

External Control Area Modeling

Background

The inclusion of emergency assistance (EA) benefits from external areas in IRM studies has been standard practice since the very beginning of these studies¹. The New York State Reliability Council (“NYSRC”) Installed Reserve Margin (“IRM”) Study appropriately recognizes the benefit of New York’s regionally interconnected electric grid. The connections among the New York Independent System Operator (“NYISO”) and Hydro Quebec (“HQ”), Independent Electricity System Operator for Ontario (“IESO”), ISO New England (“ISO-NE”), and the PJM Interconnection (“PJM”) provide mutual benefits and strengthen grid reliability. The IRM Study explicitly models these interconnections and allows the New York Control Area (NYCA) to receive emergency assistance” from neighboring regions.

The first IRM study conducted for the 2000-2001 capability year by the NYISO for the NYSRC modeled the external areas of HQ, IESO, ISO-NE, and PJM as single areas. They were initially modeled with all “as-found” resources. This resulted in external areas with reserves well above the required minimum and Loss of Load Expectation (“LOLE”) much better than their LOLE criterion. Initial model runs indicated that the New York Control Area (NYCA) could meet its LOLE criterion with reserves in the single digits. The primary driver of this result was the availability of the excess reserves in the neighboring control areas resulting in over dependence by NYCA on emergency assistance. To address this overdependence concern the Policy Five requirements that an external Control Area’s LOLE assumed in the IRM Study cannot be lower than its own LOLE criterion and its reserve margin can be no higher than that external Control Area’s minimum requirement were developed and implemented.

The IRM study for the 2006-2007 capability year introduced multiarea models for ISO-NE and PJM for the first time. These multiarea representations have evolved and expanded to their current state. Also, there have been four “white papers” produced that have reviewed and addressed modeling elements for the external areas. They were: 1) “Modeling of Emergency Operating Procedures (EOPs) and Demand Resources (DR) in External Areas in IRM Studies” which was conducted in 2015; 2) “Review of PJM Modeled LOLE” which was conducted in 2016; 3) “MARS Emergency Assistance Modeling Findings, Conclusions and Recommendations” which was also conducted in 2016; and 4) “Evaluation of External Area Modeling in NYCA IRM Studies” which was conducted in 2019.

Study 1 above resulted in change in how DR in PJM would be handled and required a change to Policy 5. It also recommended the current practice for modeling EOPs be maintained. Study 2 above resulted in a target LOLE of 0.14 be adopted for PJM. Study 3 above resulted in the 3500 MW hourly limit for emergency assistance entering NYCA based on available excess 10- minute operating reserves in the external Areas. Study 4 above concluded how

¹ See “early evolution of LOLP *evaluating generating capacity requirements*,” Roy Billinton and Kelvin Chu, *IEEE Power & Energy Magazine*, July/August 2015, pages 88-98

load is scaled² in the external Area to comply with the LOLE and IRM requirements has an important impact on the availability of emergency assistance available to NYCA. It was implemented for the 2019 IRM study and resulted in changes to Policy 5. In addition, it made recommendation for additional work.

It is this additional work which forms the basis for the 5th white paper which addresses modeling elements for the external Areas.

Problem Statement and Next Steps

The 2019 EA white paper was undertaken when the updating of the external Areas models for the 2019 IRM study resulted in a larger than expected EA benefit and wasn't fully understood even after accounting for the required Policy 5 adjustments. As result, the NYSRC's decided to fix (i.e., hold unchanged from the prior year) the external area models for the 2019 IRM study. It also was decided for the 2020 IRM study to revisit (and update) how external area models are adjusted to achieve the Policy 5 requirement which is to avoid overdependence on the external Control Areas for emergency capacity support. That objective was successfully completed.

However, the 2019 EA white paper made a number of recommendations for further investigation. One is to continue with the efforts regarding individual EA limits for external areas instead of the single 3,500 MW limit. A second is to investigate models of external Areas that result in simplified or less complex representations of the external Areas. A third recommendation is to review how the Policy 5 requirement of not modeling EOPs in external Areas affects the amount of EA available to NYCA, especially, the potential impact of their locational aspects. Currently, EOPs are not modeled in external Areas but the Areas are brought to a target LOLE criterion which assumes the EOP utilized by to achieve criterion are operable. This process effectively replaces EOPs with other resources.

The objective of the 2020 EA whitepaper is to complete the work proposed in the 2019 EA white paper by determining whether external control area representations that are more transparent (i.e., less complex) and produce explainable levels of emergency assistance are achievable and are compliant with Policy 5 requirements for modeling emergency assistance. Any external Area modeling changes that result from the 2020 EA white paper would be implemented for the 2022 IRM Study

Project Scope

Conceptually, the following options could simplify how the NYSRC models emergency assistance from external control areas:

1. Individual external Areas limits which specify the amount of emergency assistance that can be expected from each neighboring region (*e.g.*, ISO-NE for the NYCA)
2. Simplified external control area topology representations (*e.g.*, PJM)

² Load adjustments by zone shall be made proportional to the excess resources (zonal resources – zonal load) in the load zones in the external Area

3. Simplified external load and resource and load representations (*e.g.*, PJM)
4. Determine what EOP steps are used by neighboring Areas, if any, to achieve their LOLE criterion and whether modeling EOPs will improve overall transparency.

Organizations outside of the NYSRC and NYISO rely upon these concepts to varying degrees when establishing reserve margins for their respective electric grids, including within FERC jurisdictional markets (*e.g.*, PJM, ISO-NE).

This NYSRC whitepaper will evaluate the following, independent models. Each of the models will be developed with input from the NYSRC Installed Capacity Subcommittee (“ICS”). The NYSRC ICS may then select models for more rigorous testing, including comparative IRM calculations using prior years’ IRM technical study results. This study scope acknowledges and considers the impact of external control area models on downstream processes, such as the NYISO’s determination of Installed Capacity Import Rights. The study will:

1. Model each neighboring external control area as a single bubble and with emergency assistance that is available consistent with historically available emergency assistance, and
2. Maintain current external area models but eliminate interconnections between external control areas to avoid capacity wheeling.

Project Deliverables

The NYSRC ICS will produce a whitepaper summarizing the problem statement, project scope, potential models, and justification for those potential models (including a brief summary of how New York’s neighbors model emergency assistance). The whitepaper will also recommend whether the NYSRC Executive Committee (“EC”) should adopt updated external control area representations and any applicable next steps. Project scoping, establishing the modeling assumptions, and initial modeling results are expected to be presented in 2020. Final results and NYSRC action on a final whitepaper are expected in 2021.

Project timing

- March 2020 NYSRC ICS approves the whitepaper scope, as discussed herein. NYSRC EC provides feedback on scope and next steps.
- May 2020 NYSRC ICS reviews proposed modeling assumptions. NYSRC EC provides feedback on progress-to-date and next steps.
- July 2020 NYSRC ICS review results of initial modeling efforts. NYSRC EC provides feedback on progress-to-date and next steps
- Aug 2020 – Feb 2021 NYSRC ICS review results of subsequent modeling efforts. NYSRC ICS drafts whitepaper results and identifies next steps (*e.g.*, testing on additional IRM base cases, modifying the project scope)
- March 2021 NYSRC EC reviews and acts on the final external area modeling whitepaper