

2.17 Using Transmission Constraint Penalty Factors in Market Clearing Engines

Transmission constraint penalty factors are parameters used by the Market Clearing Engines (MCE) to specify the maximum cost willing to be incurred to control a transmission constraint. The ultimate effect of the transmission constraint penalty factor is that it limits the controlling actions the MCE can take to resolve a constraint by limiting the cost that is willing to be incurred to control it.

The objective of the constraint control logic is to dispatch the least cost set of resources to meet the target line flow limit that dispatch is trying to control the constraint to at a marginal cost at or below the transmission constraint penalty factor. The transmission constraint penalty factor does not directly impact the marginal value of a constraint as long as the constraint can be solved by resources whose effective costs are lower than the value of the penalty factor. The cost of using a resource to control a constraint, or its effective cost, can be approximated by using the following equation.

$$\text{Effective Cost} \left(\frac{\$}{\text{MWh}} \right) = \left| \frac{(\text{Energy Price} + \text{Loss Price} + \text{Congestion Price (all binding constraints)} - \text{Incremental Cost})}{D_{fax}} \right|$$

If the flow on the constraint cannot be controlled below the level to which dispatch is attempting to control the line it results in a constraint violation in the MCE. The transmission constraint penalty factor is then used to set the marginal value of the violated transmission constraint.

PJM internal constraints including M2M coordinated constraints, regardless of voltage level, are defaulted to a \$30,000/MWh transmission penalty factor in the Day-ahead market clearing engine. All PJM internal constraints, regardless of voltage level, are defaulted to a \$2,000/MWh transmission penalty factor in the Real Time market. PJM may adjust the default penalty factor in real time for Market to Market Coordinated Constraints to reflect the operating practices which are mutually agreed upon with the neighboring RTO for managing such constraints.

PJM can also adjust, for an individual constraint, the default penalty factor or temporarily change the default penalty factor for an individual constraint, in order to reflect system operational needs and the cost of the resources available to effectively relieve congestion on the constraint. When PJM identifies that the effective cost of controlling actions available to relieve congestion on the constraint is not consistent with the default penalty factor, the penalty factor is increased or

decreased as documented in the Guidelines to Adjust Internal Constraint Penalty Factors posting on PJM.com.