	0	0	0	0	0
60	331	99	4	30	200,850	60	0	0	0	0	0
55	331	13	4	92	9,999	55	0	0	0	0	0
100	331	99	4	1	133,900	0	1	0	0	0	0
100	331	34	4	30	7,007	0	1	0	0	0	0
100	331	42	4	30	3,980	0	1	0	0	0	0
100	331	102	4	30	8,626	0	1	0	0	0	0
100	331	99	4	2	159,650	0	1	0	0	0	0
65	331	13	4	30	3,532	65	1	0	0	0	0
100	331	99	4	1	158,620	0	1	0	0	0	0
100	331	99	4	1	185,400	0	1	0	0	0	0
55	331	99	4	365	139,050	55	0	0	0	0	0
100	331	99	4	3	142,140	0	1	0	0	0	0
100	331	99	4	1	32,960	0	1	0	0	0	0
100	331	99	4	1	43,260	0	1	0	0	0	0
100	331	99	4	2	77,250	0	1	0	0	0	0
100	331	99	4	1	72,100	0	1	0	0	0	0
100	331	99	4	1	109,180	0	1	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
100	331	99	4	2	50,470	0	1	0	0	0	0
100	331	99	4	4	116,390	0	1	0	0	0	0
100	331	99	4	5	35,020	0	1	0	0	0	0
100	331	99	4	7	154,500	0	1	0	0	0	0
75	331	7	4	30	2,193	75	1	0	0	0	0
75	331	9	4	30	133	75	1	0	0	0	0
100	331	99	4	1	288,400	0	1	0	0	0	0
100	331	99	4	1	51,500	0	1	0	0	0	0
75	331	9	4	30	1,808	75	0	0	0	0	0
100	331	99	4	1	288,400	0	1	0	0	0	0
75	331	3	4	30	1,751	75	0	0	0	0	0
75	331	99	4	30	15,074	75	0	0	0	0	0
75	331	7	4	30	4,594	75	0	0	0	0	0
100	331	99	4	1	267,800	0	1	0	0	0	0
100	331	99	4	2	103,000	0	1	0	0	0	0
100	331	102	4	31	15,921	0	1	0	0	0	0
100	331	99	4	2	267,800	0	1	0	0	0	0
100	331	99	4	1	164,800	0	1	0	0	0	0
100	331	99	4	1	180,250	0	1	0	0	0	0
100	331	99	4	1	339,900	0	1	0	0	0	0
100	331	99	4	1	77,250	0	1	0	0	0	0
100	331	99	4	1	236,900	0	1	0	0	0	0
100	331	99	4	1	175,100	0	1	0	0	0	0
100	331	99	4	1	62,830	0	1	0	0	0	0
75	331	7	4	31	3,400	75	0	0	0	0	0
75	331	18	4	31	4,017	75	0	0	0	0	0
75	331	18	4	31	3,420	75	0	0	0	0	0
75	331	13	4	31	5,926	75	0	0	0	0	0
75	331	99	4	31	196,730	75	0	0	0	0	0
75	331	26	4	31	30,000	75	1	0	0	0	0
100	331	99	4	2	36,050	0	1	0	0	0	0
100	331	99	4	1	140,080	0	1	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
100	331	99	4	1	258,530	0	0	0	0	0	0
100	331	99	4	1	161,710	0	1	0	0	0	0
100	331	99	4	1	196,730	0	0	0	0	0	0
100	331	99	4	2	156,560	0	1	0	0	0	0
100	331	99	4	3	138,020	0	1	0	0	0	0
100	331	99	4	1	99,910	0	1	0	0	0	0
100	331	99	4	1	151,410	0	1	0	0	0	0
100	331	99	4	1	319,300	0	0	0	0	0	0
100	331	18	4	4	7,210	0	0	0	0	0	0
100	331	99	4	1	355,350	0	1	0	0	0	0
100	331	99	4	1	432,600	0	1	0	0	0	0
100	331	99	4	4	25,750	0	1	0	0	0	0
100	331	99	4	2	126,690	0	0	0	0	0	0
100	331	99	4	1	121,540	0	0	0	0	0	0
100	331	99	4	5	226,600	0	0	0	0	0	0
100	331	99	4	1	20,600	0	0	0	0	0	0
100	331	99	4	1	154,500	0	0	0	0	0	0
100	331	99	4	2	245,140	0	0	0	0	0	0
100	331	99	4	1	258,530	0	0	0	0	0	0
75	331	99	4	29	41,200	75	0	0	0	0	0
75	331	7	4	29	3,688	75	0	0	0	0	0
75	331	3	4	29	4,155	75	0	0	0	0	0
100	331	99	4	2	154,500	0	0	0	0	0	0
100	331	99	4	1	51,500	0	0	0	0	0	0
100	331	99	4	1	77,250	0	1	0	0	0	0
100	331	102	4	30	15,107	0	1	0	0	0	0
100	331	99	4	1	103,000	0	0	0	0	0	0
100	331	99	4	1	216,300	0	0	0	0	0	0
100	331	99	4	2	216,300	0	1	0	0	0	0
100	331	3	4	6	8,999	0	0	0	0	0	0
75	331	99	4	31	103,000	75	0	0	0	0	0
75	331	18	4	30	19,971	75	0	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
75	331	18	4	30	8,240	75	0	0	0	0	0
75	331	1	4	30	6,592	75	0	0	0	0	0
75	331	2	4	30	2,918	75	0	0	0	0	0
75	331	2	4	30	824	75	0	0	0	0	0
75	331	99	4	30	247,200	75	0	0	0	0	0
75	331	18	4	30	2,600	75	0	0	0	0	0
76	331	34	4	61	412	76	1	0	0	0	0
75	331	13	4	30	7,519	75	1	0	0	0	0
75	331	9	4	30	3,584	75	1	0	0	0	0
75	331	2	4	61	2,575	75	1	0	0	0	0
77	331	7	4	61	8,539	77	1	0	0	0	0
77	331	7	4	30	1,765	77	1	0	0	0	0
75	331	3	4	31	9,179	75	1	0	0	0	0
75	331	3	4	30	7,926	75	1	0	0	0	0
75	331	13	4	61	36,297	75	1	0	0	0	0
100	331	99	4	2	82,400	0	0	0	0	0	0
100	331	102	4	31	14,788	0	1	0	0	0	0
52	331	13	4	31	14,000	52	0	0	0	0	0
52	331	7	4	31	7,000	52	0	0	0	0	0
52	331	3	4	31	4,120	52	0	0	0	0	0
52	331	2	4	31	4,120	52	0	0	0	0	0
52	331	18	4	31	2,487	52	0	0	0	0	0
52	331	13	4	31	10,300	52	0	0	0	0	0
52	331	3	4	31	7,125	52	0	0	0	0	0
52	331	18	4	61	29,335	52	1	0	0	0	0
52	331	18	4	92	19,967	52	1	0	0	0	0
52	331	18	4	31	19,590	52	1	0	0	0	0
52	331	2	4	31	2,575	52	1	0	0	0	0
52	331	99	4	31	334,750	52	1	0	0	0	0
53	331	26	4	61	70,000	52	0	0	0	0	0
52	331	2	4	31	664	52	0	0	0	0	0
52	331	1	4	61	8,255	52	0	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
52	331	13	4	92	10,300	52	0	0	0	0	0
52	331	2	4	31	350	52	0	0	0	0	0
52	331	18	4	31	15,141	52	0	0	0	0	0
52	331	7	4	365	1,545	52	1	0	0	0	0
52	331	1	4	184	8,297	52	1	0	0	0	0
52	331	42	4	184	1,199	52	1	0	0	0	0
52	331	3	4	365	9,343	52	1	0	0	0	0
52	331	9	4	31	18,173	52	1	0	0	0	0
52	331	9	4	61	24,392	52	1	0	0	0	0
52	331	3	4	92	9,343	52	1	0	0	0	0
60	331	21	4	2	118,450	60	0	0	0	1	0
100	34	42	4	31	4,108	0	1	1	0	1	0
100	34	8	4	31	46	0	1	1	0	1	0
100	34	102	4	31	4,129	0	1	1	0	1	0
100	34	42	4	28	4,373	0	1	1	1	1	0
100	34	8	4	28	44	0	1	1	1	1	0
100	34	34	4	28	784	0	1	1	1	1	0
100	34	102	4	28	3,969	0	1	1	1	1	0
100	34	42	4	31	4,622	0	1	1	1	1	0
100	34	102	4	31	3,838	0	1	1	1	1	0
100	34	34	4	31	959	0	1	1	1	1	0
100	34	8	4	31	40	0	1	1	1	1	0
100	34	42	4	31	4,381	0	1	1	1	1	0
100	34	8	4	31	37	0	1	1	1	1	0
30	34	21	4	8	19,421	30	1	1	0	1	0
100	34	34	4	31	940	0	1	1	1	1	0
100	34	102	4	31	3,772	0	1	1	1	1	0
100	34	34	4	30	915	0	1	1	0	1	0
100	34	102	4	30	3,527	0	1	1	0	1	0
100	34	42	4	30	4,667	0	1	1	0	1	0
100	34	8	4	30	38	0	1	1	0	1	0
100	34	42	4	31	5,260	0	1	1	0	1	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
100	34	8	4	31	37	0	1	1	0	1	0
100	34	102	4	31	3,213	0	1	1	0	1	0
100	34	34	4	31	938	0	1	1	0	1	0
100	34	34	4	30	1,544	0	1	1	0	1	0
100	34	8	4	30	36	0	1	1	0	1	0
100	34	42	4	30	4,888	0	1	1	0	1	0
100	34	102	4	30	2,877	0	1	1	0	1	0
100	34	102	4	31	2,747	0	1	1	0	1	0
100	34	34	4	31	1,567	0	1	1	0	1	0
100	34	42	4	31	4,540	0	1	1	0	1	0
100	34	42	4	31	580	0	1	1	0	1	0
100	34	8	4	31	36	0	1	1	0	1	0
20	15	18	4	17	385	20	0	1	1	0	0
20	15	3	4	17	26,523	20	0	1	1	0	0
20	15	18	4	20	30,000	20	0	1	1	0	0
20	15	3	4	23	20,000	20	0	1	1	0	0
20	15	18	4	7	367	20	0	0	1	0	0
100	646	42	4	31	10,647	0	1	0	0	0	0
100	646	42	4	31	786	0	1	0	0	0	0
100	646	42	4	31	2,796	0	1	0	0	0	0
100	646	8	4	31	42	0	1	0	0	0	0
100	646	102	4	31	20,695	0	1	0	0	0	0
100	646	102	4	31	10	0	1	0	0	0	0
100	646	102	4	31	10	0	1	0	0	0	0
100	646	102	4	31	10	0	1	0	0	0	0
100	646	102	4	31	1	0	1	0	0	0	0
100	646	102	4	31	38	0	1	0	0	0	0
100	646	102	4	31	49	0	1	0	0	0	0
100	646	102	4	31	82	0	1	0	0	0	0
30	646	2	4	1	509	30	1	0	1	0	0
30	646	2	4	27	509	30	1	0	1	0	0
30	646	7	4	1	1,000	30	1	0	1	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
30	646	7	4	27	1,000	30	1	0	1	0	0
30	646	18	4	28	95,000	30	0	0	1	0	0
30	646	13	4	59	25,000	30	0	0	1	0	0
30	646	18	4	28	25,000	30	0	0	1	0	0
30	646	18	4	28	950	30	0	0	1	0	0
30	646	18	4	6	95,000	30	0	0	1	0	0
100	646	34	4	28	70	0	1	0	1	0	0
100	646	34	4	28	3,294	0	1	0	1	0	0
100	646	34	4	28	9,133	0	1	0	1	0	0
30	646	18	4	7	237	30	0	0	1	0	0
30	646	18	4	7	238	30	0	0	1	0	0
100	646	102	4	28	20,053	0	1	0	1	0	0
100	646	102	4	28	10	0	1	0	1	0	0
100	646	102	4	28	10	0	1	0	1	0	0
100	646	102	4	28	10	0	1	0	1	0	0
100	646	102	4	28	1	0	1	0	1	0	0
100	646	102	4	28	38	0	1	0	1	0	0
100	646	102	4	28	49	0	1	0	1	0	0
100	646	102	4	28	82	0	1	0	1	0	0
100	646	42	4	28	2,796	0	1	0	1	0	0
100	646	42	4	28	786	0	1	0	1	0	0
100	646	42	4	28	10,757	0	1	0	1	0	0
100	646	8	4	28	42	0	1	0	1	0	0
30	646	34	4	13	3,090	30	0	0	1	0	0
30	646	34	4	13	1,030	30	0	0	1	0	0
30	646	18	4	18	4,001	30	0	0	1	0	0
30	646	18	4	18	1,000	30	0	0	1	0	0
30	646	18	4	28	2,900	30	1	0	1	0	0
30	646	18	4	1	4,300	30	1	0	1	0	0
30	646	18	4	30	4,300	30	0	0	1	0	0
30	646	18	4	1	1,075	30	1	0	1	0	0
30	646	18	4	30	1,107	30	0	0	1	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
30	646	21	4	30	20,000	30	1	0	1	0	0
30	646	21	4	30	80,000	30	1	0	1	0	0
100	646	34	4	31	70	0	1	0	1	0	0
100	646	34	4	31	3,293	0	1	0	1	0	0
100	646	34	4	31	9,134	0	1	0	1	0	0
100	646	102	4	31	82	0	1	0	1	0	0
100	646	102	4	31	49	0	1	0	1	0	0
100	646	102	4	31	38	0	1	0	1	0	0
100	646	102	4	31	1	0	1	0	1	0	0
100	646	102	4	31	10	0	1	0	1	0	0
100	646	102	4	31	10	0	1	0	1	0	0
100	646	102	4	31	10	0	1	0	1	0	0
100	646	102	4	31	25	0	1	0	1	0	0
100	646	102	4	31	19,144	0	1	0	1	0	0
100	646	8	4	31	42	0	1	0	1	0	0
100	646	42	4	31	2,805	0	1	0	1	0	0
100	646	42	4	31	786	0	1	0	1	0	0
100	646	42	4	31	10,778	0	1	0	1	0	0
60	646	18	4	5	5,225	60	0	0	1	0	0
60	646	42	4	30	2,452	60	0	0	1	0	0
60	646	3	4	30	559	60	0	0	1	0	0
100	646	8	4	31	42	0	1	0	1	0	0
100	646	34	4	31	736	0	1	0	1	0	0
100	646	34	4	31	3,293	0	1	0	1	0	0
100	646	34	4	31	9,139	0	1	0	1	0	0
100	646	102	4	31	82	0	1	0	1	0	0
100	646	102	4	31	49	0	1	0	1	0	0
100	646	102	4	31	38	0	1	0	1	0	0
100	646	102	4	31	25	0	1	0	1	0	0
100	646	102	4	31	1	0	1	0	1	0	0
100	646	102	4	31	10	0	1	0	1	0	0
100	646	102	4	31	10	0	1	0	1	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
100	646	102	4	31	10	0	1	0	1	0	0
100	646	102	4	31	19,451	0	1	0	1	0	0
100	646	42	4	31	2,608	0	1	0	1	0	0
100	646	42	4	31	242	0	1	0	1	0	0
100	646	42	4	31	11,424	0	1	0	1	0	0
60	646	18	4	5	47,501	60	0	0	0	0	0
60	646	18	4	17	347	60	0	0	0	0	0
60	646	18	4	18	14,250	60	0	0	0	0	0
60	646	18	4	3	47,501	60	0	0	0	0	0
60	646	18	4	3	47,501	60	1	0	0	0	0
60	646	18	4	24	16,625	60	0	0	0	0	0
60	646	18	4	5	47,501	60	0	0	0	0	0
60	646	13	4	63	5,000	60	1	0	0	0	0
55	646	13	4	63	5,000	55	1	0	0	0	0
55	646	13	4	63	10,000	55	1	0	0	0	0
60	646	13	4	29	5,000	60	1	0	0	0	0
55	646	13	4	29	10,000	55	1	0	0	0	0
55	646	13	4	29	5,000	55	1	0	0	0	0
60	646	18	4	5	47,501	60	0	0	0	0	0
60	646	5	4	29	159	60	0	0	0	0	0
60	646	18	4	30	8,240	60	0	0	0	0	0
60	646	26	4	30	15,000	60	0	0	0	0	0
60	646	13	4	30	6,000	60	0	0	0	0	0
60	646	3	4	30	515	60	0	0	0	0	0
60	646	18	4	30	8,240	60	0	0	0	0	0
60	646	26	4	30	15,000	60	0	0	0	0	0
60	646	13	4	30	6,000	60	0	0	0	0	0
60	646	18	4	30	9,500	60	0	0	0	0	0
100	646	34	4	30	736	0	1	0	0	0	0
100	646	34	4	30	3,294	0	1	0	0	0	0
75	646	26	4	3	20,968	75	0	0	0	0	0
100	646	34	4	30	9,094	0	1	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
75	646	26	4	1	3,919	75	0	0	0	0	0
75	646	26	4	4	1,875	75	1	0	0	0	0
100	646	102	4	30	82	0	1	0	0	0	0
100	646	102	4	30	49	0	1	0	0	0	0
100	646	102	4	30	38	0	1	0	0	0	0
100	646	102	4	30	1	0	1	0	0	0	0
100	646	102	4	30	10	0	1	0	0	0	0
75	646	5	4	3	20,600	75	0	0	0	0	0
100	646	102	4	30	10	0	1	0	0	0	0
100	646	102	4	30	10	0	1	0	0	0	0
100	646	102	4	30	25	0	1	0	0	0	0
100	646	102	4	30	18	0	1	0	0	0	0
75	646	26	4	1	5,794	75	0	0	0	0	0
55	646	26	4	92	15,450	55	0	0	0	0	0
100	646	102	4	30	1	0	1	0	0	0	0
100	646	102	4	30	18,292	0	1	0	0	0	0
100	646	8	4	30	43	0	1	0	0	0	0
100	646	42	4	30	2,608	0	1	0	0	0	0
100	646	42	4	30	242	0	1	0	0	0	0
100	646	42	4	30	11,825	0	1	0	0	0	0
75	646	13	4	7	13,207	75	0	0	0	0	0
75	646	18	4	11	7,125	75	0	0	0	0	0
75	646	18	4	5	28,500	75	0	0	0	0	0
75	646	9	4	8	6,289	75	1	0	0	0	0
75	646	26	4	3	15,000	75	1	0	0	0	0
75	646	13	4	2	13,207	75	0	0	0	0	0
75	646	21	4	5	75,000	75	0	0	0	0	0
75	646	21	4	7	34,999	75	0	0	0	0	0
75	646	18	4	4	7,125	75	0	0	0	0	0
75	646	9	4	4	13,207	75	0	0	0	0	0
75	646	21	4	5	28,500	75	0	0	0	0	0
75	646	18	4	5	38,000	75	0	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
75	646	18	4	5	7,125	75	0	0	0	0	0
75	646	21	4	23	75,000	75	0	0	0	0	0
75	646	9	4	8	6,289	75	0	0	0	0	0
75	646	13	4	7	14,011	75	0	0	0	0	0
75	646	10	4	9	9,500	75	0	0	0	0	0
75	646	13	4	5	13,207	75	0	0	0	0	0
75	646	21	4	4	43,740	75	0	0	0	0	0
75	646	13	4	5	665	75	0	0	0	0	0
75	646	13	4	31	950	75	0	0	0	0	0
75	646	42	4	31	1,500	75	0	0	0	0	0
75	646	18	4	31	2,575	75	0	0	0	0	0
75	646	42	4	31	2,691	75	0	0	0	0	0
75	646	18	4	31	2,575	75	0	0	0	0	0
100	646	42	4	31	13,667	0	1	0	0	0	0
100	646	8	4	31	43	0	1	0	0	0	0
100	646	34	4	31	736	0	1	0	0	0	0
100	646	34	4	31	3,319	0	1	0	0	0	0
100	646	34	4	31	9,016	0	1	0	0	0	0
100	646	3	4	31	2,274	0	1	0	0	0	0
100	646	42	4	31	2,088	0	1	0	0	0	0
100	646	42	4	31	16	0	1	0	0	0	0
100	646	102	4	31	82	0	1	0	0	0	0
100	646	102	4	31	1	0	1	0	0	0	0
100	646	102	4	31	66	0	1	0	0	0	0
100	646	102	4	31	49	0	1	0	0	0	0
100	646	102	4	31	38	0	1	0	0	0	0
100	646	102	4	31	125	0	1	0	0	0	0
100	646	102	4	31	1	0	1	0	0	0	0
100	646	102	4	31	10	0	1	0	0	0	0
100	646	102	4	31	10	0	1	0	0	0	0
100	646	102	4	31	10	0	1	0	0	0	0
100	646	102	4	31	25	100	1	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
100	646	102	4	31	16,689	0	1	0	0	0	0
100	646	102	4	31	18	0	1	0	0	0	0
75	646	18	4	8	5,000	75	0	0	0	0	0
75	646	7	4	10	5,000	75	1	0	0	0	0
75	646	21	4	5	74,999	75	0	0	0	0	0
75	646	18	4	5	4,750	75	0	0	0	0	0
75	646	21	4	8	201,030	75	0	0	0	0	0
75	646	21	4	7	35,000	75	0	0	0	0	0
75	646	3	4	1	8,900	75	1	0	0	0	0
100	646	42	4	30	13,667	0	1	0	0	0	0
75	646	18	4	3	57,000	75	0	0	0	0	0
75	646	21	4	3	185,658	75	0	0	0	0	0
100	646	42	4	30	2,088	0	1	0	0	0	0
100	646	4	4	30	1	0	1	0	0	0	0
100	646	4	4	30	63	0	1	0	0	0	0
100	646	34	4	30	941	0	1	0	0	0	0
100	646	34	4	30	5,709	0	1	0	0	0	0
100	646	34	4	30	9,119	0	1	0	0	0	0
100	646	102	4	30	25	0	1	0	0	0	0
100	646	102	4	30	10	0	1	0	0	0	0
100	646	102	4	30	10	0	1	0	0	0	0
100	646	102	4	30	10	0	1	0	0	0	0
100	646	2	4	30	248	0	1	0	0	0	0
100	646	102	4	30	82	0	1	0	0	0	0
100	646	102	4	30	1	0	1	0	0	0	0
100	646	102	4	30	66	0	1	0	0	0	0
100	646	102	4	30	49	0	1	0	0	0	0
100	646	102	4	30	38	0	1	0	0	0	0
100	646	102	4	30	125	0	1	0	0	0	0
100	646	102	4	30	1	0	1	0	0	0	0
100	646	102	4	30	15,285	0	1	0	0	0	0
100	646	102	4	30	18	0	1	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
100	646	8	4	30	43	0	1	0	0	0	0
100	646	3	4	30	2,274	0	1	0	0	0	0
75	646	13	4	30	11,845	75	0	0	0	0	0
75	646	3	4	30	8,900	75	0	0	0	0	0
75	646	10	4	91	30,900	75	0	0	0	0	0
75	646	18	4	30	3,245	75	0	0	0	0	0
75	646	2	4	30	361	75	0	0	0	0	0
75	646	18	4	30	3,245	75	0	0	0	0	0
75	646	10	4	91	30,900	75	0	0	0	0	0
75	646	10	4	30	20,600	75	0	0	0	0	0
75	646	2	4	30	10,300	75	0	0	0	0	0
75	646	10	4	30	20,600	75	0	0	0	0	0
75	646	2	4	30	10,300	75	0	0	0	0	0
75	646	18	4	5	60,000	75	1	0	0	0	0
75	646	1	4	14	6,000	75	1	0	0	0	0
75	646	10	4	14	9,474	75	1	0	0	0	0
75	646	18	4	16	5,000	75	0	0	0	0	0
75	646	21	4	5	200,000	75	0	0	0	0	0
75	646	21	4	7	80,000	75	0	0	0	0	0
75	646	21	4	3	300,000	75	0	0	0	0	0
75	646	10	4	2	8,965	75	0	0	0	0	0
75	646	21	4	2	150,000	75	0	0	0	0	0
75	646	10	4	9	36,635	75	0	0	0	0	0
75	646	18	4	23	10,000	75	0	0	0	0	0
75	646	21	4	4	150,000	75	1	0	0	0	0
75	646	18	4	2	40,000	75	1	0	0	0	0
75	646	18	4	5	40,000	75	0	0	0	0	0
75	646	21	4	1	243,677	75	0	0	0	0	0
75	646	13	4	30	5,596	75	0	0	0	0	0
75	646	21	4	5	100,000	75	0	0	0	0	0
100	646	2	4	31	248	0	1	0	0	0	0
100	646	1	4	31	4,504	0	1	0	0	0	0

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
54	646	1	4	730	25,750	54	0	0	0	0	0
100	646	42	4	31	13,882	0	1	0	0	0	0
100	646	102	4	31	10	0	1	0	0	0	0
100	646	102	4	31	10	0	1	0	0	0	0
100	646	102	4	31	10	0	1	0	0	0	0
100	646	8	4	31	43	0	1	0	0	0	0
100	646	102	4	31	82	0	1	0	0	0	0
100	646	102	4	31	1	0	1	0	0	0	0
100	646	102	4	31	66	0	1	0	0	0	0
100	646	102	4	31	49	0	1	0	0	0	0
100	646	102	4	31	38	0	1	0	0	0	0
100	646	102	4	31	125	0	1	0	0	0	0
100	646	102	4	31	1	0	1	0	0	0	0
100	646	102	4	31	25	0	1	0	0	0	0
100	646	102	4	31	14,559	0	1	0	0	0	0
100	646	102	4	31	18	0	1	0	0	0	0
100	646	3	4	31	2,274	0	1	0	0	0	0
100	646	34	4	31	5,718	0	1	0	0	0	0
100	646	34	4	31	9,015	0	1	0	0	0	0
100	646	4	4	31	1	0	1	0	0	0	0
100	646	4	4	31	63	0	1	0	0	0	0
100	646	34	4	31	941	0	1	0	0	0	0
75	646	2	4	30	10,000	75	0	0	0	0	0
75	646	2	4	30	10,000	75	0	0	0	0	0
75	646	42	4	30	1,200	75	0	0	0	0	0
75	646	3	4	30	8,900	75	0	0	0	0	0
55	646	1	4	791	10,300	55	1	1	0	0	0
100	646	10	4	761	42,230	0	1	1	0	0	0
100	646	10	4	761	24,720	0	1	1	0	0	0
7	16	26	1	26	20,000	6	0	1	0	0	1
7	16	3	1	3	4,039	1	0	0	0	0	1
7	16	26	1	3	8,961	1	0	0	0	0	1

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
6	16	26	1	29	7,725	6	1	1	0	0	1
25	16	1	1	62	2,575	0	0	1	0	0	1
6	16	3	1	30	10,300	0	0	1	0	0	1
15	16	5	1	104	10,300	0	0	1	0	0	1
13	16	26	1	92	20,600	0	0	1	0	0	1
4	16	3	1	21	10,000	0	1	1	0	0	1
6	16	5	1	29	20,001	6	1	1	0	0	1
6	16	3	1	29	5,253	6	1	1	0	0	1
54	9	42	4	212	103	54	1	1	0	1	0
54	9	102	4	274	181	54	1	1	0	1	0
54	9	42	4	92	103	54	1	1	0	1	0
54	9	102	4	30	181	54	1	1	0	1	0
54	9	42	4	29	122	54	1	0	0	1	0
54	9	102	4	29	182	54	1	0	0	1	0
15	24	1	4	25	6,420	15	0	0	1	1	0
35	24	18	4	30	6,480	35	1	0	1	1	0
30	24	18	4	1	6,770	30	0	0	1	1	0
30	24	18	4	20	1,545	30	0	0	1	1	0
30	24	18	4	21	5,225	30	0	0	1	1	0
50	24	9	4	29	2,643	50	0	0	0	1	0
38	4	18	4	1	7,205	38	1	0	1	0	0
38	4	18	4	30	7,205	38	1	0	1	0	0
100	17	3	4	679	19,570	0	1	0	0	0	0
100	17	3	4	19	19,570	0	1	0	1	0	0
100	17	3	4	25	19,570	0	1	0	1	0	0
10	17	7	4	9	4,750	10	1	0	1	0	0
52	17	26	4	29	3,000	50	1	0	0	0	0
50	17	26	4	1	3,000	50	1	0	0	0	0
46	17	26	4	1	1,600	45	1	0	0	0	0
55	17	26	4	30	1,600	45	1	0	0	0	0
35	17	26	4	13	2,000	35	1	0	0	0	0
31	17	26	4	4	4,800	31	1	0	0	0	1

APPENDIX: El Paso Capacity Release Regression Data

%MAX	NRELEASE	NWBID	NZONES	DAYS	TVOLUME	MINRATE	PREARR	RECALL	WINTER2	RERELEASE	BIDFORM
30	17	7	4	13	4,001	30	0	0	0	0	0
40	17	26	4	61	3,600	36	1	0	0	0	1
38	17	9	4	30	4,300	0	0	0	0	0	1
17	17	3	4	29	3,000	17	1	0	0	0	1

APPENDIX: El Paso Capacity Release Regression Data