

## **6.4 Offer Price Caps.**

### **6.4.1 Applicability.**

(a) If, at any time, it is determined by the Office of the Interconnection in accordance with Sections 1.10.8 or 6.1 of this Schedule that any generation resource may be dispatched out of economic merit order to maintain system reliability as a result of limits on transmission capability, the offer prices for energy from such resource shall be capped as specified below. For such generation resources committed in the Day-ahead Energy Market, if the Office of the Interconnection is able to do so, such offer prices shall be capped for the entire commitment period, and such offer prices will be capped at a cost-based offer in accordance with section 6.4.2 and committed at the market-based offer or cost-based offer which results in the lowest overall system production cost. For such generation resources committed in the Real-time Energy Market such offer prices shall be capped at a cost-based offer in accordance with section 6.4.2 and dispatched on the market-based offer or cost-based offer which results in the lowest dispatch cost in accordance with 6.4.1(g) until the earlier of: (i) the resource is released from its commitment by the Office of the Interconnection; (ii) the end of the Operating Day; or (iii) the start of the generation resource's next pre-existing commitment.

The offer on which a resource is committed shall initially be determined at the time of the commitment. If any of the resource's Incremental Energy Offer, No-load Cost or Start-Up Cost are updated for any portion of the offer capped hours subsequent to commitment, the Office of the Interconnection will redetermine the level of the offer cap using the updated offer values. The Office of the Interconnection will dispatch the resource on the market-based offer or cost-based offer which results in the lowest dispatch cost as determined in accordance with section 6.4.1(g).

Resources that are self-scheduled to run in either the Day-ahead Energy Market or in the Real-time Energy Market are subject to the provisions of this section 6.4. The offer on which a resource is dispatched shall be used to determine any Locational Marginal Price affected by the offer price of such resource and as further limited as described in Tariff, Attachment K-Appendix, section 2.4 and Tariff, Attachment K-Appendix, section 2.4A.

In accordance with section 6.4.1(h), a generation resource that is offer capped in the Real-time Energy Market but released from its commitment by the Office of the Interconnection will be subject to the three pivotal supplier test and further offer capping, as applicable, if the resource is committed for a period later in the same Operating Day.

(b) The energy offer price by any generation resource requested to be dispatched in accordance with Section 6.3 of this Schedule shall be capped at the levels specified in Section 6.4.2 of this Schedule. If the Office of the Interconnection is able to do so, such offer prices shall be capped only during each hour when the affected resource is so scheduled, and otherwise shall be capped for the entire Operating Day. Energy offer prices as capped shall be used to determine any Locational Marginal Price affected by the price of such resource.

(c) Generation resources subject to an offer price cap shall be paid for energy at the applicable Locational Marginal Price.

(d) [Reserved for Future Use]

(e) Offer price caps under section 6.4 of this Schedule shall be suspended for a generation resource with respect to transmission limit(s) for any period in which a generation resource is committed by the Office of the Interconnection for the Operating Day or any period for which the generation resource has been self-scheduled where (1) there are not three or fewer generation suppliers available for redispatch under subsection (a) that are jointly pivotal with respect to such transmission limit(s), and (2) the Market Seller of the generation resource, when combined with the two largest other generation suppliers, is not pivotal (“three pivotal supplier test”). In the event the Office of the Interconnection system is unable to perform the three pivotal supplier test for a Market Seller, generation resources of that Market Seller that are dispatched to control transmission constraints will be dispatched on the resource’s market-based offer or cost-based offer which results in the lowest dispatch cost as determined in accordance with section 6.4.1(g).

(f) For the purposes of conducting the three pivotal supplier test in subsection (e), the following applies:

- (i) All megawatts of available incremental supply, including available self-scheduled supply for which the power distribution factor (“dfax”) has an absolute value equal to or greater than the dfax used by the Office of the Interconnection’s system operators when evaluating the impact of generation with respect to the constraint (“effective megawatts”) will be included in the available supply analysis at costs equal to the cost-based offers of the available incremental supply adjusted for dfax (“effective costs”). The Office of the Interconnection will post on the PJM website the dfax value used by operators with respect to a constraint when it varies from three percent.
- (ii) The three pivotal supplier test will include in the definition of the relevant market incremental supply up to and including all such supply available at an effective cost equal to 150% of the cost-based clearing price calculated using effective costs and effective megawatts and the need for megawatts to solve the constraint.
- (iii) Offer price caps will apply on a generation supplier basis (i.e. not a generating unit by generating unit basis) and only the generation suppliers that fail the three pivotal supplier test with respect to any hour in the relevant period will have their units that are dispatched with respect to the constraint offer capped. A generation supplier for the purposes of this section includes corporate affiliates. Supply controlled by a generation supplier or its affiliates by contract with unaffiliated third parties or otherwise will be included as supply of that generation supplier; supply owned by a generation supplier but controlled by an unaffiliated third party by contract or otherwise will be included as supply of that third party.

A generation supplier's units, including self-scheduled units, are offer capped if, when combined with the two largest other generation suppliers, the generation supplier is pivotal.

- (iv) In the Day-ahead Energy Market, the Office of the Interconnection shall include price sensitive demand, Increment Offers and Decrement Bids as demand or supply, as applicable, in the relevant market.

(g) In the Real-time Energy Market, the schedule on which offer capped resources will be placed shall be determined using dispatch cost, where dispatch cost is calculated pursuant to the following formulas:

Dispatch cost for the applicable hour = ((Incremental Energy Offer @ Economic Minimum for the hour [\$/MWh] \* Economic Minimum for the hour [MW]) + No-load Cost for the hour [\$/H])

- (i) For resources committed in the Real-time Energy Market, the resource is committed on the offer with the lowest Total Dispatch cost at the time of commitment,

where:

Total Dispatch cost = Sum of hourly dispatch cost over a resource's minimum run time [\$] + Start-Up Cost [\$]

- (ii) For resources operating in real-time pursuant to a day-ahead or real-time commitment, and whose offers are updated after commitment, the resource is dispatched on the offer with the lowest dispatch cost for the each of the updated hours.
- (iii) However, once the resource is dispatched on a cost-based offer, it will remain on a cost-based offer regardless of the determination of the cheapest schedule.

(h) A generation resource that was committed in the Day-ahead Energy Market or Real-time Energy Market, is operating in real time, and may be dispatched out of economic merit order to maintain system reliability as a result of limits on transmission capability, will be offer price capped, subject to the outcome of a three pivotal supplier test, for each hour the resource operates beyond its committed hours or Minimum Run Time, whichever is greater, or in the case of resources self-scheduled in the Real-time Energy Market, for each hour the resource operates beyond its first hour of operation, in accordance with the following provisions.

- (i) If the resource is operating on a cost-based offer, it will remain on a cost-based offer regardless of the results of the three pivotal supplier test.

- (ii) If the resource is operating on a market-based offer and the Market Seller fails the three pivotal supplier test then the resource will be dispatched on the cheaper of its market-based offer or the cost-based offer representing the offer cap as determined by section 6.4.2, whichever results in the lowest dispatch cost as determined under section 6.4.1(g).
- (iii) If the Market Seller passes the three pivotal supplier test and the resource is currently operating on a market-based offer then the resource will remain on that offer, unless the Market Seller elects to not have its market-based offer considered for dispatch and to have only the cost-based offer that represents the offer cap level as determined under section 6.4.2 considered for dispatch in which case the resource will be dispatched on its cost-based offer for the remainder of the Operating Day.

#### **6.4.2 Level.**

- (a) The offer price cap shall be one of the amounts specified below, as specified in advance by the Market Seller for the affected unit:
  - (i) The weighted average Locational Marginal Price at the generation bus at which energy from the capped resource was delivered during a specified number of hours during which the resource was dispatched for energy in economic merit order, the specified number of hours to be determined by the Office of the Interconnection and to be a number of hours sufficient to result in an offer price cap that reflects reasonably contemporaneous competitive market conditions for that unit;
  - (ii) For offers of \$2,000/MWh or less, the incremental operating cost of the generation resource as determined in accordance with Schedule 2 of the Operating Agreement and the PJM Manuals (“incremental cost”), plus up to the lesser of 10% of such costs or \$100 MWh, the sum of which shall not exceed \$2,000/MWh; and, for offers greater than \$2,000/MWh, the incremental cost of the generation resource;
  - (iii) For units that are frequently offer capped (“Frequently Mitigated Unit” or “FMU”), and for which the unit’s market-based offer was greater than its cost based offer, the following shall apply:
    - (a) For units that are offer capped for 60% or more of their run hours, but less than 70% of their run hours, the offer price cap will be the greater of either (i) incremental cost plus 10% or (ii) incremental cost plus \$20 per megawatt-hour;
    - (b) For units that are offer capped for 70% or more of their run hours, but less than 80% of their run hours, the offer price cap will be the greater

of either (i) incremental cost plus 10%, or (ii) incremental cost plus \$30 per megawatt-hour;

(c) For units that are offer capped for 80% or more of their run hours, the offer price cap will be the greater of either (i) incremental costs plus 10%; or (ii) incremental cost plus \$40 per megawatt-hour.

(b) For purposes of section 6.4.2(a)(iii), a generating unit shall qualify for the specified offer cap upon issuance of written notice from the Market Monitoring Unit, pursuant to Section II.A of the Attachment M-Appendix, that it is a “Frequently Mitigated Unit” because it meets all of the following criteria:

- (i) The unit was offer capped for the applicable percentage of its run hours, determined on a rolling 12-month basis, effective with a one month lag.
- (ii) The unit’s Projected PJM Market Revenues plus the unit’s PJM capacity market revenues on a rolling 12-month basis, divided by the unit’s MW of installed capacity (in \$/MW-year) are less than its accepted unit specific Avoidable Cost Rate (in \$/MW-year) (excluding APIR and ARPIR), or its default Avoidable Cost Rate (in \$/MW-year) if no unit-specific Avoidable Cost Rate is accepted for the BRAs for the Delivery Years included in the rolling 12-month period, determined pursuant to Sections 6.7 and 6.8 of Attachment DD of the Tariff. (The relevant Avoidable Cost Rate is the weighted average of the Avoidable Cost Rates for each Delivery Year included in the rolling 12-month period, weighted by month.)
- (iii) No portion of the unit is included in a FRR Capacity Plan or receiving compensation under Part V of the Tariff.
- (iv) The unit is internal to the PJM Region and subject only to PJM dispatch.

(c) Any generating unit, without regard to ownership, located at the same site as a Frequently Mitigated Unit qualifying under Sections 6.4.2(a)(iii) shall become an “Associated Unit” upon issuance of written notice from the Market Monitoring Unit pursuant to Section II.A of Attachment M-Appendix, that it meets all of the following criteria:

1. The unit has the identical electric impact on the transmission system as the FMU;
2. The unit (i) belongs to the same design class (where a design class includes generation that is the same size and utilizes the same technology, without regard to manufacturer) and uses the identical primary fuel as the FMU or (ii) is regularly dispatched by PJM as a substitute for the FMU based on differences in cost that result from the currently applicable FMU adder;
3. The unit (i) has an average daily cost-based offer, as measured over the

preceding 12-month period, that is less than or equal to the FMU's average daily cost-based offer adjusted to include the currently applicable FMU adder or (ii) is regularly dispatched by PJM as a substitute for the FMU based on differences in cost that result from the currently applicable FMU adder.

The offer cap for an associated unit shall be equal to the incremental operating cost of such unit, as determined in accordance with Schedule 2 of the Operating Agreement and the PJM Manuals, plus the applicable percentage adder or dollar per megawatt-hour adder as specified in Section 6.4.2(a)(iii)(a), (b), or (c) for the unit with which it is associated.

(d) Market Participants shall have exclusive responsibility for preparing and submitting their offers on the basis of accurate information and in compliance with the FERC Market Rules, inclusive of the level of any applicable offer cap, and in no event shall PJM be held liable for the consequences of or make any retroactive adjustment to any clearing price on the basis of any offer submitted on the basis of inaccurate or non-compliant information.

### **6.4.3 Verification of Cost-Based Offers Over \$1,000/Megawatt-hour**

(a) If a Market Seller submits a cost-based energy offer for a generation resource that includes an Incremental Energy Offer greater than \$1,000/megawatt-hour, then, in order for that offer to be eligible to set the applicable Locational Marginal Price as described in Tariff, Attachment K-Appendix, section 2.5 (for determining Real-time Prices) and Operating Agreement Schedule 1, section 2.6 (for determining Day-ahead Prices), the Office of the Interconnection shall apply a formulaic screen to verify the reasonableness of the Incremental Energy Offer component of such cost-based offer. For each Incremental Energy Offer segment greater than \$1,000/megawatt-hour, the Office of the Interconnection shall evaluate whether such offer segment exceeds the reasonably expected costs for that generation resource by determining the Maximum Allowable Incremental Cost for each segment in accordance with the following formula:

Maximum Allowable Incremental Cost (\$/MWh segment in accordance with the following formula: @ MW) =  

$$[ ( \text{Maximum Allowable Operating Rate}_i ) - ( \text{Bid Production Cost}_{i-1} ) ] / ( \text{MW}_i - \text{MW}_{i-1} )$$

where

$i$  = an offer segment within the Incremental Energy Offer, which is comprised of a pairing of price (\$/MWh) and a megawatt quantity

Maximum Allowable Operating Rate (\$/hour @ MW) =  

$$[ ( \text{Heat Input}_i \text{ @ MW}_i ) \times ( \text{Performance Factor} ) \times ( \text{Fuel Cost} ) ] \times ( 1 + A )$$

where

Heat Input = a point on the heat input curve (in MMBtu/hr), determined in accordance with PJM Manual 15, describing the resource's operational

characteristics for converting the applicable fuel input (MMBtu) into energy (MWh) specified in the Incremental Energy Offer;

Performance Factor = a scaling factor that is a calculated ratio of actual fuel burn to either theoretical fuel burn (i.e., design Heat Input) or other current tested Heat Input, which is determined annually in accordance with the Market Seller's PJM-approved Fuel Cost Policy, Operating Agreement, Schedule 2, and PJM Manual 15, reflecting the resource's actual ability to convert fuel into energy (normal operation is 1.0);

Fuel Cost = applicable fuel cost as estimated by the Office of the Interconnection at a geographically appropriate commodity trading hub, plus 10 percent; and

A = Cost adder, in accordance with section 6.4.2(a)(ii) of this Schedule.

$$\text{Bid Production Cost (\$/hour @ MW)} = \left[ \sum_{i=1}^n (MW_i - MW_{i-1}) \times (P_i) - \frac{1}{2} \times \text{UBS} \times (MW_i - MW_{i-1}) \times (P_i - P_{i-1}) \right] + \text{No-Load Cost}$$

where

MW = the MW quantity per offer segment within the Incremental Energy Offer;

P = the price (in dollars per megawatt-hour) per offer segment within the Incremental Energy Offer;

UBS = Uses Bid-Slope = 0 for block-offer resources (i.e., a resource with an Incremental Energy Offer that uses a step function curve); and 1 for all other resources (i.e., resources with an Incremental Energy Offer that uses a sloped offer curve); and

If the price submitted for the offer segment is less than or equal to the Maximum Allowable Incremental Cost then that offer segment shall be deemed verified and is eligible to set the applicable Locational Marginal Price. If the price submitted for the offer segment is greater than the Maximum Allowable Incremental Cost, then the Market Seller's cost-based offer for that segment and all segments at an equal or greater price are deemed not verified and are not eligible to set the applicable Locational Marginal Price and such offer shall be price capped at the greater of \$1,000/megawatt-hour or the offer price of the most expensive verified segment on the Incremental Energy Offer for the purpose of setting Locational Marginal Prices; provided however, such Market Seller shall be allowed to submit a challenge to a non-verification determination, including supporting documentation, to the Office of the Interconnection in accordance with the procedures set forth in the PJM Manuals. Upon review of such documentation, the Office of the Interconnection may determine that the Market Seller's cost-based offer is verified and eligible to set the applicable Locational Marginal Price as described above.

- (i) For the first incremental segment ( $i=1$ ), when the MW in the segment is greater than zero, the first segment shall be screened as a block-loaded segment ( $UBS=0$ ) as if there was a preceding  $MW_{i-1}$  of zero. The Maximum Allowable Incremental Cost calculation for the first incremental would use a preceding Bid Production Cost  $i-1$  (at zero MW) equal to the energy No-Load Cost.
- (ii) For the first incremental segment ( $i=1$ ), when the MW in the segment is equal to zero, and is the only bid-in segment to be verified, then the segment shall be deemed not verified and subject to the rules as described above.
- (iii) For the first incremental segment ( $i=1$ ), when the MW in the segment is equal to zero, and there are additional segments to be verified, then the first segment shall be deemed verified only if the second segment is deemed verified. If the second segment is deemed not verified, then the first segment shall also be deemed not verified and subject to the rules as described above.

(b) If an Economic Load Response Participant a cost-based demand reduction offer that includes incremental costs greater than or equal to \$1,000/megawatt-hour, in order for that offer to be eligible to determine the applicable Locational Marginal Price as described in Tariff, Attachment K-Appendix, section 2.5 (for determining Real-time Prices) and Tariff, Attachment K-Appendix, section 2.6 (for determining Day-ahead Prices), the Economic Load Response Participant must validate the incremental costs with the end use customer(s) and, upon request, submit to the Office of the Interconnection supporting documentation demonstrating that the end-use customer's costs in providing such demand reduction are greater than \$1,000/megawatt-hour in accordance with the following provisions:

- (i) The supporting documentation must explain and support the quantification of the end-use customer's incremental costs; and
- (ii) The end use customer's incremental costs shall include quantifiable cost incurred for not consuming electricity when dispatched by the Office of the Interconnection, such as wages paid without production, lost sales, damaged products that cannot be sold, or other incremental costs as defined in the PJM Manuals or as approved by the Office of the Interconnection, and may not include shutdown costs.

If upon review of the supporting documentation for the Economic Load Response Participant's, cost-based offer by the Office of the Interconnection and the Market Monitoring Unit, the Office of the Interconnection and/or the Market Monitoring Unit determines that the offer was not reasonably supported by incremental costs greater than or equal to \$1,000/megawatt-hour, the Office of the Interconnection and/or the Market Monitoring Unit may refer the matter to the FERC Office of Enforcement for investigation.

### 6.4.3A Verification of Fast-Start Resource Composite Energy Offers Over \$1,000/Megawatt-hour

(a) If a Market Seller submits a cost-based offer for a generation resource that is a Fast-Start Resource that results in a Composite Energy Offer that is greater than \$1,000/megawatt-hour, then, in order for that Composite Energy Offer to be eligible to set the applicable Locational Marginal Price under Tariff, Attachment K-Appendix, section 2.5 (for determining Real-time Prices) and Tariff, Attachment K-Appendix, section 2.6 (for determining Day-ahead Prices), the Office of the Interconnection shall apply a formulaic screen to verify the reasonableness of the offer components:

Incremental Energy Offer and No-load Cost components of each offer segment shall be evaluated for whether it exceeds the reasonably expected costs for that resource by applying the test described in Tariff, Attachment K-Appendix, section 6.4.3.

Start-Up Cost component shall be evaluated for whether it exceeds the reasonably expected costs for that resource by applying the following formula:

$$\text{Start-Up Cost (\$)} = [ [ (\text{Performance Factor}) \times (\text{Start Fuel}) \times (\text{Fuel Cost}) ] + \text{Start Maintenance Adder} + \text{Additional Start Labor} + \text{Station Service Cost} ] \times (1 + A)$$

Where:

Start Fuel =

For units without a soak process, "Start Fuel" is fuel consumed from first fire of the start process to first breaker closing plus fuel expended from last breaker opening to shutdown.

For units with soak process, "Start Fuel" is fuel consumed from first fire of start process (initial reactor criticality for nuclear units) to the level at which the unit can follow PJM's dispatch (including auxiliary boiler fuel) plus fuel expended from last breaker opening to shutdown, excluding normal plant heating/auxiliary equipment fuel requirements, fuel consumed from first fire of start process to breaker closing plus fuel expended from breaker opening of the previous shutdown to initialization of the (hot) unit start-up, excluding normal plant heating/auxiliary equipment fuel requirements;

Fuel Cost = applicable fuel cost as estimated by the Office of the Interconnection at a geographically appropriate commodity trading hub, plus 10 percent;

Performance Factor = a scaling factor that is a calculated ratio of actual fuel burn to either theoretical fuel burn (i.e., design Heat Input) or other current tested Heat Input, which is determined annually in accordance with the Market Seller's PJM-approved Fuel Cost Policy under Operating Agreement, Schedule 2 and PJM Manual 15, reflecting the resource's actual ability to convert fuel into energy (normal operation is 1.0);

Start Maintenance Adder = an adder based on all available maintenance expense history for the defined Maintenance Period regardless of unit ownership. Only expenses incurred as a result of electric production qualify for inclusion. Only Maintenance Adders specified as \$/Start, \$/MMBtu, or \$/equivalent operating hour can be included in the Start Maintenance Adder;

~~Start Additional Labor = additional labor costs for startup required above normal station manning levels; and~~

Station Service Cost = station service usage (MWh) during start-up multiplied by the 12-month rolling average off-peak energy prices as updated quarterly by the Office of the Interconnection.

A = cost adder, in accordance with Tariff, Attachment K-Appendix, section 6.4.2(a)(ii).

(b) Should the submitted Incremental Energy Offer and No-load Cost exceed the reasonably expected costs for that resource as calculated pursuant to subsection (a) above for any segment, then for the determination of Locational Marginal Prices as described in Tariff, Attachment K-Appendix, section 2.5 (for determining Real-time Prices) and Tariff, Attachment K-Appendix, section 2.6 (for determining Day-ahead Prices):

- (i) the Incremental Energy Offer for each segment shall be capped at the lesser of the cap described above in Tariff, Attachment K-Appendix, section 6.4.3 or the submitted Incremental Energy Offer; and
- (ii) the amortized No-load cost shall be adjusted as described in Tariff, Attachment K-Appendix, section 2.4 (Determination of Energy Offers Used in Calculating Real-time Prices) and Tariff, Attachment K-Appendix, section 2.4A (Determination of Energy Offers Used in Calculating Day-ahead Prices).

(c) Should the submitted Start-Up Cost exceed the reasonably expected costs for that resource as calculated pursuant to subsection (a) above, then for the determination of Locational Marginal Prices as described in Tariff, Attachment K-Appendix, section 2.5 (for determining Real-time Prices) and Tariff, Attachment K-Appendix, section 2.6 (for determining Day-ahead Prices), the Start-Up Costs shall be adjusted as described in Tariff, Attachment K-Appendix, section 2.4 (Determination of Energy Offers Used in Calculating Real-time Prices) and Tariff, Attachment K-Appendix, section 2.4A (Determination of Energy Offers Used in Calculating Day-ahead Prices).

(d) If an Economic Load Response Participant submits an offer to reduce demand for a Fast-Start Resource where the maximum segment of the resulting Composite Energy Offer exceeds \$1,000/megawatt-hour, then, in order for that Composite Energy Offer to be eligible to set the applicable Locational Marginal Price under Tariff, Attachment K-Appendix, section 2.5 (for determining Real-time Prices) and Tariff, Attachment K-Appendix, section 2.6 (for determining Day-ahead Prices), the Economic Load Response Participant must validate such costs with the end use customer(s) and, upon request, submit to the Office of the Interconnection supporting documentation demonstrating that the end-use customer's costs in providing such demand reduction are greater than \$1,000/megawatt-hour in accordance with the following provisions:

(i) The supporting documentation must explain and support the quantification of the end-use customer's incremental costs and shutdown costs; and

(ii) The end use customer's incremental and shutdown costs shall include quantifiable cost incurred for not consuming electricity when dispatched by the Office of the Interconnection, such as wages paid without production, lost sales, damaged products that cannot be sold, or other incremental costs as defined in the PJM Manuals or as approved by the Office of the Interconnection.

If upon review of the supporting documentation for the Economic Load Response Participant's, cost-based offer by the Office of the Interconnection and the Market Monitoring Unit, the Office of the Interconnection and/or the Market Monitoring Unit determines that the offer was not reasonably supported by incremental and shutdown costs greater than or equal to \$1,000/megawatt-hour, the Office of the Interconnection and/or the Market Monitoring Unit may refer the matter to the FERC Office of Enforcement for investigation.

Should the submitted shutdown cost exceed the reasonably supported costs for that resource, then for the determination of Locational Marginal Prices as described in Tariff, Attachment K-Appendix, section 2.5 (for determining Real-time Prices) and Tariff, Attachment K-Appendix, section 2.6 (for determining Day-ahead Prices), the shutdown costs shall be adjusted as described in Tariff, Attachment K-Appendix, section 2.4 (Determination of Energy Offers Used in Calculating Real-time Prices) and Tariff, Attachment K-Appendix, section 2.4A (Determination of Energy Offers Used in Calculating Day-ahead Prices).