



UNDERSTANDING MICHIGAN'S TRANSMISSION NEEDS

JUNE 2023

FACT SHEET

BACKGROUND

WHAT CHALLENGES DOES THIS STUDY RESPOND TO?

This study was in response to the Michigan Public Service Commission Order in Docket #U-21099 dated June 23 2022. The Commission sought comments on actions and policies that might maximize benefits to the reliability of Michigan's transmission connections to MISO, PJM, IESO and how to boost those connections. Michigan is situated in a unique geographical position—it is within, but located on the edge of the Midcontinent Independent System Operator (MISO) region, and has significant transmission connectivity to two additional grids—PJM Interconnection (PJM), and the Independent Electricity System Operator (IESO) located in Ontario, Canada. Due to its location within MISO, it is somewhat electrically isolated. Various policy issues are becoming increasingly relevant as Michigan transitions towards a clean power system: Michigan's inability to credit imports from IESO, which are significant, towards its local resource adequacy requirements (while MISO considers these in its system resource adequacy calculation); operation of flow regulators between IESO and Michigan given the changing power system landscape; and the robustness of Michigan's transmission system given upcoming thermal generator retirements and more renewable deployment.

HOW DID MICHIGAN'S TRANSMISSION SYSTEM EVOLVE TO ITS CURRENT STATE?

Initially, local utilities in Michigan built facilities to serve load growth within the state. Regulatory approaches and interregional coordination agreements evolved in the historical context of individual franchised electric companies serving their customer demand and



regulations addressed Michigan-specific problems. Regulations did not anticipate the rise of Regional Transmission Organizations (RTOs) two decades ago. Coordination agreements in the early RTO era, including agreements involving the phase angle regulators on the Michigan-Ontario interface originally emphasized avoidance of harm rather than promotion of regional benefits. More recently, much of the state is within RTO service territories with MISO covering most of Michigan and PJM serving a portion of the state. New regulatory developments emphasize regional transmission planning and the construction of transmission projects that serve a combination of regional reliability and regional economic values, while reorganizing regional public policy priorities, such as state renewable energy portfolio standards.

More fundamentally, the existing transmission system represents decades of planning decisions made to suit different grid and market conditions from what we have today. In the same way, current established regulatory policies and market procedures were developed for a historical grid and a technology mix that is rapidly evolving. Planning for the future will need to include some reconsideration of past decisions and agreements.

WHICH ENTITIES ARE CURRENTLY RESPONSIBLE FOR IMPACTING DECISIONS ON MICHIGAN'S TRANSMISSION SYSTEM?

There are several disparate entities that influence how transmission evolves inside and around Michigan. This underscores the importance of coordinated action by the various responsible entities:

- **Michigan Public Service Commission:** The Michigan PSC does not directly approve transmission investments but is responsible for overseeing the approval of generation and distribution system plans, which are impacted by transmission assumptions. The Michigan PSC is responsible for the achievement of Michigan's clean energy goals which will both influence and be constrained by transmission decisions inside and outside of the state. The Michigan PSC is part of the MISO stakeholder processes and a formal member of the Organization of MISO States.
- **Midcontinent Independent System Operator (MISO)** is an independent, not-for-profit, member-based organization focused on three tasks: (1) Managing the flow of high-voltage electricity across 15 U.S. states (including much of Michigan) and the Canadian province of Manitoba; (2) Facilitating one of the world's largest energy markets; and (3) Serving as the transmission planning entity for the MISO region.
- **PJM and IESO:** independent system operators in regions that have transmission connectivity with MISO. Each have their own planning criteria and resource adequacy rules. The Southwest portion of Michigan is within PJM and PJM controls 9 transmission lines that connect with MISO that connect to the lower peninsula of Michigan. IESO operates the transmission system for Ontario, Canada, and has 4 major transmission lines that connect with MISO via the lower peninsula of Michigan. (See figure)

- **ITC Holdings Corp. (ITC):** ITC is the largest independent electricity transmission company in the United States. Two of its subsidiary companies, ITCTransmission and Michigan Electric Transmission Company, own and operate the transmission network throughout most of lower Michigan. ITC also works with MISO to plan appropriate transmission improvements for its system.
- **US Department of Energy (DOE):** The Grid Deployment Office within DOE administers the Federal international electricity program, which consists of two elements: (1) Granting Presidential permits for the construction, connection, operation and/or maintenance of electric transmission lines which cross the U.S. international border; and (2) Authorizing exports of electric energy to foreign countries.
- **Federal Energy Regulatory Commission (FERC):** FERC is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. The Energy Policy Act of 2005 gave FERC additional responsibilities, including the following that are relevant to this study: regulates the transmission and wholesale sale of electricity in interstate commerce; reviews certain mergers and acquisitions and corporate transactions by electric companies; sometimes reviews transmission siting applications; issues reliability standards for the high voltage transmission system; and monitors/investigates energy markets;
- **Consumers and DTE utilities:** CMS Energy Corporation's principal subsidiary is Consumers Energy Company, Michigan's largest electric and natural gas utility. Consumers serves 6.8 million of Michigan's 10 million residents in all 68 of Michigan's Lower Peninsula counties. Its subsidiary, NorthStar Clean Energy, is engaged in independent power generation in several states.

DTE Energy is a Detroit-based diversified energy company involved in the development and management of energy-related businesses and services nationwide. Its operating units include DTE Electric, an electric company serving 2.3 million customers in Southeast Michigan.

- **Merchant generation:** Merchant Generators develop and operate generation facilities that sell electricity to the wholesale power market, delivered through the transmission grid via central marketplaces administered by an independent system operator such as MISO or PJM.



Transmission connections to the Lower Peninsula of Michigan

TRANSMISSION ANALYSIS

WHAT TRANSMISSION ANALYSIS WAS CONDUCTED AND HOW DOES IT COMPARE TO OTHER TRANSMISSION STUDIES, NAMELY THE MISO CAPACITY IMPORT LIMIT STUDY AND ITC TRANSMISSION ANALYSES?

For this study, the analysis performed is a steady-state contingency analysis in which the transmission lines, transformers, and substations on the grid are evaluated for thermal and voltage violations of the NERC transmission planning criteria following a loss of any one element of the grid (N-1 contingencies), similar to an analysis a system operator would perform for transmission planning. The transmission analysis conducted was very similar to MISO’s Capacity Import Limit/Capacity Export Limit (CIL/CEL) analysis, which is based on MISO’s MTEP transmission model for summer peak and shoulder cases, where the contingency analysis is performed for increasing levels of power imports to the lower peninsula of Michigan. Our analysis differed from MISO’s CIL/CEL analysis in that our future scenarios also considered imports to Michigan from not only MISO but also explicitly from PJM and Ontario to determine the collective import capability from all major transmission ties.

WHAT WERE THE KEY FINDINGS FROM ANALYZING MICHIGAN'S TRANSMISSION SYSTEM, CONSIDERING A FUTURE WITH ADDITIONAL RENEWABLE PLANTS, MORE THERMAL PLANT RETIREMENTS, AND MORE IMPORTS?

Our analysis considered a mid-2020s future with 8.6GW of installed solar, storage, and wind resources and the planned retirement in 2025 of the Campbell coal-fired plant. We found that:

- Power imports from the southern border are primarily from PJM (up to ~4 GW), where 9 of the 10 transmission lines at the southern border connect to PJM territory.
- Michigan can import an additional ~2 GW of power from Ontario on the highly controllable IESO-MISO interface, where the power exchanged can be set by the four phase-angle regulators.
- The MISO Tranche 1 set of transmission projects will add a new 1.7GW transmission corridor between Michigan and MISO. Furthermore, Tranche 1 enables increased power imports on the other ties to PJM and IESO before encountering thermal violations due to an N-1 contingency.
- The Ludington pumped storage hydro plant can continue to discharge at its full 2.1 GW rating without violations. During full charging operation, moderate thermal violations may be expected in the Grand Rapids region under certain grid conditions when generation or imports from southwestern Michigan are low.

RECOMMENDATIONS

WHAT OPPORTUNITIES EXIST TO IMPROVE MICHIGAN'S TRANSMISSION POSITION WITHIN THE REGION?

Michigan is in a unique position, being connected to two large market regions and providing a third connection between these markets and Canada. There are near-term opportunities to fully utilize the existing transmission capacity connecting lower Michigan with these other regions to meet both resource capacity and real-time energy requirements, and longer-term opportunities to cost-effectively expand the ability to move power into and out of lower Michigan to support Michigan's clean energy goals.

WHAT ARE THE ACTIONS THAT THE MICHIGAN PUBLIC SERVICE COMMISSION MIGHT TAKE TO IMPROVE MICHIGAN'S ACCESS TO CLEAN RESOURCES?

The Michigan Public Service Commission (PSC) could promote holistic consideration of potential transmission impacts in all applicable PSC decisions. As examples:

- Require utilities to provide analysis of transmission capacity impacts with generation addition and retirement proposals

- Require consideration of imported resources (including High-Voltage Direct Current proposals and other transmission assets) in IRP submittals
- Review operational procedures of Ludington storage to prepare for higher integration levels of variable generation

WHAT ARE THE ACTIONS THAT THE MICHIGAN PUBLIC SERVICE COMMISSION COULD TAKE IN PARTNERSHIP WITH THE MIDCONTINENT INDEPENDENT SYSTEM OPERATOR?

As most of the utilities in Michigan participate in the MISO market region, market design discussions and transmission planning activities at MISO will have a significant impact on Michigan achieving its clean energy goals. The Michigan PSC could continue engaging with MISO on a range of issues, including:

- Studies quantifying transmission import capacity and as a result, zonal resource requirements
- Evaluation of transmission projects that can increase the import capacity into the lower Michigan region (including HVDC connections)
- Accreditation of renewable resources and integration of grid-scale batteries and other storage technologies (including the Ludington Pumped Storage Plant) into MISO markets and reliability operations

WHAT ACTIONS MAY REQUIRE JOINT COOPERATION BETWEEN MISO AND PJM?

A majority of the existing transmission capacity connecting lower Michigan to Indiana and Ohio is provided by transmission circuits operated by PJM. As such, greater coordination between MISO and PJM on a range of issues, including transmission planning and utilization, market design, generation interconnection, and renewable resource accreditation will facilitate Michigan achieving its clean energy goals. The Michigan PSC could consider advocating for greater cooperation between MISO and PJM on these issues.

GIVEN MICHIGAN’S TRANSMISSION CONNECTIONS WITH CANADA (VIA THE INDEPENDENT ELECTRICITY SYSTEM OPERATOR OR IESO), WHAT TYPES OF ACTIONS MAY REQUIRE COORDINATION WITH IESO?

In the short-term, Michigan’s existing transmission connections with Ontario are under-utilized. These existing inter-ties may be able to provide resource capacity to meet MISO capacity requirements and more available real-time energy sales and purchases. The Michigan PSC could explore options with the IESO (and possible MISO) to facilitate capacity-backed transactions. In the longer-term, both Michigan and Ontario will face challenges meeting their clean energy goals while continuing to reliably serve growing electricity demand. Greater cooperation and coordinated planning between Michigan and IESO will allow development of cost-effective solutions, including projects to increase the transmission capacity between the two regions.

OTHER RECOMMENDATIONS

The Michigan PSC could consider engaging with the Organization of MISO States on the issues raised in this analysis related to resource adequacy and transmission availability. Also, the Michigan PSC could consider participating in dockets and rulemakings at the Federal Energy Regulatory Commission that involve both MISO and PJM transmission planning and market design issues.

We recommend that the Michigan PSC leverage this study for discussion in the Joint Federal-State Task Force on Electric Transmission (established by FERC on June 17, 2021 in Docket No. AD21-15-000). The issues raised here are broader than Michigan as several ISOs have import and export exchanges. As resource availability becomes more weather dependent, it will be important to understand the impact of weather on resource availability within an ISO and how it impacts power exchanges among ISOs. This has implications for accreditation and transmission planning.