# REPORT
# TO
# THE FEDERAL ENERGY REGULATORY COMMISSION

## FTR AUCTION

**Market Monitoring Unit**
**PJM Interconnection, L.L.C.**

**August 1, 2000**

**Background**

On November 25, 1997, the Commission approved the comprehensive restructuring of the PJM marketplace, establishing PJM as an Independent System Operator ("ISO").[1] The Commission further authorized PJM to administer the PJM Power Exchange ("PJM PX"), which has become one of the most active spot energy markets in North America.

In the November 25 Order, the Commission found that the restructuring of PJM "will significantly alter the operation of the electric power market within PJM" and that, as a result, "it is important to monitor its implementation to assess undue discrimination and market operation" and to evaluate "how the pool and non-pool markets and transmission pricing arrangements are working."[2] The Commission directed PJM to submit a proposed market monitoring plan that would allow PJM to monitor and report to the Commission on the potential to exercise market power within PJM.[3] The Commission stated that the plan should evaluate the operation of both pool and bilateral markets to detect either design flaws or structural problems.[4]

On June 29, 1998, PJM filed a Market Monitoring Plan ("Plan") [5] in compliance with the November 25 Order. By order issued March 10, 1999, the Commission accepted the Plan filed by PJM as part of the PJM Tariff to be effective April 1, 1999.[6] The Commission found that the ability of the Market Monitoring Unit ("MMU") to effectively and broadly monitor and investigate the PJM Market to be essential in view of its contemporaneous decision to approve market-based pricing authority on offers to sell energy into the PJM-PX.[7]

In its November 25 Order, the Commission conditionally approved a locational marginal pricing method (LMP). As part of the LMP proposal, firm point-to-point and network transmission service customers were entitled to Fixed Transmission Rights ("FTRs"), which are credits against congestion charges.

In the November 25 Order, the Commission directed PJM to file a proposal addressing any lack of price certainty that might exist under LMP. On December 31, 1997, the PJM Supporting Companies[8] filed proposed amendments to Schedule 1 of the Operating Agreement to implement an auction of FTRs, which they concluded was one way to

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1 Pennsylvania-New Jersey-Maryland Interconnection, 81 FERC ¶ 61,257 (1997); reh'g pending ("November 25 Order").

2 81 FERC at 62,282.

3 Id.

4 Id.

5 The Plan appears in the PJM Tariff at Original Sheet No. 184 through First Revised Sheet No. 190. Section references herein are to Sections of the Plan.

6 See PJM Interconnection, L.L.C., 86 FERC ¶ 61,247; reh'g denied, 88 FERC ¶ 61,974 (1999) ("March 10 Order").

7 Id. at 61,887 n.4 (citing Atlantic City Elec. Co., 86 FERC ¶ 61,248 (1999)).

8 The PJM Supporting Companies were Atlantic City Electric Company, Baltimore Gas and Electric Company, Delmarva Power & Light Company, Jersey Central Power & Light Company, Metropolitan Edison Company, Pennsylvania Electric Company, PP&L, Inc., Potomac Electric Power Company and Public Service Electric and Gas Company.

address the lack of price certainty. On March 25, 1998, PJM filed supporting the FTR auction proposal of the PJM Supporting Companies.

The Commission issued an Order on February 11, 1999, [9] rejecting the proposal, and directing PJM to develop, with stakeholder input, another FTR auction proposal addressing the Commission's concerns within 90 days. [10]

On March 2, 1999, PJM made a filing revising the FTR auction proposal in compliance with the February 11 Order. PJM's Members Committee unanimously ratified the revised FTR auction proposal on March 26, 1999. [11] PJM filed revised pages to the PJM Open Access Transmission Tariff (OATT) and Operating Agreement (OA) establishing an FTR auction.[12]

On April 13, 1999, the Commission issued an Order conditionally accepting the FTR Auction filing with an effective date of April 13, 1999.[13] That Order stated: "We direct PJM's Market Monitoring Unit to evaluate these rules and provisions, in a report to the Commission to be filed August 1, 2000, after reviewing the first year of experience with the FTR auction."[14]

This Report is filed pursuant to that direction in the Commission's April 13 Order.

**Summary**

The FTR auction was proposed as one part of a package of measures designed to respond to the Commission's concern about the level of price certainty faced by transmission customers when they reserve transmission service. The Commission stated that an FTR auction "would help provide price certainty by simplifying and enhancing the process by which FTRs can be acquired and traded."[15] While the initial FTR allocation process provided FTRs only to network and firm point-to-point transmission customers, the FTR auction was designed to make FTRs available to any bidder.

This report provides a review of the first year of operation of the FTR auction process. The FTR auction has succeeded in its purpose of increasing access to FTRs. The basic mechanics of the FTR auction have worked as intended. Auction activity has increased steadily since the inception of the auction as shown by the figures attached to this report.

The only issue raised in this report with respect to the FTR auction is not related either to the mechanics of the auction or to the level of liquidity provided by the auction. The issue is that the existence of the FTR auction has created a potential issue related to the timing of planned transmission outages. Any party with prior knowledge of planned transmission outages could use that information to take positions in the FTR auction

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9 86 FERC ¶61,147 (1999).

10 Id. at 61,527.

11 Letter from counsel for PJM dated March 26, 1999.

12 Attachment K-Appendix to the OATT and Schedule 1 of the OA.

13 87 FERC ¶61,054 (1999).

14 Id. at 61,220.

15 86 FERC ¶61,147 (1999).

market. A complaint was filed with the MMU regarding such an issue. While the MMU found no evidence that such activity has occurred, in order to maintain confidence in the markets and in order to minimize the potential for gaming the markets, the MMU will make a recommendation to PJM. The proposed solution to this issue is to clarify and strengthen the transmission outage notification provisions of the PJM Manuals and to provide appropriate incentives to provide adequate notice of transmission outages.

**PJM FTRs: Definition and Purpose**

A Fixed Transmission Right (FTR) is a financial instrument that entitles the holder to receive compensation for transmission congestion charges. An FTR does not represent a right to physical delivery of power. FTRs can be used to hedge congestion risk. FTRs can protect transmission service customers, whose energy deliveries are consistent with their firm transmission reservations, from increased costs caused by transmission congestion. FTRs can provide a hedge for marketers against the basis risk associated with delivering energy from one bus or aggregate to another bus or aggregate. An FTR holder does not need to deliver energy in order to receive congestion credits. FTRs can be purchased with no intent to deliver power on a path.

Each FTR is defined from a point of receipt, where power is injected into the grid, to a point of delivery, where the power is withdrawn from the grid.[16] For each hour in which congestion occurs on the transmission system, the holder of the FTR is awarded a share of the transmission congestion charges collected from market participants. This share is the participant's **transmission congestion credit**. The transmission congestion charges are allocated to FTR holders based on the target allocation.

If constraints exist on the transmission system, all FTR holders should receive credits equal to their FTR MW reservation multiplied by the LMP difference between the point of delivery and the point of receipt of their FTR. This is termed the **transmission credit target allocation**. Credits are paid to all FTR holders, for paths with LMP differentials, regardless of who delivered energy or how much energy was delivered across the constrained path.

An FTR can provide financial benefits or costs. An FTR provides a benefit when the path designated in the FTR is in the same direction as the congested flow, i.e., the point of withdrawal LMP is higher than the point of injection LMP. The value of the FTR is equal to the FTR MW reservation times the positive difference between the point of withdrawal LMP and the point of injection LMP. An FTR can be a liability when the designated path is in the direction opposite to the congested flow, i.e. the point of injection LMP is higher than the point of withdrawal LMP. In this case, the value of the FTR is equal to the FTR MW reservation times the negative difference between the point of withdrawal LMP and the point of injection LMP. Regardless, an FTR holder that delivered energy on the designated path consistent with the FTR would neither pay congestion charges nor receive congestion credits.

[16] Point of injection and withdrawal refers to one or more buses.

PJM time-stamps and processes all FTR requests in the order in which they are received. PJM approves FTRs based on the results of the Simultaneous Feasibility Test, and market participants must confirm approved FTRs for them to become effective.

On April 1, 1998, PJM implemented LMP for energy and offered FTRs as a transmission congestion hedging mechanism to all firm transmission service customers. The initial allocation of FTRs was for a 2-month transition period from April 1 through May 31, 1998. The first long-term FTRs were effective for the 1998-1999 Planning Period, June 1, 1998 through May 31, 1999.

**Simultaneous Feasibility Test**

The Simultaneous Feasibility Test (SFT) is a market feasibility test that provides revenue adequacy by ensuring that the transmission system can support the subscribed set of FTRs during normal system conditions. If an FTR passes the SFT, it is considered feasible. If the FTRs can be supported under normal system conditions and congestion occurs, PJM will collect sufficient revenues through congestion charges to cover the FTR congestion credits payable to the holders of FTRs, and revenue adequacy will exist. Therefore, the primary purpose of the SFT is to preserve the economic value of FTRs by ensuring that all FTRs awarded can be honored.[17]

**FTR Values**

As background for the understanding of the FTR auction activity, Table 1a lists the twenty FTRs with the largest financial benefits over the 12 month period analyzed. Each of these FTRs had target allocations greater than $1,000,000. These FTRs account for 78% of the $95,486,532 total target allocations on 460 different FTR paths. As shown, most of these are into eastern parts of the PJM system, such as the PSEG, PECO, DPL, and AECO zones, or are sourced at generators that are on the injection end of certain transmission constraints, such as the Peach Bottom, Limerick, and Brunner Island stations.

Table 1b lists the twenty FTRs with the largest financial costs over the 12 month period analyzed. These FTRs account for $1,840,382 of the $2,028,822 negative target allocations on 82 different money-losing paths. As can be seen, they tend to be from internal western resources and the majority have external or distant sinks.

[17] PJM Manual for Fixed Transmission Rights, Manual M-06.

| Table 1a. Twenty Largest FTR Target Allocations by Path | |
|---|---|
| **Path** | **Target Allocations** |
| Peach Bottom–PSEG Zone | $ 10,116,775 |
| Edgemoor–DPL Zone | $ 9,708,365 |
| Peach Bottom–PECO Zone | $ 7,339,583 |
| Muddy Run–PECO Zone | $ 5,910,554 |
| Conemaugh–PSEG Zone | $ 3,970,249 |
| Keystone–PSEG Zone | $ 3,923,413 |
| Martins Creek–PSEG Zone | $ 3,730,912 |
| Mercer–PSEG Zone | $ 3,694,633 |
| Homer City–PENELEC Zone | $ 3,110,552 |
| Limerick–PECO Zone | $ 3,098,930 |
| Conemaugh–PECO Zone | $ 2,847,540 |
| Keystone–PECO Zone | $ 2,787,492 |
| Brunner Island–PPL Zone | $ 2,786,139 |
| Burlington–PSEG Zone | $ 2,483,441 |
| Montour–PPL Zone | $ 1,857,817 |
| TMI–JCPL Zone | $ 1,839,243 |
| Susquehanna–PPL Zone | $ 1,558,333 |
| Yards Creek–PSEG Zone | $ 1,327,612 |
| Homer City–Springboro | $ 1,214,766 |
| Peach Bottom–AECO Zone | $ 1,205,857 |
| **TOTALS** | **$ 74,512,205** |

| Table 1b. Twenty Smallest FTR Target Allocations by Path | |
|---|---|
| **Path** | **Target Allocations** |
| Western Hub–Virginia Power | $ (240,297) |
| Keystone–PSEG Zone | $ (219,281) |
| Conemaugh–PSEG Zone | $ (190,094) |
| Allegheny Power–PEPCO Zone | $ (168,017) |
| Titus–MetEd Zone | $ (128,274) |
| Western Hub-First Energy | $ (239,598) |
| Warren–MetEd Zone | $ (122,230) |
| Western Hub– Allegheny Pwr | $ (102,384) |
| Warren–PENELEC Zone | $ (84,799) |
| Warren–JCPL Zone | $ (58,206) |
| Titus–PENELEC Zone | $ (58,194) |
| Western Hub-First Energy | $ (45,862) |
| Deans-Brunswick 230 | $ (28,365) |
| Seneca-MetEd Zone | $ (27,821) |
| Salem-AECO Zone | $ (23,098) |
| Seneca-JCPL Zone | $ (22,549) |
| Hillsboro-Tasley | $ (22,139) |
| Seneca-Wellsboro | $ (21,019) |
| Shawville-MetEd Zone | $ (20,163) |
| Seneca-Penelec Zone | $ (17,992) |
| **TOTALS** | **$ (1,840,382)** |

## Acquisition of FTRs

There are four ways to acquire FTRs:

- Network Integration Service;
- Firm Point-to-Point Service;
- Bilateral FTR Market;
- FTR Auction.

FTRs are obtained together with Network Integration Service and Firm Transmission Service. The Bilateral Market and the FTR Auction allow trading of existing FTRs, regardless of how the FTRs were acquired.

## Network Integration Service FTRs

Network customers may select FTRs from any combination of their network resources up to an amount equal to their total peak load, and are free to add or drop FTRs at any time, subject to feasibility. PJM approves all, part, or none of any request for modification based on the SFT. Network FTRs are designated along paths from the specific, selected capacity resources, or the interconnection point with an external control area, to customers' aggregate loads. The generators selected for FTRs are referred to as designated network resources.

FTRs are determined to be feasible from a capacity resource to a particular company's aggregate load, but may not be feasible to a different company's aggregate load. As a result, FTRs associated with specific capacity resources cannot be directly transferred, for example from the seller of a capacity resource to the buyer of a capacity resource, until feasibility is established. In general, buyers of FTRs must request the FTRs subject to feasibility. In order to establish feasibility, FTRs associated with capacity sales are available to the buyer only if the specific generating units and capacity amounts are identified. FTRs cannot be obtained for capacity credit transactions.

**Firm Point-to-Point Service FTRs**

PJM members may obtain FTRs with firm point-to-point transmission service, and may elect FTRs up to the amount of their transmission service. As in the case of network service, PJM approves all, part, or none of any FTR request based on the results of the SFT. The FTRs in effect at the start remain in effect for the duration of the transmission service, which may be one year, one month, one week, or one day. Table 2 details the required lead and response times and maximum terms for point-to-point service requests and FTRs.

Firm point-to-point transmission service is generally used in PJM for transmission out of PJM, into PJM, or through PJM. The associated FTRs also follow these rules. The point of injection (receipt) may be either a generation resource within the PJM Control Area or the interconnection point with an external control area from which the energy is being sourced or through which it is being transmitted. The point of withdrawal (delivery) may be one of the PJM aggregates or the point of interconnection with the external control area to which the energy is being delivered or through which it is being transmitted.

**Table 2.**
**Transmission Service and FTR Request and Approval Timeline**

| Event | Annual | Monthly | Weekly | Daily |
|---|---|---|---|---|
| Earliest Request | No Limit | 18-months | 2-weeks | 3-days |
| Latest Request | 2-months | 14-days | 7-days | 2-days |
| OI Respond | 1-month | Per tariff | 2-days | 4-hours |
| Customer Confirm | 15-days after PJM approves OR By 12 noon on day before service starts | | | |
| Maximum Term | No Limit | 1-month | 2-weeks | 2-days |

**Bilateral Market**

As shown in Table 3, there were 35 trades, a total of 4349 MW, of FTRs covering the period from June 1, 1999 to May 31, 2000 (92% of these were trades between affiliates). Activity in the bilateral market was at a level equal to about 13% of total FTRs (Table 5.)

**Table 3. Bilateral Market Statistics By Period**

| FTR Contract Period | Sum (MW) | Count | Average (MW) |
|---|---|---|---|
| June 1, 1999 – May 31, 2000 | 4349 | 35 | 124 |

**Monthly Auction FTRs**

PJM conducts a monthly auction of both FTRs associated with the residual capability of the PJM transmission system and FTRs offered by market participants. The residual capability of the transmission system is that remaining after network and firm point to point transmission FTRs have been awarded. PJM members and transmission customers may participate in the FTR auction.

Each monthly auction is comprised of both an on-peak and an off-peak auction. The on-peak auction is for FTRs that are valid for hours ending 0800 to 2300 on weekdays, while off-peak FTRs are valid for hours ending 2400 to 0700 on weekdays and all weekend and NERC holiday hours. All auction FTR contracts are for a period of one month.

Auction FTRs can be obtained between any single bus or combination of buses for which an LMP is calculated and posted, subject to the SFT. This includes hubs, zones, aggregates, and single buses either internal or external to PJM. Auction FTRs may be designated between any injection and withdrawal points. Auction FTRs may also be designated from an aggregate to an aggregate.

Table 4 details the timing of key events in the FTR auction. As indicated, the auction bidding period opens fifteen days prior to the effective date of the transmission rights being auction. PJM calculates and posts estimates of non-simultaneous available FTR capability for the PJM operating and external interfaces. The bids undergo pre-processing where they are verified for proper syntax and the ownership of sell offers is verified. Rejected bids are sent back to the owner for correction and resubmittal.

**Table 4. FTR Auction Timeline**

| Time | Activity |
|---|---|
| 15-days Prior to FTR Period | Bidding Period Opens |
| 10-days Prior to FTR Period | Bidding Period Closes |
| 2-days After Bidding Period Closes | Market is Cleared and Results Posted |

Bidding closes ten business days prior to the start date of the period for which the FTRs were auctioned. The bids are then subject to the SFT evaluation. The SFT determines a new set of feasible FTRs by calculating a market-clearing price for every location and then selecting the highest bid-based valued combination of feasible FTR paths. The value of an FTR path is the difference between the source and sink market clearing prices. Buy bids for a path which have prices above the clearing price pay the path clearing price and sell offers which have prices below the path clearing price receive the path clearing price. The winning set of bids is the simultaneously feasible set of FTRs that maximizes the value of the awarded FTRs to the buyers.

The auction solution awards residual system capability plus reconfigured FTRs offered into the auction. The auction solution does not attempt to match buy and sell offers on particular paths. The fact that FTRs offered for sale can make available additional FTRs

on different, seemingly unrelated paths means that buyers can buy FTRs which are different from the FTRs explicitly offered by sellers. Such reconfiguration of FTRs can change the total amount of FTRs available and make available a different, previously infeasible set of FTRs. Conversely, certain FTRs offered for sale may not clear because they would introduce an infeasible condition.

After the SFT is completed, successful bids are loaded into the FTR auction database and transferred to the PJM accounting and billing systems. Winning bids are posted in publicly available files on eFTR no later than two days after the bidding period closes, and all bids are posted after six months. Buyers and sellers settle at path clearing prices for the FTRs they acquire or sell. This settlement is separate from the transmission congestion settlements. Auction revenues, net of payments made to the FTR sellers, are allocated among the regional transmission owners in proportion to their respective transmission revenue requirements.

**Results of the FTR Auction**

As shown in Figure 1, the number of buy bids submitted in the FTR monthly auction has increased steadily since its inception and substantially the last month, while the number of sell offers has declined. Figure 2 shows that cleared FTR MWs and total auction revenue have increased fairly steadily over the first ten months and substantially over the last two months. Figure 3 compares both buy bid MWs and sell offer MWs to the MWs of buy bids and sell offers that cleared. Figure 3 shows, for example, that none of the FTRs that cleared in 8 of the 12 monthly auctions were sell offers by market participants, but rather represented residual system capability. Figure 4 shows the percentage of buy bid MWs and sell offer MWs that cleared in each month and indicates that about 30% of FTR buy bids clear the auction on average, but only 4% of sell offers clear. Figure 5 compares both buy bid revenues and sell offer revenues to the revenue of buy bids and sell offers that cleared. In summary, these figures indicate that the trend of increasing auction volume and revenue reflect the willingness of FTR buyers to pay higher prices for residual system capability. There are few FTRs offered by sellers clearing the auction.

Prior to each monthly auction PJM calculates expected non-simultaneous estimates of available FTR capability. PJM posts the anticipated available FTR capability for 12 key transmission paths. Using this measure, there are currently no additional FTRs available that cross the Eastern, Northern Public Service, or Delmarva South Interfaces. Figure 6 shows the available FTRs from the PJM Western Hub to the Eastern Hub and from the Eastern Hub to the Western Hub. As shown, east to west available capability averaged about 1750 MW over the period, while the average west to east available capability was near zero.

| Table 5. FTRs By Type | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Month | Network (MW) | Auction (MW) | Pt. To Pt. (MW) | Total (MW) | Network (%) | Auction (%) | Pt. To Pt. (%) | Bilateral (MW) | Bilateral (%) |
| May-99 | 30,684 | 409 | 607 | 31,700 | 97% | 1% | 2% | 4,350 | 14% |
| Jun-99 | 29,808 | 940 | 1,107 | 31,856 | 94% | 3% | 3% | 4,350 | 14% |
| Jul-99 | 28,058 | 708 | 1,107 | 29,873 | 94% | 2% | 4% | 4,350 | 15% |
| Aug-99 | 32,144 | 879 | 1,107 | 34,130 | 94% | 3% | 3% | 4,350 | 13% |
| Sep-99 | 32,144 | 1,721 | 1,107 | 34,972 | 92% | 5% | 3% | 4,350 | 12% |
| Oct-99 | 31,550 | 2,136 | 1,107 | 34,793 | 91% | 6% | 3% | 4,350 | 13% |
| Nov-99 | 31,178 | 1,987 | 1,107 | 34,271 | 91% | 6% | 3% | 4,350 | 13% |
| Dec-99 | 31,178 | 933 | 1,107 | 33,218 | 94% | 3% | 3% | 4,350 | 13% |
| Jan-00 | 30,936 | 2,932 | 750 | 34,619 | 89% | 8% | 2% | 4,350 | 13% |
| Feb-00 | 30,936 | 2,921 | 750 | 34,607 | 89% | 8% | 2% | 4,350 | 13% |
| Mar-00 | 30,936 | 2,585 | 750 | 34,271 | 90% | 8% | 2% | 4,350 | 13% |
| Apr-00 | 30,936 | 3,360 | 750 | 35,046 | 88% | 10% | 2% | 4,350 | 12% |
| **Average** | **30,874** | **1,792** | **946** | **33,613** | **92%** | **5%** | **3%** | **4,350** | **13%** |

Table 5 presents FTRs by type. The data in Table 5 show that network FTRs constitute some 92% of all FTRs and that point to point FTRs are 3% of all FTRs. While auction FTRs are 5% of the total on average, the auction share has risen steadily. This results from the fact that market participants have increased what they are willing to pay for FTRs, more buy bids have exceeded the path clearing prices of more FTRs and more FTR buy bids have cleared.

Figures 7 to 14 present information on buy bid and sell offer behavior and results for the most actively traded FTR paths. Figures 9 and 13 summarize revenue and volume for the ten highest revenue producing FTR paths for buy bids and sell offers that cleared.

Figures 7 to 10, which presents information for buy bids, indicate that FTRs from Homer City in Western Pennsylvania to Springbrook in Northern PSEG were the highest revenue producing FTRs both bid and cleared. These FTRs, which cross the Eastern Interface, constituted 13% of total buy revenues paid over the one-year period analyzed, and 8% of total volume. Only half of the 5500 MW of buy bids on this path cleared. The ten highest revenue-producing FTRs were responsible for 50% of all buy bid revenue and 18% of buy bid MW volume. Five of these FTR paths, Homer City-Springbrook, Bayonne-Essex, Whippany-Linden, Western Hub-PECO, and Bayonne-PVSC were both the largest in terms of MW volume bid and revenue bid (Figure 7) and in terms of MW volume cleared and revenue produced (Figure 9).

Total revenue from FTR cleared buy bids was $1,370,000 during the period analyzed, with 63% of total revenue and 32% of total volume accruing in the last two auctions.

Figures 11 to 14, which show information for sell offers, indicate that FTRs from Keystone, also in Western Pennsylvania, to PSEG were the highest revenue producing FTRs sold, producing 72% of total sell revenues received over the one-year period analyzed while representing only 10% of total volume (Figure 13). Consistent with the overall FTR data in Table 1A and the congestion data in Table 6, FTRs that cross the

Eastern Interface (from west to east) sell at relatively high prices. However, total revenue from FTR sales was only $110,000 during the 12 month period analyzed, less than 10% of revenue paid by buyers, and volume was 3132 MW, an average of 260 MW of FTRs per month. The top two FTRs, Keystone to PSEG and Conemaugh to PSEG, account for 95% of all sell revenues. (The balance of the FTRs purchased by buyers was from residual system capability.)

Figures 15 through 30 summarize revenue and volume for the ten highest revenue producing FTR sources (point of injection) and FTR destinations (point of withdrawal) for buy and sell offers offered and cleared. Figures 15 and 17 show that FTRs from the Western Hub and Homer City in Western Pennsylvania were the highest revenue producing FTRs buy bids that were both bid and cleared. As shown in the FTR path revenue data (Figures 9 and 13), most of the sources from Figure 15 were coupled with destinations on the eastern side of the Eastern Interface. The top 10 FTR source buy bids constituted 68% of total buy bid revenue and 42% of total MW bid volume over the one-year period analyzed (Figure 15). As shown in Figure 16, the average price paid for these FTRs was $49/MW-month, compared to the $37/MW-month average purchase price of all purchased FTRs. The top ten FTR source cleared buy bids comprised 77% of all cleared buy bid revenue and 59% of total cleared MW buy bid volume over the one-year period analyzed (Figure 17). Seven of the ten highest bid revenue FTR sources were also among the ten highest cleared buy bid FTR sources.

Figure 21 shows FTR source information for cleared sell offers and shows that FTRs from Keystone and Conemaugh, both in Western Pennsylvania, were the highest revenue producing FTRs sold, producing 95% of total sell revenues received over the one-year period analyzed while being only 17% of total volume sold. As before, these FTR sources were coupled with destinations on the eastern side of the Eastern Interface. Figure 22 shows that the average selling prices for these FTR sources exceeded the few other FTRs sold.

Figures 23 to 26 summarize revenue and volume for the ten highest revenue FTR destinations for buy bids and cleared buy bids. FTRs into PSEG were the most desirable, accounting for 28% of total MW volume bid and 18% of total volume cleared. PSEG FTRs constituted 57% of total cleared buy revenue (Figure 25).

Figures 27 to 30 present information for sell offers by destination. FTRs into PSEG account for 96% of total sell offer revenue and were the highest volume FTRs offered for sale. These FTRs had the highest average clearing price ($221/MW-month per Figure 30) and the highest average offer price ($474/MW-month per Figure 28). The next highest average clearing price was $4/MW-month to CEI (Figure 30).

As shown in the summary data of Table 6, transmission constraints existed in 26% of all hours on 76 unique facilities during the year under review.[18] On average, each facility was overloaded 6.3 times for a total of 38.5 hours over the year, and a mean overloaded

[18] Since the inception of LMP on April 1, 1998 there has been transmission congestion on 105 unique facilities.

duration of 5.3 hours per event. Median values were 2.0 events per overloaded facility, 11 total hours over the year, and a 4.5-hour duration per event.

**Table 6. Congestion Event Statistics**
**May 1, 1999 Through April 30, 2000**

| | Congestion Events | | | | | Congestion Events | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Monitored Facility** | **Total Hours** | **Percent Of Hours** | **Number of Occurrences** | **Average Duration** | **Monitored Facility** | **Total Hours** | **Percent Of Hours** | **Number of Occurrences** | **Average Duration** |
| Plainsboro-Trenton D 138 | 495 | 5.7% | 45 | 11.0 | Homercity 345/230 TN | 11 | 0.1% | 1 | 11.0 |
| DPLSouth Interface | 435 | 5.0% | 62 | 7.0 | Warren-Falconer 115 | 10 | 0.1% | 2 | 5.0 |
| PJM Eastern Interface | 180 | 2.1% | 49 | 3.7 | N.Salisbury-Fruitland 69 | 9 | 0.1% | 2 | 4.5 |
| Erie West 345/230 T1 | 156 | 1.8% | 25 | 6.2 | Bayonne-Marion L 138 | 9 | 0.1% | 1 | 9.0 |
| Cedar Grove-Roseland B 230 | 149 | 1.7% | 30 | 5.0 | Hunterstown 500/230 T1 | 9 | 0.1% | 1 | 9.0 |
| Oakhall-Tasley 69 | 122 | 1.4% | 18 | 6.8 | Glasgow-Mt.Pleasant 138 | 8 | 0.1% | 3 | 2.7 |
| Loretto-Vienna 138 | 98 | 1.1% | 6 | 16.3 | Trenton 230/138 T1 | 8 | 0.1% | 3 | 2.7 |
| Brunswick-Edison H 138 | 95 | 1.1% | 23 | 4.1 | Alburtis-Hosensack 230 | 8 | 0.1% | 2 | 4.0 |
| Easton-Trappe Tap 69 | 95 | 1.1% | 12 | 7.9 | Branchburg-Flagtown C 230 | 8 | 0.1% | 2 | 4.0 |
| Bayonne-Pvsc I 138 | 84 | 1.0% | 9 | 9.3 | Mt.Pleasant-Townsend 138 | 7 | 0.1% | 3 | 2.3 |
| Cedar Grove-Clifton K 230 | 80 | 0.9% | 12 | 6.7 | N. Philadelphia-Waneeta 230 | 7 | 0.1% | 2 | 3.5 |
| Manor-S.Akron 230 | 61 | 0.7% | 9 | 6.8 | Bridgeville-Taylor 69 | 7 | 0.1% | 1 | 7.0 |
| Edison-Meadow Road R 138 | 60 | 0.7% | 13 | 4.6 | Indianriver 230/138 T20 | 6 | 0.1% | 2 | 3.0 |
| PJM Western Interface | 57 | 0.7% | 10 | 5.7 | Cumberland 230/138 T2 | 6 | 0.1% | 1 | 6.0 |
| Cromby 230/69 T5 | 47 | 0.5% | 11 | 4.3 | Elko-Forest 230 | 6 | 0.1% | 1 | 6.0 |
| Loretto-Kings Creek- 69 | 46 | 0.5% | 6 | 7.7 | Hummelstwn-Middletwn 230 | 6 | 0.1% | 1 | 6.0 |
| Cheswold 138/69 T1 | 39 | 0.4% | 5 | 7.8 | Lewistown-Juniata 230 | 6 | 0.1% | 1 | 6.0 |
| Nelson-Vienna 138 | 35 | 0.4% | 9 | 3.9 | Roseland-Whippany A 230 | 5 | 0.1% | 1 | 5.0 |
| Vienna 230/138 T20 | 30 | 0.3% | 6 | 5.0 | Burtonsville-Highridge 230 | 4 | 0.0% | 1 | 4.0 |
| Oakhall-Hallwood 69 | 29 | 0.3% | 8 | 3.6 | Indian River-Milford 230 | 4 | 0.0% | 1 | 4.0 |
| Church-Ibcorn 69 | 29 | 0.3% | 4 | 7.3 | Roseland 230/138 T3 | 4 | 0.0% | 1 | 4.0 |
| Piney Grove-Mt.Olive 69 | 28 | 0.3% | 3 | 9.3 | Delanc St-Linden W 138 | 3 | 0.0% | 1 | 3.0 |
| Devils Brk-Plainsboro D 138 | 27 | 0.3% | 3 | 9.0 | Facerock-Five Forks 115 | 3 | 0.0% | 1 | 3.0 |
| Whitpain 500/230 T1 | 26 | 0.3% | 3 | 8.7 | Lewistown 230/115 T1 | 3 | 0.0% | 1 | 3.0 |
| Brunner Isl-W.Hempfield 230 | 24 | 0.3% | 5 | 4.8 | Talbot-Trappe Tap 69 | 3 | 0.0% | 1 | 3.0 |
| Brandon Shres-Riverside 230 | 24 | 0.3% | 4 | 6.0 | TMI 500/230 T1 | 3 | 0.0% | 1 | 3.0 |
| Graceton-Raphael Road 230 | 22 | 0.3% | 3 | 7.3 | Athenia-Saddlebrook Q 230 | 2 | 0.0% | 1 | 2.0 |
| Limerick 500/230 T4 | 20 | 0.2% | 6 | 3.3 | Buckinghm-Pleasnt Vy L 230 | 2 | 0.0% | 1 | 2.0 |
| Whitpain 500/230 T2 | 20 | 0.2% | 5 | 4.0 | Cheswold-Dover Tap 138 | 2 | 0.0% | 1 | 2.0 |
| N.Salisbury-Mt.Hermon 69 | 18 | 0.2% | 2 | 9.0 | Easton-Easton Muni 69 | 2 | 0.0% | 1 | 2.0 |
| Edgemoor-Harmony 230 | 17 | 0.2% | 4 | 4.3 | Erie West-Erie South 345 | 2 | 0.0% | 1 | 2.0 |
| Homercity 345/230 TS | 17 | 0.2% | 2 | 8.5 | Fairlawn-Waldwick O 230 | 2 | 0.0% | 1 | 2.0 |
| Homer City-Shelocta 230 | 16 | 0.2% | 3 | 5.3 | Martins Crk-Siegfried 2 230 | 2 | 0.0% | 1 | 2.0 |
| Steele 230/138 T20 | 14 | 0.2% | 4 | 3.5 | Susquehanna 500/230 T21 | 2 | 0.0% | 1 | 2.0 |
| PJM Central Interface | 13 | 0.1% | 3 | 4.3 | Vienna-Vienna Lo 69 | 2 | 0.0% | 1 | 2.0 |
| Cromby 138/69 T3 | 13 | 0.1% | 1 | 13.0 | Whitpain 500/230 T3 | 2 | 0.0% | 1 | 2.0 |
| Erie East-S.Ripley 230 | 12 | 0.1% | 1 | 12.0 | Athenia 230/138 T1 | 1 | 0.0% | 1 | 1.0 |
| PJM Western Volt Interface | 11 | 0.1% | 3 | 3.7 | Gloucester 230/138 T4 | 1 | 0.0% | 1 | 1.0 |
| | | | | | **Total** | **2274** | **26.0%** | **477** | |
| | | | | | **Average** | **38.5** | **0.4%** | **6.3** | **5.3** |
| | | | | | **Median** | **11.0** | **0.1%** | **2.0** | **4.5** |

**Recommendations**

This report provides a review of the first year of operation of the FTR auction process. The FTR auction has succeeded in its purpose of increasing access to FTRs. The basic mechanics of the FTR auction have worked as intended. Auction activity has increased steadily since the inception of the auction as shown by the figures attached to this report.

The only issue raised in this report with respect to the FTR auction is not related either to the mechanics of the auction or to the level of liquidity provided by the auction. The establishment of the FTR auction has created potential issues related to the timing of transmission outages. Any party with prior knowledge of transmission outages could use that information to take positions in the FTR auction market. Transmission companies will have knowledge of planned transmission outages prior to the posting of that information. There could be an issue if transmission companies take positions in the FTR market based on information which is not publicly available prior to the close of the auction. A complaint regarding such an issue was filed with the MMU, but the MMU found no evidence that inappropriate behavior occurred.

The PJM Manual for Transmission Operations, Manual M-03, in the Scheduling Transmission Outages section states: "The Transmission Owners notify the PJM OI at least three office working days before the time of the planned outage." The Manual also states, in the Requesting Planned Transmission Outages (Work Requests) section: "In order to maintain planned transmission outage status and priority, a Work Request must be submitted at least three office working days before the removal of the equipment from service."

However, the Manual, in the General Principles section, states that: "Each Transmission Owner submits the tentative dates of all transmission outage of Designated Transmission Facilities to the PJM OI as far in advance as possible."[19] The Manual also states in the Scheduling Transmission Outages section: "Each Transmission Owner submits the tentative dates of all planned transmission outages of Designated Transmission Facilities to the PJM OI as far in advance as possible. … The PJM OI maintains a planned transmission outage schedule for a period of at least the next 13 months. The planned transmission outage schedule is posted, subject to change, on the PJM Open Access Same-time Information System (OASIS)."[20] The Manual also states in the Requesting Planned Transmission Outages (Work Requests) section: "All 500 kV outages are communicated to the PJM OI as early as possible."[21]

All participants should be notified through the OASIS, as far in advance as possible, of planned transmission outages. If such general notification occurs prior to the close of the relevant FTR auctions, it gives all market participants an opportunity to hedge against the risk of congestion created by the scheduled outages. While there is no evidence that any party has acted intentionally to increase the value of its FTRs through the scheduling of outages, it is the view of the Market Monitoring Unit that the issue should be addressed.

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19 PJM Manual for Transmission Operations, Manual M-03, Section 4, page 4-1.

20 PJM Manual for Transmission Operations, Manual M-03, Section 4, Page 4-3.

21 PJM Manual for Transmission Operations, Manual M-03, Section 4, Page 4-5.

In order to maintain confidence in the markets and in order to minimize the potential for gaming the markets, the MMU is making a recommendation to PJM:

The MMU recommends to PJM that all transmission owners be required to provide notice of transmission outages to PJM for posting on the OASIS at least two days prior to the close of the FTR auction which applies to the month of the outage. The MMU recommends that if such notice is not provided, any profits obtained on FTRs purchased in the auction, by any company affiliated with the transmission owner, would be returned. In addition, the MMU recommends to PJM that all transmission owners be required to submit Planned Outage Schedules one year in advance and that such be updated on a regular basis.

**Figure 1**
**FTR Monthly Auction**
**Number of Buy Bids and Sell Offers**
**And Average Buy Bid Clearing Price**

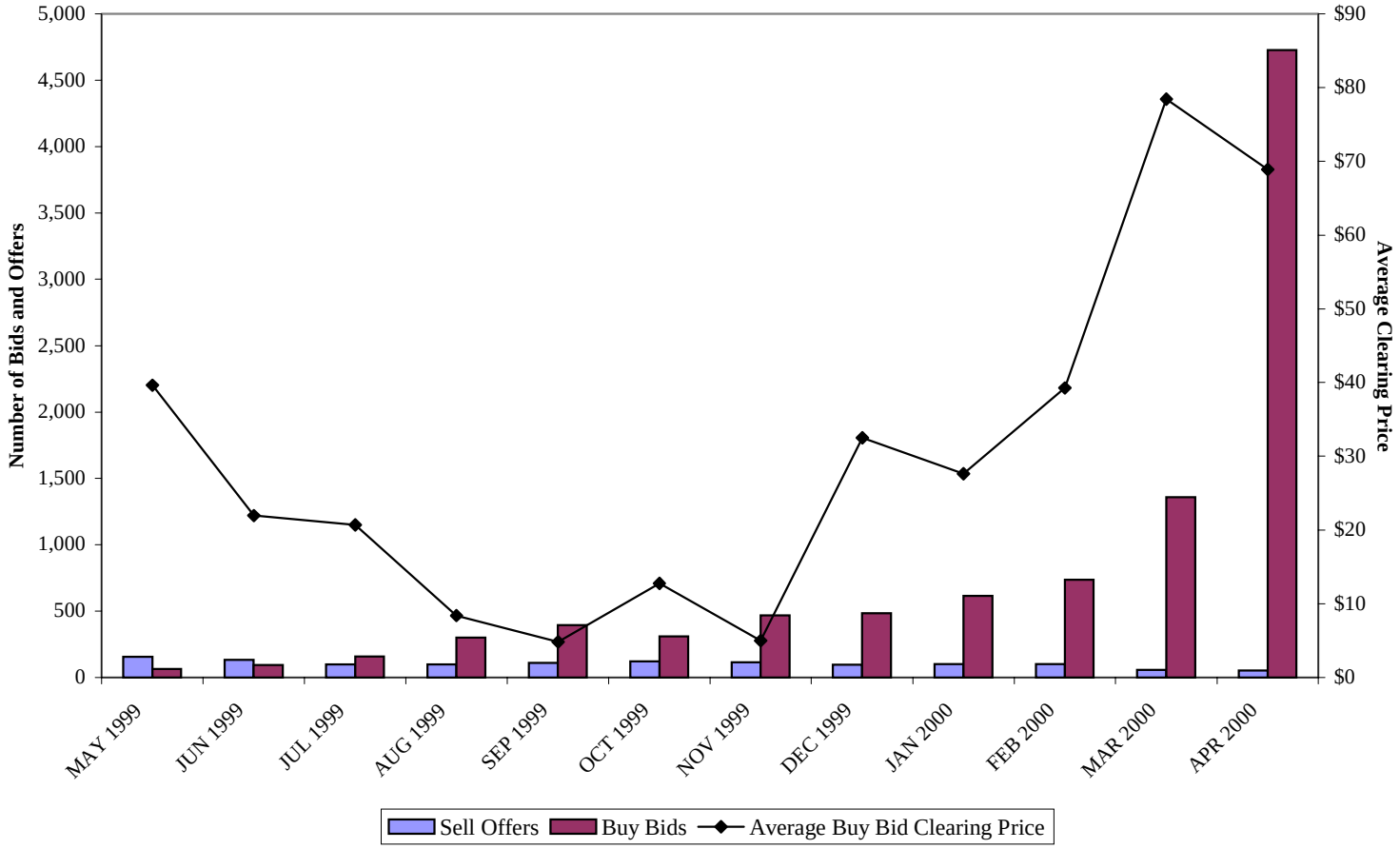

**Figure 2**
**FTR Monthly Auction**
**Net Revenue and Total Volume Cleared**

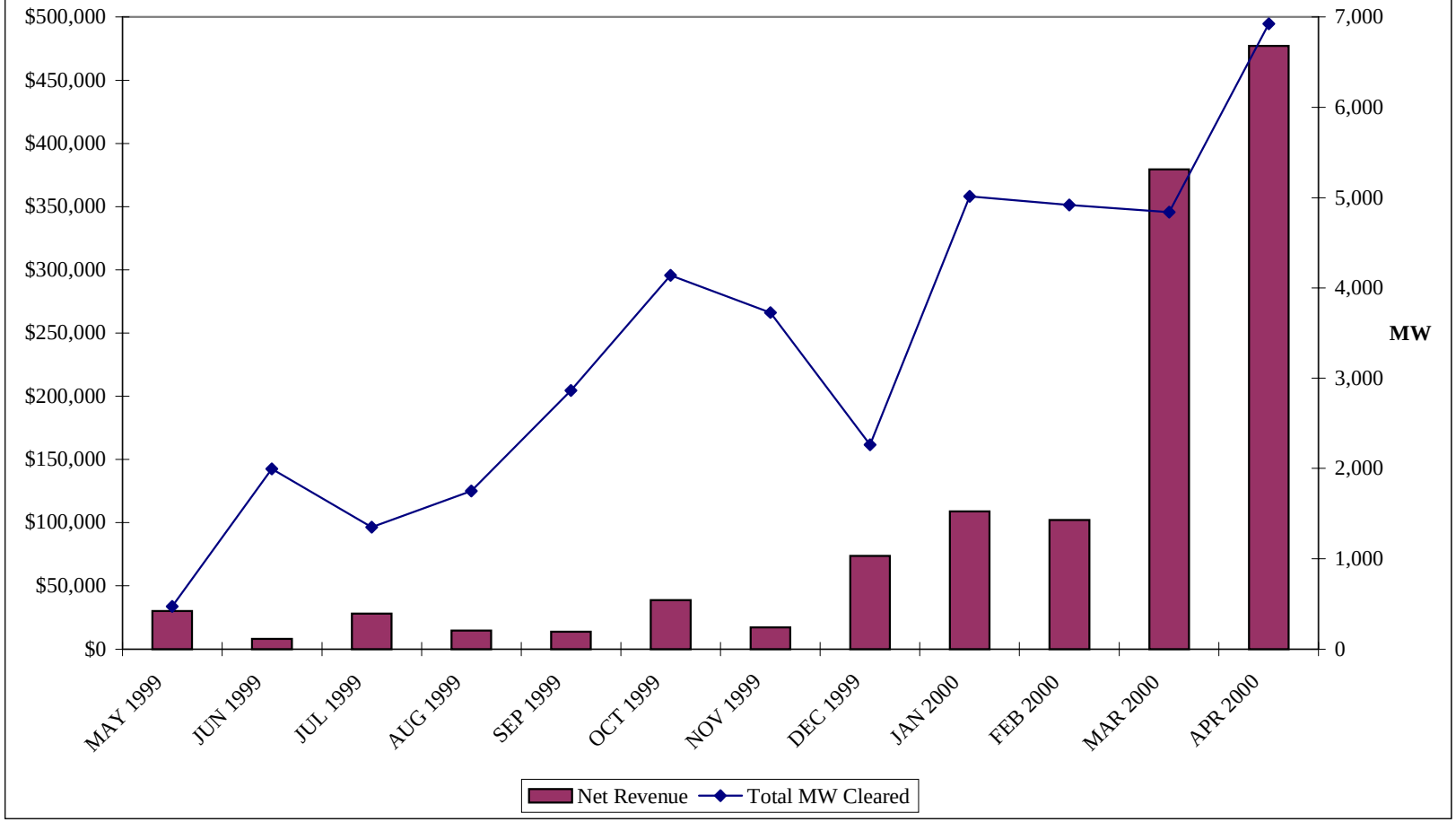

**Figure 3**
**FTR Monthly Auction**
**Volume Cleared and Offered**

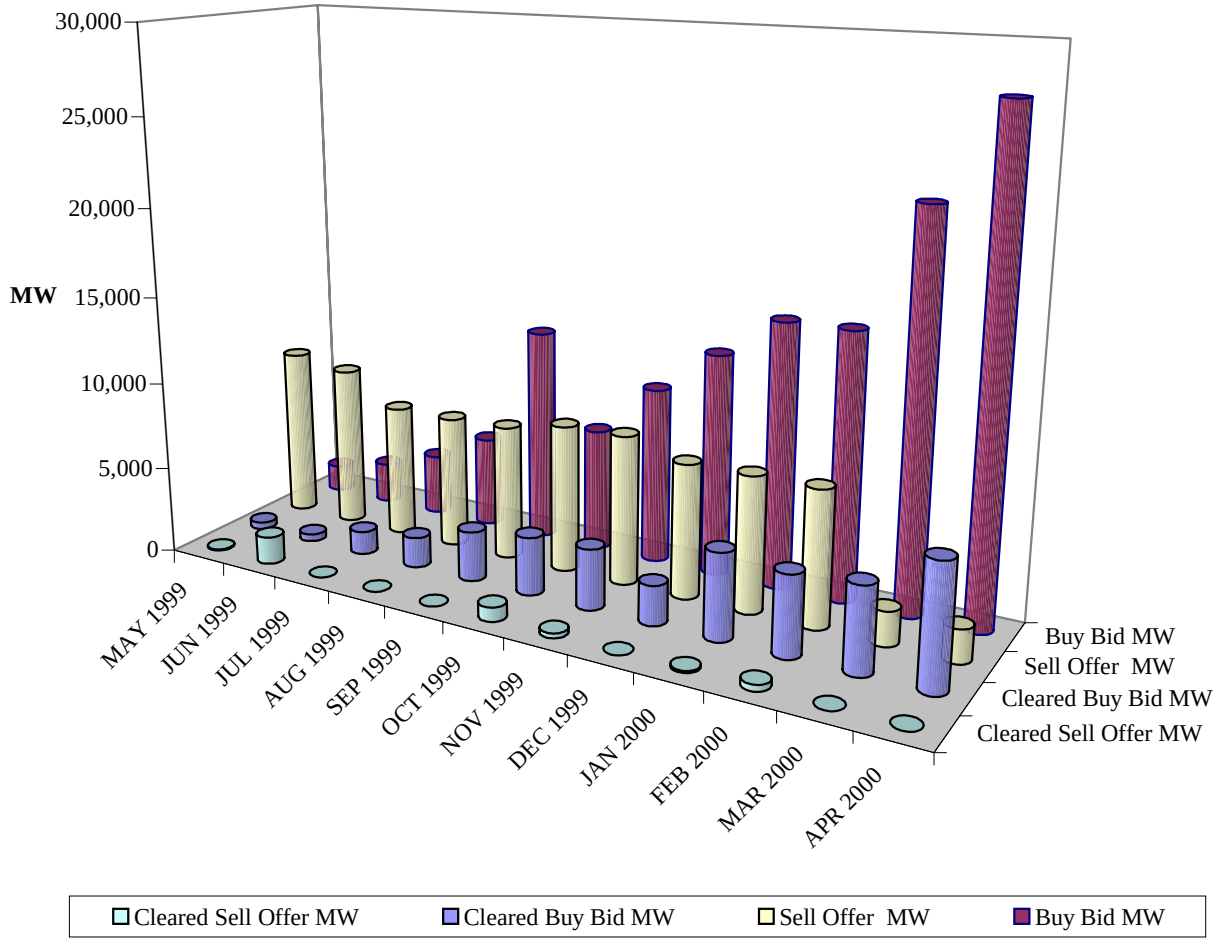

**Figure 4**
**FTR Monthly Auction**
**Percentage of Bid and Offer Volume That Cleared**

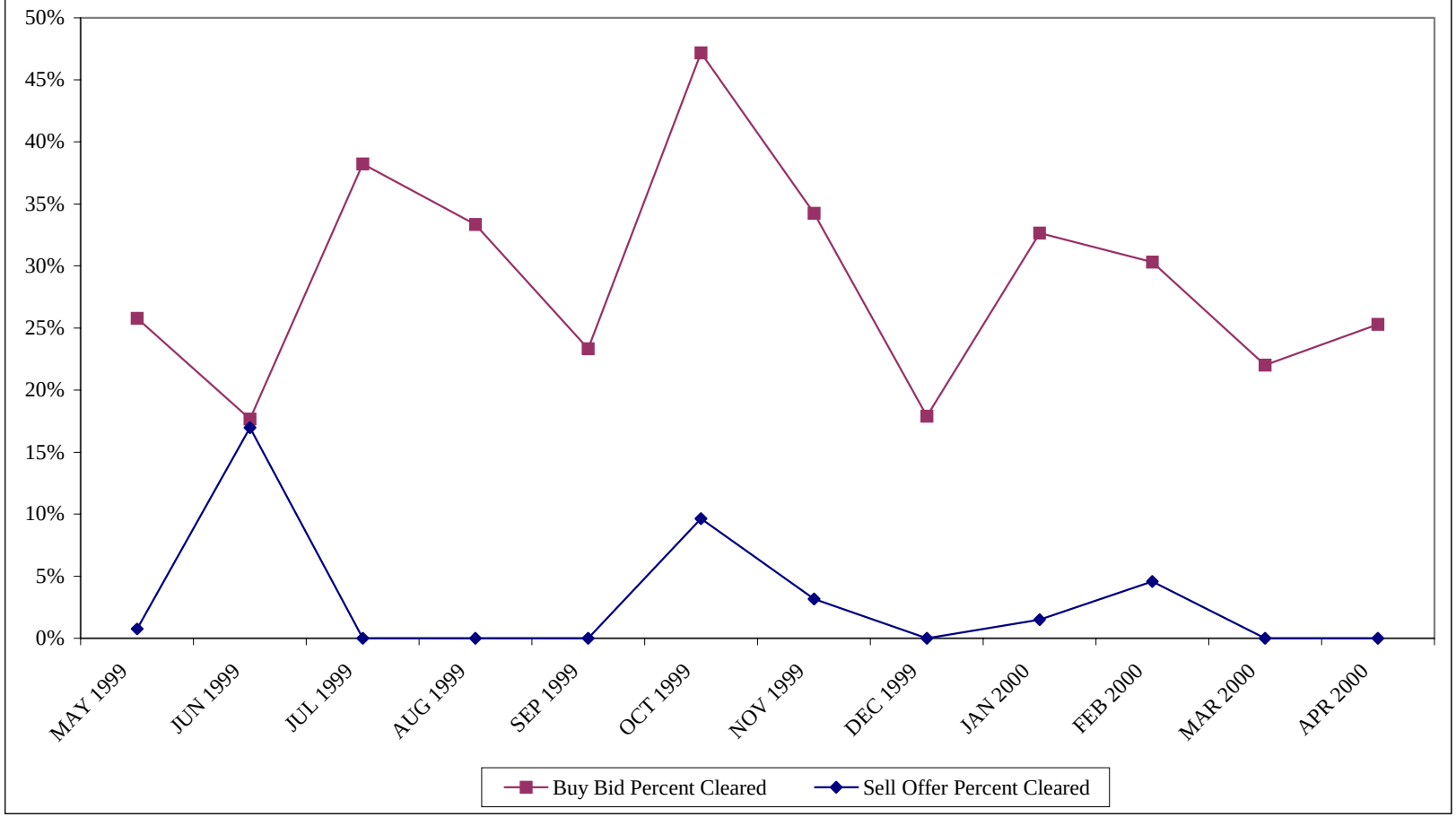

**Figure 5**
**FTR Monthly Auction**
**Revenue Cleared and Offered**

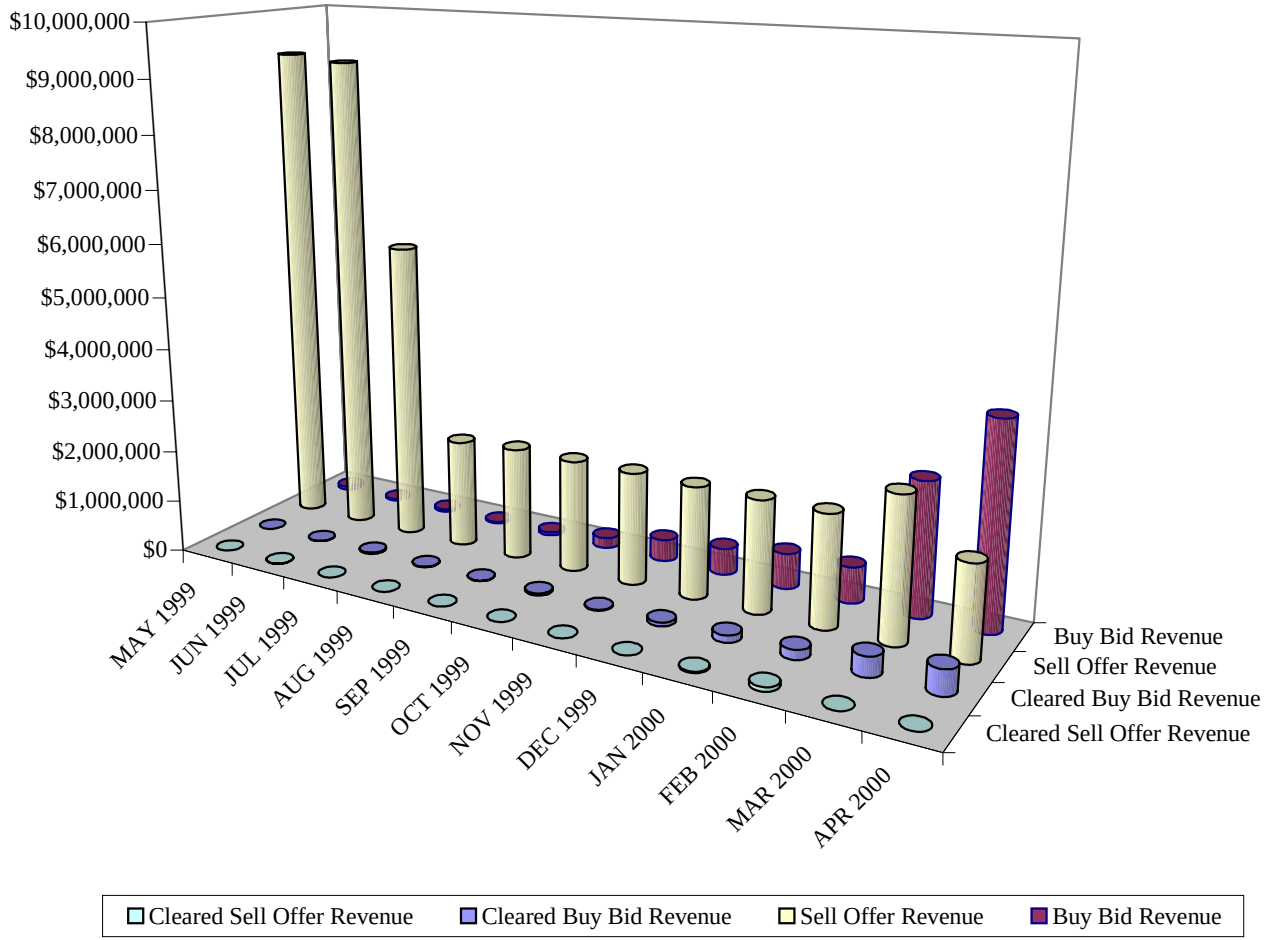

**Figure 6**
**Nonsimultaneous Available FTRs**
**Internal to PJM**

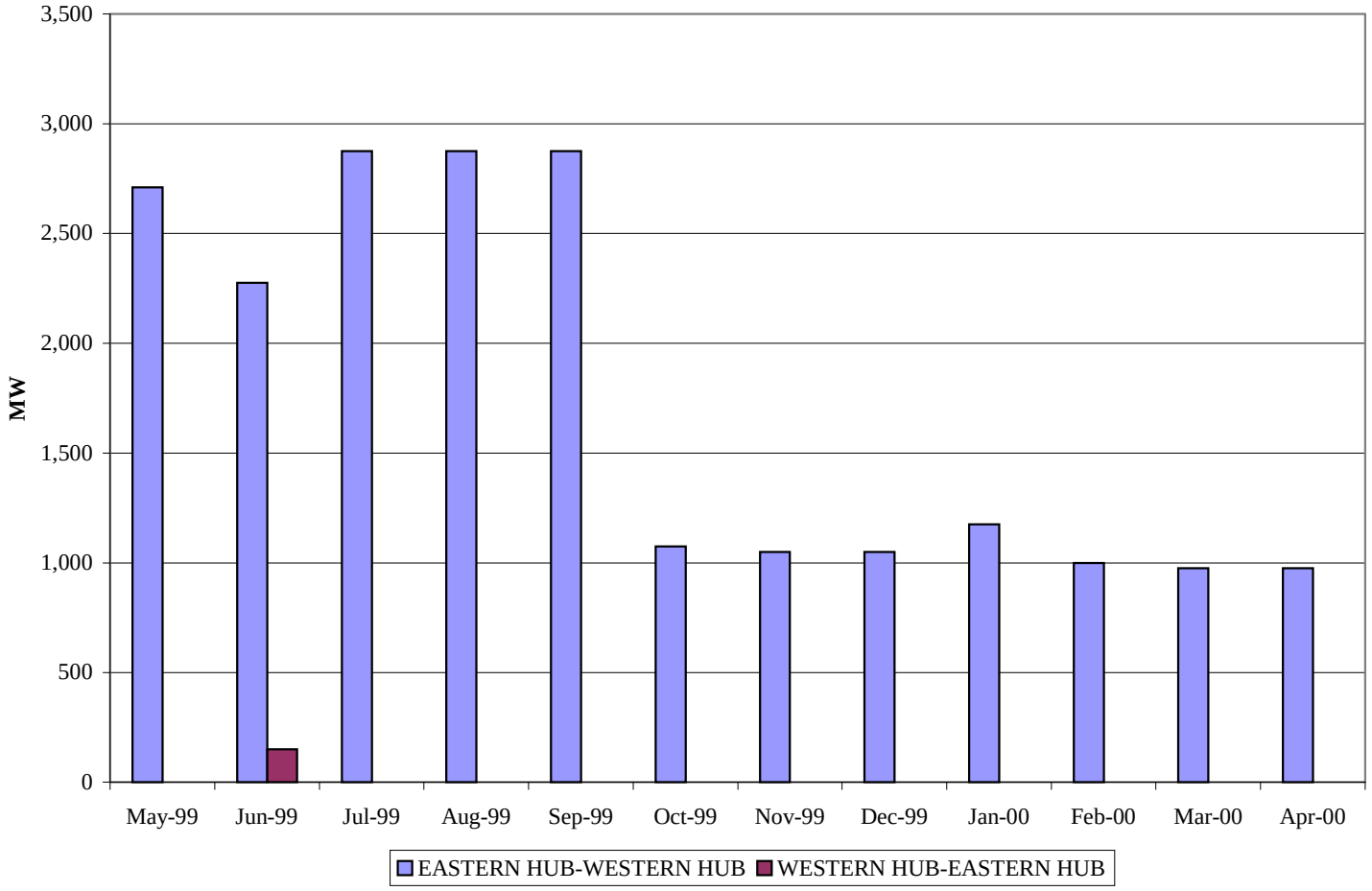

**Figure 7**
**FTR Monthly Auction**
**Annual Revenue and Volume for Ten Highest FTR Path Buy Bids**

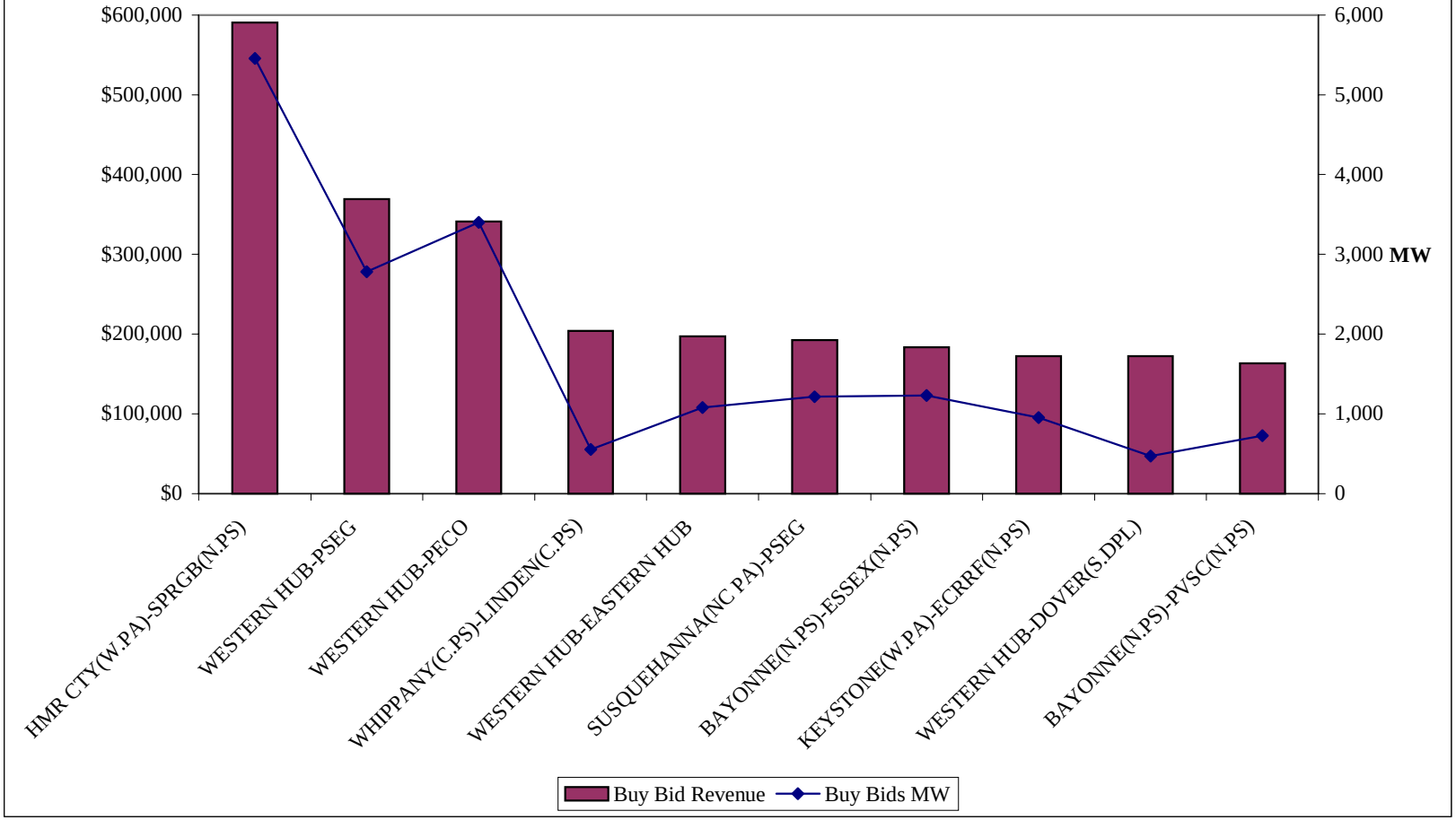

**Figure 8**
**FTR Monthly Auction**
**Average Price per MW for Ten Highest FTR Path Buy Bids**

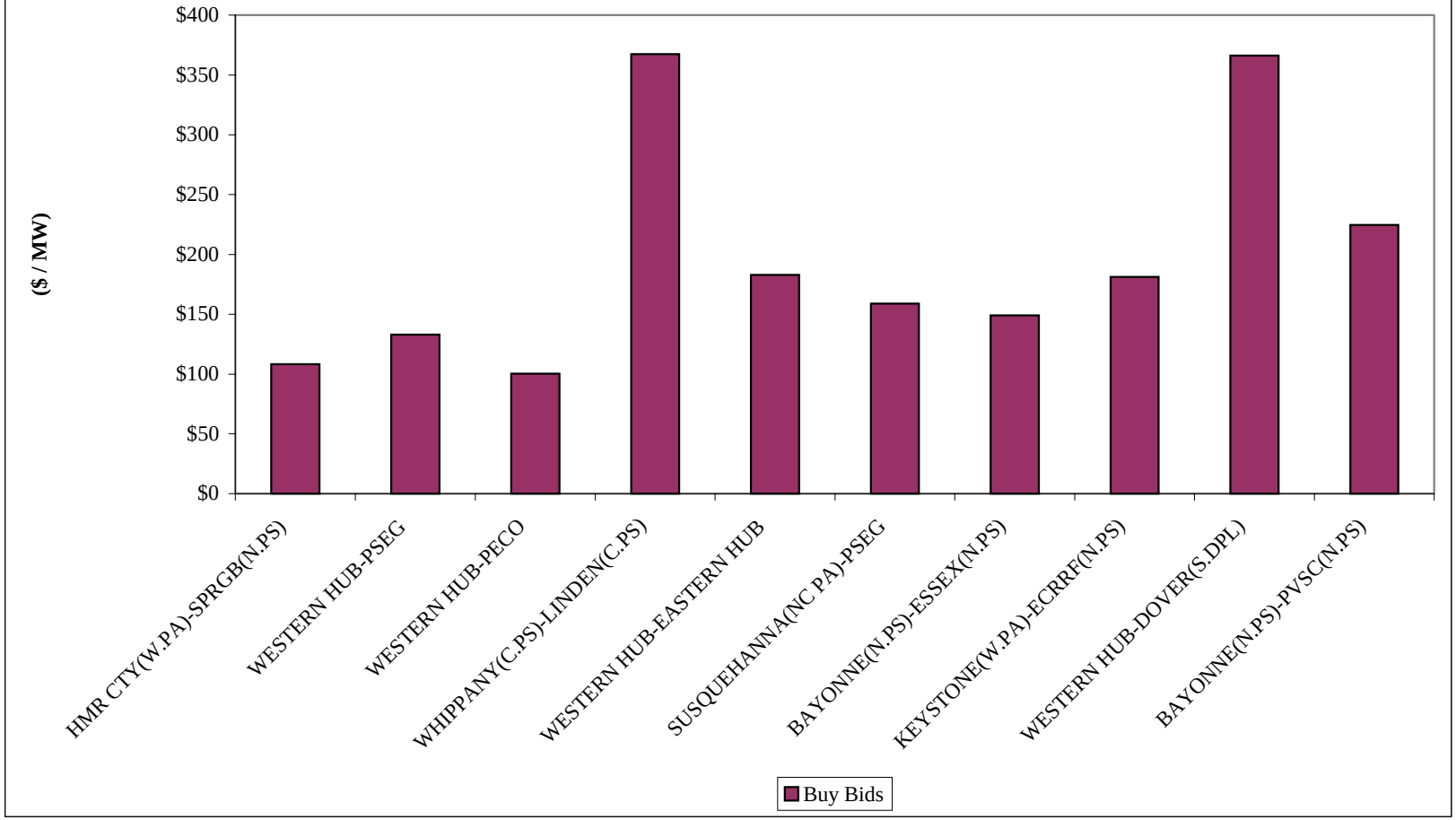

**Figure 9**
**FTR Monthly Auction**
**Annual Revenue and Volume for Ten Highest FTR Path Buy Bids That Cleared**

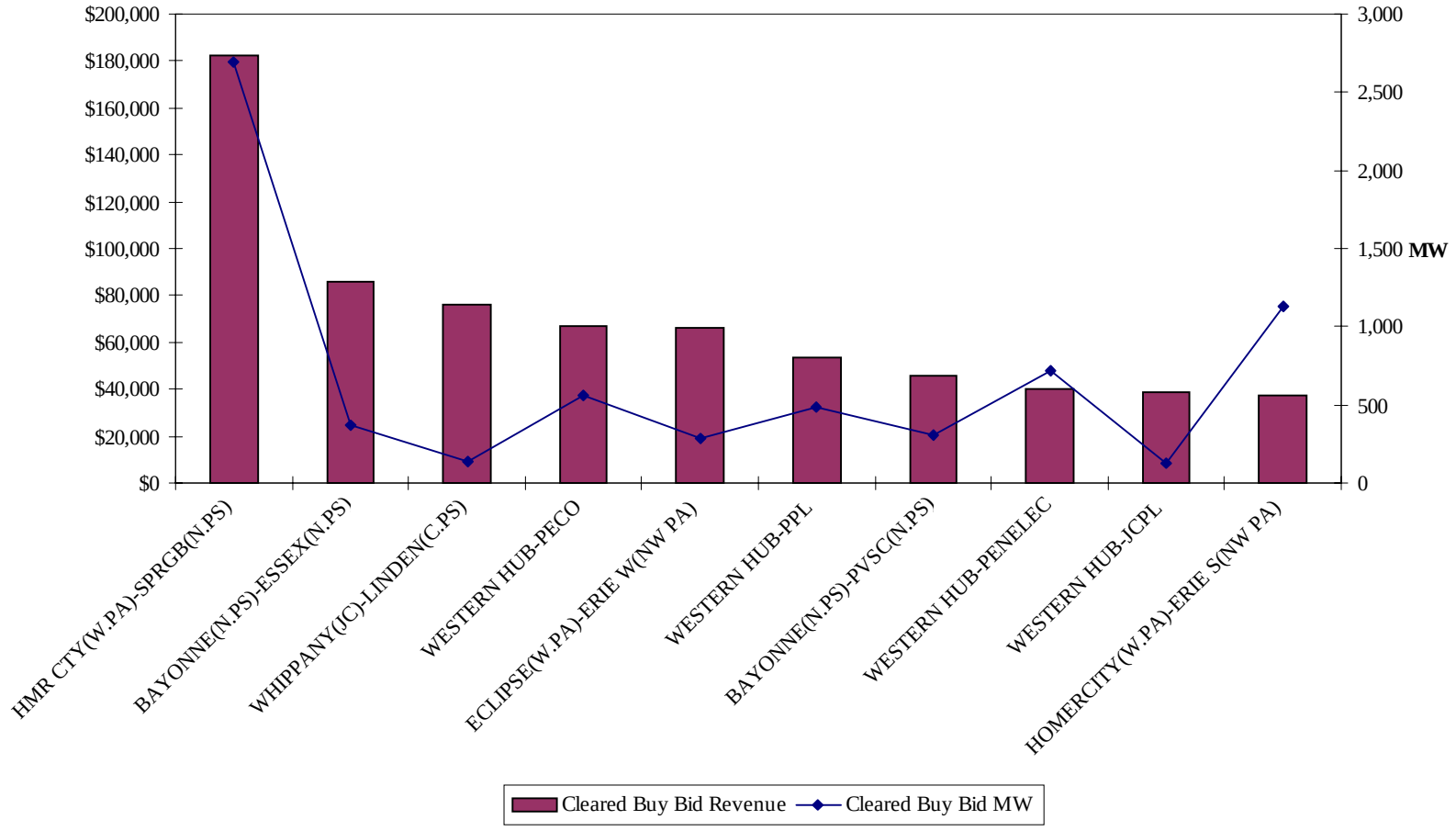

**Figure 10**
**FTR Monthly Auction**
**Average Price per MW for Ten Highest FTR Path Buy Bids That Cleared**

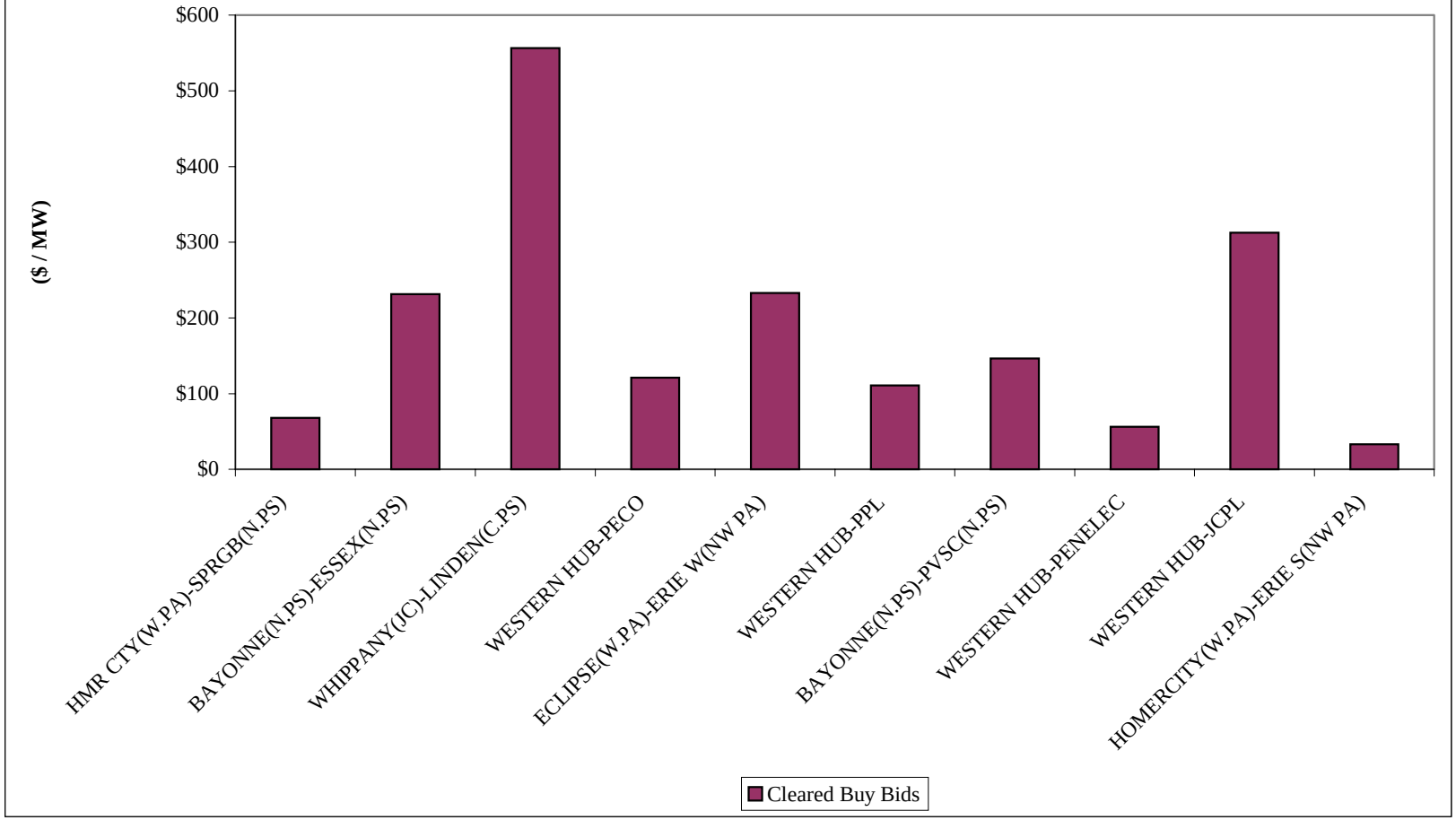

**Figure 11**
**FTR Monthly Auction**
**Annual Revenue and Volume for Ten Highest FTR Path Sell Offers**

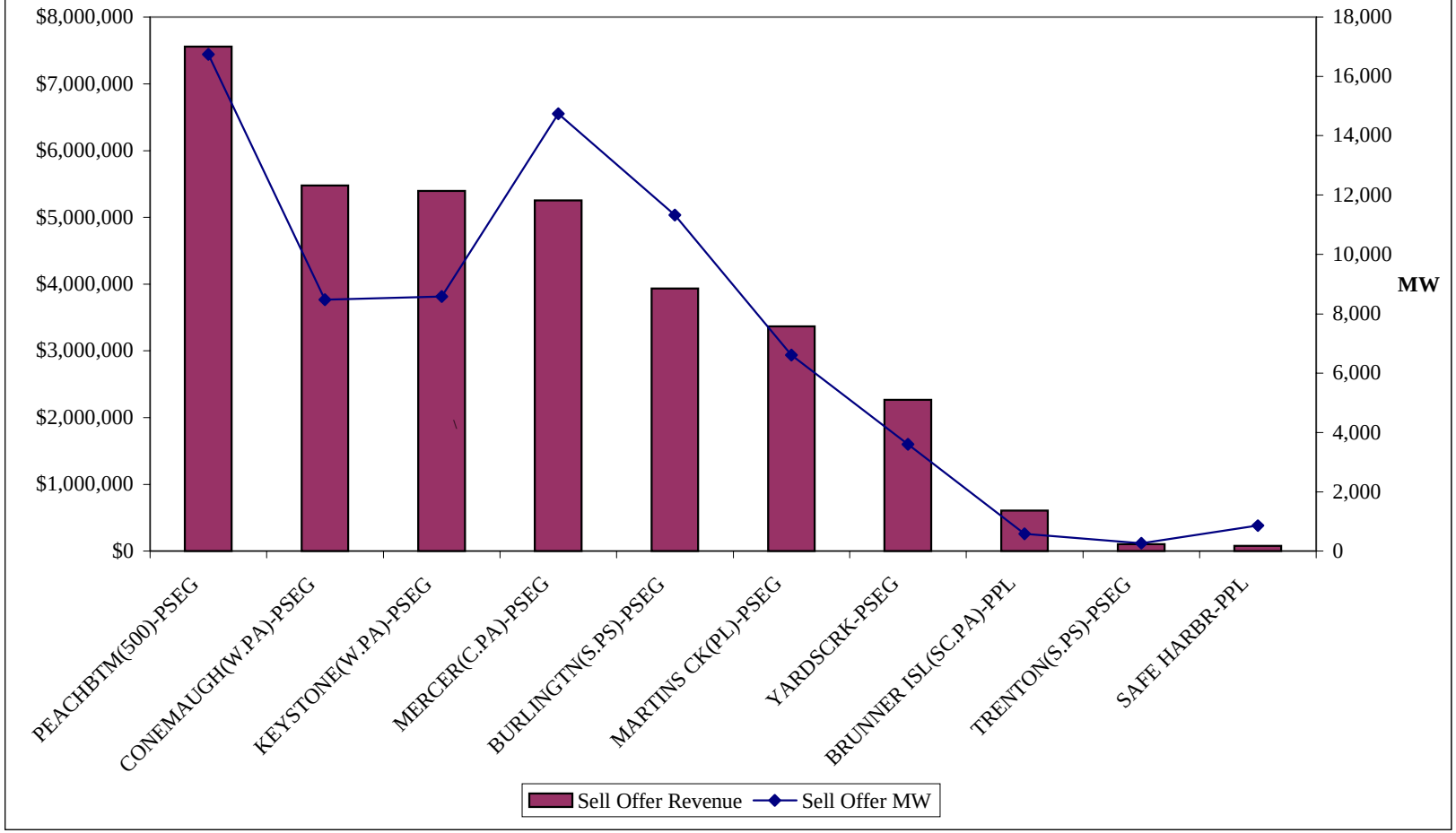

**Figure 12**
**FTR Monthly Auction**
**Average Price per MW for Ten Highest FTR Path Sell Offers**

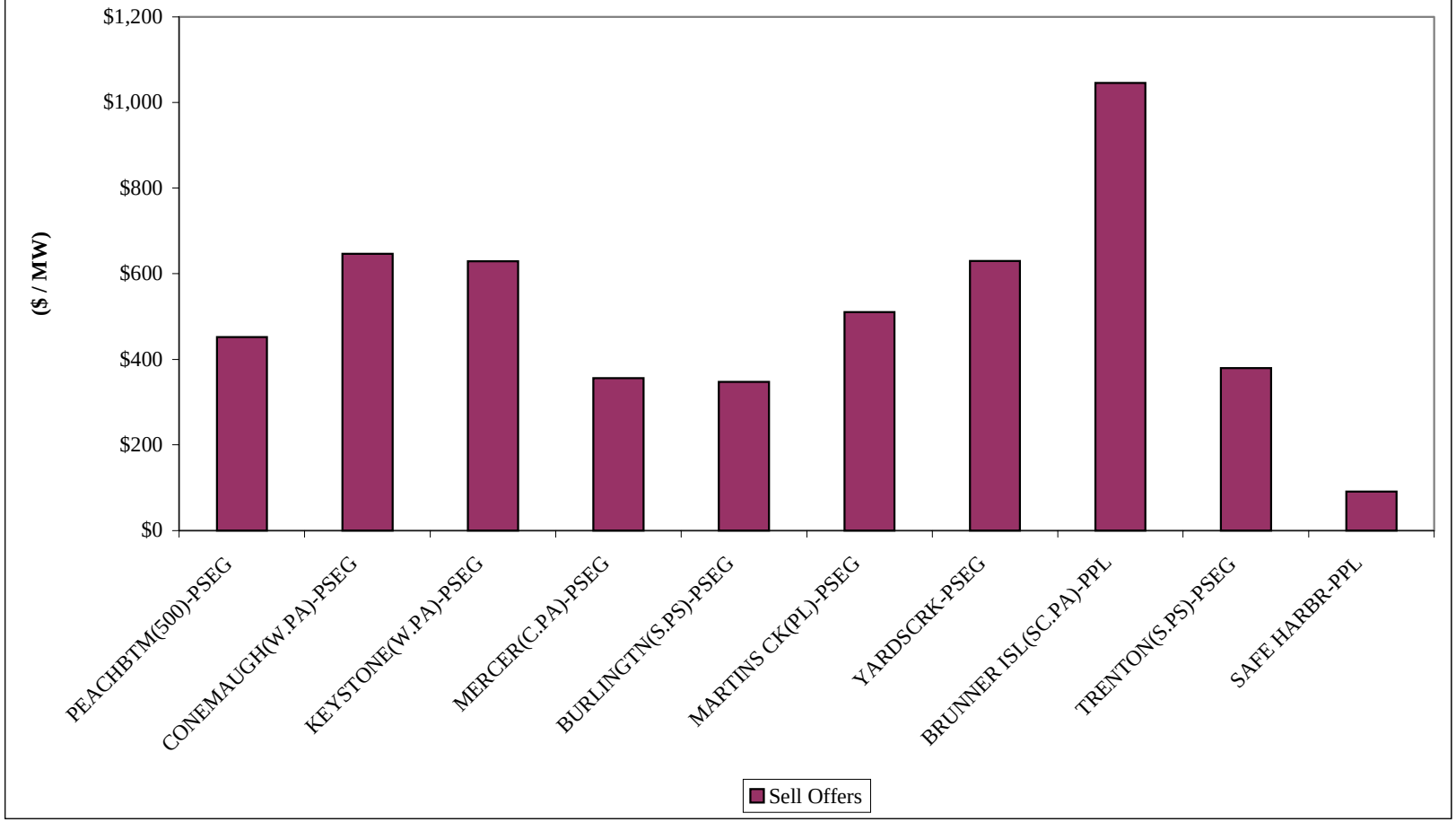

**Figure 13**
**FTR Monthly Auction**
**Annual Revenue and Volume for Ten Highest FTR Path Sell Offers That Cleared**

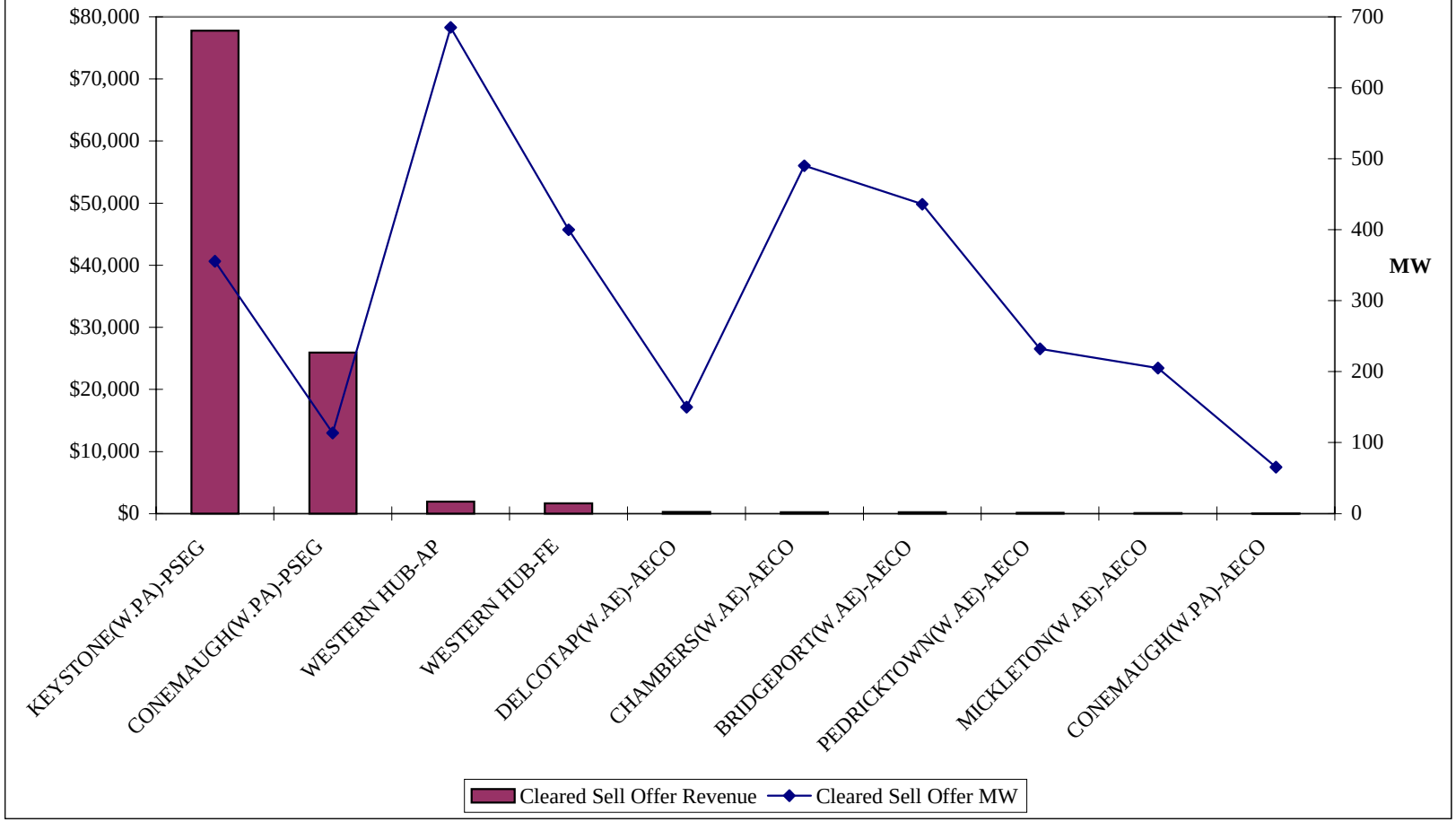


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**Figure 14**
**FTR Monthly Auction**
**Average Price per MW for Ten Highest FTR Path Sell Offers That Cleared**

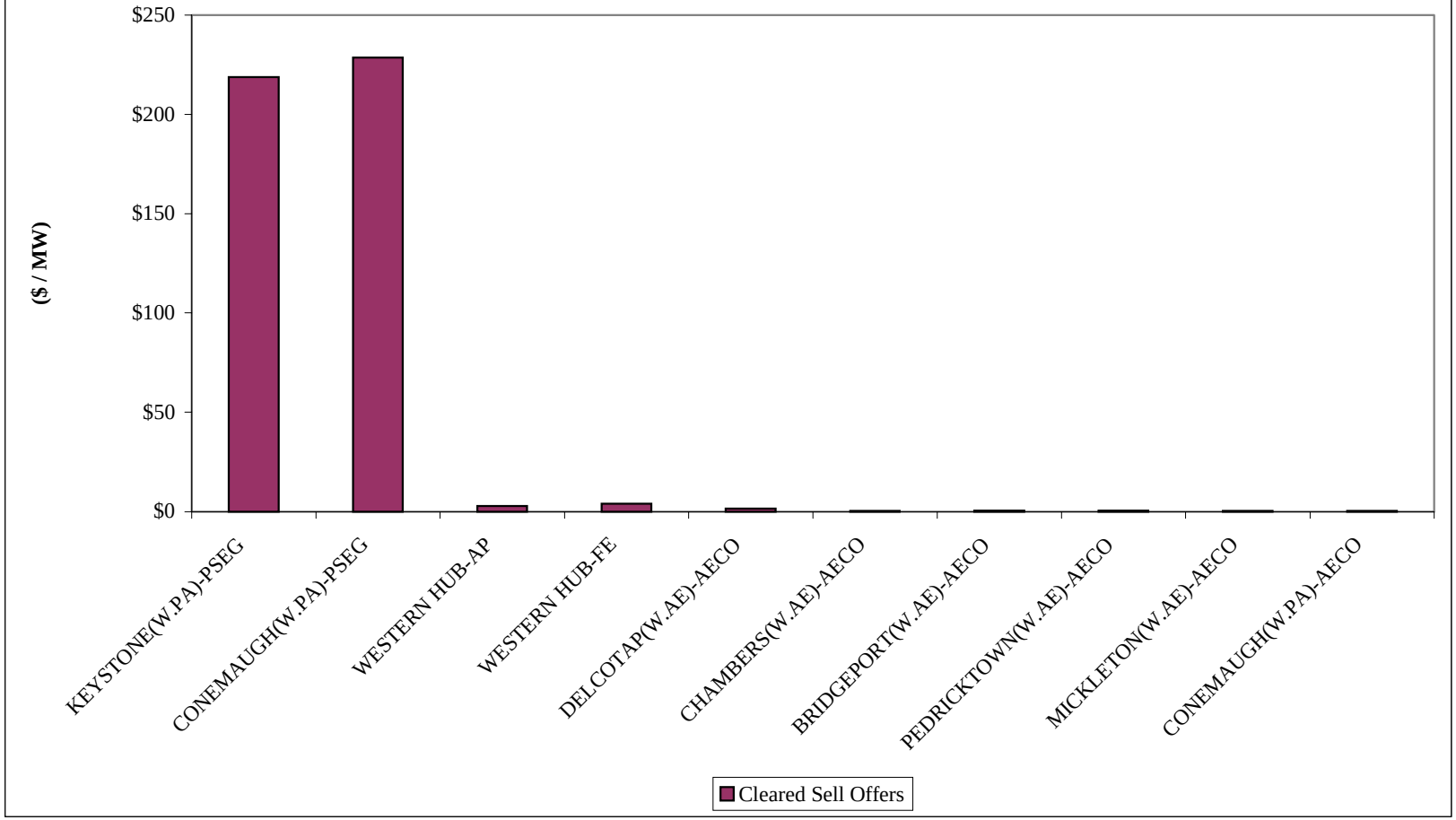

**Figure 15**
**FTR Monthly Auction**
**Annual Revenue and Volume for Ten Highest FTR Source Buy Bids**

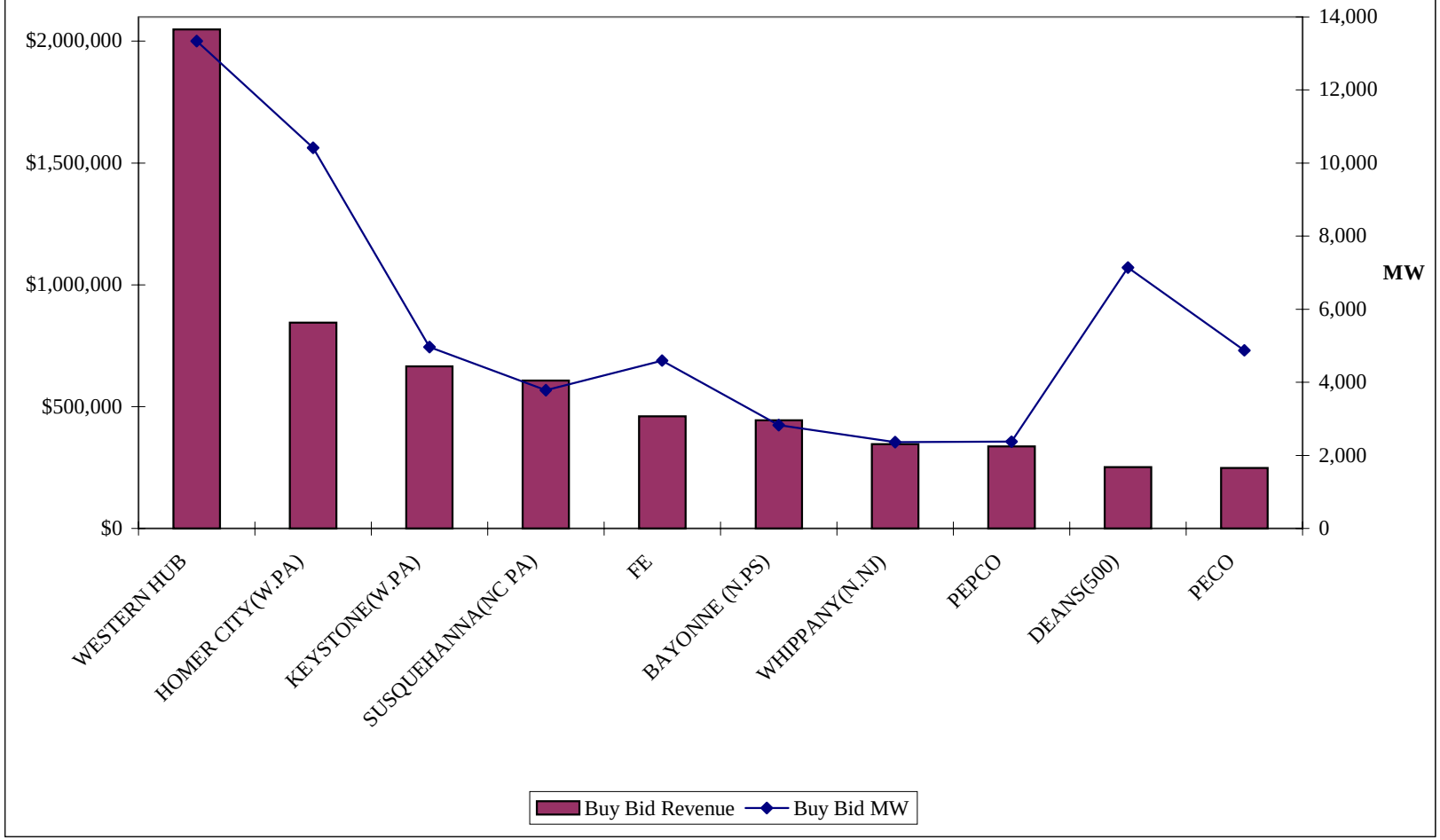

**Figure 16**
**FTR Monthly Auction**
**Average Price for Ten Highest FTR Source Buy Bids That Cleared**

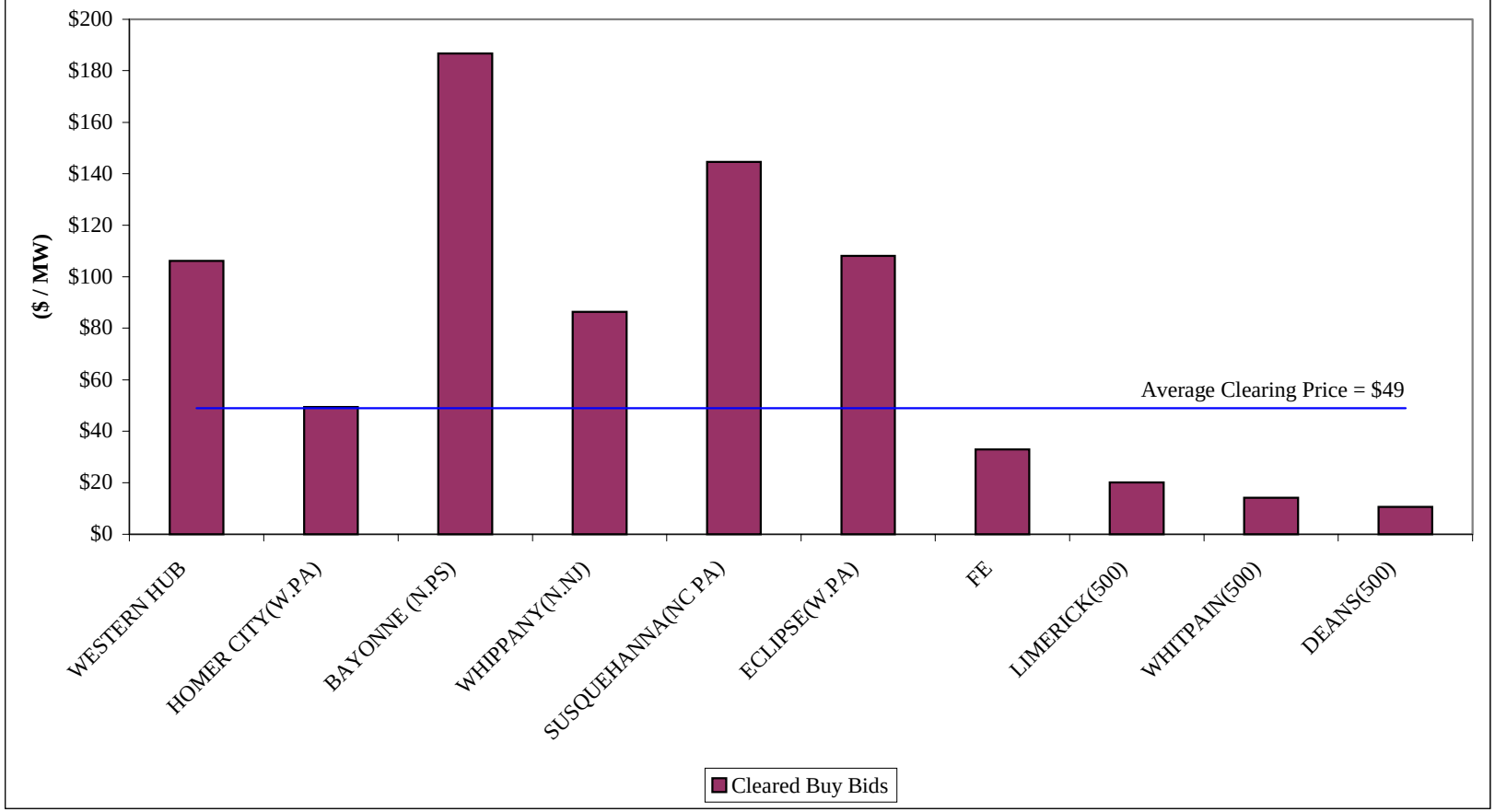

**Figure 17**
**FTR Monthly Auction**
**Annual Revenue and Volume for Ten Highest FTR Source Buy Bids That Cleared**

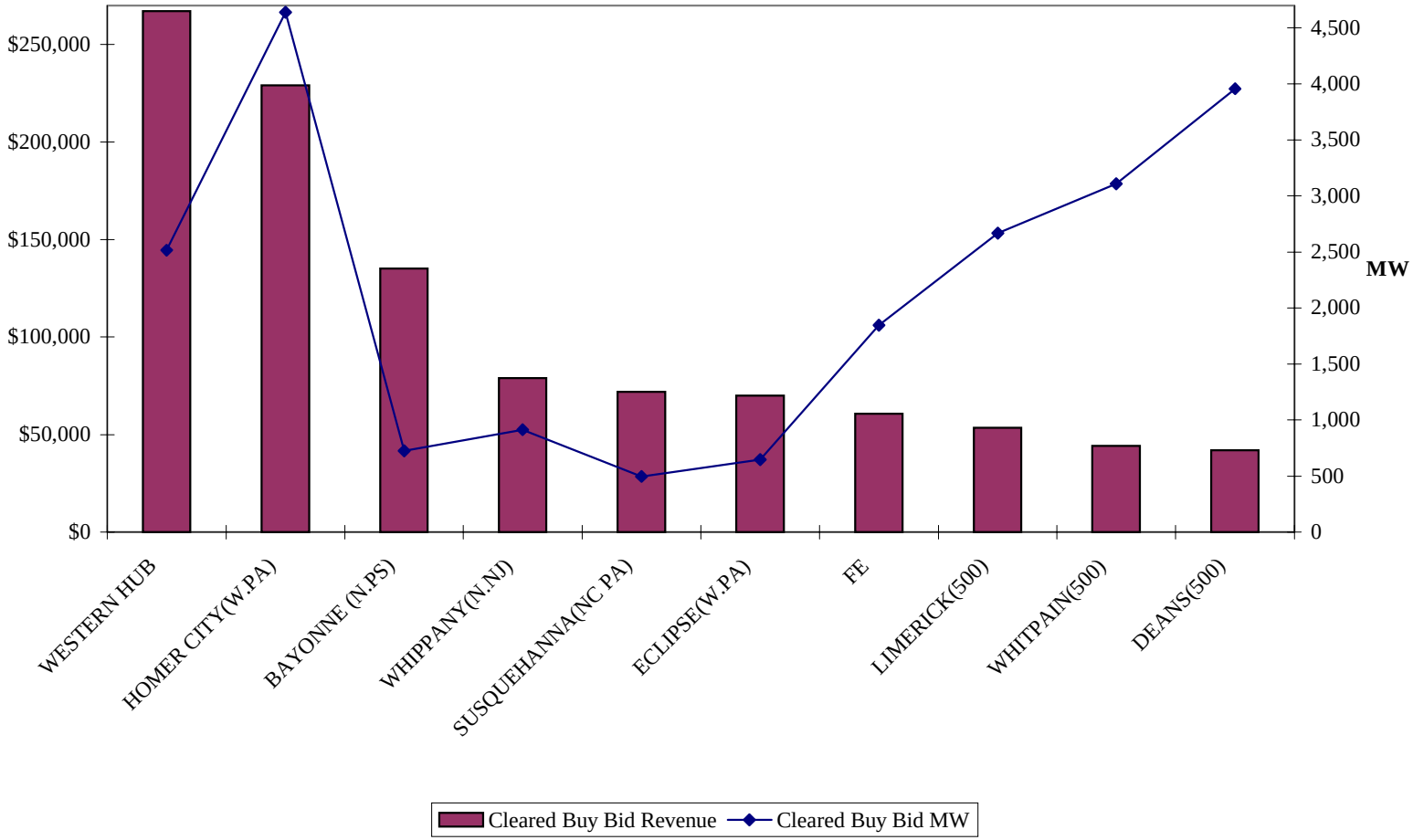

**Figure 18**
**FTR Monthly Auction**
**Average Price for Twenty Highest FTR Source Buy Bids**

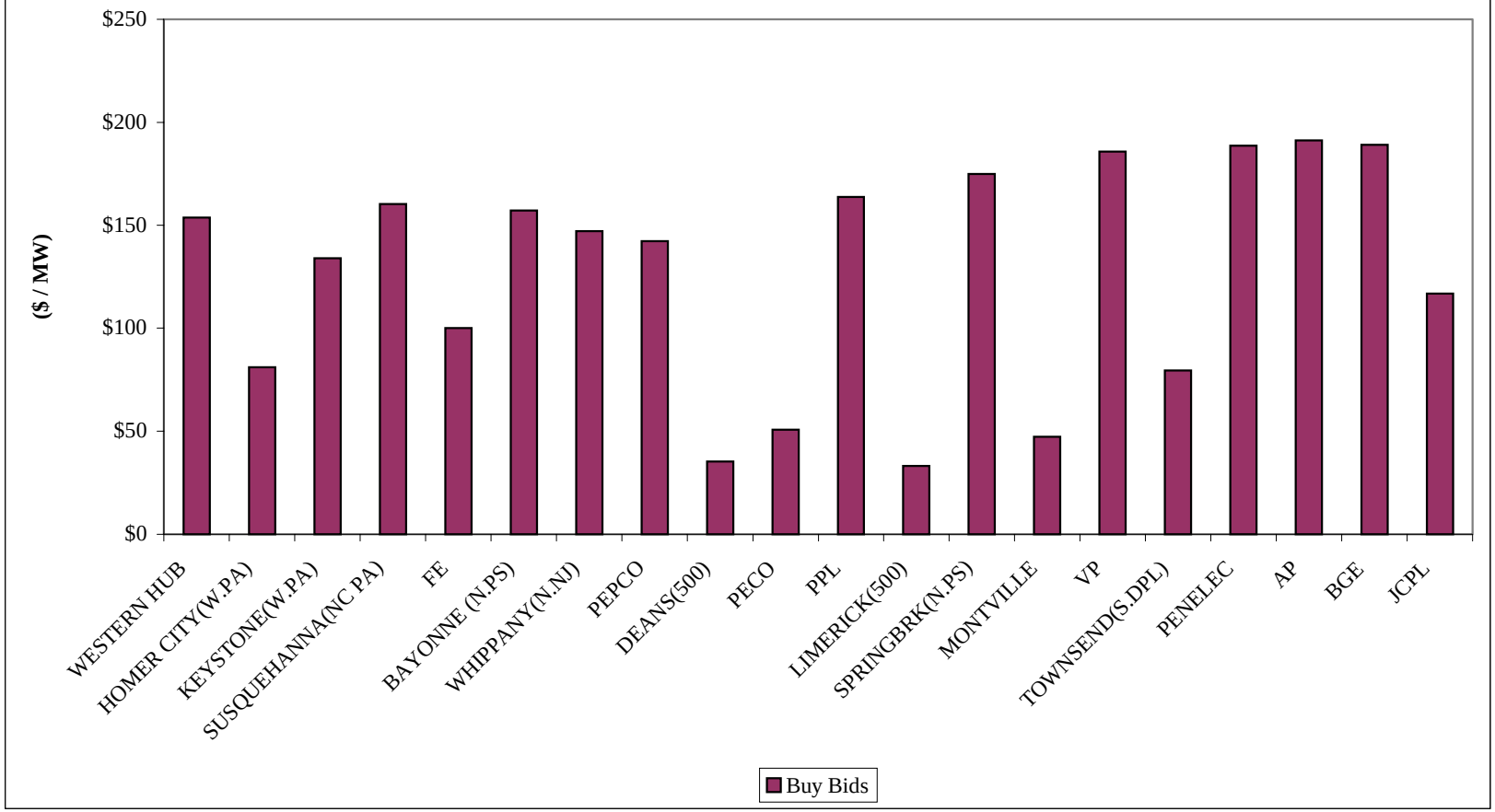

**Figure 19**
**FTR Monthly Auction**
**Annual Revenue and Volume for FTR Source Sell Offers**

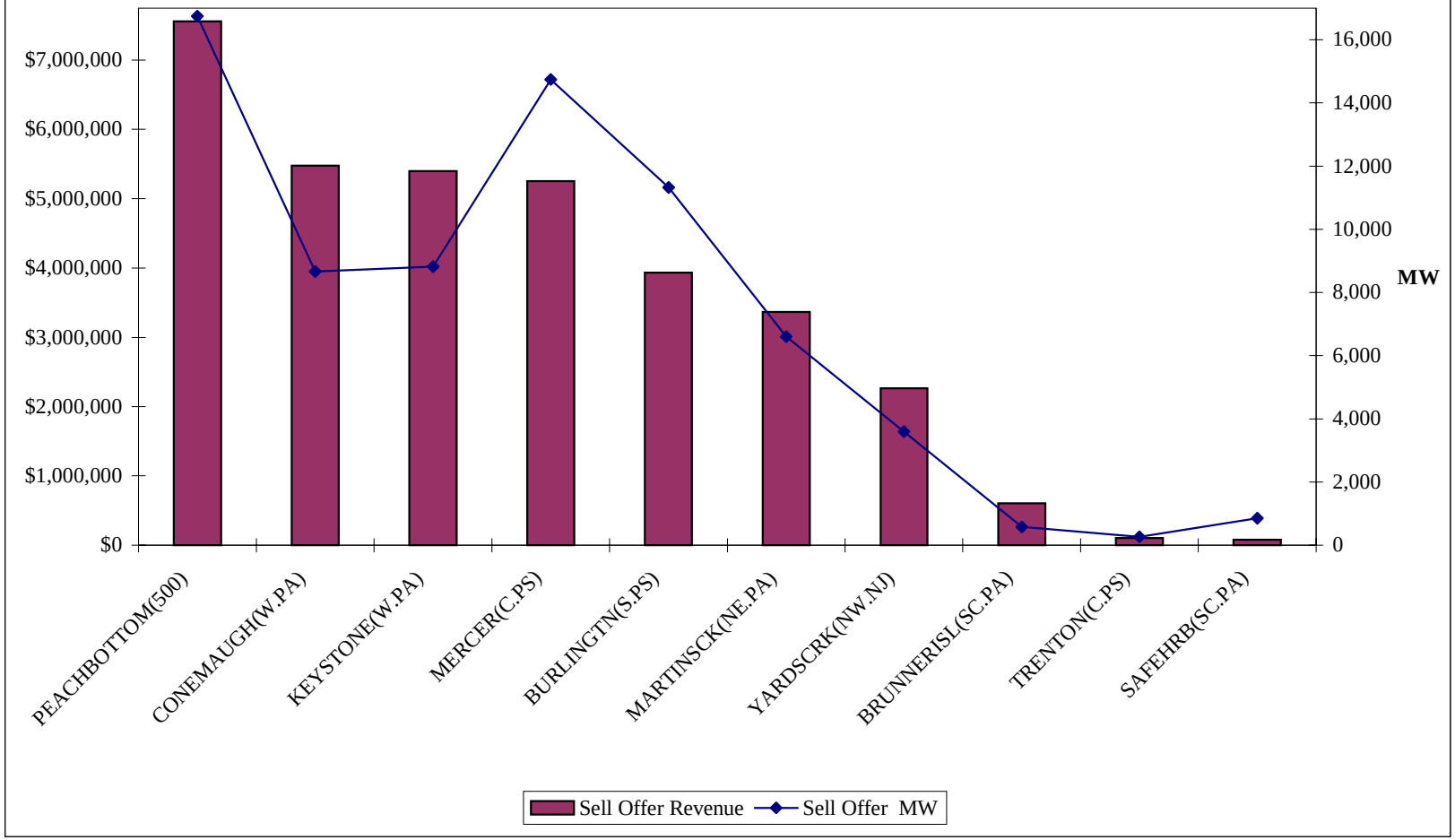

**Figure 20**
**FTR Monthly Auction**
**Average Price for Ten Highest FTR Source Sell Offers**

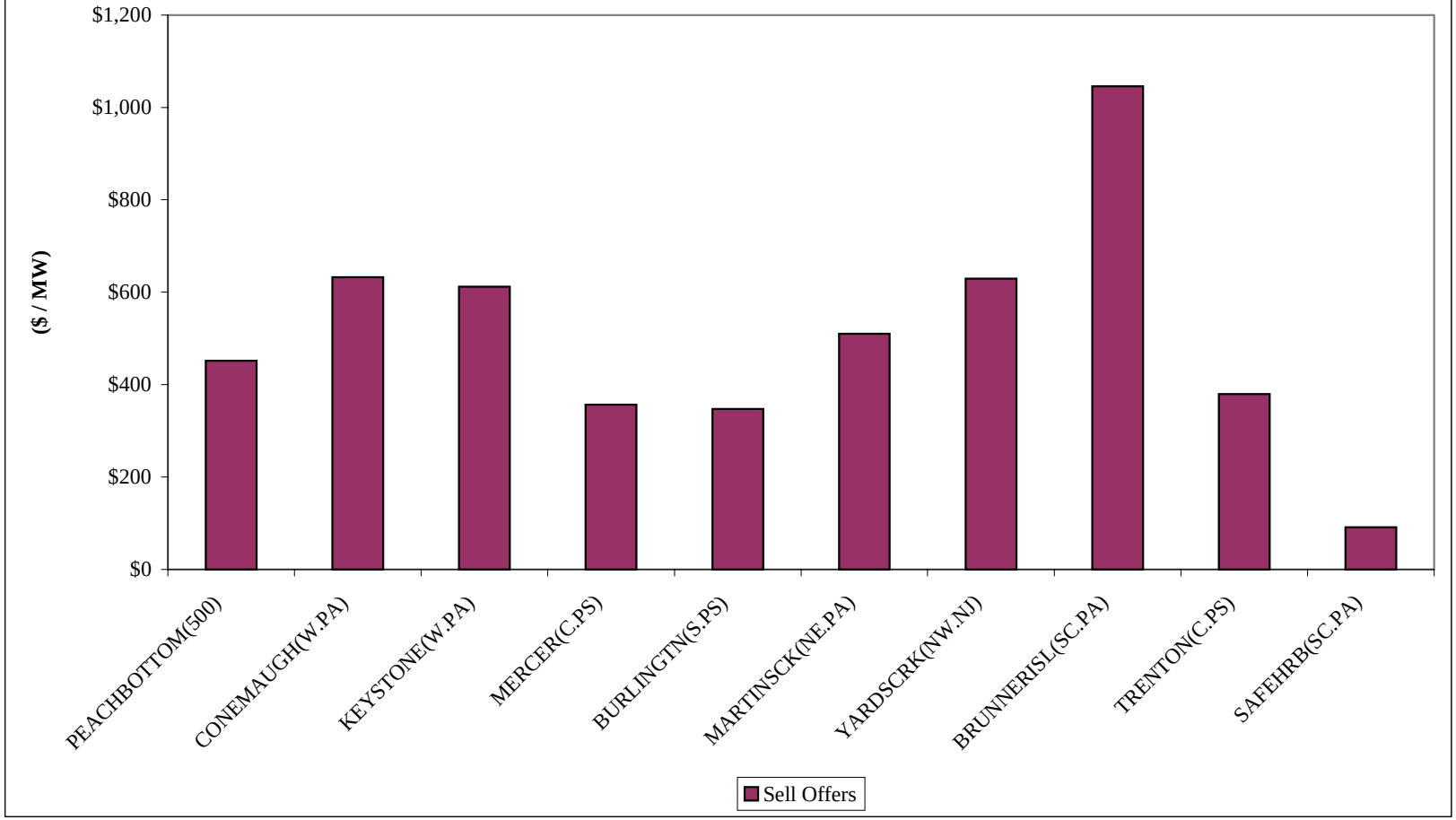

**Figure 21**
**FTR Monthly Auction**
**Annual Revenue and Volume for FTR Source Sell Offers That Cleared**

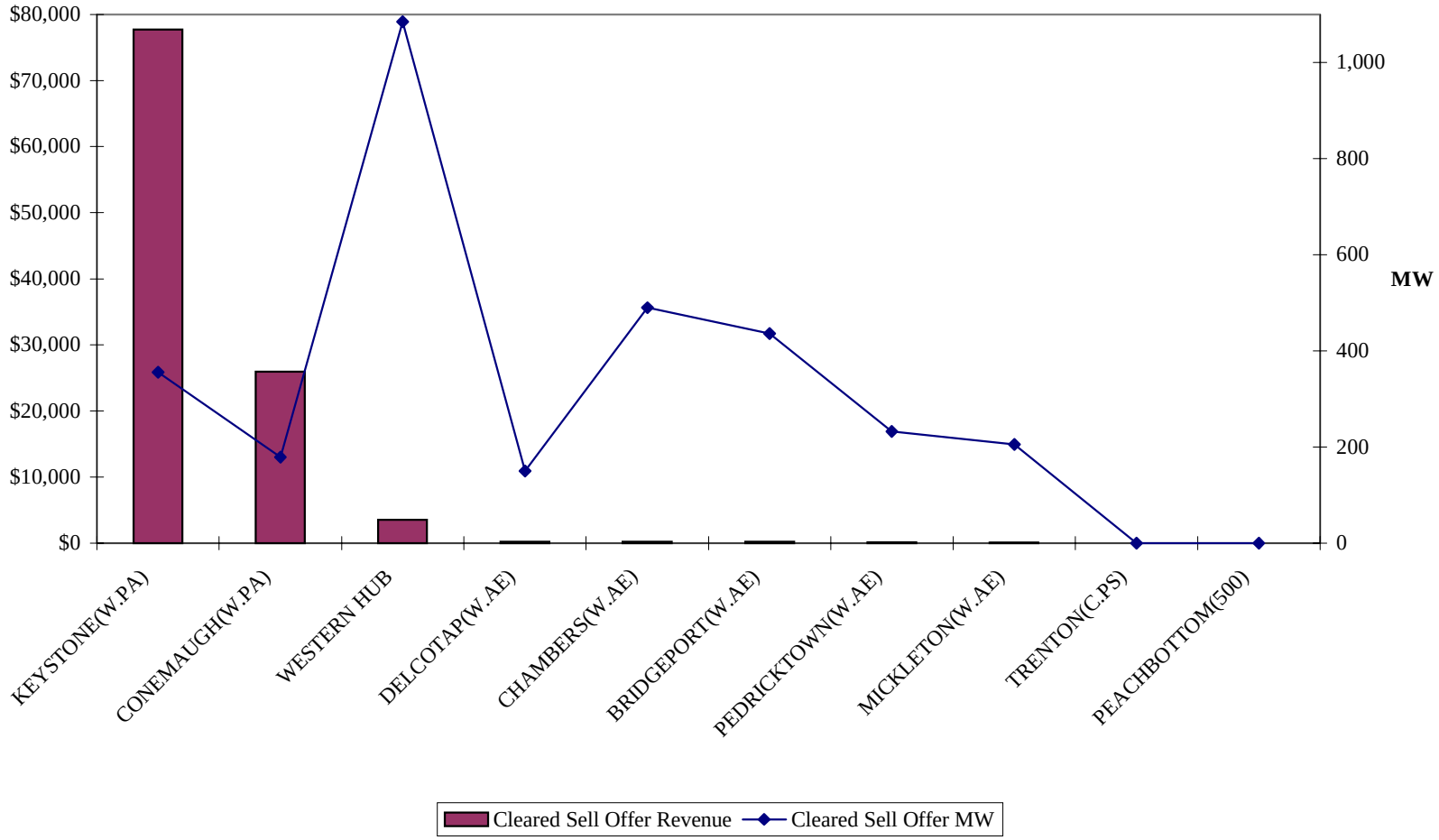

**Figure 22**
**FTR Monthly Auction**
**Average Price for FTR Source Sell Offers That Cleared**

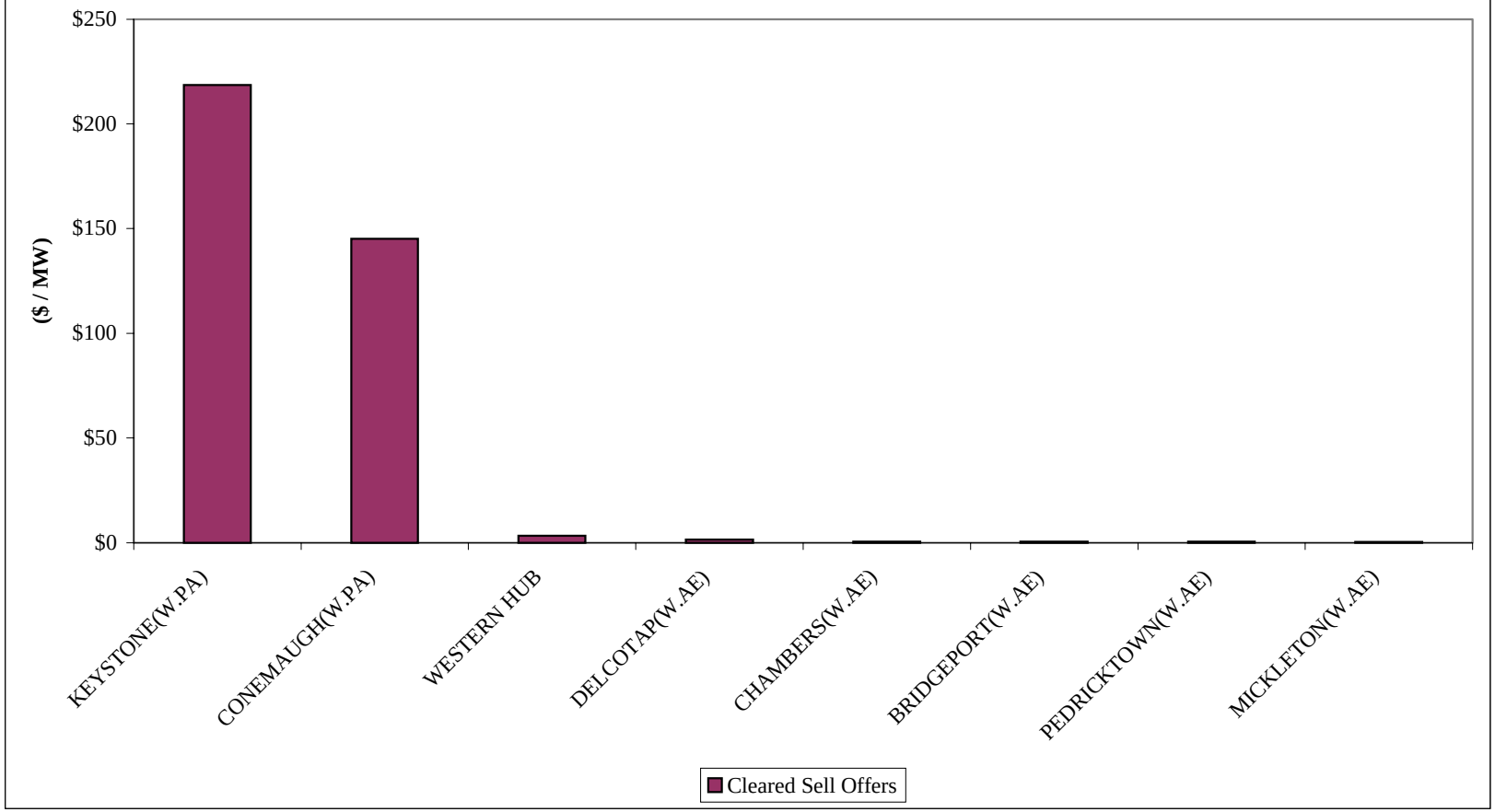

**Figure 23**
**FTR Monthly Auction**
**Annual Revenue and Volume for Ten Highest FTR Destination Buy Bids**

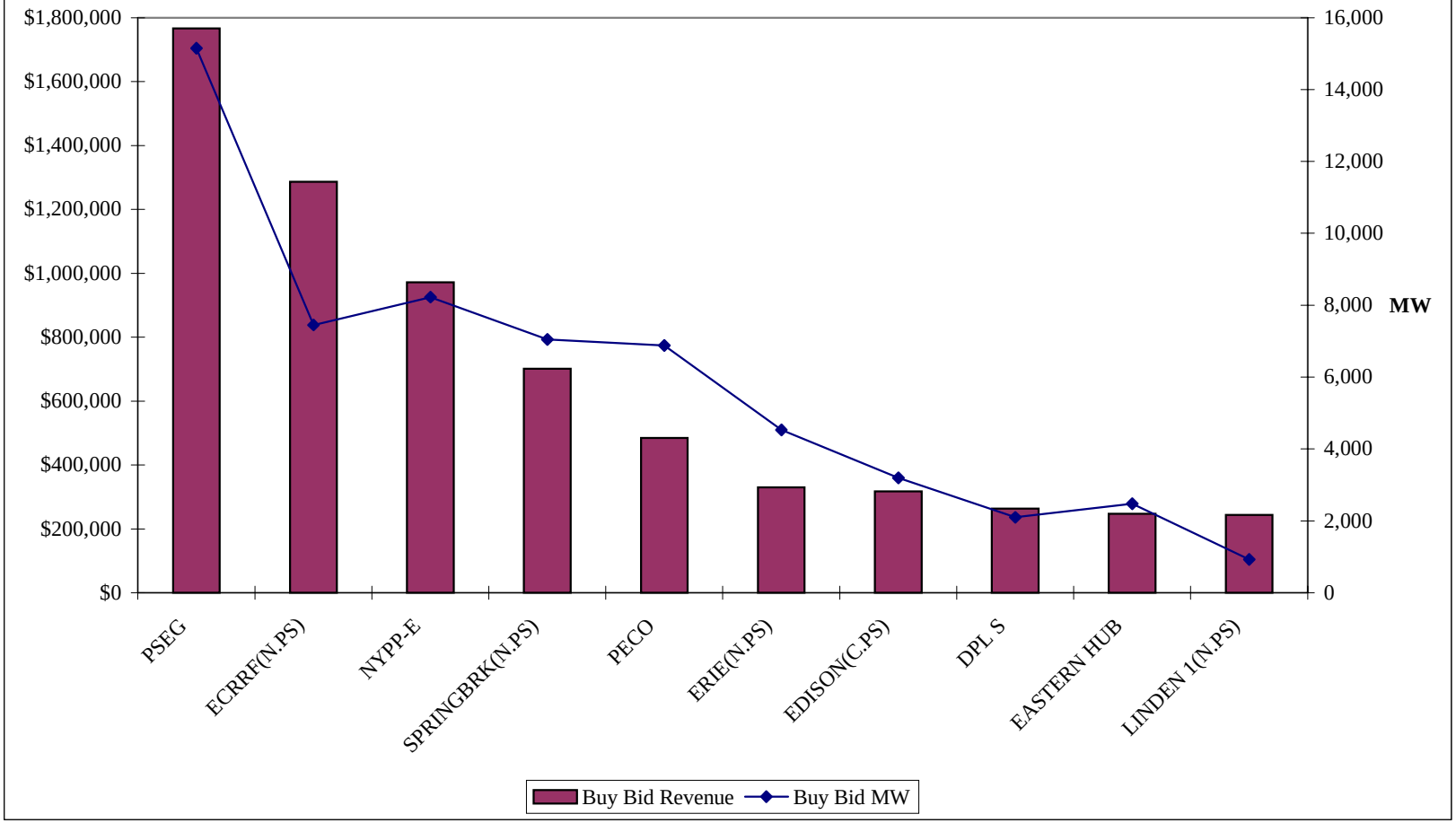

**Figure 24**
**FTR Monthly Auction**
**Average Price for Ten Highest FTR Destination Buy Bids**

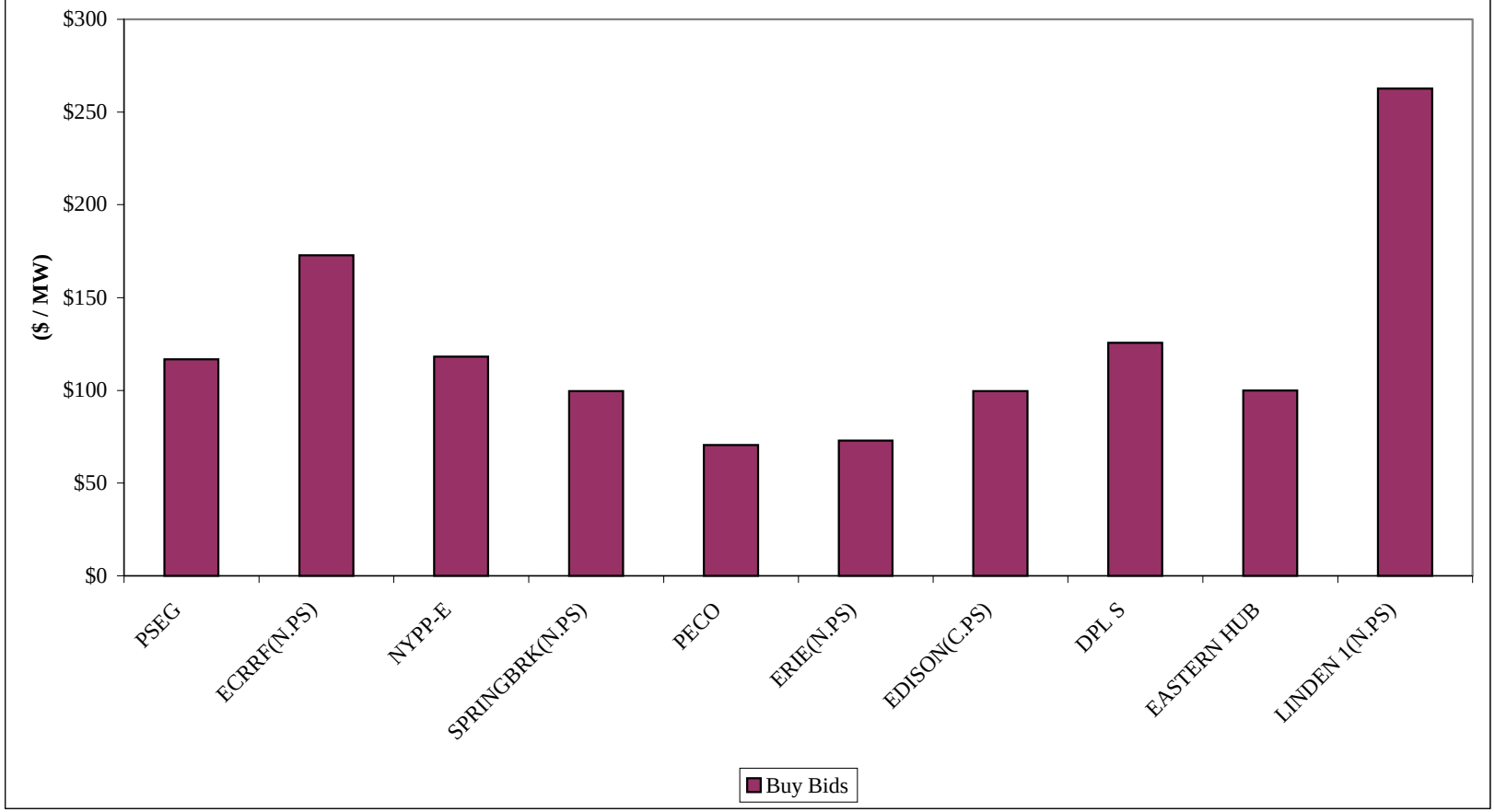

**Figure 25**
**FTR Monthly Auction**
**Annual Revenue and Volume for Ten Highest FTR Destination Buy Bids That Cleared**

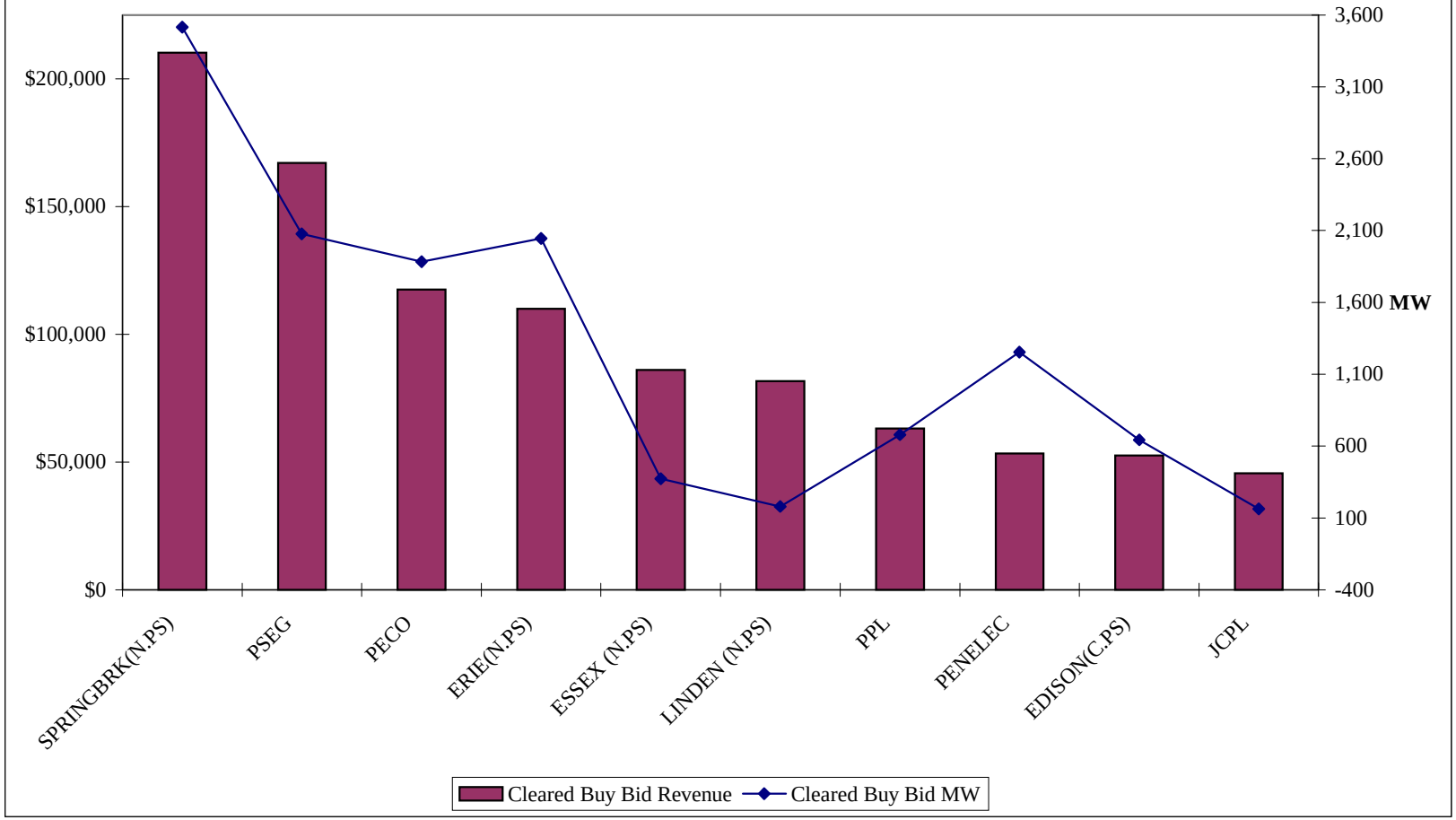

**Figure 26**
**FTR Monthly Auction**
**Average Price for Ten Highest FTR Destination Buy Bids That Cleared**

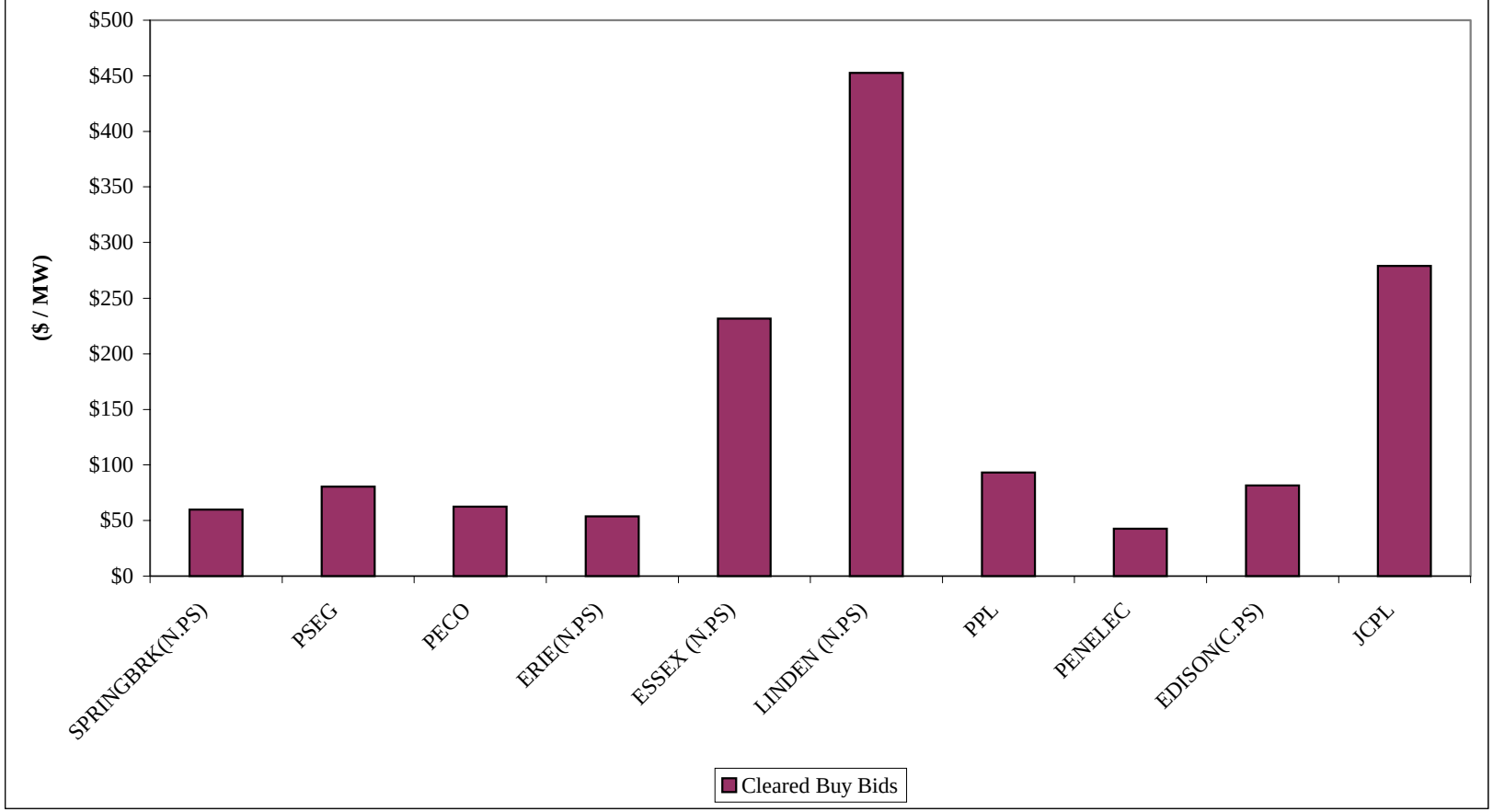

**Figure 27**
**FTR Monthly Auction**
**Annual Revenue and Volume for FTR Destination Sell Offers**

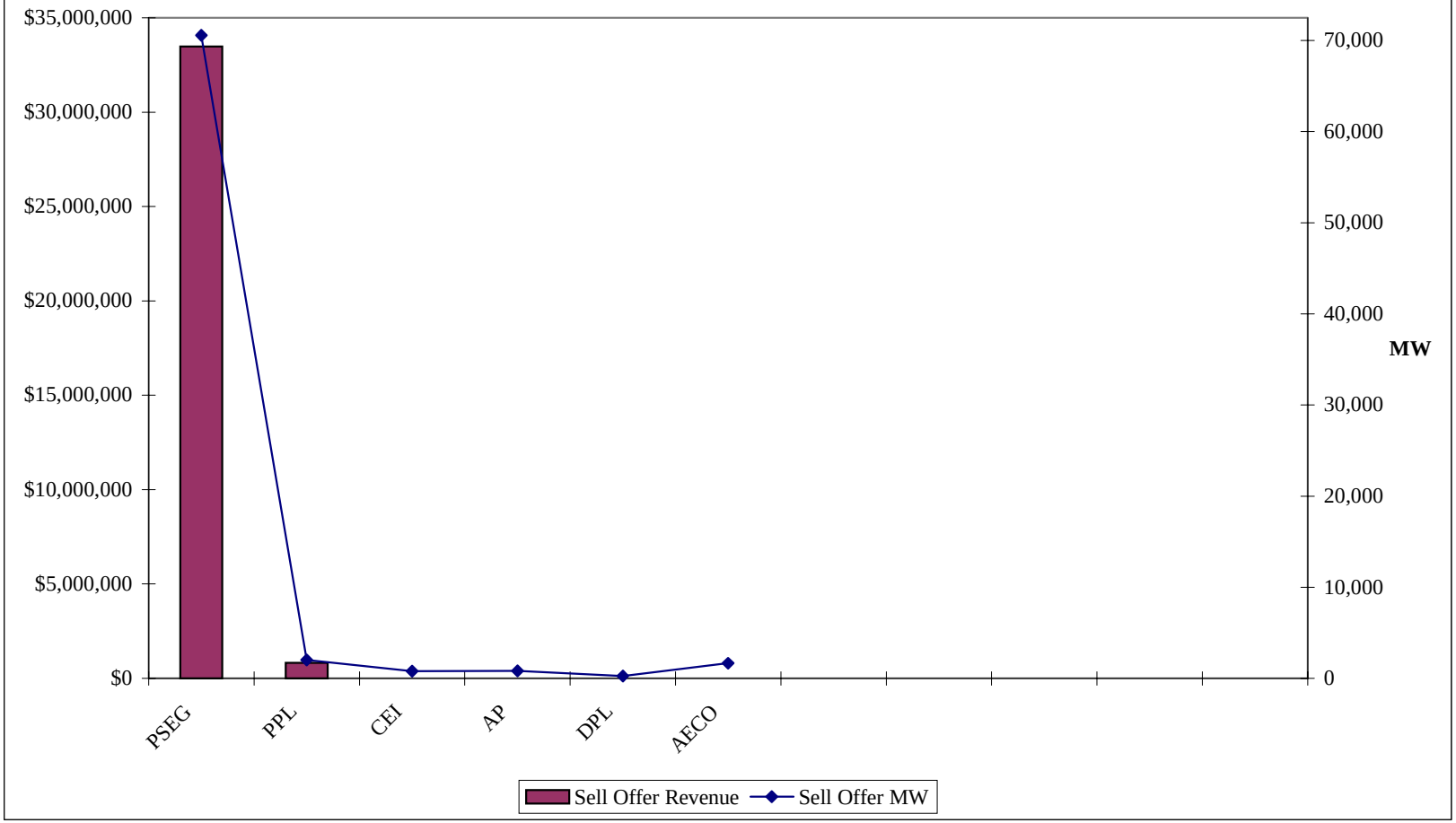

**Figure 28**
**FTR Monthly Auction**
**Average Price for FTR Destination Sell Offers**

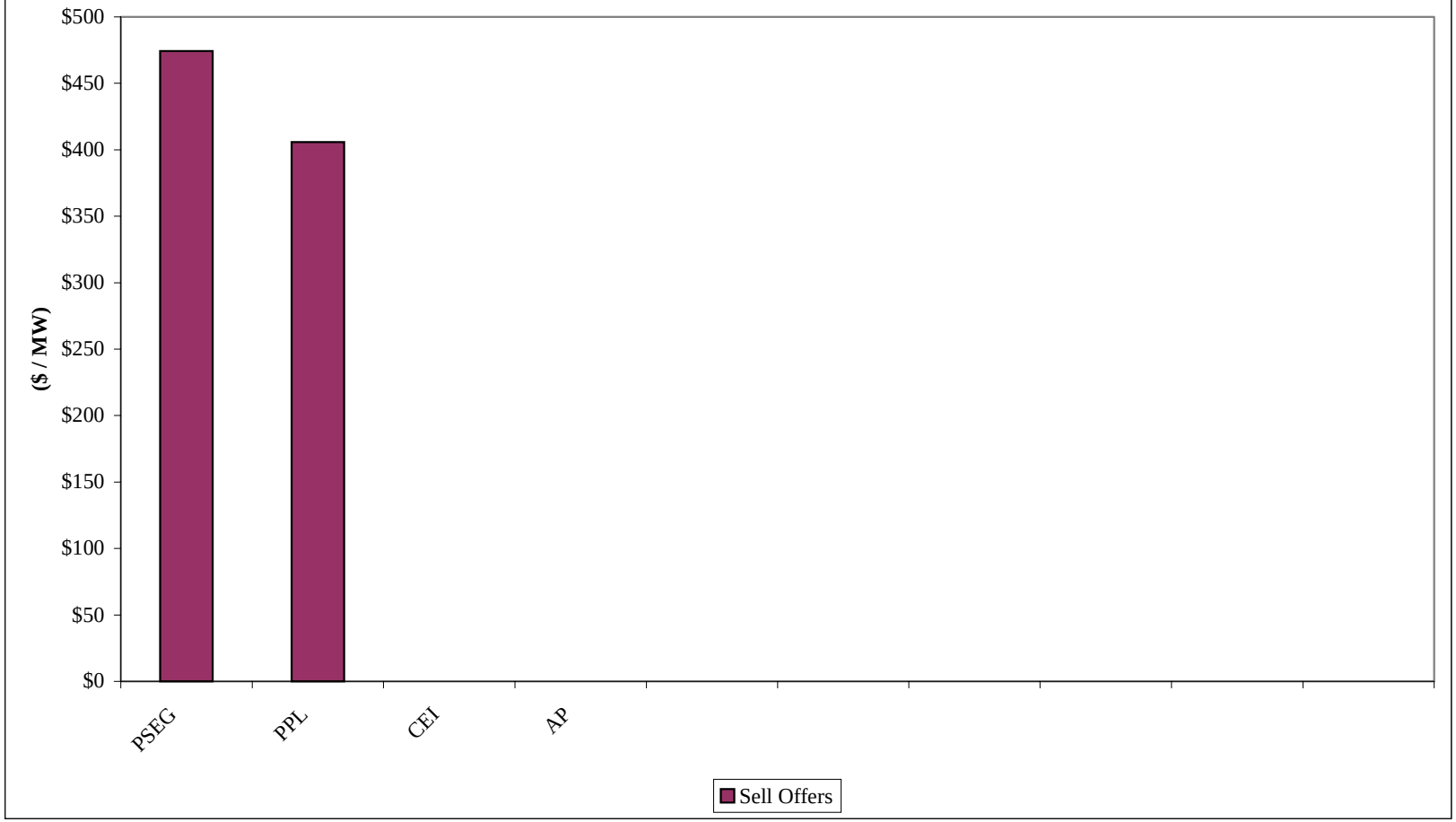

**Figure 29**
**FTR Monthly Auction**
**Annual Revenue and Volume for FTR Destination Sell Offers That Cleared**

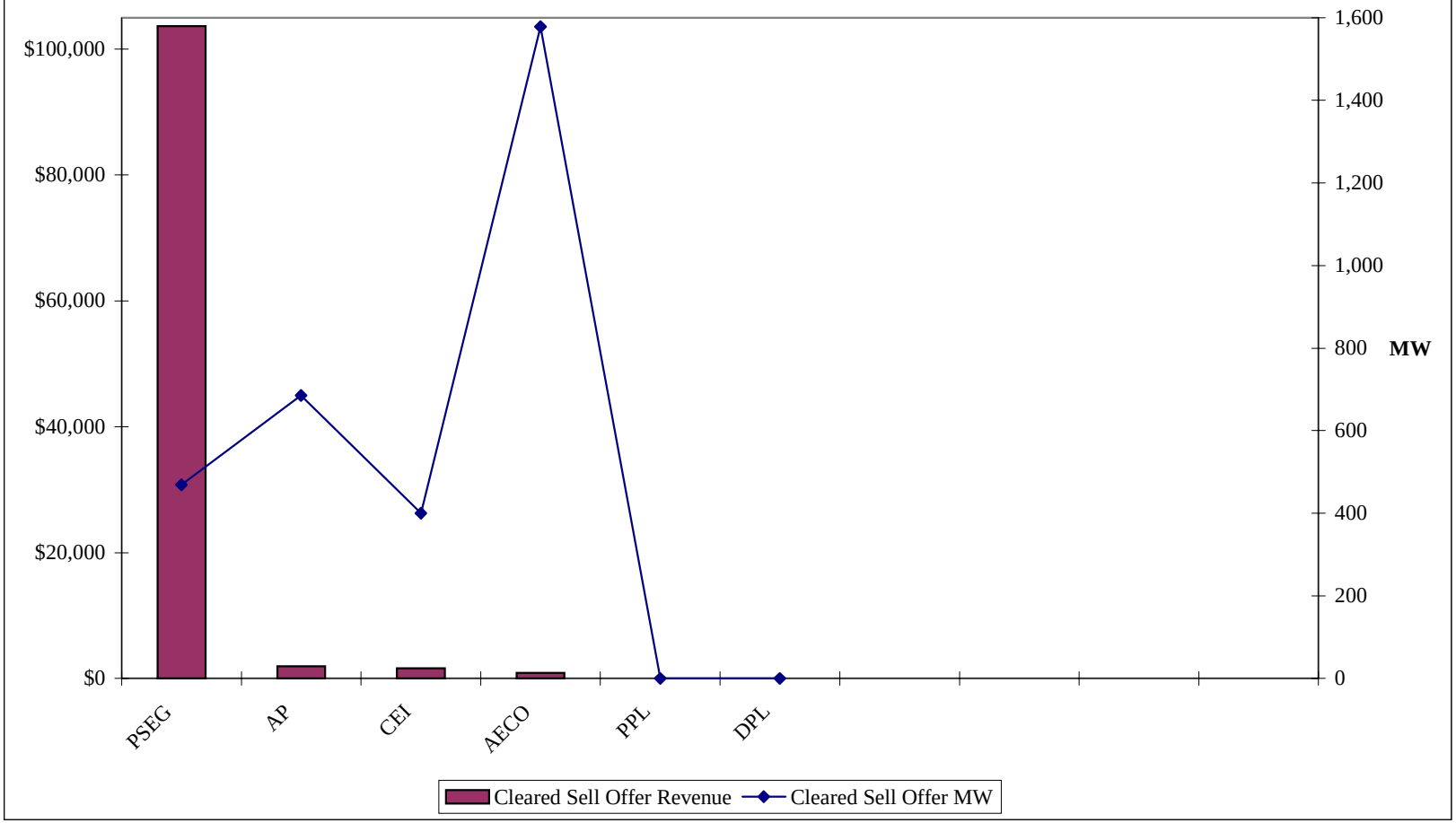

**Figure 30**
**FTR Monthly Auction**
**Average Price for FTR Destination Sell Offers That Cleared**