Long Term FTR Market Training
9/3/08
Agenda

• Long Term FTR Auction Overview
• Overview of Financial Transmission Rights (FTRs)
• Overview of Simultaneous Feasibility test (SFT)
• FTR Auctions and Bilateral Trading
• Market Settlements
Long Term FTR Auction Overview
Long Term FTR for 2009-2011

<table>
<thead>
<tr>
<th></th>
<th>Opens 0001</th>
<th>Closes 1700</th>
<th>Results 1700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round 1</td>
<td>October 1, 2008</td>
<td>October 3, 2008</td>
<td>October 10, 2008</td>
</tr>
<tr>
<td>Round 2</td>
<td>December 1, 2008</td>
<td>December 3, 2008</td>
<td>December 10, 2008</td>
</tr>
</tbody>
</table>

FTRs will be effective in June 2009, June 2010, or June 2011
Long Term FTRs

• On an annual basis, subsequent to the annual FTR auction, PJM conducts a long term auction for FTRs effective for the three planning years following the planning year of the current annual FTR auction.

• The Long Term FTR Auction offers for sale the residual system capability available assuming the self-scheduling of ARRs that may occur on an annual basis. These ARRs will be modeled as fixed injections and withdrawals in the Long Term FTR Auction along with already approved Long Term FTRs.

• Future transmission upgrades will not be included in model.
Long Term FTRs

- The Long Term FTR Auction is a multi-round auction consisting of two rounds in which 50% of the feasible FTR capability will be offered in each round.

- FTR Option products are not available in the Long Term FTR Auctions

- FTR acquired in the Long Term FTR Auctions may have terms of one year, for each of the three planning years covered by the auction, or a term of three years, for the entire three-year period covered by the auction.
Characteristics of the Long Term FTR Auctions

- Residual FTR capability of the transmission system
  - “left over” capability assuming Self-Scheduling of current planning year ARRs
  - Approved Long Term FTRs modeled as fixed injections.
- Single-product auction
  - FTR Obligations only
- Multi-round auction
  - Consisting of two rounds held 6 months apart (2 months for first LTFTR Auction) with 50% available in each round.
- Multi-Period auction
  - On Peak, Off Peak, 24 Hour
  - Any of next three planning years or the full three year period following the planning year of the current annual FTR auction
  - FTRs have a term of one year or three years
Valid Bidding Periods

- Individual year in next three planning periods after current Annual Auction FTRs
- Three-year period following current Annual Auction FTRs
The Long Term FTR Auction is a multi-round auction consisting of 2 rounds…

- 50% of the feasible FTR capability of the PJM system is awarded in each round
- The Long Term FTR Auction offers for sale the residual system capability available assuming the self-scheduling of ARRs that may occur on an annual basis. These ARRs will be modeled as fixed injections and withdrawals in the Long Term FTR Auction along with already approved Long Term FTRs.
- FTRs that are awarded in previous Long Term FTR Auctions that are effective for the market interval may be sold in either round
- FTRs that are awarded in round one may be offered for sale in round two
Long Term FTR Auction Data

• Relevant data associated with the Long Term FTR Auction will be posted under the Long Term FTR Auction section of the FTR Auction User Information Page.

  – Data includes valid market name, bidding periods, biddable nodes, etc.

• FTR Credit Calculator includes periods for Long Term FTR Auction and is located under the FTR Credit section of the FTR Auction User Information Page
The Long-Term FTR auctions are billed for in the monthly bill for which the FTRs are in effect.

Revenues from the Long-Term FTR auctions are used to first fund any shortfall in ARR Target Allocations then FTR target allocations for the planning period in which the Long-Term FTR is in effect.
Overview of Financial Transmission Rights (FTRs)
Financial Transmission Rights are …

financial instruments awarded to bidders in the FTR Auctions that entitle the holder to a stream of revenues (or charges) based on the hourly Day Ahead congestion price differences across the path.
• Challenge:
  – *LMP* exposes PJM Market Participants to price uncertainty for congestion cost charges
  – *During constrained conditions, PJM Market collects more from loads than it pays generators*

• Solution:
  – *Provides ability to have price certainty*
  – *FTRs provide hedging mechanism that can be traded separately from transmission service*
Characteristics of FTRs

- Economic value based on Day-Ahead Congestion Prices
- Defined from source to sink
- can be in form of obligation or option
  - obligation can be benefit or liability
  - option can be benefit but never liability
- Financial entitlement, *not* physical right
- Independent of energy delivery
- Must be simultaneously feasible
What are FTR Obligations Worth?

**Benefit**
- the hourly congestion value is positive
- FTR same direction as congested flow

**Liability**
- the hourly congestion value is negative
- FTR opposite direction as congested flow
FTR Credits and Congestion Charges

Congestion Charge =
MWh*(Day-ahead Sink Congestion Price - Day-ahead Source Congestion Price)

FTR Credit =
MW*(Day-ahead Sink Congestion Price - Day-ahead Source Congestion Price)
Thermal Limit

FTR Obligation = 100 MW

Congestion Charge = 100 MWh * ($30 - $15) = $1500

FTR Obligation Credit = 100 MW * ($30 - $15) = $1500

Congestion Price = $30
Congestion Price = $15

Source (Sending End)

Bus A

Energy Delivery = 100 MWh

Sink (Receiving End)

Bus B

Congestion Charge = 100 MWh * ($30 - $15) = $1500

FTR Obligation Credit = 100 MW * ($30 - $15) = $1500
FTR Obligation is a Liability

**Thermal Limit**

**FTR Obligation = 100 MW**

**Energy Delivery = 100 MWh**

**Bus A**
Source
(Sending End)
Congestion Price = $15

**Bus B**
Sink
(Receiving End)
Congestion Price = $30

**Congestion Charge = 100 MWh * ($30-$15) = $1500**

**FTR Obligation Credit = 100 MW * ($15-$30) = $-1500**
Overview of Simultaneous Feasibility Test (SFT)
What is a Simultaneous Feasibility Test?

- Test to ensure that all subscribed transmission entitlements are within the capability of the existing transmission system
- Test to ensure the PJM Energy Market is revenue adequate under normal system conditions
- **NOT** a system reliability test
- **NOT** intended to model actual system conditions
Feasibility of ARRs and FTRs

- ARRs must be simultaneously feasible to ensure that Annual FTR Auction revenues are sufficient to cover ARR Target Allocations.
- FTRs must be simultaneously feasible to ensure that total congestion charges collected from Day Ahead and Balancing Markets are sufficient to cover FTR Target Allocations.
Test Conditions and Criteria

- FTRs or ARRs are modeled as generation at source point and load at sink point
- Single contingency test criteria
- Perform DC powerflow analysis to
  - evaluate ability of all system facilities to remain within normal thermal ratings
  - evaluate ability to sustain the loss of any single contingency event with all system facilities remaining within applicable short-term, emergency ratings
SFT Data Inputs

- Uncompensated Parallel Flow Injections
- Transmission Outages
- Existing FTRs or ARRs
- Facility Ratings
- PJM Network Model
- List of Contingencies
- Interface Ratings
SFT Example #1

Net Flow = 480 MW

A
180 MW
300 MW

500 MW Rating

B
180 MW
300 MW

FTR 1: 300 MW Obligation from A to B
FTR 2: 180 MW Obligation from A to B
Net Flow on Line A-B = 480 MW
Line A-B Flow = Line A-B Rating therefore
both FTRs are simultaneously feasible
Net Flow = 600 MW

FTR 1: 300 MW Obligation from A to B
FTR 2: 300 MW Obligation from A to B
Net Flow on Line A-B = 600 MW
Line A-B Flow > Line A-B Rating therefore
both FTRs are NOT simultaneously feasible
Revenue Adequacy using SFT Examples

Day Ahead Market Energy Flow = 500 MW

Congestion Price = $10

A

500 MW Rating

B

Congestion Price = $20

Day Ahead Congestion Charge = 500 MW ($20 - $10) = $5,000

FTR Target Allocation (using SFT Example 1 FTRs)
Total FTR Target Allocation = 480 MW ($20 - $10) = $4,800

FTR Target Allocation (using SFT Example 2 FTRs)
Total FTR Target Allocation = 600 MW ($20 - $10) = $6,000
Maintaining Feasibility

Feasibility of requests is maintained by:

**Annual Allocation**

requests prorated in proportion to MWs requested and inverse proportion to effect on binding constraint

**Annual/Long Term/Monthly Auctions**

requests awarded to highest bidder
FTR Auctions
&
Bilateral Trading
How are FTRs Acquired?

FTRs are acquired in several market mechanisms …

1. Annual FTR Auction
   - multi - round
   - entire system capability minus approved Long-Term FTRs

2. Long Term FTR Auction
   - multi - round
   - purchase residual system capability assuming the self-scheduling of ARRs

3. Monthly FTR Auction
   - single - round
   - purchase “left over” capability

4. FTR Secondary Market
   - bilateral trading
Characteristics of the Annual FTR Auction

- Entire FTR capability of the transmission system minus approved Long-Term FTRs
- Multi-product auction
  - FTR Options & FTR Obligations
- Multi-round auction
  - consisting of 4 rounds with 25% available in each round
- Multi-period auction
  - On Peak, Off Peak, 24 Hour
  - FTRs have a term of one-year
Characteristics of the Long Term FTR Auctions

• Residual FTR capability of the transmission system
  – “left over” capability assuming Self-Scheduling of current planning year ARRs
  – Approved Long Term FTRs modeled as fixed injections.
• Single-product auction
  – FTR Obligations only
• Multi-round auction
  – Consisting of two rounds held 6 months apart with 50% available in each round.
• Multi-Period auction
  – On Peak, Off Peak, 24 Hour
  – Any of next three planning years or the full three year period following the planning year of the current annual FTR auction
  – FTRs have a term of one year or three years
Characteristics of the Monthly FTR Auctions

- Residual FTR capability of the transmission system
  - “left over” capability from Long-Term and Annual FTR Auction
- Multi-product auction
  - FTR Options & FTR Obligations
- Single-round auction
- Multi-Period auction
  - On Peak, Off Peak, 24 Hour
  - Any of next three individual calendar months or remaining full planning period quarters
  - FTRs have a term of one month or a three month quarter
# Comparison of FTR Auctions

<table>
<thead>
<tr>
<th></th>
<th>Annual FTR Auction</th>
<th>Long Term FTR Auction</th>
<th>Monthly FTR Auction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capability Auctioned</strong></td>
<td>Entire FTR capability of the transmission system minus approved Long-Term FTRs</td>
<td>Residual FTR capability of the transmission system assuming Self-Scheduling of current planning year ARRs</td>
<td>Residual FTR capability of the transmission system</td>
</tr>
<tr>
<td><strong>Auction Format</strong></td>
<td><strong>Multi</strong> Round</td>
<td><strong>Multi</strong> Round</td>
<td><strong>Single</strong> Round</td>
</tr>
<tr>
<td><strong>FTR Products</strong></td>
<td>FTR Obligations</td>
<td>FTR Obligations</td>
<td>FTR Obligations</td>
</tr>
<tr>
<td></td>
<td>FTR Options</td>
<td></td>
<td>FTR Options</td>
</tr>
<tr>
<td><strong>FTR Class Types</strong></td>
<td>On peak</td>
<td>On peak</td>
<td>On peak</td>
</tr>
<tr>
<td></td>
<td>Off peak</td>
<td>Off peak</td>
<td>Off peak</td>
</tr>
<tr>
<td></td>
<td>24 Hour</td>
<td>24 Hour</td>
<td>24 Hour</td>
</tr>
<tr>
<td><strong>FTR Period</strong></td>
<td>One Year</td>
<td>One Year</td>
<td>One Month</td>
</tr>
<tr>
<td></td>
<td></td>
<td>One three-year planning period</td>
<td>One three-month planning period quarter</td>
</tr>
</tbody>
</table>
## Valid Sources and Sinks

<table>
<thead>
<tr>
<th></th>
<th>Annual and Long Term FTR Auctions</th>
<th>Monthly FTR Auctions Next Calendar Month</th>
<th>Monthly FTR Auctions Quarters and 2\textsuperscript{nd}/3\textsuperscript{rd} Month</th>
</tr>
</thead>
</table>
| **FTR Obligations**  | Valid Sources & Sinks are limited to:  
• Hubs  
• Zones  
• Aggregates  
• Interface Buses  
• Generator Buses | Valid Sources & Sinks include any single bus or combination of buses for which a Day-ahead LMP is calculated & posted:  
• Hubs  
• Zones  
• Aggregates  
• Interface Buses  
• Generator/Load Buses | Valid Sources & Sinks are limited to:  
• Hubs  
• Zones  
• Aggregates  
• Interface Buses  
• Generator Buses |
| **FTR Options***     | Only a subset of paths will be eligible for FTR Options in order to prevent potential auction clearing performance issues |  | *Option Product not available in Long-Term FTR Auction |
Auction Clearing Mechanism

- The FTR Auctions maximize the quote based bid value of a set of simultaneous feasible FTRs awarded in the auction.

- The FTR Auctions evaluate the simultaneous feasibility of all outstanding FTRs, in conjunction with new FTRs to be awarded or surrendered by Market Participants.
FTR Auction Process

Quotes Entered

Market Clears

FTRs Awarded

• Bids and Offers for FTRs are submitted via eFTR

• Winning Quotes determined
  • Highest bid-based valued combination of simultaneously feasible FTRs are selected

• Auction Results are posted
FTR Auction Software

- Uncompensated Parallel Flow Injections
- Transmission Outage Schedules
- Pre-existing FTRs
- Facility Ratings
- FTR Quotes (Buy or Sell)
- PJM Network Model
- List of Contingencies
- Aggregate Price Definitions

- FTRs Awarded in Auction
- FTRs Sold in Auction
- Nodal Prices
- Option Clearing Prices
- Aggregate Prices
- Binding Constraints
The Annual, Long Term, and Monthly FTR Auctions are multi-period auctions with FTR products that can overlap across multiple timeframes…

- FTR products can be On Peak FTRs, Off Peak FTRs and 24 Hour FTRs
- FTRs awarded in the Annual FTR Auction have a term of one year
- FTRs awarded in the Long Term FTR Auctions have a term on one or three years.
- The various products are cleared simultaneously and the clearing prices of products which overlap are related
eFTR is an internet application that allows PJM Market Participants to participate in …

- Annual ARR Allocation
- FTR Auctions
- FTR Secondary Market
Submitting Valid Auction Quotes

- Market
- Source
- Sink
- Class (on-peak, off-peak or 24 hour)
- Period
- Hedge (option or obligation)
- Trade (buy, sell or self-schedule for Round 1 of annual auction)
- Bid MW
- Bid Price ($/MW-three year for three year Long Term FTR product or $/MW-year for yearly product or $/MW-month for monthly product or $/MW-quarter for quarterly product)
FTR Auction Credit Requirement

- FTR Auction participants must establish an Auction Credit Limit prior to bidding into auction.
- Credit Requirement for a participant’s bids may not exceed Credit Limit.
- Credit Requirement for individual FTR bids is the price of the FTR bid minus estimate of revenue from the FTR.
- Participant’s Credit Requirement is the sum of Credit Requirement for each individual FTR bid offset by total value of Participant’s ARRs.
FTR Auction Credit Rules

- Credit requirements apply to All FTR auctions
  - For prompt-month monthly products, credit requirement only applies to “new” auction participants
  - "New" participants defined as those with less than six months of completed activity prior to the auction
  - Use monthly weighted average of past three years (50%-30%-20%) when calculating historical value
  - Separate historic values for on-peak, off-peak and 24-hour FTRs
  - Discount historical value by 10% when calculating credit requirements for FTR paths with positive expected value and add 10% for FTR paths with negative expected value
- Specific timetable for credit release
- No credit requirement for participants that self-schedule their ARRs into FTRs since ARR credits offset FTR costs in full
FTR Auction Credit Rules

• Credit Requirement Calculation
  1. Starts with a monthly credit calculation for each FTR
     • Monthly Price minus discounted historical value for each month for each FTR
  2. Within each month individual FTR credit numbers are added across all FTRs to result in 12 monthly subtotals for the account.
     • For cleared FTRs only, negative individual FTR credit numbers will offset positive numbers within the same month.
     • ARR credits in the account are subtracted from credit requirements each month.
       – Monthly ARR value
  3. Credit requirement is the sum of positive monthly subtotals
FTR Auction Credit Rules

- **FTR credit requirements for undiversified FTR auction bidding**
  - **Undiversified Portfolio Definitions**
    - **Flow Undiversified** = the FTR Portfolio is net counterflow which means the total value of the portfolio is negative based on FTR auction clearing prices.
    - **Geographically Undiversified** = The FTR portfolio is Flow Undiversified and the FTR portfolio has lower projected target allocations because of a single transmission outage.
    - The FTR portfolio is the cumulative position for all current and future FTRs cleared in previous auctions and FTRs cleared in any current preliminary auction case.
FTR Auction Credit Rules

- Check performed after preliminary auction clearing completed
- Screen for undiversified portfolios (geographically and by flow)
- Additional collateral:
  - 2 times absolute value of FTR auction-based value if flow undiversified
  - 3 times absolute value of FTR auction-based value if flow and geographically undiversified
  - Required posted within one business day
  - Load-serving entities would get offsets for ARRs
### Historical LMPs and Hours

<table>
<thead>
<tr>
<th>NODE</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$23</td>
<td>$25</td>
<td>$27</td>
<td>$23</td>
<td>$18</td>
<td>$56</td>
<td>$52</td>
<td>$49</td>
<td>$47</td>
<td>$35</td>
<td>$29</td>
<td>$25</td>
</tr>
<tr>
<td>B</td>
<td>$36</td>
<td>$38</td>
<td>$40</td>
<td>$54</td>
<td>$49</td>
<td>$34</td>
<td>$30</td>
<td>$27</td>
<td>$25</td>
<td>$45</td>
<td>$42</td>
<td>$38</td>
</tr>
<tr>
<td>C</td>
<td>$34</td>
<td>$36</td>
<td>$38</td>
<td>$34</td>
<td>$29</td>
<td>$23</td>
<td>$27</td>
<td>$25</td>
<td>$45</td>
<td>$44</td>
<td>$40</td>
<td>$36</td>
</tr>
<tr>
<td>D</td>
<td>$14</td>
<td>$20</td>
<td>$24</td>
<td>$65</td>
<td>$60</td>
<td>$42</td>
<td>$31</td>
<td>$33</td>
<td>$56</td>
<td>$56</td>
<td>$47</td>
<td>$42</td>
</tr>
<tr>
<td>E</td>
<td>$37</td>
<td>$40</td>
<td>$37</td>
<td>$52</td>
<td>$24</td>
<td>$33</td>
<td>$31</td>
<td>$60</td>
<td>$56</td>
<td>$47</td>
<td>$42</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>$67</td>
<td>$69</td>
<td>$71</td>
<td>$13</td>
<td>$65</td>
<td>$61</td>
<td>$58</td>
<td>$56</td>
<td>$23</td>
<td>$73</td>
<td>$69</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>$34</td>
<td>$36</td>
<td>$26</td>
<td>$45</td>
<td>$41</td>
<td>$38</td>
<td>$36</td>
<td>$32</td>
<td>$40</td>
<td>$36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>$3</td>
<td>$5</td>
<td>$7</td>
<td>$67</td>
<td>$62</td>
<td>$13</td>
<td>$9</td>
<td>$6</td>
<td>$4</td>
<td>$16</td>
<td>$9</td>
<td>$5</td>
</tr>
</tbody>
</table>

Assume On-Peak, Off-Peak, and 24-HR historical LMPs are the same for example.

<table>
<thead>
<tr>
<th></th>
<th># of On-Peak Hours</th>
<th># of Off-Peak Hours</th>
<th># of 24-HR Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>JUN 2007</td>
<td>306</td>
<td>304</td>
<td>720</td>
</tr>
<tr>
<td>JUL 2007</td>
<td>306</td>
<td>408</td>
<td>744</td>
</tr>
<tr>
<td>AUG 2007</td>
<td>363</td>
<td>376</td>
<td>744</td>
</tr>
<tr>
<td>SEP 2007</td>
<td>304</td>
<td>416</td>
<td>720</td>
</tr>
<tr>
<td>OCT 2007</td>
<td>363</td>
<td>376</td>
<td>744</td>
</tr>
<tr>
<td>NOV 2007</td>
<td>386</td>
<td>386</td>
<td>721</td>
</tr>
<tr>
<td>DEC 2007</td>
<td>320</td>
<td>424</td>
<td>744</td>
</tr>
<tr>
<td>JAN 2008</td>
<td>352</td>
<td>392</td>
<td>744</td>
</tr>
<tr>
<td>FEB 2008</td>
<td>336</td>
<td>360</td>
<td>696</td>
</tr>
<tr>
<td>MAR 2008</td>
<td>336</td>
<td>407</td>
<td>743</td>
</tr>
<tr>
<td>APR 2008</td>
<td>352</td>
<td>368</td>
<td>720</td>
</tr>
<tr>
<td>MAY 2008</td>
<td>336</td>
<td>408</td>
<td>744</td>
</tr>
<tr>
<td>Total</td>
<td>4080</td>
<td>4704</td>
<td>8784</td>
</tr>
</tbody>
</table>
### FTR Credit Example

#### Annual Bids

**Auction Open**

<table>
<thead>
<tr>
<th>FTR ID</th>
<th>Source</th>
<th>Sink</th>
<th>Period</th>
<th>Trade Type</th>
<th>Bid MW</th>
<th>Hedge Type</th>
<th>Class Type</th>
<th>Bid ($MMW)</th>
<th>Payment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>C</td>
<td>All</td>
<td>Buy</td>
<td>1</td>
<td>Obligation</td>
<td>ON</td>
<td>$200</td>
<td>$200</td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td>D</td>
<td>All</td>
<td>Buy</td>
<td>1</td>
<td>Obligation</td>
<td>ON</td>
<td>-$600</td>
<td>-$600</td>
</tr>
<tr>
<td>3</td>
<td>C</td>
<td>E</td>
<td>All</td>
<td>Buy</td>
<td>1</td>
<td>Obligation</td>
<td>OFF</td>
<td>$5,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>4</td>
<td>A</td>
<td>F</td>
<td>All</td>
<td>Buy</td>
<td>1</td>
<td>Obligation</td>
<td>ON</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
</tbody>
</table>

\[($900 \times 336/4080) - ((1-0.1)(\$34-\$23)(1 \text{ MW})(336 \text{ Hrs})\]  
10% discount for volatility

\[($900 \times 320/4080) - ((1+ 0.1)(\$27-\$52)(1 \text{ MW})(320 \text{ Hrs})\]  
10% adder for counterflow bid in which Sink LMP < Source LMP

#### FTR ID

<table>
<thead>
<tr>
<th>FTR ID</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
<th>OCT</th>
<th>NOV</th>
<th>DEC</th>
<th>JAN</th>
<th>FEB</th>
<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>Bid Credit Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$3,252</td>
<td>-$3,252</td>
<td>$3,652</td>
<td>-$2,943</td>
<td>$3,961</td>
<td>$12,271</td>
<td>$8,971</td>
<td>$13,210</td>
<td>$8,133</td>
<td>-$3,647</td>
<td>-$3,497</td>
<td>-$3,295</td>
<td>$31,225</td>
</tr>
<tr>
<td>2</td>
<td>$6,002</td>
<td>$6,502</td>
<td>$6,223</td>
<td>-$6,364</td>
<td>$8,887</td>
<td>-$2,466</td>
<td>-$1,435</td>
<td>-$1,953</td>
<td>-$1,752</td>
<td>$223</td>
<td>$6,142</td>
<td>$6,864</td>
<td>$33,435</td>
</tr>
<tr>
<td>3</td>
<td>-$529</td>
<td>-$1,059</td>
<td>-$1,292</td>
<td>-$1,854</td>
<td>$7,163</td>
<td>$1,628</td>
<td>-$1,701</td>
<td>-$4,477</td>
<td>-$3,803</td>
<td>-$3,877</td>
<td>-$1,770</td>
<td>$953</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>-$35,223</td>
<td>-$13,223</td>
<td>-$14,683</td>
<td>$75</td>
<td>$100</td>
<td>-$2,839</td>
<td>-$2,514</td>
<td>-$2,785</td>
<td>-$2,839</td>
<td>$82</td>
<td>-$15,883</td>
<td>-$13,223</td>
<td>$247</td>
</tr>
</tbody>
</table>

\[($1000 \times 304/4080) - ((1-0.1)(\$15-\$34)(1 \text{ MW})(304 \text{ Hrs})\]  
$0

Expected Value is set to zero if Sink LMP < Source LMP and Hedge Type = Option

#### Cleared Credit Requirements

| FTR ID | JUN  | JUL  | AUG  | SEP  | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1      | $3,252 | -$3,252 | $3,652 | -$2,943 | $3,961 | $12,271 | $8,971 | $13,210 | $8,133 | -$3,647 | -$3,497 | -$3,295 | $31,225 |
| 2      | $6,002 | $6,502 | $6,223 | -$6,364 | $8,887 | -$2,466 | -$1,435 | -$1,953 | -$1,752 | $223  | $6,142 | $6,864 | $33,435 |
| 3      | -$529  | -$1,059 | -$1,292 | -$1,854 | $7,163 | $1,628 | -$1,701 | -$4,477 | -$3,803 | -$3,877 | -$1,770 | $953  |
| 4      | -$35,223 | -$13,223 | -$14,683 | $75   | $100  | -$2,839 | -$2,514 | -$2,785 | -$2,839 | $82   | -$15,883 | -$13,223 |

**MONTHLY SUBTOTAL**

| FTR ID | JUN  | JUL  | AUG  | SEP  | OCT  | NOV  | DEC  | JAN  | FEB  | MAR  | APR  | MAY  |
|--------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1      | $3,252 | -$3,252 | $3,652 | -$2,943 | $3,961 | $12,271 | $8,971 | $13,210 | $8,133 | -$3,647 | -$3,497 | -$3,295 | $31,225 |
| 2      | $6,002 | $6,502 | $6,223 | -$6,364 | $8,887 | -$2,466 | -$1,435 | -$1,953 | -$1,752 | $223  | $6,142 | $6,864 | $33,435 |
| 3      | -$529  | -$1,059 | -$1,292 | -$1,854 | $7,163 | $1,628 | -$1,701 | -$4,477 | -$3,803 | -$3,877 | -$1,770 | $953  |
| 4      | -$35,223 | -$13,223 | -$14,683 | $75   | $100  | -$2,839 | -$2,514 | -$2,785 | -$2,839 | $82   | -$15,883 | -$13,223 |

**Total Credit Requirement**

$14,382

Total credit requirement equals the sum of positive monthly subtotals.
Credit Release Schedule

• Specific timetable for credit release
• The individual monthly credit requirements for FTRs is removed after the billing date of each month
  – If monthly subtotal is negative than there will be no change in total credit requirement
  – If monthly subtotal is positive than the total credit requirement will be reduced by positive monthly subtotal of completed month
• Credit requirements can change as historical monthly values are updated on a yearly basis
Market Settlements
FTR Target Allocation = (FTR MW) * (Congestion Price_{FTR Sink} – Congestion Price_{FTR Source})

- FTR Target Allocation is equal to the FTR MW amount times the congestion price difference from the FTR sink point to the FTR source point.
- Congestion Price based on the clearing prices from Day Ahead Market.
- If Congestion Price_{FTR Sink} < Congestion Price_{FTR Source}:
  - the FTR is a liability if FTR defined as Obligation.
  - the FTR has zero value if defined as Option.