OLSON, BZDOK & HOWARD

January 15, 2018

Ms. Kavita Kale
Michigan Public Service Commission
7109 W. Saginaw Hwy.
P. O. Box 30221
Lansing, MI 48909

Via E-filing

RE: MPSC Case No. U-18419

Dear Ms. Kale:

The following is attached for paperless electronic filing:

CORRECTED Direct Testimony of Dale Osborn on behalf of the Michigan Environmental Council, Natural Resources Defense Council, and Sierra Club

Proof of Service

Sincerely,

Digitally signed by Christopher M. Bzdok
Date: 2018.01.15 11:41:00 -05'00'

Christopher M. Bzdok
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xc: Parties to Case No. U-18419
ALJ Suzanne D. Sonneborn
James Clift, MEC
Ariana Gonzalez and Rachel Fakhry - NRDC
Elena Saxonhouse - Sierra Club
Shannon Fisk, Jill Tauber and Cassandra McCrae - Earthjustice
Dale Osborn

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of **DTE ELECTRIC COMPANY** for approval of Certificates of Necessity pursuant to MCL 460.6s, as amended, in connection with the addition of a natural gas combined cycle generating facility to it generation fleet and for related accounting and ratemaking authorizations	U-18419 ALJ Suzanne D. Sonneborn

CORRECTED DIRECT TESTIMONY OF DALE OSBORN

ON BEHALF OF MICHIGAN ENVIRONMENTAL COUNCIL, NATURAL RESOURCES DEFENSE COUNCIL, AND SIERRA CLUB

January 15, 2018

TABLE OF CONTENTS

I. QUALIFICATIONS AND SUMMARY

Q. Please state your name, position, and business address.

A. My name is Dale Osborn. I am a consulting electrical engineer with specialization in transmission planning. I retired from full-time employment at the Midcontinent Independent System Operator ("MISO") at the end of March 2017. My business address is Osborn LLC, 16390 Java Lane, Lakeville, MN 55044.

Q. Please summarize your professional experience and qualifications.

A. I received a Bachelor of Science in Electrical Engineering and a Master of Science in Electrical Engineering, both from the University of Nebraska. From 1972 to 1982, I worked for the Nebraska Public Power District, with my final position being Transmission and Power Resource Planning Manager. In that capacity, I performed and managed the transmission planning and power resources studies for projects spanning between Nebraska and Wyoming, Kansas, Iowa, and Manitoba.

From 1982 to 2001, I worked for ABB, focusing on high voltage direct current ("HVDC") transmission projects, Static VAR Compensators ("SVC"), Power Quality engineering studies, and project management assistance. HVDC and Static VAR Compensator studies were to increase the power transfer capability into target areas.

In August 2001, I started with MISO. I managed the startup of generation interconnection planning, directed studies for the MISO Transmission Expansion Plan ("MTEP") process, implemented production cost simulation analysis, worked on the MISO Multi Value Projects ("MVP"), and worked on the Macro Grid HVDC overlay.

Q. What is the Macro Grid HVDC overlay?

A. The Macro Grid is a conceptual design of an HVDC transmission network overlay over three-fourths of the United States electric grid, intended to optimize the operations of the grid. The Macro Grid would integrate a large amount of renewable generation and displace a similar amount of gas generation. It could also significantly increase transmission into Michigan.

Q. Describe your most recent experience at MISO.

A. I finished my career as a Consulting Advisor for Policy and Economic Studies in the Transmission Asset Division of MISO. I have been part of the MISO team that established many of the planning processes that are presently used by MISO. I have mentored many current MISO planning staff. A copy of my curriculum vitae is attached as Exhibit MEC-72.

Q. Have you testified as an expert witness in utility proceedings?

A. Yes. In the early 1980s I testified before the public utility commissions of the states of North Dakota, South Dakota, and Nebraska concerning the approval of the MANDAN (Manitoba, Dakotas, and Nebraska) proposed transmission expansion and capacity diversity exchange project. Manitoba is a winter peaking utility. Nebraska is a summer peaking utility. Exchanging capacity was expected to reduce the need for new generation construction at less cost than each utility building generation. The Middle East Oil Embargo stopped the project. The project was dependent on load growth and with no load growth for 10 years the project was not economically feasible.

Q. What is the purpose of your testimony in this case?

A. The purpose of my testimony is to respond to portions of the testimony of DTE Electric ("DTE") witnesses Irene Dimitry, Kevin Chreston, Edward Weber, and Angela Wojtowicz related to transmission options, resource adequacy, capacity import limits, and DTE Request for Proposals (RFP) for generating assets.

Q. What is your understanding of DTE's overall position regarding transmission and imports?

A. I generally understand DTE's position to be that the Company has no options to import capacity beyond a modest annual purchase from the MISO footprint. Based on this conclusion, DTE made two decisions. First, DTE excluded resources outside of MISO Local Resource Zone 7 ("Zone 7") from its generation RFP. Second, DTE limited capacity imports in its IRP modeling to 300 MW of annual spot purchases in most of its modeling sensitivities over the planning period.

Q. What are your primary conclusions?

A. My primary conclusions are:

1. DTE's testimony concerning constraints on transmission import capacity is not consistent with information available from MISO.
2. DTE's decision to exclude generating resources outside of MISO Zone 7 from the generation RFP was not justified.
3. DTE's restriction of capacity imports in its IRP modeling to 300 MW of annual spot purchases was not reasonable.

4. DTE has not seriously evaluated transmission or capacity import options in its testimony or the Integrated Resource Plan (IRP) it filed in this case.

Q. Are you sponsoring any exhibits?

A. Yes. I have attached the following exhibits for review.

- Exhibit MEC-72: Resume of Dale Osborn
- Exhibit MEC-73: MISO 2017-18 LOLE Study Report (Excerpt)
- Exhibit MEC-74: NERC 2016 Long-Term Reliability Assessment (Excerpt)
- Exhibit MEC-75: MISO PJM Backbone Transmission System – Figure 4
- Exhibit MEC-76: NERC 2017 Long-Term Reliability Assessment (Excerpt)
- Exhibit MEC-77: MISO Summer Readiness Workshop (May 8, 2017) (Excerpt)
- Exhibit MEC-78: Review of Ontario Interties, OPA and IESO (2014) (Excerpt)
- Exhibit MEC-79: Ontario Flows to Others Spreadsheet
- Exhibit MEC-80: NERC 2015 Long-Term Reliability Assessment, Appendix I (Excerpt)
- Exhibit MEC-81: EIA 2016 Operational Data Spreadsheet
- Exhibit MEC-82: 2016 MTEP, Book 2 Resource Adequacy
- Exhibit MEC-83: MISO Transmission Planning Business Practice Manual 20 (Excerpt)
- Exhibit MEC-84: 2017 MTEP, Book 2 Resource Adequacy
- Exhibit MEC-85: MTEP18 1st East Subregional Planning Meeting Presentation (12/06/2017)
- Exhibit MEC-86: MISO Resource Adequacy Business Practice Manual 11 (Excerpt)

- Exhibit MEC-87: 2017 MTEP, Book 1 Transmission Expansion (Excerpt)

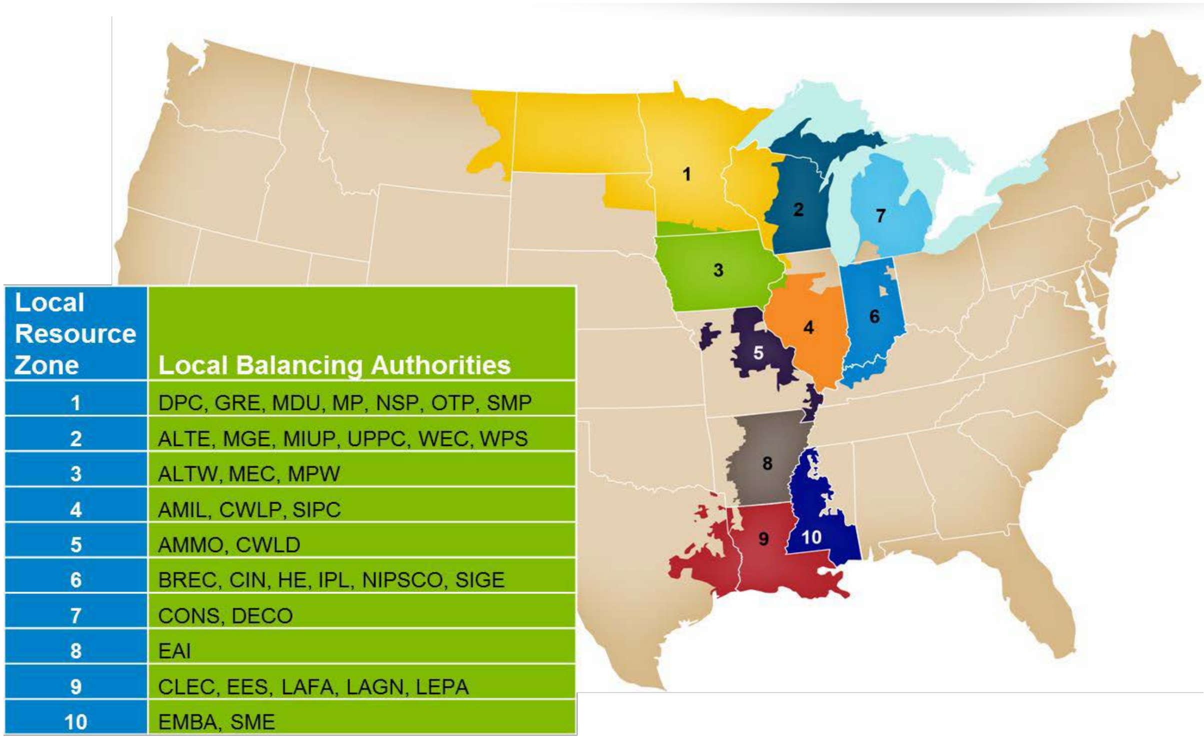
II. OVERVIEW OF MISO AND PJM

Q. What electric markets does DTE Electric connect to?

A. The DTE system has interconnections to three markets: MISO, PJM, and Ontario. I will describe each of these below.

Q. What is MISO?

A. MISO is a member-based Regional Transmission Organization ("RTO") that administers wholesale electricity markets and plans transmission over a large swath of the central United States, as well as Manitoba. MISO is divided into ten Local Resource Zones ("LRZs" or "Zones") consisting of 37 Local Balancing Authorities ("LBAs"). A map of the LRZs with a list of the LBAs can be found on page 6 of the MISO Planning Year 2017-2018 Loss of Load Expectation ("LOLE") Study Report, which I am sponsoring as Exhibit MEC-73:



Local Resource Zone	Local Balancing Authorities
1	DPC, GRE, MDU, MP, NSP, OTP, SMP
2	ALTE, MGE, MIUP, UPPC, WEC, WPS
3	ALTW, MEC, MPW
4	AMIL, CWLP, SIPC
5	AMMO, CWLD
6	BREC, CIN, HE, IPL, NIPSCO, SIGE
7	CONS, DECO
8	EAI
9	CLEC, EES, LAFA, LAGN, LEPA
10	EMBA, SME

Figure 1

Most of the Lower Peninsula of Michigan is in Zone 7. The LBAs for Zone 7 are Consumers Energy and DTE. The tan area in southwest Michigan is part of PJM.

A map of service territories for the United States-based LBAs in MISO – including DTE – can be found on the website of the Federal Energy Regulatory Commission ("FERC"):[1]

[1] https://www.ferc.gov/images/market-oversight/mkt-electric/reg-maps/mw_elect_map.gif.

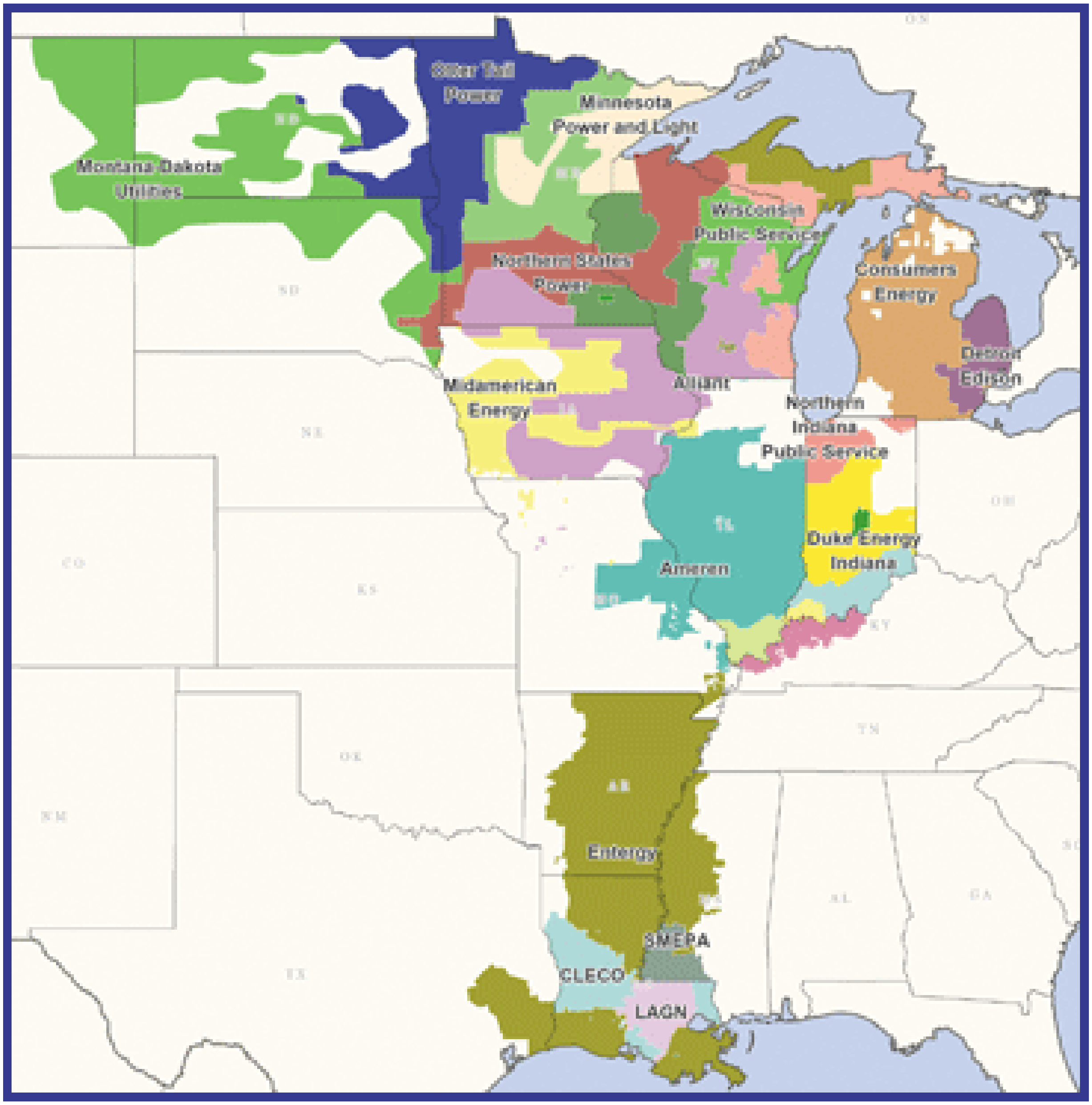


Figure 2

One can see from both of these maps that the connection between Zone 7 and Zone 6 is geographically narrow. The interconnection between Indiana, Ohio and Michigan consists of a 345 kV MISO transmission line and several PJM 345 kV transmission lines at its narrowest point.

Q. What is PJM?

A. PJM is also an RTO, one that covers parts of Illinois, Indiana, all of Ohio, and the Mid-Atlantic States. A map showing the geographic relationship between PJM and MISO can be found on page (v) of the North American Electric Reliability Corporation ("NERC") 2016 Long-Term Reliability Assessment ("LTRA"), which I am sponsoring as Exhibit MEC-74:

Figure 3

Q. Describe the transmission connection between MISO Zone 7and PJM.

A. As the map of the RTOs depicts, PJM borders MISO including Zone 7 to the south and east. The southwest corner of Michigan is also in PJM.

Q. How is transmission between MISO and PJM managed?

A. MISO and PJM have a Joint Operating Agreement to manage the transmission seam between the two RTOs. The specific transmission connections are depicted in Figure 4, which I am also sponsoring as Exhibit MEC-75:

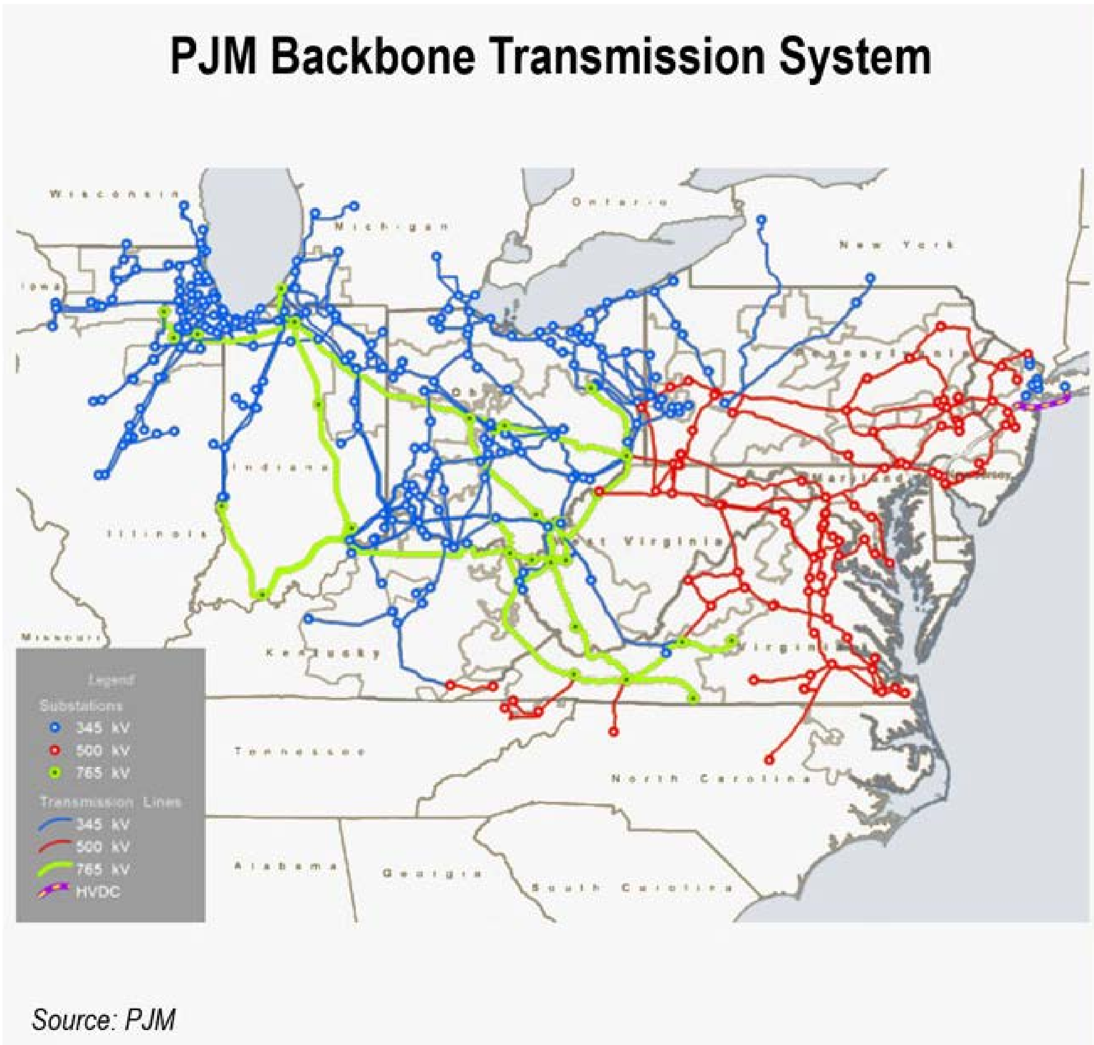


Figure 4

As this map shows, the area south of Detroit to the Michigan-Ohio border contains PJM transmission. The southwest corner of Michigan also contains PJM transmission. Both MISO and PJM transmission lines are used in the power flow models that are used by MISO for studies. The capacity import adequacy for an external resource in PJM would use the MISO and PJM combined transmission. If transmission capacity is not available and the limitations are on the PJM system, then there are provisions in the MISO-PJM Joint Operating Agreement to study the required transmission expansion. A MISO Transmission Service Request for external resources is the tool for executing that process.

Q. Describe the transmission use agreement between MISO and PJM.

A. FERC has removed the pancaked transmission rates between MISO and PJM.[2] A pancaked rate charges a Transmission Service fee for each RTO or utility that is involved in the delivery of a transaction. For example, if a resource was purchased from PJM and delivered to DTE and the pancaked rates had not been removed, there would be a PJM through- and out-rate, and possibly a MISO in-rate.

However, since 2002, FERC has recognized that the "Swiss cheese" areas of MISO and PJM required the elimination of transmission service charge pancaking between them. These areas were created by the migration of certain Illinois, Indiana and Ohio utilities from MISO to PJM, which FERC found "would result in an elongated and highly irregular seam between MISO and PJM that would 'island' portions of MISO (Wisconsin and Michigan) and would divide highly interconnected transmission systems across which substantial trade takes place."[3]

[2] *Midcontinent Independent System Operator, Inc.* (Order on Remand), 156 FERC ¶ 61,034 (2016).

[3] *Id.* at 1, and orders cited therein.

FERC addressed this concern by replacing the pancaked transmission service charges between MISO and PJM with a "license plate rate."[4] Under a license plate rate, the Network Integrated Transmission Service ("NITS") rate is the transmission cost for both PJM and MISO. MISO and PJM have transmission rates based on the zone they are in. License plate rates are analogous to license plates for automobiles, which are purchased in the state they are issued, but the car can drive in another state without purchasing a second license. DTE's primary transmission provider is ITC Holdings Corp. ("ITC Michigan") and the NITS rate that DTE pays is based on the ITC Michigan tariff. There is no additional cost for the use of PJM transmission that has capacity available above the MISO transmission tariff.

Q. Are imports from PJM to Zone 7 utilized fully?

A. No, there is currently an under-utilization of imports from PJM to Zone 7.

Q. What effect does the current under-utilization of imports have on electric customers in Zone 7?

A. It results in higher costs for Michigan customers in Zone 7.

Below is a screen shot of the MISO LMP Contour Map[5] for August 25, 2016, about 4 pm, when MISO was near peak load:

[4] *Id*. at 2.

[5] https://www.misoenergy.org/MarketsOperations/RealTimeMarketData/Pages/LMPContourMap.aspx.

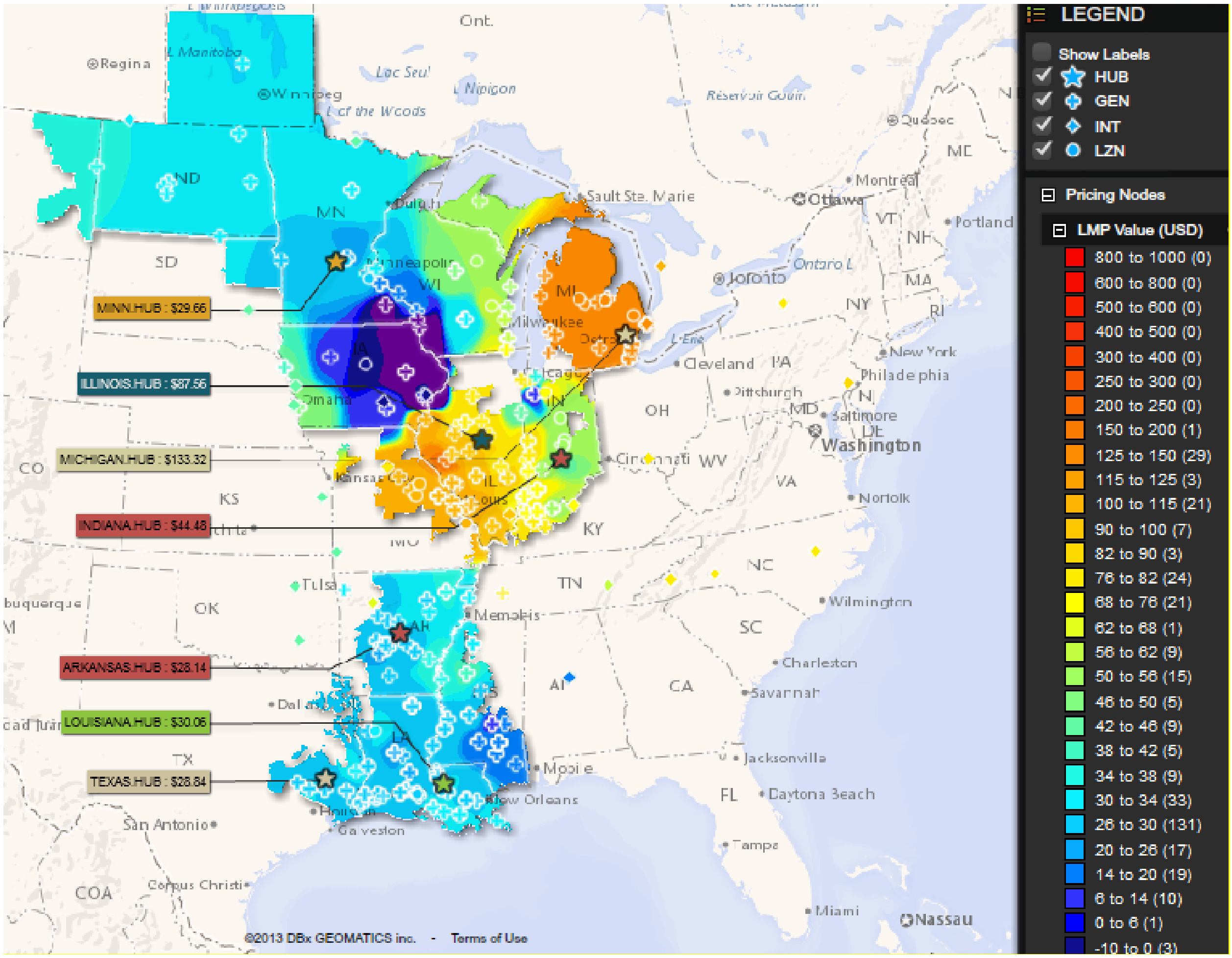


Figure 5

One can see from the color change that during this time, Locational Marginal Prices in Zone 7 were in excess of $100 per MWh, while they landed in the range of $40 to $60 per MWh a short distance away in northern Indiana. Congestion on the southern Michigan border causes prices to change within a short distance.

Q. Based on your experience at MISO, what has been the primary driver of the current situation?

A. In my opinion, it has been driven by the Michigan utilities focusing on in-state generation rather than connecting Lower Michigan to the rest of the grid. The result is higher generation prices in Michigan than in the rest of MISO.

Q. Does PJM have surplus capacity?

A. Yes. PJM has surplus capacity now and projects to have about 17,700 MW of surplus capacity in 2023.

Q. What is the source of that number?

A. Exhibit MEC-76, the NERC 2017 LTRA, has a table on page 57 showing projected demand, resources, and reserve margins. For 2023, the anticipated reserve margin is 28.6%. Subtracting the reference margin of 16.6% results in a surplus of 12.0%. Multiplying the reserve surplus by the net internal demand of 147,548 MW results in a surplus of 17,705 MW. Similar results are obtained through the end of the projections in 2027.

Q. What is the importance of the PJM generation surplus and the transmission interconnections between PJM and MISO?

A. The importance is that in considering options to procure capacity, firm imports from PJM may be an alternative that could defer, displace, or partially displace new generation in Zone 7. There is significant projected surplus capacity in PJM in the period of 2023 through 2027.

PJM has transmission ties to DTE in southeastern Michigan and to Michigan-MISO transmission in southwestern Michigan. MISO and PJM have primarily license plate transmission rate tariffs that avoid pancaked rates for power purchases of external resources from PJM for DTE. Presently, there is a loop flow from PJM to MISO that flows counter to market pricing and is often larger than 1,100 MW which is the rating of the proposed plan in the CON.[6]

The additional potential benefit associated with power purchases or exchanges is that a power purchase may have a lower cost of capacity than the cost to construct generation. The combined energy and capacity benefits from power purchases or power exchanges may be more than the cost of transmission to deliver the power. The energy associated with the purchased power may not come from the plant from which capacity is purchased. Energy sources would be determined by the markets. Projected production costs are determined by production cost simulation programs or market simulation programs. A purchase of power from PJM may be an alternative to constructing new generation or may at least defer such construction. The amount of surplus in PJM may reduce the price of a purchase of capacity below the cost of new construction. Such a purchase from PJM, with transmission requirements determined with a MISO Transmission Service Request, may be a reasonable alternative to include in an IRP study. Finally, as I explain further in Section IV of my testimony below, some of the

[6] Electricity is bought and sold using scheduled delivery routes. However, electricity follows paths determined by the laws of physics, which are not identical to the routes set in scheduled power transactions. When the actual path of electricity differs from the routes scheduled for it, this is known as "loop flow." Loop flows can increase costs when transactions cause the relationship between the scheduled route and the actual route to change.

issues DTE has raised concerning imports from other MISO LRZs do not apply to firm imports of surplus PJM generation.

Q. Is MISO as a whole currently a net importer or net exporter of capacity?

A. MISO is currently a net exporter.[7]

III. CANADIAN INTERCONNECTIONS

Q. Describe the transmission connection between Michigan and Ontario.

A. The transmission system in Zone 7 is also connected to the transmission system of the Ontario Independent Electricity System Operator ("IESO"). Figure 6 is a map showing these connections:[8]

[7] Exhibit MEC-77, MISO Summer Readiness Workshop (May 8, 2017) at 18.

[8] Exhibit MEC-78, Ontario Power Authority and IESO, Review of Ontario Interties at 21.

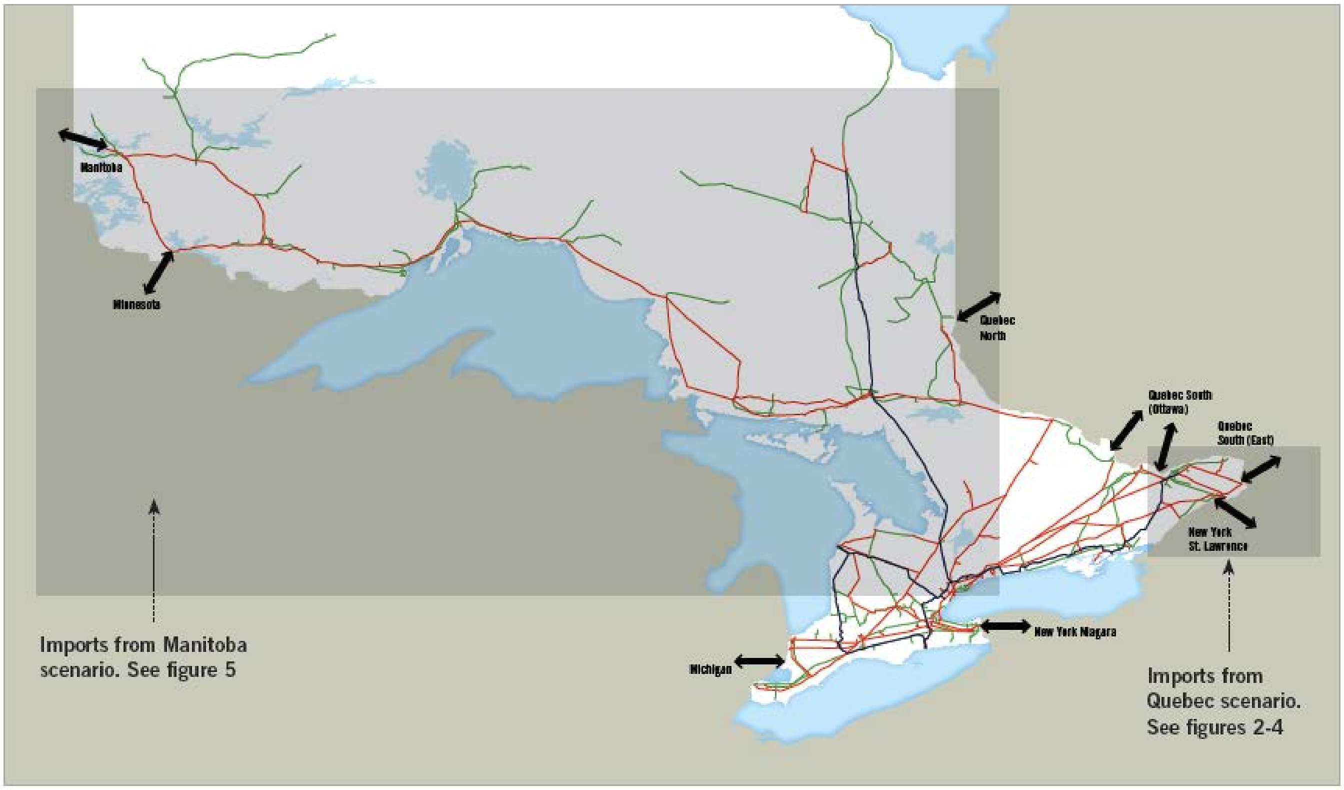


Figure 6

A recent MISO analysis found a Total Transfer Capability from IESO to MISO Central of 2,487 MW, more than double the capacity proposed in the CON.[9] Ontario also appears to have energy that is not used by markets: IESO makes ongoing short-term projections of resource adequacy that report thousands of MW of excess capacity and thousands of MWh of excess energy.[10] Typically, based on my experience, Ontario prices are lower than Michigan prices. As I discuss in Section IV of my testimony below, Michigan

[9] Exhibit MEC-77, MISO Summer Readiness Workshop (May 8, 2017) at 24. MISO Central consists of the MISO LBAs in Michigan, Illinois, Indiana, Kentucky, Missouri, and Wisconsin. All MISO Central imports must come through Michigan, so Michigan may have higher transfer capability.

[10] These reports are compiled at: http://reports.ieso.ca/public/Adequacy2/.

presently imports power from Ontario mostly through ordinary market flows.[11] The transmission from Ontario to Michigan has had actual power flows up to 1,200 MW – more than the new generation capacity proposed by DTE, but far less than the Total Transfer Capability from IESO to MISO. See Exhibit MEC-79 (Ontario flows to others spreadsheet).

Michigan's benefit from this activity is not currently optimized because Phase Angle Reflectors ("PARs") stop the low-cost energy into Michigan due to constraints in New York and to prevent "cream skimming." "Cream skimming" is when a utility in the path of low-cost energy flows keeps the low-cost energy and sells its generation to the neighbors based on what market prices allow.

Increasing the existing imports from Ontario would likely lower prices in Michigan, because of the lower Ontario prices. The use of HVDC transmission to place the delivery of lower cost energy into DTE may lower DTE prices even more than for Michigan as a whole, and may relieve other transmission constraints. Therefore, it is prudent to include alternatives to use energy and capacity efficiently from Ontario in DTE's IRP process. However, DTE appears not to have evaluated these options, which I discuss further in Section IV of my testimony, below.

In addition, as the map shows, IESO is also interconnected with Hydro Quebec. Hydro Quebec is a winter peaking utility with low-cost energy compared to MISO and PJM. The NERC 2015 LTRA report shows that Hydro Quebec has about 12,000 MW of

[11] Data as to whom Ontario sells power is not available as it is market confidential information. However, the total power being sold as firm power is about 600+ MW from Ontario, out of a total of about 7,000 MW exported from Ontario.

summer capacity surplus.[12] Hydro Quebec also has 6,000 MW of transmission export capacity. Hydro Quebec therefore has about 6,000 MW of summer capacity surplus that cannot currently be exported. DTE, by contrast, is a summer peaking utility and has about 4,000 MW of winter capacity surplus.[13] There appears to be seasonal capacity diversity between Hydro Quebec and DTE for potential power exchanges. Exchanging capacity from existing generation from DTE to Hydro Quebec in the winter in return for existing generation capacity from Hydro Quebec in the summer, with transmission through Ontario, may be an alternative to constructing generation in Michigan. I discuss this type of load capacity diversity exchange further in Section IV of my testimony, below.

IV. DTE'S POSITION REGARDING TRANSMISSION IMPORT CAPABILITY

Q. What does DTE witness Weber state concerning transmission import capability into DTE's service territory?

A. Mr. Weber states that existing transmission import capability is currently constrained by major east-west 345 kV lines into the DTE Electric service territory.

Q. What does DTE witness Weber state concerning the potential for improving transmission import capability?

A. He states that he reviewed the MTEP14 database and subsequent MTEP projects for proposed transmission projects that could impact transmission import capacity into the

[12] Exhibit MEC-80, NERC 2015 LTRA, Appendix I at 86, difference between demand and resources.

[13] Exhibit MEC-81, EIA 2016 Operational spread sheet, line 440, difference between columns G and H Summer Peak Demand and Winter Peak Demand.

Lower Peninsula of Michigan and that had an in-service date of 2025. He indicates that he found no projects that might significantly impact import capability into the Lower Peninsula. The IRP at page 104 adopts Mr. Weber's conclusions as its analysis of transmission options for this case.

Q. Do you agree with Mr. Weber's conclusions?

A. No, for three reasons:

First, I do not agree with Mr. Weber's conclusion concerning the current transmission import constraint. Mr. Weber did not identify the constrained east-west line in his testimony, nor the specific basis for his conclusion regarding the import limit into Michigan's Lower Peninsula. However, it appears he relied on MISO's identification of the 2016-2017 Planning Year Capacity Import Limit ("CIL") for Zone 7. If that is the case, then Mr. Weber was not relying on current information about the state of the system.

Second, the Capacity Import Limit is not the same thing as the capacity to import power via firm transmission service. Further, capacity to import power via firm transmission service is not constrained by the same limiting element that determines the Capacity Import Limit.

Third, neither DTE nor Mr. Weber appear to have evaluated any of the potential options for firm imports from the adjacent RTO or Ontario.

Q. Explain why you disagree with Mr. Weber regarding the current transmission import constraint.

A. MISO MTEP processes have mitigated the Capacity Import Limit constraint on which Mr. Weber appears to rely. Further, those processes are continuing and will continue to mitigate other CIL constraints as those constraints are identified.

In stating that existing transmission import capability is currently constrained by major east-west 345 kV lines into the DTE Electric service territory, Mr. Weber appears to be relying on the location of the limiting element for the 2016-2017 Planning Year Capacity Import Limit for Zone 7 – as this is the most recent MISO document that supports such a conclusion. The limiting east-west element is depicted as point number 6 on a map on page 7 of Book 2 of the 2016 MTEP, reproduced in Figure 7[14] below:

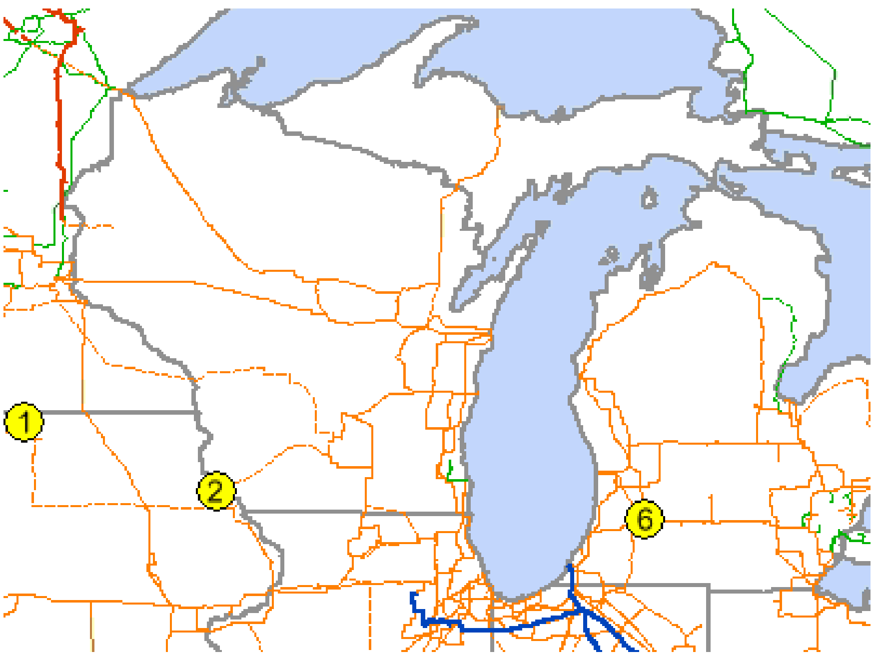


Figure 7

[14] Exhibit MEC-82, 2016 MTEP, Book 2 Resource Adequacy, also found at https://www.misoenergy.org/Library/Repository/Study/MTEP/MTEP16/MTEP16%20Book%202%20Resource%20Adequacy.pdf.

Table 6.1-2 on page 6 of the 2016 MTEP lists the Argenta to Battle Creek 345 kV line as the monitored element and the Paxton to Tompkins 345 kV line as the contingent element.[15] Table 6.1-4 on page 10 of the 2016 MTEP then lists projects planned to impact the most limiting constraints on capacity imports in MISO. That table lists as mitigation projects "Beals Road 138 kV Station Equipment Replacement, Argenta – Battle Creek 345 kV Sag Remediation and Station Equipment." The in-service date for this project is listed as 12/31/2017. Both the 2017-18 LOLE Study Report[16] and the 2017 MTEP Book 2[17] now list the Capacity Import Limit constraint for Zone 7 as being south of Detroit rather than on the east-west 345 kV line. This constraint is depicted as point number 7 on Figure 8:

[15] Monitored elements are all of the transmission lines that are 100 kV and above in the MISO model. Exhibit MEC-83, MISO Transmission Planning Business Practice Manual ("MISO BPM 20") at 128-29. A monitored element, as used in connection with a limiting constraint, is the first line or transformer in a model to have an overload or the first bus to have under voltage for the outage of the most critical line or transformer (contingency element) that is likely to cause an overload. Computer programs are used to run combinations of monitored lines and calculate the Capacity Import Limit power dispatch schedule. Computer programs are used to run a list of possible monitored elements for a list of probable contingency elements. The combination outputs are analyzed to find the set of monitored and contingent elements that have the lowest CIL.

[16] Exhibit MEC-73, 2017-18 LOLE at 15, tbl 3.3-1.

[17] Exhibit MEC-84, 2017 MTEP Book 2 Resource Adequacy at 9, fig 6.1-3.

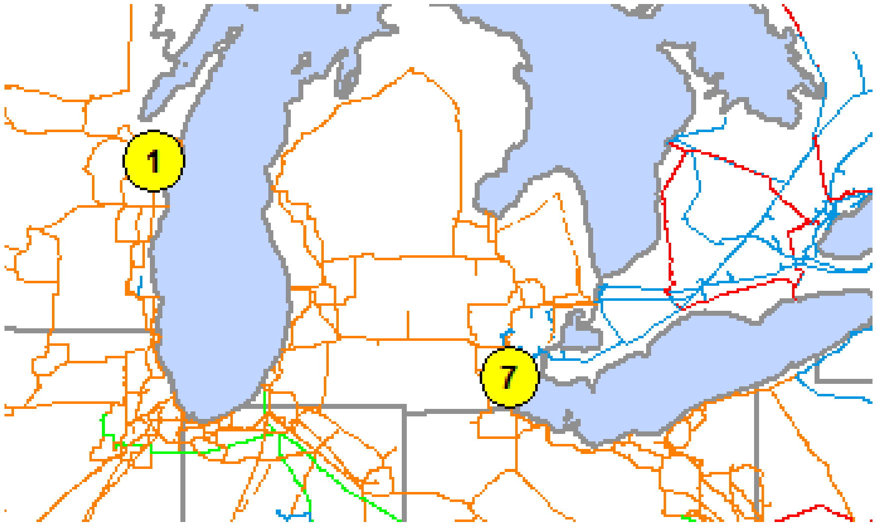


Figure 8

The 2017 MTEP Book 2 lists the monitored element for this CIL constraint as the Brownstown 345 kV Bus and the contingent element as the Monroe (south of Detroit)-Wayne (west of Detroit) 345 kV line.[18] The 2017-18 LOLE report lists the Brownstown (south of Detroit) constraint as being a voltage limit.[19] Voltage-limited transmission such as this can be addressed by supplying reactive power, which can usually be supplied in a few years.

Available options include Static VAR Compensators ("SVC"), switched capacitors, or StatCons ("Voltage Source Converter SVC"). These options can be planned and put into service within 2-4 years at a reasonable cost. In fact, MISO is currently planning to study such a fix. Exhibit MEC-85 is a presentation from the December 6, 2017 1st East Subregional Planning Meeting for the MTEP18. Pages 10-11 of the presentation list two projects to address this transmission constraint. The projects are potential upgrades to the

[18] *Id.* at 8, tbl 6.1-2.

[19] Exhibit MEC-73, 2017-18 LOLE at 20.

345kV station equipment at Brownstown and Monroe, and at Monroe and Wayne.[20] They have costs of $1.076 million and $580,000, respectively; and in-service dates of 2020 and 2018, respectively. Further studies will determine if the potential upgrades will be submitted for approval for construction.

There are a variety of options available to address transmission constraints identified after the current limiting element is resolved. For example, reconductoring lines is an option that can be accomplished within a 4-year time frame. Tying other short 345 kV lines into Wayne from nearby double circuited 345 kV lines that bypass Wayne may be an option if there is a need. The December 6, 2017 1st East Subregional Planning Meeting lists areas south and west of Detroit for further economic studies involving potentially congested transmission lines that increase costs to customers.[21]

To the extent that a future limit emerges on the east-west 345 kV line, retirement of the Palisades nuclear plant would significantly reduce the load on that line and may relieve emergent import capability constraints. Finally, importing power from Ontario to Detroit would create a counter flow that would probably relieve a constraint to the south – an option I discuss further below in this section of my testimony.

Q. Please summarize your second basis for disagreeing with Mr. Weber.

A. To the extent that Mr. Weber or DTE are relying on the Capacity Import Limit to contend that capacity cannot be imported from sources outside of MISO, they are mistaken. The CIL restricts general imports from other MISO zones, such as through capacity auction

[20] The Project IDs are 13811 and 13813.

[21] Exhibit MEC-85.

purchases. It does not, however, apply to the import of power from a specific source or sources outside of MISO. So, for example, an import from PJM of 1,100 MW would not count towards whether the CIL for MISO Zone 7 was exceeded. An evaluation of whether a limiting condition, such as the one at Brownstown, would be triggered would still be needed. But that determination would not be made by reference to the Capacity Import Limit. Rather, such a determination requires a Transmission Service Request and a specific study, which DTE has apparently neither sought nor carried out.

Q. How does MISO determine the Capacity Import Limit?

A. MISO determines the CIL as the capacity to import power into an LRZ from a utility in an adjacent MISO LRZ. The MISO Resource Adequacy Business Practice Manual ("MISO BPM 11") (Aug. 25, 2017) explains:

> To determine an LRZ's limits, a generation to generation transfer is modeled from a source subsystem to a sink subsystem. For import limits, the limit is determined for the sink subsystem. Import limits are found by increasing MISO generation resources in adjacent Local Balancing Authorities (LBAs) [source] while decreasing generation inside the LRZ [sink] under study. LBAs that are interconnected with the LRZ under study are considered adjacent. Tiers are used to define the generation pool used for import studies and are comprised of the adjacent systems of the zone being studied.
>
> • Tier 1 – Generation in the MISO LBAs adjacent to the LRZ under study
>
> • Tier 2 – Tier 1 plus generation in MISO LBAs adjacent to Tier 1
>
> Import limit studies are analyzed first using Tier 1 generation only. If a constraint is identified, redispatch is tested. If redispatch mitigates the constraint completely and an additional constraint is not identified, the limit is the adjusted available capacity in Tier 1 plus any base import or minus any base export. Available capacity must be adjusted to account for changes due to redispatch. If a constraint is not identified using Tier 1 generation only, Tier 2 generation is then considered

> using the same redispatch process. If constraints are identified using Tier 1 generation, Tier 2 generation is not needed to determine the zone's import limit.[22]

In other words, the Capacity Import Limit is the limit on power that can be imported into Zone 7 from specific Local Balancing Authorities in an adjacent Zone or Zones. It is not the simultaneous import limit of the transmission system into Lower Michigan; nor is it the capacity to import power via a firm purchase from another RTO, utility, or Canada. The MISO BPM 11 shows the Tier 1 and Tier 2 Local Balancing Authorities for Zone 7 that are used to calculate the CIL:

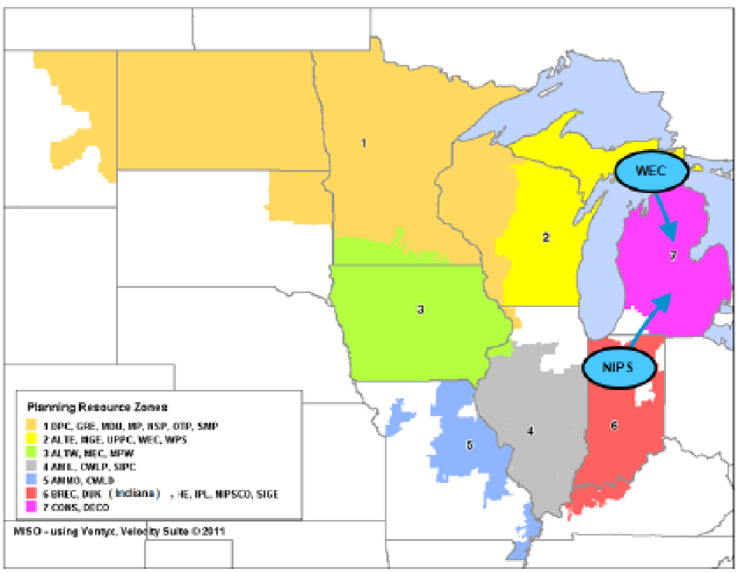


Figure 5.2: Example - MISO LBAs Used for First Test of LRZ 7 CIL

Figure 9

[22] Exhibit MEC-86, MISO BPM 11 at 75 (figure omitted). See footnote 16 of my testimony for a description of how the constraints are identified.

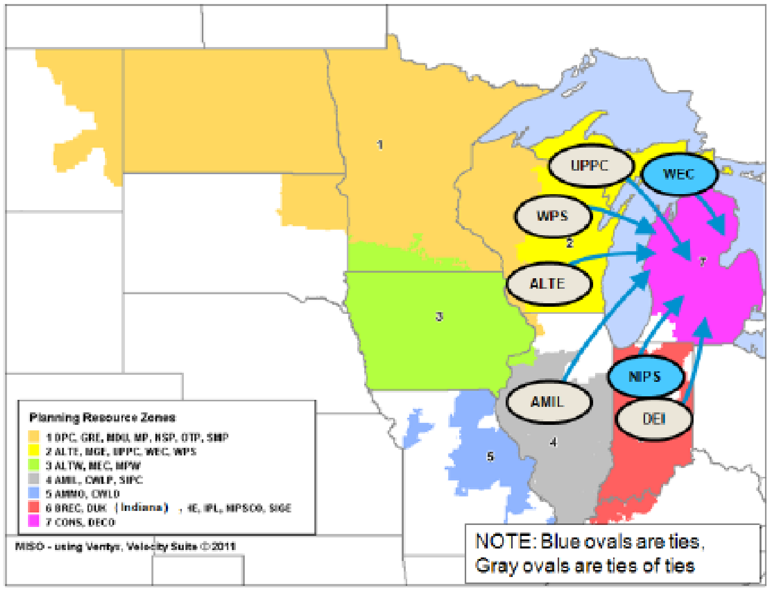


Figure 5.3: Example - MISO LBAs Used for Second Test of LRZ 7 CIL

Figure 10

The Capacity Import Limit is determined by modeling power flow from these two areas during the MISO peak load base case. The dispatch for the summer peak base case would most likely be based on economic generation dispatch in MISO with firm transactions modeled in the interchanges between neighboring systems.

By contrast, modeling firm imports from external resources (PJM east of Indiana, for example) as part of the total resources for a Load Balancing Area (DTE, for example) would not be expected to give the same transmission loading patterns as increasing Tier 1 (southwest of Michigan) generation and decreasing Zone 7 (Consumers and DTE) generation, as is done for the LOLE CIL calculation. Instead, a Transmission Service Request and subsequent study or studies would have to be performed to determine the loading pattern from a specific Point-to-Point ("PTP") transaction. If a Transmission Service Request were made and MISO conducted a study that indicated that transmission is required to import power, then the process described in the 2017 MTEP Book 1, could be executed.[23]

Q. Would transmission upgrades be required for DTE to secure a firm import?

A. Not necessarily. The current Capacity Import Limit into Zone 7 is 3,521 MW from MISO. The power import calculation from "11" IESO (Ontario) to MISO Central is 2,487 MW. Power flows from IESO to MISO Central have to pass through Michigan. Thus the power flow capability from IESO to DTE is at could reasonable be assumed to be at least 2,487 MW. DTE's stated generation capacity need is 1,100 MW. Since the CIL is already so much higher than the generation capacity need, there is probably not a need for transmission from MISO processes to accommodate a potential 1,100 MW+ import for an external resource. The current limiting constraint, Brownstown voltage, may not be a limit if the import is not loading the transmission as high as in the summer peak base case with maximum imports from Tiers 1 and 2 used to determine the CIL. Transmission Service Requests studies would provide the exact information of upgrades or expansions required for an external resource.

Q. Explain your third basis for disagreeing with Mr. Weber.

A. Neither DTE nor Mr. Weber appear to have evaluated any of the potential options for firm imports from adjacent RTOs or from elsewhere in the MISO footprint. By way of example only, these options include power from the D.C. Cook nuclear plant, which is located in the PJM territory in Southwest Michigan; securing firm power from Ontario; improving connection to Canada with HVDC; and load capacity diversity exchanges.

[23] Exhibit MEC-87, 2017 MTEP Book 1 at 53.

Q. Does MISO import power from adjacent RTOs now?

A. Yes. The MISO models included firm transactions that would include external resources. Figure 11 displays hourly imports of energy into MISO Zone 7 from PJM and from Ontario on a recent day:

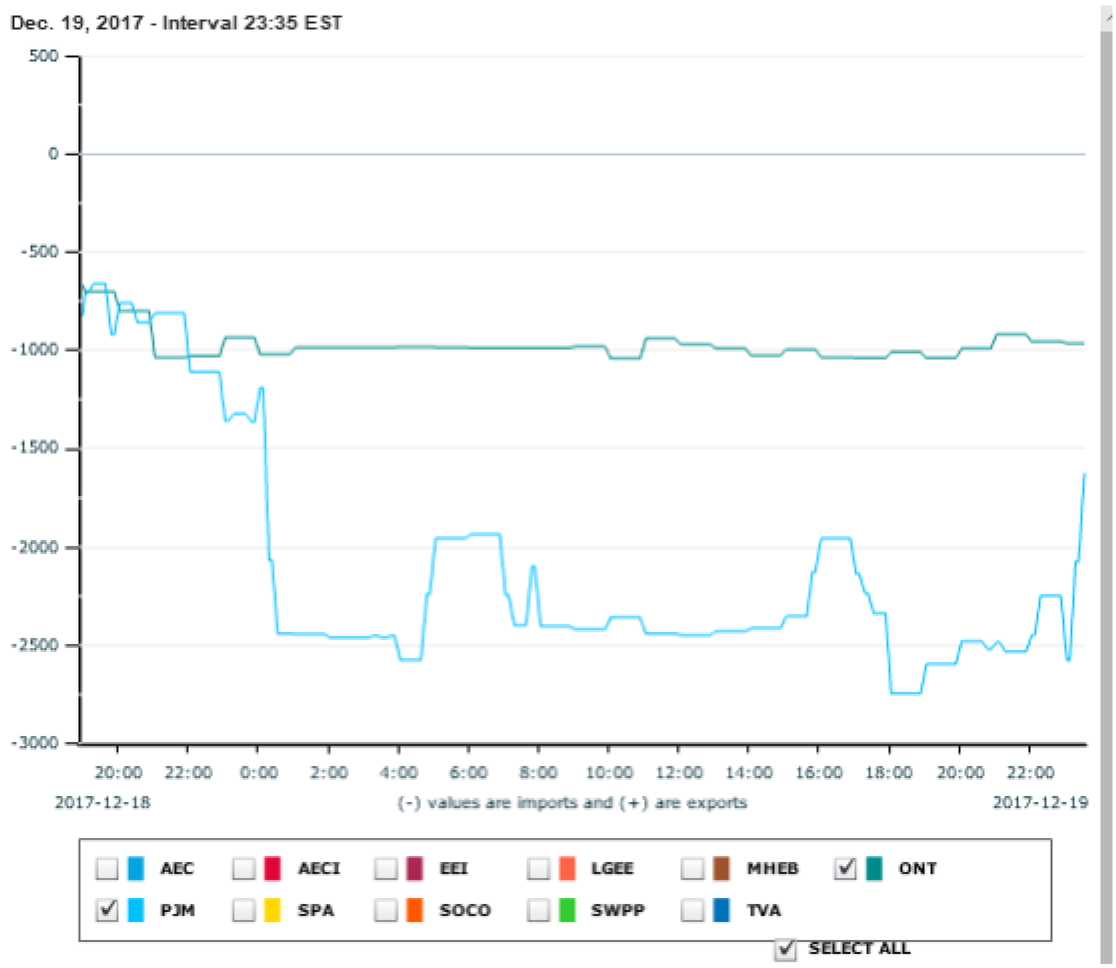


Figure 11

The chart shows imports from PJM that mostly range within a band from 1,500 to 2,500 MW; and imports from Ontario that hold around 1,000 MW. Other boxes can be checked to see the exports-imports from the other areas from MISO.[24]

Q. Discuss the D.C. Cook plant.

A. As noted earlier, PJM projects to have a generation surplus of 17,700 MW by 2022. As also noted earlier, in addition to the connections between MISO and PJM south of Detroit, there are connections between MISO and PJM in Southwest Michigan. The Donald C. Cook Nuclear Plant is in Berrien County, Michigan. It is owned by Indiana Michigan Power and located within the PJM territory in Southwest Michigan. Energy from D.C. Cook historically has been exported from Michigan. If some of the energy and capacity from D.C. Cook were rerouted within Michigan, the transmission constraints south of the Michigan border in Indiana might also be relieved and increase the Zone 7 Capacity Import Limit. The retirement of the Palisades nuclear plant in 2022 may also mitigate some of the former constraints west to east in Michigan, which could enable PJM power flow into Zone 7 and reduce the export from D.C. Cook. Since the transmission system has not yet operated with the future loading patterns resulting from the retirement of Palisades, it would be reasonable to expect upgrades or expansions in western Michigan tying the PJM transmission to the MISO transmission. MISO BPM 20, Appendix J (Exhibit MEC-83) discusses the analysis of the impact of changes in transmission loading patterns on transmission lines.

[24] https://www.misoenergy.org/MarketsOperations/RealTimeMarketData/Pages/NetScheduledInterchange.aspx.

Q. Discuss imports from Canada.

A. As Figure 11 indicated, IESO regularly exports around 1,000 MW of energy into Michigan. These exports occur as a result of daily market activity, without a capacity purchase agreement. The export price of IESO is available on the internet[25] and usually lower in price than PJM or the MISO Michigan prices.[26] Securing a firm capacity purchase agreement for power that is already flowing from IESO to MISO could enable DTE to meet reliability requirements without new generation or transmission. DTE does not indicate that it has taken any steps to explore this possibility.

In addition, as I discussed earlier, Hydro Quebec is a winter peaking utility and has about 12,000 MW of summer season surplus. Hydro Quebec is interconnected with Ontario. Ontario and Hydro Quebec have an HVDC tie that is presently being used for summer-winter capacity diversity exchanges. Quebec presently has 6,000 MW of transmission ties with New York and New England. As I discussed earlier in my testimony, Hydro Quebec has 6,000 MW of summer season capacity surplus available and DTE has 4,000 MW of Winter season capacity difference with the summer peak load. Seasonal power exchanges with Hydro Quebec and DTE through Ontario may be an alternative that could delay, displace, or partially displace the new generation proposed by DTE.

Increasing the transmission capacity to Ontario, and potentially also through Ontario to Hydro Quebec, could produce a cost-competitive capacity and energy source. If transmission capacity was increased with Canada, so would the capability of importing more low-cost, carbon-free energy into DTE and/or Michigan. If the transmission were

[25] See http://ieso.ca/en/power-data/data-directory.
[26] See http://www.miso-pjm.com/markets/contour-map.aspx.

HVDC, the physical and financial advantages could be contained primarily in Michigan or Detroit.

Q. Explain the potential use of HVDC for this purpose.

A. DTE has a unique location next to low-cost, flexible hydro generation with storage capability in months, and linked to an area with about 6,000 MW of summer surplus capacity beyond its export limits. No other utility in MISO or PJM has the options that DTE has in this respect. The question is how to capture the potential benefits.

HVDC technology has evolved and now primarily uses voltage source converters (VSC) which allow power injection with voltage support, and black start capability within urban areas. The first HVDC system using VSC in the United States is rated at 330 MW and was built in 2002. The underwater cable connects Connecticut to Long Island at a former nuclear plant.[27] This HVDC system was first energized to assist in the recovery of the 2003 black out.

The voltage and power ratings of HVDC cable have advanced to levels to be able to deliver power where needed. HVDC cable is more flexible in its installation, and easier to install underwater than AC cable. For example, cable delivery along rivers, next to rail road tracks or underground provides options for the strategic location of power injection. In addition, the installed cost of HVDC cable is about half that of AC cable. HVDC using VSC terminals acts like a generator and can inject power and provide black start capability. For example, the Trans Bay project has a terminal located in San Francisco

[27] http://www.crosssoundcable.com.

that delivers 40% of the power requirements of San Francisco.[28] The Trans Bay cable terminates near a retired generator, and the equipment is enclosed in a building and therefore reduced visual impact. The project is rated at 400 MW and includes black start capability.

The present AC ties from Michigan to Ontario are sufficient to supply at least the 1,200 MW as a CON alternative. As discussed in MEC witness Josh Berkow's testimony, the existing phase angle regulators ("PARs") between Michigan and Ontario could be replaced with an HVDC terminal. Coupled with power purchases from Ontario or through Ontario to Hydro Quebec, the HVDC option may be an alternative to generation construction.[29]

The reactive power capability of VSC terminals would support voltage at the present PAR location in St. Clair for both Michigan and Ontario. Usually adding reactive power voltage support increases the power transfer capability unless the conductors are thermally limited.

[28] http://www.transbaycable.com/the-project/.

[29] Multiple HVDC terminals could be located strategically within DTE's service territory at ratings that support the distribution system instead of one generation source. Pole locations can be split to provide more injection locations at half the rating of a bipole. The rating of a 345 kV step down transformer may be a first estimate of HVDC terminal ratings. The rating of individual terminals and their location would be a strategic decision by DTE.

HVDC used in the way described, could be classified as distribution and subject to rate basing by DTE. An HVDC asset that injects power into DTE's distribution system, controlled by DTE distribution control centers, would provide advantages for overload control and voltage control that are presently not available.

The Ontario and Hydro Quebec systems have the capability to provide months of storage for wind energy. Having storage operated with markets does not return energy as pumped storage. The storage is operated financially rather than physically.

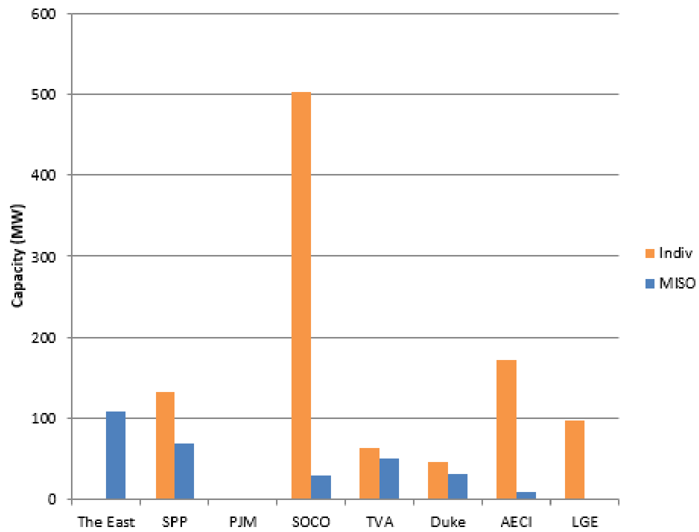
The HVDC injections of power would be into DTE's LBA and Zone 7 and would supply power and voltage support as would a generator. The CIL may also be increased due to mitigation of voltage issues and counter flows of power from DTE compared to present model flows.

Q. Discuss the potential option for Load Capacity Diversity exchanges means.

A. Load Capacity Diversity means the least value of the difference in two sets of hourly load on the peak hour for a period of years – typically nine years. The hourly load set with the least value of both sets is Load Capacity Diversity. The smaller supply determines the Load Capacity Diversity. The probability of one peak hour in nine years of data is about 11%. Utilities usually have multiple generation and reserves plus interconnections to obtain power on peak. Because the probability that a utility could not supply or purchase the capacity for a Load Capacity Diversity exchange is small, the Load Capacity Diversity exchange levels are considered to be firm capacity. One half of the Load Capacity Diversity can displace peaking generation for each of the parties in an exchange transaction. The other half is needed to transmit the peak power exchanges. Load Capacity Diversity exchanges use existing generation capacity over a large area more efficiently. Thus, the price of energy to the customer is reduced. Figure 12 shows potential Load Capacity Diversity Exchange partners for DTE in the Eastern Interconnection:

MISO

Detroit Edison Co



Region	Indiv (MW)	MISO (MW)
The East	0	108.9
SPP	132	68.3
PJM	0	0
SOCO	501.9	29.6
TVA	64	49.6
Duke	47	30.9
AECI	173	8.6
LGE	98	2.4

44

Figure 12

As an example, The Southern Company has about 500 MW of Load Capacity Diversity with DTE. Load Capacity Diversity exchanges would require two willing participants to negotiate a bilateral transaction. About 250 MW of peaking generation may be displaced if an exchange transaction were made. The transmission service required would be 250 MW. The transmission service could be arranged through some combination of TVA, MISO, and PJM. Studies would determine which parties are affected. The Transmission Service Request would be made through MISO, which would conduct and coordinate the studies with the affected parties.

Q. Have you seen any evidence in DTE's testimony or IRP that any of these potential options have been evaluated?

A. I have not.

V. EXCLUSION OF PURCHASES OUTSIDE ZONE 7 FROM THE RFP

Q. Describe DTE's RFP for generation.

A. DTE witness Irene Dimitry discusses the RFP on page 25 of her direct testimony. She states that the Company issued the RFP for purchase of natural gas-fueled generating assets with an unforced capacity of 225 to 1,200 MW, with a requirement that the asset must be physically located in Zone 7. Witness Dimitry adds that DTE also solicited proposals for power purchase agreements (PPAs) with the same conditions and a maximum term of seven years.

Q. Why did DTE limit the capacity RFP to resources physically located in Zone 7?

A. DTE Witness Dimitry does not say directly. However, on the page preceding her discussion of the RFP, she references Mr. Weber's conclusion that transmission constraints limit import capability. Ms. Dimitry further states that: "Even if transmission import limits could be expanded in a timely manner, the Company would be taking considerable risk if it simply assumed that there would be available capacity at reasonable cost in neighboring MISO zones."[30]

[30] Dimitry Direct Testimony, p 24.

Q. In your opinion, was DTE's decision to limit the RFP to resources located in Zone 7 reasonable?

A. It was not. First, as I discussed earlier, PJM is adjacent to and interconnected with DTE's service territory on the south; and also adjacent to and interconnected with Zone 7 from PJM territory located within Michigan to the west. PJM has an anticipated surplus of 17,700 MW of generation in 2023. The CIL for Zone 7 is 3,521 MW; the limiting element to the west has been mitigated; and projects may be planned to mitigate the limiting element to the south. Additionally, the Palisades retirement in 2022 would be expected to lessen east-west transmission loadings in Michigan.

Further, a firm capacity purchase contract would address the risk related to availability that Ms. Dimitry expresses concern about – particularly if DTE were to obtain transmission service for an external resource, DTE resource requirement within Zone 7 would be reduced. Once the power is purchased, the uncertainty argument concerning power not being available is no longer valid. The supplier has an obligation to provide capacity from its resources or purchase the power.

VI. RESTRICTION OF CAPACITY IMPORTS IN MODELING TO 300 MW OF ANNUAL SPOT PURCHASES

Q. What is a Planning Reserve Margin Requirement?

A. According to the MISO Resource Adequacy Business Practice Manual:[31]

> The Planning Reserve Margin Requirement (PRMR) is the number of ZRCs [Zonal Resource Credits] required to meet an LSE's Resource Adequacy Requirements (RAR). The RAR is established to ensure that LSEs have enough Planning Resources to reliably serve load.

[31] Exhibit MEC-86, MISO BPM 11 at 14.

The PRMR is expressed in the following equation obtained from MISO BPM 11 Resource Adequacy, per Asset Owner per Local Resource Zone (LRZ):

$$PRMR_{LRZ} = \sum_{LBA}[(CPDf \quad - FRP \quad + FRS \quad) \times (1 + TL\% \quad) \times (1 + PRM_{RTO})]$$

Where:

$PRMR_{LRZ}$ = Planning Reserve Margin Requirement per LRZ
CPDf = Coincident Peak Demand forecast per LBA
FRP = Full Responsibility Purchase per LBA
FRS = Full Responsibility Sale per LBA
TL% = Transmission Loss Percentage of LBA
PRM_{RTO} = Planning Reserve Margin in Unforced Capacity set by LOLE Studies

Planning Reserve Margin Requirements are set for each Load Serving Entity in MISO, each Zone in MISO, and MISO as a whole.

Q. What assumption regarding capacity imports did DTE make in its IRP modeling?

A. According to DTE witness Kevin Chreston, the Company assumed that 300 MW of spot purchases were available annually for purchase to meet the Company's PRMR in the majority of modeling sensitivities over the planning period.[32]

Q. How did Mr. Chreston justify that assumption?

A. He states it is justified due to an "Effective Capacity Import Limit" or "ECIL."

Q. Explain.

A. DTE witness Angela Wojtowicz testifies that each year MISO sets a Local Clearing Requirement, which she defines as "the minimum amount of unforced capacity . . . that

[32] Chreston Direct Testimony, p 20.

must be physically located within a LRZ while fully utilizing the CIL of the LRZ."[33] Witness Wojtowicz then states that "[b]ecause both the LCR and CIL must be enforced in the PRA to ensure a zonal reliability of 1 day per 10 years LOLE, the actual amount of capacity that a LRZ can import can be constrained more than the CIL resulting in an effective CIL (ECIL)."[34] She then defines the ECIL equal to the Planning Reserve Margin Requirement minus the Local Clearing Requirement. Her calculation of the ECIL for Zone 7 in the 2017/2018 Planning Year is:

ECIL = PRMR – LCR = 22,295 – 21,109 = 1,186 MW.[35]

She rounds this figure to approximately 1,200 MW.

Witness Chreston then refers to Witness Wojtowicz's calculation of the ECIL at 1,200 MW and notes that this capacity can be used by all Load Serving Entities in Zone 7.[36] He reasons that if the ECIL was allocated based on each LSE's proportionate share of the Planning Reserve Margin Requirement in Zone 7, DTE would have just under 600 MW and Consumers Energy would have just over 400 MW.[37] However, Mr. Chreston notes that known imports by Alternative Electric Suppliers (AES's) are in the 700 to 800 MW range, leaving a proportionately lower share of the ECIL available to DTE. Therefore, he assumes that 300 MW will be available to DTE during the planning period.

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[33] Wojtowicz Direct Testimony, p 8.

[34] *Id*.

[35] *Id.* at 10.

[36] Chreston Direct Testimony, p 19.

[37] *Id*.

Q. During your years at MISO, did you ever encounter the term "ECIL"?

A. No. It is not a term used or recognized by MISO, to my knowledge.

Q. How does MISO determine the Local Clearing Requirement?

A. MISO first determines a Local Reliability Requirement, which MISO defines as "the amount of UCAP MWs required to yield a 0.1-day-per-year LOLE, without assistance from resources outside the respective LRZ at the load level for the LRZ at the time of the LRZ peak."[38] Then MISO subtracts the Capacity Import Limit from the Local Reliability Requirement, and accounts for exports, to determine the Local Clearing Requirement.

Q. How does the Capacity Import Limit affect the Local Clearing Requirement?

A. Based on the equation MISO uses to calculate the Local Clearing Requirement, increasing the Capacity Import Limit will lower the LCR, all other things equal. I am advised by counsel that the Michigan Public Service Commission recognized the effect of transmission constraints on the LCR in a recent order concerning the electric supply reliability plans of Michigan utilities.[39] In that order, I understand that the Commission stated that the Local Clearing Requirement for Zone 7 was relatively high compared with other LRZs in the MISO footprint:

Local Resource Zone	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10
PRMR	18,316	13,366	9,781	9,894	8,598	18,422	22,295	8,329	20,850	4,902
LCR	15,975	11,980	7,968	5,839	5,885	13,005	21,109	6,766	17,295	4,831
LCR/PRMR (%)	87.2%	89.6%	81.5%	59.0%	68.4%	70.6%	94.7%	81.2%	82.9%	98.6%

[38] Exhibit MEC-86, MISO BPM 11 at 79.

[39] Commission Order in Case No. U-18197 (September 15, 2017).

The Commission noted that "Zone 7's LCR is higher than other areas in MISO due to a number of factors, including the age and reliability of resources within the zone, the geographic nature of the zone (a peninsular state with limited interconnection), and the amount of available transmission import capacity."[40] It appears the Commission recognized that addressing transmission constraints would not only increase the CIL; it would also help to improve the LCR.

Q. How would the firm purchase of capacity from PJM or IESO impact DTE's Planning Reserve Margin Requirement?

A. In the equation MISO uses to determine the Planning Reserve Margin Requirement, which I reproduced earlier in my testimony, any Full Responsibility Purchases (FRPs) are subtracted out of the utility's Coincident Peak Demand requirement. Therefore, such purchases by DTE would reduce the Company's Planning Reserve Margin Requirement, subject to also conforming to the LCR.

Further, the Open Access Transmission tariff and the Transmission Service Request process allows for the acquisition of transmission service from available capacity, not just capacity in Zone 7. I find no mention of a Transmission Service Request by DTE in MISO's online records.

Q. Summarize your concerns about DTE's reliance on an "ECIL" to justify limiting its consideration of transmission alternatives.

A. First, ECIL is not a term that I recognize as being used by MISO. Second, DTE's definition of ECIL purports to limit resources that can be imported, below the Capacity

[40] *Id*. at 34.

Import Limit, based on the Local Clearing Requirement. However, the Local Clearing Requirement is not independent of the Capacity Import limit. Increasing the CIL will lower the LCR, which will increase the ECIL as DTE has defined it. Finally, a firm purchase of one of the types I have discussed would reduce DTE's Planning Reserve Margin Requirement, prior to consideration of any constraint that ECIL would impose on DTE's ability to use imports to meet its PRMR.

Q. Putting aside for a moment the question of the validity of the ECIL, do you agree with DTE witness Chreston's assumption that only 300 MW of the ECIL would be available to DTE during the IRP planning period?

A. No. Mr. Chreston states that his assumption is based on a belief that Alternative Electric Suppliers will continue to procure 700-800 MW of capacity imports.[41] I am advised by counsel that in the Commission order I discussed above, the MPSC concluded that it will apply a Local Clearing Requirement to all Michigan electric providers – including AES's – starting in 2022, under an allocation formula to be determined in a future proceeding.[42] Imposing a Local Clearing Requirement on AES's will require them to substantially reduce their imports. It is thus not realistic for Mr. Chreston to assume that the current condition with respect to procurement of capacity imports by AES's will persist.

[41] Chreston Direct Testimony, p 19.

[42] Commission Order in Case No. U-18197 at 39-40 & 47.

VII. CONCLUSION

Q. In your opinion, has DTE demonstrated that it seriously considered and evaluated transmission and capacity import options?

A. No. From the testimony I have reviewed, I do not believe that DTE has done so. Neither DTE nor its witnesses have engaged in any detailed analysis of transmission options and purchased capacity options. Further, the cursory analysis they have presented is for the most part not based on current information about the state of the system. In my professional opinion, available information strongly suggests that a robust alternative analysis would likely identify options that could defer, displace, or partially displace DTE's claimed need for added generation capacity.

Q. Does this complete your testimony at this time?

A. Yes.

STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter of the Application of **DTE ELECTRIC COMPANY** for approval of Certificates of Necessity pursuant to MCL 460.6s, as amended, in connection with the addition of a natural gas combined cycle generating facility to it generation fleet and for related accounting and ratemaking authorizations	U-18419 ALJ Suzanne D. Sonneborn

PROOF OF SERVICE

On the date below, an electronic copy of **the CORRECTED Direct Testimony of Dale Osborn on behalf of Michigan Environmental Council, Natural Resources Defense Council, and Sierra Club** was served on the following:

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The statements above are true to the best of my knowledge, information and belief.

OLSON, BZDOK & HOWARD, P.C.
Counsel for MEC-NRDC-SC

Date: January 15, 2018

Marcia Randazzo

Digitally signed by Marcia Randazzo
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