Determination of Loop Flow Settings
In New York MARS Related Studies

Draft ICS Work Product - For Discussion Purposes

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I. Introduction

At the conclusion of the 2008 IRM study and during the testing of External ICAP Import Rights, an anomaly was observed in the resource adequacy modeling of the New York System using the GE MARS software. This anomaly resulted in the NYCA LOLE improving when increases in import capacity over certain external interfaces occurred[1]. The counterintuitive effect observed would dissipate at some point during the continued increase in the import capacity.

GE engineers were contacted when this anomaly occurred and were able to replicate the anomaly during their testing. They were not in a position to fully explain the anomaly at that time, but noticed that the effect did not occur when the 'Loop Flow' switch, in the GEN-OPTN table, was put in the 'N' or no position.

Additional analysis by GE uncovered specific hours during which assistance looping from PJM West through New York and back into PJM East during Pass 1 (described below) were preventing assistance from Ontario and Quebec from reaching New York's high risk zones during Pass 2. As a result, decreasing the transfer limits into New York from PJM improved the New York reliability during those hours.

II. Resource Allocation Process in MARS

In addition to this 'Loop Flow' switch, there are a series of switches in the RES-POOL table labeled 'Loop Flow'. For purposes of clarification, we will call the 1st 'Loop Flow' switch, the LF1P switch. The set of switches in the RES-POOL table will be referred to as LF2P switches. This second set of switches allows indirect assistance only in the second pass of the model. While the LF1P switch controls indirect flows for all Control Areas, the individual LF2P switch controls indirect flows for the Control Areas named in the table.

The GE MARS model goes through three distinct passes when providing assistance form the zones with excess capacity to those that are deficient.

Pass 1

During the first pass, zones within a given Control Area attempt to deliver any capacity excess to deficient zones within the same Control Area. The Control Areas are processed one at a time, in the order in which they are defined in the 'GEN-POOL' table. The LF1P switch in the 'GEN-OPTN' table is used in this pass and the single switch setting applies to all of the Control Areas.

[1] Import capacity is modeled by imposing restrictions on the interface limit ratings. This equivalent modeling is more fully explained in the paper "Consideration of the Impacts of Modeling External ICAP Imports on the Installed Reserve Margin", which is currently a draft dated March 2, 2009.

If the LF1P switch is set to 'no', the ties between the Control Area being processed and the rest of the system are effectively cut, leaving the Control Area's internal ties as the only means for delivering assistance. If it is set to 'yes', all of the ties are left in place and will be used as needed to deliver assistance to the deficient zones.

As subsequent Control Areas are processed in this pass, the transfer limits of the ties are adjusted to account for the flows that were introduced by the processing of previous Control Area(s). This avoids double counting of the ties. If a tie is used to deliver a certain amount of capacity in one pass it cannot then be used again to deliver that same amount of capacity in another pass.

Pass 2

In the second pass, the Control Areas provide assistance to other Control Areas based on a priority established in the RES-POOL table. This table identifies how, and to whom, a Control Area with excess capacity shares these excess reserves during the second pass. Each of these reserve sharing arrangements has its own 'Loop Flow' switch (LF2Ps), which are separate from the one in the GEN-OPTN table that was used in Pass 1.

If the individual LF2P switch is set to 'no', the assistance will be delivered using only those ties that directly connect the Control Areas involved. If it is set to 'yes', the program will use whatever ties are needed to deliver the assistance.

The reserve sharing arrangements are processed according to the priority order input in the table. As in the first pass, the transfer limits are adjusted to account for flows that have been previously imposed on the ties.

For example, if PJM listed Ontario as the first Control Area with which it would share excess capacity, and the LF2P switch for this arrangement were in the 'yes' position, PJM could send excess through New York into Ontario before it would assist New York. With this arrangement's LF2P switch in the 'no' position, PJM would be able to provide assistance to Ontario, during this pass, only if the two Control Areas were directly connected to one another.

Pass 3

The third pass opens up the sharing from all Control Areas to anywhere it can be delivered using whatever ties are available. There are no 'Loop Flow' switches associated with this pass.

III. Actions

As a result of this identified anomaly, the NYISO conducted the 2008 External ICAP Import Rights Study with the Loop Flow switch in both the 'yes' and 'no' positions. The

NYISO turned off the switch, performed the study and then tested the results with the switch in the 'yes' position to ensure the limits fell within the LOLE criteria.

The NYISO, in developing the Statement of Work for GE Energy services for the 2008 calendar year, included a task to look at this effect more closely and help the NYISO develop a recommendation about how the LF1P switch should be set.

In April of 2008, the NYISO expressed concerns about the status of the LF1P switch to the Installed Capacity Subcommittee (ICS) of the NYSRC. The ICS, at that time, indicated that there was no evidence to support changing the status of the switch, which had been in the 'yes' position since the ISO start up date of December 1999. In addition, the ICS expressed concern about whether the changing of the LF1P switch would need to be done in concert with other changes, such as the topology review.

IV. Impact of 'Loop Flow' Switch

The 2009 IRM Base Case was run with and without loop flow. When the option to allow loop flow was removed, the NYCA LOLE improved from 0.100 days/year to 0.083 days/year, while the PJM risk increased slightly from 0.686 days/year to 0.688 days/year. Comparing the LOLE for the NYCA zones showed that they all improved by roughly the same amount. This result indicates that the change in NYCA risk was due to changes in outside assistance available to all of the deficient NYCA zones rather internal constraints, which would impact only a couple of the zones.

The following table compares the net imports into NYCA from the outside regions, on several interfaces of interest for the 2009 IRM Base Case, with and without loop flow. To better capture the impact of flows on reliability, the flows are expressed in terms of energy (MWh) which is calculated from the average MW flows times the number of hours of flow.

Table 1 – Net Imports into NYCA for 2009 IRM Base Case (MWh)

Interface	With Loop Flow	Without Loop Flow	Difference
Ontario - A	608.1	1491.1	883.0
PJM W - A	-629.2	-1196.0	-566.8
PJM - C	425.4	137.9	-287.5

It would appear that in the absence of loop flow, more of the Upstate transfer capability is available for delivering imported assistance from Ontario to the NYCA zones. In both cases, Dysinger East and Volney East are limiting approximately one hour during the year. With loop flow, the flows from PJM-West into zones A and C load up those interfaces, during Pass 1, restricting the amount of Ontario assistance that can be delivered to the NYCA zones during Pass 2. Without loop flow, the flows from PJM into zones A and C are reduced, leaving room on those interfaces for the increased imports

from Ontario in A which then flows to the deficient NYCA zones. As a result, the NYCA risk improves, and PJM becomes slightly less reliable.

V. Conclusions

1. Although current capacity market rules allow for the wheeling of capacity through Control Areas to a third Control Area, there are no provisions that allow wheeling through another Control Area's transmission system and back into the sending Control Area. It seems unlikely that this type of arrangement would make sense operationally. From a planning perspective, it is not good engineering practice to allow an outside Control Area to send capacity through one system and back into itself in order to avoid the congestion that should be relieved by transmission projects within the lacking Control Area.

2. The NYISO concludes that placing the Loop Flow switch to the 'yes' position distorts the LOLE results in the LCR and IRM studies and prevents an efficient External ICAP Import Rights Allocation Study. (The 2009 study puts the switch in the 'no' position.)

3. Based on the current capacity market rules referenced above, GE Energy agrees with the NYISO that this model feature is not currently in the appropriate position to reflect the operating realities of today's New York capacity markets.

4. NPCC's CP-8 working group, in consultation with GE, have concluded that the original reserve sharing arrangements, in which the operators of the Canadian provences help each other first and US system operators help themselves first, is no longer a valid model. This group has further concluded that the Res-Pool table is no longer needed.

VI. Recommendations

The NYSRC IRM Studies, and those conducted by the NYISO, use the most advanced model available for conducting reliability studies. The GE-MARS program has analytical capabilities, modeling features, and options that allow consideration of many of the conceivable configuration that planners can imagine. Because of the level of sophistication that this model brings, it is possible that configurations that were envisioned before the start up of the NYISO are no longer appropriate for the capacity markets that exist today. The positioning of the Loop Flow switch is such an example. It is recommended that the ICS consider placing the "Loop Flow' switch to the "no" position for future studies.

During the analysis conducted for this work, it was realized that changing of the LF1P switch should not be done in isolation. Other considerations were necessary. Therefore the following recommendations should all be grouped.

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1. Place the LF1P switch in the 'no' position.

2. Remove the RES-POOL table. The appropriate sharing occurs with no table[2] modeled.

3. Perform the topology analysis with the above settings in mind. Possible changes include the modeling of the RECO load and the arrangement surrounding the New York City wheel.

[2] NPCC's CP-8 working group has removed this table from their resource adequacy analyses.