STATE OF MICHIGAN

BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter, on the Commission's own motion, to open a docket for certain regulated electric utilities to file their five-year distribution investment and maintenance plans for other related, uncontested matters.	Case No. **U-20147** (**e-file paperless**)

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MICHIGAN PUBLIC SERVICE COMMISSION STAFF'S COMMENTS

MICHIGAN PUBLIC SERVICE COMMISSION STAFF

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BACKGROUND

With the distribution plant capital investments of Consumers Energy (Consumers) and DTE Electric (DTE) approaching $900 million annually, the Commission realized several years ago the benefit in taking a long term look at distribution investments. In 2017 rate cases for Consumers and DTE, the Commission stated that "[t]he Commission supports the authorization of necessary investments to ensure the utility's distribution system is safe, reliable, and resilient. But in order to properly evaluate these investments, and provide a greater level of regulatory certainty, the Commission finds that the rate case process would benefit from the company providing a more comprehensive, forward-looking capital investment and operations plan."[1] The Commission directed both utilities to provide a capital investment and operations plan outside of the time-constrained rate case process. In a 2018 rate order, the Commission ordered Indiana Michigan Power Company (I&M) to file its five-year distribution plan.[2]

Initial five-year distribution plans were filed by DTE and Consumers on January 31, 2018 and March 1, 2018, respectively. I&M filed its initial five-year distribution plan on April 3, 2019. The Commission established a single docket, Case No. U-20147, to serve as a repository for all five-year distribution plans.

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[1] DTE: January 31, 2017 order in Case No U-18014- https://mi-psc.force.com/s/filing/a00t0000005pmTQAAY/u180140291 and Consumers: February 28, 2017 order in Case No. U-17990 – https://mi-psc.force.com/s/filing/a00t0000005pjydAAA/u179900401

[2] April 12, 2018 order in Case No. U-18370. https://mi-psc.force.com/s/filing/a00t0000004rkk4AAA/u183700199

A technical conference was held on August 7, 2018, and a series of stakeholder workgroup meetings took place between June 2019 and November 2021 to consider distribution planning reporting frameworks. Detailed information about the distribution stakeholder process is available on the Commission's MI Power Grid Electric Distribution Planning workgroup website.

The key components of an electric distribution plan are evolving as more experience is gained by stakeholders. The plans should include information on asset assessments and capital replacements, capacity upgrades and load relief, circuit reliability, grid modernization, reactive/base capital projected spending, key maintenance areas (tree trimming and preventative maintenance programs), vision of grid modernization over the next 10 – 15 years, and vision of advanced distribution planning processes.[3]

The planning horizon for this iteration of distribution plans is expanded to include 10 – and 15-year horizons with more detailed information provided for the five-year horizon. The Commission has reiterated four over-arching electric distribution system objectives for this round of distribution plans: safety, reliability and resiliency, cost-effectiveness and affordability, and accessibility.[4]

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[3] https://www.michigan.gov/mpsc/-/media/Project/Websites/mpsc/workgroups/elec-dist-planning/Full_Slides_-_ver_8.pdf?rev=5f6708216e9145ef95cb60b3ff01a716&hash=4EF8019FEAEBEC7E892B88B86F4C9EE7 October 16, 2019

[4] See U-20147, August 20, 2020 order https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t000000DcfWRAAZ page 36-37.

In addition to the information provided in the 2018 distribution plans, the Commission directed utilities to include the following:

- Hosting capacity analysis (Consumers and DTE only). For Consumers and DTE, the hosting capacity analysis should include an initial base-level zonal go/no go map published and refined with updated analyses over a two-year period. The Commission directed I&M to monitor the HCA activities of Consumers and DTE and leverage its planning expertise to contribute to the effort.
- Expanded NWA analysis. The expanded NWA (non-wires alternatives) analysis will include further progress on articulation of decision criteria used by utilities to screen projects for NWA analysis, as well as additional pilots that could be considered focusing on capacity and substation projects. Information provided for proposed NWAs should include "information regarding costs and savings, impact of the NWA in offsetting the need for traditional investment, customer consumption patterns with and without the NWA, implementation timing, and assumptions used in the analysis, including minimum customer participation levels."[5]
- Proposed performance-based regulation elements (DTE and Consumers).

[5] See U-20147 August 20, 2020 Order, page 44.

- Consider how to apply recommendations from Staff's report on Energy Programs and Technology Pilots.[6]
- Robust and risk-based resilience evaluations and mitigation strategies.
- Consider EWR (energy waste reduction) by running sensitivities in load forecasts for distribution planning and start modeling locational impacts from customer behavior to facilitate the identification of potentially cost-effective NWAs.

Review of the individual plans

All three utilities filed their final reports in accordance with the August 20, 2020, order in Case No. U-20147. The draft and final distribution plans were filed on the following dates:

Company	Draft Plan	Final Plan
Consumers	April 30, 2021	June 30, 2021
DTE	August 2, 2021	September 30, 2021
I&M	July 30, 2021	September 30, 2021

This set of Staff comments responds to all three utilities' final plans and builds on the short set of Staff comments filed on October 4, 2021. These Staff

[6] Report can be found here: https://www.michigan.gov/mpsc/commission/workgroups/mi-power-grid/energy-programs-and-technology-pilots

comments also include responses to the six questions posed by the Commission in its August 25, 2021, order in Case No. U-21122 *et al* on which the Commission sought stakeholder feedback on the final distribution plan filed by Consumers, and the draft distribution plans filed by DTE and I&M. (Order, pp 9-10).

DTE Electric Company

DTE's 2021 Distribution Grid Plan Final Report (DGP) is comprised of the following key sections: stakeholder engagement, the grid modernization process, distribution planning processes and tools, benefit cost analysis, investment summary, distribution system overview, asset health assessment, infrastructure resilience and hardening, tree trimming, infrastructure redesign and modernization, technology and automation, base capital, preventative maintenance, and performance-based ratemaking. In total, the entire DGP filing is 734 pages.

Staff discussed safety, reliability, and resilience, hosting capacity analysis, non-wires alternatives, and distribution plan vision in its comments filed on October 4, 2021.

Alternative Regulatory Approaches / Performance Based Regulation (PBR)

DTE Electric was directed, in the May 8, 2020, Order in Case No. U-20561, to include in its next distribution plan proposed PBR elements with reasonable metrics tied to utility financial performance, improvement targets, and timelines for achievement, and additional elements for consideration.

DTE met the requirements of this order. The Company has responded to both U-20147 and U-20561 in terms of elaborating on PBR possibilities, including an emphasis on reliability metrics. The Company states on page 453 of its distribution plan: "DTEE views the included proposal as foundational groundwork for future PBR and an opportunity to explore and apply many of the PBR concepts discussed in the Commission's report and e observed elsewhere (*sic*)." Staff agrees with this statement and views the PBR material in the Company's distribution plan as a starting point.

Benefit-Cost Analysis-

In its August 20, 2020, order in Case No. U-20147, the Commission directed "the Staff to continue to work with utilities and other stakeholders in continuing to explore the appropriate framework for evaluating BCA, including consideration of experiences from other jurisdictions and recommendations related to the issues highlighted in the Staff's final report. The Commission expects these additional details to inform and be integrated into future utility distribution plans."

DTE uses a Global Prioritization Model (GPM), which the Company says aligns with DSPx's "best-fit, most reasonable cost" evaluation methodology. The most weight is given to safety. The Staff has previously emphasized the importance of industry-accepted BCA practices including a variety of "cost tests" that can be used. Such industry standard practices and cost tests result in consistency of treatment of BCA methods. Staff has also expressed concern with utility

proprietary models that are used for BCA. These concerns are discussed in more detail later in these comments.

The Role of Energy Efficiency (Energy Waste Reduction) with Distribution Planning-

In the August 20, 2020, order in Case No. U-20147, the Commission stated:

> The Commission agrees with the Staff's recommendation for the utilities to consider EWR in their upcoming distribution plans due next year. The Commission finds it important to run sensitivities in load forecasts for distribution planning and to start modeling locational impacts from customer behavior (whether through plug-in electric vehicles, EWR, storage, solar DG, DR, etc.). The Commission recognizes that the purpose of distribution planning is not to design EWR programs or to conduct localized EWR/DR potential studies. It finds that a stronger linkage between EWR and DR efforts and distribution planning would facilitate the identification of potentially cost-effective NWAs that could defer to displace an expensive distribution upgrade.

DTE met the requirements of the order. DTE acknowledged that load forecasting needs to evolve in order to shift from system-level to distribution-level planning. Accordingly, DTE proposed a new integrated forecasting solution that can modularly incorporate DERs and EWR. DTE notes that EWR is a potential distribution solution and details that EWR is a primary focus of an ongoing NWA pilot.

Undergrounding distribution lines –

In 2018, DTE began an undergrounding pilot on the Appoline DC 1346 circuit. The scope of this pilot, which is now part of the Company's Strategic Undergrounding program, is to move rear-lot overhead infrastructure to rear-lot Underground Residential Distribution (URD), with the goals being to determine actual installation costs, understand customer acceptance, and determine

opportunities to improve cost and construction efficiency in subsequent pilots. This pilot includes approximately 60 residential customers on two city blocks in Detroit and includes the installation of a looped URD system with approximately 1,300 feet of primary, six transformers, and underground services to residences. When the underground equipment is completed and functional, the overhead infrastructure will be removed.

For the next phase of Strategic Undergrounding pilots, DTEE is planning a project on Fairmount DC 1593. Based on what is learned from that project, the Company plans to implement Strategic Undergrounding where it makes sense, as one of the programs to improve reliability and resiliency. The Company plans to spend around $200 million from 2021 - 2025 to move 77 miles of rear lot overhead assets to front-lot underground residential distribution.

Moving existing overhead lines is not easy. Overhead lines cross over many man-made structures in the environment, such as driveways, fences, sidewalks, streets, garages, patios, and sheds, as well as trees and shrubs. Any undergrounding of overhead lines would have to go under or around these structures and this vegetation. None of this is inexpensive either. In Exhibit 11.6.2 in the plan, DTE acknowledged that underground rear-lot construction may initially cost up to three times as much as overhead rear-lot construction.

Since DTE Electric is asking for cost recovery of undergrounding pilots in an ongoing electric rate case, Case No. U-20836, Staff will not comment on these pilots specifically. Staff is confident, however, that it would not support the

undergrounding of all existing overhead lines. More precisely, Staff would not support the costs of undergrounding overhead lines being placed into customer rates. It is simply too expensive, and such an undertaking would pull too many utility employees away from other projects. If a customer wants his or her service drop undergrounded, then the customer should have to pay for at least some of the cost themselves, as currently required by Rule 460.516.

Equity

DTE's plan does discuss energy and environmental justice. The plan states that DTE Electric's parent company, DTE Energy, is coordinating an Energy and Environmental Justice plan in conjunction with its Environmental, Social and Governance Initiatives and has established an Energy and Environmental Justice Committee. The Committee will explore ways the Company may be able to better serve customers in highly impacted communities as defined by the Michigan Environmental Justice Screen tool (MIEJScreen) and establish processes for outside stakeholders to provide feedback. In addition, the plan states that DTE has taken an active role on the Michigan Advisory Council on Environmental Justice. A goal of DTE Electric is to consider equity more in its grid modernization and clean energy investments. The plan states that the Distribution Grid Plan focuses on energy justice as it relates to the long-term planning of the grid.

DTE Electric intends to use the MIEJScreen. This screen will rate communities on numerous criteria including environmental exposures and effects, sensitive populations, and socioeconomic factors. The Company will then put

electric reliability data over the screen data to identify highly impacted communities that have poor reliability.

These efforts appear to be preliminary steps. The Energy and Environmental Justice Committee will explore ways the Company may be able to better serve customers; the Company is taking an active role on a council; and the Company plans on using the MIEJScreen tool in the future. But DTE Electric's 2021 distribution grid plan does not specifically discuss how equity, environmental and energy justice, and vulnerable communities have influenced investment decisions recently, or how they will influence such decisions in the near future. The Company's Global Prioritization Model (GPM), which is DTE's proprietary model that ranks strategic capital investments, does not explicitly cite "vulnerable communities" or "equity" as factors in prioritizing investments. The DTEE Grid Modernization Study 2021-2035, attached as Appendix IX to the plan, defines the GPM as:

> DTEE's proprietary model to effectively prioritize strategic capital investments and maximize customer benefits. It leverages historical reliability and system data, incorporates up to date assessments of the asset and system conditions, assigns values and a weighting system to analyze both monetized and nonmonetized benefits and prioritizes projects and programs among the investment portfolios.

Table M in the DTEE Grid Modernization Study shows the GPM impact dimensions, which are safety, load relief, regulatory compliance, major event risk, reliability, O&M cost avoidance, and reactive capital avoidance. Next to reliability, the Company lists the major drivers as "reduction in number of outage events

experienced by customers" and "reduction in restoration duration for outage events". While the "reliability" impact dimension and its associated drivers may encompass equity and meeting the needs of vulnerable communities, this is not explicitly stated.

Indiana Michigan Power Company

This plan is the first distribution plan filed by I&M. Staff discussed safety, reliability and resilience, distribution planning vision, hosting capacity analysis, and non-wires alternatives aspects of the plan in its comments filed on October 4, 2021

Alignment with IRPs-

I&M reorganized its central planning functions with the formation of the Grid Solutions business unit. I&M combined integrated generation, transmission, and distribution (GT&D) planning to create this single unit. To assist with the successful transition to a comprehensive, holistic approach that integrates GT&D planning, AEP has engaged an external consultant and developed a roadmap that leads to a fully integrated planning process.

Staff commends I&M for its efforts to reorganize its central planning function. Staff believes that these steps will help ensure benefits of grid investment are properly analyzed. I&M's approach is consistent with Staff recommendations made in the Advanced Planning-Alignment of Resource, Distribution and Transmission planning work group.

Forecasting

Staff is encouraged by I&M's efforts to align generation, transmission, and distribution planning processes through forecasting. In addition to its efforts to further align forecasting, Staff is hopeful I&M will maintain a high level of transparency by including the data used to derive its forecasts, such as the data used to project customer owned DERs or EV penetration, in future filings. A modular forecasting approach, which was described in the final report of the Advanced Planning-Alignment of Resource, Distribution and Transmission planning work group, should also be considered. Using this approach would aid in the ability to provide transparent evidence in any filing where a forecast is used and align it with all other planning efforts.

Benefit-Cost Analysis

The Commission did not specifically order I&M or the other utilities to complete a BCA, so there was not a requirement for I&M to meet. However, the Company's Project Value Ranking (PVR) is another example of a utility proprietary approach to BCA. PVR, which sounds similar to benefit cost analysis, is I&M's primary way of assessing the value of each potential distribution project and ranking them in order of priority. PVR uses a range of data concerning the costs and benefits of projects and allows I&M to create a list of the most impactful and cost-effective projects.

Staff commented in their report to the Commission in U-20147 that the preference for utility BCAs was for methodologies commonly used throughout the

utility industry that provide consistency and specific "tests", and not utility proprietary approaches. Methodologies commonly used throughout the utility industry that provide consistency and utilize specific "tests" assure transparency when calculating benefits and costs of potential projects and investments. The specific "tests" outlined in the National Standards Practice Manual (NSPM) include the Utility Cost test, Total Resource Cost test, and Societal Cost test. Staff does not see where the Company's PVR approach is utilizing such tests.

The Role of Energy Efficiency (Energy Waste Reduction) with Distribution Planning-

In the August 20, 2020 Order in Case No. U-20147, the Commission stated:

> The Commission agrees with the Staff's recommendation for the utilities to consider EWR in their upcoming distribution plans due next year. The Commission finds it important to run sensitivities in load forecasts for distribution planning and to start modeling locational impacts from customer behavior (whether through plug-in electric vehicles, EWR, storage, solar DG, DR, etc.). The Commission recognizes that the purpose of distribution planning is not to design EWR programs or to conduct localized EWR/DR potential studies but finds that a stronger linkage between EWR and DR efforts and distribution planning would facilitate the identification of potentially cost-effective NWAs that could defer to displace an expensive distribution upgrade.

I&M agreed in its final distribution plan that EWR as an NWA should be included, and that data is required. The Company also mentioned that field audits may best provide that level of detail. I&M is still deploying distribution system modernization plan components and AMI systems, and so data should become more readily available for use in analysis and end-use load disaggregation. Staff finds I&M's response appropriate.

Consumers Energy Company

Consumers Energy describes its distribution strategy as based on five customer-focused objectives: safety and security, reliability, system cost, sustainability, and control. Two key concepts included in the EDIIP are excelling at the basics and building for the future. Staff addressed Consumers' vision, costs, and grid modernization and longer-term view in its October 4, 2021, comments.

DERs

Consumers defines DER as: "source of electric power and its associated facilities that is a connected to a distribution system. DER includes both generators and energy storage technologies capable of exporting active power to a distribution system."

The current definition of DER aligns with the definition in the MPSC's proposed Interconnection and Distributed Generation Standards. This definition of DER may need to be revisited with the arrival of FERC Order 2222. FERC Order 2222 (paragraph 114) defines a DER:

> "any resource located on the distribution system, any subsystem thereof or behind a customer meter." These resources may include, but are not limited to, resources that are in front of and behind the customer meter, electric storage resources, intermittent generation, distributed generation, demand response, energy efficiency, thermal storage, and electric vehicles and their supply equipment – as long as such a resource is "located on the distribution system, any subsystem thereof or behind a customer meter."

Hosting Capacity

Page 113 of the plan lays out two phases of hosting capacity analysis (HCA) the Company is working on. Would the Company be able to make hosting capacity information available right away for all interconnection studies it has conducted over the last two years?

The Company indicates it has completed go maps for 301 zones and that these maps will be posted on the Company's website. What is the timing for making these maps available?

Page 117 describes Phase II hosting capacity as performing a peak loading level scaled by a factor of 0.2 per unit to represent the circuit's minimum loading level for the hosting capacity analysis. Staff would like to see the basis for the 0.2 scaling factor to represent minimum load.

Battery Storage

Staff would like to see more detail on how battery storage is being utilized. For the third prototype of battery storage, how is the Company using the battery to support the solar? In addition to smoothing that can be done with storage, is the Company utilizing the storage to collect up any clipped solar based on the interconnection limitations?

Non-Wires Solutions (NWS)

The distribution plan provides little detail on the planned non-wires solution (NWS) pilots and projects for the future, though it does provide an overall look at the Company's perspective and approach to NWS as well as its anticipated timeline.

The Company only plans on studying NWS to improve reliability and resilience, not to use it to defer or avoid traditional reliability projects. It intends to develop "off the shelf" NWS that can be used in future applications. However, it also notes NWS may require highly localized solutions where "off the shelf" solutions may not work.

The Company notes identifying locations for NWS deployment may be difficult and impede deployment. Currently, only 23 LVD substations have been identified out of nearly 1,100 LVD substations. Lastly, for NWS to be considered as a regular alternative to projects, the Company may propose other incentive mechanisms, such as shared savings, to better account for the value NWS bring to the grid and customers.

Key to successful integration of NWS into the Company's operations are effectively designed pilots that generate actionable results. As such, attention to the pilot design, goals, process, and expected results should be a focus when the Company proposes pilots in rate cases. This will help ensure pilots are designed effectively to provide clear results pertinent to the desired NWS learnings. Overly broad and general results, especially ones duplicated by prior utility learnings, should be discouraged.

In addition to understanding how NWS work, the right incentives for utilities to select NWS solutions instead of traditional capital projects are needed. The regulatory framework for NWS should also be examined. Specifically, alternative compensation mechanisms recognizing the value NWS provide to the grid and

ratepayers could be developed to incentivize NWS investments, especially when the need for large capital upgrades are obviated.

NWS may help defer reliability and capacity investments as we move to a more decentralized grid. Conducting business as usual replacements of traditional infrastructure without considering NWS may cause expensive and short-sighted investments in traditional solutions when alternatives could provide similar grid support with additional benefits. However, without analysis, the Company, Commission, and stakeholders would never know. This makes alternative structures to incentivize utilities to pursue NWS/NWA important. If these can be developed soon, it may more quickly transition the Company and other utilities to consider NWS broadly in all its investment decisions.

Comments on the plans in general

Measures to improve reliability and the scale of the challenge.

Michigan established some of the first electrical distribution infrastructure in the late 1880s, embracing a new technology during a period when Tesla and Edison were still battling over alternating or direct current dominance.[7] Since this start of its electrical infrastructure, reliable and safe electricity has supported Michigan's growth. Life has changed considerably in the last century, let alone since the late 1880s. The personal automobile, digital computer, the Internet, and the plethora of

[7] U.S. Department of Energy. (2014). The War of the Currents: AC vs. DC Power. Retrieved from: https://www.energy.gov/articles/war-currents-ac-vs-dc-power

electronic devices have all transformed our lives, providing greater convenience but also increasing consumer and societal electricity needs. Increasingly, customers and utilities are interested in connecting distributed energy resources to the system, prompting an evolution from a one-way distribution system to one requiring a two-way flow of energy and information. With greater electrification on the horizon, such as the expected widespread adoption of electric vehicles, the demands on the electric distribution system for reliable, resilient, and safe electricity will only increase in importance.

Michigan's early embrace of electrical technology now also means portions of its system are aging, with equipment serving customers near or beyond expected operating life. Portions of DTEE's electric infrastructure are more than 90 years old and still operating.[8] In Case No. U-20561, in a list of 19 DTEE distribution asset types, 13 listed industry life expectancy and DTEE average age. Of these, 10 asset types (10 out of 13 or about 77%) had an average age exceeding industry life expectancy or within industry life expectancy ranges.[9] Consumers and I&M also mention old and aging infrastructure in their electric distribution plans. All three utilities propose replacing aging infrastructure with new components to ensure reliable electric service. "[A]ging infrastructure, system configuration and high

[8] DTE Electric Distribution Grid Plan. September 30, 2021, p. 484.

[9] U-20561 DTE Electric Rate Case, Testimony of Marco A. Bruzzano, p. MAB-10-11.

operational utilization of the existing [distribution] system" increase system vulnerability to increasingly intense and frequent severe weather events.[10]

More severe and rapid storms challenge storm recovery, causing some customers to experience extended or repeated outages. DTE describes its storm response for summer 2021. Due to widespread damage and need for restoration assistance in different regions, crews made temporary repairs before returning later to make permanent repairs and replacements. However, due to storm frequency (less than 5 days between storms on average), crews could not make permanent repairs or replacements, causing some areas to be vulnerable to repeated outages.[11] Consumers Energy service restoration orders have increased in recent years and are expected to continue rising, likely due to the impacts of aging distribution assets and severe weather.[12] Utilities with rural service areas, like I&M, have additional accessibility and operational challenges that impact restoration and construction time.[13]

An electrical distribution system designed in the 1880s, let alone 100 or even 50 years ago is designed to meet the needs and values of those times, not current and future ones. All three utilities dedicate significant funding in their distribution plans towards tree trimming and the replacement and instrumentation of the aging

[10] DTE Electric Distribution Grid Plan. September 30, 2021, p. 39.

[11] DTE Electric Distribution Grid Plan. September 30, 2021, p. 10-11.

[12] Consumers Energy Company's Final Electric Infrastructure Investment Plan 2021-25, p. 139.

[13] Indiana Michigan Power. Michigan Five Year Distribution Plan (2021-2025), p. 11.

system. These investments do not address the fact that the system itself may no longer be adequate to meet current or future needs. As DTE notes, "the ability for customers to interconnect even modest amounts of new distributed generation may be limited in many parts of the DTE system absent system upgrades and/or significant efforts to optimize charging, as well as DG and storage utilization to relieve grid constraints."[14] We can no longer assume that for all areas of Michigan, the existing system of centralized generation and extensive wires is the most cost effective and optimal path forward in meeting current and future needs.

The utilities acknowledge the paradigm shift that is underway. "DTE understands that the future will fundamentally change the nature of the electric grid, to one that is different than the historical paradigm where power is centrally generated…These changes will move the grid toward a more distributed model where power flows both ways through the distribution system."[15] Consumers notes that "[t]he electric distribution system is on the cusp of a period of change, as new technologies and decentralization of the grid are set to disrupt the historical hub-and spoke model."[16] I&M states "[t]he utility industry is experiencing massive transformation…The decarbonization of the utility industry, the transportation sector and the greater

[14] DTE Electric Distribution Grid Plan. September 30, 2021, p. 42.

[15] DTE Electric Distribution Grid Plan. September 30, 2021, p. 30.

[16] Consumers Energy Company's Final Electric Infrastructure Investment Plan 2021-25. p. 5.

economy will continue to drive the transformation of the utility business, and specifically the distribution system."[17]

Despite indicating the dramatic transformation underway in the electric sector and electric distribution specifically, little detail is provided in the distribution plans on how to be ready for the expected paradigm shift. Though all three utilities propose non-wires alternative (NWA) pilots as requested by the Commission in its U-20147 order, only I&M indicated it considers NWAs along with traditional solutions to address system deficiencies in the short and long term.[18] Consumers Energy does not intend to defer or avoid traditional reliability projects and plans to study NWAs only for improving reliability and resilience in the near term.[19] DTE currently focuses on using NWAs to address load relief issues. DTE believes traditional projects addressing safety, outage event volume, and asset health concerns are not good NWA project candidates, because it does not believe NWA technologies provide these type of grid benefits.[20] It seems Michigan utilities want to focus on revamping the current system, piece by piece, in the near term.

Investing in replacing the components of a system that is broadly expected to be antiquated soon instead of examining whether investing in new technologies or alternative system configurations that address consumer and system needs is not a

[17] Indiana Michigan Power. Michigan Five Year Distribution Plan (2021-2025), p. 3.

[18] Indiana Michigan Power. Michigan Five Year Distribution Plan (2021-2025), p. 57.

[19] Consumers Energy Company's Final Electric Infrastructure Investment Plan 2021-25, p. 101.

[20] DTE Electric Distribution Grid Plan. September 30, 2021, p. 66.

reasonable and prudent use of rate payer funds. We cannot assume that replicating the old system is always the reasonable, prudent, and cost-effective path. In the face of monumental change, exploration of innovative alternatives (technologies, financing solutions, business models, etc.) must occur so that the cost-effective and optimal solutions can be selected.

Electricity is essential to modern life, and the vulnerable suffer especially without it. When an essential service like electricity stops, whether for a few hours or several days, those with funds can invest in backup solutions to ensure continuous electricity supply –generators, renewable energy, batteries, etc. Those most impacted are the vulnerable: the poor, young, and infirm. These populations may suffer increasingly difficult or catastrophic consequences without essential services. Furthermore, they may not be able to afford resilient backup solutions, let alone afford to remedy the downstream consequences resulting from the loss of electric power, however temporary.

It should not be left to customers to design resilient systems to ensure their homes, businesses, or essential community services have consistent energy supply. The utility should plan and implement technological solutions to ensure that the essential service it provides is efficiently, effectively, and safely delivered under a variety of plausible future scenarios, including a future with more severe storms. If the utility fails to do so, able customers will meet their own needs and a decentralized, inequitable, patchwork system will develop with technologies beyond

the utility's control. No community or demographic should be left behind in Michigan's energy future.

In the submitted distribution plans, particularly DTE Electric's and Consumers Energy's, large portions were largely verbiage, with little technical information provided to justify the selected paths and examined options. For a highly technical and engineered system, more information regarding the planning process and assumptions, alternatives examined, selected choices, technical implications, and underlying reasoning for the selection of the optimal outcome should be provided. Many pages are devoted to summarizing the current system state. More information providing clarity regarding the selected path forward would be beneficial and should not necessarily translate to more voluminous distribution plans. I&M had the most succinct plan submitted thus far, but also provides technical information concisely and clearly within it.

More should be done to plan and execute an electricity distribution system that can withstand the vagaries of increasingly inclement weather, changing electricity demand, and societal goals. Knowing that the electric industry will undergo monumental change, Michigan needs to be prepared. More is needed beyond proactive or reactive replacement of a system designed and implemented over a century ago. We must examine and consider alternative solutions, like microgrids and distributed energy resources, to select the most optimal paths forward that ensure all Michiganders have dependable and consistent electric service, regardless of the weather. We need more than incremental change in the

face of the monumental challenges before us. As Alison Silverstein noted in the MPSC Technical Conference, "we can't build our way out of this fast enough to avoid major harm to communities and individuals."[21] Michigan was boldly innovative when it started its electric distribution grid in the late 1880s, during a time when the technology was new and still developing. It will need to be boldly innovative again to build a distribution grid that supports Michigan far into the future.

Reliability metrics

IEEE 1366 reliability metrics are very common distribution performance metrics that have been and continue to be used across the U.S. and are also used in Michigan utility company distribution plans. All of the distribution plans use system-wide metrics (SAIDI and SAIFI) along with individual customer metrics (CEMI and CELID) to a certain extent. The Commission also has administrative rules prescribing unacceptable levels of performance during service interruptions under Rule 460.722 of the Service Quality and Reliability Standards for Electric Distribution Systems, which are also metrics found in some distribution plans. The utilities report their compliance with these levels of performance annually in docket U-12270. The administrative rules are similar to the IEEE metrics in the fact that they measure utility performance across the entire system over one year. Staff and

[21] Silverstein, A. (2021, October 22). *The Future of Electric Reliability & Resiliency*. MPSC Technical Conference.

stakeholders have worked to update the Service Quality rules, resulting in more stringent thresholds, and these rules are currently in the formal rulemaking process.

Although the reliability metrics can be effective at reducing the number and duration of outages and identifying customers experiencing multiple outages, they can also misrepresent and mask poor reliability of certain areas during shorter periods of time or in specific areas throughout the year. The generality of these measures often makes it difficult to discern areas that may significantly contribute to poor performance and fail to make certain problems apparent. To improve reliability and performance, the utilities must carefully measure and monitor performance in a way that is granular enough to make issues transparent and ultimately improve the system's performance.

Staff acknowledges that some utility plans discuss the importance of granular data needed in the future. As Michigan navigates grid transformation and adopts the grid of the future, we will find customers that experience more severe impacts from outages. It is important to understand the customer impacts across the entire service territory, which requires local attention and granular information to allow customers to experience equality in reliability performance. Tools such as the interruption cost estimate (ICE) calculator can be used to help understand the impacts of outages on customers at a local level.

Storm events: The distribution plan metrics used by utilities generally do not apply major event days (MEDs), storms, and catastrophic events. Rather, the

storms and weather trends are provided to show why investments are necessary. It is time to start applying these events to performance metrics and future planning as they are occurring more frequently. In U-12270 reports, utilities have commonly discussed storm impacts when performance goals are not met in a given year and show that goals would have been met had the storms not hit. Wind speeds, storm frequency, and storm intensity are commonly discussed in plans, but these should be considered in metrics and viewed as expected events rather than unexpected to ultimately help determine necessary measures to improve performance during storms. When applying annual IEEE and Service Quality and Reliability Standards metrics, it may appropriate to apply metrics per catastrophic storm or MED.

Proactive asset management practices: Plans are structured in a way that is generally reactive in nature by identifying areas of the worst performance and discussing spending that provides the quickest reliability improvements to improve performance in these areas. Eventually, metrics should align planning in a way that prioritizes investments in a proactive manner that will prevent outages from occurring in the first place. It may take some time to enter this proactive approach as backlogs (i.e. line clearing maintenance cycles) should be eliminated before this happens. This proactive approach should be based on findings of preventative maintenance activities and careful consideration to causes of interruptions which will require consistent failure investigation techniques along with efforts to prevent recurrence. Causes of interruptions, which impact metrics, are commonly broken

down at a system level, yet understanding these at a more granular, local level will help prioritize investments based on the location's specific configuration and needs. Consistent asset management practices need to be adopted and agreed upon across all areas of the company (finance, engineering, planning, upper management, etc.) in order to effectively and efficiently execute a proactive and preventative approach.

In summary, the metrics used in utility plans today are not necessarily inappropriate. However, it is important to be flexible and willing to shift metrics in the future to align with customer expectations. Customer dependance on electricity is higher than ever and will likely continue to increase. It is up to the utilities to be responsive and meet customer expectations with safety, reliability, and affordability in mind. In the future, it will be important to continuously ask if the metrics are appropriate and adjust when they are not.

Financial incentives and penalties

The electric grid is in a unique situation today. The grid is generally aged. Exacerbating the situation is the fact that the grid is faced with a transformation from the traditional bulk generation to generation at the transmission and distribution level. This is a widespread issue that all utilities face, not just those in Michigan. It will take careful planning and collaboration to prioritize the investments needed to provide safe and reliable service. Consideration must be given to affordability, and finding the balance between making investments and maintaining affordability is where the challenge comes in.

Some utility plans discuss incentives and penalties, most notably in the responses to the orders from the Commission in Case Nos. U-20561 and U-20697 pertaining to performance-based regulation (PBR). The PBR frameworks and proposals in the distribution plans discuss incentive design while also addressing the potential for unintended consequences associated with incentives and penalties. If penalized, utilities should not be permitted to recover these amounts in rates. A Company has no incentive to improve a metric if they can recover the penalty in rates.

Utilities earn a profit through their return on capital investments made which does not incentivize utilities to continually spend on O&M functions such as line clearing. This should not be forgotten, and incentives or penalties need to be applied in a way that supports the necessary O&M work to the system. Although the plans may naturally consider O&M improvements through targeted reliability metric performance, O&M incentives/disincentives are not specifically discussed but nevertheless should be applied to align with the goals of the Commission. It is necessary to appropriately maintain the distribution system, and utilities should be appropriately incentivized or penalized if these functions are not carried out.

Affordability is also an important consideration for utilities. Investments are needed, and the source of funding is through the customers served by the respective utility. Utilities should be encouraged to explore funding sources beyond traditional ratepayer funding to make the needed improvements while keeping the cost to customers at reasonable levels. The way utilities earn a profit does not

fundamentally incentivize a utility to explore funding options to lower customer costs. The plans discuss customer affordability to a certain degree as objectives, core functions, or commitments, but how affordability will be achieved is not always transparent. Utilities do not appear to be actively exploring all funding opportunities available to them today. As stated by Kiera Zitelman on day two of the MPSC's Technical Conference on November 5, 2021, there are funding options available that can relieve costs to ratepayers. She emphasized ratepayer funding is an option, but not the only option to fund investments before making the recommendation to gain access to revenue streams for investments. Staff agrees additional funding sources that decrease the financial burden on customers should be explored by utilities.

In summary, the distribution plans do not go into financial incentive or penalty details outside of what was ordered by the Commission. It will be important to always understand how the companies earn a profit when applying incentives and penalties and to carefully consider unintended consequences that come with each.

Balance between needed investments and customer affordability.

The distribution plans do not reflect the appropriate balance between needed investments and customer affordability. They do not examine alternatives that may better strike the balance and provide inadequate insight into customer affordability implications.

The distribution plans lack information necessary to determine whether the utilities' selected paths forward are truly "no-regrets investment opportunities," a phrase much used by DTEE.[22] In the MI Power Grid Electric Distribution Planning workgroup, Consumers Energy, DTEE, and I&M recommended that benefit cost analysis be one of the standardized components of the distribution plan filings.[23] All three utilities use their own methods to rank and select projects, but these processes are not transparent and no intuitive results are presented. Normally, a benefit cost analysis (BCA) results in a benefit cost ratio which provides an intuitive understanding of how much benefit is derived from a dollar of investment. For example, a benefit cost ratio of 1.2 shows that every dollar of investment generates $1.20 of benefit. Only detailed BCAs of the selected option and a full breadth of potential alternatives can demonstrate that the investments are truly and quantifiably "no regrets".

Commission guidance on benefit cost analysis, such as expected processes and transparency, may benefit future plans, because those plans will be required to demonstrate that the selected solutions appropriately balance the needed investment and customer affordability. The Commission has not yet provided guidance on the BCAs it expects to be included in utility regulatory proceedings. Should the Commission provide such guidance, Staff suggests that all three utilities be required to use the same benefit cost analysis process (such as one detailed by

[22] DTE Electric Distribution Grid Plan. September 30, 2021, p. 44 and others.

[23] Chapel, D. (2019, October 16). Standard Distribution Plan Components: Consumers Energy, DTE, & Indiana Michigan Power.

the National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources). By having consistent BCA processes used by regulated Michigan utilities, Commission Staff and stakeholders will more easily understand the process and subsequent results. It will also allow comparison of utility solutions across different service areas and help suggest possible solutions for one utility that another utility found beneficial. Given transparent assumptions and data used in BCA, Staff and stakeholders can better understand the value of the proposed solutions.

It is hard to assess if alternative solutions might have met the system need while better balancing customer affordability. The utilities are proposing significant capital replacement of aging systems. Some of this replacement occurs regardless of the internal benefit cost score[24] and seems automatic in nature. If asset replacement is automatic regardless of the benefit or cost, there may be alternative solutions that provide similar services at lower cost. However, this cannot be known if the utility does not analyze and consider alternative solutions with rigor and transparency. If assets are automatically renewed and this renewal is accelerating, as it is in DTEE,[25] it is possible that significant rate payer funds will be invested in the rejuvenation of systems that may have alternative solutions with greater customer affordability. Only a clear and transparent analysis of

[24] "Some capital replacement programs are funded annually, despite having lower benefit cost scores. This is done to avoid an acceleration of asset failures and a large number of assets reaching end-of-life concurrently, thus exceeding available resources to replace them." DTE Electric Distribution Grid Plan. September 30, 2021, p. 91

[25] DTE Electric Distribution Grid Plan. September 30, 2021, p. 99.

traditional and alternative solutions can generate hard data to determine which solution best balances the system need and customer affordability.

In summary, Staff finds that more detailed technical information, transparent benefit cost analysis, and further exploration of alternative solutions beyond traditional solutions will better identify whether the selected solutions are the best for the system and customer affordability. To achieve this, the Commission may have to provide further guidance on its expectations such as BCA process transparency, whether alternative solutions should be analyzed and discussed, and the level of technical detail to be provided. Staff also recommends the Commission remind utilities of its goals for the distribution plans. Such a reminder may clarify what information is desired, so the utilities focus on transparency, clarity, and brevity in future distribution plans. With greater transparency regarding the assumptions and data, greater engagement of stakeholders in the development of needed solutions, and rigorous analysis of possible solutions, future distribution plans will likely provide more surety that the right solutions that best benefit customer affordability are developed.

Equity and Environmental Justice

In traditional utility regulation, values like equity, environmental and energy justice, and vulnerable communities do not usually factor into whether an investment is considered reasonable and prudent. The Commission has limited authority to declare a reliability investment in one neighborhood with poor

reliability unreasonable or imprudent simply because there are other neighborhoods in the same service territory with poorer reliability. Indeed, the Commission's own Service Quality and Reliability Standards allow for some areas of an electric utility's distribution system to have poorer reliability than others- up to 5% of an electric utility's circuits can experience 5 or more interruptions in a year and the electric utility can still meet service quality standard R 460.722:

> R 460.722 Unacceptable levels of performance during service interruptions. Rule 22. It is an unacceptable level of performance for an electric utility to fail to meet any of the following service interruption standards:
>
> (d) Considering data derived through the amalgamation of data from both normal and catastrophic conditions, an electric utility shall not experience 5 or more same circuit repetitive interruptions in a 12-month period on more than 5% of its circuits.

The Commission, however, has been given full discretionary authority to set just and reasonable rates by the legislature.[30] How "just" is evaluated has not been formalized at the Commission. It is conceivable that future guidance on setting "just" rates includes evaluation of environmental equity and justice, such that considerations of these facets of projects may impact the Commission's final determinations.

Though factoring in equity, environmental justice, energy justice, and the vulnerability of communities in rate case prudence reviews may make recommending adjustments and disallowances more complicated, these criteria could be incorporated into the rate case process. In general, Staff agrees with the Attorney General's statement that "[i]n making investment decisions, the utilities should not discriminate against any customer group or show preference in performing work in any region or area, unless it is based on the need to reduce power outages and improve service in those areas because they have experienced inordinate outages or equipment failures when ranked as priority areas among other areas."

Before Staff can examine environmental equity and justice considerations in the rate case process, the utilities must first provide such information and analyses. No information on the socioeconomics or environmental justice context of investment locations were provided in any of the distribution plans. However, this information provides important context for proposed distribution investments. Take the example of DTE Electric's fiber and telecommunications network investments. In the Company's discussion of its planned telecommunications investments, it shared its current existing fiber system (See Figure 1).

Though Figure 1 delineates the existing fiber system, it fails to provide context for the underlying electric distribution system surrounding the fiber network that likely benefits from it or any details regarding the communities served. Staff created maps trying to bring clarity to these issues by manipulating

the transparency of available maps to overlay them. The overlays are imperfect and fuzzy, but still support a broader understanding of the fiber network location.

Figure 1. Map of Existing DTE Electric Fiber System (Owned & Leased)[31]

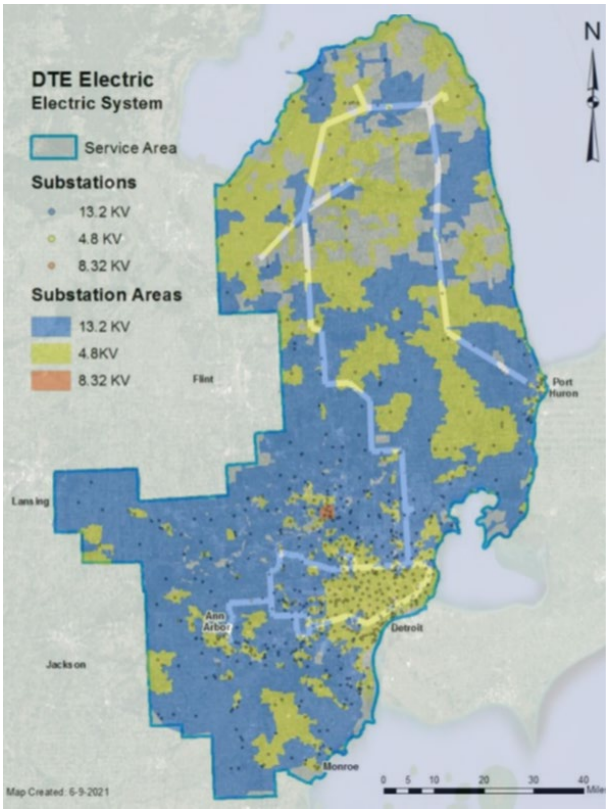


Figure 2. DTE Electric Fiber System and Electric System Overlay[32]

Staff first overlayed the existing fiber ring over the Company's electric system. See Figure 2. This overlay shows that the interior of the existing fiber ring encircling metro Detroit is mostly 4.8kV. The highest density of 4.8 kV substations in the Company's electric system also appears to be in the fiber ring. This is some of the Company's oldest infrastructure, which is located in Detroit and the surrounding

communities. These older areas have the highest volume of trouble events in the DTE Electric system.[26] The 4.8kV system is ungrounded, which complicates restoration efforts by making fault location challenging.[27] In addition, much of the oldest infrastructure includes rear-lot overhead circuits with poor accessibility, which further challenge the Company's planned and storm/emergent work.[28] Lastly, "[t]he legacy 4.8 kV system, has a design basis that is incompatible with a modern distribution grid platform...The lower distribution voltage inherent in the 4.8kV system is also becoming increasingly capacity constrained for meeting current electric load demands."[29]

Staff next overlayed the Company's fiber system over the State of Michigan EJ Screen Environmental Justice map (Figure 2). This shows that the Company's current fiber ring around metro Detroit encircles the largest area with the highest MiEJScreen overall score in its service territory. This score measures relative community environmental risk factors using environmental, health, and socioeconomic indicators.[30] Nearly half of the area within the fiber ring has scores of 90-100, indicating that only 0-10% of Michigan communities are more

[26] DTE Electric Distribution Grid Plan, September 2021, p. 233.

[27] DTE Electric Distribution Grid Plan, September 2021, 46.

[28] DTE Electric Distribution Grid Plan, September 2021, p. 338-339.

[29] DTE Electric Distribution Grid Plan, September 2021, 46.

[30] GLE MiEJScreen Environmental Justice Web Map. Retrieved from: https://egle.maps.arcgis.com/apps/webappviewer/index.html?id=b100011f137945138a52a35ec6d8676f.

environmentally disadvantaged. The fiber ring encircles some of Michigan's most environmentally disadvantaged communities.

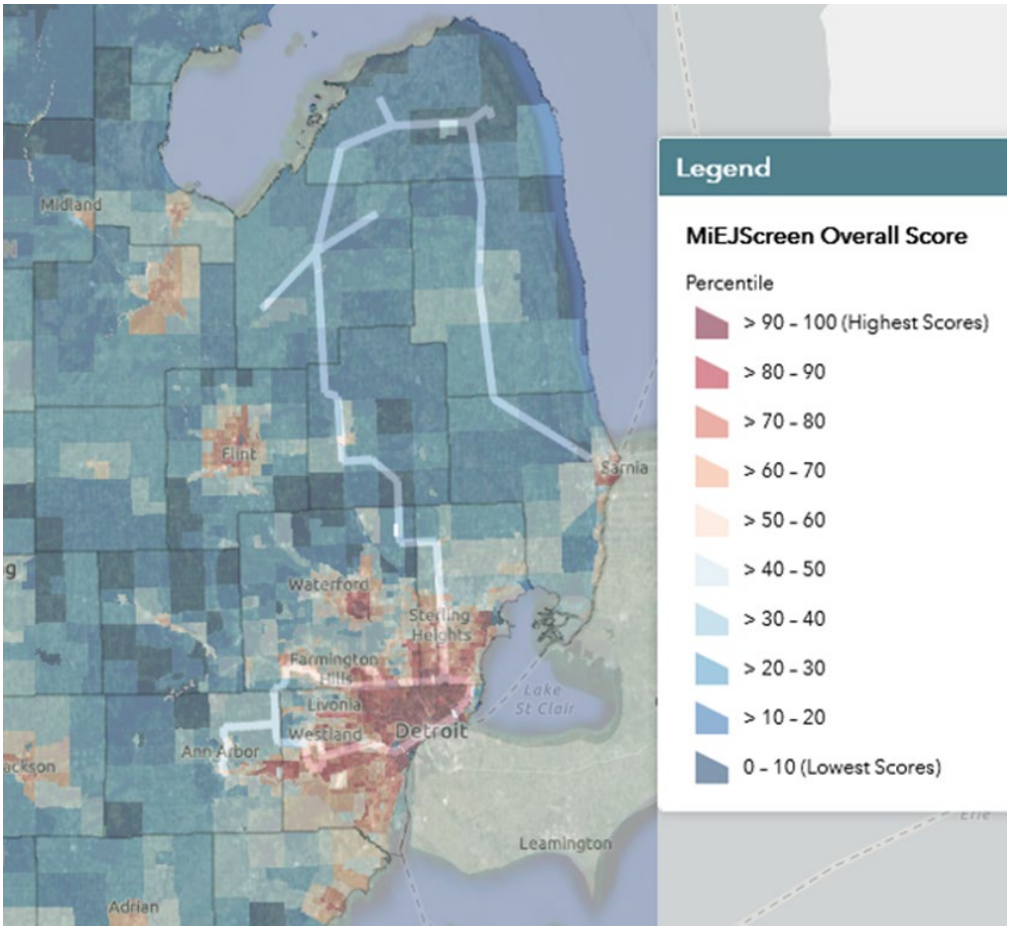


Figure 2. Fiber Ring and State of Michigan EJ Screening Tool Overlay

The Company proposes to run overhead fiber, instead of underground fiber, to 4.8kV substations due to the very low cost and possible reduction in future stranded infrastructure.[31] It also aims to harden 4.8kV systems to address safety

[31] DTE Electric Distribution Grid Plan, p. 371

and reliability of the 4.8kV system, as "in many areas, general maintenance practices are simply no longer sufficient."[32] Though overhead fiber to 4.8kV substations and 4.8kV hardening both are more affordable than their alternatives, they are only temporary solutions that support continued operation of the 4.8kV system until the Company converts it to a higher voltage. This aging infrastructure is incompatible with a modernized grid. By extending the operation of this equipment further, the Company is also ensuring the communities in the 4.8kV system are subjected to its deficiencies even longer.

By looking at the overall proposed Company investment into the 4.8kV system in terms of equity and existing infrastructure, new understandings are gained. Staff overlaid the Company's near term 4.8kV conversion projects (See Figure 3) over Figure 1 and Figure 2. The 4.8kV conversion projects are numbered, with the approximate area to be converted highlighted.

[32] DTE Electric Distribution Grid Plan, p. 233-234.

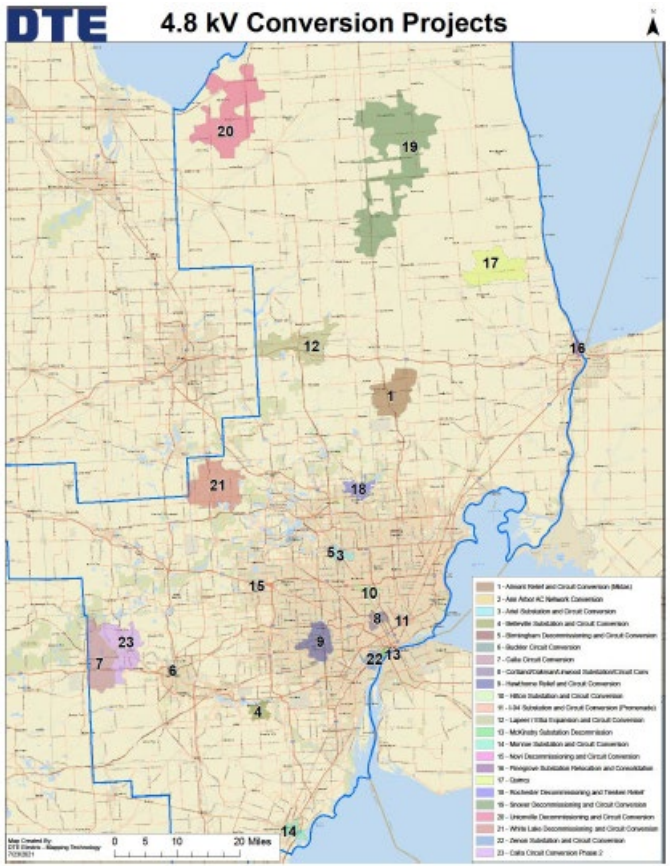


Figure 3. DTE Electric 4.8kV Conversion and Consolidation Projects[33]

[33] DTE Electric Distribution Grid Plan, Exhibit 11.3.4.4, p. 321.

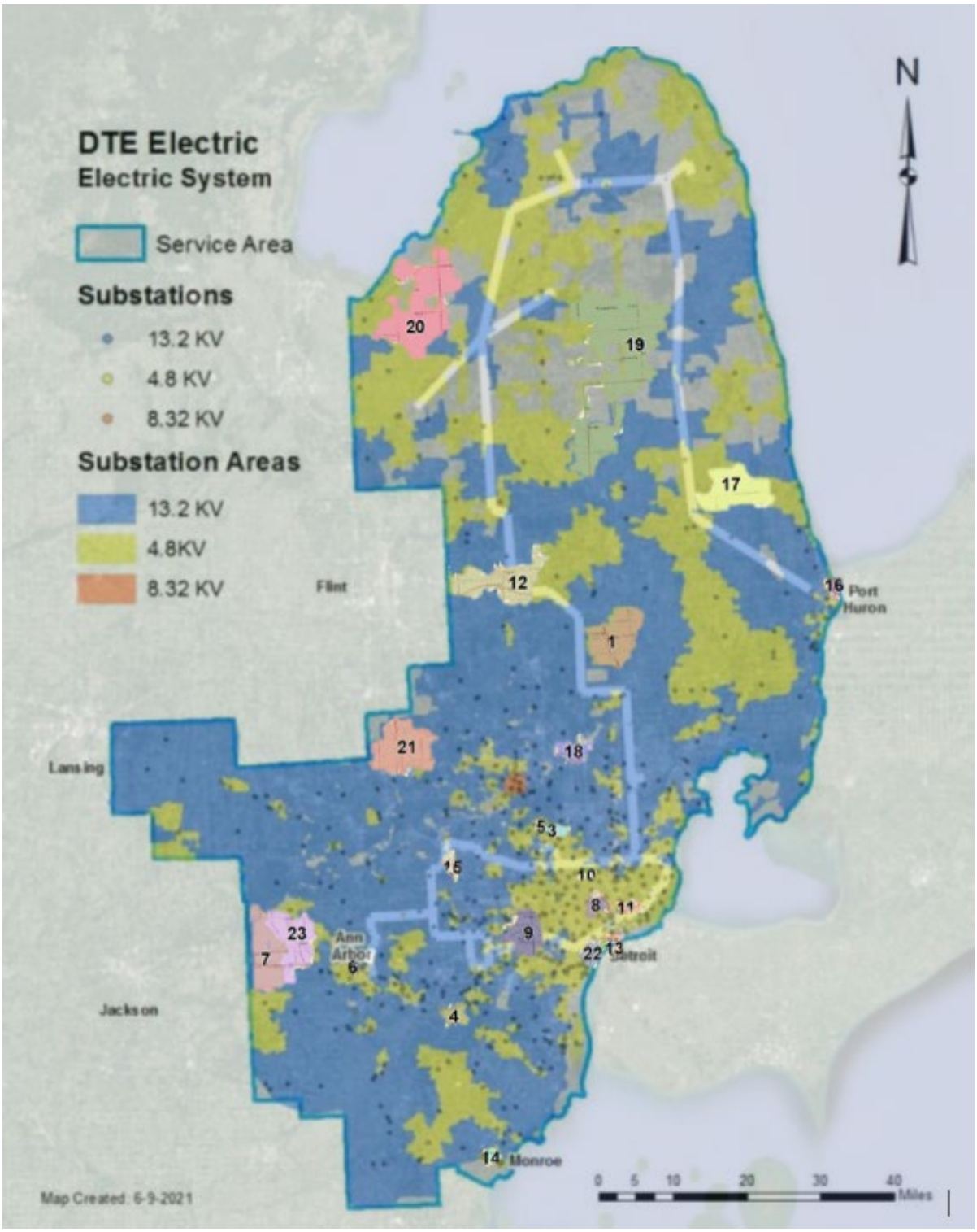


Figure 4. DTE Electric System, Fiber Network, and Near Term 4.8kV Conversion Projects

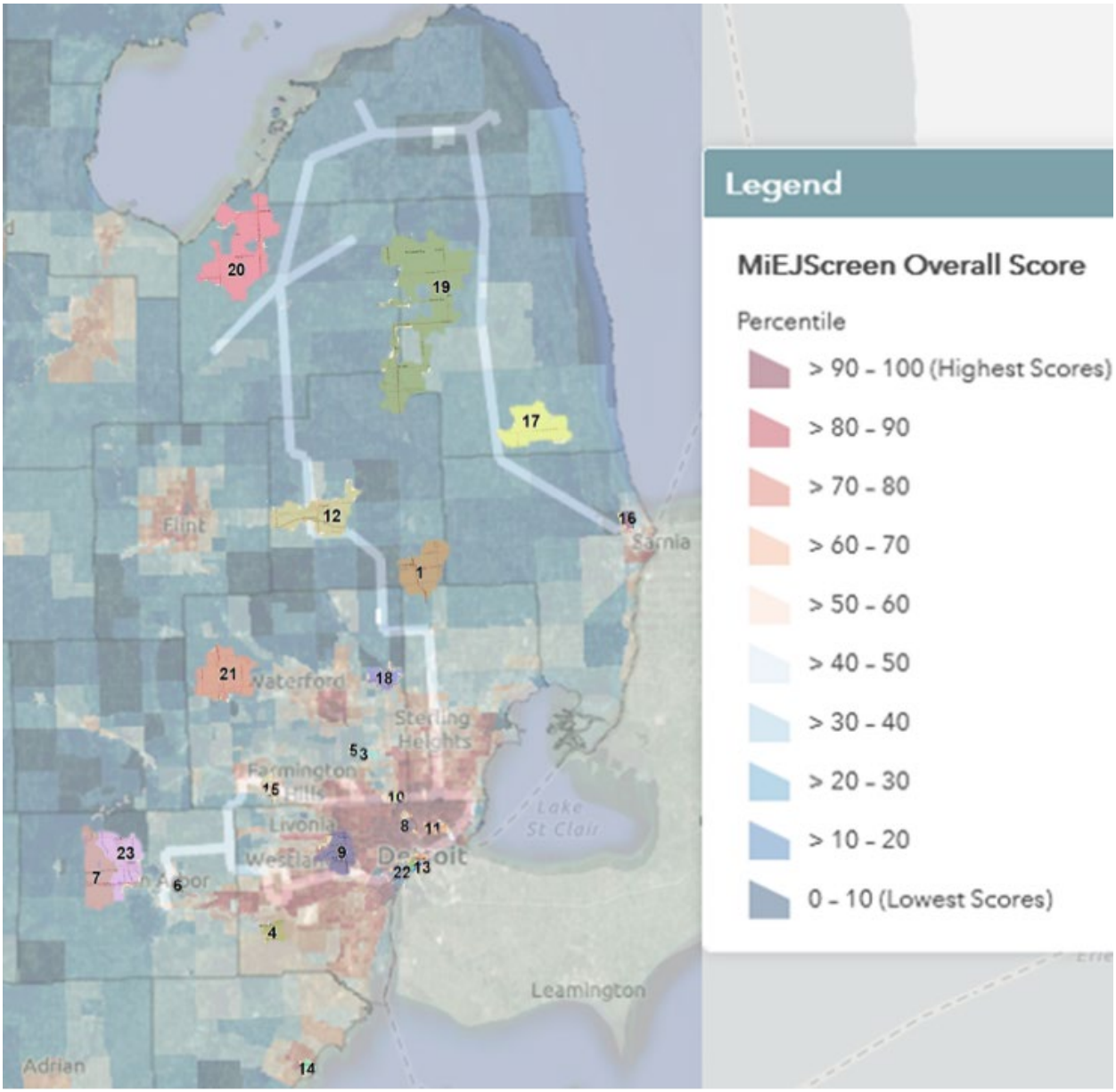


Figure 5. DTE Electric Fiber Network and Near Term 4.8kV Conversion Projects over State of Michigan EJ Screening Tool

Figure 4 shows that the largest 4.8kV conversion projects occur in areas outside of the fiber loop around Detroit. Figure 5 shows that the largest 4.8kV conversion

projects occur in areas with lower environmental disadvantage. The areas with the highest environmental disadvantage within the fiber loop around the Detroit area also have the oldest parts of the DTE Electric system. However, when looking at the area to be converted, the Company is largely selecting newer areas of the 4.8kV system to convert to 13.2kV.

There are significant equity and environmental justice implications for the proposed DTE Electric distribution plan work pertaining to the 4.8kV system. Altogether, investments to extend the life of the 4.8kV system (such as overhead fiber to 4.8kV substations and 4.8kV hardening) also prolong the duration communities must deal with the deficiencies and safety hazards of the 4.8kV system. From the timeline presented in the distribution plan, these communities will live with the 4.8kV system for decades more, even though the Company finds the 4.8kV system incompatible with a modernized grid. Near-term conversion projects focus on converting areas with lower environmental disadvantage. Altogether, this suggests severely environmentally disadvantaged communities in Detroit and around it will have to live with DTE Electric's oldest parts of the system, some of which was first installed in the late 1800s, decades into the future. They will suffer longer restoration times, greater safety hazards, and severe limits or total disbarment from participating in Michigan's energy future. The 4.8kV system is simply unable to support as many electric vehicles, distributed energy resources, and other technologies as the 13.2kV system. Those communities

historically left behind will be further left behind. Is this the Michigan clean energy future we are working towards?

Socioeconomic and equity analyses can yield further understandings of the Company's proposals. Currently, none of the companies present such analyses even though significant learnings can be gained.

Community Engagement

The importance of including communities early in the development of solutions supporting greater grid reliability and resiliency was discussed by Paul De Martini in the November 5, 2021, panel in the MPSC Technical Conference on Emergency Preparedness, Distribution Reliability, and Storm Response. It may be advisable to adopt a community centric lens when planning, designing, implementing, and studying reliability and resiliency solutions. Such a lens could begin by identifying communities of need in the utility service territory based on community safety, reliability, and resiliency needs. Then, utilities can engage the local community or residents in better understanding the issues at hand to then design solutions with high acceptance from the local community, while also meeting the utility's own standards for technical understanding and comfort.

The community centric lens clearly indicates expectations for community and customer engagement when designing distribution system solutions. Informing a community of a project would not be enough. Community engagement from problem identification to solution implementation and evaluation would be

expected. It also focuses the exploration of reliability and resiliency solutions to problematic areas of the grid or utility performance. This is a focus on improving customer experience with grid services and recognizes that the electricity provided by the utilities support essential services within Michigan communities and businesses. It also shifts the focus to also explore how to best engage local communities and businesses in challenged areas to understand their issues and develop solutions that address the local community's needs while also supporting greater grid reliability, resiliency, and safety.

Stakeholders, like Mr. Brock and MAUI, voice strong desires for greater customer and community engagement and knowledge in the utility planning process. A community centric lens to reliability and resiliency solutions will support utilities in better understanding how utility investments can be leveraged to meet the needs of Michigan communities. Likewise, there will likely also be increased environmental justice and equity components to community centric solutions when helping communities address reliability and resiliency challenges. Lower-income communities experience the most reliability and resilience issues, as noted by stakeholders like the NRC and the Michigan Welfare Rights Organization. Lastly, supporting greater engagement with stakeholders will hopefully result in greater data access and transparency such that interested stakeholders, such as ITC, may also help proactively plan and support community utility grid modernization efforts. This may further integrate Michigan efforts to develop a cohesive reliable, resilient, and safe electric distribution system and focus utility

and stakeholder investments to best support Michigan communities to flourish in our new energy future.

Staff Recommendations

1) Staff recommends the Commission revise its guidance for future distribution plans regarding NWAs. Staff recommends the Commission clarify its guidance to request the following in future distribution plans:

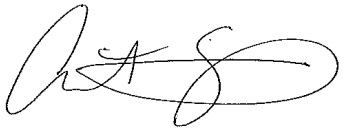
- Problem description, goals, and possible solutions determined through community and third-party engagement,
- Summarize full set of alternatives analyzed before determining the selected solution,
- Desired utility learnings or system outcomes,
- Discuss processes on how to identify and utilize market-based solutions and/or external funding to reduce ratepayer impacts,
- Identification of investment locations overlayed with:
    - socioeconomic context, such as the MiEJScreen information, and
    - electric distribution system information (4.8kV, 13.2kV, substation type and density, etc.).
- Encourage utility learning regarding quantifying reductions in ratepayer burdens when deploying technology supporting grid reliability, resiliency, and customer safety.

2) Staff recommends future distribution plans include details regarding the asset management approaches applied in the plan, efforts to prevent outages from occurring, and reducing risk in a proactive manner. The plans should not only focus on asset age but also on condition-based assessments performed through monitoring and inspections.

Staff recognizes the diligent effort and hard work that went into preparing the electric distribution plans that are the subject of these comments. Staff thanks the utilities for undertaking this effort, and hopefully looks forward to reviewing future distribution plans encompassing its recommendations.

Respectfully submitted,

MICHIGAN PUBLIC SERVICE COMMISSION STAFF



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