Relaxation of Constraints Update

Joint Stakeholder Meeting
January 22, 2007

pjm

Midwest ISO
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Relaxation of Constraints

- Problem being addressed:
  - Under the current M2M implementation, sufficient redispatch for a coordinated constraint may be available in one RTO but not the other.
  - When this condition occurs, the RTO without sufficient redispatch available sets its shadow price and resulting LMPs based on the redispatch it does have available.
  - Because the magnitude of the shadow price in the RTO without sufficient available redispatch cannot reach that of the RTO with redispatch available, there will be a divergence in the shadow prices and the LMPs at the RTO border.

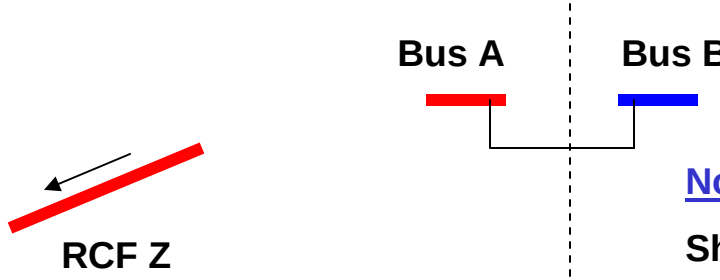
Relaxation of Constraints

- Current implementation steps
  - The monitoring RTO determines the shadow price that results from enforcing the RCF constraint on its system and the level of relief that it will request from the non-monitoring RTO.
  - The non-monitoring RTO modifies the flow limit on the RCF in its dispatch, and binds the constraint up to the shadow price calculated by the monitoring RTO.
  - If the non-monitoring RTO does not have sufficient relief available to redispatch up to the monitoring RTO's shadow price, the constraint relaxation logic will be activated and the non-monitoring RTO dispatches as much as possible.
  - The non-monitoring RTO calculates the shadow price for the RCF using the available redispatch which is limited by the maximum available physical control action inside the non-monitoring RTO.

Relaxation of Constraints

Current implementation example

Bus A & Bus B have the same impact on RCF Z (4% lower- help)



Monitoring RTO (MRTO)

Shadow Price for RCF Z = 800

MRTO system price = 50

LMP at Bus A = 50 + (800)(-0.04)

= 18

Non-Monitoring RTO (NMRTO)

Shadow Price for RCF Z = 200

(NMRTO does not have sufficient relief available to dispatch up to the MRTO's 800 shadow price. The constraint relaxation logic will be activated and the NMRTO dispatches as much relief as possible, in this case at the shadow prices of 200)

NMRTO system price = 50 *(same as MRTO)*

LMP at Bus B = 50 + (200)(-0.04)

= 42

The LMPs differ by $24 even though Bus A and Bus B are electrically close to each other.

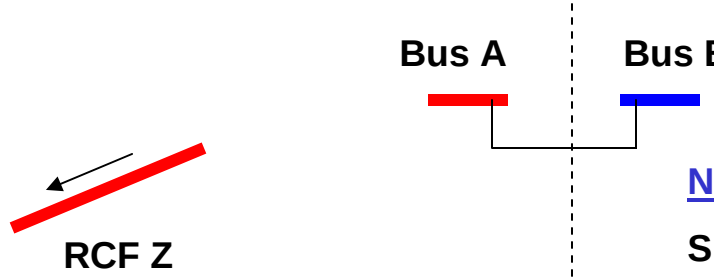
Relaxation of Constraints

- Proposed Change
  - If the non-monitoring RTO cannot provide sufficient relief to reach the monitoring RTO's shadow price, the constraint relaxation logic will be deactivated.
  - The non-monitoring RTO will then be able to use the monitoring RTO's shadow price without limiting the shadow price to the maximum shadow price associated with a physical control action inside the non-monitoring RTO.
  - With the RCF shadow prices being the same in both monitoring and non-monitor RTOs, their resulting bus LMPs will converge in a consistent price profile.
  - This change will also allow price convergence when the non-monitoring RTO has a higher shadow price than the monitoring RTO as long as the shadow price is within the willing-to-pay limit of the monitoring RTO.

Relaxation of Constraints

Example with the proposed change

Bus A & Bus B have the same impact on RCF Z (4% lower- help)



Monitoring RTO (MRTO)

Shadow Price for RCF Z = 800

MRTO system price = 50

LMP at Bus A = 50 + (800)(-0.04)

= 18

Non-Monitoring RTO (NMRTO)

Shadow Price for RCF Z = 800

(With the constraint relaxation logic deactivated, the NMRTO will be able to use the MRTO's shadow price without limiting the shadow price to the maximum shadow price associated with a physical control action inside the NMRTO)

NMRTO system price = 50 *(same as MRTO)*

LMP at Bus B = 50 + (800)(-0.04)

= 18

The LMPs converge to $18 for Bus A and Bus B.

Relaxation of Constraints

- Questions
- Comments