

Evaluating and Strengthening Iowa's Power Grid for High Wind/Solar Penetration Levels

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The electric grid infrastructure within the state of Iowa is on its way to becoming one of the most decarbonized electric systems in the U.S., with wind turbines producing almost 60% of its electric energy, while a variety of technologies are becoming of high interest, e.g., utility-scale solar, distributed generation, small modular nuclear reactors, hydrogen storage, high-voltage DC transmission, underground distribution, enhanced structural strength overhead transmission, charging control of pluggable vehicles, and demand response. Iowa utilities are investigating options related to these various technologies. The Midcontinent Independent System Operator (MISO) and the Southwest Power Pool (SPP) coordinate planning activities at the regional level; MISO's region includes portions of 15 states and most of Iowa; SPP includes portions of 14 states and a small part of Iowa. Therefore, Iowa's need for long-term expansion planning of electric infrastructure is performed at the individual company level and at the regional level. The rationale underlying this proposal is that the state of Iowa would benefit from applying expansion planning analysis at the state level as well, i.e., performing a look-ahead analysis of how the various technology options would influence a 25-year development of the state's electric infrastructure. This work, consistent with the Iowa Utilities Board's (IUB's) objectives in Docket No. INU-2021-0001, will be done with careful monitoring of the RTO planning processes performed by MISO and SPP. The tool used for this work, called Adaptive Coordinated Expansion Planning, will identify least-cost approaches to providing energy while maintaining high levels of reliability and resilience. A summary and schedule of deliverables is provided on the next page.

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Summary and schedule of deliverables

Project task	Year	Target completion date	Deliverables/comments
Start project	2023	6/1/23	
Task G1: Develop project board.	2023	7/1/23	Iowa electric G&T orgs represented.
Task G2: Describe/characterize MISO/SPP planning processes.	2023	8/30/23	Report describing MISO and SPP planning processes.
Task G3: Monitor 2023 MISO/SPP planning processes	2023-2024	8/30/24	Report developed in collaboration with Project Board.
Task G4-1: Identification of events/conditions imposing high risk to IA's electric G/T/D systems.	2023	8/31/23	Report of five (or more) types of high-risk events/conditions identified.
Task G4-2: Determine probabilities of high-risk events and conditions.	2023	8/31/23	Report on probability estimation of the five (or more) types of events/conditions identified.
Task G5-1: Identify uncertainties & futures.	2023	10/30/23	Report identifying at least 8 uncertainties and at least 5 futures.
Task G5-2: Develop visions.	2023	11/30/23	Report describing at least 4 visions.
Task G6-1: Extend ACEP/FHS to account for inertial/freq stability.	2024	3/28/24	Report describing approach used for including inertial/frequency stability.
Task G6-2: Extend ACEP/FHS to account for resource/energy adequacy.	2024	5/30/24	Report describing approach used for resource/energy adequacy, including test results validating this modeling.
Task G6-3: Enhance resilience modeling.	2024	9/30/24	Report describing enhanced resilience modeling, including test results validating this modeling.
Task 7: Develop reduced network model.	2024	10/30/24	Report describing reduced network model with validation results.
Task G8-1: Develop ACEP dataset.	2024	11/31/24	Report describing ACEP dataset.
Task G8-2: Use ACEP to identify 4 strategic plans, 1 per vision.	2025	7/30/25	Report describing the 4 strategic plans developed from ACEP.
Task G9-1: Adapt ACEP model for use in FHS.	2025	11/31/25	Report describing FHS model and test results validating this model.
Task G9-2: Use FHS to evaluate 4 strategic plans using 50-100 scenarios not used in G6.	2026	4/31/26	Report describing FHS evaluation for the 4 strategic plans.
Task G10: Distribute final project report to various Iowa stakeholders with all previous reports available via website.	2026	6/1/26	Solicit comments on reports.