MI POWER GRID

Making the Most of Michigan's Energy Future

Utility Pilot Best Practices and Future Pilot Areas

Michigan Public Service Commission Staff Report

MI Power Grid: Energy Programs and Technology Pilots Workgroup

September 30, 2020

MPSC

Michigan Public Service Commission

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MI Power Grid: Energy Programs and Technology Pilots

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A list of organizations that participated in the stakeholder process or shared their expertise with Michigan Public Service Commission staff is below. The list may not be comprehensive as not all participants shared their organizations.

Participating Organizations

5 Lakes Energy
Accenture
Acuitas
Advanced Energy Economy
Alabama Public Service Commission
Alpena Power Company
American Council for an Energy-Efficient Economy
American Electric Power
Ann Arbor 2030 District
The Brattle Group
Cadmus
Chart House Energy
Citizen Utility Board of Michigan
City of Three Rivers
City of Grand Rapids
CLEAResult
Consumers Energy
Daniel Blair Consulting
Dimension Renewable Energy
DTE Electric
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Google
Great Lakes Energy Electric Cooperative
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Great Lakes Water Authority
ICF
Indiana Michigan Power
Institute of Electrical and Electronics Engineers
ITC Transmission
Lawrence Berkeley National Laboratory
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Smart Electric Power Alliance
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WattTime

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Executive Summary

On October 17, 2019, the Michigan Public Service Commission (MPSC) launched MI Power Grid in collaboration with Governor Whitmer. MI Power Grid is a customer-focused, multi-year stakeholder initiative intended to ensure safe, reliable, affordable, and accessible energy resources for the state's clean energy future. The initiative is designed to maximize the benefits of the transition to clean, distributed energy resources for Michigan residents and businesses.

This report highlights the efforts of the Energy Programs and Technology Pilots workgroup, its stakeholder process, and its learnings regarding past and current Michigan pilot projects, pilot best practices, and future pilot areas. It also includes MPSC staff (Staff) recommendations.

There are many difficulties with pilot studies. First, the term "pilot" is often ambiguously defined and varies from entity to entity. Second, there is little available guidance on conducting pilot studies. Third, pilots can have methodological issues causing misleading conclusions. Fourth, the same or similar pilots are many times repeated in different locations due to limited or no information sharing. Fifth, key information regarding pilots may go unreported and impact the applicability of the results. These issues, which present opportunities for improvement and guidance, transcend the utility arena and seemingly face every sector conducting pilots.

Though many U.S. public utilities commissions support innovation and actively promote energy pilots, few have provided clear and readily available guidance regarding how pilots should be evaluated for best practices when approving associated spending. Many review pilots on an ad hoc basis, as does Michigan currently.

Staff's review of Michigan pilots found no clear definition of "pilot" in Michigan. Limited information regarding pilot design, evaluation, criteria for determining a pilot's success, and reporting is located within MPSC dockets and energy waste reduction annual reports. However, this information may not be missing entirely. Significant pilot reporting occurs through informal presentations or reports to the Commission. This information may not be readily accessible, especially to interested stakeholders unfamiliar with the Commission's many venues for pilot data and reports.

In this workgroup, Staff conducted seven stakeholder meetings, three surveys, pilot reviews, and literature reviews. Staff synthesized the information and guidance from these workgroup activities to make its recommendations.

First, Staff recommends the MPSC establish and promote more detailed foundational goals underpinning future energy pilots. A cohesive vision with clear metrics will help unify the State's future energy pilot investments while also increasing movement toward realizing that vision in a safe and affordable manner.

Second, Staff recommends the following broad definition for the term pilot: *A pilot is a limited duration experiment to determine the impact of a measure on one or more outcomes of interest.*

Third, Staff recommends objective criteria that can be used when evaluating pilot proposals that come before the Commission for funding approval. The proposed objective criteria below are intended to apply to any utility pilot projects meeting the recommended pilot definition. Utility provision of data listed in the objective criteria is not envisioned to guarantee funding approval. Likewise, failure to provide information for some of the listed criteria or subcomponents is not envisioned to automatically lead to funding rejection.

1. ***Pilot need and goals detailed.***
    a. Need for the pilot is expressed. Results of similar pilots and findings are shared to justify the need for the proposed pilot.
    b. Pilot goals and desired learnings are detailed.
2. ***Pilot design and evaluation plan designed and presented together.***
    a. Pilot program design and evaluation plans are designed together so examined metrics and collected data support evaluation of the pilot in meeting goals and desired learnings.
    b. If applicable, define target customer population, selection rationale, recruitment plans, and evaluation plans for customer adoption and satisfaction.
    c. If statistical analysis will be conducted on pilot results, a statistically significant sample size must be selected, supported, and detailed. If a statistically significant sample size is not selected, justification must be provided.
    d. If statistical analysis will not be conducted, justification must be provided as well as an approach for evaluating pilot goals.
    e. If changes are required during implementation, pilot design, and evaluation impacts are shared.
3. ***Pilot project costs detailed.***
    a. Project costs are detailed by source and amount for all applicable periods.
    b. Availability of non-utility funding and whether any was pursued (such as state or federal funding opportunities) described.
    c. Projected cost-effectiveness of piloted measure at scale over expected life described.
4. ***Project timeline detailed.***
    a. Proposed timeline for the pilot project and any related reports or evaluations delineated.
5. ***Stakeholder engagement plan detailed.***
    a. Stakeholder engagement plan before, during, and after pilot takes place detailed.
    b. Interim and final stakeholder reporting described.
    c. Expected publicly available data from pilot shared.
6. ***Public interest detailed.***
    a. Pilot support of the transition to clean, distributed energy resources, and its expected impacts described.

b. Any added benefits to ratepayers or the energy delivery system, either due to proposed site selection or through other pilot variables, especially if any system weaknesses or forecasted needs are addressed, shared.
c. Expected impacts of the piloted measure on reliability, resilience, safety, and ratepayer bills detailed.
d. Expected local or Michigan based employment and business opportunities created by pilot described.
e. Any potential impacts or added benefits of the pilot on low-income customers, seniors or other vulnerable populations described.

Fourth, Staff recommends the development of a streamlined pilot review process that provides cost recovery clarity.

Fifth, Staff recommends the development of an online Michigan pilot directory with the following information for utility pilot projects provided at a minimum: a utility contact person, a summary of pilot need and goals, any applicable MPSC case numbers, and links to any pilot design, evaluation, and update information. The directory could also list a contact per utility for future pilots so third parties and researchers can share ideas or interest. This may help facilitate information sharing and communication between interested third parties and utilities regarding future pilot ideas.

Staff hopes its recommendations are the start of a clearer pilot framework supporting Michigan energy innovation. Though it has tried to reflect the depth and diversity of topics discussed in this workgroup, Staff recognizes that there is still much to explore regarding how pilots can help maximize the benefits of Michigan's transition to cleaner and more distributed energy resources, which is the focus of the MI Power Grid initiative. For that reason, Staff looks forward to further Commission guidance and the findings of ongoing and future MI Power Grid workgroups that will likely shed more light on how to better support energy innovation and pilots within the state.

Introduction

1.1 MI Power Grid Initiative

On October 17, 2019, the Michigan Public Service Commission (MPSC) launched MI Power Grid in collaboration with Governor Whitmer. MI Power Grid is a customer-focused, multi-year stakeholder initiative intended to ensure safe, reliable, affordable, and accessible energy resources for the state's clean energy future. The initiative is designed to maximize the benefits of the transition to clean, distributed energy resources for Michigan residents and businesses. MI Power Grid encompasses outreach, education, and changes to utility regulation by focusing on three core areas: customer engagement; integrating new technologies; and optimizing grid performance and investments. The MPSC maintains a dedicated website for the initiative at www.michigan.gov/mipowergrid.

MI Power Grid seeks to engage a variety of stakeholders, including utilities, energy technology companies, customers, consumer advocates, state agencies, and others, in discussions about how Michigan should best adapt to the changing energy industry. This report highlights the efforts and findings of the Energy Programs and Technology Pilots workgroup within the Customer Engagement core area of MI Power Grid.

1.2 Energy Programs and Technology Pilots Workgroup and Tasks

In the order U-20645 establishing the MI Power Grid Initiative, the Energy Program and Technology Pilots workgroup was tasked with (Michigan Public Service Commission, 2019a):

- engaging with electric utilities and other stakeholders to better understand the outcomes and learnings from past and current pilot projects,
- investigating pilot program best practices and past MPSC actions on pilot programs,
- proposing objective criteria for Commission/Staff to use when evaluating future proposed utility pilot projects, and
- identifying potential areas for additional pilot proposals.

To accomplish these tasks, the workgroup initiated a series of stakeholder meetings, conducted utility and stakeholder surveys, reviewed available literature, and reviewed past pilots in case filings before the Commission.

1.3 Global and National Context

MI Power Grid recognizes the rapidly changing energy landscape and the importance of clean, distributed energy resources within Michigan. As the electrical grid evolves and adapts to new technologies, customer demand, and public policy priorities, the types of energy pilots needed to support it also changes. Efforts around the country to update utility regulatory frameworks to realize a clean, reliable, and affordable electrical system have increased (Cross-Call, Goldenberg, & Wang, 2019). This energy transition is occurring not only within Michigan, but also nationally and around the world.

1.3.1 Global Energy Transformation Rapid and Near Term

The global energy transformation is driven by changing customer expectations and rapid technology innovation. A global survey of power and utility company executives in 2018 found 82% believed their company was not ready for the market transformation and 44% believed they would not be ready by 2020. However, 90% believed the window of opportunity for readiness will close by 2023. The majority (89%) believed technology advancement is driving the energy industry evolution (PwC, 2018). However, the convergence of technological innovation, growth of distributed generation, new forms of competition, customer behavior changes, and policies sets the utility sector on a path to (PwC, 2018):

> *…evolve from an analogue, scale-driven, centralized and standardized model to one that is digital, distributed and personalized… An industry accustomed to long-term and large-scale asset investment timescales now has to adjust to much shorter technology and project cycles. There is an awareness that more agile business model thinking is needed for utilities to adapt to this changing environment.*

Utility pilots are an important tool that allows companies to explore how to best evolve to meet the needs of the rapidly changing energy sector.

1.3.2 U.S. Electrical Infrastructure is Aging

In its 2017 infrastructure report, the American Society of Civil Engineers (ASCE) graded the U.S. energy system a D+. The ASCE summarized the aging U.S. electric grid (American Society of Civil Engineers, 2020a):

> *Some parts of the U.S. electric grid predate the turn of the 20th century. Most [transmission and distribution] T&D lines were constructed in the 1950s and 1960s with a 50-year life expectancy, and were not originally engineered to meet today's demand, nor severe weather events. With more than 640,000 miles of high-voltage transmission lines across the three interconnected electric transmission grids…the lower 48 states' power grid is at full capacity, with many lines operating well beyond their design.*

Aging infrastructure and weather-related outages cost the U.S. an annual average of $18 to $33 billion from 2003 to 2012. Moving forward, energy system cybersecurity and physical security continue to be important issues for resiliency. There are also significant public safety and economic impacts of low-probability severe threats like geomagnetic pulse (American Society of Civil Engineers, 2020a). Pilots will be needed to find solutions to these electrical grid challenges.

1.3.3 U.S. Energy Consumption Changing

In 2019, total U.S. energy use (100 quadrillion Btu) was at the third-highest level ever. Of that, 20% came from non-fossil fuel sources. Natural gas, nuclear, wind, and solar reached record consumption values (U.S. Energy Information Administration, 2020b).

U.S. renewable energy consumption increased for the fourth year in a row in 2019 to 11.5 quadrillion Btu and exceeded coal consumption for the first time since before 1885. Coal use

declined by 15% to 11.3 quadrillion Btu, falling to its lowest level since 1964 (U.S. Energy Information Administration, 2020b, 2020e). In 2019, wind energy surpassed hydroelectric power as the leading renewable energy source for electricity generation (U.S. Energy Information Administration, 2020e).

The electric power sector consumes 56% of U.S. commercially available renewable energy. Other sectors use the rest: industrial (22%), transportation (12%), residential (7%), and commercial (2%) (U.S. Energy Information Administration, 2020e).

National trends of increased natural gas and renewable electricity generation, especially wind and solar, are projected to continue. Through 2050, natural gas, solar, and wind are projected to be the primary sources of new generation capacity. Customer-owned generation, including rooftop solar, is also expected to increase (U.S. Energy Information Administration, 2020a).

1.3.4 Energy Impacts Environment, Equity, Health and Jobs

Changes in electricity generation have implications beyond the energy sector. Increases in wind and solar energy generation reduce emissions of carbon dioxide (CO_2) and criteria air pollutants, including sulfur dioxide (SO_2), nitrogen oxides (NO_x), and fine particular matter ($PM_{2.5}$) (Siler-Evans, Azevedo, Morgan, & Apt, 2013). Though the impact of greenhouse gases, like CO_2, does not depend on geographic location, air pollutants like SO_2, NO_x, and $PM_{2.5}$ have more localized geographic impacts especially on communities near generating units (de Chalendar, Taggart, & Benson, 2019).

The reduction in greenhouse gas and air pollutant emissions from wind and solar resources does not only depend on the amount generated by renewable energy sources, but also the conventional generators that they displace. There are significantly greater benefits when wind or solar resources displace coal or oil-fired generators (Siler-Evans et al., 2013). Changes in utility generation can have not only environmental impacts, but also subsequent health impacts, especially on the communities surrounding displaced generating units.

The geographic impacts of air pollution are unequally distributed and low-income communities of color are disproportionately impacted. A study of $PM_{2.5}$ air pollution from 1981 to 2016 found substantial decreases over the period, but the subpopulations that were most exposed in 1981 remained the same (Colmer, Hardman, Shimshack, & Voorheis, 2020). Despite overall pollution reduction, the disproportionate level of air pollution exposure experienced by low-income communities of color has persisted (Groom, 2020).

Limiting global warming can provide health and economic benefits. Warming temperatures increase climate-related risks for natural and human systems. Human activities have caused between 0.8 to 1.2°C of global warming above pre-industrial levels and is likely to reach 2.5°C between 2030-2052 (Masson-Delmotte et al., 2018). By limiting warming to a 2°C increase over the next 50 years, "roughly 4.5 million premature deaths, about 3.5 million hospitalizations and emergency visits, and approximately 300 million lost workdays in the US" could be avoided. This

translates "to over $700 billion in benefits per year in the US from health and labor alone" (Shindell, 2020). In a decade, air quality improvements from a rapid shift to a pathway limiting warming to 2°C reduces U.S. air pollution health and mortality impacts by 40%. In the next 20 years, air quality improvement can save about 1.4 million lives. Shindell summarizes the impact of the energy sector (2020):

> *[T]he burning of fossil fuels that is the primary driver of climate change is also responsible for the majority of deadly air pollution in the US. Transitioning to alternative energy sources not only improves the environment but would create jobs and reduce the disproportionate suffering from climate change and air pollution that falls upon the most vulnerable and exacerbates inequalities.*

Utility sector changes in energy technologies can lead to significant impacts on climate change as well as environmental, health, employment, and equity impacts.

1.3.5 New Technologies and Business Models Needed

Exploration of new technologies and business models are needed to address emerging needs. For instance, increased renewable energy generation introduces intermittency and price volatility issues. Coordinated aggregation of consumers and producers using distributed generation, demand response, and battery storage can help "accelerate the integration of intermittent electricity sources, enhance demand flexibility and decrease the reliance on renewable energy support schemes" (De Clercq & Guerrero Lucendo, 2018). However, management of distributed generation and storage, including electric vehicles, is underdeveloped and requires the use of new technological solutions (De Clercq & Guerrero Lucendo, 2018). Pilot programs will be essential in exploring the use of new technologies to address current and emerging energy needs.

1.4 Michigan Context

Michigan energy trends are described below. In addition, some situational impacts that may affect the energy pilots Michigan can expect and will need in the future are also discussed.

1.4.1 Energy Infrastructure Aging but Meeting Current Needs

Michigan energy infrastructure is aging. It has the second oldest fleet of fossil fuel electricity generators in the U.S. with an average age of 49 years. The ASCE grades Michigan's energy system at a C-, which is higher than ASCE's grade for the national energy system. Not all states have ASCE energy infrastructure grades. Those with grades are listed in Table 1 for comparison.

Though the ASCE finds Michigan's energy system meets current needs, it notes several challenges. These are: aging infrastructure, increasing energy dependence, demand for high service reliability, limited investment to preserve function, exposure to physical and cyber threats, congestion, and dependence on externally sourced fossil and nuclear fuels. To meet future needs, avoid energy disruptions, and lower risk of increasing energy costs, the ASCE recommendations for Michigan include: diversify energy supply through renewable energy expansion, use electric transmission and distribution systems, and increase resilience (American Society of Civil Engineers, 2020c).

Table 1: ASCE 2017 Energy Infrastructure Grades

B+	North Carolina					
B	Alabama	Georgia	Wisconsin			
B-	Idaho	Kentucky	Maine	Nevada	Vermont	
C+	Colorado	Iowa	New Hampshire	New Jersey	North Dakota	Rhode Island
C	Kansas	Minnesota	Mississippi	Montana	Pennsylvania	Washington D.C.
C-	Alaska	Florida	Hawaii	Maryland	Michigan	
D+	Missouri	Oregon				
D-	California					
F	Puerto Rico					

Where A is exceptional, B is good, C is mediocre, D is poor, and F is failing.
Data from American Society of Civil Engineers (2020b).

1.4.1 Natural Gas and Renewable Energy Use Increasing

Broad change in Michigan's energy resources and use is underway. Though coal was the largest source for Michigan's electricity generation in 2019 (~32%), natural gas-fired generation accounted for 30% of Michigan's electricity and exceeded nuclear power for the second year. Renewables provided 8% of its electricity. Wind supplied 60% of that, ranking Michigan 15th nationally for wind electricity generation (U.S. Energy Information Administration, 2020d).

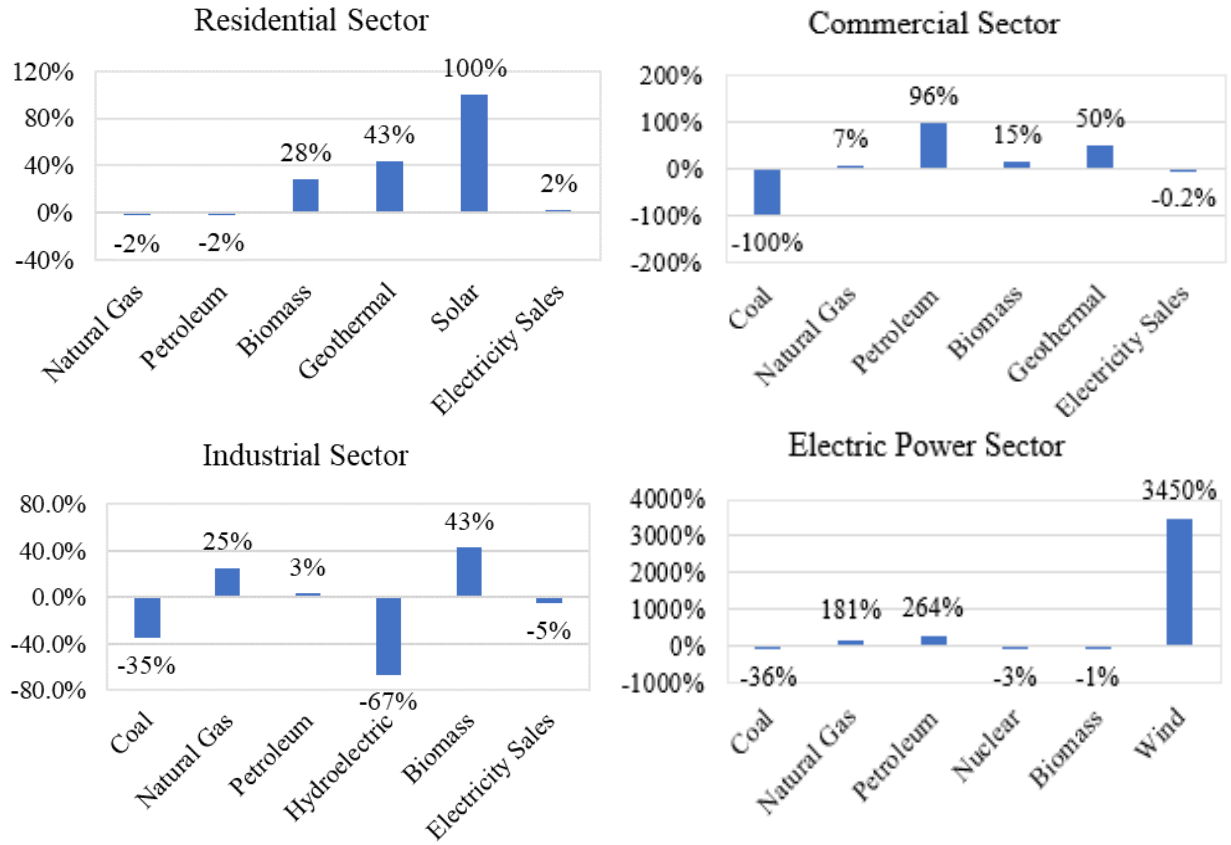

Figure 1. Change in Michigan Energy Consumption by Sector, 2008-2018
Data from U.S. Energy Information Administration (2020d)

When examining the decade since the passage of Michigan's Clean and Renewable Energy and Energy Waste Reduction Act in 2008 (Michigan Legislature, 2020), significant energy changes have occurred across sectors in the state. See Figure 1 for the percentage change in energy consumption by source and sector in 2018 compared to 2008.

Figure 1 shows, from 2008 to 2018, an increase in renewable energy use for all sources in all sectors, except for industrial hydroelectric use (decrease of 67%) and electric power biomass use (decrease of 1%). Most notably, wind generated electricity increased 3,450% from 1.4 trillion Btu (TBtu) in 2008 to 49.7 TBtu in 2018. During the same period, solar generated electricity increased from 0 to 1.1 TBtu in the electric power sector (U.S. Energy Information Administration, 2020d).

These energy changes impact CO_2 emissions. Michigan's electric power sector has seen generally declining CO_2 emissions over the last decade (See Figure 2). In 2017, its CO_2 emissions were 24% below 2008 levels. This CO_2 emissions reduction in Michigan's electric power sector was larger than overall CO_2 emissions reduction in the state, which realized a 13% reduction over the same period (U.S. Energy Information Administration, 2020c). In 2017, the electric power sector represented nearly 37% of total Michigan CO_2 emissions (See Figure 3).

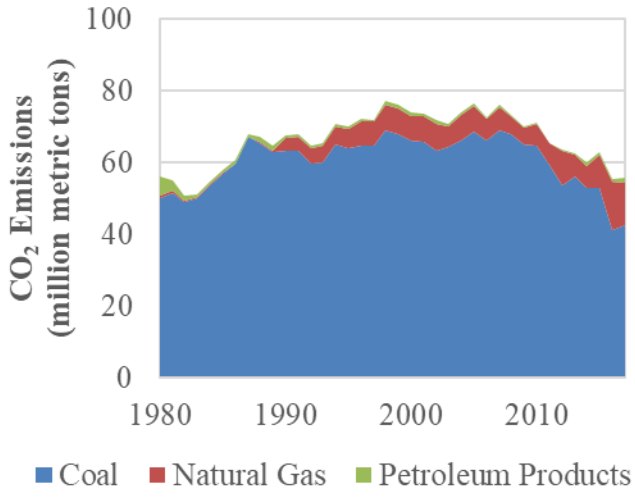

Figure 2. Michigan Electric Power Sector CO_2 Emissions (1980-2017)

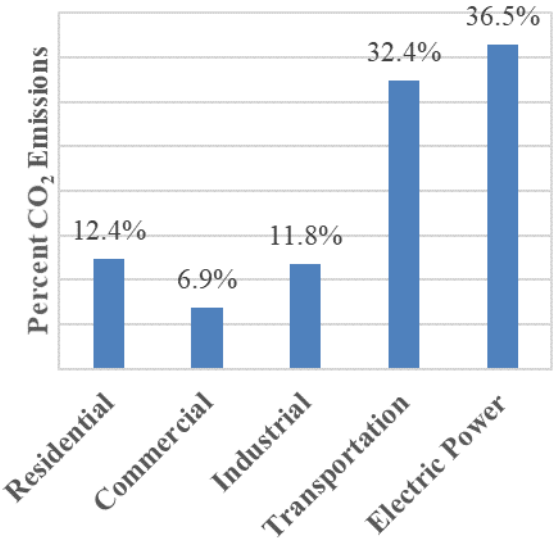

Figure 3. Michigan CO_2 Emissions by Sector, 2017

Data from U.S. Energy Information Administration (2020c).

The increasing share of renewables and natural gas used for electricity generation in the electric sector will likely impact the state's transportation sector. Michigan has dedicated significant resources towards transportation electrification. The Michigan Environment, Great Lakes, and Energy (EGLE) awarded $4.2 million to seven school districts for seventeen electric school buses, the first of which began operating in September 2019 (Michigan Department of Environment, Great Lakes, & Energy, 2019a, 2019b). In July 2020, the state established the Office of Future

Mobility and Electrification (Office of Governor Whitmer, 2020). In August 2020, EGLE awarded $1.7 million to support the statewide network of EV charging stations after identifying optimal charger locations across Michigan (Ghamami, Zockaie, Wang, & Miller, 2019; Michigan Department of Environment, Great Lakes, & Energy, 2020a). In addition, Consumers Energy, DTE Energy, and Indiana Michigan Power Co. (I&M) all have ongoing electric vehicle pilot programs approved by the MPSC (Michigan Public Service Commission, 2019b).

With significant transportation electrification, the transportation sector CO_2 emissions will likely decrease due to the lower carbon energy sources used for utility generation. From 1980 to 2017, 97-99% of Michigan transportation sector CO_2 emissions arose from petroleum product use (U.S. Energy Information Administration, 2020c). If full transportation electrification is achieved, the utility sector could impact nearly 69% of Michigan's CO_2 emissions, if the CO_2 emissions by sector resemble 2017 (See Figure 3).

The trend of declining carbon dioxide emissions in Michigan will likely continue. In terms of total capacity, Michigan projects in the Midcontinent Independent Systems Operator (MISO) generator interconnection queue are dominated by solar energy (4,491 MW), natural gas combined cycle (1,175 MW), and wind energy (1,154 MW). Though not all projects in the MISO generator interconnection queue come to fruition, this information suggests that future Michigan energy projects will continue the trend of increased renewable energy and natural gas use. Additional pilots may be required to explore management of increasing electric vehicles and intermittent generation. See Figure 4 for a chart of the total capacity by project type in the MISO Generator Interconnection Queue for Michigan.

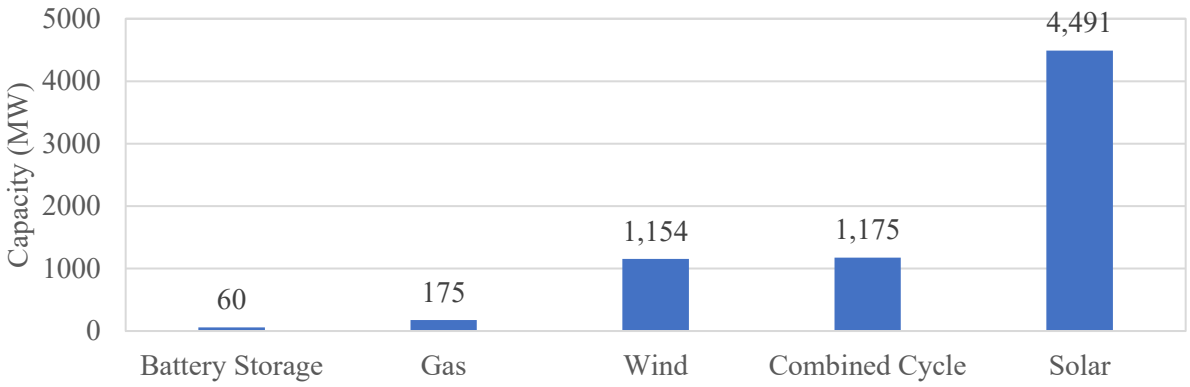

Figure 4. Michigan MISO Generator Queue
Data from Mid-continent Independent System Operator (2020).

1.4.2 Utility Pilots Will Need to Address Climate and Environmental Impacts

Michigan's transition to cleaner electricity generation reduces greenhouse gases (GHG) and their subsequent climate change impacts. The Great Lakes region has experienced an increase of 2.3°F (1.3°C) rise in annual average air temperature since 1951. Air temperature changes in the region

are projected to continue increasing from 3°F to 6°F (1.7°C to 3.3°C) by 2050 (Great Lakes Integrated Sciences+Assessments, nd).

Climate change impacts in the Great Lakes region will impact utility infrastructure and demands due to likely increased rainfall, flooding, heat wave intensity and frequency, and extreme winter weather. During the last century, extreme rainfall events and flooding have increased in the Midwest region (Pryor et al., 2014), with a 13.6% increase in total annual precipitation since 1951 (Great Lakes Integrated Sciences+Assessments, nd). Heat wave intensity and frequency have also increased. These weather trends are expected to continue (Pryor et al., 2014). In the near term, lake-effect snow may increase from reduced lake ice cover and increased evaporation, especially in northern areas. By late century, more rain instead of snow will fall during the winter months across the region due to rising temperatures (Pryor et al., 2014; USGCRP, 2017; Vavrus, Notaro, & Zarrin, 2013; Wright, Posselt, & Steiner, 2013). Severe winter weather is significantly related to the warming arctic. When examining records since 1950, researchers found cold temperatures and heavy snowfall more frequent during warm arctic temperatures, with snowfall and extreme winter weather in the northeastern U.S. being most sensitive to arctic variability (Cohen, Pfeiffer, & Francis, 2018).

Michigan utilities will likely face increasing severe weather in the coming years due to these climatic trends. Pilots may be necessary to explore how utilities can best prepare and withstand severe weather impacts while increasing infrastructure reliability, resiliency, and safety in a cost-effective manner. In addition, pilots may also help study the environmental and equity impacts of utility investments.

1.4.3 Intermittent Resources Introduce Surmountable Challenges

Though the transition to more renewable resources like wind and solar helps reduce greenhouse gas emissions and criteria air pollutants, the intermittent generation of these resources presents challenges and requires greater system flexibility to manage the variable generation and its relationship with electric loads. Many options can provide the needed flexibility and range, such as "institutional changes, operational practices, storage, demand-side flexibility, flexible generators, and other mechanisms" (Bird, Milligan, & Lew, 2013). Utilities and system operators in the U.S. and abroad have used varied tools and practices to integrate renewables, as the most viable and economic solution depends on the grid infrastructure, operational practices, generation fleet, and regulatory structure (Bird et al., 2013).

Michigan's performance during the 2019 Polar Vortex demonstrates how utility and system operators overcame unexpected and rapid reduction in generation while facing increasing customer demand. During January 29 to February 1, 2019, Michigan experienced a polar vortex with historic extreme cold weather (Talberg, Scripps, & Phillips, 2020). In the MISO region, wind generation dropped off, mainly due to cold weather cutoffs. These cutoffs, combined with forced conventional generation outages, contributed to a maximum generation event on January 30 (Mid-continent Independent System Operator, 2019). In Michigan, a fire at Consumers Energy's

Ray Compressor Station exacerbated the cold weather threat by reducing the supply of natural gas to the region.

The response in both Michigan and the MISO territory demonstrated the importance of demand response resources in addressing the 2019 polar vortex's energy challenges. The Michigan State Police used the statewide emergency alert system to request residents to lower thermostats to 65°F to decrease natural gas demand. Michigan residents cooperated and demand dropped off within hours, avoiding shutoffs to residential gas customers (Talberg et al., 2020). Similarly, voluntary load management and deployed and self-scheduled load modifying resources helped dampen demand in the MISO region (Mid-continent Independent System Operator, 2019).

Though the challenges introduced by the adoption of intermittent resources are not limited to and somewhat distinct from those faced during the 2019 polar vortex experience, the event provided a valuable real-world learning experience regarding the responsiveness of both utility and system operators to unexpected and sudden change in generation and load. In many ways, challenges posed by intermittent resources are dwarfed by the 2019 polar vortex experience, where Michigan faced the loss of a key natural gas compressor station and the MISO region experienced nearly 29 GW of unplanned outages (Mid-continent Independent System Operator, 2019).

Given that Michigan overcame the 2019 polar vortex issues, any challenges presented by intermittent resources should be surmountable if properly addressed. However, it is important for utilities to explore demand response and other options for integrating intermittent resources to determine how to best address energy needs, particularly in times of peak demand or extreme weather events. Utility pilots will be central to the exploration of technologies and programs that may provide solutions to alleviate some of these current and emerging issues.

1.4.4 Michigan Entities are Committed to Energy and Climate Goals

Many Michigan utilities, communities, educational entities, and military bases have declared energy and climate goals. All three of Michigan's largest investor owned utilities have carbon reduction commitments. DTE Electric and Gas committed to net zero carbon emissions by 2050 (DTE Energy, 2020). Consumers Energy's goal is to reach zero carbon emissions by 2040 (Consumers Energy, 2020). Lastly, AEP, of which Indiana Michigan Power (I&M) is a subsidiary, committed to a 70% reduction in CO_2 emissions by 2030 (American Electric Power, 2019). Twelve Michigan communities, eight higher education institutions, and one military base have also declared energy and climate goals (Michigan Climate Action Network, 2019). The types of energy programs Michigan entities desire to fulfill their energy and climate goals will likely impact utility programs as well as future developments that will be explored and offered in the state.

Michigan's commitments have translated to significant clean energy jobs in areas like solar and wind energy, energy efficiency, clean vehicles, grid and storage, and clean fuels. In 2019, Michigan ranked fifth nationally for clean energy jobs with 125,365 jobs. It ranked second nationally for rural clean energy jobs with 24,954 jobs (E2, 2020), nearly 20% of its clean energy workforce.

Michigan's metropolitan areas also lead in clean energy jobs. Detroit ranked eleventh in the top 50 metropolitan areas for clean energy jobs, with 55,466 jobs. For metropolitan areas with the largest share of clean energy jobs in the total workforce, Holland-Grand Haven ranked second nationally with 8.6% and Niles-Benton Harbor ranked tenth with 4.2% of its workforce in the clean energy sector. (E2, 2020). These figures demonstrate the significant jobs and economic impact of Michigan's energy and climate goals.

Recent commitments will only accelerate the impact of energy and climate goals. On September 23, 2020, Governor Whitmer's Executive Directive No. 2020-10 established goals for economy-wide carbon neutrality by 2050 with an interim goal of 28% reduction below 1999 levels in greenhouse gas emissions by 2025. The Department of Environment, Great Lakes, and Energy will develop and oversee the implementation of a MI Healthy Climate Plan that details the plan for transition towards economy-wide carbon neutrality. It will coordinate and support implementation efforts of utilities and others. It will evaluate the impacts of proposed energy generation resources and alternatives in utility integrated resource plans for consistency with emission reduction goals while also considering environmental justice and health impacts.

Michigan utilities are making commitments to help meet the current and emerging challenges from changing customer demand, increased severe weather, and a rapidly evolving energy landscape. In this narrowing window of opportunity, they will need to explore solutions and innovate rapidly while still maintaining a reliable, safe, and resilient electrical grid. Utility pilot programs will be key tools as utilities approach this uncertain and evolving future and as Michigan transitions to clean and distributed energy resources.

2. Background

Pilots are essential in exploring, validating, and learning from solutions to current and emerging problems. The smaller scale of pilot programs provides utilities the opportunity to ensure utility solutions effectively address the problems at hand before full deployment.

The rapidly evolving energy industry and the clamor for social and environmental change have only increased pressures for utilities to adapt. Given the short window of opportunity global utility leaders believe is available to build and acquire the needed strategies and capabilities to meet evolving societal demands (PwC, 2018), there is an urgency to learn and adapt quickly. However, regulators, such as the MPSC, are tasked with protecting the "public interest" and seek to provide just and reasonable rates by allowing only prudently incurred costs to be recovered by regulated utilities in customer rates. (Lazar, 2016).

There is a natural tension between the utilities' need to adapt and quickly meet customer needs and the MPSC's need to ensure that approved costs are reasonable and prudent. These tensions extend to utility pilots and factor in the development of a widely applicable set of objective criteria with which to evaluate utility pilot proposals. Any set of objective criteria needs to balance the need for rapid utility innovation with the need to protect the public interest while providing the

information needed to review the reasonableness and prudency of utility costs. Pilot challenges and the guidance provided by public utilities commissions nationally are discussed below, followed by an overview of Michigan's utility pilots.

2.1 The Problem with Pilots

There is frustration regarding pilots in not just the energy sector, but also in other areas, such as education, medicine, and engineering. Many of the challenges associated with pilots transcend the utility arena and seemingly face every sector conducting pilots. These issues, which are described below, present opportunities for improvement and guidance.

First, the term "pilot" is often ambiguously defined, and its definition may vary from entity to entity. Other descriptions like trials, demonstration projects, and field studies, have been used interchangeably with the term "pilots" (Davis, Krishnamurti, Fischhoff, & de Bruin, 2013; George & Bell, 2020; Padula, 2020; Trabish, 2017). Some entities have defined pilots to also be distinct from some of these terms, especially distinguishing between pilots and demonstration projects (Fairbrother, Cuccione, Henchen, & Teixeira, 2017; Padula, 2020). The lack of a consistent definition can create confusion.

Second, there is little guidance available about conducting pilot studies. In 1984, even after a decade of energy pilots in response to the 1970s energy crisis, there was "surprisingly little…known about energy demonstrations" and their effectiveness (Lefevre, 1984). Even in areas where pilot studies are routinely required, such as education research, the methods for their appropriate use are rarely, if ever, detailed (Westlund & Stuart, 2017). An analysis examining bias issues in energy pilots used a methodology from the medical field (Davis et al., 2013), in part due to the lack of research and guidance in the energy field on this issue. A literature search for energy pilot best practices found no clear guidance in scholarly publications and limited guidance elsewhere, although there appears to be growing interest in recent years.

Third, pilots can have methodological issues that lead to misleading conclusions. In a meta-analysis of 32 pilot studies, researchers found methodological problems are common and that they artificially inflated results relative to implementation in the general population. Methodological issues included highly motivated volunteers, participants choosing their preferred intervention, and high attrition rates (Davis et al., 2013).

Fourth, the same or similar pilots projects are many times repeated in different areas due to limited or no information sharing (Begin, Eggertson, & Macdonald, 2009). This phenomenon, especially common for consumer facing utility pilot programs (Tweed, 2012), can lead to pilot fatigue and the impression of "perpetual pilot projects" (Begin et al., 2009). For example, four generations of time-of-use (TOU) rate pilots have occurred since 1975, prompted by the global energy crisis, an energy crisis in California, federal funding for smart meter deployment, and the digital transformation of consumer energy lifestyles. However, despite nearly five decades of piloting TOU rates and numerous studies finding them effective, only 4% of U.S. residential customers in 2018 were on TOU rates. Of that, 15 utilities and 8 states accounted for 86% of all TOU deployment

(Faruqui, 2020). The lack of reporting and reporting inconsistencies are common issues with pilots (Kistin & Silverstein, 2015), and impair the ability to share pilot results.

Fifth, key information regarding pilots may go unreported and impact the applicability of results. In the meta-analysis of 32 pilot studies, none reported information to assess certain methodological vulnerabilities. Most pilots also did not report within-group variances, though overall effects were largely reported. Incomplete pilot reporting complicates analyses by researchers while also limiting the value of pilot findings to decision makers (Davis et al., 2013). Reporting issues for electricity pilot studies are well noted and so severe that a thorough meta-analysis was deemed infeasible by some (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Fischer, 2008). In a review of time-varying pricing and load control pilots, researchers found the pilots frequently surveyed participant satisfaction. However, nearly all the pilots failed to collect details on household composition and socio-economic characteristics. As such, these pilots could not predict the impact of characteristics like income and education, both of which have been found to be significant predictors on energy use during the pilots (Newsham & Bowker, 2010). The exclusion of pilot predictors and information can impact interpretation of pilot effects. Misinterpretation of results may cause unjustified and potentially misleading conclusions and misinformed decisions (Kistin & Silverstein, 2015).

2.2 Pilot Guidance

Staff researched pilot guidance provided by utility commissions around the country. Findings are discussed below.

2.2.1 Survey of NARUC Staff Subcommittee on Electricity

To better understand whether other state utility commissions provided guidance regarding utility pilots, Staff surveyed the NARUC Staff Subcommittee on Electricity members, which has representatives from 38 states.[1] The following survey questions were sent on January 21, 2020:

- Has your commission provided any guidance regarding utility pilots or pilot best practices?
- If so, please detail this guidance and provide any criteria your commission has established.
- If possible, please include references to any Commission orders or documents that detail this information.

A total of five states responded (Alabama, Florida, Mississippi, Missouri, and Nebraska) for a response rate of 13%. All states indicated no guidance regarding utility pilots or pilot best practices has been provided by their respective Commissions. Two states (AL and MO) indicated utility pilot projects are examined on an ad hoc basis during rate case proceedings. Nebraska has little to no authority to issue pilot program guidance to electric utilities. These responses were

[1] Data regarding the NARUC Staff Subcommittee on Electricity retrieved on July 15, 2020 from: https://maxxwww.naruc.org/forms/committee/CommitteeFormPublic/viewExecCommittee?id=764000C02FD.

consistent with Staff's initial research, but the respondents were only a small percentage of total states.

2.2.2 Commission Guidance in Other Jurisdictions

When researching pilot guidance, Staff found it difficult to access and search documents of other public utilities commissions. In this workgroup, Staff spoke and heard from many experts and practitioners. Through those interactions, Staff learned of grid modernization and innovation efforts resulting in pilots around the country, including the District of Columbia (DC), New Jersey, New York, Vermont, and California. Even with an improved understanding of pilot activities nationally, Staff still finds that few public utilities commissions have provided guidance regarding the criteria with which to review pilots, even if they are actively engaged in encouraging pilots and innovation. Pertinent findings are shared below.

2.2.2-1 PowerPath DC Pilot Governance Board and Funding

The Public Service Commission of the District of Columbia (or DC PSC) launched the Modernizing the Energy Delivery System for Increased Sustainability (MEDSIS) initiative on June 2015 (DC PSC, 2020). As a result of the Pepco Exelon merger, approved in March 2016 by Order No. 18148, Exelon was required to provide $21.55 million into a MEDSIS Pilot Project Fund subaccount (DC PSC, 2016). The funds were to support pilot projects related to energy delivery system modernization and were held in escrow until the Commission approved disbursements of funds (DC PSC, 2017, 2020).

In Phase I, the DC Commission Staff recommended MEDSIS pilot project grant funding qualification parameters. Twelve broad parameters were detailed. Refer to the DC PSC staff report for a comprehensive list of subtopics for each of the twelve parameters (DC PSC, 2017). The parameters are listed below with subtopics pertinent to the MI Power Grid Energy Programs and Technology Pilots workgroup endeavors identified:

1. *Type and Purpose of the Pilot Project*
    a. Description of proposed pilot
    b. Impact on modernizing DC's energy delivery system
    c. Ownership and operational structures explored and why were they not selected
    d. Number of ratepayers and rate classes impacted by the pilot project
    e. Resulting employment opportunities for DC residents and businesses
2. *Reputation & Track Record of Applicants*
    a. Experience relevant to proposed pilot
    b. Unregulated subsidiaries or affiliates of utilities regulated by the PSC involved directly or indirectly in pilot proposal
3. *Project Funding Plan*
    a. Project funding requirements by source and use, by quarter and year
    b. Availability of District or Federal government funding opportunities for proposed pilot and whether any pursued

4. *Environmental Benefits*
    a. Inclusion of clean or renewable energy
    b. Short and long-term environmental impact on GHGs, air pollution emissions, environmental justice concerns, etc.
    c. Site selection considerations, including public input
5. *Interconnection Considerations*
    a. How pilots fit into utilities' long-term plans
    b. Any added benefit to ratepayers or energy delivery system due to identified system weaknesses or forecasted load needs
6. *PJM Interconnection*
7. *Commission Oversight*
    a. Reporting and evaluation strategy to measure pilot outcomes
    b. Proposed timelines for project, reports, and evaluations
8. *Public Interest Determination*
    a. Impacts on reliability, resilience, and ratepayer bills
    b. Cost-effectiveness of pilot over expected life
9. *Risk Management*
10. *Enabling Contracts*
11. *Economic & Fiscal Impacts*
    a. Description of employment and business opportunities created by project
    b. Identify District wards and neighborhoods that will benefit and how
12. *Impacts on Obligation to Serve & Public Safety Responsibilities*
    a. Measures in place to ensure public safety

In Phase 2, one MEDSIS working group focused on pilot projects. A final report was submitted in May 2019 with recommendations and learnings for commission consideration. In August 2019, the DC PSC approved the formation of a Pilot Governance Board to examine pilot technology readiness and to use a two-phase selection process to help review, select, and oversee pilot projects (DC PSC, 2019, 2020). The first pilot deployments are expected in 2021 (DC PSC, 2019).

2.2.2-2 New York Reforming the Energy Vision

In December 2014, the State of New York Public Service Commission issued a memorandum and resolution regarding demonstration projects for the New York Reforming the Energy Vision (REV) efforts. In it, a list of eight REV Demonstration principles intended to guide third-party proposals were appended. The REV demonstrations should (NYSERDA, 2020; State of New York Public Service Commission, 2014):

1. Include partnership between utility and third-party service providers,
2. Identify utility questions to answer or solve grid problems/situations and the market should respond with solutions,
3. Delineate how the generated economic value is divided between the customer, utility, and third-party service provider(s),

4. Create a competitive market for grid services,
5. Propose rules (data, terms, standards, etc.) that will help create subsequently competitive markets,
6. Inform pricing and rate design modifications,
7. Consider deploying advanced distribution systems, including two-way communications, real time operation of dynamic load, and other system technologies that support awareness, flexibility, efficiency, and cost-effectiveness, and
8. Explore opportunities to work with and include various residential, commercial, institutional, and industrial customer participants.

The New York PSC requires New York utilities to develop and file REV demonstration projects and to regularly assess them. The REV demonstration project summary, initial filing, implementation plan, quarterly updates, and other related documents can be found by project name on the REV Demonstration Project website. The website also links to the REV Connect website, where interested parties can submit REV demonstration project ideas that will be shared with New York investor-owned utilities and a state team working with demonstration project ideas (New York State Department of Public Service, 2019).

2.2.2-3 California Energy Data Request and Release Process

In May 2014, the State of California Public Utilities Commission issued a decision establishing the California Energy Data Request and Release Process (EDRP). The EDRP establishes the protocol followed by investor owned utilities in the state to allow approved third parties, like local governments, university researchers, and state and federal agencies, to access aggregated customer utility data (California Public Utilities Commission, 2020). Though the EDRP does not specifically pertain to utility pilot programs and data, it was mentioned by several stakeholders in the MI Power Grid Energy Program and Technology Pilots workgroup as an example of public data sharing.

In its decision, the California PUC recognized the public interest in providing access to energy use and related data as long as the data does not raise issues regarding customer privacy or other statutorily recognized data protections. It also recognized the critical need for research in the effectiveness and efficiency of energy efficiency, distributed generation, and renewable energy programs in maintaining California's status as a national leader (State of California Public Utilities Commission, 2014).

Several acceptable research areas for EDRP data access were identified, many of which are like areas explored in the MI Power Grid initiative. Data access was justified for research that (State of California Public Utilities Commission, 2014):

- analyzed the efficacy of energy efficiency or demand response programs,
- quantified electricity consumer response to different energy prices or pricing structures,
- examined greenhouse gas emissions,
- studied the integration of renewable energy supplies into the electric grid,

- analyzed grid operations, and
- related to any energy policy identified in the Public Utilities code as serving a public purpose.

The Commission established an Energy Data Access Committee to provide utility advice, review disputes, and serve as an ongoing forum for EDRP protocol changes in response to technological developments. The aggregated data is provided directly by the investor owned utilities to approved third parties (California Public Utilities Commission, 2020). Utilities may seek recovery of EDRP data access costs, which are noted in a separate account, through application or a general rate case (State of California Public Utilities Commission, 2014).

2.3 Understanding Michigan's Utility Pilots

In this workgroup, Staff was tasked with understanding the outcomes and learnings from past and current pilot projects as well as past MPSC actions. Staff developed and conducted a utility survey to better understand past and current pilot projects. Staff then conducted reviews of past MPSC pilots for both energy waste reduction (EWR) pilots and non-EWR pilots. All are discussed below.

2.3.1 Utility Survey

Staff created a survey regarding utility pilot projects from 2008-2019 (See Appendix C). This survey was sent to all investor-owned utilities in Michigan. Four utilities responded: Consumers Energy, DTE Energy (DTE), I&M, and Alpena Power Company. Only Consumers Energy, DTE, and I&M reported pilots. Data from survey responses was compiled and summarized by Staff.

The exploration and application of new technologies appears to be the focus of most Michigan pilots. Technology pilots accounted for most of the pilots (93%), followed by customer focused pilots (24%). See Figure 5. Of the 95 reported pilots, 12% tested multiple technologies. Note that some pilots are classified in more than one category, so the cumulative percentage exceeds 100% in Figure 5.

Of the technology pilots, EWR pilots were most popular (39%), followed by energy storage (13%), electric vehicles (11%), and renewable energy (11%). "Other technology" (16%) groups miscellaneous technology pilots and should not be viewed as a cohesive grouping when examining most popular types of implemented pilots. See Figure 6 for the composition of the technology pilots (93%) by technology group.

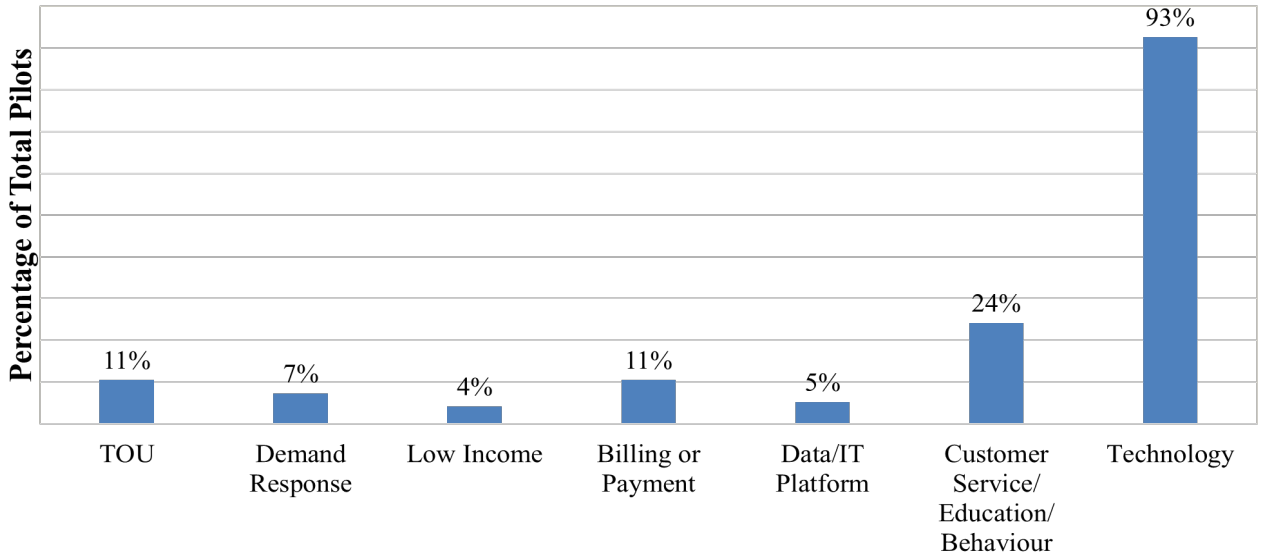

Figure 5. Utility Survey – Pilot Types in Dataset

Note: *Some pilots are classified in more than one category, so cumulative percentage exceed 100%.*

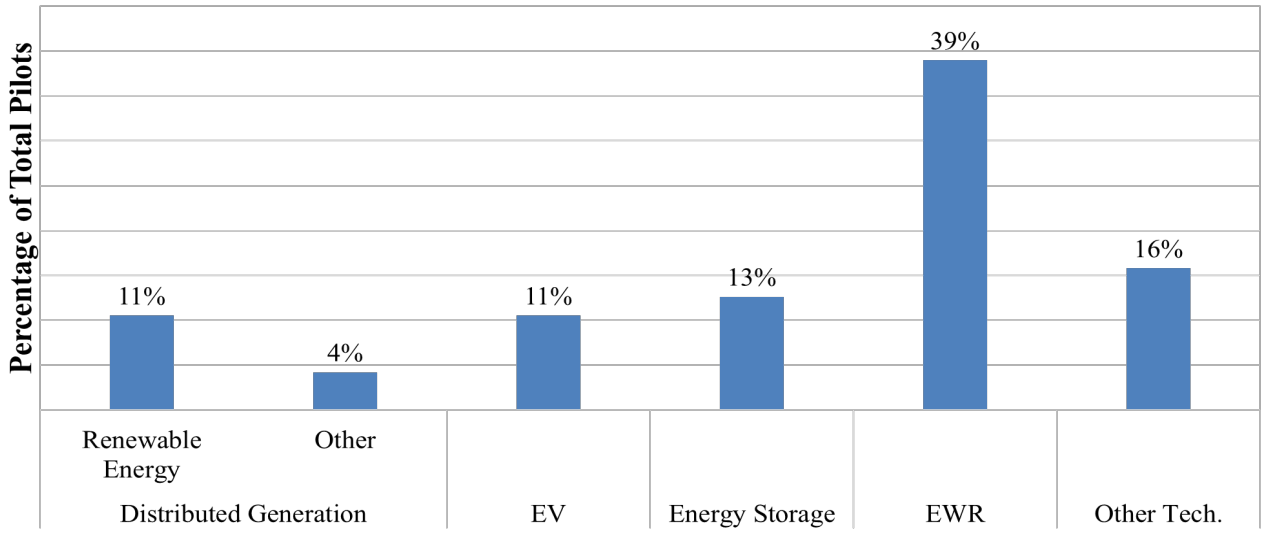

Figure 6. Utility Survey – Technology Pilots in Detail

Not all pilots became permanent programs. Only 36% percent became permanent programs, while 31% did not result in a permanent program and 26% were still ongoing. See Figure 7 for a chart on pilot development to a permanent program.

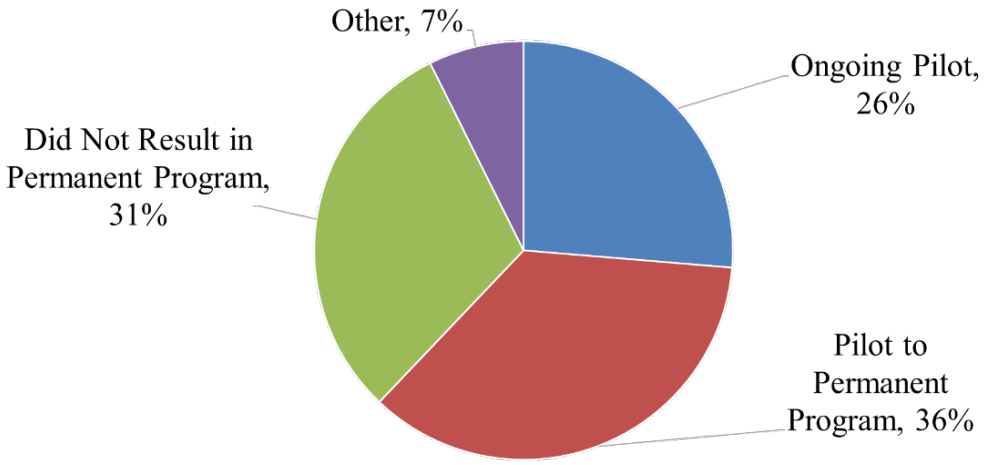

Figure 7. Utility Survey – Pilot Movement to Permanent Program

Lastly, the utilities noted that most pilots must report pilot progress and results to the Commission, with differing amounts per utility (See Table 2).

Table 2. Utility Survey – Pilots with Required Reporting

Utility	Total Pilots	Reporting Required	Pilots with Reporting Required (%)
Consumers Energy	47	31	66%
DTE	43	33	77%
I&M	5	0	0%
Total	*95*	*64*	

2.3.2 MPSC Case Review

The MPSC case review was conducted to examine past Commission-approved pilots. Staff reviewed the period from 2008-2019, electing to begin in 2008 due to the passage of the Clean and Renewable Energy and Energy Waste Reduction Act, also known as Act 295 of 2008 (Michigan Legislature, 2020). Fourteen MPSC staff reviewed the applicable Commission-approved pilots to identify pilot best practices and understand outcomes from existing pilot programs. EWR pilots were excluded from this review. The separate review for EWR pilots is discussed in Section 2.3.3.

In late 2019 and early 2020, Staff reviewed documents in the MPSC Electronic Docket Filings System (e-docket system), such as the utility application, testimony, Commission Orders, and any additional documents. Staff collected data on pilot type, technology applied, concepts or goals, justification, sample size and participant selection, evaluation methods, success criteria, guidance provided from Commission or Staff, and if any reports were filed to the docket.

In reviewing MPSC cases, Staff found some of the desired data missing from the e-docket system. This lack of data could have been due to several reasons. For instance, the data could have been

unreported, the information could have been informally reported and not filed to the docket, or reviewers missed information due to the voluminous files contained in each docket.

Staff reviewed 155 total cases with pilot programs. Of these, 76 cases had unique pilots that generated a dataset of 85 total pilots from four investor-owned utility companies. These were: Consumers Energy, DTE, I&M, and the Upper Peninsula Power Company (UPPCO). See Figure 8 for the percentage of the collected pilots from each utility.

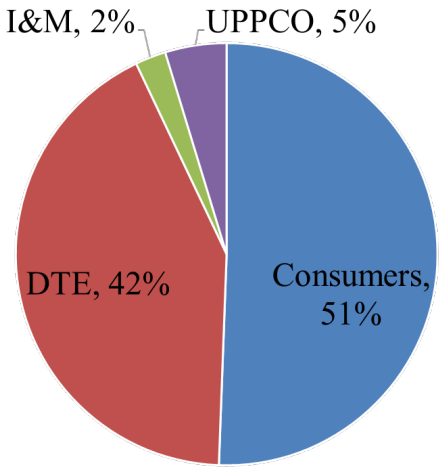

Figure 8. MPSC Case Review – Percentage of Pilots Reviewed by Investor Owned Utility

From this review, it was evident that there is no clear and consistent pilot definition used by Michigan utilities. Many MPSC cases included the word "pilot." However, the term "pilot" is loosely and inconsistently applied in docketed files.

The MPSC case review also found a wide range of areas explored by the pilots, with technology (32%), customer service related (26%), and billing or payment (20%) pilots being the most frequently seen. These findings are similar to the results from the utility pilot survey, where technology (93%), customer focused (24%), and billing or payment (11%) pilots were most frequently seen.

Please see Figure 9 for the areas explored by the examined pilots. Note that some pilots are classified in more than one category, so the cumulative percentage exceeds 100%.

Staff categorized the "technology" area as any physical technology that was implemented. An examination of the types of technologies implemented shows renewable energy (20%) and electric vehicle related (6%) pilots to be the most frequent technology pilot types. The "other technology" category serves as a miscellaneous technology category. See Figure 10 for the breakdown of technology types observed.

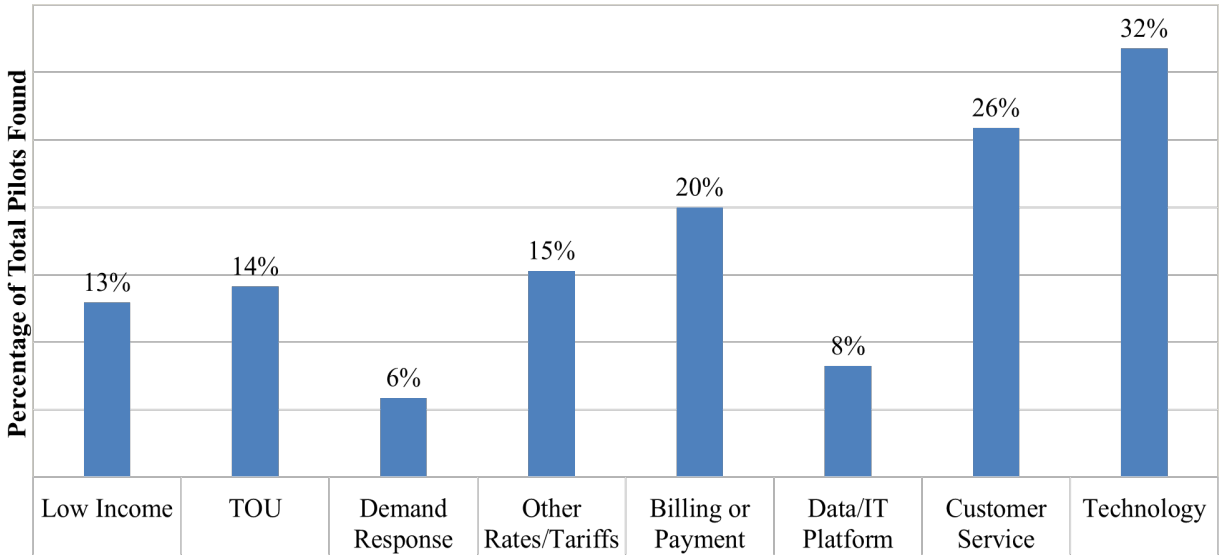

Figure 9. MPSC Case Review – Pilot Types in Dataset

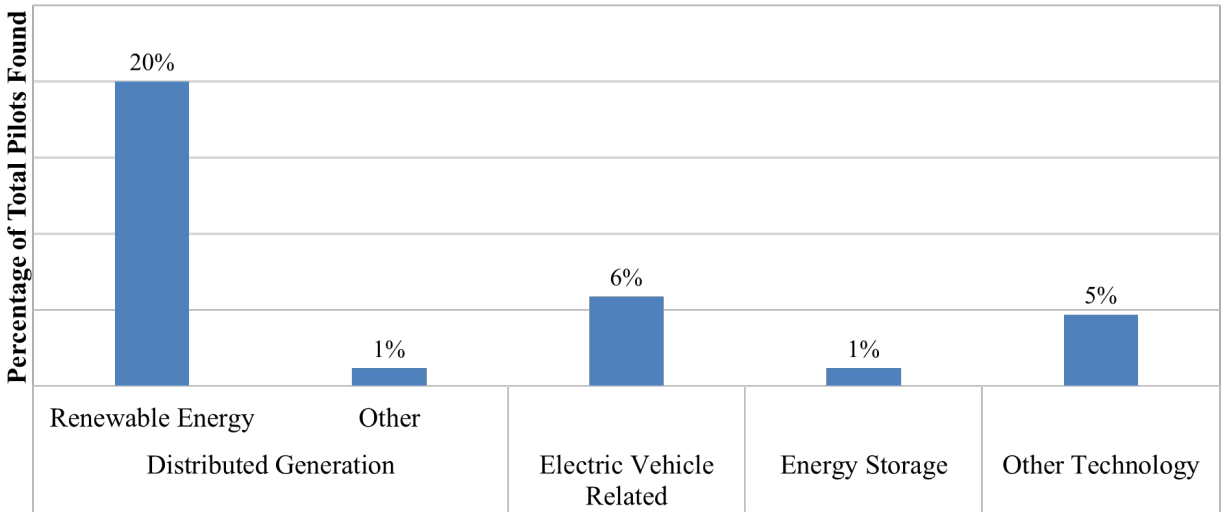

Figure 10. MPSC Case Review – Technology Pilots in Detail

In reviewing the pilots documented in the MPSC e-docket system, Staff found many pilots failed to provide pilot design information. The majority did not include clear goals or share the need for the pilot project. Further details on the pilot design, such as the sample size or how participants would be selected or recruited for the pilot, were also missing from the submitted documents, which included initial Company testimony requesting funding approval. See Figure 11 for the percentages of pilots in the dataset that provided pilot design information.

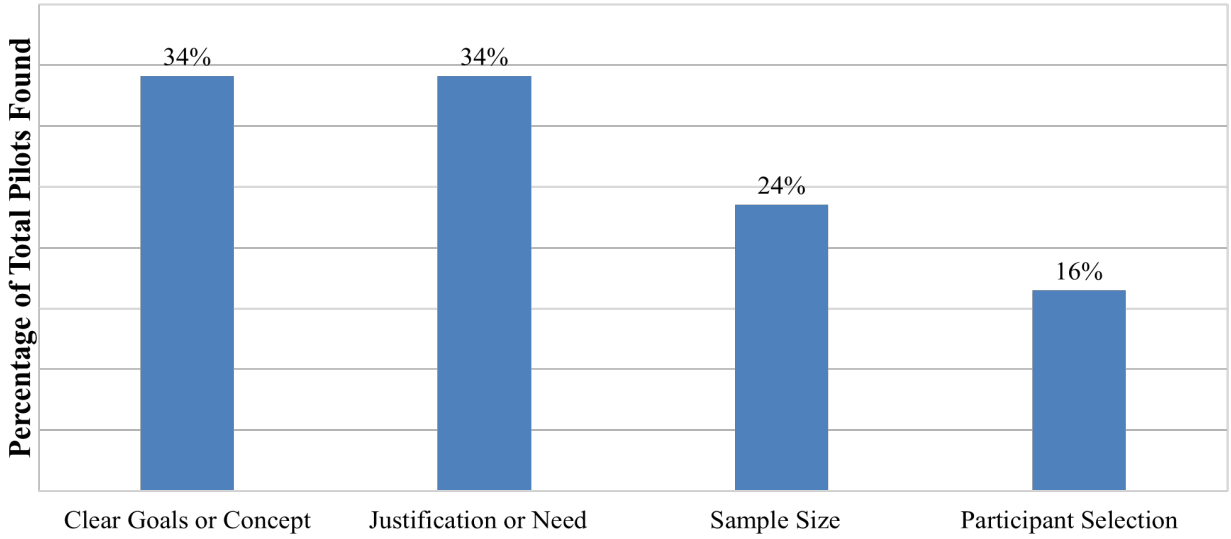

Figure 11. MPSC Case Review – Pilots in Dataset Providing Pilot Design Information

Similarly, Staff found limited information on pilot evaluation methods. Only 16% of the pilots provided any information regarding evaluation methods. Even fewer (13%) provided any information on the success criteria which the pilot project was evaluated against.

In the analysis, Staff found 20% of the pilots were required to report pilot results but only 14% had reports filed. This contrasts with the utility survey responses, which indicated a high percentage of pilots required reporting (Consumers Energy 66%; DTE Energy 77%). From these results, it seems pilot reporting is largely informal and not filed to the docket.

Guidance from the Commission and MPSC Staff regarding pilot best practices or goals was limited. On average, only 12% of examined pilots had such guidance. Only Consumers Energy and DTE pilots received guidance regarding best practices or goals. Of these, the instances where Commission and Staff guidance coincided differed by utility (See Table 3).

Table 3. MPSC Case Review – Guidance on Pilot Best Practices and Goals

	Total Pilots	**Commission**	**Staff**	**Both Provided**
Consumers Energy	43	5 (12%)	4 (9%)	4
DTE	36	5 (14%)	6 (17%)	3
I&M	2	0	0	0
UPPCO	4	0	0	0
Total	*85*	*10*	*10*	*7*
Commission's Own Motion	12	6	5	5

Note: Percentages displayed are a percentage of total pilots from the specific utility.

Commission guidance on proposed pilots is limited for general rate cases. However, the likelihood of the Commission providing guidance on pilot best practices and goals increases significantly

(50% vs 12-14%) for the Commission's own motions. The coincidence of both Staff and Commission guidance varies by utility. For Consumers Energy, the Commission provided pilot guidance in all cases in which Staff provided guidance. For DTE, the Commission provided guidance in only half of the cases in which Staff provided guidance (See Table 2).

In summary, the MPSC Case review found that the term "pilot" is loosely applied and has no clear definition within MPSC filings. A variety of pilots have been explored in Michigan from 2008-2019, with technology pilots being the most popular. Information formally reported to the Commission regarding pilot design, success criteria, and evaluation methods is limited. Guidance from Commission and Staff on pilot goals and best practices is often not provided. However, incidence of Commission guidance is more likely in its own motions.

2.3.3 EWR Annual Report Review

Staff reviewed MPSC cases involving EWR pilots separately. EWR pilots have dedicated funding and different reporting requirements. Act 295 of 2008 required "a set of energy waste reduction programs that include offerings for each customer class, including low-income residential" be proposed (Michigan Legislature, 2020).

Staff reviewed EWR pilot annual reports from 2012-2019, focusing on Consumers Energy, DTE, and electric cooperatives. A total of six staff members reviewed 28 annual reports and identified 342 unique pilots. Consumers Energy and DTE pilots represented the majority of the EWR pilots in the dataset. See Figure 12 for the utilities represented.

Data collected includes: pilot type (residential or commercial/industrial), pilot duration, concepts or goals, justification, sample size and participant selection, evaluation method, success criteria, pilot results, reporting requirements, lesson learned, and if any reports were filed to the docket.

Most of the pilots had a commercial and industrial focus, likely because these types of pilot projects have the largest energy reduction potential when examined per entity. However, this focus differed based on the utility. Consumers Energy and DTE implemented a larger percentage of commercial and industrial pilots than residential pilots. I&M and the cooperatives had a larger number of residential EWR pilots than commercial and industrial pilots. These differences in sectors of focus for EWR pilots may be due to different utility goals and customer needs. See Figure 13 for a chart of EWR pilots by sector.

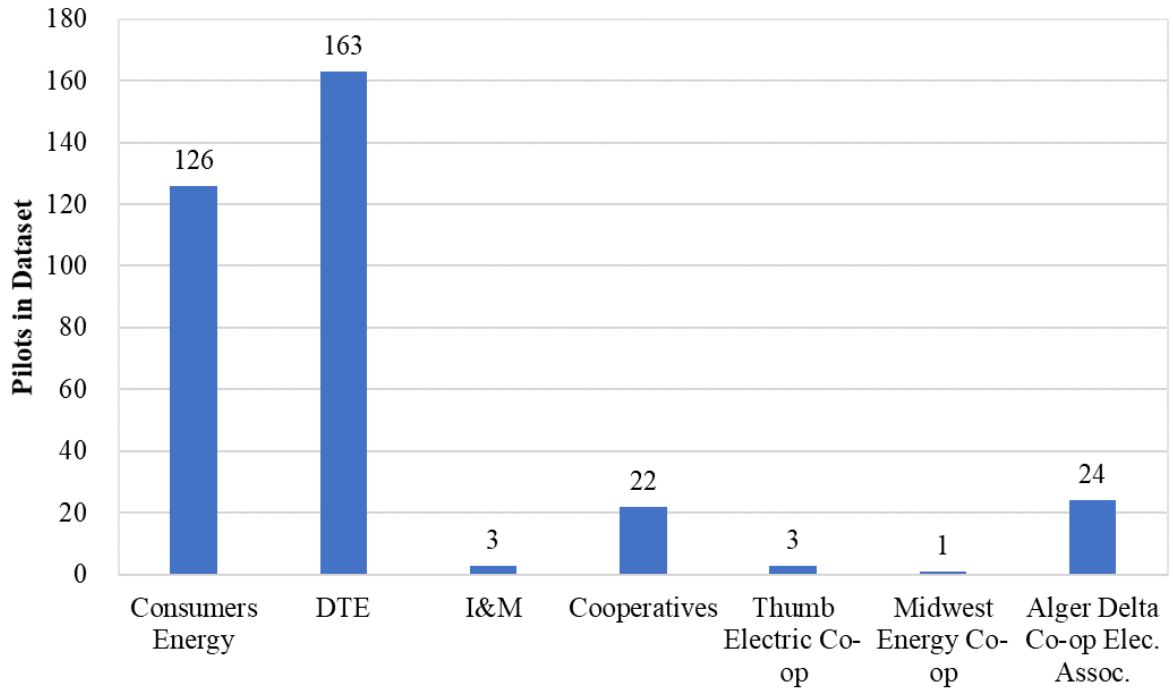

Figure 12. MPSC EWR Pilot Review – Utilities Represented

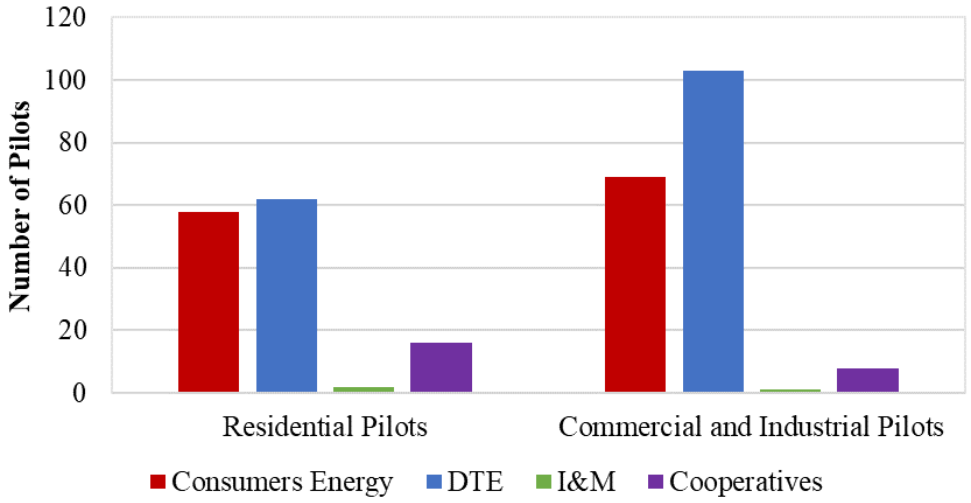

Figure 13. MPSC EWR Pilot Review – Pilots by Sector and Utility

Details on EWR pilot designs, evaluation, and success criteria in the EWR annual reports were limited. Frequently, only pilot names and pilot type were provided. If pilot information was provided, it was grouped together with other pilots, making it difficult to differentiate what information pertained to a specific pilot. See Figure 14 for the number of EWR pilots out of the 342 pilots examined that provided pilot design information by utility. See Figure 15 for the number of EWR pilots by utility which provided evaluation and success information. Note that Consumers

Energy pilots are not noted in the figures as none were found to provide the information in the EWR annual reports.

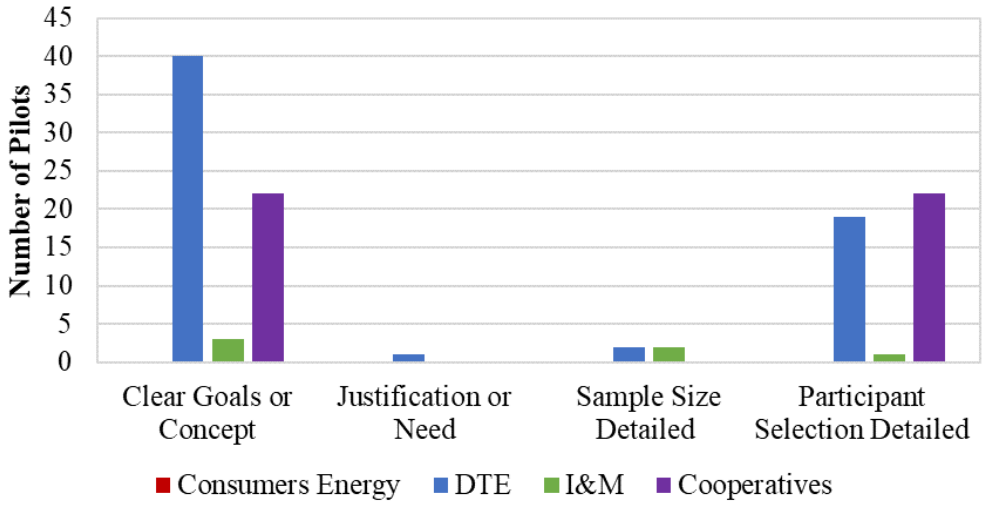

Figure 14. MPSC EWR Pilot Review – Pilots in Dataset Providing Pilot Design Information

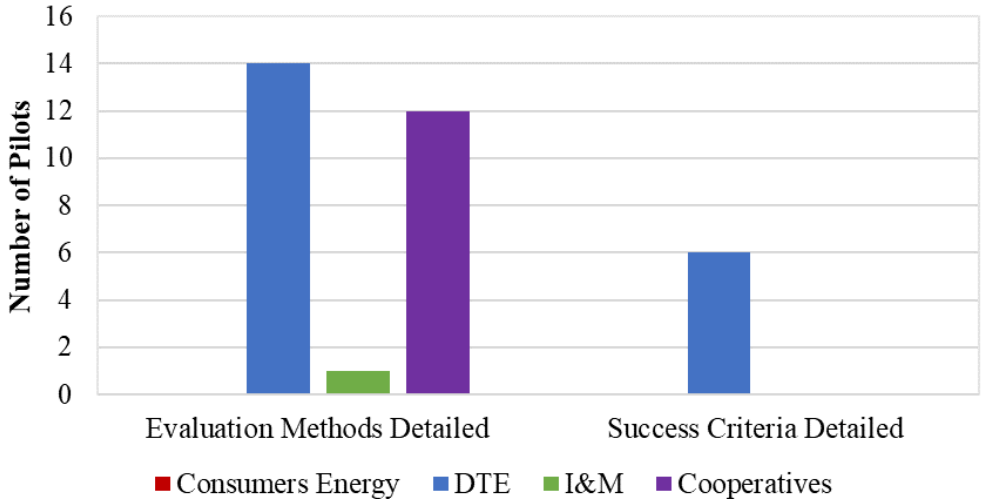

Figure 15. MPSC EWR Pilot Review – Pilots Providing Evaluation and Success Information

Based on Staff's review, the EWR annual reports do not provide adequate pilot details. However, this does not mean EWR pilot information is unreported. It can largely be found through other venues at the MPSC. EWR pilots, whether a program or measure, are different from other types of pilots due to the availability of dedicated funds to support them as well as additional reporting and stakeholder engagement venues.

There are three ways that Staff reviews EWR pilot details and outcomes. The first is through annual evaluation, measurement and verification reports submitted by utilities. The second is through participation in the EWR Collaborative where ideas and suggestions are collected from all

participants and stakeholders. Information regarding pilot design, implementation, and evaluation is also shared in the collaborative. Content at EWR Collaborative meetings can be accessed online through the collaborative website.[2] Lastly, pilot findings may be submitted confidentially for a particular measure in white paper form to the Michigan Energy Measures Database (MEMD) Technical Subcommittee for review and entry into the MEMD (Gould, 2020).

These varied avenues provide ample EWR pilot details. However, since there is no single location for this information, locating EWR pilot details may be difficult for many interested parties. This can be an area of improvement to increase accessibility of available reported EWR pilot data.

3. Summary of Stakeholder Process

3.1 Stakeholder Meetings

The stakeholder series kicked-off in February 2020 with an in-person event at the Michigan Public Service Commission. Due to the novel coronavirus (COVID-19) pandemic, the stakeholder series was converted from the planned in-person all-day sessions to a series of shorter, staggered tele-conferences (Michigan Public Service Commission, 2020). Stakeholder meetings resumed in this new format in April 2020.

In total, seven stakeholder meetings were held from February to June 2020. See Appendix A for meeting summaries by date and links to meeting presentations and recordings. See Appendix B for meeting agendas. Specific details from stakeholder meetings are discussed in Section 4.

3.2 Stakeholder Survey on Pilot Best Practices and Future Pilots

With the transition from in-person stakeholder meetings to online meetings due to the COVID-19 pandemic, Staff recognized that stakeholders may have had less opportunity to provide comments during remote meetings. For stakeholders interested in sharing their thoughts on pilot best practices, future pilot areas, and the stakeholder process, Staff created a survey that was sent via the workgroup listserv on July 1, 2020. See Appendix D for the survey.

A total of 450 individuals subscribe to the Energy Programs and Technology Pilots workgroup listserv. Of these, 444 have working emails. Nine stakeholders responded to the stakeholder survey (2% response rate) over a 26-day period.

The survey results on stakeholder satisfaction with the workgroup stakeholder process are summarized below. Stakeholder survey feedback on pilot best practices and future pilot areas are discussed in relevant areas in the report. See Appendix E for the summary of survey results together.

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[2] Access the MPSC Energy Waste Reduction Collaborative website at: https://www.michigan.gov/mpsc/0,9535,7-395-93309_94801_94813-507305--,00.html

3.2.1 Stakeholder Satisfaction with the Stakeholder Process

Seven out of nine respondents either agreed or strongly agreed that the workgroup stakeholder process met their expectations. However, several challenges were noted. Though many acknowledged the smooth transition to remote meetings during the pandemic, several missed the free-flowing dialogue with Staff and speakers during in-person meetings that could not be duplicated in the remote format. Respondents noted the wide breadth of information covered, but some desired additional specifics on pilot programs or additional meetings with Staff to digest meeting content, especially near the end of the series.

Lastly, difficulties with stakeholder awareness and ability to engage were noted. Greater promotion of the workgroup series may have been beneficial. One respondent was not aware of the series at all, likely accessing the survey through an associate. Another suggested more broadly promoting the MI Power Grid stakeholder series, like posting the information on customer electricity bills. However, knowledge of the stakeholder series does not necessarily translate to engagement. One respondent noted the overwhelming number of MI Power Grid engagement opportunities that made active participation for public or small organizations difficult.

4. Discussion

4.1 Pilot Definition

The term "pilot", as discussed in previous sections, is loosely defined. The stakeholders presented various interpretations of the term. Nearly all groups agreed that pilots play an important role in expanding the knowledge of different technologies, customer behaviors, and business operations. Most also agreed that the characteristics of pilots were numerous and diverse. All agreed that pilots are designed to "test" and should have the appropriate flexibility to do so.

For example, the New York Department of Public Service distinguishes pilot programs from demonstrations of new technology and business practices. While pilots are limited to tariff and rate design, demonstration programs tested under the "Reforming the Energy Vision" (REV) initiative, launched by the commission in 2015, are used to streamline new technologies and projects without the lengthy processes involved in more complex rate design (Padula, 2020). Most Michigan utilities do not distinguish between technology demonstrations and other pilots.

While there is no universal interpretation of the term "pilot" in Michigan, George offers a definition that encompasses all current pilots in Michigan: "[a pilot is] a test to determine the impact of an intervention on one or more outcomes of interest" (George & Bell, 2020). Amy Ellsworth of Cadmus agrees, and calls pilot programs a "series of experiments" which should not only be of viable design, but also the most efficient solution (Ellsworth, 2020).

In a workpaper submitted by the three largest Michigan investor-owned utilities after the stakeholder series, they recommend defining pilot as a "program idea or delivery approach offered in limited duration, geography, sector, or technology with a set of objectives designed to be tested" (Consumers Energy, DTE Energy, & Indiana Michigan Power, 2020). This definition is

broad enough to not only encapsulate new technology demonstrations, but also novel rate designs, studies of demand response, and considerations of customer behavior.

4.2 Pilot Design and Evaluation

Pilots are experiments that test new ideas and technologies. The basics of the scientific method apply (Cappers, 2019). As such, there are overarching best practices for pilot design and evaluation even though tested measures may vary significantly.

Currently, Michigan utilities develop pilots on a case-by-case basis. Each utility has its own methodology and criteria for pilot design and evaluation. DTE Energy processes pilot programs using a DOE technology readiness level as well as a utility program readiness level. Each of these models allows a thoughtful step-by-step process that prepares ideas for treatment and launch (Serna, 2020). I&M employs software and third-party experts to assist in pilot development. In the past, it managed a pilot using the largest randomized encouragement design ever conducted for smart thermostat optimization (Walter & Wallace, 2020). Consumers Energy categorizes foundational success factors for EWR pilots as speed, flexibility, funding, and connection to a viable business model. It believes a goal of good EWR pilot programs is to provide energy savings that are tied to a financial incentive. According to Consumers, this goal establishes the flexibility and clear motivation to test new pilot approaches (Kiley, 2020).

Pilots can serve as test-beds that allow experimentation and familiarization with new ideas and approaches like grid modernization or performance-based regulation (Cross-Call et al., 2019). However, pilot programs need anchoring and direction (Cross-Call et al., 2019, p. 31).

> *A pilot should be designed to test specific aspects of power sector transformation, should directly tie to a future decision that a commission seeks to make, and should fit into the broader vision of why transformation is needed to ensure utility buy-in and properly evaluate the pilot's effectiveness.*

How pilot success is defined should be carefully and clearly delineated in the design phase. If utilities are only rewarded for pilots that are successfully implemented at full scale, then likely only the most mature technologies, which often do not need piloting, would be tested (Harari & Bovarnick, 2018). Pilots are opportunities to learn, and their design and subsequent success should be evaluated based on the generated learnings and not whether they yield permanent programs or wide deployment (Goka, 2020; Kiley, Serna, & Williamson, 2020; Williams, 2020). Flexibility and allowance for failure are important in recognizing that pilots generate learnings, regardless of whether it realizes full deployment (Lefevre, 1984).

The success of the pilot is tied largely to pilot design. Care should be taken from the onset regarding pilot procedures or operating plan (George & Bell, 2020; Sergici, 2020; Williams, 2020), as pilots with methodological shortcomings can result in "squander[ed] resources, duplication of effort, missed opportunities, and misleading findings [with] wide-scale adverse consequences" (Neenan & Robinson, 2010).

Most importantly, the pilot should be designed in conjunction with the evaluation plan (Todd-Blick, 2020). During the design phase, it is important to identify specific metrics to be collected and the degree of accuracy crucial to the pilot's evaluation, data collection, enrollment approach, and marketing plan. Though rigorous evaluation is important in accurately evaluating pilot effectiveness, it is also challenging. Bad evaluation can result in misleading conclusions and poor policy decisions (Todd-Blick, 2020).

A clear timeline for scaling up the project at the outset is important, especially for vendors and other partners who may be more interested in full-scale programs. The project design should integrate needs of pilot partners when deploying full-scale, as well as align incentives to support productive and collaborative partnerships (Fairbrother et al., 2017). A clear timeline for the pilot and the subsequent plans help provide clarity and reduce the likelihood of the state of limbo some refer to as "pilot purgatory" (Hart, 2019).

Sergici recommends pilot proposals submitted to the Commission should contain the following components at minimum (2020):

- rate design details,
- pilot design details,
- intended marketing,
- customer education plans,
- customer recruitment plans,
- evaluation measurement verification plans,
- planned budget and cost recovery intentions, and
- a firm timeline.

In the stakeholder survey, respondents noted the following as important pilot design and evaluation best practices to include in a list of objective criteria (See Appendix E-3):

- Pilot opportunity, justification, and need stated,
- Pilot goals defined,
- Pilot timeline,
- Anticipated results shared,
- Stakeholder outreach and inclusion in pilot design, implementation, and evaluation,
- Metrics to track pilot progress on areas such as:
    - Environmental impact
    - Stakeholder engagement
    - Community impact
- Independent and objective evaluations of utility pilot programs.

Providing pilot details to regulators can be critical. Regulators need to evaluate pilot proposals in a cost-effective and time-efficient manner, so utilities and stakeholders need to provide the underlying evidence supporting why the pilot will work, where it has worked, and why it should be supported (Harari & Bovarnick, 2018).

4.2.1 Clear Pilot Goals and Hypotheses

A pilot is initiated based on need. There must be a problem to solve or an opportunity to test in order to justify the pilot (Harari & Bovarnick, 2018; Williams, 2020). The purpose, goals, and hypotheses of the pilot should be clearly defined (Goka, 2020; Harari & Bovarnick, 2018; Lancaster, Dodd, & Williamson, 2004; Padula, 2020; Sridhar & Lewis, 2020; Williams, 2020). This communicates how the pilot addresses current or future grid problems and why pilot investments are justified (Harari & Bovarnick, 2018). Care should be taken so that valid and current information is used to define the problem, not assumptions (Kasunic, 2004). It should be clear that the pilot is the best approach in the design, as there may be other options besides the proposed pilot that address the same issue. This can be clarified by clearly stating pilot objectives and key uncertainties. Lastly, pilot objectives should be developed to ensure that the pilot is a component of an overall long-term strategy (Teletzke, Wattenbarger, & Wilkinson, 2010).

Pilots should build on lessons learned elsewhere when possible (Fairbrother et al., 2017). By sharing results from other similar pilots when justifying its need, a pilot may be able to adapt and improve on past experiences (Stakeholder survey response, Appendix E-3). However, pilots often need to be customized to a utility service area due to high electrical grid variation. Utilities may hesitate to give significant weight to pilots in other service areas. They may instead prioritize testing technologies that have been piloted elsewhere (Harari & Bovarnick, 2018).

The planning phase should limit the number of policies and principles addressed in one project. Studying too many hypotheses and variables in one study may increase the difficulty of interpreting results and the likelihood of inconclusive or spurious results (Chilton, 2019; Kasunic, 2004). A pilot should be sized appropriately for the stated goals, with a defined time frame that allows for sufficient learning and testing (Goka, 2020). A clear and concise pilot with limited scope will be more successful than an overly complex pilot (Padula, 2020). Developing well-defined and bounded experiments that are limited in duration and expense with a well-defined exit strategy can lead to broader implementation (Faruqui, 2020).

Metrics to measure pilot success should be clearly defined and measurable (Padula, 2020; Sridhar & Lewis, 2020). These metrics make it possible to evaluate whether stated goals have been met and whether hypotheses have been proven or disproven (Padula, 2020). Given that proxy measures can sometimes be inadequate in measuring whether a pilot meets its goals, the selection of the right metrics to collect in the pilot design phase is key in accurately evaluating whether a pilot meets its intended goals. In the case study of the California Self-Generation Incentive Program, the use of inadequate proxy measures actually caused pilots to have effects counter to initial goals (Sridhar & Lewis, 2020).

It is important to design the pilot goals for evaluation and possible scaling (Anderson, Beecher, & Kirkpatrick, 2020). The pilot planning phase requires a forecast or vision of what the pilot project will look like at scale. Recruitment of a representative sample is imperative in enabling extrapolation of larger lessons. Pilot participation should be randomized and include a control group if statistically appropriate (Anderson et al., 2020).

When evaluating the goals and hypotheses of the pilot, it should also be noted that regulatory barriers may exist that are beyond the control of the Commission. For example, there may be city and township codes that prevent pilot project activities. If cities have moratoriums on erecting additional wind farms, pilots including adding new wind resources to such communities cannot be completed. Such regulations may present challenges to pilots that cannot be overcome by the Commission (Padula, 2020).

During meetings, stakeholders emphasized the importance of engaging project stakeholders, such as communities and academics, in the early stages of pilot planning (Anderson et al., 2020; Cira-Reyes, Culbertson, LaFave, Roth, & Sutter, 2020). Academics may have ideas to improve precision and generalizability at a lower cost (Anderson et al., 2020), while communities may offer clarifications on the problem they experience and suggest acceptable possible solutions (Cira-Reyes et al., 2020).

4.2.2 Evaluation Plan

The evaluation plan is an important aspect in the planning and design phases of a pilot project. However, in the review of past pilots submitted in MPSC rate cases, pilot evaluation information was many times lacking (Wang, 2020b). There have been no clear guidelines or metrics for evaluation plans provided by the Commission.

The evaluation of the pilot data is critical to the piloting process, as it is used to interpret the pilot results, as well as whether the pilot's findings can be extrapolated to a larger scale. A review of energy efficiency behavioral programs found few, except for asynchronous and real-time feedback programs, conducted rigorous experimental and quasi-experimental studies when estimating savings. Since the findings of such programs may not have controlled for market conditions and other issues, their findings can only be used cautiously. Several of the programs also did not undergo independent third-party evaluations. Only residential asynchronous feedback programs, like home energy reports, evaluated savings persistence with and without continued treatment (Dougherty, Henderson, Dwelley, & Jayaraman, 2015).

The evaluation plan, much like the pilot itself, must have a narrow focus. Attempting to include too many criteria in the evaluation process can expand the scope of the pilot beyond what is reasonable and realistic. Conversely, too few criteria can render the pilot inconclusive. Including a focused evaluation plan in the pilot development is an important step in the development of the pilot project (Cappers, 2020).

There are several key principles in developing a pilot evaluation plan. First, it is important to engage evaluators early in the pilot ideation and design (Ellsworth, 2020; Kraft, 2020). This step ensures evaluators help develop the pilot with the evaluation criteria as a basis.

Next, regular communication between evaluators and other pilot staff should be scheduled throughout a pilot (Ellsworth, 2020). The evaluation team should receive regular communication to stay abreast of the pilot progress (Kraft, 2020). Should any changes to the pilot design occur

during implementation, the evaluation team should be notified to assess the pilot and the evaluation plan in real time and make changes if necessary (George & Bell, 2020). Evaluators can engage early, provide rapid feedback, and evaluate iteratively by using a developmental evaluation approach (Kraft, 2020).

Lastly, the pilot evaluation plan should incorporate lessons learned from previous pilots. It is important to apply learnings from previous pilot programs and evaluations when developing an evaluation plan to prevent the repetition of previous mistakes or failures. This reduces pilot project costs and time (Ellsworth, 2020).

During one stakeholder presentation, a detailed evaluation plan was provided as an example of what should be presented to the Commission for pilots. It included (George & Bell, 2020):

- a description of evaluation objectives,
- a description of the statistical analysis and/or other methods that will be used to determine each outcome of interest given the pilot design,
- the survey strategy and sampling plan that will be used, if any, including survey mode, expected response rate, etc., and
- the number and timing of interim and final reports and summaries of what will be conveyed in each report.

This suggested evaluation plan can help guide the criteria considered in developing an evaluation plan.

4.2.3 Statistical Design and Significance

Statistical design of pilot programs is inseparable from pilot design and clear project goals. Sample sizes and control groups must be established alongside the desired pilot outcomes and must be consistent with other pilot design components such as goals, recruiting, and implementation. Pilot design involves balancing tradeoffs between what the utility desires to know and what it can afford to test (George & Bell, 2020).

Pilot implementation and evaluation should be conducted with a statistically trained implementation team to avoid deviation from critical design elements (Sergici, 2020). Properly designed pilots use control groups to validate results. Pilots should also be designed to ensure internal and external validity. Internal validity establishes a direct cause-and-effect relationship between the treatment tested in the pilot and the desired outcome, while external validity extrapolates pilot results onto a greater population. Both require different pilot designs. The former requires a robust control group for effectiveness, while the later requires adequate recruitment to mimic a wider population (George & Bell, 2020).

Three widely accepted pilot designs are: randomized control trial (RCT), randomized encouragement design (RED), and random sampling with matched control group (Sergici, 2020). See Table 4 for descriptions of these pilot designs. RCTs and REDs are the most rigorous pilot design options (George & Bell, 2020; Sergici, 2020; Todd-Blick, 2020). A RCT provides

transparency; robust, accurate and valid program estimates; and a high degree of confidence in program evaluation (Todd-Blick, 2020). Properly designed, both RCT and RED are feasible for pilot programs (Sergici, 2020).

Table 4. Three Widely Accepted Pilot Design Approaches

	Description	**Pros**	**Cons**
Randomized Control Trial	Random assignment of recruited customers into treatment and control groups	Most rigorous approach from measurement perspective	Rarely used due to potential adverse impact on customer satisfaction ("recruit-and-deny" or "recruit-and-delay" approaches used for some recruited customers).
Randomized Encouragement Design	Allows construction of a valid control group	Maintains benefits of RCT design while not negatively affecting customer experience	Requires larger sample sizes than RCT to detect statistically significant impact, which increases pilot implementation costs
Random Sampling with Matched Control Group	Treated customers recruited from randomly selected sample. Match customers from rest of population that are most like treatment customers via regression.	Strikes balance between statistically valid results and manageable level of pilot participants	

Note: Table adapted from Sergici (2020).

Communication between pilot designers and marketing teams must occur frequently to ensure participant recruitment functions as planned (Sergici, 2020). It is acceptable to adjust pilots as needed during the implementation process, but design and evaluation experts must both provide input to ensure success (George & Bell, 2020). A common recruitment mistake is to deviate from the pilot design solely to meet sampling size targets (Sergici, 2020).

Testing multiple hypotheses using the same data may result in inconclusive results from higher instances of false positives, which arise when the observed difference between two groups is due to random chance rather than the evaluated treatment (Chilton, 2019). Chilton suggests multiple hypotheses testing and false positives can arise when evaluation is outsourced to independent researchers or when publicly available data is analyzed by researchers. He believes private firms, like Google, are more likely to randomize pilots and commit to looking only at certain outcomes. Chilton recommends pre-registering pilot research designs so only predetermined analyses are conducted, thereby eliminating ex-post analyses leading to spurious or inconclusive results (2019). If pilot data is provided publicly, it may be especially important for the pilot research design to also be available. Additional pilot results and reporting issues are discussed in Section 4.4.

4.3 Stakeholder Engagement

When investing in pilots, utilities are concerned not only about revenue impacts, but also about customer satisfaction (Faruqui, 2020). Misalignment between stakeholder expectations and pilot project results occurs when key stakeholders are not identified and consulted in pilot planning. Dissatisfaction may arise as key stakeholder interests are ignored (Leader & Tucker, 2019).

Frequent stakeholder engagement is critical throughout the entire pilot process (Dueweke, 2020; Jester, 2020; Sergici, 2020). Stakeholders should not be constrained to only consumers, but also include third-parties like contractors (Michigan Energy Efficiency Contractors Association, 2020). Engaging the public prior to beginning pilot programs and throughout pilot implementation is important and appropriate, especially when pilots are funded by ratepayers. However, the type and amount of stakeholder input depends on the pilot type and purpose (Kiley, Serna, Sherman, Snyder, & Williamson, 2020).

Clear definitions and scope of work help prevent scope creep and maintain focus. Clear definitions that match the mission, vision, and goals of the pilot are critical to determine at the start of the pilot. Pilot needs should also be clearly communicated to utility customers. This can be assisted by a robust customer support program (Kiley, Serna, Sherman, et al., 2020).

Engagement begins at the community level. Direct education can drive pilot adoption and trust in future projects (Dueweke, 2020). However, every community is different. Local engagement with customers is key in determining the types of pilot services and products those customers find beneficial. Likewise, engagement with municipal government leaders helps establish the relationship and trust between the utility, local government, and affected customers (Cira-Reyes et al., 2020).

Pilots should target nontraditional customers and diverse geographies across the state. Communities should be involved in the development of new pilots and the engagement should not be limited to qualifying customers (Cira-Reyes et al., 2020; Grocoff & Washington, 2020). The answers to what pilots are needed often depends on who is asked. Locational differences in customer need exist internally in a utility's service territory. For instance, an affluent neighborhood in Ann Arbor may likely have vastly different needs and pilot results when compared to a lower-income neighborhood in Detroit. Thus, pilot goals should also consider locational impacts (Grocoff & Washington, 2020). Currently, socioeconomic measures are routinely excluded from pilot evaluations (Cira-Reyes et al., 2020; Kiley, Serna, Sherman, et al., 2020). This makes socioeconomic impacts on pilot results difficult to measure.

Stakeholders strongly supported the importance of stakeholder input and outreach in developing pilot programs (See Appendix E.3). However, while stakeholder engagement is important, it must also be balanced with the pilot scope and purpose. Too much stakeholder input may lead to scope creep. Stakeholder engagement may be more appropriate for some pilots than others (Kiley, Serna, Sherman, et al., 2020). Hence, it is important to define a pilot's framework and boundaries early on. Engaging stakeholders can be challenging due to difficulties in achieving consensus

among disparate stakeholders. Stakeholder engagement can lead to "suboptimal design, unrealistic expectations, enormous cost, or all of the above" (George, 2020). See Appendix F-8.

4.3.1 Equity Considerations

Equity considerations were an important topic of discussion among workgroup participants, especially during the June 11 and June 25 stakeholder meetings. Some identified points are described below.

4.3.1-1 Target Pilots to Benefit Low-Income Customers and Communities of Color

Stakeholders emphasized equity and the inclusion of diverse stakeholders in the pilot development and implementation process. In stakeholder survey results, there was strong agreement that equitable pilot program design and outreach were important in pilot development (See Appendix E-3). There is a need to understand and address the unique energy issues facing low-income customers as well as by communities of color in pilot program development. Low-income customers and communities of color should be included as key demographic criteria when designing, targeting, and launching pilot programs (Cira-Reyes et al., 2020).

These specific customers must be meaningfully engaged to understand what types of pilot programs are most beneficial and will achieve participation from low-income community members and communities of color. Pilots should focus on tangible savings and outcomes to low-income customers (Cira-Reyes et al., 2020).

Community solar opportunities, such as the award-winning Department of Environment, Great Lakes, and Energy's Michigan Solar Communities program, were noted as important projects for both low-income communities and communities of color. The Michigan Solar Communities program aims to reduce roadblocks for low-to-moderate-income Michigan homeowners to access alternative energy and save money on their energy bills. The current program engages customers in the Cherryland Electric Coop Power service territory in Northwest Michigan as well as municipal customers in the Village of L'Anse in the Upper Peninsula (Cira-Reyes et al., 2020; Michigan Department of Environment, Great Lakes, & Energy, 2020b).

4.3.1-2 Address Barriers and Create Solutions to Promote Intentional Involvement

Stakeholders discussed barriers and solutions to engage low-income community members and communities of color in the pilot process. The June 11 community panel noted that many existing pilots are designed by individuals who are not low-income or from communities of color. As such, members of underserved communities may not be engaged in the design and implementation of pilot programs. Intentionally or not, excluding these communities inhibit full program deployment to all demographics and disproportionately benefit middle-class or upper-class communities. It is difficult to properly design pilots for low-income and communities of color without meaningfully engaging them. End users must be consulted and engaged in pilot program design and implementation to ensure equity in both pilot programs and pilot results (Cira-Reyes et al., 2020).

Many times, an invitation to participate in stakeholder engagement cannot generate meaningful response from these communities due to barriers they might face, such as the lack of internet access, inability to travel, or inadequate time to participate. To involve all end users, including low-income community members and people of color, panelists suggested accommodations that might enable these customers to physically attend meetings to be "at the table." Some suggestions included providing food, transportation, and childcare at the meetings to encourage in-person participation. The panelists also mentioned compensating customers for their participation in pilot-related meetings as a way to boost involvement (Cira-Reyes et al., 2020).

4.3.1-3 Improve Information Accessibility

Accessibility to information was also discussed as a concern for low-income customers and communities of color. Panelists suggested expansion of education and research efforts for these customers, such as clear explanations of affordability issues and multilingual documentation and support. Stakeholders also emphasized clear communication of pilot impacts on customer utility bills and health outcomes, including greater transparency regarding how customer fees fund the pilot programs. To provide some of this information, pilot programs should track race and ethnicity demographics for pilot participants as well as the locational impacts of any related infrastructure expansion (Cira-Reyes et al., 2020).

4.3.1-4 No Formal Reporting Criteria for Equity Considerations

Stakeholders recognized that there are no formal reporting criteria for equity. Since each pilot varies greatly, any equity guidelines should be adaptable (Kiley, Serna, Sherman, et al., 2020). However, stakeholders strongly agree that customer focused utility pilots should examine race, socioeconomic, and locational variables when evaluating program effectiveness in reaching customer groups (See Appendix E-3). Stakeholders appear supportive of equity guidelines, especially regarding the examination of equity related variables in assessing pilot effectiveness.

4.4 Pilot Results and Reporting

4.4.1 Current Pilot Reporting Status in Michigan and Elsewhere

Utilities frequently share learnings with other utilities, the MPSC, and third-party stakeholders. Utilities generate and share data-driven results from numerous pilots each year (Farrell, 2020; Kiley, Prentice, & McGraw, 2020; Mueller, 2020; Walter, 2020). This information includes the goal of the pilot, metrics, results, and future stages. There are also usually collaborative discussions about the development of pilot next steps (Consumers Energy, DTE Energy, & Indiana Michigan Power, 2020). Many program and technology pilots require documentation that describes outcomes and scope. For Consumer Energy, the utility shares preliminary pilot results with the Commission and stakeholders prior to the final report (Kiley, Prentice, et al., 2020).

There are various methods of reporting addressed in EWR forums (Kiley, Serna, Sherman, et al., 2020). EWR pilots have different reporting requirements than other pilots in Michigan. Staff reviews pilot design and outcomes through annual evaluations, measurement and verification

reports, EWR Collaborative presentations, EWR reports, and MEMD white papers (Gould, 2020). Stakeholders may be unaware of the many venues providing pilot information at the MPSC.

In New York, the Department of Public Service issues a compliance letter upon completing a review of the pilot. Utilities provide assessment reports and file implementation plans to update the department. Meetings are also conducted with utilities to discuss filed quarterly reports (Padula, 2020).

4.4.2 Importance of Reporting Pilot Results

It is important for utilities to report pilot outcomes to the MPSC to ensure reasonable and prudent pilot investments. However, accountability should focus on documenting a successful pilot approach that explains the decisions made and the learnings achieved. It should not focus on ensuring that the pilot resulted in full deployment (Kiley, Serna, & Williamson, 2020). Reporting pilot results and documenting progress is essential to providing this type of accountability.

Publicly available pilot data will help support emerging regulatory processes. A key aspect of emerging regulatory processes is to "maximize use of data, promote information sharing, and leverage outside expertise" (Cross-Call et al., 2019). Publicly available pilot data achieves this by addressing information asymmetries and supporting robust stakeholder participation and consensus, an important facet of emerging regulatory processes. Regulators can support multi-stakeholder collaboration outside of formal proceedings on cutting-edge demonstration projects, as well as cross-utility collaborations where "utilities publicly share meaningful evaluations of their own pilots and demonstrations" (Fairbrother et al., 2017). Publicly available pilot data supports greater multi-stakeholder collaboration and cross-utility learning.

All empirical studies have limitations, whether it be scope, time, personnel constraints, dated empirical methods, or potential errors. Future researchers can reanalyze pilot data to answer new questions, apply new methods, and correct errors. Beyond pilot data, regular utility data is also highly valuable to academics. Utility prices, rate structures, technologies, and programs change over time and differ across utility areas. These "natural experiments" offer opportunities for researchers to evaluate program impacts. Such studies can complement research based on pilot programs (Anderson et al., 2020). Peter Cappers (LBNL) shared his experiences with pilot data during the Department of Energy's Smart Grid Investment Grant (SGIG) consumer behavior studies. By having unique access to all data generated and collected by each utility's pilot, his team of researchers conducted cross-utility analyses to gain valuable programmatic insights that an individual utility could not conduct on its own (Cappers, 2020). Public access to pilot data could support these types of studies. In the stakeholder survey, the majority agreed that pilot data should be shared publicly to allow others to possibly distill new learnings (See Appendix E-3).

4.4.3 Pilot Reporting Considerations

There are four risks associated with publicly reporting available pilot data: analysis, monetization, confidentiality, and protection. Analysis risks arise when competing version of the truth are presented that can reflect poorly on the utility and its customers while undercutting previous

decisions. Data can be monetized, either sold directly or used to develop and pursue commercial opportunities that may have no ratepayer benefits. Confidentiality and privacy can be compromised if data is used to derive personally identifiable information. Lastly, data protection from illegal and legal access is another risk (Cappers, 2020).

When discussing the provision of publicly available pilot data, Michigan stakeholders were especially concerned about confidentiality and protection of consumer information. In addition, some pilot information may be subject to non-disclosure agreements. (Kiley, Serna, Sherman, et al., 2020). Processes and safeguards for information storage, access, management, and protection can be set up, as was set up for the U.S. Department of Energy SGIG. Cappers recommends that the MPSC examine and address any FOIA issues when developing pilot data reporting processes (Cappers, 2020).

The difficulties of sharing the results of pilot projects is not unique to the energy sector. Researchers in the medical field expressed frustrations with perpetual pilot programs and repetition of the same or similar pilots due to lack of information sharing. They concluded that "We need to share the results of [pilots], both successes and failures. A central, publicly accessible registry of pilot projects and their evaluations would help. Such a registry might include short project descriptions, evaluations and contact information, stored at an open-access site" (Bégin, Eggertson, & Macdonald, 2009). Canada's municipal sector maintains a database of pilot studies financed by the Green Municipal Funds and members have used it to successfully replicate best practices (Begin, Eggertson, et al.).

However, mandating reporting of evaluation data alone is not sufficient in realizing additional learning from pilots. Policy clarity, such as evidence definitions, program inventories, specified cost-benefit analyses, and required program effectiveness data must also be detailed (Chien & de Figueiredo, 2019). Government policies should encourage the production of high-quality data and reliable pathways for sharing it. Some of the greatest challenges state officials reported were data accessibility, data quality, and data sharing. Clear data documentation, a centralized and digitized data clearinghouse, and the capacity to link data across agencies are key aspects of supporting evidence-based learning (Chien & de Figueiredo, 2019).

Lastly, while information is critical, there is a balance point between the knowledge gained from the requested information and the cost and burden to collect the information. Regulators should be judicious in requesting data (Prabhu, 2019). Any requirements regarding pilot results and reporting need to balance the costs and benefits of collecting the required information.

4.4.4 Data Access Models and Possible Pilot Reporting Solutions

There are three basic models of data access. First, data can be provided on a project-by-project basis. Second, data can be provided via a formalized, transparent, streamlined, and predictable process like California's Energy Data Request Program. In this model, any researcher meeting specified standards can gain access to confidential utility data while following data protection processes. Lastly, a third-party arbitrator can hold the pilot data. Researchers can ask the third

party for specific data queries and answers will be provided without being overly specific (Anderson et al., 2020).

Stakeholders believe reporting requirements are an essential part of future pilot guidance (Kiley, Serna, Sherman, et al., 2020). Consumers Energy, DTE Energy, and I&M recognize the interest in publicly available granular pilot data. However, they recommend pilot data be aggregated at an appropriate level and for the Commission to uphold the data privacy and data accessibility rules approved in 2017 (Consumers Energy et al., 2020). Panelists at the May 28th session believed pilot reporting can be required with appropriate steps to address confidentiality concerns (Kiley, Serna, Sherman, et al., 2020). Stakeholder survey respondents also strongly agreed on the importance of aggregating publicly available pilot data to protect customer information. Most respondents agreed that (See Appendix E-3):

- formal pilot reporting to MPSC dockets should be required to assess inclusion of pilot best practices and accountability,
- utility pilots should provide documentation demonstrating the use of pilot best practices and accountability, and
- when utility pilots evolve during implementation, documentation should be provided to demonstrate adherence to the pilot goals.

To support the ease of accessing pilot results provided by utilities to the Commission, a webpage or system that compiles all pilot information, including docket links, in one place could be established. Due to the quantity of pilots, housing pilot reports in their original dockets may not be user-centric, as it may still not be easy to locate pilot results (Gould, 2020; Kiley, Serna, Sherman, et al., 2020). A webpage directory could cross-reference pilot data to allow the public to readily navigate and locate pilot information (Consumers Energy et al., 2020).

4.5 Pilots to Full Deployment

There are no clear-cut criteria for deciding when to transition a pilot to a permanent program. There are a variety of factors to consider based on customer acceptance and cost effectiveness (Farrell, 2020). Each utility has its own approach, which may also vary based on the pilot program in question. DTE, for example, uses a "Utility Program Readiness Model" as a guideline for launching a pilot into a program. Different program readiness levels are assessed for program launch (Serna, 2020).

Factors beyond proven pilot success can also impact whether a pilot moves to full deployment. One such factor is the presence of a decision-maker that is invested in the pilot and serves as a champion, either within the utility or the regulating body. For example, the Ontario Energy Board introduced default time-of-use rates in 2011 without conducting a pilot (Faruqui, 2020).

Ahmad Faruqui (the Brattle Group) laid out five steps to bridge the gap between time-of-use pilots and full deployment (2020):

- design cost-reflective rates but make sure they are customer friendly and consider offering choices,

- learn how customers think and market the rates using the customer's language,
- educate customers on how to benefit from the rates,
- use enabling technologies and behavioral messaging to enhance the price signal, and
- transition gradually and consider providing bill protection.

Even when pilots are scaled for full deployment, the realized impacts may differ from the pilot. This "scale-up effect" can be a negative or positive change. There are three major threats to scalability (List, 2019):

- implementing pilots at a large scale without sufficient evidence of efficacy or when pilots suffer from inference problems, like false positives,
- pilot population is not representative of the full-scale program population, and
- pilot situation differs from the implemented full-scale program in areas like program specifics, correct dosage and delivery, implementation costs, and unanticipated consequences regarding program participation.

These major threats can be addressed partially and preemptively through careful pilot design and evaluation. They can also be alleviated through a clear understanding of the pilot and its differences with the full-deployment population and program (Al-Ubaydli, Lee, List, Mackevicius, & Suskind, 2019). See Al-Ubaydli et al. for recommendation lists for different stakeholder groups (researchers, policymakers/practitioners, and funders) to reduce the impact of the "scale-up effect" (2019).

4.6 Future Pilot Areas and Projects

Statewide and nationally, pilot programs will continue to grow. National pilot trends include behavioral programs, market transformation, grid stabilization, decarbonization, and segment-wide strategies (Ellsworth, 2020). Stakeholders have indicated interest in the areas below for future Michigan pilot programs.

4.6.1 Utilize Michigan Resources

Stakeholders were interested in future pilots utilizing Michigan resources, whether it be existing energy infrastructure or in-state resources and talent. They wished to utilize Michigan businesses and talent to magnify the economic impacts of pilots in the state (Fingland & Jaques, 2020; Grocoff & Washington, 2020). In addition, they wanted to cultivate Michigan's energy innovation environment through developing targeted technology initiatives and partnerships with industry leaders, as well as early stage funding for start-ups (Fingland & Jaques, 2020).

Utilities and Michigan universities can benefit from partnership in utility pilots. Utilities can benefit from the participation of independent university researchers that possess the necessary skills for pilot design, development, and assessment. The university peer review and publication process can also provide certainty and credibility to pilot experiments. At the same time, universities benefit from real-world industry projects by gaining expertise from industry experts as well as access to data (Anderson et al., 2020).

There is no platform connecting academics and other interested third parties, like technology developers, with upcoming utility pilot programs to leverage ready and willing Michigan talent. This is not unique to the utility sector. Often, those seeking real-world problems to study have difficulty connecting with entities, like government agencies and utilities, needing analytical evaluation of these problems. The partnership of academics with government agencies has yielded important insights, but there is no platform connecting interested talent with the pilot projects that government agencies plan to study (Chien & Sukhatme, 2019). Such a platform could increase partnership of non-utility talent with planned and ongoing pilot projects. However, even listing planned pilots online may help facilitate peer and third-party evaluations of methodologies and support rigorous evaluation (Chien & Sukhatme, 2019). A platform listing upcoming utility pilots may help connect these third parties with real-world utility pilots. Such a platform could better leverage existing academic and industry talent in furthering utility pilot projects.

Lastly, there was interest in pilots addressing Michigan's increasingly renewable, but intermittent, energy generation portfolio by leveraging Michigan resources and energy infrastructure. Joe Tesar (Quantalux) suggests the limited duration of battery storage can be solved by renewable natural gas (RNG) and hydrogen. The cost can be reduced by leveraging existing infrastructure and injecting RNG and hydrogen into natural gas pipelines that can be later used to generate electricity. Michigan has a high number of dairies that can provide inputs to generate RNG. However, a viable RNG market needs to be developed in the state. Pilot projects could explore the creation of a renewable natural gas market with high transparency and easy access (Tesar, 2020).

4.6.2 Interest in a Systems Approach

Stakeholders expressed interest in a systems approach to developing and evaluating utility pilots. In the June 11 meeting, panelists suggested a more multi-faceted look at pilots that examined affordability, equity, and health impacts. In addition, they suggested tracking pilot impacts on infrastructure expansion and local geography. Local stakeholders should also be engaged and educated on the pilot impacts on utility bills and how customer bills fund pilots. Panelists suggested that more pilots should focus specifically on addressing the needs of low-income customers, as well as employing Michigan small businesses owned by people of color (Cira-Reyes et al., 2020). These considerations emphasize the importance of non-energy benefits to stakeholders when designing and evaluating utility pilot programs.

Stakeholder survey respondents also expressed interest in the additional systems impacts of pilots. They recommended the following be analyzed in future pilots (Appendix E-5):

- systems or holistic view of pilots examining the interaction of multiple pilots,
- non-energy impacts, such as environmental and societal impacts (e.g. equity, jobs, health, and safety), and
- pilot variables like housing type (i.e. age and upkeep) impacts on results.

Lastly, there was also interest in examining systems solutions at the energy systems level. Shared ideas included pursuing inter-company collaboration in split service territories for EWR pilots with gas and electric savings, studying EWR contributions to load reduction to offset generation or distribution investments, and integrated design and financing of building envelop and mechanical system improvements (Michigan Energy Efficiency Contractors Association, 2020). See Appendix F-6.

A systems approach to evaluating utility pilots will likely cause different utility solutions to be selected for full implementation. Lessons from Drawdown Georgia, where promising solutions for reducing carbon emissions in Georgia were identified, indicates that there are synergistic and competitive interactions between solutions. Some solutions "maximize each other's carbon-reduction potentials, cost competitiveness, policy motivation, or ease of installation" while other solutions "lessen each other's emissions reduction potential, create installation obstacles, or compete in costs" (Brown, 2020). This suggests that utility pilots selected using a systems approach may be distinct from those that only consider direct energy benefits.

4.6.3 Distribution Related Pilots

Several distribution related pilots were discussed by stakeholders or mentioned in other MI Power Grid workgroups.

June 25th panelists suggested several ways future pilots can explore integrating distributed energy resources (DERs) for maximum benefit. First, programs can explore using price signals and performance-based compensation. Second, programs can provide greater flexibility on the demand side. Lastly, platform orchestration can connect technology enhancements and business interactions (Bolino, Geller, & O'Connell, 2020).

Pilots exploring load flexibility will likely be of interest due to increasing intermittent renewable energy generation. Time-of-use rates may help increase load flexibility, preserve system reliability, and lower customer costs. Load flexibility, from technology enabled real-time pricing and batteries, will be imperative as the grid is increasingly dominated by intermittent energy resources (Faruqui, 2020).

Two other MI Power Grid workgroups provided distribution related pilot ideas. One pilot idea, from the Demand Response workgroup, is to explore partnerships with demand response aggregators and service providers and demand response value stacking by registering customers on multiple programs. Two pilot areas arose from the Electric Distribution Planning workgroup. Pilots for non-wire alternatives (NWAs) could focus on issues such as: geo-targeted load relief, power quality support, reliability improvement for customers, behind the meter management, operational support, and confidence in the reliability of NWAs. Suggested hosting capacity analysis pilots were recommended to explore the time, cost, and resources used to perform hosting capacity (Wang, 2020).

4.6.4 Stakeholder Survey - Summary of Future Pilot Areas of Interest

Stakeholder survey respondents expressed interest in the following current and future pilot areas and programs (Appendix E-5):

- Customer service,
- Distributed generation,
- Electromagnetic pulse protection,
- Energy waste reduction,
- Electric vehicles,
- Performance based metrics,
- Renewable energy,
- Residential energy generation assisting the broader community,
- Resiliency measures, such as backup power in response to severe weather,
- Systems or holistic view of pilots examining interaction effects,
- Time-of-use and other time-varying incentives, and
- Utility infrastructure.

4.7 Grid Modernization and Innovation Frameworks

The electrical grid is modernizing. Utilities face major challenges in the coming years. Aging infrastructure, slowing needs for traditional power loads, modern requirements for power quality, and the global climate emergency are just a few examples (Stanton, 2020b).

In the U.S., pilot projects are a key part of grid modernization. Excluding the MI Power Grid initiative, twenty-two states have broad grid-modernization dockets. These efforts focus on topics like non-wires alternatives, behind-the-meter solar and storage, beneficial electrification, electric vehicles, and time-varying rates. These projects vary widely in cost, scope, and location. Since it can take several years if the system is not properly optimized to handle many varied pilot programs, Stanton suggests innovation platforms may be a method to increase the success of grid modernization pilots (2020b).

Innovation platforms, also known as regulatory sandboxes, structured experimentalism, hubs, incubators, or accelerators, facilitate experimental pilots and large-scale changes. Innovation platforms are frameworks set up by regulators to allow small-scale, live testing of innovations by private firms in a controlled environment under the regulator's supervision (Jenik & Lauer, 2017). These platforms improve collaborative decision-making between multiple diverse parties researching the same disruptions, while also increasing innovation speed and rapid testing without the risk of large failures. Eights states and D.C. have innovation platforms that a variety of agencies oversee. (Stanton, 2020a)

An innovation platform creates an environment where pilot projects can be tested with minimal risk to innovators. Agility of a pilot begins with a clear regulatory framework for designers and investors. Stakeholders expressed the need for pilot agility and a clearer pilot framework, which an innovation platform can provide. (Kiley, Serna, Sherman, et al., 2020).

However, there are also risks inherent in the innovation process. Some innovations may not fit into the existing or changing regulatory environment. It can be difficult to measure success. Some innovators may be reluctant to share innovations before introduction to the market. Lastly, care must be taken to avoid unfair advantage to larger parties or potentially wasteful duplication efforts (Stanton, 2020a).

Stanton lists the following as components of a good innovation platform (2020a):

- clear set of platform objectives,
- clear eligibility requirements for participants,
- established criteria regarding risks and safeguards in the platform application,
- strict and limited timing for applications, reviews, and tests at small scales,
- specific regulatory actions allowed before, during, and after innovation tests,
- established mechanisms to monitor and evaluate costs and benefits for both regulators and innovators with maximum transparency,
- experienced regulatory team to identify potential value and flaws and respond rapidly to innovator questions, and
- accessible funding source to allow new projects initial tests.

4.7.1 Innovation Platform Example: Reforming the Energy Vision

New York uses an innovation platform for much of what Michigan also considers pilots, namely demonstration of new technology and novel business practices. The Reforming the Energy Vision (REV) initiative instills a culture of innovation without harsh consequence or large expense. Building the culture of innovation, however, took years of work with the platform goals in mind (Padula, 2020).

For REV demonstration projects, New York utilities can recover up to $10 million or 0.5% of their delivery service revenue requirement. This amount can be recovered over ten years with an approved return. Project costs incurred between rate cases are deferred to the next rate plan. However, quarterly reporting is required until demonstration project costs are included in a rate case order. This reporting details the revenue requirement amount and project details like in-service dates, incremental incurred costs, operational savings, tax benefits, grants, etc. Utilities can only collect incremental demonstration project capital and operating costs and these are noted in separate subaccounts (State of New York Public Service Commission, 2015).

Once a filing is made in the New York REV process, NY Staff reviews the proposals and issues a compliance letter without Commission intervention. The process facilitates more discussion after the filing. Utilities are required to file an implementation plan to which NY Staff submits addendums during a review process. The utility can modify the demonstration at any time but is required to submit quarterly reports on progress or barriers. The REV Connect program also allows third party providers to connect with utilities directly for specific needs and real-time feedback (Padula, 2020).

Using lessons learned from the New York REV process, Padula recommends the following to support development of an innovation platform (Padula, 2020):

- encourage the formation of a new office/section to champion innovation,
- clearly define specific project goals and hypotheses,
- clearly define measurable metrics for each stated goal to quantify whether stated goals have been met and hypotheses proven/disproven,
- require a forecast/vision of what the project looks like at scale,
- be aware of regulatory barriers beyond the control of the PSC like city codes,
- limit the number of policies and principles attempting to be addressed in one project to ease the execution and evaluation,
- outreach and offerings must be attractive to customers, and
- focus on partnerships not vendor relationships.

4.8 Regulatory Certainty & Guidance

A guiding vision should anchor every regulatory undertaking to communicate the available opportunities, customer and utility system benefits, and outputs (Cross-Call et al., 2019). By clarifying their strategic priorities for energy system transformation, regulators help support utilities in developing complementary corporate strategies and innovation road maps (Fairbrother et al., 2017). The Commission can help focus pilot efforts by providing a clear guiding vision and strategic priorities.

During the stakeholder process, many stakeholders and speakers discussed the need for regulatory certainty and guidance. Regulators must specify a clear framework to provide pilot programs with the agility to change and record possible less-than optimal results. Rather than having several small frameworks, or individual utility regulations, overall guidance on the entire topic from regulators is desired by the utilities (Kiley, Serna, & Williamson, 2020). Jester presented several areas for the Commission to address for future pilot projects based on relevance, planning, and overall benefit to society (Jester, 2020). George recommends the Commission provide strategic guidance and constructive feedback on detailed pilot submissions, as well as the flexibility to make pilot adjustments that may require Commission approval (George & Bell, 2020).

Any provided regulatory guidance regarding pilots should provide some degree of certainty while supporting flexibility. Bull suggests that regulatory agencies can support trial-and-error dynamism in pilot programs, primarily by (Bull, 2019):

- designing rules to allow and encourage variation and experimentation, while also providing some degree of stability,
- considering regulatory policy making a never-ending process, and
- promoting learning and expand existing knowledge with perpetual retrospective review.

Outside of recommending strategic guidance on pilots, the following recommendations for the Commission were received by source. Stakeholders suggested the Commission:

- Stakeholder survey responses (Appendix E-4):

    - provide guidance regarding areas of concern or interest that pilots may address,
    - detail expectations or standards for pilot performance,
    - provide opinions on next steps if an initial pilot fails to meet Commission standards of pilot performance,
    - require adherence to a clear outline of pilot best practices that provides flexibility for varied pilot types, and
    - request a thorough review of prior pilots of a similar nature be provided in pilot submissions.
- April 30 presentation by George and Bell (2020):
    - provide constructive feedback on detailed pilot submissions,
    - provide flexibility to make pilot adjustments within boundaries and without Commission approval, and
    - provide quick turnaround for any adjustments requiring Commission approval.
- May 28 panel (Kiley, Serna, Sherman, et al., 2020):
    - develop a flexible framework from which to develop, implement, and evaluate future pilots,
    - establish pilot reporting criteria,
    - require connectivity between goals, metrics, evaluation, and post-pilot wrap up,
    - develop tools and templates for pilot programs, and
    - look to technology and business communities for examples of pilot program execution.

Lastly, stakeholder survey respondents also recommended further Commission stakeholder engagement to (Appendix E):

- educate stakeholders on energy options such as:
    - alternative energy resources supporting great environmental stewardship like solar, wind, and pedal power,
    - resiliency measures such as electromagnetic pulse protections.
- converse in informal small group settings to share Commissioners' thoughts.

5. Recommendations

Staff has five main recommendations. The first focuses on establishing foundational goals and vision for future pilots. The second provides a definition of the term "pilot." The third focuses on objective criteria for evaluating pilot projects. The fourth focuses on a streamlined pilot review process. Lastly, the fifth focuses on establishing a pilot data repository. All are detailed below.

5.1 Foundational Goals and Vision for Future Pilots

In the many future pilot areas shared in the stakeholder group, several common themes emerged:

- Stakeholders expressed strong interest in leveraging Michigan resources when developing future energy pilots to encourage the development of a vibrant energy innovation environment utilizing and growing Michigan talent and businesses.

- There is strong interest in future energy pilots meeting the needs of Michigan communities and including customer groups, especially low-income and communities of color, in a meaningful and equitable fashion.
- Communities want to be partners in the transition to clean and distributed energy resources and there is a desire to be at the table when developing and designing pilots.
- Energy pilots should consider system and holistic impacts, not only their direct energy impacts. Consideration should also be given to non-energy related impacts when pursuing energy pilots and solutions.
- There is a desire for clear goals and direction from the MPSC or the legislature to help focus state-wide energy pilot efforts. Some stakeholders expressed interest in funding to support innovative pilots and others expressed interest in greater regulatory certainty regarding pilot treatments.

The MI Power Grid initiative is clearly focused on optimizing Michigan's transition to clean and distributed energy resources. However, Staff recommends more detailed foundational goals underpinning future energy pilots be established and promoted by the Commission. A cohesive vision with clear metrics, such as health, equity, and environmental criteria, will help unify the State's future energy pilot investments while also increasing movement towards realizing that vision. It will also help Staff as it evaluates future pilot programs.

5.2 Pilot Definition

In the stakeholder process, a wide variety of past, current, and possible future pilot projects were shared. Due to the rapidly evolving energy industry and changing customer needs, Staff expects continued variety in utility pilot projects in the future. Staff believes that there will be new business models, technologies, and platforms piloted in the future that may be yet unknown or undeveloped. Since it is impossible to anticipate and plan for all possible future developments, any pilot definition should be flexible and not limit future pilot options.

Given the current ambiguity of the term in Michigan, it is necessary to adopt a definition so it is clear when the proposed objective criteria apply. Based on input from workgroup speakers and stakeholders, Staff recommends the Commission adopt the following definition of pilot:

> *A pilot is a limited duration experiment to determine the impact of a measure on one or more outcomes of interest.*

The proposed objective criteria below are intended to apply to any utility pilot projects meeting the above definition.

5.3 Objective Criteria for Evaluating Pilot Projects

The development of a general set of objective criteria brings the tensions between agility and accountability into stark contrast. The energy industry is changing rapidly. Utilities need to proactively anticipate these developments to provide the level of energy service, reliability,

resiliency, and safety that their customers and communities need. To be responsive to customers now and in the future, utilities require agility and speed in piloting and executing solutions.

However, utilities must also be held accountable for their investments. The MPSC and other commissions like it are tasked with maintaining the "public interest" (Lazar, 2016). It routinely examines the reasonableness and prudency of utility investments to ensure safe, reliable, and accessible energy and telecommunications services at reasonable rates for Michigan residents. However, there are also social principles to rate making, where rates are also designed to be responsive to social needs and costs. There is history of public service commission decisions where departures from cost-price standards are made because of social considerations (Bonbright, 1961). Therefore, any set of objective criteria for pilots should also hold utilities accountable for the reasonableness, prudency, and public interest impacts of their pilot investments.

Lastly, as these objective criteria are developed through the MI Power Grid initiative, the focus of the initiative must be kept in mind. MI Power Grid focuses on maximizing the benefits of the transition to clean, distributed energy resources for Michigan residents and businesses.

Staff recommends the following objective criteria be used when evaluating future pilot proposals coming before the Commission for funding approval. These criteria are intended to apply to any utility pilot projects meeting the recommended pilot definition. Utility provision of data listed in the objective criteria is not envisioned to guarantee funding approval. Likewise, failure to provide information for some of the listed criteria or subcomponents is not envisioned to automatically lead to funding rejection.

1. ***Pilot need and goals detailed.***
    a. Need for the pilot is expressed. Results of past similar pilots and findings are shared to justify the need for the proposed pilot.
    b. Pilot goals and desired learnings detailed.
2. ***Pilot design and evaluation plan designed and presented together.***
    a. Pilot program design and evaluation plans are designed together so examined metrics and collected data support evaluation of the pilot in meeting goals and desired learnings.
    b. If applicable, define target customer population, selection rationale, recruitment plans, and evaluation plans for customer adoption and satisfaction.
    c. If statistical analysis will be conducted on pilot results, a statistically significant sample size must be selected, supported, and detailed. If a statistically significant sample size is not selected, justification must be provided.
    d. If statistical analysis will not be conducted, justification must be provided as well as an approach for evaluating pilot goals.
    e. If changes are required during implementation, pilot design, and evaluation impacts are shared.
3. ***Pilot project costs detailed.***
    a. Project costs are detailed by source and amount for applicable periods.

b. Availability of non-utility funding and whether any was pursued (such as state or federal funding opportunities) described.
c. Projected cost-effectiveness of piloted measure at scale over expected life described.

4. ***Project timeline detailed.***
    a. Proposed timeline for the pilot project and any related reports or evaluations delineated.
5. ***Stakeholder engagement plan detailed.***
    a. Stakeholder engagement plan before, during, and after pilot takes place detailed.
    b. Interim and final stakeholder reporting described.
    c. Expected publicly available data from pilot shared.
6. ***Public interest detailed.***
    a. Pilot support of the transition to clean, distributed energy resources, and its expected impacts described.
    b. Any added benefits to ratepayers or the energy delivery system, either due to proposed site selection or through other pilot variables, especially if any system weaknesses or forecasted needs are addressed, shared.
    c. Expected impacts of the piloted measure on reliability, resilience, safety, and ratepayer bills detailed.
    d. Expected local or Michigan based employment and business opportunities created by pilot described.
    e. Any potential impacts or added benefits of the pilot on low-income customers, seniors or other vulnerable populations described.

Staff recommends a comprehensive pilot plan submitted to Staff with all the above details so that the information is clear and easily located. Staff encourages utilities to also share where the pilot evaluation will be filed or made available in the comprehensive pilot plan.

5.4 Streamlined Pilot Review Process

Pilots are currently approved in a rate case, integrated resource plan, renewable energy plan, voluntary green pricing program, energy waste reduction plan, and other Commission proceedings. There can be significant lag from when a pilot is conceived to its final approval in one of these proceedings. Rate case orders occur ten months after filing, IRPs are filed every three to five years, and EWR plans are filed every two years (Indiana Michigan Power, 2020). Renewable energy plans and voluntary green pricing programs usually have one-year case schedules.

Given the rapid and near-term energy transformation, there is a need to support pilot agility so potential solutions to emerging needs can be explored in a timely manner and any necessary pivots during implementation can also occur. Staff recommends the development of an alternative streamlined regulatory process so pilots may be reviewed and approved as they emerge or as implementation changes are required. This process should also address cost recovery. This will

help Michigan utilities respond and adapt to the fast-changing energy sector while maintaining a reliable, resilient, and safe electrical system that meets modern needs.

Currently, the Commission does not have such a streamlined process available for utility investments. Current alternative processes like EWR pilot treatment and learnings from other Commissions may help inform its development. For instance, the Commission could:

- Cap pilot investment costs,
    - Currently, Michigan EWR pilot costs are capped at 5% of the utility's energy optimization budget (Michigan Public Service Commission, 2008). New York capped REV Demonstration project costs at $10 million or 0.5% of the utility's delivery service revenue requirement (State of New York Public Service Commission, 2015).
- Allow recovery of approved pilot capital and operation costs,
    - New York allows REV demonstration project costs to be recovered over ten years with an approved return. Project costs incurred between rate cases are deferred to the next rate plan (State of New York Public Service Commission, 2015).
- Allow Staff to review and approve pilots between rate cases after establishment of foundational goals and objective criteria. Staff can evaluate pilot project proposals for their support of a safe, reliable, accessible, and affordable electrical grid as well as achievement of overarching goals. Staff can also evaluate and approve changes in pilot design during implementation that help achieve the pilot goals.
    - New York REV allows Staff to review project proposals and issue a compliance letter without Commission intervention (Padula, 2020).
- Require quarterly reports for ongoing utility pilots
    - New York REV requires quarterly reports that include "revenue requirement amounts, project details such as descriptions and in-service dates, incremental costs incurred, operational savings, tax benefits, grants (including in-kind or matching grants) and all other benefits" (State of New York Public Service Commission, 2015).
- Set reconciliation and evaluation processes on a periodic and more frequent basis (such as semi-annually) to allow review of reasonableness and prudency of pilot costs.
    - EWR pilots are currently reconciled annually in Michigan.

The items above are only examples of different approaches. This stakeholder process did not delve deep into streamlined pilot review processes and possible cost recovery methods. However, stakeholders such as Consumers Energy (See Appendix F-2) and I&M (See Appendix F-4) support a more agile and streamlined approach for pilot approval and cost reconciliation.

Staff can only recommend that a streamlined pilot review process providing cost recovery clarity be created. Additional exploration of the best mechanism to achieve a streamlined regulatory process for Michigan pilots is advisable. Given the need to support energy innovation and grid solutions, Staff recommends any such exploration, recommendations, and decisions occur soon.

5.5 Online Michigan Pilot Directory

Many stakeholders expressed interest in accessing pilot data. Publicly available pilot data allows the leverage of existing pilot data to distill new learnings. However, significant data privacy concerns arise when pilot data is publicly shared, especially in raw form (Cappers, 2020). At the same time, there is currently available pilot data and information that has been shared with the MPSC that is available but not readily known or accessed.

Staff recommends developing an online pilot directory that lists pilots by utility and provides links to available pilot data and information shared with the MPSC through docket filings, presentations, or other means. Current informal presentations or updates regarding pilot progress could be posted in the future for public access. This allows all interested stakeholders to learn about MI pilots in an easy, simple manner.

Though more detailed data availability for pilots may provide benefits to researchers and third parties, Staff recommends implementation of the online Michigan pilot directory first. This allows determination of the value stakeholders obtain from the current available pilot data before investing in the development of an online repository with detailed pilot data. Such a repository introduces significant data security and privacy concerns as well as management needs. However, Staff believes a minor investment in an online Michigan pilot directory will optimize the availability and use of currently available pilot information and data. It may also satisfy stakeholder needs and render a repository of more detailed pilot data unnecessary. Should the need for a detailed pilot data repository be made clear in the future, one can be designed and implemented later.

Staff recommends the online Michigan pilot directory provide at least the following information for utility pilot projects:

- utility contact person,
- summary of pilot need and goals,
- applicable MPSC case number(s), and
- links to any pilot design, evaluation, and update information.

Such a directory, when utility contacts are provided for pilots, can also serve as a link between interested third parties and the utilities. In addition to the information above, the directory page could also list a contact per utility for future pilots so third parties and researchers can share ideas or interest. This may help facilitate information sharing and communication between interested third parties and utilities regarding future pilot ideas. Some stakeholders expressed difficulties in reaching out to utility contacts to share relevant technologies or ideas.

6. Summary

The Energy Programs and Technology Pilots workgroup of the MI Power Grid initiative conducted a series of stakeholder engagement meetings from February through June 2020. MPSC Staff also conducted a series of surveys and reviews to better assess learnings from utility pilot programs,

regulatory guidance around the nation, and stakeholders. This report summarizes the workgroup efforts and subsequent Staff recommendations.

First, Staff recommends the MPSC establish and promote more detailed foundational goals underpinning future energy pilots. Second, Staff recommends the adoption of a broad definition of "pilot" for the purpose of MPSC efforts to encompass the wide variety of pilot topics explored. Third, Staff recommends objective criteria for evaluating pilot best practices when pilots are proposed in the future. These objective criteria are intended to assess the reasonableness, prudency, and public interest impact of pilot investments. Fourth, Staff recommends the development of a streamlined pilot review process that provides cost recovery clarity. Fifth, Staff recommends the development of an online directory of Michigan pilots that provides utility contacts and links to existing pilot information and data to allow interested parties to easily access this information. A section of the directory can also list a contact per utility for future pilots so third parties and researchers can share ideas or interest. This may help facilitate information sharing and communication between interested third parties and utilities regarding pilot ideas.

Staff hopes that its recommendations are the start of developing a clearer pilot framework to support energy innovation in Michigan. Though Staff has tried to reflect the depth and diversity of topics discussed in this workgroup, it recognizes that there is still much to explore regarding pilots in the transition to cleaner and more distributed energy resources. For that reason, it looks forward to the findings of ongoing and future MI Power Grid workgroups, such as the Financial Incentives/Disincentives and New Technologies and Business Models, that will likely shed more light on how to better support energy innovation and pilots.

A wide range of stakeholders from utilities, non-profits, technology developers, academic institutions, communities, and individual utility customers participated in this stakeholder process. Though the stakeholders were varied in background, they were unified in their enthusiasm for and dedication to Michigan's energy future and the pilots that will help shape it.

The Commission order in Case No. U-18368 quoted Henry Ford (Michigan Public Service Commission, 2018): "Coming together is the beginning. Keeping together is progress. Working together is success."

Coming together to discuss energy programs and pilots in this workgroup is only the beginning. Staff hopes its recommendations and future clarity from the Commission and others will allow stakeholders, utilities, and the Commission to work together in supporting and forming Michigan's energy future through innovative pilots.

References

Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2005). A Review of Intervention Studies Aimed at Household Energy Conservation. Journal of Environmental Psychology, 25, 273-291. doi:10.1016/j.jenvp.2005.08.002

Al-Ubaydli, O., Lee, M. S., List, J. A., Mackevicius, C., & Suskind, D. (2019). How Can Experiments Play a Greater Role in Public Policy? 12 Proposals from an Economic Model of Scaling. University of Chicago, Becker Friedman Institute for Economics Working Paper(2019-131).

American Electric Power. (2019, September 10). AEP Accelerates Carbon Dioxide Emissions Reduction Target. Retrieved from https://aep.com/news/releases/read/1615

American Society of Civil Engineers. (2020a). 2017 Infrastructure Report Card: Energy. Retrieved from https://www.infrastructurereportcard.org/cat-item/energy/

American Society of Civil Engineers. (2020b). 2017 Infrastructure Report Card: State Infrastructure Facts. Retrieved from https://www.infrastructurereportcard.org/state-by-state-infrastructure/

American Society of Civil Engineers. (2020c). 2018 Michigan Infrastructure Report Card. Retrieved from https://www.infrastructurereportcard.org/state-item/michigan/

Anderson, S., Beecher, J., & Kirkpatrick, J. (2020, April 16). Designing and Evaluating Utility Pilot Projects: an Academic Perspective. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_April16_fulldeck_687933_7.pdf

Begin, H. M., Eggertson, L., & Macdonald, N. (2009). A Country of Perpetual Pilot Projects. Canadian Medical Association Journal, 180(12), 1185. doi:10.1503/cmaj.090808

Bird, L., Milligan, M., & Lew, D. (2013). Integrating Variable Renewable Energy: Challenges and Solutions. Retrieved from https://www.nrel.gov/docs/fy13osti/60451.pdf

Bolino, G., Geller, G., & O'Connell, R. (2020). Panel: Direction for Future Pilots. Part I: Emerging Integrated Solutions. Moderated by Ryan Katofsky. In MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series, June 25 meeting.

Bonbright, J. C. (1961). Principles of Public Utility Rates. New York: Columbia University Press.

Brown, M. (2020, June 25). Identifying the Most Promising Solutions for Reducing Carbon Emissions in Michigan: Lessons from Drawdown Georgia. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_June_25_Slides_695381_7.pdf

California Public Utilities Commission. (2020). Energy Data Access Committee (EDAC). Retrieved from https://www.cpuc.ca.gov/General.aspx?id=10151

Cappers, P. (2019). Planning & Implementing Pilot Programs. In: MSU Institute of Public Utilities Advance Studies Program: Accounting, Finance, and Evaluation.

Cappers, P. (2020, May 28). Making Pilot Data Publicly Available: Experiences and Opportunities. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_Mtg_6_Full_Slides_692817_7.pdf

Chien, C. V., & Sukhatme, N. U. (2019, November 19). A Proposal for PolicyPilots.gov. Using Rigorous Policy Pilots to Improve Governance. Retrieved from https://www.theregreview.org/2019/11/19/chien-sukhatme-proposal-policypilots-gov/

Chilton, A. (2019, November 20). Randomizing Policy and the Risk of Multiple Hypothesis Testing. Using Rigorous Policy Pilots to Improve Governance. Retrieved from https://www.theregreview.org/2019/11/20/chilton-randomizing-policy-risk-multiple-hypothesis-testing/

Cira-Reyes, S., Culbertson, J., LaFave, R., Roth, A., & Sutter, A. (2020). Panel: Community Pilot Experience, Best Practies, and Strategic Plans. Moderated by Sarah Mills. In MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series, June 11 meeting.

Cohen, J., Pfeiffer, K., & Francis, J. A. (2018). Warm Arctic Episodes Linked with Increased Frequency of Extreme Winter Weather in the United States. Nature Communications, 9(1), 869. doi:10.1038/s41467-018-02992-9

Colmer, J., Hardman, I., Shimshack, J., & Voorheis, J. (2020). Disparities in PM2.5 air pollution in the United States. Science, 369(6503), 575-578. doi:10.1126/science.aaz9353

Consumers Energy. (2020, February 24). Consumers Energy Commits to Net Zero Carbon Emissions, Takes Stand for the Planet. News Release. Retrieved from https://www.consumersenergy.com/news-releases/news-release-details/2020/02/24/16/03/consumers-energy-commits-to-net-zero-carbon-emissions-takes-stand-for-the-planet

Consumers Energy, DTE Energy, & Indiana Michigan Power. (2020). Program and Technology Pilots Workgroup: Summarized Information for Consumers Energy, DTE Energy, and I&M. Retrieved from https://www.michigan.gov/documents/mpsc_old/Pilot_WG_Utility_Whitepaper_2020.07.06_697797_7.pdf

Cross-Call, D., Goldenberg, C., & Wang, C. (2019). Process for Purpose: Reimagining Regulatory Approaches for Power Sector Transformation. Retrieved from https://rmi.org/insight/process-for-purpose/

Davis, A. L., Krishnamurti, T., Fischhoff, B., & de Bruin, W. B. (2013). Setting a Standard for Electricity Pilot Studies. Energy Policy, 62, 401-409.

DC PSC. (2016, March 23). Order No. 18148. Retrieved from https://edocket.dcpsc.org/apis/api/filing/download?attachId=75638&guidFileName=e4399611-a652-4fad-892d-53912288d323.pdf

DC PSC. (2017). MEDSIS Staff Report. Retrieved from https://dcpsc.org/getmedia/6048d517-1d9d-4094-b0f4-384f19a11587/MEDSISStaffReport.aspx

DC PSC. (2019, August 2). Order No. 19984. Retrieved from https://edocket.dcpsc.org/apis/api/filing/download?attachId=86359&guidFileName=d43bcc94-e7d3-4c60-b6ab-db54c8cbae4b.pdf

DC PSC. (2020). Power Path DC. Retrieved from https://dcpsc.org/Newsroom/HotTopics/Grid-Modernization/Power-Path-DC.aspx

de Chalendar, J. A., Taggart, J., & Benson, S. M. (2019). Tracking Emissions in the US Electricity System. Proceedings of the National Academy of Sciences, 116(51), 25497-25502. doi:10.1073/pnas.1912950116

De Clercq, S., & Guerrero Lucendo, C. (2018). Monitoring and Performance Evaluation of the Real-life Pilot Projects. Retrieved from http://bestres.eu/wp-content/uploads/2019/01/BestRES_D4.4.pdf

Dougherty, A., Henderson, C., Dwelley, A., & Jayaraman, M. (2015). Energy Efficiency Behavioral Programs: Literature Review, Benchmarking Analysis, and Evaluation Guidelines. Retrieved from https://mn.gov/commerce-stat/pdfs/card-report-energy-efficiency-behavorial-prog.pdf

DTE Energy. (2020, June 24). DTE Gas Announces 2050 Net Zero Goal: Unique and Comprehensive Plan Addresses Greenhouse Gas Emissions and Invites Customers to Participate. News Release. Retrieved from https://skrift.meltwater.io/site/5e12ac481b7bea03e16a9079/article/5ef5ada4195d6b001b3e5289

Dueweke, B. (2020, April 30). Community EWR Pilots in Detroit. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_April_30_Presentations_689551_7.pdf

E2. (2020, April). Clean Jobs America 2020: Repowering America's Economy in the Wake of COVID-19. Retrieved from https://e2.org/wp-content/uploads/2020/04/E2-Clean-Jobs-America-2020.pdf

Ellsworth, A. (2020, February 27). Pilot Programs in Michigan and Beyond. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/Full_Presentation_Deck_-_2-27-2020_682655_7.pdf

Fairbrother, C., Cuccione, L., Henchen, M., & Teixeira, A. (2017). Pathways for Innovation: The Role of Pilots and Demonstrations in Reinventing the Utility Business Model. Retrieved from www.rmi.org/insight/pathways-for-innovation/

Farrell, K. (2020, May 14). SmartCurrents: Dynamic Peak Pricing Pilot. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_May_14_Presentation_Slides_691441_7.pdf

Faruqui, A. (2020, April 16). Bridging the Chasm: From Pilots to Full-Scale Deployments. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_April16_fulldeck_687933_7.pdf

Fingland, B., & Jaques, P. (2020, June 11). Startup Overview. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_June_11_Slides_693980_7.pdf

Fischer, C. (2008). Feedback on Household Electricity Consumption: A Tool for Saving Energy? Energy Efficiency, 1, 79-104. doi:10.1007/s12053-008-9009-7

George, S. (2020, August 17). Nextant Comments on Staff Draft Report. Retrieved from https://www.michigan.gov/documents/mpsc_old/Nextant_Comments_699700_7.pdf

George, S., & Bell, E. (2020, April 30). Industry Insights: Pilot Definition and Best Practices. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_April_30_Presentations_689551_7.pdf

Ghamami, M., Zockaie, A., Wang, J., & Miller, S. (2019). Electric Vehicle Charger Placement Optimization in Michigan: Phase I - Highways. Retrieved from https://www.michigan.gov/documents/energy/EV-Charger-Placement-Opt-PhaseI-Final-Report-021319_646220_7.pdf

Goka, N. (2020, February 27). From Pilot to Product: Viewpoints on Utility Pilot Design. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/Full_Presentation_Deck_-_2-27-2020_682655_7.pdf

Gould, K. (2020, May 28). MPSC EWR Pilot Annual Report Review. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_Mtg_6_Full_Slides_692817_7.pdf

Great Lakes Integrated Sciences+Assessments. (nd). Climate Change in the Great Lakes Region References. Retrieved from http://glisa.umich.edu/gl-climate-factsheet-refs

Grocoff, M., & Washington, G. (2020). Panel: Direction for Future Pilots. Part II: Michigan Project Examples. Moderated by Laura Sherman. In MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series, June 25 meeting.

Groom, N. (2020, July 30). After three decades, most polluted U.S. neighborhoods haven't changed. Retrieved from https://www.reuters.com/article/us-usa-environment-pollution/after-three-decades-most-polluted-us-neighborhoods-havent-changed-idUSKCN24V3BS

Harari, S., & Bovarnick, B. (2018, April 17). Regulators and Pilots: Now for Our First Act Clean Energy Finance Forum. Retrieved from https://www.cleanenergyfinanceforum.com/2018/04/17/regulators-and-pilots-now-for-our-first-act

Hart, K. (2019, November 13). Axios Cities. Retrieved from https://www.axios.com/newsletters/axios-cities-1d9f6fa6-a88e-406a-93b1-ca8e474cead4.html

Indiana Michigan Power. (2020). Comments on the Electric Distribution Planning Stakeholder Staff Report Draft. Retrieved from https://www.michigan.gov/documents/mpsc_old/IM_Comments_699698_7.pdf

Jenik, I., & Lauer, K. (2017). Working Paper: Regulatory Sandboxes and Financial Inclusion. Consultative Group to Assist the Poor (CGAP), a World Bank Agency. Washington D.C. Retrieved from www.cgap.org

Jester, D. (2020, May 14). Agility, Prudence, and the Commission's Approach to Pilot Projects. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_May_14_Presentation_Slides_691441_7.pdf

Kasunic, M. (2004). Conducting Effective Pilot Studies. Retrieved from https://resources.sei.cmu.edu/asset_files/Presentation/2004_017_001_22829.pdf

Kiley, R., Prentice, H., & McGraw, E. (2020, May 14). Pilot Case Studies. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_May_14_Presentation_Slides_691441_7.pdf

Kiley, R., Serna, C., Sherman, L., Snyder, W., & Williamson, A. (2020). Panel: Reflections on Pilot Best Practices, Recommendations, and Path Forward. Moderated by Joy Wang. In MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series, May 28 meeting.

Kiley, R., Serna, C., & Williamson, A. (2020). Panel: Agility and Accountability. Moderated by Joy Wang. In MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series, May 14 meeting.

Kistin, C., & Silverstein, M. (2015). Pilot Studies: A Critical but Potentially Misused Component of Interventional Research. Jama, 314(15), 1561-1562.

Kraft, J. (2020, February 27). Introduction to Pilot Program Evaluations. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/Full_Presentation_Deck_-_2-27-2020_682655_7.pdf

Lancaster, G. A., Dodd, S., & Williamson, P. R. (2004). Design and Analysis of Pilot Studies: Recommendations for Good Practice. Journal of evaluation in clinical practice, 10(2), 307-312.

Lazar, J. (2016). Electricity Regulation in the US: A Guide. Retrieved from Montpelier, VT: http://www.raponline.org/knowledge-center/electricityregulation-in-the-us-a-guide-2

Leader, J., & Tucker, R. (2019). Pilot Projects – Guidelines for a Successful Grid Modernization Pilot Project Program. Grid Modernization Briefing. Retrieved from https://sepapower.org/resource/pilot-projects-guidelines-for-a-successful-grid-modernization-pilot-project-program/

Lefevre, S. R. (1984). Using Demonstration Projects to Advance Innovation in Energy. Public Administration Review, 483-490.

List, J. A. (2019, November 18). How Can Experiments Play a Greater Role in Public Policy. Using Rigorous Policy Pilots to Improve Governance. Retrieved from https://www.theregreview.org/2019/11/18/list-how-can-experiments-play-greater-role-public-policy/

Masson-Delmotte, V., Zhai, P., Pörtner, H.-O., Roberts, D., Skea, J., Shukla, P. R., . . . Pidcock, R. (2018). Global Warming of 1.5 C: Summary for Policymakers. Report of the Intergovernmental Panel on Climate Change.

Michigan Climate Action Network. (2019). Michigan Cities Taking Action on Climate. Retrieved from https://www.miclimateaction.org/michigan_cities_taking_action_on_climate

Michigan Department of Environment, Great Lakes, & Energy. (2019a, September 12). First Electric School Buses in Michigan Roll Out for "Back to School" Retrieved from https://www.michigan.gov/mienvironment/0,9349,7-385-90161-507156--,00.html

Michigan Department of Environment, Great Lakes, & Energy. (2019b, September 12). Michigan Signs Agreement Paving Way for 7 School Districts to Buy Electric Buses. Retrieved from https://www.michigan.gov/egle/0,9429,7-135-3308_3323-507289--,00.html

Michigan Department of Environment, Great Lakes, & Energy. (2020a, August 6). EGLE Awards $1.7 Million for 36 EV Charger Stations. Retrieved from https://www.michigan.gov/egle/0,9429,7-135-3308-535879--,00.html

Michigan Department of Environment, Great Lakes, & Energy. (2020b, June 10). EGLE Low- to Moderate-Income Solar Energy Program Wins National Accolade Retrieved from https://www.michigan.gov/egle/0,9429,7-135-3308_3323-531529--,00.html

Michigan Energy Efficiency Contractors Association. (2020, August 17). Comments on Energy Programs and Technology Pilots Draft Report. Retrieved from https://www.michigan.gov/documents/mpsc_old/MEECA_Comments_699699_7.pdf

Michigan Legislature. (2020). Act 295 of 2008. Retrieved from http://www.legislature.mi.gov/(S(12rw1aqpyusrz1uumtuh4zwy))/mileg.aspx?page=getobject&objectName=mcl-Act-295-of-2008

Michigan Public Service Commission. (2008, December 4). Case No. U-15800 Order. Retrieved from https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t0000000wNSvAAM

Michigan Public Service Commission. (2018, March 29). Case No. U-18368. Retrieved from https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t0000002286rAAA

Michigan Public Service Commission. (2019a, October 17). Case No. U-20645. Retrieved from https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t00000077Gq4AAE

Michigan Public Service Commission. (2019b). Electric Vehicles Issue Brief. Retrieved from https://www.michigan.gov/documents/mpsc/EV_Pilot_Issue_Brief_05-02-2019_653974_7.pdf

Michigan Public Service Commission. (2020, April 15). Commission Order Case No. U-20757. Retrieved from https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t000000BRC2YAAX

Mid-continent Independent System Operator. (2019, February 27). MISO January 30-31 Maximum Generation Event Overview. Retrieved from https://cdn.misoenergy.org/20190227%20RSC%20Item%2004%20Jan%2030%2031%20Max%20Gen%20Event322139.pdf

Mid-continent Independent System Operator. (2020). Generator Interconnection Queue. Retrieved from https://www.misoenergy.org/planning/generator-interconnection/GI_Queue/

Mueller, R. (2020, May 14). O'Shea Battery Storage Project - New Technology: Battery Storage Integration. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_May_14_Presentation_Slides_691441_7.pdf

Neenan, B., & Robinson, J. (2010). Guidelines for Designing Effective Energy Information Feedback Pilots: Research Protocols. Retrieved from Palo Alto, CA: https://www.smartgrid.gov/files/EPRI.pdf

New York State Department of Public Service. (2019, November 22). REV-Demonstration Projects. Retrieved from http://www3.dps.ny.gov/W/PSCWeb.nsf/All/B2D9D834B0D307C685257F3F006FF1D9?OpenDocument

Newsham, G. R., & Bowker, B. G. (2010). The Effect of Utility Time-varying Pricing and Load Control Strategies on Residential Summer Peak Electricity Use: a Review. Energy Policy, 38(7), 3289-3296.

NYSERDA. (2020). REV Connect: Principles for REV Demonstrations. Retrieved from https://nyrevconnect.com/rev-briefings/principles-rev-demonstrations/

Office of Governor Whitmer. (2020, July 2). Michigan's Office of Future Mobility and Electrification Formally Launches, Sets Course for Economic Growth, Job Creation. Retrieved from https://www.michigan.gov/whitmer/0,9309,7-387-90487-533468--,00.html

Padula, M. (2020, April 16). REV Demos - Process and Experience. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_April16_fulldeck_687933_7.pdf

Pryor, S. C., Scavia, D., Downer, C., Gaden, M., Iverson, L., Nordstrom, R., . . . Robertson, G. P. (2014). Chapter 18: Midwest. Retrieved from http://nca2014.globalchange.gov/report/regions/midwest

PwC. (2018). 15th PwC Glboal Power & Utilities Survey. Retrieved from https://www.pwc.com/gx/en/energy-utilities-mining/publications/pdf/15th-global-power-utilities-survey.pdf

Sergici, S. (2020, April 30). Pilot Design Best Practices and Lessons Learned from Pricing and Technology Pilots. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_April_30_Presentations_689551_7.pdf

Serna, C. (2020, February 27). DTE Pilot Process and Approaches. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/Full_Presentation_Deck_-_2-27-2020_682655_7.pdf

Shindell, D. (2020, August 5). Health and Economic Benefits of a 2°C Climate Policy: Testimony to the House Committee on Oversight and Reform Hearing on "The Devastating Impacts of Climate Change on Health". Retrieved from https://nicholas.duke.edu/sites/default/files/documents/Shindell_Testimony_July2020_final.pdf

Siler-Evans, K., Azevedo, I. L., Morgan, M. G., & Apt, J. (2013). Regional Variations in the Health, Environmental, and Climate Benefits of Wind and Solar Generation. Proceedings of the National Academy of Sciences, 110(29), 11768-11773. doi:10.1073/pnas.1221978110

Sridhar, L., & Lewis, C. (2020, May 28). Unintended Consequences of not Aligning Metrics with Program Goals. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from

https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_Mtg_6_Full_Slides_692817_7.pdf

Stanton, T. (2020a, May 14). Facilitating Utility and Regulatory Innovation: Implementing Hubs, Links, Sandboxes, and More. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_May_14_Presentation_Slides_691441_7.pdf

Stanton, T. (2020b, February 27). Summary of Grid Mod Programs Nationally. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/Full_Presentation_Deck_-_2-27-2020_682655_7.pdf

State of California Public Utilities Commission. (2014, May 5). Decision 14-05-016. Retrieved from http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M090/K845/90845985.PDF

State of New York Public Service Commission. (2014, December 12). Case 14-M-0101: Memorandum and Resolution on Demonstration Projects. Retrieved from http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7bA846946F-6C99-40A2-8CFC-B2EB0CC5AC9A%7d

State of New York Public Service Commission. (2015, February 26). Case 14-M-0101 - Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision. Order Adopting Regulatory Policy Framework and Implementation Plan. Retrieved from http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={0B599D87-445B-4197-9815-24C27623A6A0}

Talberg, S. A., Scripps, D. C., & Phillips, T. L. (2020). Michigan Public Service Commission 2019 Annual Report. Retrieved from https://www.michigan.gov/documents/mpsc/2019_Final_MPSC_Annual_Report_-_030220_682519_7.pdf

Teletzke, G. F., Wattenbarger, R. C., & Wilkinson, J. R. (2010). Enhanced Oil Recovery Pilot Testing Best Practices. SPE Reservoir Evaluation & Engineering, 13(01), 143-154.

Tesar, J. (2020, June 25). Emerging Technologies: Candidates for Michigan's Grid. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_June_25_Slides_695381_7.pdf

Todd-Blick, T. (2020, February 27). Utility Pilots: Issues and Best Practices. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/Full_Presentation_Deck_-_2-27-2020_682655_7.pdf

Trabish, H. K. (2017, September 21). Reporter's Notebook: Utility Pilot Projects Could Soothe Contentious Regulatory Proceedings Retrieved from https://www.utilitydive.com/news/reporters-notebook-utility-pilot-projects-could-soothe-contentious-regula/504709/

Tweed, K. (2012, October 29). Just Say "No" to Utility Pilot Programs. Retrieved from https://www.greentechmedia.com/articles/read/just-say-no-to-utility-pilot-programs

U.S. Energy Information Administration. (2020a). Annual Energy Outlook 2020. Retrieved from https://www.eia.gov/outlooks/aeo/pdf/AEO2020%20Full%20Report.pdf

U.S. Energy Information Administration. (2020b, July 1). Nonfossil Sources Accounted for 20% of U.S. Energy Consumption in 2019. Today in Energy. Retrieved from https://www.eia.gov/todayinenergy/detail.php?id=44277

U.S. Energy Information Administration. (2020c, May 20). State Carbon Dioxide Emissions from Fossil Fuels Tables: Michigan. . Energy-Related CO2 Emission Data Tables. Retrieved from https://www.eia.gov/environment/emissions/state/

U.S. Energy Information Administration. (2020d). State Energy Consumption Estimates 1960 through 2018. (DOE/EIA-0214(2018)). Retrieved from https://www.eia.gov/state/seds/archive/seds2018.pdf

U.S. Energy Information Administration. (2020e, May 28). U.S. Renewable Energy Consumption Surpasses Coal for the First Time in Over 130 years. Today in Energy. Retrieved from https://www.eia.gov/todayinenergy/detail.php?id=43895

USGCRP. (2017). Climate Science Special Report: Fourth National Climate Assessment, Volume I. Retrieved from U.S. Global Change Research Program website: https://www.globalchange.gov/browse/reports/climate-science-special-report-fourth-national-climate-assessment-nca4-volume-i

Vavrus, S., Notaro, M., & Zarrin, A. (2013). The Role of Ice Cover in Heavy Lake-effect Snowstorms Over the Great Lakes Basin as Simulated by RegCM4. Monthly Weather Review, 141(1), 148-165.

Walter, J. (2020, May 14). I&M Pilot Case Study. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_May_14_Presentation_Slides_691441_7.pdf

Wang, J. (2020, June 25). Pilot Ideas from Other MI Power Grid Workgroups. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_June_25_Slides_695381_7.pdf

Westlund, E., & Stuart, E. A. (2017). The Nonuse, Misuse, and Proper Use of Pilot Studies in Experimental Evaluation Research. American Journal of Evaluation, 38(2), 246-261.

Williams, S. (2020, June 25). Pilot Program Importance & Best Practices. MI Power Grid Energy Programs and Technology Pilots Workgroup Stakeholder Series. Retrieved from https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_June_25_Slides_695381_7.pdf

Wright, D. M., Posselt, D. J., & Steiner, A. L. (2013). Sensitivity of Lake-effect Snowfall to Lake Ice Cover and Temperature in the Great Lakes Region. Monthly Weather Review, 141(2), 670-689.

Appendix A: Stakeholder Meeting Summaries by Date

A-1. February 27, 2020 (Presentation Slides | Recording)

Commissioner Tremaine Phillips and Anne Armstrong-Cusack, MPSC Customer Assistance Division Director, provided opening statements. Tom Stanton (National Regulatory Research Institute) presented a national overview of state grid modernization programs and actions, including pilot projects. He introduced the concept of a "regulatory sandbox," an innovation framework providing regulatory oversight and flexibility to demonstrate new technologies and business models.

Next, Staff provided an overview of the MI Power Grid and the Energy Programs and Technology Pilots workgroup goals. This was followed by results from Staff's MPSC case review, intended to investigate Commission approved pilots since 2008, and utility survey, to learn from past and ongoing utility pilots. Consumers Energy, DTE, and I&M discussed their pilot definitions and pilot processes, followed by presentations by Annika Todd-Blick (Lawrence Berkeley National Lab) and Nekabari Goka (Oracle) on pilot best practices.

Consumers Energy, DTE, and I&M representatives as well as Jeremy Kraft (EMI Consulting) and Amy Ellsworth (Cadmus) presented feedback on workgroup process and content before a discussion.

A-2. April 16, 2020 (Presentation Slides | Recording)

The second stakeholder meeting was the first via teleconference. Soren Anderson, Jan Beecher, and Justin Kirkpatrick (Michigan State University) presented an academic perspective of designing and evaluating utility pilot projects. Marco Padula (New York State Department of Public Service) discussed the Reforming the Energy Vision initiative and learnings. In his presentation *Bridging the Chasm: From Pilots to Full-Scale Deployments*, Ahmad Faruqui (Brattle Group) discussed the history, implementation, and benefits of time-of-use rates.

A-3. April 30, 2020 (Presentation Slides | Recording)

Sanem Sergici (Brattle Group) and Stephen George (Nextant) discussed pilot design and best practices. Ben Dueweke (Walker-Miller Energy Services) overviewed pilot best practices from Detroit community-based energy waste reduction project focused on intentional community engagement.

A-4. May 14, 2020 (Presentation Slides | Recording)

Tom Stanton (NRRI) spoke on facilitating innovation through innovation platforms. Utility representatives from Consumers Energy, DTE, and I&M presented pilot case studies to share their pilot processes and to share the learnings from pilots, regardless of whether they moved on to become full programs or not. Douglas Jester discussed pilot agility and prudence. Lastly, a panel composed of Ryan Kiley (Consumers Energy), Camilo Serna (DTE Electric), and Andrew Williamson (I&M) discussed balancing agility and accountability.

A-5. May 28, 2020 (Presentation Slides | Recording)

A panel discussion entitled "Reflections on Pilot Best Practices Recommendations, and Path Forward" occurred. Panelists were Ryan Kiley (Consumers Energy), Camilo Serna (DTE), Laura Sherman (Michigan EIBC), Wayne Snyder (NextEnergy) and Andrew Williamson (I&M). MPSC staff, Joy Wang,

moderated. The panelists' discussed pilot areas such as stakeholder input, objective criteria fitting all pilots, marketing strategy, partnering with third parties, reporting results, and Commission guidance. Pete Cappers (Lawrence Berkeley National Lab) presented on the benefits and considerations of making pilot data publicly available. Karen Gould (MPSC) shared Staff's review of Energy Waste Reduction (EWR) Pilot Annual Reports and where EWR pilot information reported to the Commission can be found. Lastly, Lekha Sridhar and Christy Lewis (WattTime) discussed the unintended consequences of not aligning metrics with program goals. It is important to be clear about a pilot's objectives and how success will be measured.

A-6. June 11, 2020 (Presentation Slides | Recording)

A panel discussed *Community Pilot Experience, Best Practices, and Strategic Plans*. The panelists were Sergio Cira-Reyes (Urban Core Collective), Jan Culbertson (Ann Arbor 2030 District), Robert LaFave (Village of L'Anse), Amy Roth (City of Three Rivers), and Alison Sutter (City of Grand Rapids). Sarah Mills (University of Michigan) moderated a discussion on the local government point of view on topics like clean energy, community engagement, past and future pilots, equity considerations, and how utilities can assist in meeting strategic goals. Brad Fingland and Paul Jaques (MSU Innovation Center-Spartan Innovations) shared examples of energy start-ups supported by the MSU Foundation efforts. They shared ways to help address challenges faced by Michigan energy entrepreneurs. Lastly, Staff lead Joy Wang gave an update on the Staff report timeline and the next scheduled meeting.

A-7. June 25, 2020 (Presentation Slides | Recording)

Commissioner Tremaine Phillips provided opening statements. Afterward, a panel on *Emerging Integrated Solutions* with Greg Bolino (Accenture), Greg Geller (EnelX), Ric O'Connell (GridLab), moderated by Ryan Katofsky (AEE), discussed how Michigan can take advantage of future distributed resources with price signals and additional flexibility. A second panel on *Michigan Project Examples* encouraged community involvement and a more individualistic integration from panelists Matt Grocoff (THRIVE Collaborative) and Gibran Washington (EcoWorks). Joe Tesar (Quantalux) presented on future pilot ideas, followed by *Pilot Program Importance and Best Practices* from Sean Williams (CLEAResult). Joy Wang (MPSC) presented pilot ideas from other MI Power Grid workgroups. Lastly, Marilyn Brown (Georgia Institute of Technology) shared strategies for reducing carbon emissions in Michigan based on the Drawdown Georgia analysis. Anne Armstrong-Cusack (MPSC) provided closing statements.

Appendix B: Stakeholder Meeting Agendas

Appendix B-1. February 27, 2020 Stakeholder Meeting

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
PUBLIC SERVICE COMMISSION

ORLENE HAWKS
DIRECTOR

SALLY A. TALBERG
CHAIRMAN

DANIEL C. SCRIPPS
COMMISSIONER

TREMAINE L. PHILLIPS
COMMISSIONER

MI Power Grid Energy Programs and Technology Pilots
Stakeholder Meeting

Thursday, February 27, 2020
9:00 a.m. - 4:00 p.m.
Lake Michigan Hearing Room, Michigan Public Service Commission

Map to MPSC Offices: 7109 West Saginaw Highway, Lansing, MI 48917

Join Skype Meeting
Join by phone: +1 248-509-0316; 956637779 # (Dial-in Number)

Agenda Items		
9:00 a.m.	Welcome & Introduction	Tremaine Phillips, MPSC Commissioner Anne Armstrong-Cusack, Director, MPSC Customer Service Division
9:20 a.m.	Summary of Grid Mod Programs Nationally	Tom Stanton, NRRI
9:40 a.m.	MI Power Grid Summary, Tasks, & Timeline	Kayla Fox, MPSC Staff
9:50 a.m.	MPSC Case Review & Utility Survey Results	Joy Wang, MPSC Staff
10:05 a.m.	Break	
10:15 a.m.	Current Pilot Processes (25 min each)	Consumers, DTE, & Indiana Michigan Power
11:30 a.m.	Utility Pilots: Issues and Best Practices Part 1	Annika Todd-Blick, LBNL
12:00 p.m.	Lunch on Your Own (Shove It Pizza Truck onsite)	
1:00 p.m.	Utility Pilots: Issues and Best Practices Part 2	Annika Todd-Blick, LBNL
1:30 p.m.	From Pilot to Product: Viewpoints on Utility Pilot Design	Nekabari Goka, Oracle
2:00 p.m.	Utility/Stakeholder Input on Process and Content (10 min each)	DTE Indiana Michigan Power Tamara Dzubay, Ecobee
2:30 p.m.	Break	
2:45 p.m.	Utility/Stakeholder Input on Process and Content (10 min each)	Consumers Energy Jeremy Kraft, EMI Consulting Amy Ellsworth, Cadmus
3:25 p.m.	Discussion: Workgroup Process and Content	Moderated by MPSC Staff
3:55 p.m.	Closing Comments	Joy Wang, MPSC Staff
4:00 p.m.	Adjourn	

Coffee and tea will be provided. To reduce waste, please consider bringing your own reusable cup.

Appendix B-2. April 16, 2020 Stakeholder Meeting

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
PUBLIC SERVICE COMMISSION

ORLENE HAWKS
DIRECTOR

SALLY A. TALBERG
CHAIRMAN

DANIEL C. SCRIPPS
COMMISSIONER

TREMAINE L. PHILLIPS
COMMISSIONER

MI Power Grid Energy Programs and Technology Pilots
Stakeholder Meeting
Thursday, April 16, 2020
10:00 a.m. - 12:00 p.m.

Via Teleconference Only

Join Microsoft Teams meeting here
Join by phone: +1 248-509-0316; Conference ID: 586 411 276#

Agenda Items		
10:00 a.m.	Welcome & Overview of Last Meeting	Joy Wang, MPSC Staff
10:05 a.m.	Designing and Evaluating Utility Pilot Projects: an Academic Perspective	Soren Anderson, Jan Beecher, and Justin Kirkpatrick, Michigan State University
10:15 a.m.	REV Demos – Process and Experience	Marco Padula, New York State Department of Public Service
10:55 a.m.	Bridging the Chasm: From Pilots to Full-Scale Deployments	Ahmad Faruqui, Brattle
11:55 a.m.	Closing Comments	Joy Wang, MPSC Staff
12:00 p.m.	Adjourn	

Appendix B-3. April 30, 2020 Stakeholder Meeting

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
PUBLIC SERVICE COMMISSION

ORLENE HAWKS
DIRECTOR

SALLY A. TALBERG
CHAIRMAN

DANIEL C. SCRIPPS
COMMISSIONER

TREMAINE L. PHILLIPS
COMMISSIONER

MI Power Grid Energy Programs and Technology Pilots
Stakeholder Meeting
Thursday, April 30, 2020
2:00 p.m. - 4:30 p.m. Eastern

Via Teleconference Only

Join Microsoft Teams meeting here
Join by phone: +1 248-509-0316; Conference ID: 358 351 972#

Agenda Items		
2:00 p.m.	Welcome & Overview of Last Meeting	Joy Wang, MPSC Staff
2:05 p.m.	Pilot Design Best Practices and Lessons Learned from Pricing and Technology Pilots	Sanem Sergici, Brattle
3:05 p.m.	Industry Insights: Pilot Design and Best Practices	Stephen George, Nexant
4:05 p.m.	Community EWR Pilots in Detroit	Ben Dueweke, Walker-Miller Energy Services
4:15 p.m.	Closing Comments	Joy Wang, MPSC Staff
4:30 p.m.	Adjourn	

Appendix B-4. May 14, 2020 Stakeholder Meeting

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
PUBLIC SERVICE COMMISSION

ORLENE HAWKS
DIRECTOR

SALLY A. TALBERG
CHAIRMAN

DANIEL C. SCRIPPS
COMMISSIONER

TREMAINE L. PHILLIPS
COMMISSIONER

MI Power Grid Energy Programs and Technology Pilots Stakeholder Meeting

Thursday, May 14, 2020
1:00 – 3:30 p.m.

Via Teleconference Only

Join Microsoft Teams meeting here
Join by phone: +1 248-509-0316; Conference ID: 300 157 48#

Agenda Items		
1:00 p.m.	Welcome & Overview of Last Meeting	Joy Wang, MPSC Staff
1:05 p.m.	Facilitating Utility and Regulatory Innovation: Implementing Hubs, Links, Sandboxes, and More	Tom Stanton
1:35 p.m.	Utility Pilot Definitions: Case Studies	Consumers: Emily McGraw & Heather Prentice DTE: Keegan Farrell & Richard Mueller I&M: Jon Walter
2:35 p.m.	Agility, Prudence, and the Commission's Approach to Pilot Projects	Douglas Jester
2:45 p.m.	Panel: Agility and Accountability	Consumers Energy: Ryan Kiley DTE: Camilo Serna I&M: Andrew Williamson Moderated by MPSC Staff
3:25 p.m.	Closing Comments	Joy Wang, MPSC Staff
3:30 p.m.	Adjourn	

Appendix B-5. May 28, 2020 Stakeholder Meeting

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
PUBLIC SERVICE COMMISSION

ORLENE HAWKS
DIRECTOR

SALLY A. TALBERG
CHAIRMAN

DANIEL C. SCRIPPS
COMMISSIONER

TREMAINE L. PHILLIPS
COMMISSIONER

MI Power Grid Energy Programs and Technology Pilots Stakeholder Meeting

Thursday, May 28, 2020
1:30 p.m. - 4:00 p.m.

Via Teleconference Only

Join Microsoft Teams meeting here
Join by phone: +1 248-509-0316; Conference ID: 606 661 731#

Agenda Items		
1:30 p.m.	Welcome & Overview of Last Meeting	Joy Wang, MPSC Staff
1:35 p.m.	Panel: Reflections on Pilot Best Practices, Recommendations, and Path Forward	Panelists: Ryan Kiley (Consumers) Camilo Serna (DTE) Laura Sherman (MiEIBC) Wayne Snyder (NextEnergy) Andrew Williamson (I&M) Moderator: MPSC Staff
2:35 p.m.	Break	
2:45 p.m.	Making Pilot Data Publicly Available: Experiences and Opportunities	Peter Cappers (Lawrence Berkeley National Lab)
3:15 p.m	MPSC EWR Pilot Annual Report Review	Karen Gould (MPSC Staff)
3:45 p.m.	Unintended Consequences of not Aligning Metrics with Program Goals	Lekha Sridhar and Christy Lewis (WattTime)
3:55 p.m.	Closing Statements	Joy Wang, MPSC Staff
4:00 p.m.	Adjourn	

Appendix B-6. June 11, 2020 Stakeholder Meeting

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
PUBLIC SERVICE COMMISSION

ORLENE HAWKS
DIRECTOR

SALLY A. TALBERG
CHAIRMAN

DANIEL C. SCRIPPS
COMMISSIONER

TREMAINE L. PHILLIPS
COMMISSIONER

MI Power Grid Energy Programs and Technology Pilots Stakeholder Meeting

Thursday, June 11, 2020
1:30 p.m. - 3:45 p.m.

Via Teleconference Only

Join Microsoft Teams meeting here
Join by phone: +1 248-509-0316; Conference ID: 607 378 743#

Agenda Items		
1:30 p.m.	Welcome & Overview of Last Meeting	Joy Wang, MPSC Staff
1:35 p.m.	Panel: Community Pilot Experience, Best Practices, and Strategic Plans	Panelists: Sergio Cira-Reyes (Urban Core Collective) Jan Culbertson (Ann Arbor 2030 District) Robert LaFave (Village of L'Anse) Amy Roth (City of Three Rivers) Alison Sutter (City of Grand Rapids) Moderator: Sarah Mills (University of Michigan)
2:50 p.m.	Break	
3:00 p.m.	TBD	Brad Fingland and Paul Jaques (MSU Innovation Center – Spartan Innovations)
3:30 p.m.	Staff Report Timeline	MPSC Staff
3:40 p.m.	Closing Statements	Joy Wang, MPSC Staff
3:45 p.m.	Adjourn	

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Appendix B-7. June 25, 2020 Stakeholder Meeting

GRETCHEN WHITMER
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS
PUBLIC SERVICE COMMISSION

ORLENE HAWKS
DIRECTOR

SALLY A. TALBERG
CHAIRMAN

DANIEL C. SCRIPPS
COMMISSIONER

TREMAINE L. PHILLIPS
COMMISSIONER

MI Power Grid Energy Programs and Technology Pilots Stakeholder Meeting

Thursday, June 25, 2020
1:00 p.m. - 4:00 p.m.

Via Teleconference Only

Join Microsoft Teams meeting here
Join by phone: +1 248-509-0316; Conference ID: 126 927 161#

Agenda Items		
1:00 p.m.	Welcome & Overview of Last Meeting	Joy Wang (MPSC Staff)
1:05 p.m.	Opening Statements	Tremaine Phillips (MPSC Commissioner)
1:15 p.m.	Panel: Direction for Future Pilots	*Part I: Emerging Integrated Solutions* Panelists: Greg Bolino (Accenture) Greg Geller (EnelX) Ric O'Connell (GridLab) Moderator: Ryan Katofsky (AEE) *Part II: Michigan Project Examples* Panelists: Matt Grocoff (THRIVE Collaborative) Gibran Washington (EcoWorks) Moderator: Laura Sherman (Michigan EIBC)
2:15 p.m.	Flex Time/Break	
2:30 p.m.	Emerging Technologies: Candidates for Michigan's Grid	Joe Tesar (Quantalux)
2:40 p.m.	Pilot Program Importance & Best Practices	Sean Williams (CLEAResult)
2:50 p.m.	Pilot Ideas from Other MI Power Grid Workgroups	Joy Wang (MPSC Staff)
3:00 p.m.	Break	
3:05 p.m.	Identifying the Most Promising Solutions for Reducing Carbon Emissions in Michigan: Lessons from Drawdown Georgia	Marilyn Brown (Georgia Institute of Technology)
3:50 p.m.	Closing Statements	Anne Armstrong (MPSC, Director, Customer Assistance Division)
3:55 p.m.	Timeline and Next Steps	Joy Wang (MPSC Staff)
4:00 p.m.	Adjourn	

Appendix C: Utility Survey

UTILITY PILOT SURVEY

MI Power Grid is a focused, multi-year stakeholder initiative supported by Governor Whitmer and the Michigan Public Service Commission (MPSC) to maximize the benefits of the transition to clean, distributed energy resources for Michigan residents and businesses. Visit the MI Power Grid website for more information. As part of the initiative, the Energy Programs and Technology Pilots workgroup will initiate a stakeholder process, investigate past MPSC actions, and look at best practices to propose objective criteria for Commission/Staff to utilize when evaluating proposed utility pilot projects.

We seek your assistance in creating a pilot framework that has the input of utilities and stakeholders. Your participation is greatly appreciated, as your responses to the following survey will help Staff understand your company's previous pilots and inform the planning of future stakeholder meetings for this workgroup. Please respond either by typing directly within this document in the space provided after each prompt or by creating a new MS Word document. Please submit completed surveys to Joy Wang at wangj3@michigan.gov by **January 24, 2020**.

1. Excluding energy waste reduction pilots, please provide a list of pilot projects since 2008. Include the following information in your list:
    a. MPSC case number and year of approval, if applicable
    b. Years pilot was conducted (start and end dates)
    c. Brief scope of work
    d. Approved and actual pilot cost
    e. Any reporting requirements for the pilot
    f. Brief summary of findings
    g. Did pilot move to become a permanent program (Y/N)?
    h. Staff contact (name and email)

2. For energy waste reduction pilots, please provide a list of pilots since 2008 that cost $1 million or more. Include the following information in your response:
    a. MPSC case number and year of approval, if applicable
    b. Years pilot was conducted (start and end dates)
    c. Brief scope of work
    d. Approved and actual pilot cost
    e. Any reporting requirements for the pilot
    f. Brief summary of findings
    g. Did pilot move to become a permanent program (Y/N)?
    h. Staff contact (name and email)

3. For each of the following areas (a-d), please list at least one MPSC approved pilot that your company is willing to share with stakeholders and Commission staff. If your company does not have any pilots in a category, state "N/A." Please also list the preferred staff contact.

   Note: The pilots listed need not have successfully evolved into full-scale programs. We understand that many lessons can be learned even when a pilot fails to come to fruition. Also, for each pilot listed below, please be willing to discuss topics at the workgroup meeting such as the origination of the pilot concept, development process, implementation process, findings and programmatic implications, and any other lessons learned.

   a. Customer Service Pilots
   b. Innovative Rate Offering Pilots
   c. Distributed Technology and Microgrid Pilots
   d. Technology Demonstration Pilots

4. If your company has a general process when developing and evaluating pilots, please describe it. Please include in your description how your company does the following:

   a. Defines pilot objectives
   b. Evaluates success for the pilot
   c. Uses cost-benefit analysis
   d. Determines when to stop a pilot program
   e. Varies from the general process, if ever, and why

5. Does your company solicit feedback from customers throughout the pilot development and implementation process? If so, please describe how.

6. How do you normally engage with Commission staff and outside stakeholders throughout pilot development and implementation?

7. Does your company use internal criteria for advancing a pilot project into multiple years or transitioning it to a permanent program? If so, please share the criteria used.

8. How does your company share pilot findings internally with staff and externally with the Commission or other interested stakeholders? Please describe.

9. Has your company shared any pilot findings with other Michigan utilities? If so, did other utilities request the information? If they did not request the information, please describe how your company came to share pilot findings.

10. Has your company ever requested information about a pilot from another utility, co-operative, or municipality? If so, please describe.

11. What questions regarding your pilots do you most receive from the following groups? Please list the questions you receive in accordance with each group.

    a. Other utilities
    b. Stakeholders
    c. Commission staff
    d. Customers

12. What future pilot projects does your company have planned? Please be descriptive.

13. If there are other individuals you would like included on future communications from Commission staff regarding the Energy Programs and Technology Pilots workgroup, please provide the staff names and emails.

Thank you for your time.

We look forward to receiving your responses and working with your company and other stakeholders to create a pilot framework for Michigan utilities.

Appendix D: Stakeholder Survey

Energy Programs & Technology Pilots

Stakeholder Process, Pilot Best Practices, & New Pilot Areas Survey

This survey is to capture additional stakeholder feedback, as stakeholders may have had less opportunity during the online meetings to provide comments. Please share your thoughts on pilot best practices, future pilot areas, and the stakeholder process in this survey.

This first section focuses on your experiences with the stakeholder process.

1. Which of the stakeholder meetings did you attend? Please select all stakeholder meetings you attended.

- [ ] February 27
- [ ] April 16
- [ ] April 30
- [ ] May 14
- [ ] May 28
- [ ] June 11
- [ ] June 25

2. The stakeholder meetings were effective.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

3. Did the stakeholder process meet your expectations? Why or why not?

Appendix D: Stakeholder Survey, continued

4. What elements of the stakeholder process could have been improved?

Next

Energy Programs & Technology Pilots

Stakeholder Process, Pilot Best Practices, & New Pilot Areas Survey

Please share your thoughts on pilot best practices in this section.

5. Stakeholder input is important in developing pilot proposals.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

6. Equitable pilot program design and outreach is important in developing pilot proposals.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

7. Customer focused utility pilots should examine race, socioeconomic, and locational variables when evaluating program effectiveness in reaching customer groups.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

Appendix D: Stakeholder Survey, continued

8. Formal pilot reporting to MPSC dockets should be required to assess inclusion of pilot best practices and accountability.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

9. Utility pilots should provide documentation demonstrating the use of pilot best practices and accountability.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

10. When utility pilots evolve during implementation, documentation should be provided to demonstrate adherence to the pilot goals.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

11. Pilot data should be shared publicly so others can analyze the data and possibly distill new learnings.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

12. If pilot data is publicly available, it should be aggregated so customer data is protected.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
○	○	○	○	○

13. What do you believe are the most important pilot best practices that should be included in a list of objective criteria that applies to all pilots?

14. If you have other thoughts on pilot best practices you'd like to share, please input it here.

Appendix D: Stakeholder Survey, continued

Prev Next

Energy Programs & Technology Pilots

Stakeholder Process, Pilot Best Practices, & New Pilot Areas Survey

Please share your thoughts on guidance and new pilot areas in this section.

15. What type of strategic guidance regarding pilots would you like to see from the Commission?

16. What pilot areas do you believe should be a focus in the future? Why?

17. Are there any specific utility pilots that you'd like to see in Michigan that we did not discuss? Why?

Prev Done

Appendix E: Stakeholder Survey – Summary of Results

E-1. Stakeholder Survey on Pilot Best Practices and Future Pilots

With the transition from in-person stakeholder meetings to online meetings due to the COVID-19 pandemic, Staff recognized that stakeholders may have had less opportunity to provide comments during the remote meetings. For stakeholders interested in sharing their thoughts on pilot best practices, future pilot areas, and the stakeholder process, Staff created a survey that was sent via the workgroup listserv on July 1, 2020. See Appendix D for the survey.

A total of 450 individuals subscribe to the Energy Programs and Technology Pilots workgroup listserv. Of these, 444 have working emails. Nine stakeholders responded to the stakeholder survey (2% response rate) over a 26-day period. The survey results are summarized below.

E-2. Stakeholder Satisfaction with the Stakeholder Process

Seven out of nine respondents either agreed or strongly agreed that the workgroup stakeholder process met their expectations. However, several challenges were noted. Though many acknowledged the smooth transition to remote meetings during the pandemic, several missed the free-flowing dialogue with Staff and speakers during in-person meetings that could not be duplicated in the remote format. Respondents noted the wide breadth of information covered, but some desired additional specifics on pilot programs or additional meetings with Staff to digest meeting content, especially near the end of the series.

Lastly, difficulties with stakeholder awareness and ability to engage were noted. Greater promotion of the workgroup series may have been beneficial. One respondent was not aware of the series at all, likely accessing the survey through an associate. Another suggested more broadly promoting the MI Power Grid stakeholder series, such as through posting the information on customer electricity bills. However, knowledge of the stakeholder series does not necessarily translate to engagement. One respondent noted the overwhelming number of MI Power Grid engagement opportunities that made active participation for public or small organizations difficult.

E-3. Stakeholder Comments and Recommendations on Pilot Best Practices

There was strong stakeholder agreement that:

- Stakeholder input and equitable pilot program design and outreach are important in developing pilot proposals,
- Customer focused utility pilots should examine race, socioeconomic, and locational variables when evaluating program effectiveness in reaching customer groups, and
- If pilot data is publicly available, it should be aggregated to protect customer data.

Though the majority agreed, at least one respondent disagreed on the following statements:

- Formal pilot reporting to MPSC dockets should be required to assess inclusion of pilot best practices and accountability,
- Utility pilots should provide documentation demonstrating the use of pilot best practices and accountability,

- When utility pilots evolve during implementation, documentation should be provided to demonstrate adherence to the pilot goals, and
- Pilot data should be shared publicly so others can analyze the data and possibly distill new learnings.

Stakeholders noted the following as important pilot best practices to include in a list of objective criteria:

- Pilot opportunity, justification, and need stated
- Pilot goals defined,
- Anticipated results shared,
- Stakeholder outreach and inclusion from pilot design, implementation, and evaluation
- Pilot timeline
- Metrics to track pilot progress on areas such as:
    - Environmental impact
    - Stakeholder engagement
    - Community impact
- Independent and objective evaluations of utility pilot programs
- Any publicly shared pilot data requirement should consider customer concerns

Respondents noted the importance of any adopted criteria in allowing utility flexibility and autonomy to manage pilots and to respond to situational changes in achieving pilot learnings. Another note was the importance of sharing results from other, similar pilots when justifying the need for a novel pilot, considering that existing pilots may be adapted instead of starting a pilot from scratch. Lastly, respondents stressed the importance of utility funding and incentives for pilots.

E-4. Stakeholder Recommendations on Commission Guidance

Stakeholder respondents had several recommendations regarding Commission pilot guidance. They recommended that the Commission:

- provide guidance regarding areas of concern or interest that pilots may address,
- detail their expectations or standards for pilot performance,
- provide opinions on next steps if an initial pilot fails to meet Commission standards of pilot performance,
- require adherence to a clear outline of pilot best practices that provides flexibility for varied pilot types, and
- request a thorough review of prior pilots of a similar nature be provided in pilot submissions.

There were also recommendations on further Commission stakeholder engagement to:

- educate stakeholders on energy options such as:
    - alternative energy resources supporting great environmental stewardship like solar, wind, and pedal power,
    - resiliency measures such as electromagnetic pulse protections.
- converse in informal small group settings to share Commissioners' thoughts.

E-5. Current and Future Pilot Areas of Interest to Stakeholders

Stakeholder respondents expressed interest in the following current and future pilot areas and programs:

- Customer service,
- Distributed generation,
- Electromagnetic pulse protection,
- Energy waste reduction,
- Electric vehicles,
- Performance based metrics,
- Renewable energy,
- Residential energy generation assisting the broader community,
- Resiliency measures, such as backup power in response to severe weather,
- Time-of-use and other time-varying incentives, and
- Utility infrastructure.

Respondents expressed interest in additional variables being included in pilot analysis as well as the analysis of additional pilot impacts. They recommended the following metrics be analyzed in future pilots:

- non-energy impacts, such as environmental and societal impacts (e.g. equity, jobs, health, and safety),
- systems or holistic view of pilots examining the interaction of multiple pilots, and
- pilot variables like housing type (i.e. age and upkeep) effects on results.

Appendix F: Stakeholder Comments on Draft Staff Report

Appendix F-2. Consumers Energy Comments

Customer Program and Technology Pilots Workgroup – Comments on Draft Report
August 17, 2020

Consumers Energy
Count on Us®

BACKGROUND

The Michigan Public Service Commission ("Commission") established MI Power Grid in October 2019 as a multi-year stakeholder initiative designed to maximize the benefits of the transition to clean, distributed energy resources for Michigan customers. MI Power Grid was established with three foundational pillars: 1) customer engagement; 2) integrating emerging technologies; and 3) optimizing grid investments and performance.

The Energy Programs and Technology Pilots workgroup began in February 2020, and was designed to address the following MPSC objectives:

- Investigate past Commission-approved pilots
- Understand outcomes and apply lessons learned from existing pilot projects
- Identify pilot best practices
- Propose objective criteria for the Commission to use when evaluating proposed utility pilot projects

Consumers Energy appreciates the opportunity to participate in this workgroup seeking stakeholder input on these topics and looks forward to continued partnership with the MPSC on potential changes that will enable successful outcomes for future utility pilots.

CONSUMERS ENERGY'S PILOT OBJECTIVES

Consumers Energy supports changes to the regulatory construct that:

- Ensure pre-approved and flexible use of funding for utility pilots;
- Allow emerging programs and technologies to be delivered to customers in an expeditious manner;
- Promote agility and flexibility to allow pilots to evolve within the defined learning outcomes.

Consumers Energy believes changes are needed from today's construct to successfully deploy pilots quickly and effectively. Today, the time required to deploy new and innovative customer solutions – moving from ideation, to rate case approval of a pilot, and then (if pilot warrants) to rate case approval supporting potentially moving to a full program – can take 2-3+ years. In reviewing Staff's draft report, it is not clear that any changes are being proposed that would achieve Consumers Energy's desired outcomes as stated above.

Applying an approach like that used for Energy Waste Reduction ("EWR") pilots, including consistent funding, incentives, and a flexible process, can be used to

advance these objectives. For example, use of an EWR-like pilot approach for demand response and certain other types of pilots would be supported by the company. Specifically, a pilot process could be designed to include predictable reconciliation and evaluation processes on a periodic basis (such as semi-annually) that allows the Commission to review pilots for prudency on the back end. This approach promotes transparency and offers flexibility for utilities to iterate on a pilot and achieve the learning objectives. Pilots offer utilities a valuable opportunity to experiment with new technologies and programs – it is important to note that not all pilots will necessarily lead to the creation of a new utility program, and not all pilots will necessarily be cost effective.

While utilizing an EWR-like approach may help ensure the timely deployment of utility pilots, the use of utility rate cases and other regulatory filings should continue to be an option to receive Commission approval and authorization, in order to maintain flexibility and consideration of broader objectives. There are benefits to having different pathways for pilots – an EWR-like approach leads to speed and agility in pilot deployment, while approvals through rate case processes can be used to incorporate objective criteria and increased stakeholder engagement, consistent with Staff's recommendations. It may be possible to delineate the types of pilots that might go through each of these pathways based on scope, funding level, or number of customers impacted.

OTHER REPORT THEMES

Definitions: Staff's report proposes the following pilot definition: "A pilot is a limited duration experiment to determine the impact of an intervention on one or more outcomes of interest."

Consumers Energy supports Staff's proposed definition. One term it may be beneficial to provide clarity on is "limited". "Limited" duration may vary widely based on the type of pilot. For certain pilot types, three months may be considered limited, whereas in other cases, a year or 18 months could be considered limited.

Objective Criteria: Consumers Energy agrees with Staff and stakeholders that, in many cases, learning objectives can be shared earlier in the development of utility pilots. One option would be for utilities to file forward-looking pilot plans which contain the types of pilots the company expects to conduct, learning objectives for each pilot category, and potential longer-term benefits from the suite of pilots being conducted.

Overall, the objective criteria recommended imply a "one-size-fits-all" approach to utility pilots. It is helpful to start applying a standard lens around utility pilots, but not all recommendations may be effectively applied to all pilots. There should be some flexibility afforded to look and apply the objective criteria on a case-by-case basis depending on the scope and objectives of the pilot.

Objective Criteria 1: Clear pilot need and goals.

Consumers Energy supports the recommendation.

Objective Criteria 2: Pilot design and evaluation plan designed and presented together.

Consumers Energy agrees that these are important elements to consider in pilot deployment. Certain high-level design and evaluation elements can be relatively easily shared upfront. It may be more prudent to share additional design and evaluation details later in the process so that pilots are not slowed down upfront.

In the case of EWR pilots, the rigorous evaluation methods are warranted because of the consistent funding source and policy support to do so. Not all pilots will have statistically significant sample sizes and methods, which would warrant larger and more consistent funding for these pilots. It is especially hard to conduct pilots with large sample sizes on the commercial and industrial side, which would be highly costly and impactful to these customers.

Objective Criteria 3: Pilot project costs detailed.

Some of these requirements would be contrary to Consumers Energy's pilot objectives. First, while government funds can be a good resource and Consumers Energy does pursue these opportunities, grant criteria may not always align with Consumers Energy's learning objectives and pursuing these funds may impact the ability to move quickly in pilot deployment.

Secondly, it may not be possible to prove cost-effectiveness during the pilot stage. Pilots are rarely cost-effective because of scale. There can be a large difference between what is considered a pilot for purposes of evaluating new technologies, versus programs or offerings that the utility is simply making available for the first time. **A pilot is focused on learning rather than necessarily being cost-effective, and a pilot should contain a test plan rather than a business case**. There could be other instances where the utility is simply doing something for the first time, where a business case should be included with proven cost-effectiveness and customer value. Cost-effective considerations are more appropriate when evaluating programs at scale.

Objective Criteria 4: Project timeline detailed.

Consumers Energy supports the recommendation.

Objective Criteria 5: Stakeholders engaged.

Consumers Energy agrees that stakeholder engagement is critical, and does consult with vendors, utility peers, customer groups, and others in development of new pilots and products.

While stakeholder engagement should be conducted in some pilots, particularly large-scale pilots with the potential to significantly impact a large number of customers, it is important that the rigorous stakeholder engagement being

suggested does not become burdensome and slow down the pilot deployment process – particularly in the "before pilot" stage.

Consumers Energy suggests exploring a new pilot engagement process with retrospective reviews with interested stakeholders on a regular cadence (e.g. semi-annually). This could encourage two-way information flow and presentation of ideas between utilities and other interested parties, without slowing down existing pilot deployment.

Objective Criteria 6: Public interest is clear.

While it is prudent for these details to be considered, some of these recommendations are more applicable when evaluating programs at scale rather than pilots (as mentioned in response to Staff's recommendation 3). Additionally, Consumers Energy suggests that part (a) regarding DERs is removed, as there are pilots that could be deployed for other reasons (e.g. simply for reliability purposes) and not intended to advance DER integration. In the case that the pilot being proposed does support DER integration, part (c) would capture the benefits.

We look forward to partnering with the Commission as it continues to explore processes for regulatory review.

Information Sharing: Several stakeholders suggested changes around data sharing and stakeholder engagement. While Consumers Energy agrees that these are key items to consider, we have concerns around privacy and intellectual property that may come with broader information sharing with public institutions and competitors. Additionally, it is critical that any potential changes do not slow down the deployment of pilots or create a barrier to utility offerings that could provide significant customer benefits.

Centralized docket: Staff suggested the creation of an online pilot directory which could be used for easy access to utility pilot information for interested stakeholders.

Consumers Energy is open to further exploring the concept of an online pilot directory, if the following unintended consequences can be avoided: 1) avoid slowing down pilot deployment; 2) avoid increased regulatory burden; 3) avoid confusion between various regulatory processes; 4) avoid applying a "one-size-fits-all" approach to widely varying use cases.

Consumers Energy suggests that future pilot areas of interest may be better suited to another venue and should be left off any online pilot directory.

Future Pilot Ideas: Consumers Energy agrees with Staff that more detailed foundational goals underpinning the MI Power Grid effort would assist with providing direction for future utility pilots. Funding and incentives to support these goals would ensure utility deployment of such projects.

Additionally, Consumers Energy agrees that increased focus should be placed on low-income customers and communities of color in development of pilots.

Appendix F-1. Consumers Energy, DTE Energy, and I&M Joint Comments

Summarized Information for Consumers Energy, DTE Energy, and I&M

Introduction

The utilities appreciate the discussion over the course of the collaborative workgroup. It has been a constructive forum for sharing the many pilots and pilot approaches both within Michigan and across the country. The idea that there are numerous approaches to pilot conceptualization, objective setting, design, and analysis was mentioned by several stakeholders, including the Michigan utilities and the many expert presenters from around the country. There was broad agreement from all parties that pilots play an important role in learning about technology readiness and impact, behavior responses, operational technology, and business process improvement. The regulatory constructs to support the wide array of pilots past and present are effective at ensuring prudent efforts which drive meaningful outcomes for customers. The diversity in pilots requires a diversity in approaches, both procedurally and in implementation, to maintain the robust agility and accountability present today.

Definition of a "pilot"

A pilot can be defined in many ways and depending on context or orientation, those definitions may be very different. This was evident in the presentations in the early meetings of the collaborative as several vendors and service providers discussed their approaches to defining and contextualizing pilots. The suggested definitions were diverse and reflected both differing views on the fundamental nature of pilots and boundaries for considering if an effort is a "pilot".

The utilities suggest a pilot definition that allows for flexibility and evolution as requirements and best practices change, recognizing that pilots take many forms and supporting requirements will not be static. One option is adapted from the EPA's National Action Plan for Energy Efficiency, "a program idea or delivery approach offered in limited duration, geography, sector, or technology with a set of questions and objectives designed to be tested".

Recommendations for objective criteria for use when evaluating proposed utility pilot projects

There is a great deal of variance in pilot types, pilot designs and information needed. Note the following examples:

- Study of Self-Sustaining Treatment for Active Remediation (STAR) for a Manufactured Gas Plant Remediation (Consumers Energy)
- Study of Demand Response using Customer Thermostats in a Bring Your Own Device Pilot (Consumers Energy)
- Study of residential customer behavior in the SmartCurrents Pilot (DTE Energy)
- Study of technology and operational processes in the O'Shea Battery Storage Pilot (DTE Energy)
- Study of energy savings in an electrical plug load pilot (I&M)

It is important to keep in mind that the priority for every pilot is to learn, and a pilot project is a success if learnings are achieved. It is clear that across these pilots and the many others conducted by the utilities, the critical objective criteria includes, but is not limited to, how learnings from the pilot may enable a utility to improve safety, reliability, customer satisfaction, affordability. While recognizing that each pilot is distinct with diverse planning objectives, such criteria should allow for flexible approaches the support efficiency and cost-effective processes within each utility.

Description of the pilot process and recommendations for stakeholder involvement

At a high level, each utility described how they generally approach pilot development and execution. While the names of specific steps differ among the utilities, they each include core elements including definition the opportunity or need, and planning, executing, and assessing the pilot. Utilities respectfully recommend that the processes remain consistent with successful existing practices, which have been developed over time to meet specific needs at each utility and in cross-utility areas (such as Energy Waste Reduction, for example).

Utilities engage stakeholders across our respective pilot development processes. The type and scope of that engagement is reflective of the specific pilot, and larger, broader scope pilots will drive more expansive stakeholder coordination and discussion. Early engagement is a feature of certain pilots that have extensive or novel touchpoints with customers, or which have a specific focus that is best informed by early collaboration. Other pilots are the subject of extensive discussion with Staff before being formally proposed. The presentations and discussions during the collaborative workgroup captured this broad range of pilot objectives, scope, and stakeholder engagement. Beyond what is already standard practice, the utilities continue to look for approaches to engage with stakeholders, including Staff, and expand the involved stakeholders as is appropriate to a particular pilot.

Reporting and Information Sharing

Utilities frequently share learnings with other utilities, the Commission and Staff, and third-party stakeholders. The key information shared includes the goal of the pilot, key metrics, the results, and the next stages planned, and often includes collaborative discussions about where and how to develop next steps. Utilities generate and share data-driven results from many pilots each year – some of these reports were highlighted during the utility presentations. Many program and technology pilots require filed information that describe outcomes and scope. To support the coordination of pilot results provided by utilities to the Commission in many proceedings, the utilities could support the establishment of a system where publicly filed information on pilots can be cross-referenced for ease of navigation and identification.

The utilities recognize the interest in the publication of granular data and recommend that expectations regarding reporting reflect data aggregation at an appropriate level and include information generally provided and understood not to infringe on the data privacy and data accessibility rules approved in 2017. Further reporting should remain voluntary based on details specific to the pilot project being discussed and the pilot specific considerations.

Conclusion

The utilities appreciate the opportunity to participate in the workgroups. In summary, some recommendations include

- Pilots defined as “a program idea or delivery approach offered in limited duration, geography, sector, or technology with a set of questions and objectives designed to be tested”.
- Processes remain consistent with successful existing practices.
- Reporting reflects data aggregation at an appropriate level, include information generally provided and understood not to infringe on data privacy, and that further reporting remain voluntary.
- Objective criteria should be matched to the objective and scope of the pilot, with appropriate flexibility.

Appendix F-3. DTE Electric Comments

Comments of DTE Electric on the Staff Draft Report
Energy Programs and Technology Pilots Collaborative – August 17, 2020

DTE Electric (DTE or Company) would like to first extend its appreciation for the hard work of the Michigan Public Service Commission Staff (Staff) and all parties involved in the Energy Programs and Technology Pilots collaborative workgroup. The discussions have been robust and brought forth many perspectives in this important area. DTE would like to take the opportunity to provide a set of targeted comments in response to the Staff's draft report published on July 31. The document is organized by the recommendations provided in Section 5 of the draft report.

a. Pilot definition. DTE is supportive of the inclusion of a definition of "pilot" as a means to focus the scope of the recommendations and the report overall. The Company also appreciates the fact that stakeholders have diverse perspectives on how to consider the term, as evidenced by the many suggestions made during the collaborative. DTE suggests a narrowed version of the Staff's proposed definition, which could be based on duration, geography, sector, or technology, for example.

b. Objective criteria. The wide majority of pilots undertaken by DTE today include an element of Commission approval, either as a standalone filing, included within a general rate case, or otherwise addressed in an energy waste reduction or demand response plan or reconciliation. The test of prudence for recoverable utility expenditures, including pilots and their associated costs, is one that is applied today. The objective criteria proposed by Staff in part codify good practice and reflect information and approaches already considered, but they do not reflect the diversity in pilot topics and approaches and are not all applicable to all pilots. **In general, DTE recommends that the necessity and applicability of the objective criteria be evaluated relative to the specific pilot and not applied on a blanket basis**. The potential administrative burden generated by the full set of objective criteria may inadvertently disfavor smaller, more targeted pilots that could produce critical learnings and instead shift the utility to larger, more expansive pilots for which many of these criteria are already met. While larger efforts may have great value, the flexibility and lower cost of smaller pilots makes them a critical piece of the pilot ecosystem. To the extent the objective criteria create an additional approval requirement, there could be adverse consequences to existing and successful programs.

The Company also highlights the comment in the introduction of the Objective Criteria which states "However, utilities must also be held accountable for their investments". As discussed more extensively below, investments made by DTE for pilots, general system improvement, or any other area are reviewed for reasonableness and prudency by the Commission. The Staff notes this context in the next sentence, offering that the Commission "routinely examines the reasonableness and prudency of utility investments in its work to ensure safe, reliable, and accessible energy and telecommunications services at reasonable rates for Michigan residents". DTE cannot recover the costs of any investment in rates without approval from the Commission – to the extent DTE chooses to pursue a pilot or other investment without approval, any risk is borne by the Company and not customers.

- *Clear pilot need and goals.* DTE agrees with the recommendation that pilots have a prudent basis for being pursued, and detailing goals and desired learnings. However, the Company initiates pilots to meet many different needs, and the presence or lack of similar pilots at DTE or elsewhere is not the only criteria considered for determining need. In addition, the

existence of a similar pilot elsewhere does not inherently negate the need for DTE to conduct its own pilot, as system considerations, customer segmentation, and other characteristics do not allow for a simple extrapolation of pilot results from another jurisdiction. There is limited value in outside benchmarking work when DTE is piloting the expansion of an existing program (e.g. Bring-Your-Own-Device) to a different group of customers who are adding new thermostats to their homes in the DTE's service territory. Administratively, a requirement to identify and share information on prior pilots conducted outside of DTE could be burdensome. Extensive research, benchmarking, and associated reporting on similar efforts could be unduly onerous. For some pilots (e.g. Charging Forward), this benchmarking is already clearly articulated due to the nature of the effort. And for the majority of operational technology pilots, the critical question is one of system integration with DTE's assets, which is not a learning an outside pilot would have uncovered. **DTE recommends that pilot need be justified in the context of the proposed intervention and learnings.**

- *Pilot design and evaluation plan designed and presented together.* DTE supports the general pilot principle of designing the pilot and the evaluation plan contemporaneously. With respect to statistical design, DTE highlights two comments. First, with regard to statistically significant sample sizes, this is a moving target based on the specific outcomes being tested. As the sample is increasingly segmented (by usage, by demographics, by location, etc.) larger and larger sample sizes are required to maintain statistical significance. This impact is exacerbated when considering attrition in recruitment. Second, the extensive recruitment efforts required to yield a large enough sample to demonstrate statistical significance can become costly and make all but the largest efforts imprudent to conduct. **DTE recommends that Staff, in Sections 4.2.2 and 4.2.3, articulate the cost and effort considerations of the proposed statistical methodologies upon which these objective criteria are premised.**

- *Pilot project costs detailed.*
  - Costs detailed by source. The Company is presently required to justify the prudence of all costs for which it requests recovery, and the Commission has broad latitude to approve or deny requests for recovery. When requesting recovery in a general rate case, the Company is obligated to explain which costs will be incurred in the bridge period and the test year, as these inform the revenue requirement and rates. To the extent a pilot spans multiple years or rate case periods, the Company endeavors to highlight future spend, but it must still request recovery in the relevant rate case. **DTE recommends continuing with existing cost justification requirements and avoiding unnecessary duplication of information.**
  - Description of available non-utility funding. DTE leverages available funding and support as it is available and will continue to do so going forward. One such example, the SmartCurrents effort in conjunction with the Department of Energy Smart Grid Investment Grant program, was presented by both the Company and Berkeley National Lab during the collaborative.
  - Projected cost effectiveness. Pilots are initiated and designed to learn about how a one or more interventions generates one or more outcomes. One of those outcomes is often comparing the cost of the intervention to the impact of the intervention. That learning will then inform how the intervention compares to other technologies, approaches, or methods on a cost-effectiveness basis and a performance basis. If the underlying motivation for the pilot is to learn about the characteristics of the outcomes generated by the intervention, it is not possible to prospectively know if the intervention is or is not

cost-effective. While a cost-effectiveness test may be prudent for certain full programs, and the DTE EWR program currently utilizes such tests, it is not an appropriate metric to evaluate prospectively for a new technology or intervention when the outcome (the "effectiveness") is unknown. In addition, many desirable outcomes are not measurable on a cost basis (such as safety, reliability, and customer satisfaction) and would thus be lost by a cost-effectiveness test. **DTE recommends that pilots be considered on their broad merits and that a cost-effectiveness test for pilots is not appropriate.**

- *Project timeline detailed.* The Company typically includes projected timelines when proposing pilots, but also notes that pilots do not always follow firmly to those projections. External factors may delay pilot design, implementation, evaluation, or reporting, and while the Company endeavors to both set and maintain realistic timelines, they are not always met. Timelines are also subject to potential changes as learnings become clear and there is a value in extending or reorienting the focus of the effort.

- *Stakeholders engaged.* DTE agrees that engaging stakeholders is appropriate and, as supported by reference by Staff on pages 29 and 30, that the specific pilot scope and intent should be a key driver of the appropriate breadth and depth of stakeholder engagement. DTE also highlights Staff's comment by reference on page 30 that "stakeholder engagement may be more appropriate for some pilots than others", which aligns with current practices. **DTE recommends a continuation of current practice and leveling stakeholder outreach to the scale, scope, and intent of the pilot.**

- *Public interest is clear.*
  - Describe how the pilot supports the transition to clean, distributed energy resources and its expected interest in this regard. The Company has committed to net zero by 2050 and achieving this goal will necessarily require the use of technologies which are emergent today and those which have not yet come to market. Many of these technologies will require piloting in the DTE system context to better understand their impacts and efficacies, and they provide a natural path to continue to focus on a lower carbon future. DTE will continue to explore opportunities to achieve its 2050 carbon goals through pilots and other means.
  - Share any added benefits to ratepayers or the energy delivery system. The Company is not clear what is recommended by the Staff with this criterion. Pilots are implemented specifically to assess and understand the benefits to customers and the system (e.g. cost-effectiveness, reliability, affordability, etc.), not to generate extensive benefits themselves – in fact, some pilots "fail" to achieve the desired outcomes and may be a net cost while providing learnings for future efforts. Full implementations and general business optimizations that generate cost savings are already effectively shared with customers over the long term through reductions in the revenue requirement.
  - Expected impacts of the pilot intervention on reliability, resilience, safety, and ratepayer bills. In designing pilots and requesting approval and recovery, the Company must justify the prudence of the effort and the related costs. The Commission determines prudence through a broad view of the totality of the pilot itself and costs. Reliability, resilience, safety, and affordability are key tenets of the Company's approach to serving customers with excellence, both in pilot environments and in the normal course of business.
  - Description of expected local or Michigan based employment and business opportunities created by the pilot. DTE is committed to investing in Michigan. In 2019, DTE spent $2.1B

with more than 2,300 Michigan business, including more than $750M with Detroit business and more than $600M with certified diverse women and minority owned suppliers. The Company believes that this goal is most effectively pursued on a holistic, company-wide basis and not on a pilot-by-pilot basis. It would also be inappropriate to assess the long-term employment or business opportunity impacts of an intervention before assessing and learning from the intervention – to do so would require broad assumptions and speculation.

c. **Pilot directory.** With minor modification, **DTE supports the proposal for a pilot directory hosted by the Commission and populated with available and existing information**. DTE believes this is an effective approach to compiling and sharing pilot information that does not increase the administrative burden on the Company. The Company also highlights the Staff's acknowledgment that data privacy and security concerns are "significant", and share their caution of a more expansive, open, and granular data provision.

   DTE recommends that the pilot directory be separated from the otherwise distinct idea of providing a mechanism for unsolicited proposals. DTE technology pilots are tests of internally-designed applications or existing, commercialized technology. The goals typically include learning about integration of the technology with the DTE system (such as control interfaces and interoperability), and the impact the technology has on DTE system operations (such as load management). To the extent technology providers have solutions to meet DTE pilot objectives and requirements, the existing RFP process supports the consideration of those solutions.

d. **Foundational goals and vision for future pilots.** The Company recognizes the interest in expanding the reach of utility pilots. DTE is actively designing and implementing a number of pilots and programs to reach many customer groups, including low income customers. When designing or executing any pilot, the key goals include safety, reliability, affordability, and strong customer service, and these are constant – if a pilot cannot advance one of those goals then it is unlikely to be implemented. **DTE encourages the Staff, Commission, Governor, and Legislature to keep these core objectives of utility service at the forefront when considering foundational goals for future pilots.**

existence of a similar pilot elsewhere does not inherently negate the need for DTE to conduct its own pilot, as system considerations, customer segmentation, and other characteristics do not allow for a simple extrapolation of pilot results from another jurisdiction. There is limited value in outside benchmarking work when DTE is piloting the expansion of an existing program (e.g. Bring-Your-Own-Device) to a different group of customers who are adding new thermostats to their homes in the DTE's service territory. Administratively, a requirement to identify and share information on prior pilots conducted outside of DTE could be burdensome. Extensive research, benchmarking, and associated reporting on similar efforts could be unduly onerous. For some pilots (e.g. Charging Forward), this benchmarking is already clearly articulated due to the nature of the effort. And for the majority of operational technology pilots, the critical question is one of system integration with DTE's assets, which is not a learning an outside pilot would have uncovered. **DTE recommends that pilot need be justified in the context of the proposed intervention and learnings.**

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  - Description of available non-utility funding. DTE leverages available funding and support as it is available and will continue to do so going forward. One such example, the SmartCurrents effort in conjunction with the Department of Energy Smart Grid Investment Grant program, was presented by both the Company and Berkeley National Lab during the collaborative.
  - Projected cost effectiveness. Pilots are initiated and designed to learn about how a one or more interventions generates one or more outcomes. One of those outcomes is often comparing the cost of the intervention to the impact of the intervention. That learning will then inform how the intervention compares to other technologies, approaches, or methods on a cost-effectiveness basis and a performance basis. If the underlying motivation for the pilot is to learn about the characteristics of the outcomes generated by the intervention, it is not possible to prospectively know if the intervention is or is not

cost-effective. While a cost-effectiveness test may be prudent for certain full programs, and the DTE EWR program currently utilizes such tests, it is not an appropriate metric to evaluate prospectively for a new technology or intervention when the outcome (the "effectiveness") is unknown. In addition, many desirable outcomes are not measurable on a cost basis (such as safety, reliability, and customer satisfaction) and would thus be lost by a cost-effectiveness test. **DTE recommends that pilots be considered on their broad merits and that a cost-effectiveness test for pilots is not appropriate.**

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- *Public interest is clear.*
  - Describe how the pilot supports the transition to clean, distributed energy resources and its expected interest in this regard. The Company has committed to net zero by 2050 and achieving this goal will necessarily require the use of technologies which are emergent today and those which have not yet come to market. Many of these technologies will require piloting in the DTE system context to better understand their impacts and efficacies, and they provide a natural path to continue to focus on a lower carbon future. DTE will continue to explore opportunities to achieve its 2050 carbon goals through pilots and other means.
  - Share any added benefits to ratepayers or the energy delivery system. The Company is not clear what is recommended by the Staff with this criterion. Pilots are implemented specifically to assess and understand the benefits to customers and the system (e.g. cost-effectiveness, reliability, affordability, etc.), not to generate extensive benefits themselves – in fact, some pilots "fail" to achieve the desired outcomes and may be a net cost while providing learnings for future efforts. Full implementations and general business optimizations that generate cost savings are already effectively shared with customers over the long term through reductions in the revenue requirement.
  - Expected impacts of the pilot intervention on reliability, resilience, safety, and ratepayer bills. In designing pilots and requesting approval and recovery, the Company must justify the prudence of the effort and the related costs. The Commission determines prudence through a broad view of the totality of the pilot itself and costs. Reliability, resilience, safety, and affordability are key tenets of the Company's approach to serving customers with excellence, both in pilot environments and in the normal course of business.
  - Description of expected local or Michigan based employment and business opportunities created by the pilot. DTE is committed to investing in Michigan. In 2019, DTE spent $2.1B

with more than 2,300 Michigan business, including more than $750M with Detroit business and more than $600M with certified diverse women and minority owned suppliers. The Company believes that this goal is most effectively pursued on a holistic, company-wide basis and not on a pilot-by-pilot basis. It would also be inappropriate to assess the long-term employment or business opportunity impacts of an intervention before assessing and learning from the intervention – to do so would require broad assumptions and speculation.

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   DTE recommends that the pilot directory be separated from the otherwise distinct idea of providing a mechanism for unsolicited proposals. DTE technology pilots are tests of internally-designed applications or existing, commercialized technology. The goals typically include learning about integration of the technology with the DTE system (such as control interfaces and interoperability), and the impact the technology has on DTE system operations (such as load management). To the extent technology providers have solutions to meet DTE pilot objectives and requirements, the existing RFP process supports the consideration of those solutions.

d. **Foundational goals and vision for future pilots.** The Company recognizes the interest in expanding the reach of utility pilots. DTE is actively designing and implementing a number of pilots and programs to reach many customer groups, including low income customers. When designing or executing any pilot, the key goals include safety, reliability, affordability, and strong customer service, and these are constant – if a pilot cannot advance one of those goals then it is unlikely to be implemented. **DTE encourages the Staff, Commission, Governor, and Legislature to keep these core objectives of utility service at the forefront when considering foundational goals for future pilots.**

Appendix F-4. Indiana Michigan Power Comments

Indiana Michigan Power
P O Box 60
Fort Wayne, IN 46801
indianamichiganpower.com

August 17, 2020

To: Joy Wang, Ph.D., Public Utilities Engineer, Smart Grid Section, Michigan Public Service Commission

Re: Comments on the Electric Distribution Planning Stakeholder Staff Report Draft

Indiana Michigan Power Company (I&M or Company) submits these comments on the Michigan Public Service Commission (MPSC) Staff's draft report entitled Utility Pilot Best Practices and Future Pilot Areas issued July 31, 2020 (Draft Report). The issuance of the Draft Report is an important milestone in the Michigan Power Grid Forum. I&M appreciates this opportunity to comment on Staff's proposed review, summary, and recommendations regarding the process so far. I&M has participated throughout these proceedings, providing information about its systems and operations in Commission workshops, and plans to continue its participation. I&M appreciates the input provided by all participants in this process.

I. Energy Program and Technology Pilot Workgroup Purpose and Considerations

The Draft Report does an excellent job of summarizing the process and the input of participants in this workgroup, along with identifying many key topics around utility pilot projects. I&M reviewed the Draft Report and is providing comments while keeping the Commission's October 17, 2019 Order in U-20645 (U-20645 Order), establishing the workgroup, in mind. As provided in the U-20645 Order, the Energy Program and Technology Pilots workgroup (Pilot Workgroup) was tasked to:

1) engage with utilities and stakeholders on existing pilot projects to understand outcomes and apply lessons learned;
2) investigate past Commission-approved pilots and identify best practices in other states, in order *to propose objective criteria for the Commission to utilize when evaluating proposed utility pilot projects*; and
3) work with utilities and stakeholders to identify potential areas for additional pilot proposals, including distributed generation, storage, microgrids, third-party-owned community solar power, on-bill financing, and electric vehicle infrastructure.

U-20645 Order, at 9 (emphasis added).

The U-20645 Order further noted that Staff's report was to provide a summary of efforts to date, providing recommendations for objective criteria to apply when evaluating proposed utility pilot projects, and identifying potential areas for additional pilot proposals. *Id.*

While the MI Power Grid's focus is on guiding Michigan residents and businesses through the energy industry's rapid changes in the transition to clean energy, the Pilot Workgroup's task was broader. The Pilot Workgroup's scope has been utility pilot projects generally, which is not limited only to pilots that support Michigan's transition to clean, distributed energy resources. That broader scope has a direct impact on Staff's pilot definition, proposed objective criteria, and on Staff's recommendation for establishing foundational goals. I&M submits that Staff's Final Report should reflect the broader purpose of pilots.

A Public Utility's Role: As a regulated public utility, I&M has an obligation to serve customers with safe and reliable power and the responsibility to manage the business it owns and operates to ensure investments are reasonable and necessary for the provision of service to its customers.

Pilots are an important part of I&M's business. This is especially true today as technology, equipment, business operations, and customer interests are rapidly changing and evolving. Customers often bring ideas and needs to I&M, and look to I&M as their trusted energy advisor. The challenge to I&M is to find solutions for its customers that I&M can offer as a regulated utility within a timeframe that supports their interest or need. Pilots can provide a path forward to be innovative, enhancing business operations and services, and solving customer needs by examining potential solutions in real-world applications.

Pilots provide I&M the ability to "drive before buying," by allowing a utility to validate assumptions and expectations on a smaller scale. As technology and businesses change, it can be difficult to determine if expectations are accurate until an idea is implemented. Pilots allow a utility to implement ideas on a more limited scale and determine if the assumptions and results align with goals and expectations.

There are several key considerations around pilot projects. One such consideration is pilot agility. Agility requires a pilot framework that is flexible and can therefore be responsive to the utility and its customers' needs and interests. Today pilots are developed and undertaken in many different forums that include a variety of stakeholder engagement. Maintaining or expanding this optionality and utility discretion in managing its business is key to supporting innovation through pilots.

A second key consideration is customer interest. Pilots need to consider new services and emerging technologies that are important to utility customers in meeting their needs.

Another key consideration is the utility perspective, as each utility is unique. Generally, the Draft Report proposes uniform criteria for utilities. Utilities can have distinct service area, business operations, and customer size and profile characteristics that should be considered in evaluating pilot project objective criteria. For I&M, utility characteristics include the level of distributed energy resources (DER), a smaller and more rural service area compared to the largest utilities serving the state, the status of advanced metering infrastructure (AMI), and the multistate areas served. When designing pilot objectives, it is important to be mindful of the utility position and situation, and that the final recommendations do not create a one-size-fits-all approach.

A final key consideration is risk. Pilot projects can bring risk. The utility, Commission, and stakeholders have to be willing to accept that a primary goal in a pilot is learning. The outcome is ancillary to this and goals and outcomes can be different. Technology tested today may or may not provide the benefits expected, but that does not mean that what is learned during the pilot will not be useful in the future. Pilot projects also help to avoid taking larger-consequence risks by allowing exploration of possible solutions on a limited scale or scope, limiting financial exposure.

Pilot Approval and Cost Recovery: The discussions during the workshops supported that a streamlined pilot review and approval process coupled with timely cost recovery are key to fostering pilot innovation. However, the Draft Report does not address a streamlined approach for requesting Commission pilot project approval and timely cost recovery. Under the current regulatory process, it can take multiple years from pilot conception to pilot approval. Currently, pilots are often approved as part of a base rate proceeding, IRP proceeding, or EWR proceeding. These types of dockets do not provide agility or timeliness for pilot project review and approval. Base rate proceedings are complex and require several months to prepare. Once filed, an order will not be issued for 10 months. Smaller utilities in the state, such as I&M, do not file annual base rate proceedings. Likewise, utility IRP filings are filed every 3-5 years and involve multi-year processes including a prefiling stakeholder process, followed by a contested regulatory proceeding. Likewise, EWR plans are filed every two years and the contested dockets can take over a year to conclude. The Final Report should address alternative procedural vehicles that provide utilities seeking pre-approval and timely cost recovery of pilots the opportunity for a streamlined review.

Staff's Final Report also should address the subject of cost recovery. Staff's recommendations in the Draft Report all require the expenditure of utility funds, for mandated pilot criteria, stakeholder engagement, pilot analysis, and reporting; they did not, however, include recommendations regarding cost recovery. It is imperative that all aspects of a pilot, including its costs, be included as part of the overall discussion on pilot programs and processes.

II. Comments on Staff Recommendations

Recommendation 1: Pilot Definition

I&M recommends slight changes to Staff's proposed pilot definition. I&M's changes seek to recognize in the definition that a pilot project can be a customer service or a resource and involve behavior and technology. I&M further recommends removing "intervention" from the definition as it can have a negative connotation. I&M's proposed pilot definition is:

> *A pilot is a limited duration experiment to determine the impact of an ~~intervention~~ idea or technology on one or more outcomes of interest.*

Recommendation 2: Pilot Objective Criteria

There is a balance between creating a framework to support and evaluate pilots and ensuring sufficient flexibility is retained to allow utilities to respond to changes in customer needs and interests and available technologies and services. Pilot opportunities should not be limited to those pre-defined through the regulatory process. Nor should pilots be strictly reviewed and approved in a "check the box" manner. Greater benefits will be realized if utilities are provided the opportunity to support pilot proposals without overly defined sub-categories. As discussed further below I&M supports the majority of Staff's six objective criteria for purposes of evaluating pilots. However, the various sub criteria further defining the main criteria should be taken as more illustrative than as strict requirements.

With this background in mind, I&M submits the following comments on Staff's six objective criteria to apply to any utility pilot projects meeting the recommended pilot definition.

1. Clear pilot need and goals

I&M Comment: The objective criteria should steer clear from using subjective words such as "clear" and "clearly." I&M suggests the words "clear" and "clearly" be removed and that utilities be required to provide pilot need, goals, and details.

2. Pilot design and evaluation plan designed and presented together.
   a. Pilot program design and evaluation plans should be designed together so examined metrics and collected data support evaluation of the pilot in meeting goals and desired learnings.
   b. If applicable, define target customer population, selection rationale, recruitment plans, and evaluation plans for customer adoption and satisfaction.
   c. If statistical analysis will be conducted on pilot results, a statistically significant sample size must be selected, supported, and detailed.

d. If statistical analysis will not be conducted, justification must be provided.

I&M Comment: Statistical analysis is not defined and can be subjective. In addition, for 2(d), I&M recommends the following wording change:

> If statistical analysis will not be conducted, ~~justification~~ *an approach* for evaluating pilot goals must be provided.

3. *Pilot project costs detailed.*
   a. Project costs detailed by source and amount for all applicable rate case periods.
   b. Description of available non-utility funding and whether any was pursued (such as state or federal funding opportunities).
   c. Projected cost-effectiveness of pilot over expected life described.

I&M Comment: As discussed initially, I&M supports the objective criteria that project costs be detailed, but recommends that objective criteria not specifically define how that is to be done, but leave that to the utility to tailor to the particular pilot itself. Pilots may be undertaken to demonstrate benefits to customers that are uncertain or unquantified. The "projected cost-effectiveness" of a pilot would be conjecture against these unknowns. A pilot outcome may be to discover that the benefits do not exceed the costs—that is the idea or technology is not "cost-effective." This is the purpose of conducting pilots. To impose a cost-effectiveness criterion at the outset would defeat this purpose. As such, I&M recommends removing 3(c).

It is also unclear what is meant or required by the wording in 3(a) "all applicable rate case periods" as many pilots are reviewed and approved outside general rate case proceedings.

4. *Project timeline detailed.* a. Proposed timeline for the pilot project and any related reports or evaluations clearly delineated.

I&M Comment: As addressed above, I&M requests removal of the word "clearly."

5. *Stakeholders engaged.*
   a. Describe stakeholder engagement plan before, during, and after pilot takes place.
   b. Interim and final stakeholder reporting described.
   c. Publicly available data from pilot described.

I&M Comment: It is important to recognize that stakeholders come in many different forms from customers and the communities we serve to internal business units. The type and nature of stakeholder engagement is dependent on the type of pilot program being undertaken. A

balanced and flexible approach to stakeholder engagement should be supported and not be pre-determined or defined by the Commission. In addition, a formal stakeholder process is not always necessary and in some cases can be burdensome. For example, for commercial and industrial customers, utility stakeholder engagement can occur naturally during the course business as new business offerings are being developed or as customers reach out to I&M for business needs.

I&M appreciates Staff's recognition of the need for low income and equity stakeholder engagement as discussed in Section 4.3.1 of the Draft Report. I&M is committed to including key stakeholders such as CAP agencies and community organizations in pilot programs impacting this customer segment. As addressed in Section 4.3.1-2 of the Draft Report, it has historically been a challenge to engage income-qualified and racially diverse customers. The Draft Report accurately discusses many of the barriers that utilities face when trying to engage customers. This has also been I&M's experience. For example, there were fewer participants in energy efficiency workshops that I&M held in the past because potential attendees lacked transportation or childcare, or had to work at the same time as the event. Pilot cost recovery which includes a budget for stakeholder participation in pilot creation and design, including childcare, transportation, and incentives such as food or drawings for prizes, could increase participation for this customer segment.

6. *Public interest is clear.*
   a. Describe how pilot supports the transition to clean, distributed energy resources and its expected impacts in this regard.
   b. Share any added benefits to ratepayers or the energy delivery system, either due to proposed site selection or through other pilot variables, especially if any system weaknesses or forecasted needs are addressed.
   c. Expected impacts of the piloted intervention on reliability, resilience, safety, and ratepayer bills.
   d. Description of expected local or Michigan based employment and business opportunities created by pilot.

I&M Comment: In the criteria that "public interest is clear," the term "clear" is very subjective and it is recommended that it be replaced with "demonstrated." Limiting the pilot guidance to only pilots that support the transition to clean, distributed energy resources is too limiting. As noted above, utilities undertake pilots for several reasons, including to evaluate potential improvements to reliability and operating efficiencies. The Pilot Workgroup's focus has been on utility pilot projects and is not limited to pilots that only support Michigan's transition to clean, distributed energy resources. In view of this, 6a should be removed as an objective criterion. In 6c, "intervention" should be replaced with "idea or technology" to match I&M's recommended pilot definition. I&M is concerned that the inclusion of 6d may impact multi-

jurisdictional utilities' ability to obtain pilot approval or cost recovery if the Michigan requirement is not satisfied.

Recommendation 3: Pilot Directory

A Pilot Directory hosted by the Commission is reasonable. However, careful consideration should be given to the nature and type of content to be posted. Foremost, any posting should recognize the importance of confidentiality and protection of customer and utility data. Depending on the nature of the information, access to certain data should be restricted to governmental and academic sources. In addition, it is important to recognize that the cost associated with pilots and related data are utility expenditures subject to approval by the Commission and a component of a utilities cost of service. Therefore, the benefits and value of such should to inure to those entities, or otherwise support broad public policy goals – and specifically not advance the commercial interests of individual third-party for-profit entities, at the expense of the utility and its customers. Pilot information should not be required to be posted if a pilot has not been approved by the Commission and granted cost recovery. While a pilot is being reviewed by the Commission, pilot information would be available publically through that docketed proceeding. This will ensure to the extent a pilot is modified as a result of approval that it is not necessary to have to update, revise or remove information in the pilot directory.

In determining, the information beyond utility contact, utility pilots, and associated docket numbers that would be included in a Pilot Directory, the following issues should also be considered and addressed:

- Posted data should conform to utility data privacy tariffs.
- Posted data should be anonymized, and a receiving party should be required to explicitly agree that it will not attempt to de-anonymize the information it obtains.
- There should be some definition of "approved parties" having access to the data. That should be defined narrowly to governmental agencies and academic institutions.

Recommendation 4: Foundational Goals

I&M recommends that Staff reconsider the need to establish foundational goals because, as discussed above, pilot programs should not be limited to clean energy initiatives, but rather be encouraged in all aspects of providing safe and reliable energy at reasonable prices to Michigan residents. Moreover, while I&M recognizes the economic and environmental benefits of clean energy and the "movement toward realizing that vision in a safe and affordable manner," I&M also supports improving other aspects of reliably serving customers through pilots programs that are not exclusively focused on clean energy.

Narrowing the policy directive of the legislature to include only clean energy programs may miss opportunities to improve the customers' experience.

The Company's commitment to advancing clean energy through green technologies is driven by a number of factors including capacity and energy needs, the economic realities of today's energy market, customer interests and consistency with applicable state laws and regulations. Looking forward, the use of additional pilot projects beyond clean energy initiatives may be critical to charting the best course for the future. The rapid growth of distributed energy resources and large-scale renewable energy is driving all utilities to develop and test a wide range of new technologies, business models, and customer programs. I&M looks forward to working with the MPSC to advance a wide spectrum of innovative technologies for our customers when approval and cost recovery is sought. Collective efforts can better effectuate a more robust spectrum of innovations to better provide for safe and reliable energy at reasonable prices for Michigan residents.

III. Summary and Conclusion

I&M appreciates the time and effort Staff has devoted to conducting this workshop and developing its draft report. The workshops brought a tremendous amount of information and perspectives to a diverse group of stakeholders. It is encouraging to see the Commission and Staff's interest in pilots. Fostering a regulatory environment which encourages pilots through a diverse and agile framework will drive pilot innovation for the benefit of Michigan customers. I&M respectfully requests that Staff consider the above positions and make appropriate modifications in its Final Report before filing it with the Commission.

Appendix F-5. Lawrence Berkeley National Laboratory Comments

Hi Joy,

Thanks for giving me the opportunity to review the report. The references and citations are exhaustive - kudos on performing such a thorough lit review. In reading over the report, I have a few comments for your consideration:

1) Page 28: I think Annika would agree with Sanem that an RCT or an RED are advisable and would strongly recommend either design for producing results that have limited self-selection bias. You never define "gold standard", but this paragraph seems to presume the reader knows what that means. So I would urge you to either define what you mean by gold standard, or use some other terms to characterize the same sentiment. However, RCTs and REDs need not be employed universally to adequately answer the questions of interest in the pilot. My LBNL report that I asked you to review sought to lay out the balancing act associated with different experimental designs. Certainly, for some pilots, it would be best if they used an RCT or an RED, but for others that are looking to do a proof-of-concept or are focusing on implementability, an RCT/RED is totally overkill. My point is that the experimental design should be more closely tied to the goals, objectives, and purpose of the pilot as well as the cost of getting a wrong result and making a decision on that wrong result. If the cost is high, then more internal validity, power, and precision are needed via more rigorous experimental designs. If the cost is relatively low, then less rigorous experimental designs will do.

2) Page 33 (Section 4.4.2): You will probably need to explain further what the SGIG Consumer Behavior studies were for your reader to understand the subsequent few sentences. Something like the following:

"Peter Cappers (LBNL) shared his experience with organizing, collecting, and analyzing data from the 11 utility pricing pilots that came out of the Department of Energy's Smart Grid Investment Grant's consumer behavior studies. By having unique access to all data generated and collected by each utility's pilot, his team of researchers was able to conduct a number of different cross-utility analyses to gain valuable programmatic insights that an individual utility on its own could not (Cappers, 2020). Public access to pilot data in Michigan would support these types of cross-utility studies. In the stakeholder survey..."

3) Page 33 (Section 4.4.3): You didn't mention what I think was a critical issue that ultimately doomed my efforts to make all the SGIG CBS data publicly available - the challenge of competing versions of the truth. By having the data at the same level of granularity as the utility evaluators, third-parties can replicate the utility analysis but apply their own methods and data screening techniques to arrive at the answer they may want. This creates a massive risk for the utility who then must defend and justify their findings and approach, relative to a competing version of results.

I'd be happy to talk through any of these issues if you want in more detail. Again, great job on this report!!

Best regards,

Pete

Peter Cappers
Electricity Markets and Policy Department
Lawrence Berkeley National Laboratory

Appendix F-6. Michigan Energy Efficiency Contractors Association

MEECA

August 17, 2020

Dr. Joy Wang
Michigan Public Service Commission
P.O. Box 30221
Lansing, MI 48909

Re: Comments on Energy Programs and Technology Pilots Draft Report

The Michigan Energy Efficiency Contractors Association (MEECA) is a nonprofit trade group working to strengthen Michigan's energy efficiency industry for the benefit of our member companies—mainly contractors who serve electric and gas utility customers in the residential, commercial, industrial and agricultural sectors. MEECA participated in the Energy Programs and Technology Pilots workgroup and we thank MPSC Staff for this opportunity to comment on its draft report, *Utility Pilot Best Practices and Future Pilot Areas*.

Given the growing number of public commitments by Michigan utilities, communities and institutions to significantly reduce carbon emissions, a statewide framework is needed to plan, coordinate, and evaluate clean energy pilots to help expand low-carbon solutions going forward. As the draft report conveys, Michigan has extensive experience with EWR pilots from which to draw useful lessons about improving the EWR category of pilots specifically, and all utility pilot programs more generally.

Regarding the draft report:

MEECA supports Staff's proposed definition of pilot ("*A pilot is a limited duration experiment to determine the impact of an intervention on one or more outcomes of interest.*"). Our support assumes that working definitions of the terms "experiment" and "intervention" are broad enough to include research questions that cover application of new technologies, business model viability, and issues of scalability.

MEECA supports Staff's proposed criteria #1-6 for evaluating pilot proposals that come before the Commission for funding approval. As many stakeholders conveyed during the workgroup process, we also recommend that these criteria be applied with enough flexibility to allow for adjusting an active pilot if timely feedback suggests this would improve the effort.

MEECA supports Staff's recommendation for development of an online Michigan pilot directory that would archive previous efforts, facilitate cross-referencing, and identify future pilot areas by utility. This would help eliminate duplication of effort by different utilities. It would also enhance pilot design and planning by incorporating lessons learned from previous efforts. To the extent that information about EWR pilots already exists in annual program EM&V reports, EWR Collaborative documents, and MEMD white papers, the pilot directory should contain clear references to these other sources of information.

MEECA

MEECA supports Staff's recommendation that the MPSC, Governor, or Legislature establish and promote more detailed foundational goals underpinning future energy pilots. Scaling up low-carbon energy solutions requires a statewide energy vision. Integrated resource planning (IRP) already provides a formal process to evaluate future utility investments. Having pilots that can inform and demonstrate scalability of these investments should be considered in planning and evaluating new pilots. Likewise, the IRP development process for each utility should include an analysis of results from all potentially relevant pilots conducted to date. This would explicitly link small-scale pilot research to large-scale energy resource decisions.

Additionally, MEECA offers the recommendations listed below.

Recommendations related to process:

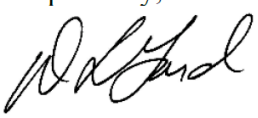
- MPSC should facilitate regular benchmarking of new pilot concepts and results from jurisdictions beyond Michigan to reduce duplication of effort and capture good ideas.
- MPSC should encourage and support inter-company collaboration in split service territories for EWR pilots which achieve combined gas and electricity savings.
- Planning and design of pilots should routinely incorporate early engagement with stakeholders including contractors.
- Ideas for new pilot programs should be solicited from all MI Power Grid workgroups.

Recommendations for pilot topic areas to consider:

- Scalability of deep energy retrofits—Integrated design and financing of improvements to building envelop and mechanical systems in existing structures.
- Scalability of on-bill financing and other means of addressing the challenge of providing upfront capital for EWR projects.
- Effectiveness of post-commissioning programs in all sectors including residential
- Contribution of EWR programs to achieve load reduction which can offset or delay generation and/or distribution investments
- Enhanced business and technical support of trade allies toward driving greater uptake of EWR programs (e.g., assistance with meeting workforce development challenges, etc.)

In closing, MEECA again thanks MPSC Staff for considering these comments on its draft report. We look forward to ongoing discussion about improving Michigan's pilot program framework.

Respectfully,



David Gard
Executive Director, e-mail: david@meeca.info

Appendix F-7. Michigan Energy Innovation Business Council and Advanced Energy Economy Comments

Michigan Energy Innovation Business Council
115 W. Allegan, Suite 710
Lansing, MI 48933

Advanced Energy Economy
1000 Vermont Ave NW, 3rd Floor
Washington, DC 20005

August 14, 2020

Ms. Kavita Kale,
Executive Secretary
Michigan Public Service Commission
7109 West Saginaw Highway
Lansing, Michigan 48917

Re: Energy and Technology Pilot Programs Staff Draft Report

Dear Commissioners and Staff,

The Michigan Energy Innovation Business Council (Michigan EIBC) and Advanced Energy Economy (AEE) appreciate the opportunity to provide comments on the Staff's Utility Pilot Best Practices and Future Pilot Areas Draft Report ("Draft Report"). Both organizations were active participants in the workshops, and we appreciate the Commission's continued attention to these important issues and look forward to the continuation of the MI Power Grid process.

If there are any questions, comments, or concerns related to these comments, feel free to contact us directly.

Regards,

Laura Sherman
President
Michigan EIBC
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Ryan Katofsky
Managing Director
Advanced Energy Economy
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I. **Advanced Energy Economy (AEE) and the Michigan Energy Innovation Business Council (Michigan EIBC) support the definition and recommendations outlined in Staff's Draft Report and respectfully urge the Commission to adopt the transition to clean, distributed energy resources as part of the foundational goals underpinning future energy pilots.**

AEE and Michigan EIBC strongly support Staff's recommended criteria for utility pilot projects and the proposed "pilot definition."[1] Overall, the Draft Report sets Michigan on the right path to piloting and integrating innovative technologies to decrease costs for customers and provide beneficial grid solutions. We agree with Staff's determination that pilot projects would benefit from clear and consistent foundational goals to unify pilot investments and move Michigan toward a clean and distributed power grid.[2] To that end, we encourage the Commission to adopt the goals of MI Power Grid as the underlying guidance for pilot projects pursued by utilities. This will help to ensure that future pilots in Michigan will be better aligned and complement the Commission's overall policy objectives and strategic vision. In particular, we note that some MI Power Grid work streams that have not yet started will be addressing not just technology-related issues, but broader regulatory model issues around utility financial motivations and utility business models. Pilots can and should be designed to test not just innovative technologies but also new utility business opportunities and innovative business partnerships that can enable greater customer engagement and more value creation from the technologies that are driving the change to the utility industry that the Draft Report identifies.

We also agree with Staff's statement that a clear need for a proposed pilot should be given and results of similar pilots and findings should be shared as part of the justification for the need for a pilot.[3] This is particularly important to ensure that approved pilots will provide new information and insights, thereby limiting repetitive pilots. However, if results from "similar pilots" are not readily available, this requirement should not hinder utilities from pursuing a novel pilot (e.g., the autonomous grid concept).

II. AEE and Michigan EIBC support the creation of a pilot directory. We urge the Commission to adopt formal reporting requirements for pilots to increase the efficacy of a directory.

We appreciate Staff's recommendation that an online pilot directory be created and maintained. Such an online pilot directory would make information more readily accessible to all stakeholders. Additionally, it is important that the Commission institute public pilot reporting requirements. It is not sufficient for information regarding pilot learnings and conclusions to be communicated to the Commission Staff or select stakeholders verbally. Instead, formal reporting in a publicly available

[1] Utility Pilot Best Practices and Future Pilot Areas Draft Report ("Staff Draft Report"), Michigan Public Service Commission, Page 22, September 30, 2020, https://www.michigan.gov/documents/mpsc_old/MPG_Pilots_Report_Draft073120_698001_7.pdf.
[2] Staff Draft Report, Page 45.
[3] Staff Draft Report, Page 44.

manner (such as in the docket) is necessary to allow all interested parties to benefit from the lessons learned in each pilot. Such reporting requirements are especially critical for ratepayer funded pilots. As noted in the Draft Report, only 20% of pilots reviewed were required to report results and only 14% had reports filed to the docket.[4] Currently available pilot information is scarce and more robust data is required to satisfy stakeholder needs. Although the proposed online pilot directory is a step in the right direction, the included information will not allow stakeholders to fully assess the efficacy of a given pilot and will not allow utilities to review the results of a previous pilot when considering a future pilot. The lack of transparency and information sharing also currently hinders third-party vendors from participating and offering innovative solutions. All parties would greatly benefit from additional formal reporting requirements, especially for ratepayer funded pilots, whether that is through a more robust online pilot directory or through required formal reporting to the relevant docket. While Staff states that a detailed pilot data repository "can always be designed and implemented at a later date" should the need be made clear, we argue that the need for more robust data is presently clear.[5] We also urge the Commission to apply best practices for competitive procurement to utility pilot projects to open the door for third-party participation.

III. Utilities should continue to collaborate with technology vendors to design and deploy pilots and deliver innovative solutions to customers.

As utilities continue to explore innovative technologies through pilots, there are substantial benefits to utility collaboration with a diverse set of stakeholders. A pilot directory will open the doors to information sharing, but it is essential that utilities continue to engage technology vendors and industry experts to explore the relative roles that vendors can play in shaping the quality and effectiveness of pilots undertaken.

IV. AEE and Michigan EIBC offer the following minor changes to the report.

1. Page 35: According to the American Wind Energy Association, 99% of wind farms are located in rural areas.[6] Although there are a limited number of rural communities in Michigan which have established moratoriums on wind energy, this is generally not the case in cities (as is suggested on page 35). We suggest that Staff review a database of wind and solar ordinances recently

[4] Staff Draft Report, Page 17.
[5] Staff Draft Report, Page 44.
[6] American Wind Energy Association, Wind 101, https://www.awea.org/wind-101/benefits-of-wind/economic-development

released by the Department of Environment, Great Lakes, and Energy: https://www.michigan.gov/climateandenergy/0,4580,7-364-85453_85458-519951--,00.html

2. Page 42: “FIOA” should be “FOIA.”

Appendix F-8. Nexant Comments

Joy

Thanks for sending the draft report for our review. We have just a few comments.

1. The only thing I saw concerning ideas attributable to Eric and me that needs to be corrected is on page 41, where you attribute the following recommendations to us:

- o provide constructive feedback on detailed pilot submissions, and
- o provide to make pilot adjustments that may require Commission approval.

There is something missing in the second bullet. What we said in our slide deck was the following

- –Flexibility to make adjustments during the pilot period within boundaries and quick turnaround for any adjustments that require Commission approval so as not to significantly extend the pilot duration

While this may be a bit wordy, what you have in the current draft should be modified. There really are two ideas embedded in what we said. Flexibility to make adjustments within boundaries without approval and quick turnaround for adjustments that do require approval. Perhaps there should be a total of three bullets under this heading on page 41.

2. In the ES as well as on page 43, you say that the objective criteria for pilots should include the "Projected cost-effectiveness of pilot over expected life described. I'm not sure exactly what is meant by this but if it means that pilots themselves should be cost effective, I would disagree with this. Many (perhaps most) pilots are not cost effective as they because they often reflect small scale tests of potentially larger programs where design and start up costs are a much higher proportion of total costs than they are for full scale programs. Also, some pilots that, for example, test a wide variety of marketing and outreach options are designed to determine how to cost effectively implement something at scale. As such, they might test 10 different things to find the one or two most cost effective things and the overall pilot that includes the 8 or 9 less cost effective options is likely not to be cost effective. I would give further thought to how to this idea of cost effectiveness so utilities don't think that the only things they can test in a pilot is something with a very high likelihood of being cost effective even at a small scale level because I think that could eliminate a lot of potentially important pilot ideas.

3. On page 24, you quote Sanem Segici as saying "Only treatments and functionalities intended to be offered as full scale development should be tested in pilot programs (Sergici, 2020)." I don't know whether this is a direct quote. If it is, I personally disagree with it. In many cases, the objective of a pilot is to see whether or not something should be offered at full scale. If you are only piloting things that you have already decided should be full scale, I don't see a reason to do the pilot (other than, perhaps, to get the implementation kinks out before going full scale). Many pilots are intended to determine if the load impacts of technologies, rates and/or behavioral program options are large enough to justify offering them at full scale.

4. The lengthy discussions starting around page 30 concerning stakeholder involvement and involvement of low income and black communities is important but I would personally

recommend a little more discussion of the burdens of stakeholder involvement in pilot design. Having led a number of large scale stakeholder pilot design efforts, I can say from experience that it is very challenging and can easily lead to either suboptimal designs, unrealistic expectations, enormous cost, or all of the above. The old adage that a donkey is a horse designed by committee is very accurate when it comes to pilot design. I think what allowed a collaborative process to work well in designing the most recent TOU pilots in CA, which I facilitated, was that the Commission was very involved and made many key decisions at the end of the day that it was clear that we were never going to get everyone to agree to. The often singular special interests of many stakeholder groups can easily hold the design process hostage unless someone (like the Commission) steps in and says "we understand your point of view but in order to move forward, we are going to do X." This is something you should think carefully about and perhaps add a paragraph or so in those sections to acknowledge more explicitly that not everyone's concerns can be met in a pilot.

5. There is a typo on page 40, where you say "trail-and-error" rather than "trial-and-error." I'm sure someone would probably catch this before going final but just thought I'd mention it.

Once again, thanks for including us in the workshops and for the opportunity to review the report. I think it's a useful report that should serve you and the utilities well as you move forward in Michigan. Good luck with all that lies ahead.

Steve

Appendix F-9. Oracle Comments

Joy,

I hope you're doing well and had a good weekend!

Thanks so much for sending us the Utility Pilot Best Practices and Future Pilot Areas draft report. I reviewed it in detail and thought I would share the following brief comments and suggested edits:

- The report looks great. It is clearly written and the recommendations include a variety of useful elements. I think the proposed pilot definition and objective criteria for evaluating pilot proposals are appropriate.
- Page v - "Lastly, Staff . . . " should probably be a new paragraph
- Page 3 - Electric Power Sector chart is missing the bar for Coal (-36%)
- "Utility decisions can have equity implications." The Equity Considerations section is an important inclusion with appropriate and actionable recommendations.
- Typo page 15 - "bene" to "been"
- Typo page 17 - "methods ." to "methods."
- Page 27 - "A review of energy efficiency behavioral programs found few conducted rigorous experimental and quasi-experimental studies when estimating savings" - I was surprised by this statement and would be interested to learn what EE behavioral programs were reviewed and are being referenced here. I assume pilot programs only, correct? Opower's behavioral programs utilize experimental design as a standard practice to calculate savings with a high degree of accuracy.
- Typo page 30 - "not limited" to "not be limited"
- Typo page 30 - "pilots results" to "pilot results"
- Typo page 33 - "FIOA" to "FOIA"
- Typos pages 38-39 - "innovative platform" to "innovation platform"
- Typo page 39 - "experience regulatory team" to "experienced regulatory team"
- Page 45 - "Staff recommends objective criteria for evaluating pilot best practices when pilots are proposed in future rate cases." Pilots may be proposed in other cases besides rate cases, correct? If so, removing the word "rate" would likely make more sense here.
- Regarding the Staff recommendations in this report, is there a clear case or process through which the MPSC will adopt these recommendations? For example, how exactly will the recommended definition of "pilot" be adopted? Who should be responsible for developing the online Michigan pilot directory? (Or if that is undetermined, how should it be decided?) I think the report would be improved with a clearer articulation of the action items that will result from this report to help ensure its recommendations are implemented.

I hope these comments are helpful. Please be in touch anytime.

Thank you,

David Siddiqui
Senior Manager, Regulatory Affairs and Market Development
Oracle - Utilities Global Business Unit

Appendix F-10. Quantalux Comments

Dear Joy

Thank you for the opportunity to review the Energy Programs and Technology Pilots draft report. The document contains an excellent summary of the meetings, and is very comprehensive. Indeed, we were all challenged with an on-line format, but I feel the report did a great job of capturing the most important aspects of the various presentations.

My main comment is focused on the "why" any technology pilot should be supported. The Stakeholder report explains clearly "how" to structure a pilot test, and gives a step-by-step listing for objectives that any given pilot test should meet. But the Report appears to under-emphasize one of the core tasks for the Workgroup as defined by Order U-20645; namely, to "*<propose> objective criteria for Commission/Staff to use when evaluating future proposed utility pilots*" (Section 1.2 of the Report).

As you point out in Section 4.2, individual Michigan utilities currently are in the lead when it come so defining pilot testing. But it is not clear if these pilot tests are consistent with an overall strategic vision for the next-generation grid. In my mind, any pilot (irrespective of who proposes the work) should be tested against the MPSC's strategy for a next-generation energy framework in Michigan. But where are the objective criteria defined for any test to meet?

Marco Padula's presentation on REVconnect program gives a good example of how NY State defined specific goals based on clear REVconnect Policy Objectives (Section 2.2.2-3). These objectives included items like new business models, testing of new technologies, reduction of carbon emissions, etc. To my knowledge, the Michigan Commissioners have not yet defined these goals.

I'll note that Section 5.4 gives a hint that the MPSC needs to establish priorities, but frankly, this is at the end of the report and will likely be lost to the average reader. You state "*Staff recommends more detailed foundations goals underpinning future energy pilots...*" on page 45, and also summarize the recommendation in the Executive summary, but in a rather tepid fashion (and as the fifth of five items).

My recommendation is to strongly emphasize the need for MPSC to clearly define the goals and policy objectives for Michigan's energy framework. Once the high-level goals/objectives are in place, it will be much easier to define criteria that any proposed pilot test must meet. Because of its importance, I suggest putting this recommendation as a primary item in the report, namely #1 in the Executive Summary and prominently in the body of the proposal. In terms of an example of sustainable power guidelines, you may also highlight PowerPath DC (Section 2.2.2-1) as an example of how another PSC has prioritized energy innovations.

Of course, it only makes sense to also offer guidance how exactly the MPSC can define the goals and objectives. I believe that this is an excellent opportunity for the MiPowerGrid report to

recommend an executive committee be established to make recommendations to the MPSC similar to those defined by REVconnect in NYS. This committee should include a broad range of stakeholders, and be well-versed in current and emerging energy technologies.

Thank you for your hard work with the Energy Programs and Technology Pilots workgroup.

Regards

Joe

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Appendix F-11. WattTime Comments

Date: Aug 17, 2020

Via email

Michigan Public Service Commission
7109 W. Saginaw Highway
Lansing, MI 48917

Subject: Comments regarding the Draft Staff Report "Utility Pilot Best Practices and Future Pilot Areas" for the Energy Programs and Technology Pilots Workgroup

WattTime is a California non-profit founded in 2014 that provides research, education, and assistance on the environmental benefits of electricity use timing, and advocates for a data-driven approach to solving environmental problems. WattTime

WattTime appreciates the opportunity to have presented at the MI Power Grid workgroup meeting on May 28, 2020 and submits the following comments regarding the draft staff report.

1. **Correction with regard to WattTime's presentation**

On page 26 para 2, the following line *"In the case study of the Massachusetts Clean-Peak Standard, the use of inadequate proxy measures actually caused pilots to have effects counter to initial goals*" should read "In the case study of the California Self-Generation Incentive Program (SGIP) the use of inadequate proxy measures actually caused the energy storage program to have effects counter to initial goals".

2. **Addressing climate and environmental impacts requires direct measurements of emissions**

The MI Power Grid initiative has the stated goal to "*maximize the benefits of the transition to clean, distributed energy resources for Michigan residents and businesses.*"

The draft Staff report also notes that "*The initiative is designed to maximize the benefits of the transition to clean, distributed energy resources for Michigan residents and businesses*." and that the utility pilots will need to address climate and environmental impacts (page 4).

However, it should be noted that distributed energy resources (DERs) do not necessarily result in clean energy benefits or reduce emissions if appropriate metrics are not selected. In WattTime's presentation to the workgroup, reference was made to several case studies related to energy storage programs in other states which either led to actual increase in emissions, or where WattTime analysis showed that the programs could lead to an increase in emissions if implemented without direct measurement of emissions.

WattTime supports future pilot projects that have climate and environmental goals, and will continue to participate in this workgroup to assist the Commission in designing a data-driven approach to emissions reduction from DERs.

Submitted by

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