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March 2, 1999

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OFFICE OF THE SECRETARY
FEDERAL ENERGY REGULATORY COMMISSION

Honorable David P. Boergers
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E. Room 1A
Washington, D.C. 20426

Re: PJM Interconnection, L.L.C., Docket No. ER99-_____

Dear Mr. Boergers:

Description Of Filing

In accordance with the Federal Energy Regulatory Commission's ("Commission") order in Atlantic City Electric Co., 86 FERC ¶ 61,147 (Feb. 11, 1999) ("February Order"), PJM Interconnection, L.L.C. ("PJM"), hereby tenders this filing, including revised pages to Attachment K-Appendix to the PJM Open Access Transmission Tariff ("PJM Tariff") and Schedule 1 of the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. ("PJM Operating Agreement"), establishing a Fixed Transmission Rights ("FTR") auction.

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On December 31, 1997, the PJM Supporting Companies[1] filed proposed amendments to Schedule 1 of the PJM Operating Agreement to implement an auction of Fixed Transmission Rights ("FTRs"). In the February Order, while the Commission commended the Supporting Companies for "for fulfilling their commitment to make the December 1997 Filing," it rejected the filing because it lacked "clarity and too many important details . . . to be implemented as filed." February Order, slip op. at 1 & 9. The Commission then ordered PJM, rather than the Supporting Companies, to refile more detailed FTR auction procedures. See id.

The Commission indicated that the FTR auction procedures filed by the Supporting Companies in the December 1997 Filing held "promise" and "would help provide price certainty by simplifying and enhancing the process by which FTRs can be acquired and traded," but that the proposal was not detailed enough to be implemented. February Order, slip op. at 9 & 11. Therefore, to comply with the Commission's directives in the February Order, PJM resubmits a revised version of Supporting Companies' December 1997 Filing that includes significantly greater detail and clarity, as required by the Commission.

Notably, as PJM's planned commencement of FTR auctions has approached, PJM and the PJM members, through the PJM Energy Market Committee, have been discussing comprehensively the details of the FTR auctions. See Stakeholder Process, below. PJM and the members discussed FTR auction details at several meetings in September,

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[1] The PJM Supporting Companies are: Atlantic City Electric Company, Baltimore Gas and Electric 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.

October, November, and December 1998, and January and February 1999. This filing and the detail that it adds to the FTR auction process reflect these comprehensive discussions.[2]

The changes and additions PJM makes to the December 1997 Filing are described below.

Detailed Description of PJM's Additions to the December 1997 Filing

1. Time and Scope of FTR Auctions

In rejecting the December 1997 Filing, the Commission expressed concern that the Supporting Companies' proposal did not "identify the time by which FTRs must be offered on the day of the auction, or the time when the auction begins." February Order, slip op. at 9. PJM addresses this and other related matters as follows.

PJM has added language to the Supporting Companies' proposed section 7.1.1 (Auction Period and Scope of Auctions) of Schedule 1 of the PJM Operating Agreement[3] to specify that (i) the period covered by the FTR auction shall be for one month following the date of the auction;[4] (ii) in the auction, PJM shall offer for sale any remaining FTR

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2 This filing does not address the procedures for a multi-settlement system, which the Supporting Companies' December 1997 Filing and the February Order also addressed. The Commission ordered PJM to make a filing regarding multi-settlement procedures 18 months from the date of the February Order. As the Commission recognized, PJM will not be ready to implement a multi-settlement system until June 2000, but is ready to implement the FTR auction process now. See February Order, slip op. at 11.

3 Schedule 1 of the PJM Operating Agreement and the Appendix to Attachment K to the PJM Tariff are identical. Therefore, PJM also makes the same revisions or additions described herein to the corresponding sections of the Appendix to Attachment K to the PJM Tariff.

4 The Commission noted that having auctions for shorter or longer periods could improve the liquidity of the FTR market. PJM will continue to investigate the

capability for the month after taking into account all of the FTRs already outstanding at the time of the auction; and (iii) each monthly auction will consist of separate auctions for on-peak and off-peak FTRs. On-peak and off-peak FTRs are defined in a revised section 7.3.4. On-peak FTRs will cover the periods from 7:00 a.m. up to the hour ending at 11:00 p.m. on Mondays through Fridays, except holidays. Off-peak FTRs will cover the periods from 11:00 p.m. up to 7:00 a.m. Mondays through Fridays, and all hours on Saturdays, Sundays, and holidays.

PJM also revises section 7.1.2 (Frequency and Time of Auctions) to specify that the auctions will be held monthly, and that the period for submitting both bids and offers shall open at 12:00 midnight (Eastern Prevailing Time) on the fifteenth business day preceding the month for which FTRs are being auctioned, and shall close at 12:00 midnight (Eastern Prevailing Time) on the tenth business day preceding the month for which FTRs are being auctioned.[5]

Similarly, section 7.1.3 (Duration of Fixed Transmission Rights) now specifies that holders of FTRs acquired in the auction will be entitled to credits of Transmission Congestion Charges for the one-month period for which the FTRs were auctioned, and will cover either on-peak or off-peak hours during the month depending on the auction in which they were acquired.

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feasibility of this option in its Energy Market Committee. See February Order, slip op. at 12.

[5] As the auction is structured, there is no need to require offers to be submitted earlier than bids are submitted.

2. Offer and Bid Specifications

PJM is revising section 7.3.5 (Offers and Bids), which sets forth the format in which offers and bids are to be submitted for the auction, so as to provide more detail and clarity. Sections 7.3.5(b) and (c) are revised to clarify that an offer to sell and a bid to purchase: (i) must specify whether it is for the on-peak or the off-peak auction; and (ii) may not specify a minimum quantity of FTRs being offered. This section now clarifies that an offer or bid specifying a particular megawatt quantity of FTRs shall constitute an offer to sell or a bid to purchase a quantity of FTRs equal to or less than the specified quantity.[6] Section 7.3.5(d) also is modified to specify that bids to purchase and offers to sell shall be specified "to the nearest tenth of a megawatt and shall be greater than zero."

3. Determination of Winning Bids and Market Clearing Price

In response to the Commission's concerns that the December 1997 Filing did not set forth clearly "the precise manner in which the winning bid will be determined,"[7] PJM revises section 7.3.6 (Determination of Winning Bids and Clearing Price) to describe more fully the method PJM will use for determining the winning bids and the clearing prices for the FTR auctions.

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[6] In the February Order, the Commission expressed concern that, in the event participants could specify minimum quantities of FTRs in their offers to sell or bids to purchase, it was unclear how these minimums would "affect the relationship between simultaneous feasibility, market clearing prices and the level of auction revenues." February Order, slip op. at 9. Sections 7.3.5(b) & (c), as revised, now clearly state that no offer to sell or bid to purchase shall specify a minimum quantity of FTRs.

[7] February Order, slip op. at 6.

A new section 7.3.6(a) describes in more detail the base FTR Case Model that will be used to perform the FTR auction analysis. At the close of the bidding period each month, PJM "will create a base Fixed Transmission Rights power flow model that includes all outstanding Fixed Transmission Rights that have been approved and confirmed for any portion of the month for which the auction was conducted and that were not offered for sale in the auction." The model also will include the "estimated uncompensated parallel flows into each interface point of the PJM Control Area and estimated scheduled transmission outages." Section 7.3.6(b) sets forth that winning bids will be determined from a linear programming model that, while respecting transmission constraints and the maximum MW quantities of the bids and offers, selects the set of simultaneously feasible Fixed Transmission Rights with the highest net total auction value as determined by the bids of buyers and taking into account the reservation prices of the sellers. See § 7.3.6(b) (revised).[8] Section 7.3.6(c) is revised to explain in further detail how the linear programming model will determine the market clearing price. Specifically, the clearing prices of all fixed transmission rights paths will be based on "the bid value of the marginal Fixed Transmission Rights, which are those Fixed Transmission Rights with the highest bid values that could not be awarded fully because they were not simultaneously feasible," and "the flow sensitivities of each Fixed Transmission Rights path relative to the marginal Fixed Transmission Rights paths flow sensitivities on the binding transmission constraints." Id. § 7.3.6(c) (revised).

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[8] Consistent with the revisions to section 7.3.6(b), PJM also revised section 7.2.1 to explain that a linear programming model will maximize the value to the bidders of the FTRs sold at the auction.

Section 7.3.7 is revised to clarify that within two business days after the close of the auction, PJM will post the results of the auction. Results of the on-peak and off-peak auctions will be posted separately.

4. Auction Revenues

Revenues from the auction, net of the payments to those entities selling Fixed Transmission Rights into the auction, will be distributed to the regional transmission owners in proportion to their respective transmission revenue requirements. Id. § 7.3.9 (Allocation of Auction Revenues). Such revenues will be taken into account in the transmission owners' costs of service that determine revenue requirements in rate cases. In the February Order, the Commission concluded that "the allocation of net auction revenues appears reasonable." February Order, slip op. at 10.

5. Other Revisions

For consistency, other minor revisions also are made to section 7.2.2 (Specified Buses), section 7.3.3 (Pending Applications for Firm Service), and section 7.4 (Simultaneous Feasibility).

Additional Information Regarding Clearing Prices

For informational purposes and to provide additional detail to illustrate more fully how the winning bids and clearing prices will be determined in the FTR auction process, PJM has attached The Fixed Transmission Rights Business Rules, which includes the rules for FTR auctions, as Exhibit A, and a PJM FTR Auction Example, as Exhibit B, to this transmittal letter. These documents will be included in the training materials that PJM will distribute during FTR auction training commencing in March 1999, and will be

incorporated in the PJM Manuals and posted on PJM's internet site once the FTR auction process is approved by the Commission and implemented.[9]

Stakeholder Process

PJM's revisions to the Supporting Companies' December 1997 Filing have the support of the PJM membership. Following the issuance of the February Order, the PJM members urged PJM to proceed as expeditiously as possible to make a revised FTR auction filing and commence the FTR auctions.

As noted, over the last several months, the details of the FTR auction process have been addressed by PJM's Energy Market Committee. The FTR auction process was discussed at Energy Market Committee meetings held in September, October, November, and December 1998, and January and February 1999. In September 1998, PJM presented to the Energy Market Committee a plan to commence FTR auctions in April 1999. In October, PJM presented plans to conduct "trial" auctions before the implementation date in order to familiarize market participants with the auction tools. In December 1998, PJM explained in detail how the FTR auction process would work and presented a five-bus model example to the Energy Market Committee. In January 1999, PJM presented to the Energy Market Committee detailed proposed business rules for the FTR auctions. These rules were discussed again at the February meeting of the Energy Market Committee.

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[9] PJM has incorporated much of the detail from the Fixed Transmission Rights Business Rules into the PJM Tariff and PJM Operating Agreement, but, consistent with the Commission's "rule of reason" policy, PJM has not incorporated details relating to every operating procedure. See Pennsylvania-New Jersey-Maryland Interconnection, 81 FERC ¶ 61,257 (1997); Central and South West Servs., Inc., 48 FERC ¶ 61,197 (1989); Town of Easton, 24 FERC ¶ 61,251 (1983).

Additional stakeholder input was received following the Commission's issuance of the February Order. The revised PJM Operating Agreement language that PJM is submitting with this filing was reviewed by the Energy Market Committee on February 23, 1999, and by the PJM Tariff Advisory Committee on February 25, 1999. PJM will present the revised language to the PJM Members Committee for approval on March 25, 1999, and implementation of the FTR auctions is contingent on that approval. The PJM members encouraged PJM to proceed aggressively towards a mid-April start date for auctions if possible.[10]

Effective Date and Waiver

If possible, PJM would like to conduct the first FTR auction for the month of May in mid-April, as originally contemplated. Therefore, PJM is making this filing regarding the FTR auction process prior to the 90 days allowed by the Commission in the February Order. February Order, slip op. at 15. PJM respectfully requests a waiver of the 60 day notice requirement in 18 C.F.R. § 35.3, and requests that, if possible, the Commission act in this matter prior to April 13, 1999, making the revisions filed herein effective as of April 13, 1999. However, PJM will not implement the FTR auction procedures until such time as the Commission has approved the PJM Tariff and PJM Operating

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[10] The PJM Members Committee does not meet until March 25, 1999. As explained below, PJM is making this filing prior to that meeting because, consistent with the PJM members' desire, if possible, PJM would like to commence the FTR auction process as originally contemplated in mid-April. The Energy Market Committee and Tariff Advisory Committee have reviewed the filed language, and, in the past, the Commission has accepted proposed PJM Tariff amendments conditioned on the subsequent approval of the Members Committee. PJM Interconnection, L.L.C., 84 FERC ¶ 61,212, at 62,034 (1998).

Agreement amendments. See February Order, slip op. at 11 n.30. If the Commission has not acted before April 13, 1999, PJM will delay the first auction. In that event, PJM would conduct the first auction in mid-May with respect to FTRs for the month of June.

Reconfiguring FTRs Outside the Auction Context

In the February Order, in addition to requiring the refiling of the FTR Auction procedures, the Commission directed PJM "to file a detailed description of the current process by which individual FTR holders may reconfigure their receipt and delivery points outside of an auction context." February Order, slip op. at 12. An FTR holder may reconfigure its FTRs outside the auction process in one of three ways.

Secondary Market. The FTR holder may reconfigure the composite position of its FTRs by purchasing FTRs on the FTR secondary market. The FTR secondary market is a bilateral trading system that facilitates the trading of existing FTRs between PJM members through a web-based bulletin board system.[11] Because simultaneous feasibility of FTRs must be maintained, the FTR secondary market allows trading of existing FTRs only; no new FTR paths can be created in the secondary market. This means that reconfiguration of the source and sink points of the FTR themselves is not permitted in the secondary market. However, an FTR holder may reconfigure its FTR composite position in the following manner. If the FTR holder owns an FTR from Point A to Point B and wants to change its FTR configuration so that it effectively owns an FTR from Point A to Point C, it may accomplish such a reconfiguration by purchasing an existing FTR from Point B to Point C on the secondary market. The combination of the FTRs

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[11] Because the secondary market is designed to allow bilateral trading directly between market participants, PJM's role is to track trading for PJM accounting purposes only. It does not approve or perform trades.

from Point A to Point B and from Point B to Point C results in the desired composite FTR position from Point A to Point C.[12] FTR trades on the secondary market will be instantaneous and effective the next day.

Request Additional Point-To-Point Service FTRs. FTR holders also effectively may reconfigure their FTRs by requesting additional point-to-point service on the PJM OASIS. Such requests may be made daily, must pass the simultaneous feasibility test, and must satisfy the other requirements under the PJM Tariff. Requests for point-to-point service to reconfigure FTRs will be processed in the same time frame prescribed in the PJM manuals for requests for point-to-point service, and will be based on the length of the requested service. For example, if the service being requested to reconfigure the FTRs is for annual service, PJM will process the request in thirty days, for weekly service, in two days, and for daily service, in four hours.

Request to Alter Configuration of Network Service FTRs. Finally, FTR holders may reconfigure their FTRs by submitting requests to alter the configuration of the network service FTRs that they hold. Network service customers may request reconfigured FTRs from any of their network resources to their load.[13] Such requests to reconfigure network service FTRs may be made daily and must pass the simultaneous feasibility test. Requests for network service to reconfigure FTRs will be processed in the same time frame prescribed in the PJM manuals for regular requests for network

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12 With the FTR Auction, the FTR holder similarly may accomplish this reconfiguration by purchasing an FTR from Point B to Point C in the auction.

13 As the Commission directed in the February Order, there will be no minimum FTRs required for network customers. See February Order, slip op. at 10; PJM Operating Agreement Schedule 1 § 5.2.2(b) (revised).

service. For example, PJM will process network FTR reconfiguration requests that involve existing designated Capacity Resources within ten days, and requests that involve new Capacity Resources within thirty days.

Documents Enclosed

PJM encloses the original and five copies of the following:

1. Transmittal letter.

2. PJM Tariff and PJM Operating Agreement revised pages, including redlined versions of same.

3. Exhibit A: The Fixed Transmission Rights Business Rules.

4. Exhibit B: PJM FTR Auction Example.

5. Federal Register Notice. (Also enclosed on diskette.)

Correspondence And Communications

Correspondence and communications with respect to this filing should be sent to, and PJM requests the Secretary to include on the official service list, the following:

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Service and Federal Register Notice

PJM has served a copy of this filing on all members of PJM and each state electric utility regulatory commission in the PJM control area. A form of notice suitable for publication in the Federal Register is attached and enclosed on diskette.

Respectfully submitted,

Barry S. Spector
Carrie L. Bumgarner

Counsel for
PJM Interconnection, L.L.C.

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UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM Interconnection, L.L.C.) ER99-_____

NOTICE OF FILING

Take notice that on March 2, 1999, PJM Interconnection, L.L.C. ("PJM"), tendered for filing revised pages to Attachment K-Appendix to the PJM Open Access Transmission Tariff ("PJM Tariff") and Schedule 1 of the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. ("PJM Operating Agreement"), establishing Fixed Transmission Rights ("FTR") auction procedures.

PJM respectfully requests a waiver of the 60 day notice requirement in 18 CFR § 35.3, and requests that the FTR auction provisions filed herein be effective as of April 13, 1999.

Copies of this filing were served upon all PJM Members and the state electric regulatory commissions in the PJM Control Area.

Any person desiring to be heard or to protest this filing should file a petition to intervene or protest with the Federal Energy Regulatory Commission, 888 First Street, N.E., Washington, D.C. 20426, in accordance with Rules 210, 211 and 214 of the Commission's Rules of Practice and Procedure (18 C.F.R. §§ 385.210, 385.211, 385.214). All such petitions or protests should be filed on or before _____. Protests will be considered by the Commission in determining the appropriate action to be taken, but will not serve to make protestants parties to the proceeding. Any person wishing to become a party must file a petition to intervene. Copies of this application are on file with the Commission and are available for public inspection.

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(FTR Auctions)

K:\pjm\tarrevs\Tariff 030299 revisions

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1.3.2 Equivalent Load.

"Equivalent Load" shall mean the sum of a Market Participant's net system requirements to serve its customer load in the PJM Control Area, if any, plus its net bilateral transactions.

1.3.3 External Market Buyer.

"External Market Buyer" shall mean a Market Buyer making purchases of energy from the PJM Interchange Energy Market for consumption by end-users outside the PJM Control Area, or for load in the Control Area that is not served by Network Transmission Service.

1.3.4 External Resource.

"External Resource" shall mean a generation resource located outside the metered boundaries of the PJM Control Area.

1.3.5 Fixed Transmission Right.

"Fixed Transmission Right" shall mean a right to receive Transmission Congestion Credits as specified in Section 5.2.2 of this Schedule.

1.3.6 Generating Market Buyer.

"Generating Market Buyer" shall mean an Internal Market Buyer that is a Load Serving Entity that owns or has contractual rights to the output of generation resources capable of serving the Market Buyer's load in the PJM Control Area, or of selling energy or related services in the PJM Interchange Energy Market or elsewhere.

1.3.7 Generator Forced Outage.

"Generator Forced Outage" shall mean an immediate reduction in output or capacity or removal from service, in whole or in part, of a generating unit by reason of an Emergency or threatened Emergency, unanticipated failure, or other cause beyond the control of the owner or operator of the facility, as specified in the relevant portions of the PJM Manuals. A reduction in output or removal from service of a generating unit in response to changes in market conditions shall not constitute a Generator Forced Outage.

1.3.8 Generator Maintenance Outage.

"Generator Maintenance Outage" shall mean the scheduled removal from service, in whole or in part, of a generating unit in order to perform necessary repairs on specific components of the facility, if removal of the facility meets the guidelines specified in the PJM Manuals.

5.1.5 Operating Margin Customer Calculation.

Each Control Area purchasing Operating Margin shall be assessed Transmission Congestion Charges for any the increase in the cost of energy resulting from the provision of Operating Margin. The Transmission Congestion Charge shall be the amount of Operating Margin purchased in an hour multiplied by the difference in the Locational Marginal Price at what would be the delivery interface and the Locational Marginal Price at what would be the source interface, if the operating contingency that was the basis for the purchase of Operating Margin had occurred in that hour. Operating Margin may be allocated among multiple source and delivery interfaces in accordance with an applicable load flow study.

5.1.6 Transmission Loading Relief Customer Calculation.

(a) Each Transmission Loading Relief Customer shall be assessed Transmission Congestion Charges for any increase in the cost of energy in the PJM Control Area resulting from its energy schedules over contract paths outside the PJM Control Area during Transmission Loading Relief.

(b) The Transmission Congestion Charge shall be the total amount of energy specified in such energy schedules multiplied by the difference between a Locational Marginal Price calculated by the Office of the Interconnection for the energy schedule source location specified in the NERC Interchange Distribution Calculator and a Locational Marginal Price calculated by the Office of the Interconnection for the energy schedule sink location specified in the NERC Interchange Distribution Calculator. Transmission Congestion Charges that are less than zero shall be set equal to zero for Transmission Loading Relief Customers.

(c) The Office of the Interconnection will determine the Locational Marginal Prices at the energy schedule source and sink locations external to PJM with reference to and based solely on the prices of energy in the PJM Control Area and at the interface buses between the PJM Control Area and adjacent Control Areas and the system conditions and actual power flow distributions as described by the PJM State Estimator program. The Office of the Interconnection will determine the Locational Marginal Prices at the external energy schedule source and sink locations and the resulting Congestion Charge based on the portion of the energy schedule that flows through the PJM Control Area as reflected by the flow distributions from the PJM State Estimator Program.

5.1.7 Total Transmission Congestion Charges.

The total Transmission Congestion Charges collected by the Office of the Interconnection each hour will be the sum of the amounts determined as specified in this Schedule. The Office of the Interconnection shall collect Transmission Congestion Charges for each hour the transmission system operates under constrained conditions.

5.2 Transmission Congestion Credit Calculation.

5.2.1 Eligibility.

Each holder of a Fixed Transmission Right shall receive as a Transmission Congestion Credit a proportional share of the total Transmission Congestion Charges collected for each constrained hour.

5.2.2 Fixed Transmission Rights.

(a) Transmission Congestion Credits will be calculated based upon the Fixed Transmission Rights held at the time of the constrained hour. Initial assignments of a Fixed Transmission Rights shall be made to each Network Service User and Transmission Customer as specified below.

(b) On a periodic schedule established by the Office of the Interconnection, each Network Service User shall designate a subset of its Network Resources for which Fixed Transmission Rights will be assigned. Fixed Transmission Rights shall be assigned for each Network Resource in a number of megawatts equal to or less than the installed capacity summer megawatt rating of each designated Network Resource, determined at the PJM Control Area transmission bus at which the designated Network Resource is connected. Each Fixed Transmission Right shall be to the aggregate load busses of the Network Service User in a Zone or, with respect to Non-Zone Network Load, to the border of the PJM Control Area. The sum of each Network Service User's assigned Fixed Transmission Rights for a Zone must be equal to or less than the Network Service User's peak load for that Zone as determined under Section 34.1 of the Tariff. The sum of each Network Service User's Fixed Transmission Rights for Non-Zone Network Load must be equal to or less than the Network Service User's transmission responsibility for Non-Zone Network Load as determined under Section 34.1 of the Tariff.

(c) Each Transmission Customer receiving firm Point-to-Point Transmission Service shall be assigned Fixed Transmission Rights; provided, however, that a Transmission Customer may notify the Office of Interconnection that it does not wish to receive any FTRs or wishes to receive FTRs only for certain Point or Points of Receipt and Point or Points of Delivery, in which event no FTRs or such reduced amount of FTRs shall be issued to the Transmission Customer. The Fixed Transmission Right for each instance of Point-to-Point Transmission Service

shall be a number of megawatts equal to the megawatts of firm service being provided between the receipt and delivery points as to which the Transmission Customer has firm Point-to-Point Transmission Service.

(d) A Fixed Transmission Right, or the right to Transmission Congestion Credits attributable to a Fixed Transmission Right, may be sold or otherwise transferred by agreement, subject to compliance with such procedures as may be established by the Office of the Interconnection for verification of the rights of the purchaser or transferee.

5.2.3 Target Allocation for Network Service Users.

A target allocation of Transmission Congestion Credits for each Network Service User shall be determined for each of its Fixed Transmission Rights. Each Fixed Transmission Right shall be multiplied by the percent of the Network Service User's annual peak load assigned to each load bus multiplied by the difference calculated as the Network Service User's load bus Locational Marginal Price minus the generation bus Locational Marginal Price of the Network Resource associated with the Fixed Transmission Right. The total target allocation for each Fixed Transmission Right is the sum of the target allocations for each load bus. The total target allocation for each Network Service User for each hour is the sum of the total target allocations for each of the Network Service User's Fixed Transmission Rights.

5.2.4 Target Allocation for other Holders.

A target allocation of Transmission Congestion Credits for each Transmission Customer or entity holding an FTR acquired by other means shall be determined for each Fixed Transmission Right. Each Fixed Transmission Right shall be multiplied by the hourly Locational Marginal Price differences for the receipt and delivery points associated with the Fixed Transmission Right, calculated as the Locational Marginal Price at the delivery point(s) minus the Locational Marginal Price at the receipt point(s). The total target allocation for the Transmission Customer for each hour shall be the sum of the target allocations associated with all of the Transmission Customer's Fixed Transmission Rights.

6. [RESERVED]

7. FIXED TRANSMISSION RIGHTS AUCTIONS

7.1 Auctions of Fixed Transmission Rights.

Periodic auctions to allow Market Participants to acquire or sell Fixed Transmission Rights shall be conducted by the Office of the Interconnection in accordance with the provisions of this Section.

7.1.1 Auction Period and Scope of Auctions.

The period covered by an auction shall be the one-month period next following the date that the auction is conducted. The Office of the Interconnection shall offer for sale in the auction any remaining Fixed Transmission Rights capability for the month after taking into account all of the Fixed Transmission Rights already outstanding at the time of the auction. In addition, any holder of a Fixed Transmission Right for the period covered by an auction may offer such Fixed Transmission Right for sale in such auction. Each monthly auction will consist of a separate auction for on-peak Fixed Transmission Rights and a separate auction for off-peak Fixed Transmission Rights. Market Participants may bid for and acquire any number of Fixed Transmission Rights, provided that all Fixed Transmission Rights awarded are simultaneously feasible with each other and with all Fixed Transmission Rights outstanding at the time of the auction and not sold into the auction.

7.1.2 Frequency and Time of Auctions.

Fixed Transmission Rights auctions shall be held monthly. The bid and offer period shall open at 12:00 midnight (Eastern Prevailing Time) on the fifteenth (15th) business day preceding the month for which Fixed Transmission Rights are being auctioned and shall close at 12:00 midnight (Eastern Prevailing Time) on the tenth (10th) business day preceding the month for which Fixed Transmission Rights are being auctioned.

7.1.3. Duration of Fixed Transmission Rights.

Each Fixed Transmission Right acquired in a Fixed Transmission Rights auction shall entitle the holder to credits of Transmission Congestion Charges for the one-month period for which the Fixed Transmission Rights were auctioned.

7.2 Fixed Transmission Rights Characteristics.

7.2.1 Reconfiguration of Fixed Transmission Rights.

Through an appropriate linear programming model, the Office of the Interconnection shall reconfigure the Fixed Transmission Rights offered or otherwise available for sale in any auction to maximize the value to the bidders of the Fixed Transmission Rights sold, provided that any Fixed Transmission Rights acquired at auction shall be simultaneously feasible in combination with those Fixed Transmission Rights outstanding at the time of the auction and not sold in the auction. The linear programming model shall, while respecting transmission constraints and the maximum MW quantities of the bids and offers, select the set of simultaneously feasible Fixed Transmission Rights with the highest net total auction value as determined by the bids of buyers and taking into account the reservation prices of the sellers.

7.2.2 Specified Buses.

Auction bids for Fixed Transmission Rights may specify any combination of receipt and delivery buses represented in the State Estimator model for which the Office of the Interconnection calculates and posts Locational Marginal Prices. Auction bids may specify receipt and delivery points from locations outside of the PJM Control Area to locations inside the PJM Control Area, from locations within the PJM Control Area to locations outside of the PJM Control Area, or to and from locations within the PJM Control Area.

7.2.3 Transmission Congestion Charges.

Fixed Transmission Rights, whether acquired at auction or otherwise, shall entitle holders thereof to credits only for Transmission Congestion Charges, and shall not confer a right to credits for payments arising from or relating to transmission congestion made to any entity other than the Office of the Interconnection.

7.3 Auction Procedures.

7.3.1 Role of the Office of the Interconnection.

Fixed Transmission Rights auctions shall be conducted by the Office of the Interconnection in accordance with standards and procedures set forth in the PJM Manuals, such standards and procedures to be consistent with the requirements of this Schedule.

7.3.2 Notice of Offer.

A holder of a Fixed Transmission Right wishing to offer the Fixed Transmission Right for sale shall notify the Office of the Interconnection of any Fixed Transmission Rights to be offered. Each Fixed Transmission Right sold in an auction shall, at the end of the period for which the Fixed Transmission Rights were auctioned, revert to the offering holder or the entity to which the offering holder has transferred such Fixed Transmission Right, subject to the term of the Fixed Transmission Right itself and to the right of such holder or transferee to offer the Fixed Transmission Right in the next or any subsequent auction during the term of the Fixed Transmission Right.

7.3.3 Pending Applications for Firm Service.

(a) Prior to the start of each auction bidding period, the Office of the Interconnection shall exert reasonable effort to complete its review of pending applications for Network Transmission Service and Firm Point-to-Point Transmission Service and to ascertain the corresponding Fixed Transmission Rights to be assigned to the entities receiving such service, subject to compliance with all applicable deadlines and other procedures by the applicant. Fixed Transmission Rights so assigned shall be included in the simultaneous feasibility test performed by the Office of the Interconnection for the auction.

(b) Fixed Transmission Rights may be assigned to entities requesting Network Transmission Service or Firm Point-to-Point Transmission Service only if such Fixed Transmission Rights are simultaneously feasible with all outstanding Fixed Transmission Rights, including Fixed Transmission Rights effective for the then-current auction period. If an assignment of Fixed Transmission Rights pursuant to a pending application for Network Transmission Service or Firm Point-to-Point Transmission Service cannot be completed prior to an auction, Fixed Transmission Rights attributable to such transmission service shall not be assigned for the then-current auction period. If a Fixed Transmission Right cannot be assigned for this reason, the applicant may withdraw its application, or request that the Fixed Transmission Right be assigned effective with the start of the next auction period.

7.3.4 On-Peak and Off-Peak Periods.

The Office of the Interconnection will conduct separate auctions simultaneously for on-peak and off-peak periods. On-Peak Fixed Transmission Rights shall cover the periods from 7:00 a.m. up to the hour ending at 11:00 p.m. on Mondays through Fridays, except holidays as defined in the PJM Manuals. Off-Peak Fixed Transmission Rights shall cover the periods from 11:00 p.m. up to the hour ending 7:00 a.m. on Mondays through Fridays and all hours on Saturdays, Sundays, and holidays as defined in the PJM Manuals. Each bid shall specify whether it is for an on-peak or off-peak period.

7.3.5 Offers and Bids.

(a) Offers to sell and bids to purchase Fixed Transmission Rights shall be submitted during the period set forth in Section 7.1.2, and shall be in the form specified by the Office of the Interconnection in accordance with the requirements set forth below.

(b) Offers to sell shall identify the specific Fixed Transmission Right, by megawatt quantity and receipt and delivery points, offered for sale. An offer to sell a specified megawatt quantity of Fixed Transmission Rights shall constitute an offer to sell a quantity of Fixed Transmission Rights equal to or less than the specified quantity. An offer to sell may not specify a minimum quantity being offered. Each offer may specify a reservation price, below which the offeror does not wish to sell the Fixed Transmission Right. Offers submitted by entities holding rights to Fixed Transmission Rights acquired other than by assignment in connection with reservations of Network Transmission Service or Firm Point-to-Point Transmission Service shall be subject to such reasonable standards for the verification of the rights of the offeror as may be established by the Office of the Interconnection. Offers shall be subject to such reasonable standards for the creditworthiness of the offeror or for the posting of security for performance as the Office of the Interconnection shall establish.

(c) Bids to purchase shall specify the megawatt quantity, price per megawatt, and receipt and delivery points of the Fixed Transmission Right that the bidder wishes to purchase. A bid to purchase a specified megawatt quantity of Fixed Transmission Rights shall constitute a bid to purchase a quantity of Fixed Transmission Rights equal to or less than the specified quantity. A bid to purchase may not specify a minimum quantity that the bidder wishes to purchase. A bid may specify as receipt or delivery points any bus for which the Office of the Interconnection calculates and posts Locational Marginal Prices in accordance with Section 2 of this Schedule and may include Fixed Transmission Rights for which the associated Transmission Congestion Credits may have negative values. Bids shall be subject to such reasonable standards for the creditworthiness of the bidder or for the posting of security for performance as the Office of the Interconnection shall establish.

(d) Bids and offers shall be specified to the nearest tenth of a megawatt and shall be greater than zero.

7.3.6 Determination of Winning Bids and Clearing Price.

(a) At the close of the bidding period each month, the Office of the Interconnection will create a base Fixed Transmission Rights power flow model that includes all outstanding Fixed Transmission Rights that have been approved and confirmed for any portion of the month for which the auction was conducted and that were not offered for sale in the auction. The base Fixed Transmission Rights model also will include estimated uncompensated parallel flows into each interface point of the PJM Control Area and estimated scheduled transmission outages.

(b) In accordance with the requirements of Section 7.4 of this Schedule and subject to all applicable transmission constraints and reliability requirements, the Office of the Interconnection shall determine the simultaneous feasibility of all outstanding Fixed Transmission Rights not offered for sale in the auction and of all Fixed Transmission Rights that could be awarded in the auction for which bids were submitted. The winning bids shall be determined from an appropriate linear programming model that, while respecting transmission constraints and the maximum MW quantities of the bids and offers, selects the set of simultaneously feasible Fixed Transmission Rights with the highest net total auction value as determined by the bids of buyers and taking into account the reservation prices of the sellers.

(c) Fixed Transmission Rights shall be sold at the market-clearing price for Fixed Transmission Rights between specified pairs of receipt and delivery points, as determined by the bid value of the marginal Fixed Transmission Right that could not be awarded because it would not be simultaneously feasible. The linear programming model shall determine the clearing prices of all Fixed Transmission Rights paths based on the bid value of the marginal Fixed Transmission Rights, which are those Fixed Transmission Rights with the highest bid values that could not be awarded fully because they were not simultaneously feasible, and based on the flow sensitivities of each Fixed Transmission Rights path relative to the marginal Fixed Transmission Rights paths flow sensitivities on the binding transmission constraints.

7.3.7 Announcement of Winners and Prices.

Within two (2) business days after the close of an auction, the Office of the Interconnection shall post the winning bidders, the megawatt quantity, and the receipt and delivery points for each Fixed Transmission Right awarded in the auction and the price at which each Fixed Transmission Right was awarded. Results of the on-peak auction and off-peak auction will be posted separately. The Office of the Interconnection shall not disclose the price specified in any bid to purchase or the reservation price specified in any offer to sell.

7.3.8 Auction Settlements.

All buyers and sellers of Fixed Transmission Rights between the same points of receipt and delivery shall pay or be paid the market-clearing price, as determined in the auction, for such Fixed Transmission Rights.

7.3.9 Allocation of Auction Revenues.

All auction revenues, net of payments to entities selling Fixed Transmission Rights into the auction, shall be allocated among the Regional Transmission Owners in proportion to their respective transmission revenue requirements.

7.4 Simultaneous Feasibility.

The Office of the Interconnection shall make the simultaneous feasibility determinations specified herein using appropriate powerflow models of contingency-constrained dispatch. Such determinations shall take into account outages of both individual generation units and transmission facilities and shall be based on reasonable assumptions about the configuration and availability of transmission capability during the period covered by the auction that are not inconsistent with the determination of the deliverability of Capacity Resources under the Reliability Assurance Agreement. The goal of the simultaneous feasibility determination shall be to ensure that there are sufficient revenues from Transmission Congestion Charges to satisfy all Fixed Transmission Rights obligations for the auction period under expected conditions.

Tariff Revisions
Red-Lined
(FTR Auctions)

Underlining shows changes from currently effective Schedule 1.

Italics show additions to what the Supporting Companies previously submitted to FERC.

Deletions from the Supporting Companies' version are not shown.

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List of Regional Transmission Owners 182

ATTACHMENT M
PJM Market Monitoring Plan 183

1.3.2 Equivalent Load.

"Equivalent Load" shall mean the sum of a Market Participant's net system requirements to serve its customer load in the PJM Control Area, if any, plus its net bilateral transactions.

1.3.3 External Market Buyer.

"External Market Buyer" shall mean a Market Buyer making purchases of energy from the PJM Interchange Energy Market for consumption by end-users outside the PJM Control Area, or for load in the Control Area that is not served by Network Transmission Service.

1.3.4 External Resource.

"External Resource" shall mean a generation resource located outside the metered boundaries of the PJM Control Area.

1.3.5 Fixed Transmission Right.

"Fixed Transmission Right" shall mean a ~~number determined~~right to receive Transmission Congestion Credits as specified in Section 5.2.2 of this Schedule.

1.3.6 Generating Market Buyer.

"Generating Market Buyer" shall mean an Internal Market Buyer that is a Load Serving Entity that owns or has contractual rights to the output of generation resources capable of serving the Market Buyer's load in the PJM Control Area, or of selling energy or related services in the PJM Interchange Energy Market or elsewhere.

1.3.7 Generator Forced Outage.

"Generator Forced Outage" shall mean an immediate reduction in output or capacity or removal from service, in whole or in part, of a generating unit by reason of an Emergency or threatened Emergency, unanticipated failure, or other cause beyond the control of the owner or operator of the facility, as specified in the relevant portions of the PJM Manuals. A reduction in output or removal from service of a generating unit in response to changes in market conditions shall not constitute a Generator Forced Outage.

1.3.8 Generator Maintenance Outage.

"Generator Maintenance Outage" shall mean the scheduled removal from service, in whole or in part, of a generating unit in order to perform necessary repairs on specific components of the facility, if removal of the facility meets the guidelines specified in the PJM Manuals.

5.1.5 Operating Margin Customer Calculation.

Each Control Area purchasing Operating Margin shall be assessed Transmission Congestion Charges for any the increase in the cost of energy resulting from the provision of Operating Margin. The Transmission Congestion Charge shall be the amount of Operating Margin purchased in an hour multiplied by the difference in the Locational Marginal Price at what would be the delivery interface and the Locational Marginal Price at what would be the source interface, if the operating contingency that was the basis for the purchase of Operating Margin had occurred in that hour. Operating Margin may be allocated among multiple source and delivery interfaces in accordance with an applicable load flow study.

5.1.6 Transmission Loading Relief Customer Calculation.

(a) Each Transmission Loading Relief Customer shall be assessed Transmission Congestion Charges for any increase in the cost of energy in the PJM Control Area resulting from its energy schedules over contract paths outside the PJM Control Area during Transmission Loading Relief.

(b) The Transmission Congestion Charge shall be the total amount of energy specified in such energy schedules multiplied by the difference between a Locational Marginal Price calculated by the Office of the Interconnection for the energy schedule source location specified in the NERC Interchange Distribution Calculator and a Locational Marginal Price calculated by the Office of the Interconnection for the energy schedule sink location specified in the NERC Interchange Distribution Calculator. Transmission Congestion Charges that are less than zero shall be set equal to zero for Transmission Loading Relief Customers.

(c) The Office of the Interconnection will determine the Locational Marginal Prices at the energy schedule source and sink locations external to PJM with reference to and based solely on the prices of energy in the PJM Control Area and at the interface buses between the PJM Control Area and adjacent Control Areas and the system conditions and actual power flow distributions as described by the PJM State Estimator program. The Office of the Interconnection will determine the Locational Marginal Prices at the external energy schedule source and sink locations and the resulting Congestion Charge based on the portion of the energy schedule that flows through the PJM Control Area as reflected by the flow distributions from the PJM State Estimator Program.

5.1.7 Total Transmission Congestion Charges.

The total Transmission Congestion Charges collected by the Office of the Interconnection each hour will be the sum of the amounts determined as specified in this Schedule. The Office of the Interconnection shall collect Transmission Congestion Charges for each hour the transmission system operates under constrained conditions.

5.2 Transmission Congestion Credit Calculation.

5.2.1 Eligibility.

Each holder of a Fixed Transmission ~~Customer using firm Point-to-Point Transmission Service and each Network Service User~~Right shall receive as a Transmission Congestion Credit a proportional share of the total Transmission Congestion Charges collected for each constrained hour.

5.2.2 Fixed Transmission Rights.

(a) Transmission Congestion Credits will be calculated based upon the Fixed Transmission Rights ~~of~~ held at the time of the constrained hour. Initial assignments of a Fixed Transmission Rights shall be made to each Network Service User and Transmission Customer~~, determined~~ as specified below.

(b) ~~Each~~ On a periodic schedule established by the Office of the Interconnection, each Network Service User shall designate a subset of its Network Resources for which Fixed Transmission Rights will be assigned. ~~The sum of the~~ Fixed Transmission Rights shall be assigned for each Network Resource ~~shall be~~in a number of megawatts equal to or less than the installed capacity summer megawatt rating of each designated Network Resource, determined at the PJM Control Area transmission bus at which the designated Network Resource is connected. Each Fixed Transmission Right shall be to the aggregate load busses of the Network Service User in a Zone or, with respect to Non-Zone Network Load, to the border of the PJM Control Area. The sum of each Network Service User's assigned Fixed Transmission Rights for a Zone must be equal to or less than the Network Service User's peak load for that Zone as determined under Section 34.1 of the Tariff. The sum of each Network Service User's Fixed Transmission Rights for Non-Zone Network Load must be equal to or less than the Network Service User's transmission responsibility for Non-Zone Network Load as determined under Section 34.1 of the Tariff.

(c) Each Transmission Customer receiving firm Point-to-Point Transmission Service shall be assigned Fixed Transmission Rights; provided, however, that a Transmission Customer may notify the Office of Interconnection that it does not wish to receive any FTRs or wishes to receive FTRs only for certain Point or Points of Receipt and Point or Points of Delivery, in which event no FTRs or such reduced amount of FTRs shall be issued to the Transmission Customer. The Fixed Transmission Right for each instance of Point-to-Point Transmission Service

shall be a number of megawatts equal to the megawatts of firm service being provided between the receipt and delivery points as to which the Transmission Customer has firm Point-to-Point Transmission Service.

(d) ~~The foregoing assignment of Fixed Transmission Rights shall be enhanced by an amendment to this Schedule, to be filed with FERC not later than December 31, 1997, that will provide for an auction of Fixed Transmission Rights over and above those FTRs obtained and retained by Network Service Users and Transmission Customers then receiving firm Point-to-Point Transmission Service (including firm Point-to-Point transmission service for existing bilateral contracts), such auction to be implemented as soon after December 31, 1997 as shall be determined by the Office of the Interconnection to be reasonably practical. For so long as Fixed Transmission Rights are assigned on the basis of Network Transmission Service and firm Point-to-Point Transmission Service, any Fixed Transmission Rights awarded pursuant to an auction shall be simultaneously feasible with all Network Transmission Service and firm Point-to-Point Transmission Service obligations. The Members specified in Section 11.5(c) of the Agreement, working with the Office of the Interconnection, shall develop the details of the implementation of such an auction, including but not limited to the nature of the bidding process, the frequency of auctions, and the duration of the Fixed Transmission Rights purchased at auction.~~ A Fixed Transmission Right, or the right to Transmission Congestion Credits attributable to a Fixed Transmission Right, may be sold or otherwise transferred by agreement, subject to compliance with such procedures as may be established by the Office of the Interconnection for verification of the rights of the purchaser or transferee.

5.2.3 Target Allocation for Network Service Users.

A target allocation of Transmission Congestion Credits for each Network Service User shall be determined for each of its Fixed Transmission Rights. Each Fixed Transmission Right shall be multiplied by the percent of the Network Service User's annual peak load assigned to each load bus multiplied by the difference calculated as the Network Service User's load bus Locational Marginal Price minus the generation bus Locational Marginal Price of the Network Resource associated with the Fixed Transmission Right. The total target allocation for each Fixed Transmission Right is the sum of the target allocations for each load bus. The total target allocation for each Network Service User for each hour is the sum of the total target allocations for each of the Network Service User's Fixed Transmission Rights.

5.2.4 Target Allocation for other Holders.

A target allocation of Transmission Congestion Credits for each Transmission Customer or entity holding an FTR acquired by other means shall be determined for each Fixed Transmission Right. Each Fixed Transmission Right shall be multiplied by the hourly Locational Marginal Price differences for the receipt and delivery points associated with the Fixed Transmission Right, calculated as the Locational Marginal Price at the delivery point(s) minus the Locational Marginal Price at the receipt point(s). The total target allocation for the Transmission Customer for each hour shall be the sum of the target allocations associated with all of the Transmission Customer's Fixed Transmission Rights.

6. [RESERVED]

7. FIXED TRANSMISSION RIGHTS AUCTIONS

7.1 Auctions of Fixed Transmission Rights.

Periodic auctions to allow Market Participants to acquire or sell Fixed Transmission Rights shall be conducted by the Office of the Interconnection in accordance with the provisions of this Section.

7.1.1 Auction Period and Scope of Auctions.

The period covered by an auction shall be the one-month period next following the date that the auction is conducted. The Office of the Interconnection shall offer for sale in the auction any remaining Fixed Transmission Rights capability for the month after taking into account all of the Fixed Transmission Rights already outstanding at the time of the auction. In addition, any holder of a Fixed Transmission Right for the period covered by an auction may offer such Fixed Transmission Right for sale in such auction. *Each monthly auction will consist of a separate auction for on-peak Fixed Transmission Rights and a separate auction for off-peak Fixed Transmission Rights.* Market Participants may bid for and acquire any number of Fixed Transmission Rights, provided that all Fixed Transmission Rights awarded are simultaneously feasible with each other and with all Fixed Transmission Rights outstanding at the time of the auction and ~~*not put up for sale in*~~ *not sold into the* auction.

7.1.2 Frequency *and Time* of Auctions.

Fixed Transmission Rights auctions shall be held *monthly. The bid and offer period shall open at 12:00 midnight (Eastern Prevailing Time) on the fifteenth (15th) business day preceding the month for which Fixed Transmission Rights are being auctioned and shall close at 12:00 midnight (Eastern Prevailing Time) on the tenth (10th) business day preceding the month for which Fixed Transmission Rights are being auctioned.*

7.1.3. Duration of Fixed Transmission Rights.

Each Fixed Transmission Right acquired in a Fixed Transmission Rights auction shall entitle the holder to credits of Transmission Congestion Charges for the *one-month* period for which the Fixed Transmission Rights were auctioned.

7.2 Fixed Transmission Rights Characteristics.

7.2.1 Reconfiguration of Fixed Transmission Rights.

*Through an appropriate linear programming model, T*he Office of the Interconnection shall reconfigure the Fixed Transmission Rights offered or otherwise available for sale in any auction to maximize the value to the bidders of the Fixed Transmission Rights sold, provided that any Fixed Transmission Rights acquired at auction shall be simultaneously feasible in combination with those Fixed Transmission Rights outstanding at the time of the auction and not sold in the auction. *The linear programming model shall, while respecting transmission constraints and the maximum MW quantities of the bids and offers, select the set of simultaneously feasible Fixed Transmission Rights with the highest net total auction value as determined by the bids of buyers and taking into account the reservation prices of the sellers.*

7.2.2 Specified Buses.

Auction bids for Fixed Transmission Rights may specify any combination of receipt and delivery buses represented in the State Estimator model for which the Office of the Interconnection *calculates and posts* Locational Marginal Prices. Auction bids may specify receipt and delivery points from locations outside of the PJM Control Area to locations inside the PJM Control Area, from locations within the PJM Control Area to locations outside of the PJM Control Area, or to and from locations within the PJM Control Area.

7.2.3 Transmission Congestion Charges.

Fixed Transmission Rights, whether acquired at auction or otherwise, shall entitle holders thereof to credits only for Transmission Congestion Charges, and shall not confer a right to credits for payments arising from or relating to transmission congestion made to any entity other than the Office of the Interconnection.

7.3 Auction Procedures.

7.3.1 Role of the Office of the Interconnection.

Fixed Transmission Rights auctions shall be conducted by the Office of the Interconnection in accordance with standards and procedures set forth in the PJM Manuals, such standards and procedures to be consistent with the requirements of this Schedule.

7.3.2 Notice of Offer.

A holder of a Fixed Transmission Right wishing to offer the Fixed Transmission Right for sale shall notify the Office of the Interconnection of any Fixed Transmission Rights to be offered. Each Fixed Transmission Right sold in an auction shall, at the end of the period for which the Fixed Transmission Rights were auctioned, revert to the offering holder or the entity to which the offering holder has transferred such Fixed Transmission Right, subject to the term of the Fixed Transmission Right itself and to the right of such holder or transferee to offer the Fixed Transmission Right in the next or any subsequent auction during the term of the Fixed Transmission Right.

7.3.3 Pending Applications for Firm Service.

(a) Prior to *the start of* each auction *bidding period*, the Office of the Interconnection shall exert reasonable effort to complete its review of pending applications for Network Transmission Service and Firm Point-to-Point *Transmission* Service and to ascertain the corresponding Fixed Transmission Rights to be assigned to the entities receiving such service, subject to compliance with all applicable deadlines and other procedures by the applicant. Fixed Transmission Rights so assigned shall be included in the simultaneous feasibility test performed by the Office *of the Interconnection* for the auction.

(b) Fixed Transmission Rights may be assigned to entities requesting Network Transmission Service or Firm Point-to-Point Transmission Service only if such Fixed Transmission Rights are simultaneously feasible with all outstanding Fixed Transmission Rights, including Fixed Transmission Rights effective for the then-current auction period. If an assignment of Fixed Transmission Rights pursuant to a pending application for Network Transmission Service or Firm Point-to-Point Transmission Service cannot be completed prior to an auction, Fixed Transmission Rights attributable to such transmission service shall not be assigned for the then-current auction period. If a Fixed Transmission Right cannot be assigned for this reason, the applicant may withdraw its application, or request that the Fixed Transmission Right be assigned effective with the start of the next auction period.

7.3.4 On-Peak and Off-Peak Periods.

The Office of the Interconnection *will* conduct separate auctions simultaneously for on-peak and off-peak periods. *On-Peak Fixed Transmission Rights shall cover the periods from 7:00 a.m. up to the hour ending at 11:00 p.m. on Mondays through Fridays, except holidays as defined in the PJM Manuals. Off-Peak Fixed Transmission Rights shall cover the periods from 11:00 p.m. up to the hour ending 7:00 a.m. on Mondays through Fridays and all hours on Saturdays, Sundays, and holidays as defined in the PJM Manuals.* Each bid shall specify whether it is for an on-peak or off-peak period.

7.3.5 Offers and Bids.

(a) Offers to sell and bids to purchase Fixed Transmission Rights shall be submitted *during the period set forth in Section 7.1.2*, and shall be in the form specified by the Office of the Interconnection in accordance with the requirements set forth below.

(b) Offers to sell shall identify the specific Fixed Transmission Right, by megawatt quantity and receipt and delivery points, offered for sale. *An offer to sell a specified megawatt quantity of Fixed Transmission Rights shall constitute an offer to sell a quantity of Fixed Transmission Rights equal to or less than the specified quantity. An offer to sell may not specify a minimum quantity being offered.* Each offer may specify a reservation price, below which the offeror does not wish to sell the Fixed Transmission Right. Offers submitted by entities holding rights to Fixed Transmission Rights acquired other than by assignment in connection with reservations of Network Transmission Service or Firm Point-to-Point Transmission Service shall be subject to such reasonable standards for the verification of the rights of the offeror as may be established by the Office of the Interconnection. Offers shall be subject to such reasonable standards for the creditworthiness of the offeror or for the posting of security for performance as the Office of the Interconnection shall establish.

(c) Bids *to purchase* shall specify the megawatt quantity, price per megawatt, and receipt and delivery points of the Fixed Transmission Right that the bidder wishes to purchase. *A bid to purchase a specified megawatt quantity of Fixed Transmission Rights shall constitute a bid to purchase a quantity of Fixed Transmission Rights equal to or less than the specified quantity. A bid to purchase may not specify a minimum quantity that the bidder wishes to purchase.* A bid may specify as receipt or delivery points any bus for which the Office of the Interconnection calculates *and posts* Locational Marginal Prices in accordance with Section 2 of this Schedule and may include Fixed Transmission Rights for which the associated Transmission Congestion Credits may have negative values. Bids shall be subject to such reasonable standards for the creditworthiness of the bidder or for the posting of security for performance as the Office of the Interconnection shall establish.

(d) Bids and offers shall be *specified to the nearest tenth of a megawatt and shall be greater than zero.*

7.3.6 Determination of Winning Bids *and Clearing Price.*

(a) At the close of the bidding period each month, the Office of the Interconnection will create a base Fixed Transmission Rights power flow model that includes all outstanding Fixed Transmission Rights that have been approved and confirmed for any portion of the month for which the auction was conducted and that were not offered for sale in the auction. The base Fixed Transmission Rights model also will include estimated uncompensated parallel flows into each interface point of the PJM Control Area and estimated scheduled transmission outages.

(b) In accordance with the requirements of Section 7.4 of this Schedule and subject to all applicable transmission constraints and reliability requirements, the Office of the Interconnection shall determine the simultaneous feasibility of all outstanding Fixed Transmission Rights not offered for sale in the auction and of all Fixed Transmission Rights that could be awarded in the auction for which bids were submitted. *The winning bids shall be determined from an appropriate linear programming model that, while respecting transmission constraints and the maximum MW quantities of the bids and offers, selects* the set of simultaneously feasible Fixed Transmission Rights with the highest *net* total auction value as determined by the bids of buyers and taking into account the reservation prices of the sellers.

(c) Fixed Transmission Rights shall be sold *at* the market-clearing price for Fixed Transmission Rights between specified pairs of receipt and delivery points, as determined by the bid value of the marginal Fixed Transmission Right that could not be awarded because it would not be simultaneously feasible. *The linear programming model shall determine the clearing prices of all Fixed Transmission Rights paths based on the bid value of the marginal Fixed Transmission Rights, which are those Fixed Transmission Rights with the highest bid values that could not be awarded fully because they were not simultaneously feasible, and based on the flow sensitivities of each Fixed Transmission Rights path relative to the marginal Fixed Transmission Rights paths flow sensitivities on the binding transmission constraints.*

7.3.7 Announcement of Winners and Prices.

Within two (2) business days after the close of an auction, the Office of the Interconnection shall post the winning bidders, the megawatt quantity, and the receipt and delivery points for each Fixed Transmission Right awarded in the auction and the price at which each Fixed Transmission Right was awarded. *Results of the on-peak auction and off-peak auction will be posted separately.* The Office of the Interconnection shall not disclose the price specified in any bid *to purchase* or the reservation price specified in any offer to sell.

7.3.8 Auction Settlements.

All buyers and sellers of Fixed Transmission Rights between the same points of receipt and delivery shall pay or be paid the market-clearing price, as determined in the auction, for such Fixed Transmission Rights.

7.3.9 Allocation of Auction Revenues.

All auction revenues, net of payments to entities selling Fixed Transmission Rights into the auction, shall be allocated among the Regional Transmission Owners in proportion to, ~~*and shall be credited against,*~~ their respective transmission revenue requirements.

7.4 Simultaneous Feasibility.

The Office of the Interconnection shall make the simultaneous feasibility determinations specified herein using appropriate powerflow models of contingency-constrained dispatch. Such determinations shall take into account outages of both individual generation units and ~~*transmission lines*~~ *transmission facilities* and shall be based on reasonable assumptions about the configuration and availability of transmission capability during the period covered by the auction that are not inconsistent with the determination of the deliverability of Capacity Resources under the Reliability Assurance Agreement. The goal of the simultaneous feasibility determination shall be to ensure that there are sufficient revenues from Transmission Congestion Charges to satisfy all Fixed Transmission Rights obligations for the auction period under expected conditions.

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1.3.4 External Resource.

"External Resource" shall mean a generation resource located outside the metered boundaries of the PJM Control Area.

1.3.5 Fixed Transmission Right.

"Fixed Transmission Right" shall mean a right to receive Transmission Congestion Credits as specified in Section 5.2.2 of this Schedule.

1.3.6 Generating Market Buyer.

"Generating Market Buyer" shall mean an Internal Market Buyer that is a Load Serving Entity that owns or has contractual rights to the output of generation resources capable of serving the Market Buyer's load in the PJM Control Area, or of selling energy or related services in the PJM Interchange Energy Market or elsewhere.

1.3.7 Generator Forced Outage.

"Generator Forced Outage" shall mean an immediate reduction in output or capacity or removal from service, in whole or in part, of a generating unit by reason of an Emergency or threatened Emergency, unanticipated failure, or other cause beyond the control of the owner or operator of the facility, as specified in the relevant portions of the PJM Manuals. A reduction in output or removal from service of a generating unit in response to changes in market conditions shall not constitute a Generator Forced Outage.

1.3.8 Generator Maintenance Outage.

"Generator Maintenance Outage" shall mean the scheduled removal from service, in whole or in part, of a generating unit in order to perform necessary repairs on specific components of the facility, if removal of the facility meets the guidelines specified in the PJM Manuals.

1.3.9 Generator Planned Outage.

"Generator Planned Outage" shall mean the scheduled removal from service, in whole or in part, of a generating unit for inspection, maintenance or repair with the approval of the Office of the Interconnection in accordance with the PJM Manuals.

1.3.10 Internal Market Buyer.

"Internal Market Buyer" shall mean a Market Buyer making purchases of energy from the PJM Interchange Energy Market for ultimate consumption by end-users inside the PJM Control Area that are served by Network Transmission Service.

1.3.11 Inadvertent Interchange.

"Inadvertent Interchange" shall mean the difference between net actual energy flow and net scheduled energy flow into or out of the PJM Control Area, as determined and allocated each hour by the Office of the Interconnection in accordance with the procedures set forth in the PJM Manuals to each Electric Distributor that reports to the Office of the Interconnection its hourly net energy flows from metered tie lines.

5.1.6 Transmission Loading Relief Customer Calculation

(a) Each Transmission Loading Relief Customer shall be assessed Transmission Congestion Charges for any increase in the cost of energy in the PJM Control Area resulting from its energy schedules over contract paths outside the PJM Control Area during Transmission Loading Relief.

(b) The Transmission Congestion Charge shall be the total amount of energy specified in such energy schedules multiplied by the difference between a Locational Marginal Price calculated by the Office of the Interconnection for the energy schedule source location specified in the NERC Interchange Distribution Calculator and a Locational Marginal Price calculated by the Office of the Interconnection for the energy schedule sink location specified in the NERC Interchange Distribution Calculator. Transmission Congestion Charges that are less than zero shall be set equal to zero for Transmission Loading Relief Customers.

(c) The Office of the Interconnection will determine the Locational Marginal Prices at the energy schedule source and sink locations external to PJM with reference to and based solely on the prices of energy in the PJM Control Area and at the interface buses between the PJM Control Area and adjacent Control Areas and the system conditions and actual power flow distributions as described by the PJM State Estimator program. The Office of the Interconnection will determine the Locational Marginal Prices at the external energy schedule source and sink locations and the resulting Congestion Charge based on the portion of the energy schedule that flows through the PJM Control Area as reflected by the flow distributions from the PJM State Estimator program.

5.1.7 Total Transmission Congestion Charges.

The total Transmission Congestion Charges collected by the Office of the Interconnection each hour will be the sum of the amounts determined as specified in this Schedule. The Office of the Interconnection shall collect Transmission Congestion Charges for each hour the transmission system operates under constrained conditions.

5.2 Transmission Congestion Credit Calculation.

5.2.1 Eligibility.

Each holder of a Fixed Transmission Right shall receive as a Transmission Congestion Credit a proportional share of the total Transmission Congestion Charges collected for each constrained hour.

5.2.2 Fixed Transmission Rights.

(a) Transmission Congestion Credits will be calculated based upon the Fixed Transmission Rights held at the time of the constrained hour. Initial assignments of Fixed Transmission Rights shall be made to each Network Service User and Transmission Customer as specified below.

(b) On a periodic schedule established by the Office of the Interconnection, each Network Service User shall designate a subset of its Network Resources for which Fixed Transmission Rights will be assigned. Fixed Transmission Rights shall be assigned for each Network Resource in a number of megawatts equal to or less than the installed capacity summer megawatt rating of each designated Network Resource, determined at the PJM Control Area transmission bus at which the designated Network Resource is connected. Each Fixed Transmission Right shall be to the aggregate load busses of the Network Service User in a Zone or, with respect to Non-Zone Network Load, to the border of the PJM Control Area. The sum of each Network Service User's assigned Fixed Transmission Rights for a Zone must be equal to or less than the Network Service User's peak load for that Zone as determined under Section 34.1 of the Tariff. The sum of each Network Service User's Fixed Transmission Rights for Non-Zone Network Load must be equal to or less than the Network Service User's transmission responsibility for Non-Zone Network Load as determined under Section 34.1 of the Tariff.

(c) Each Transmission Customer receiving firm Point-to-Point Transmission Service shall be assigned Fixed Transmission Rights; provided, however, that a Transmission Customer may notify the Office of Interconnection that it does not wish to receive any FTRs or wishes to receive FTRs only for certain Point or Points of Receipt and Point or Points of Delivery, in which event no FTRs or such reduced amount of FTRs shall be issued to the Transmission Customer. The Fixed Transmission Right for each instance of Point-to-Point Transmission Service shall be a number of megawatts equal to the megawatts of firm service being provided between the receipt and delivery points as to which the Transmission Customer has firm Point-to-Point Transmission Service.

(d) A Fixed Transmission Right, or the right to Transmission Congestion Credits attributable to a Fixed Transmission Right, may be sold or otherwise transferred by agreement, subject to compliance with such procedures as may be established by the Office of the Interconnection for verification of the rights of the purchaser or transferee.

6. [RESERVED]

7. FIXED TRANSMISSION RIGHTS AUCTIONS

7.1 Auctions of Fixed Transmission Rights.

Periodic auctions to allow Market Participants to acquire or sell Fixed Transmission Rights shall be conducted by the Office of the Interconnection in accordance with the provisions of this Section.

7.1.1 Auction Period and Scope of Auctions.

The period covered by an auction shall be the one-month period next following the date that the auction is conducted. The Office of the Interconnection shall offer for sale in the auction any remaining Fixed Transmission Rights capability for the month after taking into account all of the Fixed Transmission Rights already outstanding at the time of the auction. In addition, any holder of a Fixed Transmission Right for the period covered by an auction may offer such Fixed Transmission Right for sale in such auction. Each monthly auction will consist of a separate auction for on-peak Fixed Transmission Rights and a separate auction for off-peak Fixed Transmission Rights. Market Participants may bid for and acquire any number of Fixed Transmission Rights, provided that all Fixed Transmission Rights awarded are simultaneously feasible with each other and with all Fixed Transmission Rights outstanding at the time of the auction and not sold into the auction.

7.1.2 Frequency and Time of Auctions.

Fixed Transmission Rights auctions shall be held monthly. The bid and offer period shall open at 12:00 midnight (Eastern Prevailing Time) on the fifteenth (15th) business day preceding the month for which Fixed Transmission Rights are being auctioned and shall close at 12:00 midnight (Eastern Prevailing Time) on the tenth (10th) business day preceding the month for which Fixed Transmission Rights are being auctioned.

7.1.3. Duration of Fixed Transmission Rights.

Each Fixed Transmission Right acquired in a Fixed Transmission Rights auction shall entitle the holder to credits of Transmission Congestion Charges for the one-month period for which the Fixed Transmission Rights were auctioned.

7.2 Fixed Transmission Rights Characteristics.

7.2.1 Reconfiguration of Fixed Transmission Rights.

Through an appropriate linear programming model, the Office of the Interconnection shall reconfigure the Fixed Transmission Rights offered or otherwise available for sale in any auction to maximize the value to the bidders of the Fixed Transmission Rights sold, provided that any Fixed Transmission Rights acquired at auction shall be simultaneously feasible in combination with those Fixed Transmission Rights outstanding at the time of the auction and not sold in the auction. The linear programming model shall, while respecting transmission constraints and the maximum MW quantities of the bids and offers, select the set of simultaneously feasible Fixed Transmission Rights with the highest net total auction value as determined by the bids of buyers and taking into account the reservation prices of the sellers.

7.2.2 Specified Buses.

Auction bids for Fixed Transmission Rights may specify any combination of receipt and delivery buses represented in the State Estimator model for which the Office of the Interconnection calculates and posts Locational Marginal Prices. Auction bids may specify receipt and delivery points from locations outside of the PJM Control Area to locations inside the PJM Control Area, from locations within the PJM Control Area to locations outside of the PJM Control Area, or to and from locations within the PJM Control Area.

7.2.3 Transmission Congestion Charges.

Fixed Transmission Rights, whether acquired at auction or otherwise, shall entitle holders thereof to credits only for Transmission Congestion Charges, and shall not confer a right to credits for payments arising from or relating to transmission congestion made to any entity other than the Office of the Interconnection.

7.3 Auction Procedures.

7.3.1 Role of the Office of the Interconnection.

Fixed Transmission Rights auctions shall be conducted by the Office of the Interconnection in accordance with standards and procedures set forth in the PJM Manuals, such standards and procedures to be consistent with the requirements of this Schedule.

7.3.2 Notice of Offer.

A holder of a Fixed Transmission Right wishing to offer the Fixed Transmission Right for sale shall notify the Office of the Interconnection of any Fixed Transmission Rights to be offered. Each Fixed Transmission Right sold in an auction shall, at the end of the period for which the Fixed Transmission Rights were auctioned, revert to the offering holder or the entity to which the offering holder has transferred such Fixed Transmission Right, subject to the term of the Fixed Transmission Right itself and to the right of such holder or transferee to offer the Fixed Transmission Right in the next or any subsequent auction during the term of the Fixed Transmission Right.

7.3.3 Pending Applications for Firm Service.

(a) Prior to the start of each auction bidding period, the Office of the Interconnection shall exert reasonable effort to complete its review of pending applications for Network Transmission Service and Firm Point-to-Point Transmission Service and to ascertain the corresponding Fixed Transmission Rights to be assigned to the entities receiving such service, subject to compliance with all applicable deadlines and other procedures by the applicant. Fixed Transmission Rights so assigned shall be included in the simultaneous feasibility test performed by the Office of the Interconnection for the auction.

(b) Fixed Transmission Rights may be assigned to entities requesting Network Transmission Service or Firm Point-to-Point Transmission Service only if such Fixed Transmission Rights are simultaneously feasible with all outstanding Fixed Transmission Rights, including Fixed Transmission Rights effective for the then-current auction period. If an assignment of Fixed Transmission Rights pursuant to a pending application for Network Transmission Service or Firm Point-to-Point Transmission Service cannot be completed prior to an auction, Fixed Transmission Rights attributable to such transmission service shall not be assigned for the then-current auction period. If a Fixed Transmission Right cannot be assigned for this reason, the applicant may withdraw its application, or request that the Fixed Transmission Right be assigned effective with the start of the next auction period.

7.3.4 On-Peak and Off-Peak Periods.

The Office of the Interconnection will conduct separate auctions simultaneously for on-peak and off-peak periods. On-Peak Fixed Transmission Rights shall cover the periods from 7:00 a.m. up to the hour ending at 11:00 p.m. on Mondays through Fridays, except holidays as defined in the PJM Manuals. Off-Peak Fixed Transmission Rights shall cover the periods from 11:00 p.m. up to the hour ending 7:00 a.m. on Mondays through Fridays and all hours on Saturdays, Sundays, and holidays as defined in the PJM Manuals. Each bid shall specify whether it is for an on-peak or off-peak period.

7.3.5 Offers and Bids.

(a) Offers to sell and bids to purchase Fixed Transmission Rights shall be submitted during the period set forth in Section 7.1.2, and shall be in the form specified by the Office of the Interconnection in accordance with the requirements set forth below.

(b) Offers to sell shall identify the specific Fixed Transmission Right, by megawatt quantity and receipt and delivery points, offered for sale. An offer to sell a specified megawatt quantity of Fixed Transmission Rights shall constitute an offer to sell a quantity of Fixed Transmission Rights equal to or less than the specified quantity. An offer to sell may not specify a minimum quantity being offered. Each offer may specify a reservation price, below which the offeror does not wish to sell the Fixed Transmission Right. Offers submitted by entities holding rights to Fixed Transmission Rights acquired other than by assignment in connection with reservations of Network Transmission Service or Firm Point-to-Point Transmission Service shall be subject to such reasonable standards for the verification of the rights of the offeror as may be established by the Office of the Interconnection. Offers shall be subject to such reasonable standards for the creditworthiness of the offeror or for the posting of security for performance as the Office of the Interconnection shall establish.

(c) Bids to purchase shall specify the megawatt quantity, price per megawatt, and receipt and delivery points of the Fixed Transmission Right that the bidder wishes to purchase. A bid to purchase a specified megawatt quantity of Fixed Transmission Rights shall constitute a bid to purchase a quantity of Fixed Transmission Rights equal to or less than the specified quantity. A bid to purchase may not specify a minimum quantity that the bidder wishes to purchase. A bid may specify as receipt or delivery points any bus for which the Office of the Interconnection calculates and posts Locational Marginal Prices in accordance with Section 2 of this Schedule and may include Fixed Transmission Rights for which the associated Transmission Congestion Credits may have negative values. Bids shall be subject to such reasonable standards for the creditworthiness of the bidder or for the posting of security for performance as the Office of the Interconnection shall establish.

(d) Bids and offers shall be specified to the nearest tenth of a megawatt and shall be greater than zero.

7.3.6 Determination of Winning Bids and Clearing Price.

(a) At the close of the bidding period each month, the Office of the Interconnection will create a base Fixed Transmission Rights power flow model that includes all outstanding Fixed Transmission Rights that have been approved and confirmed for any portion of the month for which the auction was conducted and that were not offered for sale in the auction. The base Fixed Transmission Rights model also will include estimated uncompensated parallel flows into each interface point of the PJM Control Area and estimated scheduled transmission outages.

(b) In accordance with the requirements of Section 7.4 of this Schedule and subject to all applicable transmission constraints and reliability requirements, the Office of the Interconnection shall determine the simultaneous feasibility of all outstanding Fixed Transmission Rights not offered for sale in the auction and of all Fixed Transmission Rights that could be awarded in the auction for which bids were submitted. The winning bids shall be determined from an appropriate linear programming model that, while respecting transmission constraints and the maximum MW quantities of the bids and offers, selects the set of simultaneously feasible Fixed Transmission Rights with the highest net total auction value as determined by the bids of buyers and taking into account the reservation prices of the sellers.

(c) Fixed Transmission Rights shall be sold at the market-clearing price for Fixed Transmission Rights between specified pairs of receipt and delivery points, as determined by the bid value of the marginal Fixed Transmission Right that could not be awarded because it would not be simultaneously feasible. The linear programming model shall determine the clearing prices of all Fixed Transmission Rights paths based on the bid value of the marginal Fixed Transmission Rights, which are those Fixed Transmission Rights with the highest bid values that could not be awarded fully because they were not simultaneously feasible, and based on the flow sensitivities of each Fixed Transmission Rights path relative to the marginal Fixed Transmission Rights paths flow sensitivities on the binding transmission constraints.

7.3.7 Announcement of Winners and Prices.

Within two (2) business days after the close of an auction, the Office of the Interconnection shall post the winning bidders, the megawatt quantity, and the receipt and delivery points for each Fixed Transmission Right awarded in the auction and the price at which each Fixed Transmission Right was awarded. Results of the on-peak auction and off-peak auction will be posted separately. The Office of the Interconnection shall not disclose the price specified in any bid to purchase or the reservation price specified in any offer to sell.

7.3.8 Auction Settlements.

All buyers and sellers of Fixed Transmission Rights between the same points of receipt and delivery shall pay or be paid the market-clearing price, as determined in the auction, for such Fixed Transmission Rights.

7.3.9 Allocation of Auction Revenues.

All auction revenues, net of payments to entities selling Fixed Transmission Rights into the auction, shall be allocated among the Regional Transmission Owners in proportion to their respective transmission revenue requirements.

7.4 Simultaneous Feasibility.

The Office of the Interconnection shall make the simultaneous feasibility determinations specified herein using appropriate powerflow models of contingency-constrained dispatch. Such determinations shall take into account outages of both individual generation units and transmission facilities and shall be based on reasonable assumptions about the configuration and availability of transmission capability during the period covered by the auction that are not inconsistent with the determination of the deliverability of Capacity Resources under the Reliability Assurance Agreement. The goal of the simultaneous feasibility determination shall be to ensure that there are sufficient revenues from Transmission Congestion Charges to satisfy all Fixed Transmission Rights obligations for the auction period under expected conditions.

OPERATING AGREEMENT REVISIONS

RED-LINED

(FTR AUCTIONS)

Underlining shows changes from currently effective Schedule 1.

Italics show additions to what the Supporting Companies previously submitted to FERC.

Deletions from the Supporting Companies' version are not shown.

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1.3.4 External Resource.

"External Resource" shall mean a generation resource located outside the metered boundaries of the PJM Control Area.

1.3.5 Fixed Transmission Right.

"Fixed Transmission Right" shall mean a ~~number determined~~right to receive Transmission Congestion Credits as specified in Section 5.2.2 of this Schedule.

1.3.6 Generating Market Buyer.

"Generating Market Buyer" shall mean an Internal Market Buyer that is a Load Serving Entity that owns or has contractual rights to the output of generation resources capable of serving the Market Buyer's load in the PJM Control Area, or of selling energy or related services in the PJM Interchange Energy Market or elsewhere.

1.3.7 Generator Forced Outage.

"Generator Forced Outage" shall mean an immediate reduction in output or capacity or removal from service, in whole or in part, of a generating unit by reason of an Emergency or threatened Emergency, unanticipated failure, or other cause beyond the control of the owner or operator of the facility, as specified in the relevant portions of the PJM Manuals. A reduction in output or removal from service of a generating unit in response to changes in market conditions shall not constitute a Generator Forced Outage.

1.3.8 Generator Maintenance Outage.

"Generator Maintenance Outage" shall mean the scheduled removal from service, in whole or in part, of a generating unit in order to perform necessary repairs on specific components of the facility, if removal of the facility meets the guidelines specified in the PJM Manuals.

1.3.9 Generator Planned Outage.

"Generator Planned Outage" shall mean the scheduled removal from service, in whole or in part, of a generating unit for inspection, maintenance or repair with the approval of the Office of the Interconnection in accordance with the PJM Manuals.

1.3.10 Internal Market Buyer.

"Internal Market Buyer" shall mean a Market Buyer making purchases of energy from the PJM Interchange Energy Market for ultimate consumption by end-users inside the PJM Control Area that are served by Network Transmission Service.

1.3.11 Inadvertent Interchange.

"Inadvertent Interchange" shall mean the difference between net actual energy flow and net scheduled energy flow into or out of the PJM Control Area, as determined and allocated each hour by the Office of the Interconnection in accordance with the procedures set forth in the PJM Manuals to each Electric Distributor that reports to the Office of the Interconnection its hourly net energy flows from metered tie lines.

5.1.6 Transmission Loading Relief Customer Calculation

(a) Each Transmission Loading Relief Customer shall be assessed Transmission Congestion Charges for any increase in the cost of energy in the PJM Control Area resulting from its energy schedules over contract paths outside the PJM Control Area during Transmission Loading Relief.

(b) The Transmission Congestion Charge shall be the total amount of energy specified in such energy schedules multiplied by the difference between a Locational Marginal Price calculated by the Office of the Interconnection for the energy schedule source location specified in the NERC Interchange Distribution Calculator and a Locational Marginal Price calculated by the Office of the Interconnection for the energy schedule sink location specified in the NERC Interchange Distribution Calculator. Transmission Congestion Charges that are less than zero shall be set equal to zero for Transmission Loading Relief Customers.

(c) The Office of the Interconnection will determine the Locational Marginal Prices at the energy schedule source and sink locations external to PJM with reference to and based solely on the prices of energy in the PJM Control Area and at the interface buses between the PJM Control Area and adjacent Control Areas and the system conditions and actual power flow distributions as described by the PJM State Estimator program. The Office of the Interconnection will determine the Locational Marginal Prices at the external energy schedule source and sink locations and the resulting Congestion Charge based on the portion of the energy schedule that flows through the PJM Control Area as reflected by the flow distributions from the PJM State Estimator program.

5.1.7 Total Transmission Congestion Charges.

The total Transmission Congestion Charges collected by the Office of the Interconnection each hour will be the sum of the amounts determined as specified in this Schedule. The Office of the Interconnection shall collect Transmission Congestion Charges for each hour the transmission system operates under constrained conditions.

5.2 Transmission Congestion Credit Calculation.

5.2.1 Eligibility.

Each holder of a Fixed Transmission ~~Customer using firm Point-to-Point Transmission Service and each Network Service User~~Right shall receive as a Transmission Congestion Credit a proportional share of the total Transmission Congestion Charges collected for each constrained hour.

5.2.2 Fixed Transmission Rights.

(a) Transmission Congestion Credits will be calculated based upon the Fixed Transmission Rights ~~of~~ held at the time of the constrained hour. Initial assignments of Fixed Transmission Rights shall be made to each Network Service User and Transmission Customer~~, determined~~ as specified below.

(b) ~~Each~~ On a periodic schedule established by the Office of the Interconnection, each Network Service User shall designate a subset of its Network Resources for which Fixed Transmission Rights will be assigned. ~~The sum of the~~ Fixed Transmission Rights shall be assigned for each Network Resource ~~shall be~~ in a number of megawatts equal to or less than the installed capacity summer megawatt rating of each designated Network Resource, determined at the PJM Control Area transmission bus at which the designated Network Resource is connected. Each Fixed Transmission Right shall be to the aggregate load busses of the Network Service User in a Zone or, with respect to Non-Zone Network Load, to the border of the PJM Control Area. The sum of each Network Service User's assigned Fixed Transmission Rights for a Zone must be equal to or less than the Network Service User's peak load for that Zone as determined under Section 34.1 of the Tariff. The sum of each Network Service User's Fixed Transmission Rights for Non-Zone Network Load must be equal to or less than the Network Service User's transmission responsibility for Non-Zone Network Load as determined under Section 34.1 of the Tariff.

(c) Each Transmission Customer receiving firm Point-to-Point Transmission Service shall be assigned Fixed Transmission Rights; provided, however, that a Transmission Customer may notify the Office of Interconnection that it does not wish to receive any FTRs or wishes to receive FTRs only for certain Point or Points of Receipt and Point or Points of Delivery, in which event no FTRs or such reduced amount of FTRs shall be issued to the Transmission Customer. The Fixed Transmission Right for each instance of Point-to-Point Transmission Service shall be a number of megawatts equal to the megawatts of firm service being provided between the receipt and delivery points as to which the Transmission Customer has firm Point-to-Point Transmission Service.

(d) ~~The foregoing assignment of Fixed Transmission Rights shall be enhanced by an amendment to this Schedule, to be filed with FERC not later than December 31, 1997, that will provide for an auction of Fixed Transmission Rights over and above those FTRs obtained and retained by Network Service Users and Transmission Customers then receiving firm Point-to-Point Transmission Service (including firm Point-to-Point transmission service for existing bilateral contracts), such auction to be implemented as soon after December 31, 1997 as shall be determined by the Office of the Interconnection to be reasonably practical. For so long as Fixed Transmission Rights are assigned on the basis of Network Transmission Service and firm Point-to-Point Transmission Service, any Fixed Transmission Rights awarded pursuant to an auction shall be simultaneously feasible with all Network Transmission Service and firm Point-to-Point Transmission Service obligations. The Members specified in Section 11.5(c) of the Agreement, working with the Office of the Interconnection, shall develop the details of the implementation of such an auction, including but not limited to the nature of the bidding process, the frequency of auctions, and the duration of the Fixed Transmission Rights purchased at auction.~~ A Fixed Transmission Right, or the right to Transmission Congestion Credits attributable to a Fixed Transmission Right, may be sold or otherwise transferred by agreement, subject to compliance with such procedures as may be established by the Office of the Interconnection for verification of the rights of the purchaser or transferee.

6. [RESERVED]

7. FIXED TRANSMISSION RIGHTS AUCTIONS

7.1 Auctions of Fixed Transmission Rights.

Periodic auctions to allow Market Participants to acquire or sell Fixed Transmission Rights shall be conducted by the Office of the Interconnection in accordance with the provisions of this Section.

7.1.1 Auction Period and Scope of Auctions.

The period covered by an auction shall be the one-month period next following the date that the auction is conducted. The Office of the Interconnection shall offer for sale in the auction any remaining Fixed Transmission Rights capability for the month after taking into account all of the Fixed Transmission Rights already outstanding at the time of the auction. In addition, any holder of a Fixed Transmission Right for the period covered by an auction may offer such Fixed Transmission Right for sale in such auction. *Each monthly auction will consist of a separate auction for on-peak Fixed Transmission Rights and a separate auction for off-peak Fixed Transmission Rights.* Market Participants may bid for and acquire any number of Fixed Transmission Rights, provided that all Fixed Transmission Rights awarded are simultaneously feasible with each other and with all Fixed Transmission Rights outstanding at the time of the auction and ~~*not put up for sale in*~~ *not sold into the* auction.

7.1.2 Frequency *and Time* of Auctions.

Fixed Transmission Rights auctions shall be held *monthly. The bid and offer period shall open at 12:00 midnight (Eastern Prevailing Time) on the fifteenth (15th) business day preceding the month for which Fixed Transmission Rights are being auctioned and shall close at 12:00 midnight (Eastern Prevailing Time) on the tenth (10th) business day preceding the month for which Fixed Transmission Rights are being auctioned.*

7.1.3. Duration of Fixed Transmission Rights.

Each Fixed Transmission Right acquired in a Fixed Transmission Rights auction shall entitle the holder to credits of Transmission Congestion Charges for the *one-month* period for which the Fixed Transmission Rights were auctioned.

7.2 Fixed Transmission Rights Characteristics.

7.2.1 Reconfiguration of Fixed Transmission Rights.

Through an appropriate linear programming model, ~~T~~the Office of the Interconnection shall reconfigure the Fixed Transmission Rights offered or otherwise available for sale in any auction to maximize the value to the bidders of the Fixed Transmission Rights sold, provided that any Fixed Transmission Rights acquired at auction shall be simultaneously feasible in combination with those Fixed Transmission Rights outstanding at the time of the auction and not sold in the auction. *The linear programming model shall, while respecting transmission constraints and the maximum MW quantities of the bids and offers, selects the set of simultaneously feasible Fixed Transmission Rights with the highest net total auction value as determined by the bids of buyers and taking into account the reservation prices of the sellers.*

7.2.2 Specified Buses.

Auction bids for Fixed Transmission Rights may specify any combination of receipt and delivery buses represented in the State Estimator model for which the Office of the Interconnection *calculates and posts* Locational Marginal Prices. Auction bids may specify receipt and delivery points from locations outside of the PJM Control Area to locations inside the PJM Control Area, from locations within the PJM Control Area to locations outside of the PJM Control Area, or to and from locations within the PJM Control Area.

7.2.3 Transmission Congestion Charges.

Fixed Transmission Rights, whether acquired at auction or otherwise, shall entitle holders thereof to credits only for Transmission Congestion Charges, and shall not confer a right to credits for payments arising from or relating to transmission congestion made to any entity other than the Office of the Interconnection.

7.3 Auction Procedures.

7.3.1 Role of the Office of the Interconnection.

Fixed Transmission Rights auctions shall be conducted by the Office of the Interconnection in accordance with standards and procedures set forth in the PJM Manuals, such standards and procedures to be consistent with the requirements of this Schedule.

7.3.2 Notice of Offer.

A holder of a Fixed Transmission Right wishing to offer the Fixed Transmission Right for sale shall notify the Office of the Interconnection of any Fixed Transmission Rights to be offered. Each Fixed Transmission Right sold in an auction shall, at the end of the period for which the Fixed Transmission Rights were auctioned, revert to the offering holder or the entity to which the offering holder has transferred such Fixed Transmission Right, subject to the term of the Fixed Transmission Right itself and to the right of such holder or transferee to offer the Fixed Transmission Right in the next or any subsequent auction during the term of the Fixed Transmission Right.

7.3.3 Pending Applications for Firm Service.

(a) Prior to *the start of* each auction *bidding period*, the Office of the Interconnection shall exert reasonable effort to complete its review of pending applications for Network Transmission Service and Firm Point-to-Point *Transmission* Service and to ascertain the corresponding Fixed Transmission Rights to be assigned to the entities receiving such service, subject to compliance with all applicable deadlines and other procedures by the applicant. Fixed Transmission Rights so assigned shall be included in the simultaneous feasibility test performed by the Office *of the Interconnection* for the auction.

(b) Fixed Transmission Rights may be assigned to entities requesting Network Transmission Service or Firm Point-to-Point Transmission Service only if such Fixed Transmission Rights are simultaneously feasible with all outstanding Fixed Transmission Rights, including Fixed Transmission Rights effective for the then-current auction period. If an assignment of Fixed Transmission Rights pursuant to a pending application for Network Transmission Service or Firm Point-to-Point Transmission Service cannot be completed prior to an auction, Fixed Transmission Rights attributable to such transmission service shall not be assigned for the then-current auction period. If a Fixed Transmission Right cannot be assigned for this reason, the applicant may withdraw its application, or request that the Fixed Transmission Right be assigned effective with the start of the next auction period.

7.3.4 On-Peak and Off-Peak Periods.

The Office of the Interconnection *will* conduct separate auctions simultaneously for on-peak and off-peak periods. *On-Peak Fixed Transmission Rights shall cover the periods from 7:00 a.m. up to the hour ending at 11:00 p.m. on Mondays through Fridays, except holidays as defined in the PJM Manuals. Off-Peak Fixed Transmission Rights shall cover the periods from 11:00 p.m. up to the hour ending 7:00 a.m. on Mondays through Fridays and all hours on Saturdays, Sundays, and holidays as defined in the PJM Manuals.* Each bid shall specify whether it is for an on-peak or off-peak period.

7.3.5 Offers and Bids.

(a) Offers to sell and bids to purchase Fixed Transmission Rights shall be submitted *during the period set forth in Section 7.1.2*, and shall be in the form specified by the Office of the Interconnection in accordance with the requirements set forth below.

(b) Offers to sell shall identify the specific Fixed Transmission Right, by megawatt quantity and receipt and delivery points, offered for sale. *An offer to sell a specified megawatt quantity of Fixed Transmission Rights shall constitute an offer to sell a quantity of Fixed Transmission Rights equal to or less than the specified quantity. An offer to sell may not specify a minimum quantity being offered.* Each offer may specify a reservation price, below which the offeror does not wish to sell the Fixed Transmission Right. Offers submitted by entities holding rights to Fixed Transmission Rights acquired other than by assignment in connection with reservations of Network Transmission Service or Firm Point-to-Point Transmission Service shall be subject to such reasonable standards for the verification of the rights of the offeror as may be established by the Office of the Interconnection. Offers shall be subject to such reasonable standards for the creditworthiness of the offeror or for the posting of security for performance as the Office of the Interconnection shall establish.

(c) Bids *to purchase* shall specify the megawatt quantity, price per megawatt, and receipt and delivery points of the Fixed Transmission Right that the bidder wishes to purchase. *A bid to purchase a specified megawatt quantity of Fixed Transmission Rights shall constitute a bid to purchase a quantity of Fixed Transmission Rights equal to or less than the specified quantity. A bid to purchase may not specify a minimum quantity that the bidder wishes to purchase.* A bid may specify as receipt or delivery points any bus for which the Office of the Interconnection calculates *and posts* Locational Marginal Prices in accordance with Section 2 of this Schedule and may include Fixed Transmission Rights for which the associated Transmission Congestion Credits may have negative values. Bids shall be subject to such reasonable standards for the creditworthiness of the bidder or for the posting of security for performance as the Office of the Interconnection shall establish.

(d) Bids and offers shall be *specified to the nearest tenth of a megawatt and shall be greater than zero.*

7.3.6 Determination of Winning Bids *and Clearing Price.*

(a) At the close of the bidding period each month, the Office of the Interconnection will create a base Fixed Transmission Rights power flow model that includes all outstanding Fixed Transmission Rights that have been approved and confirmed for any portion of the month for which the auction was conducted and that were not offered for sale in the auction. The base Fixed Transmission Rights model also will include estimated uncompensated parallel flows into each interface point of the PJM Control Area and estimated scheduled transmission outages.

(b) In accordance with the requirements of Section 7.4 of this Schedule and subject to all applicable transmission constraints and reliability requirements, the Office of the Interconnection shall determine the simultaneous feasibility of all outstanding Fixed Transmission Rights not offered for sale in the auction and of all Fixed Transmission Rights that could be awarded in the auction for which bids were submitted. *The winning bids shall be determined from an appropriate linear programming model that, while respecting transmission constraints and the maximum MW quantities of the bids and offers, selects* the set of simultaneously feasible Fixed Transmission Rights with the highest *net* total auction value as determined by the bids of buyers and taking into account the reservation prices of the sellers.

(c) Fixed Transmission Rights shall be sold *at* the market-clearing price for Fixed Transmission Rights between specified pairs of receipt and delivery points, as determined by the bid value of the marginal Fixed Transmission Right that could not be awarded because it would not be simultaneously feasible. *The linear programming model shall determine the clearing prices of all Fixed Transmission Rights paths based on the bid value of the marginal Fixed Transmission Rights, which are those Fixed Transmission Rights with the highest bid values that could not be awarded fully because they were not simultaneously feasible, and based on the flow sensitivities of each Fixed Transmission Rights path relative to the marginal Fixed Transmission Rights paths flow sensitivities on the binding transmission constraints.*

7.3.7 Announcement of Winners and Prices.

Within two (2) business days after the close of an auction, the Office of the Interconnection shall post the winning bidders, the megawatt quantity, and the receipt and delivery points for each Fixed Transmission Right awarded in the auction and the price at which each Fixed Transmission Right was awarded. *Results of the on-peak auction and off-peak auction will be posted separately.* The Office of the Interconnection shall not disclose the price specified in any bid *to purchase* or the reservation price specified in any offer to sell.

7.3.8 Auction Settlements.

All buyers and sellers of Fixed Transmission Rights between the same points of receipt and delivery shall pay or be paid the market-clearing price, as determined in the auction, for such Fixed Transmission Rights.

Revised: March 2, 1999
Effective:

7.3.9 Allocation of Auction Revenues.

All auction revenues, net of payments to entities selling Fixed Transmission Rights into the auction, shall be allocated among the Regional Transmission Owners in proportion to, ~~*and shall be credited against,*~~ their respective transmission revenue requirements.

7.4 Simultaneous Feasibility.

The Office of the Interconnection shall make the simultaneous feasibility determinations specified herein using appropriate powerflow models of contingency-constrained dispatch. Such determinations shall take into account outages of both individual generation units and ~~*transmission lines*~~ *transmission facilities* and shall be based on reasonable assumptions about the configuration and availability of transmission capability during the period covered by the auction that are not inconsistent with the determination of the deliverability of Capacity Resources under the Reliability Assurance Agreement. The goal of the simultaneous feasibility determination shall be to ensure that there are sufficient revenues from Transmission Congestion Charges to satisfy all Fixed Transmission Rights obligations for the auction period under expected conditions.

Exhibit A

PJM Interconnection, L.L.C.
Fixed Transmission Rights
Business Rules

Analysis Procedure
Monthly Auction
Secondary Market
Simultaneous Feasibility Test

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Introduction

Definition of Fixed Transmission Rights

A Fixed Transmission Right (FTR) is a financial contract that entitles the holder to a stream of revenues (or charges) based on the reservation level and hourly energy prices across the specified transmission path. It financially binds the owner to the transmission congestion activity on that path. The path is defined by the transmission reservation as the point where the power is scheduled to be injected onto the PJM grid (source) to the point where it is scheduled to be withdrawn (sink). Once determined, the FTR is in effect for the predefined period whether or not energy is actually delivered.

An FTR's economic value is based on the MW quantity multiplied by the difference between the Locational Marginal Prices of the source and sink points. These Locational Marginal Price differences reflect the opportunity cost of the transmission path. FTRs are financially binding and can either be a benefit or a liability to the holder. They are a benefit when the designated path is in the same direction as the congested flow. This occurs when the sink bus LMP is greater than the source bus LMP. FTRs are a liability when the inverse occurs. The FTR holder must pay for having the FTR when the sink bus LMP is less than the source bus LMP. This charge is equal to the difference in LMP from source to sink, multiplied by the MW amount of the FTR.

Acquisition of FTRs

Transmission Service customers who acquire Network or Firm Point-to-Point Transmission Service pay the embedded cost of the transmission system. In return for paying these fixed costs, these Firm Transmission Service customers have the option of requesting FTRs. FTRs can also be acquired through the centralized PJM FTR Auction or through the PJM Secondary FTR Market (a bulletin board system for bilateral trading of FTRs). All FTR requests submitted to PJM (whether through transmission service requests or the auction) must pass a simultaneous feasibility analysis in order to be approved. The simultaneous feasibility analysis ensures that the financial entitlements granted through approved FTR requests can be simultaneously honored within the existing capability of the PJM transmission grid under normal system conditions.

Description of the four methods to request FTRs:

a) *Network Integration Service* — On an annual basis (corresponding to the planning year June1 – May 31) , network service transmission customers are allocated FTRs up to their annual peak load. These FTRs are designated along paths from specific capacity resources to their aggregated load. The network service customer has the option to request FTRs from any of its desig-

nated capacity resources to its aggregated load. Once the annual set of Network service FTRs is awarded, the configuration of the Network service FTRs for each transmission customer can be changed as often as daily by submitting a change request. If approved, such requests are assumed to be valid for the remainder of the planning year.

Each individual FTR requested under Network Service must not exceed the installed capacity of the associated generator. FTRs are specified to the nearest O.1 of a MW. The total amount of Network FTRs requested by each Network customer cannot exceed that customer's annual peak load.

b) *Firm Point-to-Point Service* — Firm point-to-point transmission customers can request FTRs for their associated firm reservations. The path of the FTR is equivalent to the path of the firm reservation from source to sink. The source is either the generation resource within PJM or the interconnection point from the sending control area. The sink is the set of load busses designated in OASIS or the point of interconnection with the receiving control area.

All FTRs are allocated for the same duration of the reserved transmission service according to the following rules:

- Annual point-to-point service FTRs may begin at the start of any month and continue for twelve months.
- Monthly service can begin on the first of any month and extend through the month (i.e., not May 15th to June 15th)
- Daily service can run from midnight through hour 2400 of any day.

c) *FTR Auction* — A monthly process of selling and buying FTRs through an auction conducted by PJM. The FTR Auction offers for sale any residual transmission entitlement that is available after Network and long-term point-to-point transmission service FTRs have been awarded. It also allows participants an opportunity to sell FTRs that they currently hold.

d) *FTR Secondary Market* — The FTR Secondary Market is a bilateral trading system that facilitates trading of existing FTRs between PJM members through a web-based bulletin board system. Since the secondary market is designed to allow bilateral trading directly between Market Participants, the PJM OI's role in the secondary Market is to track trading for PJM accounting purposes only, no analysis or approval of trades is performed. Therefore, because simultaneous feasibility of FTRs must be maintained, the FTR secondary market allows trading of existing

FTRs only, no new FTR paths can be created in the secondary Market. This means that reconfiguration of the source and sink points of the FTR themselves is not permitted in the secondary market. However, a customer may reconfigure their FTR position in the following manner: If the customer owns an FTR from Point A to Point B and wants to change his position such that he effectively owns an FTR from Point A to Point C, he may accomplish the reconfiguration by purchasing an existing FTR from Point B to Point C on the secondary market. The combination of the FTRs from Point A to Point B and from Point B to Point C results in the desired composite FTR position from Point A to Point C.

Overview of FTR Allocation Process

Before describing the allocation mechanism itself, it is helpful to summarize the overall framework of network firm transmission service, the designation of capacity resources, and FTRs (in the context of both wholesale and retail competition). Prior to the beginning of each annual capability period (i.e., prior to June 1), LSEs will acquire network integration transmission service to meet their peak loads and will identify sufficient capacity resources to meet these peak loads while maintaining the required reserve margin. The designation of new capacity resources and loads will require a request for a modification of service and will be subject to a determination by the PJM OI that available transmission capability (ATC) will be sufficient to provide the requested firm service. The PJM OI will first determine the capability of the transmission system to reliably provide prior committed network and point-to-point service for the term of the requested new or additional service(s), and will then evaluate the system's ability to provide the requested new service. The designation of new capacity resources and loads will be accommodated on a first-come, first-served basis up to the limits of the existing transmission grid. LSEs designating capacity resources that cannot be accommodated in conjunction with prior committed service will have an opportunity to pay for an expansion of the transmission grid to accommodate their needs.

Once the process of designating capacity resources and loads is complete, LSEs purchasing firm network service will be able to designate a subset of capacity resources as the origin point for FTRs from those capacity resources to the total amount of the peak load for which they purchased firm network service. Each FTR will be assigned from the capacity resource to the location of load in proportion to the estimated peak load. This designation of FTRs will then be subjected to a simultaneous feasibility test. This feasibility test will also include FTRs requested through long term Point-to-Point transmission service reservations.

Under wholesale competition, an LSE can change the designation of its capacity resources and loads throughout the capability period, but the amount of change in loads and resources may be greater under retail competition as loads switch between suppliers from month to month. Following the initial designation of capacity resources and loads in the annual planning process, each LSE will acquire network firm service to meet its projected annual peak load and designate capacity resources sufficient to meet its annual peak load while maintaining the specified reserve margin. LSEs whose customers change from month to month due to retail competition may have a varying peak load responsibility that changes on a daily basis. These LSEs will identify the daily revised peak loads, purchase different amounts network firm service and identify a higher or lower number of capacity resources. The cap on the number of FTRs that such an LSE could designate in conjunction with network transmission service would therefore also change on a daily basis in line with the changes in the LSE's peak load responsibility.

The changes in Network service FTR requests received throughout the month and the FTR requests associated with monthly Firm Point-to-Point Transmission service requests will be processed on a first come first served basis. These FTR request are subject to a simultaneous feasibility test with the analysis assumptions modified to be consistent with the month being analyzed. Network Service FTR requests for a duration of less than one month may be requested no earlier than two weeks prior to the requested effective date of the FTR.

Fifteen business days before the start of the month, any new FTR requests associated with Network resource changes or with Firm Point-to-Point Transmission service within the next month are suspended so that the monthly FTR Auction process can be performed. The auction will be held for residual FTRs and any FTRs that firm service customers choose to sell into the auction. These FTRs would be residual in the sense that they would be simultaneously feasible in combination with the FTRs that are allocated in conjunction with network integration transmission service and firm point-to-point transmission service.

After the monthly FTR Auction has been performed, any FTR requests that were suspended during the auction period can now be processed along with near-term Network Service changes and shorter term firm Point-to-point transmission service requests. These additional requests create the requirement to perform additional FTR feasibility analysis. These FTRs have the same characteristics as longer term FTRs except that the requests will be analyzed taking into account all previously assigned FTRs both from longer term transmission service requests and from the auction. .

Simultaneous Feasibility Test

The Simultaneous Feasibility Test is conducted to ensure that all subscribed transmission entitlements are within the capacity of the existing transmission system. The Simultaneous Feasibility Test is a market feasibility test that is designed to ensure that the transmission system can support the subscribed set of FTRs during

normal system conditions. If the FTRs can be supported under normal system conditions, and congestion does occur, PJM will be collecting enough congestion revenue to cover the FTR credits, thus becoming revenue adequate.

The Simultaneous Feasibility Test is a powerflow case that calculates the power flows on each transmission line resulting from the injections at each FTR source and withdrawals at each FTR sink. The powerflow program calculates the MW flow on each line and determines if these values can be supported without violating a transmission constraint.

The following criteria and assumptions are used in the Simultaneous Feasibility Test :

- *Network Topology* — All bulk facilities are in service unless there is a known outage
- *Circulating Flows* — Circulating Power Flow is flow imposed on PJM by external systems and is not compensated for within PJM. (e.g. Power moving from OH to NY may circulate around Lake Erie through ECAR and PJM to NY). All circulating power flow is estimated according to available data.
- *Existing FTRs* — FTRs previously granted selected by network service customers and assigned to point-to-point customers
- *Single-Contingency Criteria* — Consistent with the PJM Operating and Planning criteria, Simultaneous Feasibility Test evaluates the ability of all system facilities to remain within normal ratings during normal, extended-period operation while maintaining an acceptable bulk system voltage profile.

Structural Rules and Guidelines

Only market participants who are licensed by their state regulators to serve end-use customers are eligible for network transmission service and, therefore, network service FTRs.

FTR Definitions

The path for each network service FTR is defined from designated network capacity resources to aggregate network customer load or other designated load aggregation zone.

Network service customers' total FTRs may not exceed their contract load—the forecast annual peak load. Included in this total are any FTRs that have been sold on the secondary market or the FTR auction.

Network service customers may have load across multiple transmission zones. FTRs are defined to each zone separately.

The total MW value of all concurrent FTRs for a given network capacity resource may not exceed the summer installed capacity rating of the resource.

The total MW value of a customer's FTRs for a given network capacity resource may not exceed the customers ownership of capacity at the resource.

FTRs may be selected in 0.1 MW increments for a given capacity resource.

If capacity associated with FTRs is sold, the associated FTRs are available to the buyer only if specific generating units and MW amounts are identified in the transaction.

If capacity associated with FTRs is sold, the seller must relinquish the associated FTRs. If it is not feasible for the FTRs to be relinquished then the transaction cannot be approved.

Open Enrollment

April is the network service open enrollment period for the annual planning period that extends from June 1st of the same year to May 31st of the following year, and all requests received during the open enrollment period are deemed to have arrived simultaneously.

During the open enrollment period, FTRs can be requested only for network resources that are in network resource plans as of the first day of the planning period, June 1st.

Network service FTRs are approved for the duration of the current planning period only. If all requested FTRs cannot be simultaneously accommodated, then existing FTRs that were active during the entire previous planning period and are requested for the entire upcoming planning period will have first priority.

eCapacity System for Daily Requests

Network service FTR requests and changes made outside the open enrollment period are made via the eCapacity system, an internet application that can be accessed via the PJM website at http://www.pjm.com. These requests are processed along with a request for network transmission service associated with an installed capacity change. Such FTR requests are time-stamped and processed in the order in which received.

Requests for Network Service FTRs with a duration of less than one month may be requested no earlier than 2 weeks (10 business days) prior to the start date of the requested FTR.

Upon submittal of a network service FTR request associated with a capacity resource that has been pre-certified with PJM, the OI must approve or deny the requests within ten business days. An FTR request associated with a capacity resource that has been not pre-certified with PJM must be approved or denied within sixty business days.

FTR modifications, whether additions or deletions, must pass the Simultaneous Feasibility Test . The OI may approve all or part of the request based on the results of the Simultaneous Feasibility Test .

Within five days of a network customer's peak load decrease because of retail activity, the customer must select FTRs to be reduced such that their total FTRs do not exceed their contract load. Otherwise, the OI will reduce all of the customer's FTRs in proportion to their MW value subject to feasibility. If the customer does not own any FTRs that can be feasibly surrendered, then the set of FTRs above load that introduces the least unfeasibility, as determined by the OI, may be dropped.

The bus aggregates, i.e., load distribution within a zone, of all LSEs will be determined and submitted by the host EDCs in consultation with the load aggregators. Customers may submit updates to their monthly bus aggregates at any time, and the OI will update the bus aggregates monthly, using the distribution on record as of the 21st of the preceding month.

Mechanical / Technical Rules

Open Enrollment

Network customers may submit a completed FTR request spreadsheet to PJM each year during the April 1-30 open enrollment period for the upcoming annual planning period that runs from June 1 through May 31 of each year. The spreadsheet must include the identification data, installed capacity value, and the amount of FTRs requested for each of the network customer's capacity resources. Prior to the open enrollment period PJM Market Services Division will forward each existing network customer a FTR spreadsheet that contains the customer's network capacity resources and associated installed capacity values. New network customers may contact PJM Customer Relations and Training department who will provide an electronic copy of a blank spreadsheet on request.

Once received, the OI will acknowledge receipt of these annual FTR requests within three business days.

During the second week of May, the OI will analyze all received network service FTRs together with the firm point-to-point FTRs that have been submitted up to that time.

PJM will approve feasible FTRs during the third week of May, and notify network service customers via e-mail and letter.

After approval and customer notification, PJM will enter accepted FTRs into the FTR database.

eCapacity System for Daily Requests

Network service FTR requests are made via the eCapacity system, an internet application that can be accessed via the PJM website at http://www.pjm.com.

Once received, the OI will analyze all network service FTRs together with the firm point-to-point FTRs that have been submitted up to that time.

PJM will approve feasible FTRs within ten days of receipt. Customer notification will be via the eCapacity application.

Valid FTR Request:

A request for network service FTRs must contain at a minimum the following data to be considered a valid request:

EIA Plant Code – The plant name of the capacity resource consistent with the EIA-411 Report.

EIA Generator Code – The generator unit id at the plant code bus consistent with the EIA-411 Report.

B1, B2, & B3 – The "From" location of the network service FTRs. The bus name, voltage class, and equipment designation, respectively, where the capacity resource is located consistent with the PJM real-time system.

Installed Summer Capacity – The rated summer capacity of the capacity resource.

Fixed Transmission Rights – The amount of requested FTRs for the capacity resource.

Bus Aggregate Identification – The "To" location of the network service FTRs. The name of a valid LSE.

Structural Rules and Guidelines

Only registered PJM transmission customers are eligible to obtain point-to-point transmission service and, therefore, point-to-point FTRs.

Firm point-to-point transmission service FTR requests are made via the OASIS system, an internet application that can be accessed via the PJM website at http://www.pjm.com. These FTR requests are time-stamped and processed in the order in which received.

FTR Definitions

The path for each point-to-point service FTR is defined from the OASIS point of receipt to the OASIS point of delivery for which the customer has firm point-to-point transmission service.

For firm point-to-point service out of the PJM control area, the point of receipt is the generation resource within the PJM control area, and the point of delivery is the interface with the receiving control area.

For firm point-to-point service through the PJM control area, the points of receipt and delivery are the interfaces with the sending and receiving control areas, respectively.

Valid sources and sinks for FTRs are any of the 10 PJM LSE Zones, the 3 PJM Trading Hubs, or the 5 interfaces to external control areas, and are listed in Table 1.

PJM Trading Hubs—Eastern Hub, Western Hub, and Western Interface Hub—are fixed weighted averages of the Locational Marginal Prices at a set of representative busses for the designated region. FTRs may be acquired both to and from the PJM Trading Hubs.

Firm point-to-point FTRs may not exceed the amount of the associated firm transmission service and may be selected in 0.1 MW increments.

The duration of a firm point-to-point FTR is the same as the associated firm transmission service, which may be one year or longer (starting at the beginning of any month), one month (starting the first day of the month), one week (Monday through Sunday), or one day (hours 0 through 24).

All requests received during the first 15-minute period of each transmission request period are deemed to have arrived simultaneously.

LSE Zones	**Interface Hubs**
AE	Western Hub
BG&E	Eastern Hub
DP&L	Western Interface Hub
GPU-JCP&L	
GPU-Met-Ed	**External Systems Interfaces**
GPU-Penelec	NYPP-E
PECO	NYPP-W
PP&L	CEI
PEPCO	AP
PSE&G	VAP

Table 1. Valid FTR Source and Sinks

Mechanical / Technical Rules

Obtaining FTRs

Qualified customers must submit a completed firm point-to-point transmission service request with associated FTRs via the PJM OASIS.

Requests for transmission service may be submitted no earlier then 18-months prior to service commencement for monthly service, 2-weeks for weekly service, and 2-business days for daily service.

Requests for transmission service can be submitted no later then 2-months for annual service, 2-weeks for monthly service, 1-week for weekly service, and 1.5-business days for daily service.

The customer may pre-confirm a transmission service request which will automatically finalize the request regardless of the disposition of the FTR approval.

The OI will perform the Simultaneous Feasibility Test , approve feasible FTRs, and notify the customer via the OASIS of the status of their FTR request within 1-month for annual service, 1-week for monthly service, 2-business days for weekly service, and 0.5-business days for daily service.

The customer must confirm their acceptance of approved transmission service requests and associated FTRs via the OASIS within 2-weeks of approval for annual service, 3-business days for monthly service, 1-business day for weekly service, and 1-business hour for daily service. If the customer does not confirm acceptance of the FTRs within the prescribed guidelines, the request for FTRs will be deemed to have been withdrawn.

When the customer confirms the transmission service, FTRs are automatically generated in the PJM FTR database and posted as a confirmed FTR.

The timeline for the transmission service request and approval process for firm point-to-point transmission service and associated FTRs is summarized in the following table:

	Annual	**Monthly**	**Weekly**	**Daily**
Earliest Request, before start of service	*No Limit*	18 months	2 weeks	3 days
Latest Request, before start of service	*2 months*	2 weeks	1 week	2 days
OI Respond, after receipt of TSR	*1 month*	Per tariff	2 days	4 hours
Customer Confirm, after OI Response	*2 weeks*	15 days	15 day	15 days
Maximum Term	*No Limit*	1 month	2 weeks	2 days

Valid FTR Request

A request for point-to-point FTRs must contain at a minimum the following data to be considered a valid request:

Path Name – The path name of the transmission service request and associated FTRs.

Source – The location where PJM receives the energy to be delivered.

Sink – The location where PJM delivers the energy.

Product Designator – The duration and type of service for which the FTR is being requested.

Capacity – The amount of the transmission service request which may or may not have associated FTRs.

FTR Indicator Flag – Indicates whether or not the customer wants FTRs. "Yes" indicates that the customer wants an amount of FTRs equal to the amount of the transmission service, "No" indicates that the customer does not want FTRs, while "Partial" indicates that the customer wants an amount of FTRs less than the amount of transmission service, with the desired amount of FTRs indicated in the comment field. The default value is "No" and customers must make a conscious effort to indicate their desire to obtain FTRs.

Start Date – The date when the transmission service and associated FTRs commence.

End Date – The date when the transmission service and associated FTRs expire.

Comments – This is where the amount of FTRs are specified for a partial request.

Purpose

The purpose of the FTR Auction is to offer the residual PJM FTR capability for sale for the upcoming calendar month that is unallocated at the time of the close of the auction bidding period and to allow market participants to submit offers to sell existing FTRs.

Structural Rules and Guidelines

The bidding period opens at 12 midnight (Eastern Prevailing Time), 15 business days prior to the start of the Auction Month.

The bidding period closes at 12 midnight (Eastern Prevailing Time), 10 business days prior to the start of the Auction Month.

The OI performs the FTR auction clearing analysis and posts auction results within 2 business days after the bidding period closes.

The FTR auction process occurs once per month, and the term of FTRs awarded at auction is one calendar month. Bids may be submitted for the next auction month only. (Multiple month bids are not supported.)

As an indication of available FTRs, PJM will post FTR ATC at the start of the bidding period. The PJM OI will post these FTR ATC values as non-simultaneous estimates of available FTR capability on the five paths into and out of the PJM control area to the Western Hub, and from the Western Hub to and from the Eastern Hub, (CEI-Western Hub, AP-Western Hub, VP-Western Hub, NYPPW-Western Hub and NYPPE-Western Hub, Western Hub–Eastern Hub), prior to the opening of the auction bidding period.

The monthly FTR auction consists of an on-peak and an off-peak auction. On-peak FTRs are valid for the hours ending 0800 to 2300 on weekdays, while off-peak FTRs are valid for hours ending 2400 to 0700 on weekdays and for hours ending 0100-2400 on weekends and holidays.

Bids into the auction may be submitted through the interactive screens or through the file upload feature of the FTR Auction Market User Interface (e-FTR).

Participants' must be a PJM Member or a PJM Transmission Customer to be eligible to submit bids or offers into the FTR auction.

Mechanical / Technical Rules

Participants cannot submit offers into the Auction to sell FTRs that they do not own at the time of bid submittal.

Invalid bids into the auction will be rejected and PJM will contact the owner of such invalid bids. These bids may be resubmitted and if timestamped as received by the PJM OI before the close of the auction period, will be incorporated into the auction.

If upload files contain invalid bids, the entire upload file will be rejected and the customer will be notified with a specific list of errors. The file may be corrected and resubmitted and if timestamped as received by the PJM OI before the close of the auction period, will be incorporated into the auction.

Valid FTR Auction Bid:

FTR Source – May be any single Bus, Hub, Aggregate or Zone for which a Locational Marginal Price is posted in the PJM daily LMP file.

FTR Sink – May be any single Bus, Hub, Aggregate or Zone for which a Locational Marginal Price is posted in the PJM daily LMP file.

FTR MW – The MW amount of FTR requested. The MW amount is specified to the nearest 0.1 MW and must be greater than or equal to zero. FTR MW values are treated as up-to bids in the Auction analysis. (That is, a successful bid may be cleared at a MW amount that is anywhere from zero MW to the full bid MW value).

Price – The dollar amount of the bid specified in $/ MW. Price is specified to the nearest $0.01.

Type - Designates that the bid / offer is for the on-peak or off-peak auction.

Buy / Sell Flag - Designates whether the bid is an offer to sell an FTR into or a request to purchase an FTR in the auction.

Month – The month for which the bid is submitted. This value defaults to the current auction month.

Posting of FTR Auction Results includes:

Public posting of a list of Binding transmission constraints encountered in the auction

Public posting of prices at each bus, Hub, Aggregate and Zone

Public posting of all FTRs awarded in the auction

Private Posting to each participant regarding the disposition of their Bids and Offers, and FTR clearing prices.

Historic Auction results posting will be maintained for the last twelve Auctions

If a customer sells an existing FTR in the FTR auction or in the secondary market the original FTR reservation amount still counts against their allocation of FTRs under Network and Point-to-Point Transmission Service.

All FTRs that are granted under Network and Firm point-to-point Transmission service, and have a status of approved and confirmed by the customer at the close of the Auction Bidding Period will be

modeled as fixed injections in the Auction analysis if such FTRs are defined for any portion of the Auction Month and are not offered for sale in the Auction.

Any FTR request that is approved by PJM but not confirmed by the customer by the close of the FTR Auction bidding period will be deemed to be withdrawn. This pertains to FTR request from E-capacity (Network Service FTRs) and from Oasis (Firm point-to-point Transmission Service FTRs).

Requests for Network Service FTRs with a duration of less than one month may be requested no earlier than 2 weeks (10 business days) prior to the start date of the requested FTR.

The OI will model estimated uncompensated parallel flow injections at each interface point into the PJM control area in the Auction analysis.

The analysis of any Transmission service requests (Network or Point-to-Point) that involve FTRs and that are received after the start of the FTR Auction Bidding Period will be suspended until after the after the Auction results are posted. The PJM response time requirement for such requests will be adjusted accordingly.

Analysis of pending Transmission service requests (Network or Point-to-Point) that involve FTRs and that are not processed by the OI by the close of the Auction Bidding Period will be suspended until after the Auction results are posted. The OI will make its best efforts to complete processing of all transmission service requests involving FTRs that are submitted prior to the close of the Auction Bidding Period. The PJM response time requirement for such requests will be adjusted accordingly.

The FTR Auction process will maximize the bid based value of the bids submitted into the Auction while maintaining flows on transmission facilities and transmission interfaces within their ratings under normal and single-contingency conditions.

Scheduled Transmission outages will be modeled in the Auction process.

Accounting Issues

All revenues from the FTR Auction are distributed to Transmission Owners on a pro-rata basis according to their transmission revenue requirement.

All bids and offers into the FTR Auction that are not withdrawn prior to the close of the Auction Bidding Period represent binding financial commitments to the PJM customers who submitted them.

All FTRs awarded in the auction entitle the holder to FTR Target Allocations and FTR Credits in the hourly PJM accounting as described in the PJM Accounting Manual. Target Allocations for FTRs awarded in the auction have the same priority in PJM accounting as those defined under transmission service.

Purpose

The purpose of the FTR secondary market is to provide a bulletin board system to facilitate bilateral trading of FTRs among PJM members.

Structural Rules and Guidelines

The OI maintains an Internet computer application—eFTR—that allows PJM members to buy and sell FTRs directly with other market participants. Only PJM members and registered users may buy and sell FTRs through the PJM eFTR system.

FTRs originally issued to firm transmission service customers may be traded freely on the secondary market directly between parties.

For FTR trades made through the eFTR, the OI automatically transfers ownership and adjusts the members' monthly billing statements accordingly. The OI has no knowledge of FTR trades made outside of eFTR, and, as such, will not be able to adjust PJM members' monthly billing statements appropriately.

When a FTR is traded, the associated firm transmission capacity is not reassigned. The original FTR holder remains financially responsible for any FTR which is associated with a specific capacity resource that is later sold or reduced in output below the FTR MW level.

FTR trades are specified by path, not by individual FTR. The quantity of FTR traded is limited to the amount that is owned by the seller for the defined period at the time of the trade. The start and end dates chosen are required to be within the period for which the seller owns FTR capability on the specified path.

FTRs cannot be reconfigured into FTRs with a different path, larger total MW value, earlier start or later end dates.

The minimum size of an FTR that can be traded through the PJM eFTR system is 0.1 MW.

Purpose

The Simultaneous Feasibility Test is a market feasibility test designed to provide FTR holders with revenue adequacy by ensuring that the transmission system can support the subscribed set of FTRs during normal system conditions. If the FTRs can be supported during normal system conditions and congestion does occur, PJM will collect enough congestion charges to cover the FTR credits, and revenue adequacy will exist. Stated another way, the purpose of the Simultaneous Feasibility Test is to preserve the economic value of FTRs by ensuring that all FTRs awarded can be honored.

Structural Rules and Guidelines

Every FTR must pass the Simultaneous Feasibility Test to be approved.

Simultaneous Feasibility Test s are run for annual, monthly, and weekly analysis periods and when network resource changes are submitted.

For daily FTRs, the PJM OI performs a brief market feasibility test via lookup tables based on the Simultaneous Feasibility Test .

The Simultaneous Feasibility Test uses a DC power flow solution that models requested and existing FTRs and expected network topology during the time period being analyzed. The Simultaneous Feasibility Test is not a system reliability test and is not intended to model actual system operating conditions.

System factors that are in effect for the study period are all overlaid on the set of FTRs existing for the study period and the base transmission network. These factors include all newly-requested FTRs, transmission line outage schedules, thermal operating limits for transmission lines, PJM reactive interface limits, and estimates of uncompensated circulating power flow through PJM from other control areas that are valid for the study period.

FTRs for firm point-to-point service are modeled as generation at the receipt (source) point and load at the delivery (sink) point.

FTRs for network service are modeled as a set of injections at the designated capacity resource locations and a set of withdrawals at the network load at the delivery points.

Consistent with PJM Operating and Planning criteria, the Simultaneous Feasibility Test evaluates the ability of all system facilities to remain within normal ratings during normal, extended-period operation while maintaining an acceptable bulk system voltage profile.

The system must also be able to sustain any single contingency event with all system facilities remaining within applicable short-term, emergency ratings while maintaining an acceptable bulk system voltage profile and a maximum bulk system voltage drop of five percent. This voltage criterion is modeled in the Simultaneous Feasibility studies as reactive interface limits.

If the set of FTRs included in the Simultaneous Feasibility Test proves to be infeasible, the OI proportionately reduces all new FTRs in proportion to their MW value and level of impact on the binding constraint in the Simultaneous Feasibility Test .

Mechanical / Technical Rules

FTRs requests associated with point-to-point transmission service requests are automatically passed to the Simultaneous Feasibility Test from the OASIS, while FTRs requests associated with network service transmission service requests are passed to the Simultaneous Feasibility Test by the eCapacity system.

The OI will incorporate requested FTRs into the existing FTR database for each affected time period. Additionally, transmission line outage schedules, PJM reactive interface limits, estimates of uncompensated power flow circulation from other control areas through PJM, and seasonal adjustments to facility ratings shall all be incorporated into the Simultaneous Feasibility Test .

PJM will evaluate the ability of all system facilities to remain within normal ratings during normal, extended-period operation, while maintaining an acceptable bulk system voltage profile.

PJM will also evaluate the ability of the system to sustain any single contingency event with all system facilities remaining within applicable short-term, emergency ratings while maintaining an acceptable bulk system voltage profile and a maximum bulk system voltage drop of five percent.

FTRs are awarded if an acceptable bulk system voltage profile can be maintained and there are no facility overloads for normal or contingency conditions and there are no bulk system voltage drops greater than five percent immediately following a contingency.

If the set of FTRs included in the Simultaneous Feasibility Test proves to be infeasible, the OI will reduce all new FTRs requests in proportion to their MW value and level of impact on the binding constraint.

Customer notification of the disposition of their requested FTRs will be made through the PJM OASIS and eCapacity systems for point-to-point and network services, respectively.

After approval and customer notification, PJM will enter accepted FTRs into the FTR database.

Exhibit B

PJM FTR Auction Example

The purpose of this example is to provide a simplified demonstration of the PJM FTR Auction mechanism. The example will show the calculation of clearing prices using a simple ratio technique that is intended to explain the selection of winning bidders and the FTR clearing price calculations in a non-mathematical manner. The example will also demonstrate the simultaneous feasibility analysis for FTRs and will show how FTRs distribute Transmission Congestion Charges to FTR holders in PJM accounting.

The purpose of the PJM FTR Auction is to sell any residual FTR capability that is available after Network and long-term point-to-point transmission service FTRs have been awarded. It also allows participants an opportunity to offer for sale or reconfigure any FTRs that they currently hold. The FTR Auction will clear based on maximizing the net bid-based value of FTR bids and offers submitted into the Auction.

Overview of the FTR Auction Example

The following areas will be covered in this example:

Five bus power system overview

System Participant Profiles

Constrained Energy Market Example
- Dispatch ignoring transmission limits
- Dispatch with transmission limits
- LMP Calculation
- Transmission Congestion Charge Calculation

Fixed Transmission Right Allocation (Network and Point-to Point Transmission Service)

Simultaneous Feasibility Test

Pre-Auction FTR Target Allocations

FTR Auction Example
- Bids and Offers submitted
- Selection of winning bids and offers
- Clearing price calculation
- Auction Results
- Post Auction FTR Target Allocations

PJM Five Bus Power System Model

The PJM five bus power system model will be used to explain the FTR Auction mechanism, this model has been used extensively in PJM training courses to explain Locational Marginal Pricing. In order to explain the FTR Auction mechanism, it is necessary to explain the set up of the five bus model and to show the security constrained dispatch process to develop a constrained energy market example. It is also necessary to demonstrate the allocation of FTRs for Network and Point-to-Point Transmission Service and to show the Simultaneous Feasibility analysis for these FTRs

The sample power system shown below consists of:

- Five Buses: A-E
- Three Loads at B, C and D
- Five Generators
  - Brighton at E, Alta at A, Park City at A, Solitude at C, Sundance at B
- Six Transmission Lines
- A 240 MW thermal limit on line E-D
- Impedances as shown – ***R = 0 for all lines***

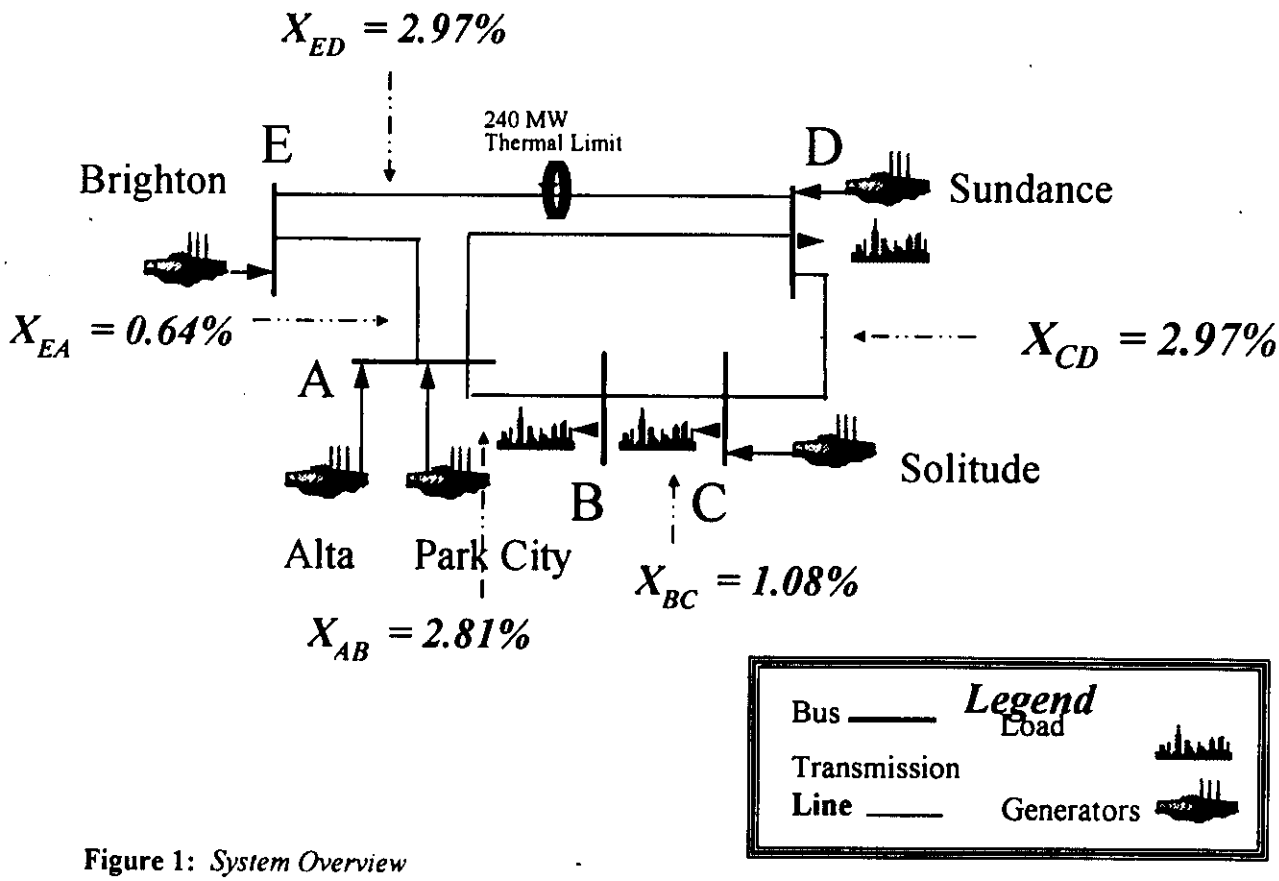


Figure 1: *System Overview*

System Participant Profiles

LSE B – Party to the Market Operations Agreement, Reserve Sharing Agreement and the Transmission Tariff

- Annual Peak Load: 400 MW
- Generation Capacity: Requirement (120% of Peak): 480 MW
- Generation Commitments: 400 MW from Brighton
  80 MW from Solitude
- Network Transmission Service 400 MW

LSE C – Party to the Market Operations Agreement and Reserve Sharing Agreement and the Transmission Tariff

- Annual Peak Load: 350 MW
- Generation Capacity: Requirement (120% of Peak): 420 MW
- Generation Commitments: 200 MW from Brighton
  220 MW from Solitude
- Network Transmission Service 350 MW

LSE D – Party to the Market Operations Agreement and Reserve Sharing Agreement and the Transmission Tariff

- Annual Peak Load: 350 MW
- Generation Capacity: Requirement (120% of Peak): 420 MW
- Generation Commitments: 200 MW from Sundance
  220 MW from Solitude
- Network Transmission Service 350 MW

Park City - an independent generator at Bus A who is party to the Market Operations Agreement. It sells energy to the PJM Spot Market

Alta - an independent generator at Bus A who has entered into a bilateral contract for energy only with LSE D, therefore LSE D is bidding the generator into the market. Alta has also purchased firm point-to-point service for 70 MW from Bus A to Bus D.

Constrained Energy Market Example

Generator Bids

The following is a list of bids for each of the five generators on the system. These bids will be used in the determination of economic dispatch.

Generator Bids for the Hour

BUS	Generator	MWh Available	Bid Price
E	Brighton	600	$10/MWh
A	Alta	110	$14/MWh
A	Park City	100	$15/MWh
C	Solitude	520	$30/MWh
D	Sundance	200	$30/MWh

Table 1: *Generator Bids*

Loads

- Total System Load = 900 MW
- Bus B, C and D Load = 300 MW (each)

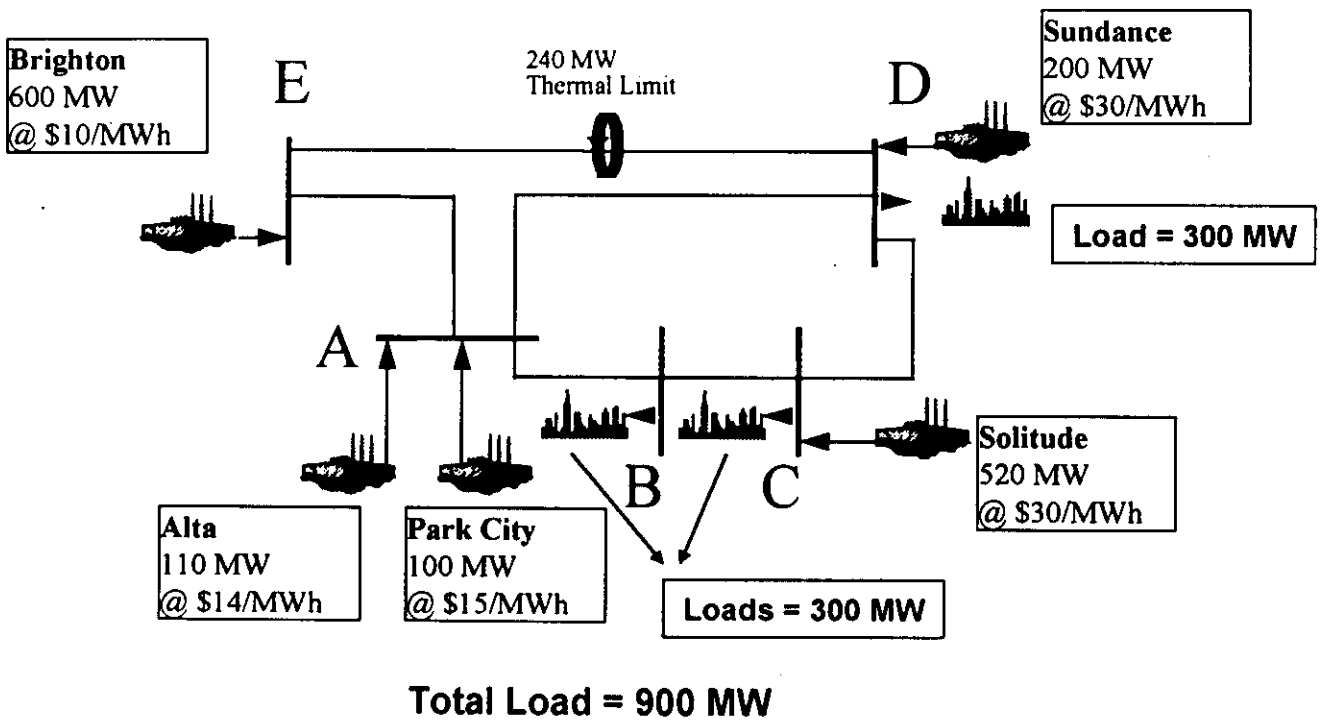


Figure 2: *Constrained Case, Generator Bids and Loads*

Dispatch Solution, Ignoring Transmission Limitations

If normal economic dispatch is followed, Alta and Park City are run at capacity, while Sundance only generates 90 MW. The diagram below details this solution. Notice the flow on line E-D, it is above the thermal limit. Supplying generation in this fashion will allow for an economic solution, but the limitation on line E-D will be violated.

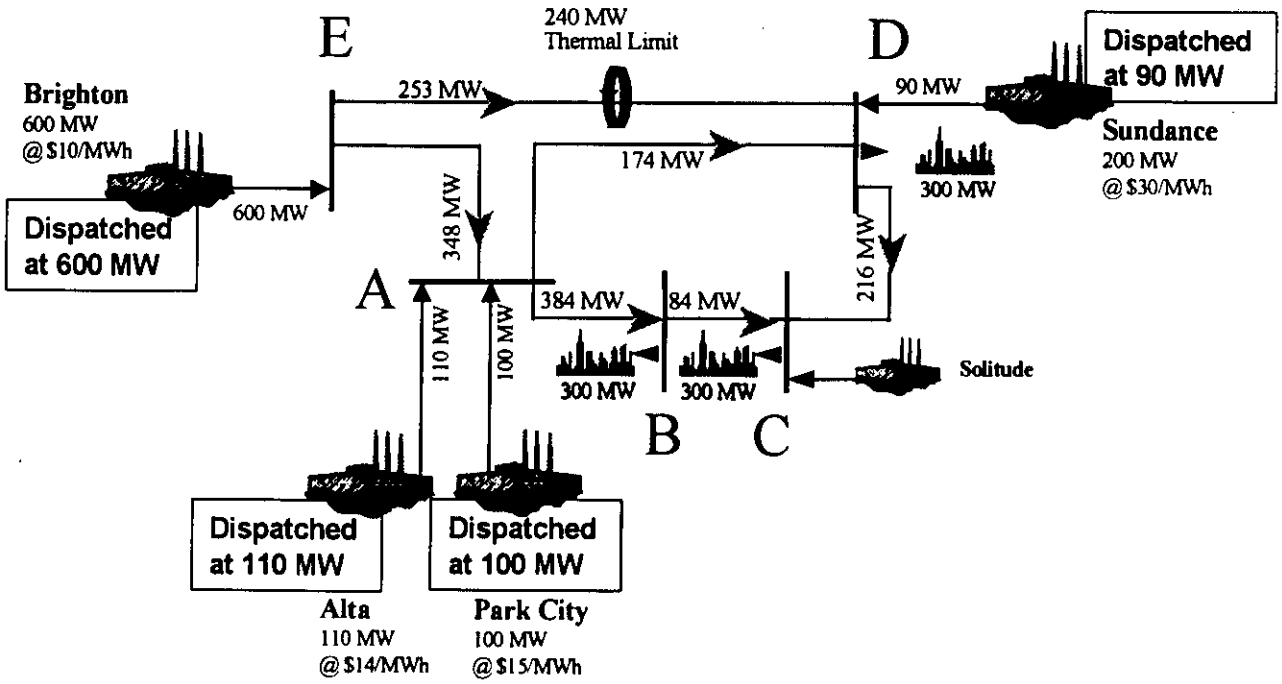
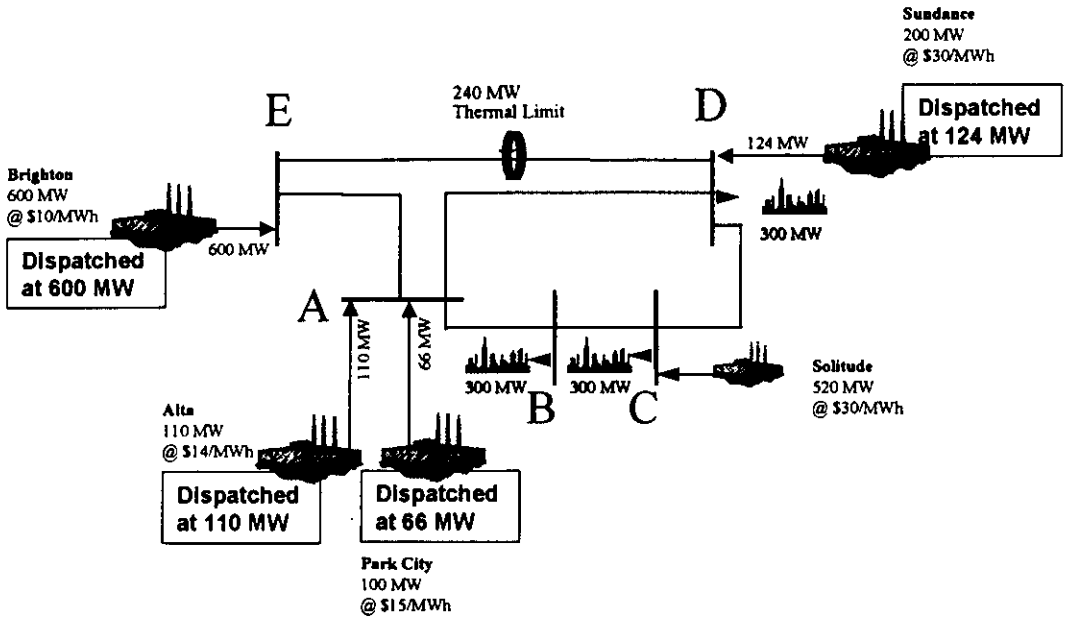


Figure 3: *Dispatch Solution, Ignoring Limitations*

Another dispatch solution is required for security-constrained economic operation which takes into account the thermal limit on line E-D.

Actual Dispatch Solution

The dispatch solution needed to meet the economic and reliability requirements is shown below:



Total Dispatch 900 MW

Figure 4: *Constrained Dispatch Solution*

The resulting security constrained economic dispatch for the hour included the 240 MW thermal limit on line E-D as a binding constraint. Consequently, Park City was not dispatched at full capacity and Sundance was selected to run out of economic merit order. This solution kept the flow on transmission line E-D at 240 MW. The new dispatch rates will change line flow as follows:

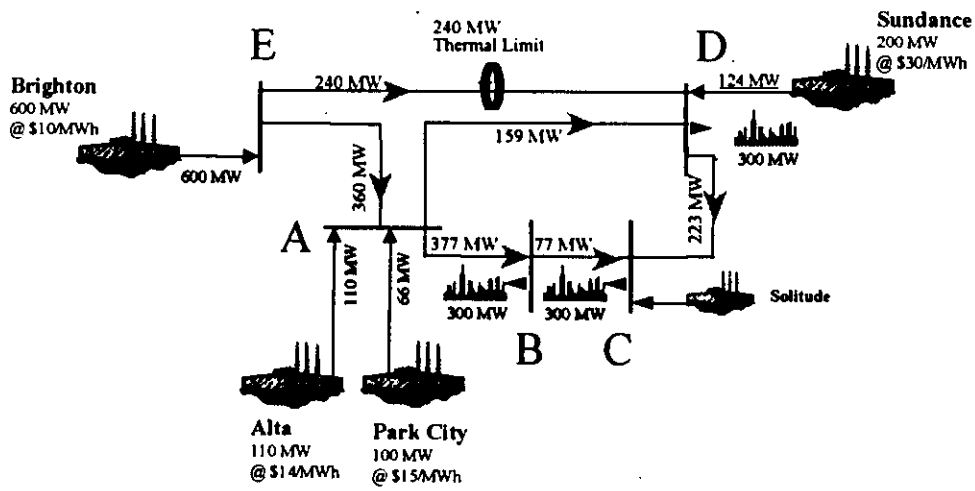


Figure 5: *System Flow, Constrained*

Locational Marginal Prices (LMPs)

LMPs

⇨ **cost of generation at the margin**

⇨ **cost of delivering the energy over a limited amount of transmission capacity**

Summary of Economic Dispatch Solution and the Resulting Location Marginal Prices (LMPs)

BUS	Generator	MW Dispatch	LMP
A	Park City	66	$15.00/MWh
A	Alta	110	$15.00/MWh
B			$21.14/MWh
C	Solitude	0	$23.51/MWh
D	Sundance	124	$30.00/MWh
E	Brighton	600	$10.44/MWh
	Total Generation = 900 MW		

Table 2: *Locational Marginal Prices*

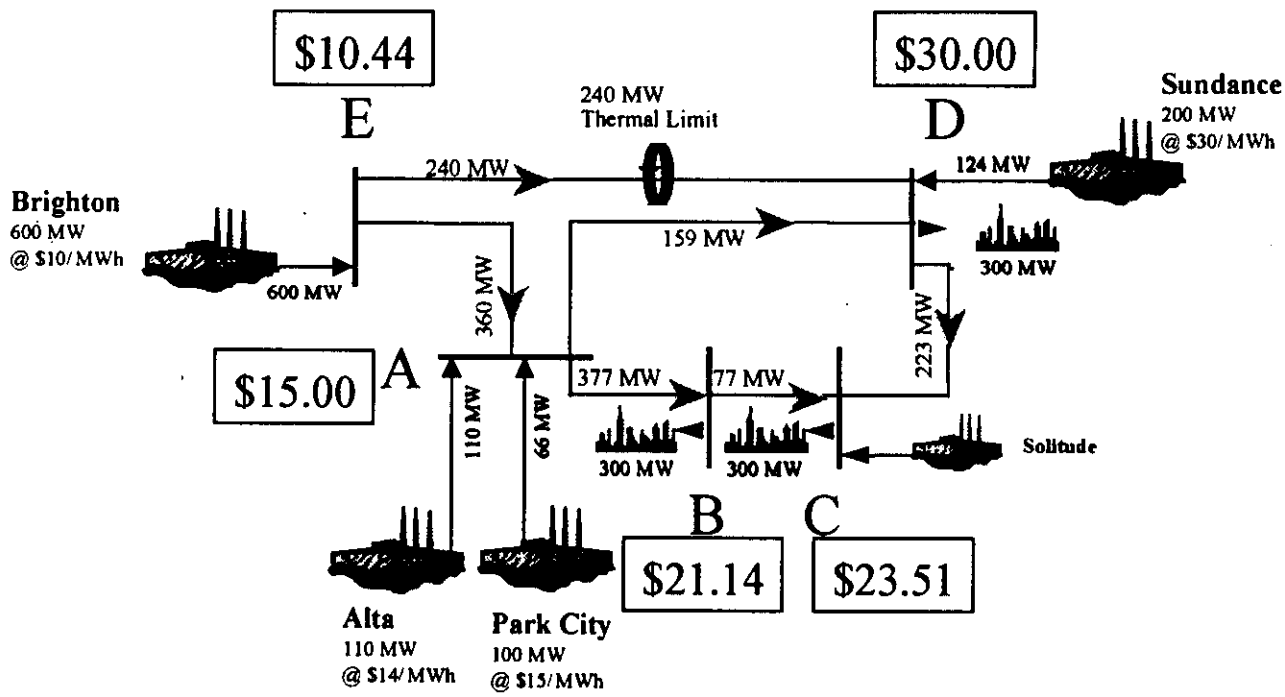


Figure 6: *5 Bus Model with LMPs*

The binding transmission limit creates a need for two marginal generating units, Park City on the sending side of the transmission constraint and Sundance on the receiving side. These two units become the marginal generators as they control flow on line E-D.

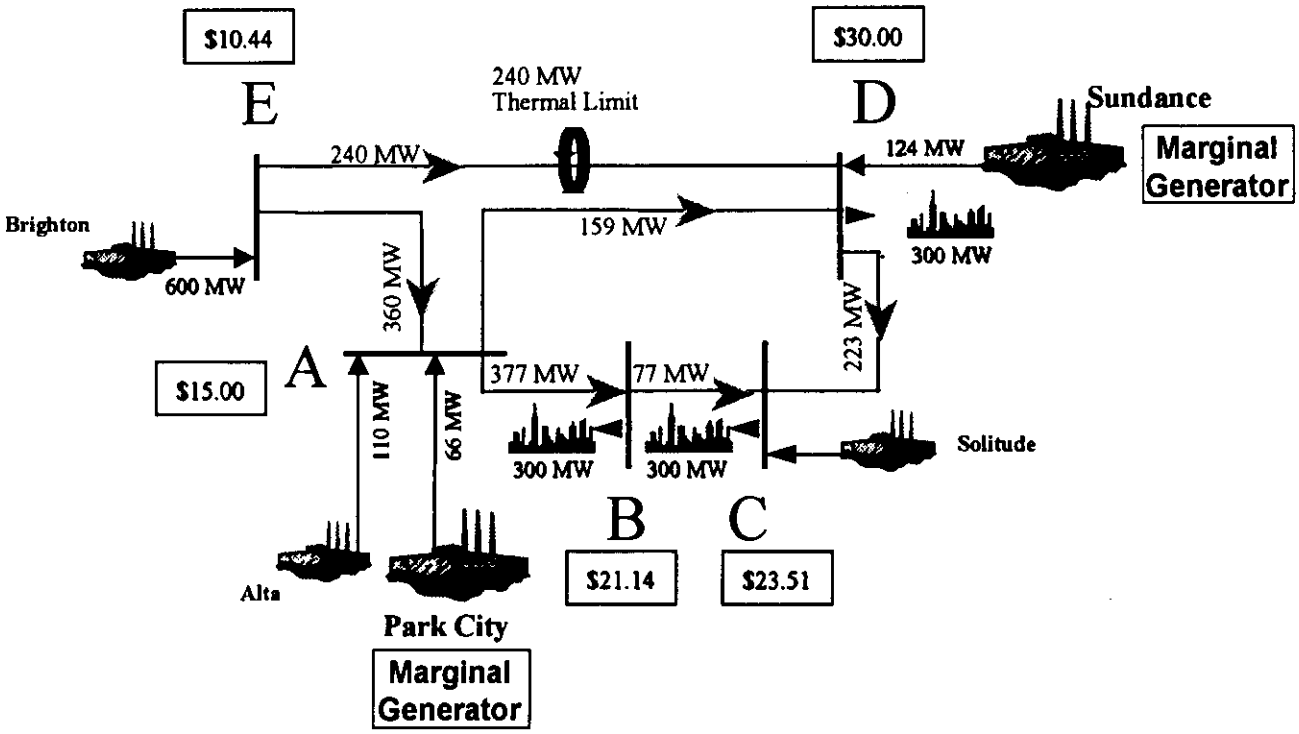


Figure 7: *Marginal Generators*

LMPs and Sensitivity Factors

In order to respect the thermal limit on line ED, the LMPs at each bus location are calculated by serving an additional increment of load (for example, 1 MW) from the marginal units. LMP calculations were made for each bus location as follows:

Bus Location	Sensitivity Factors for 1 MW of Load Supplied from:		Calculation Details
	Park City @ $15.00	Sundance @ $30.00	
A	1.00 MW	0.00 MW	LMP = 1.00 MW*($15.00) + 0.00 MW*($30.00) = $15.00/MWh
B	0.59 MW	0.41 MW	LMP = 0.59 MW*($15.00) + 0.41 MW*($30.00) = $21.14/MWh
C	0.43 MW	0.57 MW	LMP = 0.43 MW*($15.00) + 0.57 MW*($30.00) = $23.51/MWh
D	0.00 MW	1.00 MW	LMP = 0.00 MW*($15.00) + 1.00 MW*($30.00) = $30.00/MWh
E	1.30 MW	-0.30 MW	LMP = 1.30 MW*($15.00) + (-0.30) MW*($30.00) = $10.44/MWh

Table 3: *LMP Sensitivity Factors*

Sensitivity Factors to serve load from the marginal units are calculated by a **least cost security constrained dispatch algorithm**. This linear programming based algorithm calculates the least expensive way to serve load while respecting the transmission limits.

Example: to serve 1 MW of load at Bus B and keep the power flow on line ED at 240 MW or less, 0.59 MW of less expensive generation at A must be offset with 0.41 MW of more expensive generation at D.

Total Transmission Congestion Charge Calculation

The total Transmission Congestion Charges may be calculated by subtracting the total generation revenue from the total load payments.

Each load bus payment is equal to the load at each bus times the LMP at that bus. The total load payments is the sum of all load bus payments.

Total load payments = 300 * $21.14 + 300 * $23.51 + 300 * $30.00

Total load payments = $22,395

Each generator's revenue is equal to the MW output of the generator times the LMP at the bus. The total generation revenue is the sum of all individual generator revenues.

Total generation revenue = 600 * $10.44 + 110 * $15.00 + 66 * $15.00 + 124 * $30.00

Total generation revenue = $12,624

Total Transmission Congestion Charges = Load payments – Generation revenues

Total Transmission Congestion Charges = $22,395 - $12,624

Total Transmission Congestion Charges = $9771

Therefore the Total Transmission Congestion Charges for this constrained dispatch example are $9771. This is the amount to be distributed to FTR holders.

Fixed Transmission Rights Allocation

1. Define Firm Transmission Reservations and Generation Capacity Requirements for each Market Participant.

Revisiting the participant profile material from the beginning of the example. The following capacity requirements and firm transmission reservations (network and point-to-point) apply:

Capacity Requirements and Firm Transmission Reservations

Market Participant	Generation Capacity Requirements	Firm Transmission Reservations
LSE B	480 MW	400 MW Network Service
LSE C	420 MW	350 MW Network Service
LSE D	420 MW	350 MW Network Service
Alta		70 MW Point-to-Point from A to D

Table 4: *Capacity Requirements and Firm Transmission Reservations*

Fixed Transmission Rights are allocated to market participants based on firm transmission reservations.

2. Define fixed Transmission Rights (FTRs) associated with Firm Transmission Reservations for each Market Participant

Fixed Transmission Rights

As discussed before, FTRs are awarded to all PJM Firm Transmission Service customers.
Network service customers designate FTRs up to their annual peak load from capacity resource (source) to aggregated load (sink).
Point-to-point customers receive FTRs for the MW value of their transaction from the point of delivery (source) to the point of receipt (sink).

Market Participant	Firm Network Transmission Reservations	Firm Point-to-Point Transmission Reservations	Fixed Transmission Rights
LSE B	Peak Load = 400 MW		400 MW from Brighton to LSE B
LSE C	Peak Load = 350 MW		150 MW from Solitude to LSE C (net to zero) 200 MW from Brighton to LSE C
LSE D	Peak Load = 350 MW		220 MW from Solitude to LSE D 130 MW from Sundance to LSE D (net to zero)
Alta		70 MW from A to D	70 MW from A to D

Table 5: *FTRs by Market Participant*

The FTR values will be used later to determine FTR Target Allocations for each market participant. Congestion credits based on these Target Allocations are given to the holders of FTRs that are consistent with the price differential between to the source and sink of the FTRs and the MW values.

Simultaneous Feasibility Test

To ensure that all firm transmission service requests (and their associated FTRs) are deliverable within the control area reliability criteria, the ISO performs a Simultaneous Feasibility Test on an annual basis for each planning period, or when the test is necessary for network resource reconfiguration or point-to-point reservations.

The purpose of this test is to ensure that all subscribed Transmission Entitlements are within the capability of the existing Transmission System. The Simultaneous Feasibility Test is designed to ensure that the PJM Energy Market will be revenue adequate under normal system conditions.

The Simultaneous Feasibility Test models requested Firm Transmission reservations, it is not:

- A system reliability test
- Intended to model actual system operating conditions

Summary of Generation and Load used in Simultaneous Feasibility Test

Market Participant	Generation	Load
LSE E	600 MW Comprised of: • 400 MW to LSE B • 200 MW to LSE C	
Alta	70 MW Comprised of: • 70 MW to Bus D for Firm Wheel	
LSE B		400 MW Served from: • 400 MW from Brighton
LSE C		350 MW Served from: • 200 MW from Brighton • *150 MW from Brighton
Solitude	370 MW Comprised of: • 220 MW to LSE D • *150 MW to LSE C	
LSE D		420 MW Served from: • 220 MW from Solitude • *130 MW from Sundance • 70 MW from Alta (Wheel)
Sundance	130 MW Comprised of: • *130 MW to LSE D	

* Generator and Load at same Bus

Table 6: *Summary of Generation and Load Used in the Simultaneous Feasibility Test*

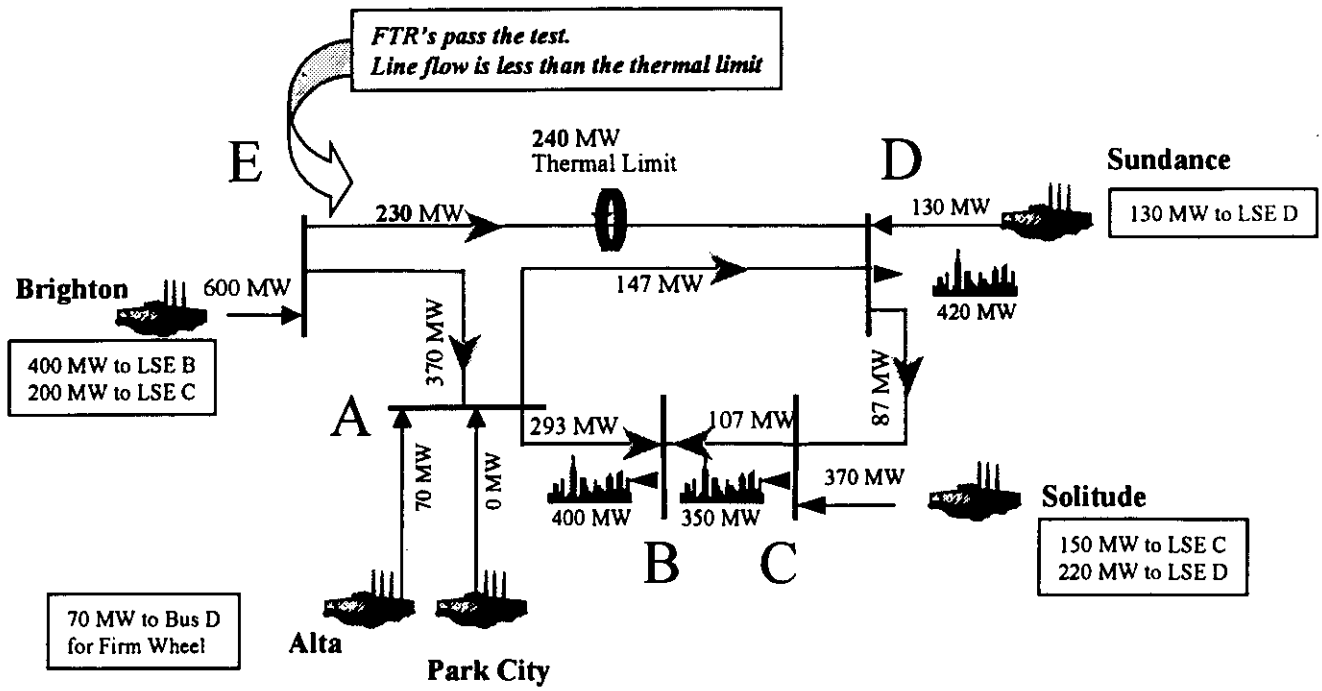


Figure 8: *Simultaneous Feasibility Test Results*

The above diagram shows the results of the SFT. The results show the flow on line E-D to be under the thermal limit, thus deeming the system revenue adequate. If the MW value of all FTRs assigned were to actually be delivered the sample system would remain unconstrained.

FTR Target Allocations Calculation (Considering only FTRs Awarded Prior to the FTR Auction)

Transmission Congestion Credit Target Allocations are the amount of credit each Market Participant should receive in each constrained hour due to the value of their FTRs. FTRs were defined for each Market Participant in the example above. The purpose of these FTRs is to protect the holder from increased energy cost due to transmission congestion.

The Transmission Congestion Credit Target Allocation is calculated for each FTR in each hour by multiplying the MWh value of the FTR times the destination LMP minus the source LMP. The total Target Allocation for each Market Participant is the sum of the Target Allocations for all FTRs that it holds.

Summary of Transmission Congestion Credit Target Allocations by Market Participant

Market Participant	Fixed Transmission Rights	Source LMP ($/MWh)	Destination LMP ($/MWh)	Target Allocations Calculation	Calculation Details Target Allocation = FTR MWh * (Destination LMP – Source LMP)
LSE B	400 MW from E to B	$10.44	$21.14	$4,280.00	TA = 400 MWh * ($21.14 - $10.44)
LSE C	200 MW from E to C	$10.44	$23.51	$2,614.00	TA = 200 MWh * ($23.51 - $10.44)
LSE D	220 MW from C to D	$23.51	$30.00	$1,427.80	TA = 220 MWh * ($30.00 - $23.51)
Alta	70 MW from A to D	$15.00	$30.00	$1,050.00	TA = 70 MWh * ($30.00 - $15.00)
				$9,372	

Table 7: *FTR Target Allocations*

Note: **FTRs from C-C or from D-D have no economical value as they net to zero. These FTRs are not listed above.**

FTR Auction Example

As shown above, the total FTR Target allocations for the constrained example are $9372. However the total congestion charges collected for the hour are $9771. The difference between the Total congestion charges collected and the FTR Target allocations in this example is $399. This result is not surprising since the simultaneous feasibility test for FTRs that was shown above had a flow of 230 MW on the line from bus E to bus D. The capability of this line is 240 MW. Therefore, the reason for the excess congestion charges of $399 in this example is that the FTR capability is not fully allocated. Therefore this residual 10 MW of FTR capability that exists after all Network and Point-to-Point FTRs were awarded is available to be auctioned. After the auction is performed, another comparison of Target Allocations to Total Congestion Charges will be made (see Table 12).

FTR Auction Bids

The sample set of bids and offers into the FTR Auction is shown below.

Auction Buy Bids and Sell Offers

FTR Buy Bids

$5/MW Bid for 40 MW A-to-D FTR

$4/MW Bid for 10 MW E-to-B FTR

$4/MW Bid for 10 MW A-to-D FTR

$4/MW Bid for 10 MW E-to-C FTR

FTR Sell Offers

$2/MW Sell Offer for 10 MW E-to-C FTR

$6/MW Sell Offer for 10 MW A-to-D FTR

Table 8: *FTR Auction Bids and Offers*

If all of the FTR bids and sell offers were accepted, the resulting power flows would be as shown below:

Power Flows with all Auction Buy Bids and Sell Offers Modeled

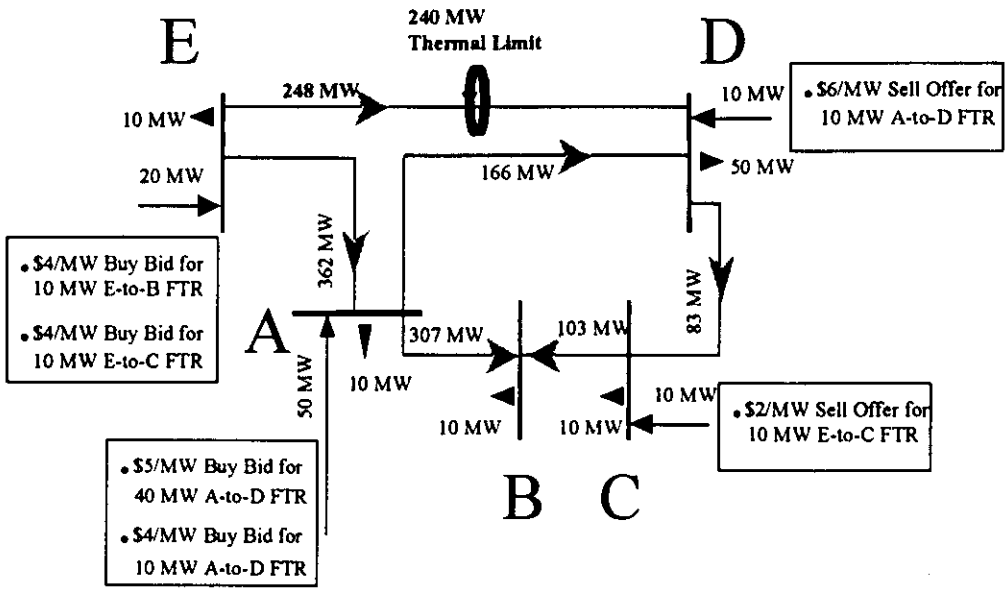


Figure 9: Power Flows Resulting from all *FTR Auction Bids*

The example shown above is **not feasible** since the flow on line E-D is 248 MW and the limit on the line is 240 MW. Therefore all of the Bids and offers into the FTR Auction cannot be awarded if revenue adequacy is to be maintained.

An analysis must be performed to select a set of winning bids to maximize the net bid based value of FTR bids and offers submitted to the Auction while respecting the physical limitations of the power grid. In the actual PJM FTR Auction analysis, this process is performed using a linear program that models all PJM security constraints including both normal flow ratings (all lines in service) and single contingency events. Since this example is intended to be non-mathematical, the actual formulation will not be discussed here. Rather the auction mechanism will be described using a simplified ratio approach that works well when there is only a single binding transmission limitation.

Selection of Winning Bids

The selection process is based on calculating the cost effectiveness ratio for each bid and offer as outlined in Table 9. The cost effectiveness ratio is determined by dividing the price bid or offer by the flow sensitivity of the FTR on the limited transmission facility. The flow sensitivity is the portion of the FTR MW quantity that flows on the limited facility expressed as a percentage. In the first step of the selection process, the bids are awarded from highest to lowest cost effectiveness until all residual FTR capability is consumed. In this example, there is 10 MW of residual capability which is awarded to the bids as shown in step 1 in Table 9. In the second step, any FTR sale offers that have cost effective ratio that is lower than the marginal FTR bid from step 1 will be awarded. Step 3 will award any additional capability created in step 2. This process would repeat as necessary until there is no change in the marginal FTR bid. In this example, the marginal FTR is the FTR from A-to-D with a bid of $5.00 per MW. This FTR will set the clearing price for FTRs on all paths.

FTR Auction Example
Selection of Winning Bids and Offers

Path	Quantity (MW)	Price ($/MW)	Sensitivity (Portion of FTR that flows on Line E-D)	ost Effectiveness (Ratio of Price to sensitivity)	Effect on line E-D Capability (MW times Sensitivity)
Bids					
E-to-B	10	$4.00	0.2629	$15.21	2.6
A-to-D	40	$5.00	0.36849	$13.57	14.7
E-to-C	10	$4.00	0.32092	$12.46	3.2
A-to-D	10	$4.00	0.36849	$10.86	3.7
Sell Offers					
E-to-C	10	$2.00	-0.32092	-$6.23	-3.2
A-to-D	10	$6.00	-0.36849	-$16.28	-3.7

- Step 1 Bids are awarded by selecting from highest to lowest Cost effectiveness selection continues until all E-D capability is utilized In this step the 10 MW E-to-B FTR is awarded first and then 20 MW of the A-to-D, $5.00, bid is awarded to consume the 10 MW of residual FTR capability on line E-D
- Step 2 The next step is to compare the sell offer cost effectiveness ratios (sorted high to low) to the cost effectiveness ratio of the last (marginal) bid awarded in step 1 In this case the cost effectiveness of the sell offer from E-to-C is favorable to the marginal bid cost effectiveness Therefore this sell offer is awarded
- Step 3 Additional bids are awarded to consumer the FTR capability made available by the sell offer. In this case an additional 8 MW of the A-to-D, $5.00, bid is awarded
- The process would repeat as necessary In this case no additional sell offers are awarded and the solution is complete The FTR from A-to-D, $5.00 bid is the marginal bid and it will set the clearing price for all paths

Table 9: Winning bid Selection

FTR Clearing Price Calculation

The process of selecting the winning bids that was shown in the previous section will determine which FTR in on the margin. Since all bids are treated as up to MW quantity values, this marginal FTR will have a quantity awarded somewhere between zero and the specified bid quantity. In this example 28 of the 40 MW in the bid were awarded. As shown in table 10, the process of calculating the clearing prices depends on the marginal FTR and the flow sensitivities of each FTR path relative to the marginal FTR path flow sensitivity. The underlying nodal prices at each bus shown in Figure 10 are dependant on these values and on the selection of the price reference bus. Because the PJM LMP system does not include marginal losses, the selection of the price reference is arbitrary.

FTR Auction
Clearing Price Calculation

Source	Sink	Portion of FTR that flows on Line E-D	Clearing Price Calculation
A	D	0.36849	A – D is the Marginal FTR Path
A	B	0.15094	=$5.00* 0.15094/0.36849 = $2.05
A	C	0.20895	=$5.00* 0.20895/0.36849 = $2.83
A	E	-0.11196	=$5.00* -0.11196/0.36849 = -1.52
E	D	0.48045	=$5.00* 0.48045/0.36849 = $6.52
E	C	0.32092	=$5.00* 0.32092/0.36849 = $4.35
E	B	0.26290	=$5.00* 0.26290/0.36849 = $3.57
B	C	0.05802	=$5.00* 0.05802/0.36849 = $0.79
B	D	0.21755	=$5.00* 0.21755/0.36849 = $2.95
C	D	0.15953	=$5.00* 0.15953/0.36849 = $2.16

Table 10: *FTR Clearing Price Calculations*

FTR Auction Results

Table 11 shows a summary of the FTR Auction results. The auction revenues (or payments) are calculated for each FTR awarded by multiplying the MW quantities cleared by the clearing price on the path. The net revenues from the Auction are calculated by summing the revenues and payments for all FTR bids and offers that were awarded in the Auction. In this example, the net Auction revenue is $132.20. These net Auction revenues are distributed to Regional Transmission Owners by ratio of their respective transmission revenue requirements.
It is also important to recognize that the FTR Auction has performed automatic reconfiguration of the FTRs submitted into the Auction. This reconfiguration is demonstrated by the surrender of an FTR for 10 MW from E-to-C based on the sell offer which allowed for an additional 8 MW of FTR from A-to-D to be awarded to the highest bidder. This automatic reconfiguration was performed based on the bids submitted while maintaining the simultaneous feasibility requirements of the system. This point illustrates the efficiency in trading FTRs in the Auction.

Auction Results

FTR Buy Bids	Bids Cleared
$5/MW Bid for 40 MW A-to-D FTR	28 MW @ $5.00/MW
$4/MW Bid for 10 MW E-to-B FTR	10 MW @ $3.57/MW
$4/MW Bid for 10 MW A-to-D FTR	0 MW
$4/MW Bid for 10 MW E-to-C FTR	0 MW

FTR Sell Offers	Bids Cleared
$2/MW Sell Offer for 10 MW E-to-C FTR	10 MW @ $4.35/MW
$6/MW Sell Offer for 10 MW A-to-D FTR	0 MW

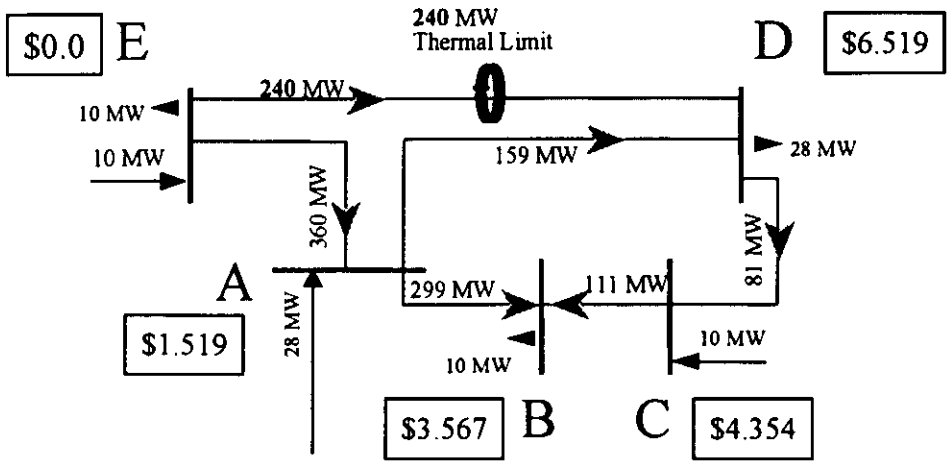
FTR Auction Revenues

(28 MW)($5.00/MW) + (10 MW)($3.57/MW) - (10 MW)($4.35/MW) = $132.20

Table 11: *FTR Auction Results Summary*

FTR Nodal Prices and Clearing Prices by Path

Figure 10 displays the underlying nodal prices that result from the FTR Auction solution. The nodal prices are driven by the Marginal FTR bid, the flow sensitivities on the binding transmission constraint and by the selection of the price reference bus. In the full size PJM FTR Auction, the underlying FTR nodal prices are made available in a download file so that Market Participants can calculate the clearing price on any FTR path they choose.



Sink / Source	A	B	C	D	E
A	0	2.0481	2.8353	5	-1.5191
B	-2.0481	0	0.7872	2.9519	-3.5672
C	-2.8353	-0.7872	0	2.1647	-4.3544
D	-5	-2.9519	-2.1647	0	-6.5191
E	1.5191	3.5672	4.3544	6.5191	0

Auction Results - Clearing Prices by Path

Figure 10: *FTR nodal Prices and Clearing Prices by Path*

Post-Auction FTR Target Allocations Calculation

To complete this FTR Auction example, it is helpful to compare the FTR Target Allocations ($9372 from Table 7) that were calculated considering only FTRs defined before the Auction with the FTR Target Allocations for the full set of FTRs including those awarded in the Auction ($9768 from table 12 below). The full set of FTRs shown below include those awarded and reconfigured in the Auction (shown in bold print). It is important to note that the total Target Allocations of $9768 is very close to the total congestion charges collected, $9771 for the hour. In fact we would expect the Target allocations to equal the Transmission congestion (the $3 difference is due to rounding error in the calculations). Therefore, the FTR Auction performed the sale of the residual 10 MW of FTR capability and allowed reconfiguration of FTRs while maintaining revenue adequacy. These results illustrate the performance of the simultaneous feasibility requirements that are built into the FTR Auction mechanism to maintain the revenue adequacy of the Transmission congestion accounting process.

Post-Auction Congestion Credit Target Allocations

FTR	Source LMP	Sink LMP	Target Allocation
400 MW from E to B	$10.44	$21.14	$4,280.00
190 MW from E to C	$10.44	$23.51	**$2,483.30**
70 MW from A to D	$15.00	$30.00	$1,050.00
220 MW from C to D	$23.51	$30.00	$1,427.80
150 MW from C to C	$23.51	$23.51	$ 0.00
130 MW from D to D	$30.00	$30.00	$ 0.00
28 MW from A to D	$15.00	$30.00	**$ 420.00**
10 MW from E to B	$10.44	$21.12	**$ 106.80**
			$9,768.10

Table 12: Post-Auction *FTR Target Allocation Calculations*