TCC Expansion Awards for Controllable Devices: Initial Discussion

Prepared for NYISO Market Structures Working Group

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CONTROLLABLE DEVICES — Overview

The expansion TCC award process developed by the MSWG applies to the award of TCCs for free-flowing AC expansions.

However, many of the expansions proposed in NY are controllable devices.

- DC Lines
- Phase Shifters
- FACTS Devices

CONTROLLABLE DEVICES — Basic Questions

The treatment of controllable expansions must address:

- The quantity and characteristics of the TCCs to award.
- The method for calculating the congestion rents that they will be paid.
- The method for representing the devices in TCC feasibility tests.

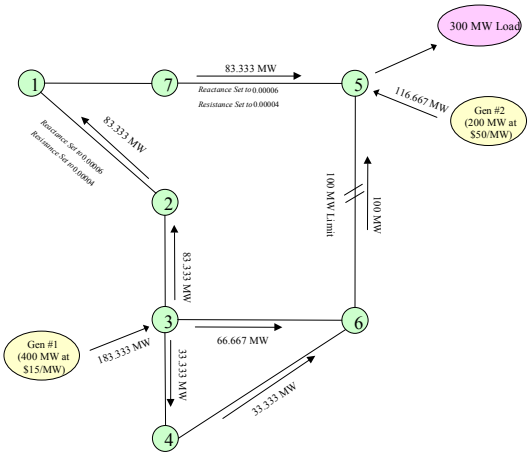
This discussion should be started, since it is so relevant.

CONTROLLABLE DEVICES — TCC Awards

Owners that build controllable lines (and other controllable devices) could be awarded TCCs reflecting the increase in transfer capability associated with the operation of the controllable line.

- The increase in transfer capability may depend on the schedule assumed for the controllable line.
- TCCs would be defined from the pricing point for deliveries from the controllable line to the destination of the TCC.
- TCC awards could vary with the direction of the schedule on the controllable line. Expansion awards could consist of two TCC options, one that applies for each direction of the scheduled flow on the line.

Scenario 3 Figure 14: (Line 2-5 Outage)



(From page I-29 of *Feasibility Study for a Combined Day-Ahead Market in the Northeast*, May 4, 2001, modified.)

CONTROLLABLE DEVICES — TCC Awards

TCC quantities would be determined from the increase in transfer capability provided by the controllable line.

- This increase in transfer capability would be determined from the maximal flows over the controllable line in any binding contingencies. The example shows that the controllable line from bus 7 to bus 5 increases transfer capability to bus 5 by 83.333 MW in the contingency in which the line from bus 2 to bus 5 is out.
- As with the analysis of AC expansions, the analysis would reserve all TCCs that are outstanding after the last Type A auction.
- The analysis could, in principal, optimize the schedule on the line and award TCCs based on this optimized level.

CONTROLLABLE DEVICES — TCC Pricing

Appendix I to the *Feasibility Study for a Combined Day-Ahead Market in the Northeast* discusses efficient pricing of deliveries from controllable lines. Under some circumstances these deliveries would be priced differently than power delivered at the same location from free-flowing lines.

Pricing for deliveries from controllable lines will depend on:

- Who schedules the line.
- Whether the line is the only binding contingency.
- How the line is operated in contingencies.

CONTROLLABLE DEVICES — Scheduling Entity

The ISO may schedule a controllable line as part of its overall economic dispatch.

- All receipts and deliveries would be identically priced, regardless of whether the energy is scheduled to flow over controllable or free-flowing lines.
- Separate prices for controllable lines are not required to incent efficient scheduling.
- ISO can collect congestion rents identically for all schedules.

Alternatively, schedules over the controllable line may be determined by individual market participants, in which case, the pricing should be designed to provide efficient incentives for scheduling use of the line.

CONTROLLABLE DEVICES — Contingencies

In the case in which an individual market participant schedules a controllable line, efficient pricing for deliveries will depend on whether or not the outage of the controllable line is a binding contingency.

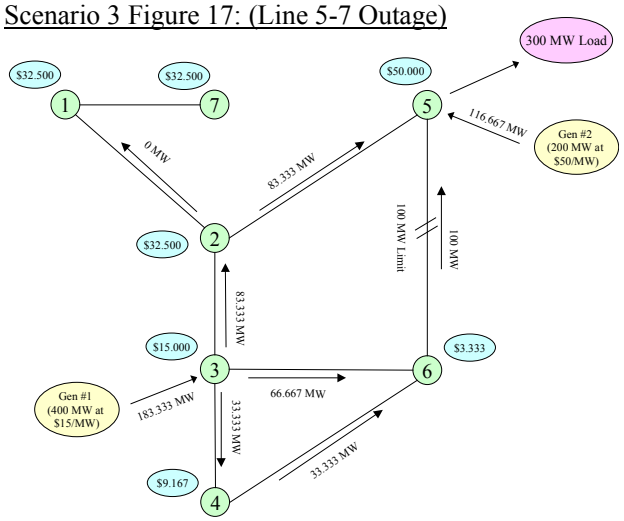
This pricing methodology for controllable lines is needed to support the revenue adequacy of TCCs awarded in the quantities previously described.

CONTROLLABLE DEVICES — Contingencies

If the controllable line is a binding contingency, then:

- Total deliveries will not depend on the schedule over the controllable line.
- A modified delivery price is therefore not needed to incent efficient scheduling of the controllable line.
- The price at the pricing point of the controllable line would be less than the price at the delivery bus, since there is congestion.

Scenario 3 Figure 17: (Line 5-7 Outage)



(From page I-25 of *Feasibility Study for a Combined Day-Ahead Market in the Northeast*, May 4, 2001.)

CONTROLLABLE DEVICES — Contingencies

The accompanying figure shows a case in which the outage of the controllable line from bus 7 to bus 5 is a binding contingency.

- The total pre-contingency schedules into bus 5 on the free-flowing lines (2-5 and 6-5) and the controllable line must be less than 183.333 to be secure.
- Any increase in the schedule on the free-flowing line would need to be accompanied by a decrease in schedules on the AC lines.
- The proxy price for deliveries from the controllable line would be $15, since an increase in the schedule on the controllable line simply displaces energy delivered on the open ties to bus 5.

CONTROLLABLE DEVICES — Contingencies

If the outage of the controllable line is not a binding contingency, then an increase in the schedule of the controllable line can increase total deliveries to a receiving area.

- In this case, separate prices are needed for deliveries from the controllable line and from the AC system.
- An increase in the schedule over the controllable line allows an increase in total deliveries of cheap power, decreasing the injections scheduled from constrained-on generation.
- The proxy price for deliveries from the controllable line is higher than for other deliveries to the receiving area.
  - If the controllable line schedule is held constant in the contingency, then the price is the avoided cost of higher cost generation at the delivery bus.
  - If the controllable line schedule increases in the contingency, it allows a further increase in low cost schedules, and a commensurate increase in the proxy price for deliveries from the controllable line.

CONTROLLABLE DEVICES — Modeling

For DC lines, the approach to representing the line in subsequent feasibility tests would include:

- Representing the line in the grid model as a fixed withdrawal at the "in" bus, and a fixed injection at the "out" bus. The fixed quantities would correspond to the schedule assumed for the DC line in the feasibility test for its expansion award.
- The fixed injections and withdrawals could vary between the pre-contingency power flow and the contingencies, depending on how the line is operated in contingencies.
- The expansion TCCs would be represented as options (bi-directional) in the feasibility test, as described elsewhere.

Further analysis is required to identify approaches to modeling other types of controllable devices in feasibility tests.