

5.6 Transmission Constraint Penalty Factors

5.6.1 Application of Transmission Constraint Penalty Factors in the Day-ahead and Real-time Energy Markets

In the Day-ahead Energy Market, the Transmission Constraint Penalty Factors shall be used to ensure a feasible market clearing solution but not used to determine the Marginal Value of a transmission constraint. In the Real-time Energy Market, the Office of the Interconnection shall use Transmission Constraint Penalty Factors to determine the Marginal Value for a transmission constraint when that transmission constraint cannot be managed within the binding transmission limit in a dispatch interval. If a Market Suspension greater than twenty-four (24) consecutive hours is declared in the Real-time Energy Market as per Operating Agreement, Schedule 1, section 2.5.2, Transmission Constraint Penalty Factors shall not be used to determine the Marginal Value of a transmission constraint. The Marginal Value of the transmission constraint shall be used in the determination of the Congestion Price component of Locational Marginal Price as referenced in Tariff, Attachment K-Appendix, section 2.5 through Tariff, Attachment K-Appendix, section 2.6, and the parallel provisions of Operating Agreement, Schedule 1, section 2.5 through Operating Agreement, Schedule 1, section 2.6. The Transmission Constraint Penalty Factor may set the Marginal Value of the transmission constraint during any dispatch interval in the Real-time Energy Market depending on the following:

(a) If the market clearing software that clears the Real-time Energy Market cannot produce a solution that manages the flow on a constraint within the binding limit in a dispatch interval at a cost less than or equal to the Transmission Constraint Penalty Factor, the Transmission Constraint Penalty Factor shall set the Marginal Value of the transmission constraint. In such instances, to manage the flow over the constraint, the Office of the Interconnection may adjust the Transmission Constraint Penalty Factor as set forth in Tariff, Attachment K-Appendix, section 5.6.3 and the parallel provisions of Operating Agreement, Schedule 1, section 5.6.3.

(b) If the Real-time Energy Market constraints are subject to market-to-market congestion management protocols with an adjacent Regional Transmission Organization and the market clearing software cannot produce a solution that manages the flow on a constraint within the binding limit in a dispatch interval, the Office of the Interconnection may coordinate with such Regional Transmission Organization to either allow the Transmission Constraint Penalty Factor to set the Marginal Value of the transmission constraint or to apply the Constraint Relaxation Logic upon mutual agreement in accordance with applicable Joint Operating Agreements.

5.6.2 Default Transmission Constraint Penalty Factor Values

Transmission constraints modeling the flow of energy located within the metered boundaries of the PJM Region, including market-to-market coordinated constraints, regardless of voltage level, are defaulted to a \$30,000/MWh Transmission Constraint Penalty Factor in the Day-ahead Energy Market when determining the day-ahead security constrained economic dispatch, known as the dispatch run, and \$2,000/MWh in the determination of Day-ahead Prices in the pricing

run. Constraints modeling the flow of energy located within the metered boundaries of the PJM Region, excluding market-to-market coordinated constraints, regardless of voltage level, are defaulted to a \$2,000/MWh Transmission Constraint Penalty Factor in the Real-time Energy Market. Market-to-market coordinated constraints in the Real-time Energy Market, located within the metered boundaries of the PJM Region, will use a default Transmission Constraint Penalty Factor of \$1,000/MWh or a value agreed upon by PJM and the relevant Regional Transmission Organization in accordance with applicable Joint Operating Agreements.

Transmission constraints modeling the joint flow of energy and reserves, as described in the PJM Manuals, located within the metered boundaries of the PJM Region, excluding market-to-market coordinated constraints, will use a default Transmission Constraint Penalty Factor of \$1,000/MWh in both the dispatch run and the pricing run of the Day-ahead Energy Market and the Real-time Energy Market. Reserve deliverability constraints will not be modeled on market-to-market coordinated flowgates.

5.6.3 Modifications to Transmission Constraint Penalty Factor Values

(a) The Office of the Interconnection may modify the default Transmission Constraint Penalty Factor values used in the Real-time Energy Market or Day-ahead Energy Market for individual transmission constraints modeling the flow of energy to: (1) ensure the market clearing solution is feasible, (2) reflect changes to the operating practices which are mutually agreed upon with the neighboring RTO for managing such constraints for market-to-market coordinated constraints, or (3) reflect persistent system operational or reliability needs and the cost of the resources available to effectively relieve congestion on the constraint. When such conditions occur, the Office of the Interconnection may raise the Transmission Constraint Penalty Factor for transmission constraints modeling the flow of energy when sufficient congestion relief on the constraint cannot be provided by available resources at a cost below the default Transmission Constraint Penalty Factor. The Office of the Interconnection may lower the Transmission Constraint Penalty Factor for transmission constraints modeling the flow of energy when sufficient congestion relief on the constraint can be provided by available resources at a cost below the default Transmission Constraint Penalty Factor in order to prevent a high cost resource that cannot provide material congestion relief on the constraint from inappropriately setting price for the constraint or when congestion relief on the constraint can be provided by available resources at a cost below the default Transmission Constraint Penalty Factor but resources are not available for congestion relief between the marginal value of the appreciable resource and the default Transmission Constraint Penalty Factor if the congestion results from a transmission outage needed to address Regional Transmission Expansion Plan criteria or interconnection requests in the impacted area designed to improve system reliability. In either instance, to effectively relieve congestion on the constraint, the revised Transmission Constraint Penalty Factor value for transmission constraints modeling the flow of energy may be determined using the following formula, while accounting for the ability for such inputs to vary as system conditions change throughout the operating day:

$$\text{Revised Transmission Constraint Penalty Factor (\$/MW)} = \frac{\text{System Energy Price} + \text{Loss Price} + \text{Congestion Price} \\ \text{(all binding constraints)} - \text{Incremental Energy Offer}^*}{D_{\text{fax}}}$$

Where D_{fax} equals the distribution factor of the resource for the transmission constraint

*For purposes of this equation only, Incremental Energy Offer includes start up and no load costs where appropriate.

In the instance where the Transmission Constraint Penalty Factor for the transmission constraint modeling the flow of energy is modified, the values of the Transmission Constraint Penalty Factors for the corresponding transmission constraints modeling the joint flow of energy and reserves, as described in the PJM Manuals, located within the metered boundaries of the PJM Region, will be set to the lesser of (i) half of the revised value of the Transmission Constraint Penalty Factor for the transmission constraint modeling the flow of energy and (ii) \$1,000/MWh.

(b) The Office of the Interconnection shall post, as soon as practicable, on its website any changes to the default Transmission Constraint Penalty Factor values used in the Real-time Energy Market and/or the Day-ahead Energy Market.