Modelling & Study Methodologies

Modelling Adjustments

The models used in the assessment of the MISO energy storage system projects were the DPP 2021 and 2022 models. No load adjustments were made to the original models. All of the generators indicated by the IPA were already present in the models. Some generator capacity values were changed to match the values requested by the IPA. MISO projects were adjusted based on the information provided by Levitan and the IPA and studied in accordance with MISO BPM 015-Generation Interconnection[1]. The MISO projects, points of interconnection, and capacity values modelled and studied are listed in Table 1.

Table 1: MISO ESS Projects

Queue Position	County	State	Point of Interconnection (POI)	Capacity (MW)	Fuel
J1655	Jefferson	IL	West Mt Vernon - Xenia 345kV Line (J1241)	50	Battery Storage
J1695	Perry	IL	Aster 138kV Substation (Rebuild of North Coulterville 138kV)	50	Battery Storage
J1882	Tazewell	IL	San Jose Rail 138kV	45	Battery Storage
J1973	Champaign	IL	Mira Tap-Sydney 138kV	40	Battery Storage
J1975	Coles	IL	Mattoon West 138kV	40	Battery Storage
J2124	Champaign	IL	Rising 345 kV Bus 1	100	Battery Storage
J2159	Clark	IL	Hutsonville - Neoga 138KV	100*	Battery Storage
J2161	Fulton	IL	Ipava 138KV	100*	Battery Storage
J2170	Clark	IL	Snyder 345 kV (J1180/J1475 POI)	150	Battery Storage
J2195	Fayette	IL	Ramsey East 138 kV	100	Battery Storage
J2197	Clay	IL	Xenia 345 kV	100	Battery Storage
J2375	Macon	IL	Faraday 345 kV	100	Battery Storage
J2376	Shelby	IL	4PANA-4SHELBYVL 138kV	100*	Battery Storage
J2377	Peoria	IL	Bloomington Brokaw 345 kV	300	Battery Storage

[1] MISO BPM 015-Generation Interconnection

J2379	Clay	IL	Xenia 345kV Substation	200	Battery Storage
J2383	Macon	IL	Faraday 345kV	100	Battery Storage
J2402	Johnson	IL	7E W FKFT - 7SHAWNEE FP (TVA) 345kV	200	Battery Storage
J2413	McLean	IL	Hoopeston West 138kV	150	Battery Storage
J2426	Marion	IL	Kinmundy 138kV	200	Battery Storage
J2532	Sangamon	IL	Latham 345 kV	200	Battery Storage
J2536	LaSalle	IL	Fox River - Ottawa 138kV	200	Battery Storage
J2551	Putnam	IL	Putnam 138kV Substation, MTEP20 Project ID 13709	110	Battery Storage
J2552	Whiteside	IL	Cordova to Sub 39 345kV line	130*	Battery Storage
J2575	Tazewell	IL	Cincinnati 138 kV Substation	200	Battery Storage
J2607	Montgomery	IL	Redhawk 138 kV - MTEP Project (17976)	200	Battery Storage
J2627	Adams	IL	East Quincy 138 kV substation	150	Battery Storage
J2647	Franklin	IL	West Frankfort East 345 kV (7E W FKFT)	300	Battery Storage
J2724	Cumberland	IL	7NEOGA-7HOLLAND 345 kV	300	Battery Storage
J2853	Sangamon	IL	Westchester 138 kV station - PSSE bus 343513	100	Battery Storage
J2974	Adams	IL	4Hull - 4Herleman 138 kV	85*	Battery Storage
J2998	St. Clair	IL	Fayetteville Bee Hollow Road 138kV Substation	200	Battery Storage
J3011	St. Clair	IL	Prairie State Plant Switchyard 345 kV	100	Battery Storage
J3031	Jefferson	IL	4WLTNVL TP 138 kV	200	Battery Storage
J3200	St. Clair	IL	Turkey Hill 345kV	250	Battery Storage
J3216	Peoria	IL	Bloomington Brokaw 345 kV	300	Battery Storage

* Indicates Capacity values that were changed in the models

The PJM models used in the analysis were the PJM AG1 System Impact Study models from 2019. No load adjustments were made to the original models. PJM projects were added to the cases based on the information provided by Levitan and the IPA and studied in accordance with PJM Manual 14b Attachment C.3: Deliverability of Generation[2].

The Great Lakes offshore wind generator was not existing in the model and had to be added at the requested POIs. Each POI was studied individually to see their specific impacts.

[2] PJM Manual 14B: m14b.ashx (pjm.com)

Two of the ten energy storage system projects in PJM were already in the AG1 model. The other eight had to be added to the model for the analysis. The PJM ESS projects were studied together as their own cluster. The PJM projects, points of interconnection, and capacity values modelled and studied are listed in Table 2.

No additional modelling needed to be done to perform the SOO Green analysis.

Table 2: PJM ESS Projects

Queue Position	Point of Interconnection (POI)	State	County	Capacity (MW)	Fuel
AG1-298	Calumet-Burnham 345 kV	IL	Cook	500	Storage
AG2-357	Wilton 345 kV	IL	Will	250	Storage
AG2-545	Silver Lake 345 kV	IL	McHenry	400	Storage
AF2-441	Burnham 138kV	IL	Cook	250*	Storage
AH2-015	Nelson 138 kV	IL	Lee	110	Storage
AH2-204	Lancaster 138 kV	IL	Stephenson	170	Storage
AH2-259	Plano 345 kV	IL	Kendall	150	Storage
AH2-290	Sandwich 138 kV	IL	DeKalb	60	Storage
AH2-339	Wempletown 138 kV	IL	Winnebago	110	Storage
AH2-341	Toulon 138 kV	IL	Stark	250	Storage

* Indicates Capacity values that were changed in the models

N-1 Thermal Criteria

All facilities 100 kV and above in all PJM or MISO zones were monitored for thermal violations. These facilities shall be loaded below normal ratings for system intact conditions (all lines in-service or N-0) and loaded below long-time emergency (LTE) ratings for post-contingency (N-1) conditions.

This analysis focused on thermal analysis since the upgrades from voltage analysis are generally lower in cost, require shorter time to construct, and face fewer permitting challenges.

For contingencies, all PJM and MISO system contingencies were studied with the corresponding cases.

Study Tools

The study models for steady-state analysis were developed using the Siemens PTI PSS®E power flow software (Version 34). The PJM Generator Deliverability analysis was conducted in PowerGEM TARA software version 2302a using the PJM Generator Deliverability 2022 Reform Tool. The MISO analysis was conducted in PowerGEM TARA software version 2301.1.