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

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MPSC

Michigan Public Service Commission

DRAFT

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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 utility 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 appear to review pilots on an ad hoc basis in rate cases, as does Michigan currently.

Staff's review of Michigan pilots found no clear definition of "pilot" in Michigan. Technology implementation pilots are most popular within the state. Limited information regarding pilot design, evaluation, success criteria, 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 known, 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 following broad definition for pilot: *A pilot is a limited duration experiment to determine the impact of an intervention on one or more outcomes of interest.*

Second, 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.

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

Third, Staff recommends the development of an online Michigan pilot directory. At least the following information for utility pilot projects should be provided: 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 include future pilot areas of interest by utility with contact information to enable communication with interested third parties. Lastly, Staff recommends the MPSC, Governor, or Legislature 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.

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 Pilot workgroup within the Customer Engagement core area of MI Power Grid.

1.2 Energy Programs and Technology Pilots Workgroup and Tasks

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

- 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, 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. The types of energy pilots needed to support the electrical grid changes as the grid evolves and adapts to new technologies, customer demand, and public policy priorities. Efforts around the country to update utility regulatory frameworks to realize a clean, reliable, and affordable electrical system have increased along with these changes (Cross-Call, Goldenberg, & Wang, 2019). This energy transition is occurring not only within Michigan, but also nationally and around the world.

The global energy transformation is driven by changing customer expectations and rapid technology change. A global survey of power and utility company executives in 2018 found 82% believe their company is not ready for the market transformation and 44% believe 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 change, growth of distributed generation, new forms of competition, customer behavior changes, and policies sets the utility sector on a path "to 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" (PwC, 2018). 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.

Forms of utility generation are also changing. In 2019, total U.S. energy consumption was at the third-highest level ever at 100 quadrillion BTU. Of that amount, 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 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, 2020d). At the same time, renewable energy consumption increased to 11.5 quadrillion Btu. In 2019, wind energy surpassed hydroelectric power as the leading renewable energy used for electricity generation in the U.S. (U.S. Energy Information Administration, 2020d). The electric power sector consumes only 56% of U.S. commercially available renewable energy. The rest is consumed by the other sectors: industrial (22%), transportation (12%), residential (7%), and commercial (2%) (U.S. Energy Information Administration, 2020d).

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 through 2050 (U.S. Energy Information Administration, 2020a).

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

Energy trends within Michigan are similar to national trends and are described below. In addition, some situational impacts that may affect the types of energy pilots Michigan can expect and will need in the future are also discussed.

1.4.1 Natural Gas and Renewable Energy Use Increasing

Broad change in Michigan's energy resources and usage 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 Michigan electricity. Wind supplied 60% of that, ranking Michigan 15th nationally for wind powered electricity generation (U.S. Energy Information Administration, 2020c).

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.

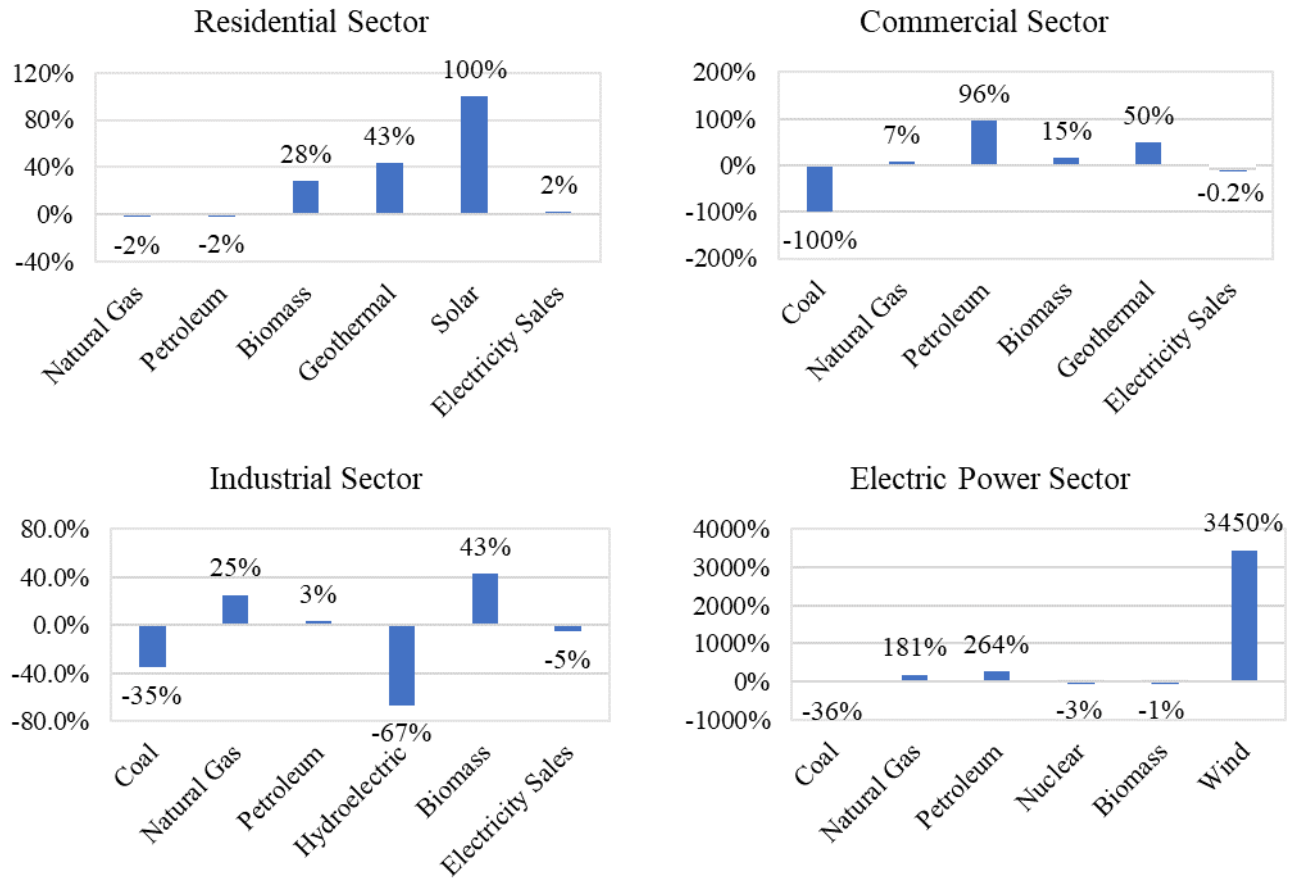

Figure 1. Change in Michigan Energy Consumption by Sector, 2008-2018

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

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 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, 2020c).

1.4.2 Utility Pilots Will Need to Address Climate and Environmental Impacts

Changes in electricity generation have implications beyond energy. 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 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). Utility decisions can have equity implications.

Michigan's transition to cleaner electricity generation reduces greenhouse gases (GHG) and their subsequent climate change impacts. 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). 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; Vavrus, Notaro, & Zarrin, 2013; Wright, Posselt, & Steiner, 2013; Wuebbles, Fahey, & Hibbard, 2017). 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 can present challenges, especially during extreme weather events. 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, and triggered 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.

This response taken in both Michigan and the MISO territory demonstrated the importance of demand response in addressing the 2019 polar vortex's energy challenges. 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 intermittent resources introduce challenges, Michigan's 2019 polar vortex experience shows that they are surmountable. However, it also emphasizes the need for utilities to explore demand response and other customer programs to determine how to best use them in addressing energy needs, particularly in times of peak demand or extreme weather events. Utility pilots will likely explore 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 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 these Michigan entities desire to fulfill their energy commitments will likely impact utility programs as well as future developments that will be explored and offered in Michigan.

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 an essential in exploring and validating solutions to current and emerging problems and learning from them. 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 utility 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 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. The majority of 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 questions were included in the survey 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 that no guidance regarding utility pilots or pilot best practices was provided by the Commission. Two states (AL and MO) indicated that utility pilot projects are examined on an ad hoc basis during rate case proceedings. Nebraska indicated that it had little to no authority to issue pilot program guidance to electric utilities. These responses

[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.

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

2.2.2 Commission Guidance in Other Jurisdictions

When researching pilot guidance provided by other public utilities commissions, Staff found it difficult to access and search documents of other commissions. In the planning and implementation of 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 utility 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 DC (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 of the six MEDSIS working groups 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 pilots are expected to be deployed 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.

New York utilities are required by the New York PSC 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 similar to 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 first 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 in detail below.

2.3.1 Utility Survey

Staff created a utility 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.

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 2). Of the technology pilots, EWR pilots were most popular (39%), followed by energy storage (13%), electric vehicles (11%), and renewable energy (11%) (See Figure 3). "Other technology" (16%) groups miscellaneous technology pilots. 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%.

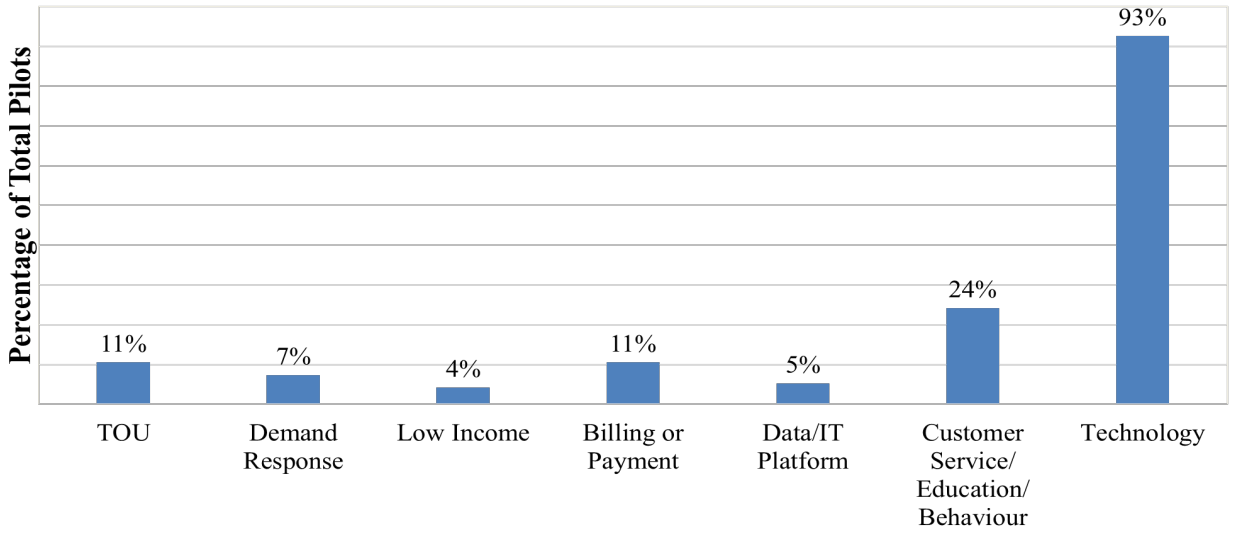

Figure 2. Utility Survey – Pilot Types in Dataset

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

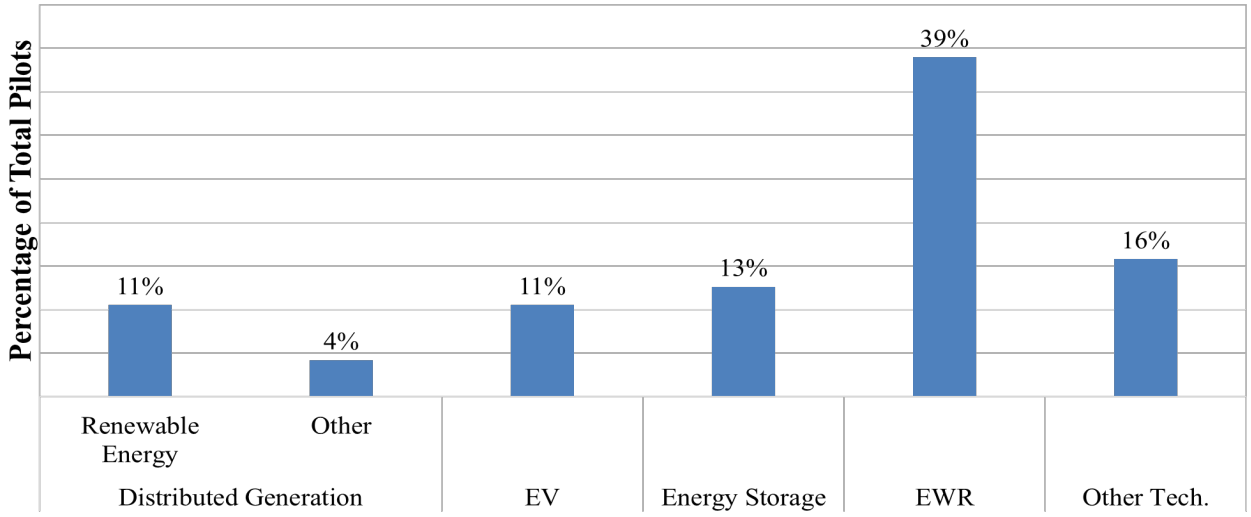

Figure 3. Utility Survey – Technology Pilots in Detail

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.

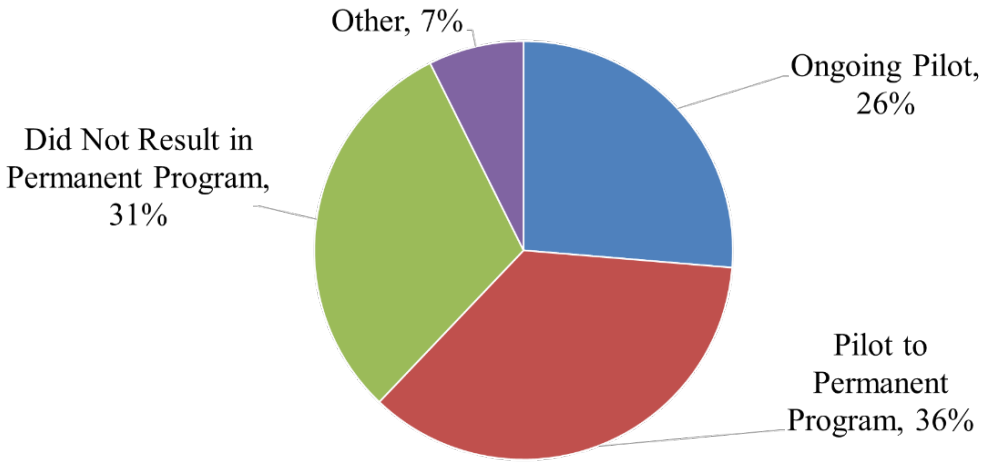

Figure 4. Utility Survey – Pilot Movement to Permanent Program

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

Table 1. 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. A separate review for EWR pilots was conducted and 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 bene informally reported and not filed to the docket, or reviewers missed information due to voluminous files contained in each docket.

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.

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 5 for the percentage of the collected pilots from each utility.

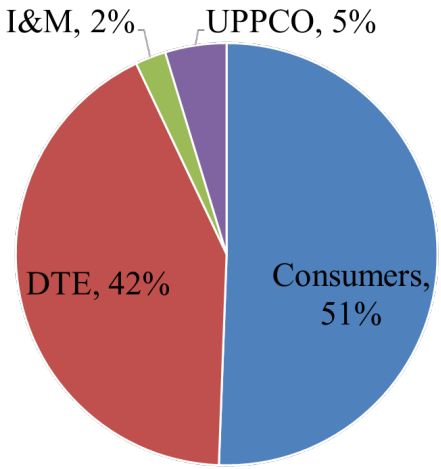

Figure 5. MPSC Case Review – Percentage of Pilots Reviewed by Investor Owned Utility

There are 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. Please see Figure 6 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%.

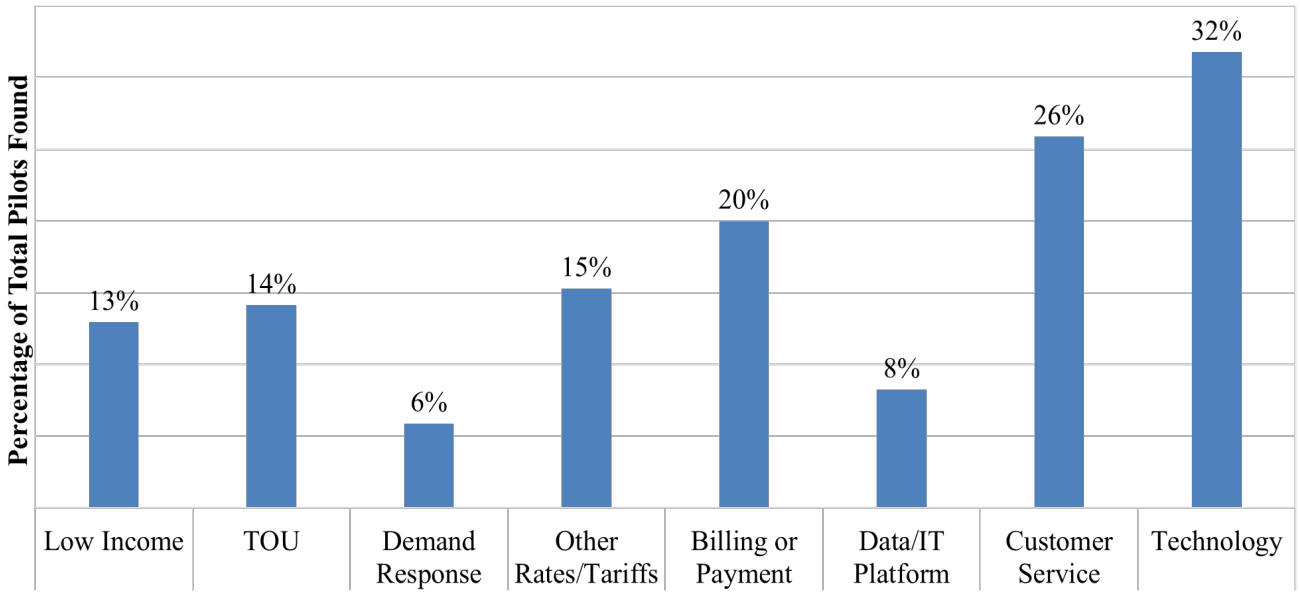

Figure 6. MPSC Case Review – Pilot Types in Dataset

Since 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 7 for the breakdown of technology types observed.

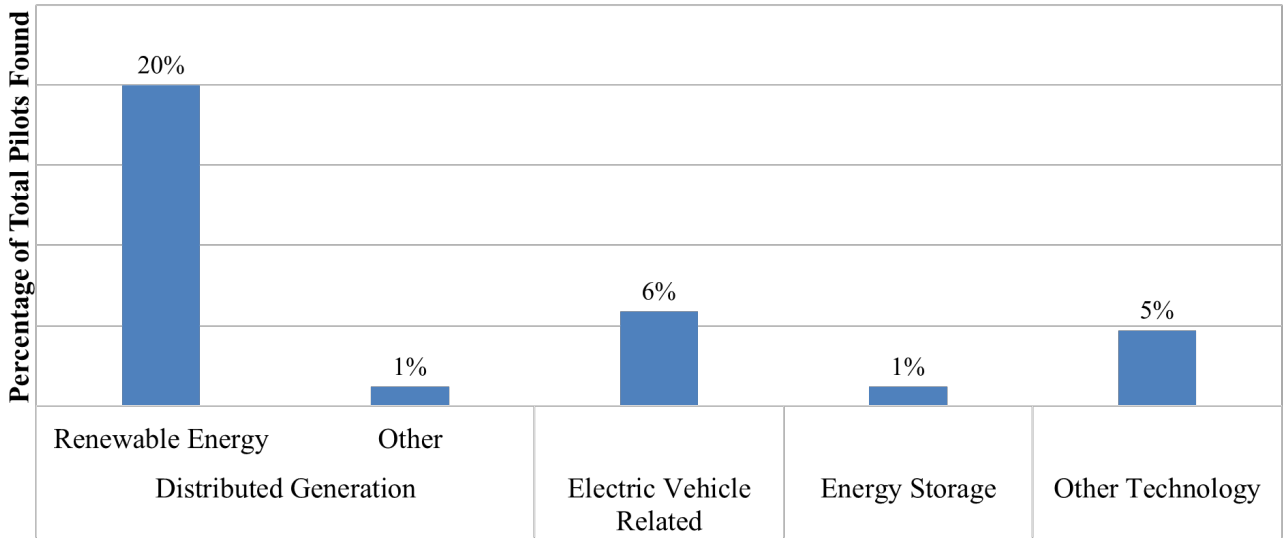

Figure 7. MPSC Case Review – Technology Pilots in Detail

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 8 for the percentages of pilots in the dataset that provided pilot design information.

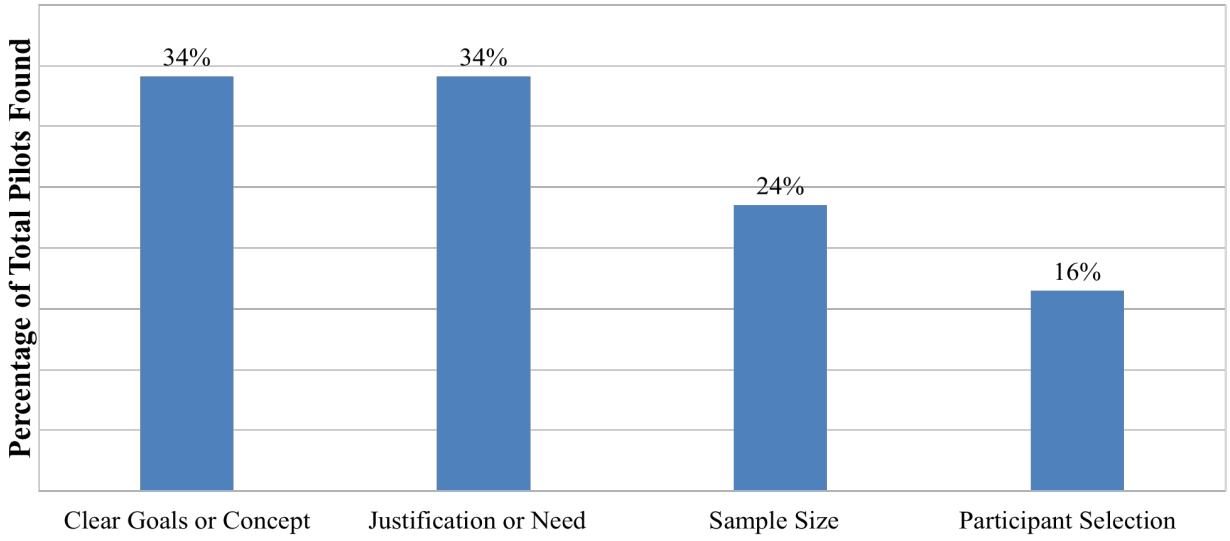

Figure 8. MPSC Case Review – Pilots in Dataset Providing Pilot Design Information

Similarly, Staff found limited information on pilot evaluation methods in the documents filed to MPSC dockets. 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 to the docket. This contrasts with the utility survey responses, which indicated a high percentage of pilots required the utilities to self-report (Consumers Energy 66%; DTE Energy 77%). This finding leads Staff to believe that pilot reporting is largely informal and not posted to the MPSC e-docket system.

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 2).

Table 2. 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 9 for the utilities represented in the dataset.

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 utility goals and customer needs. See Figure 10 for a chart of differences in EWR pilots by sector.

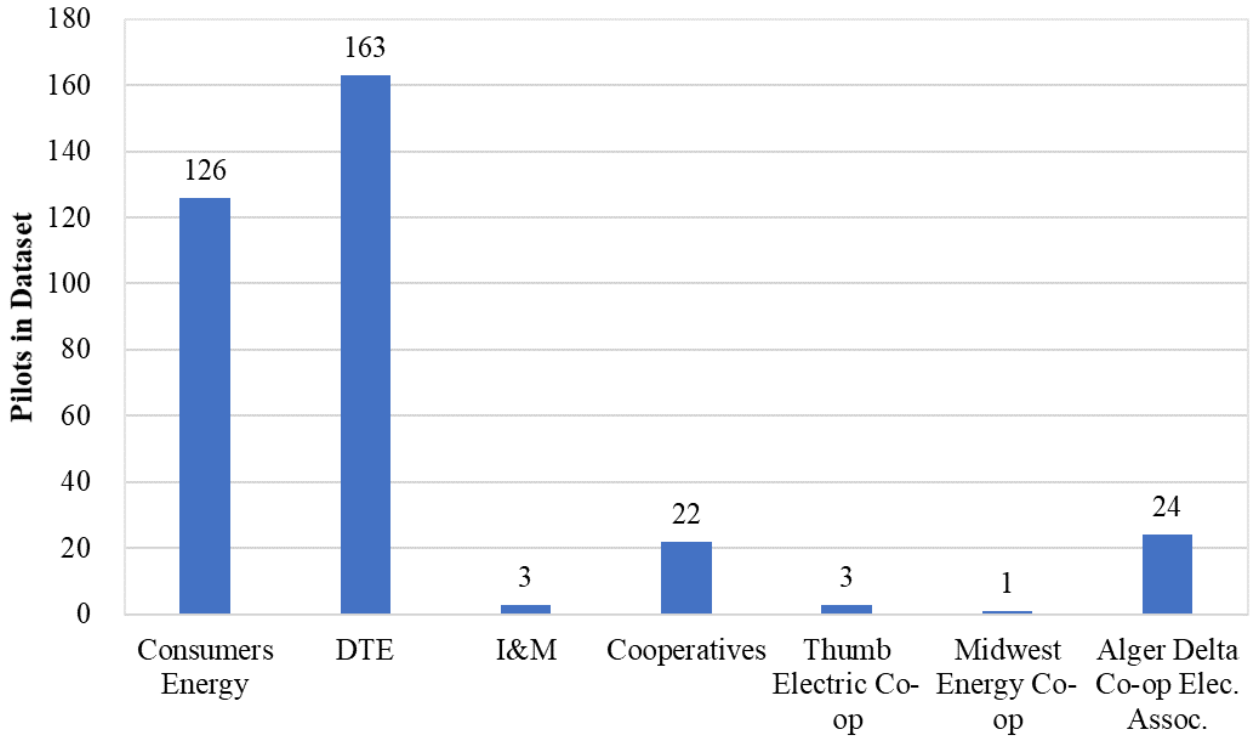

Figure 9. MPSC EWR Pilot Review – Utilities Represented

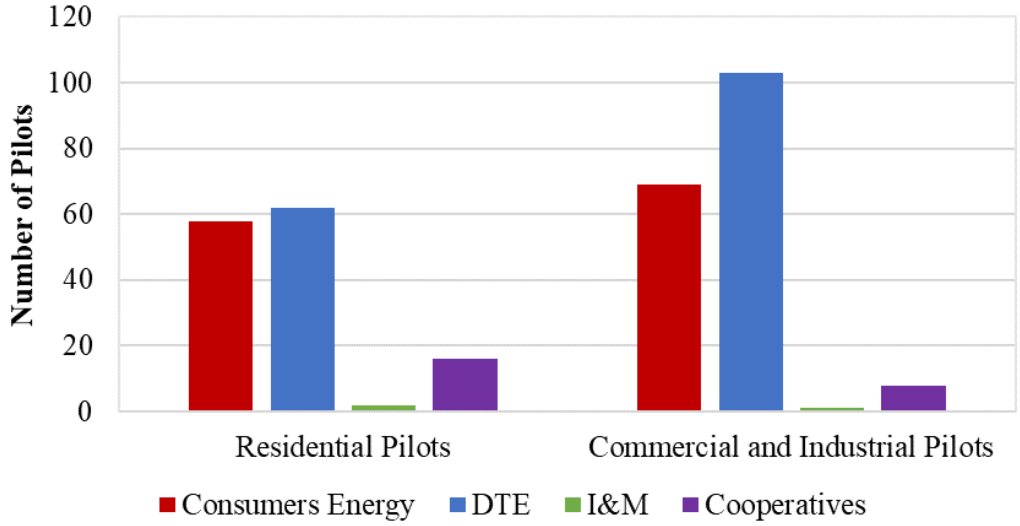

Figure 10. MPSC EWR Pilot Review – Pilots by Sector and Utility

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 each one. See Figure 11 for the number of EWR pilots out of the 342 pilots examined that provided pilot design information by utility. See Figure 12 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.

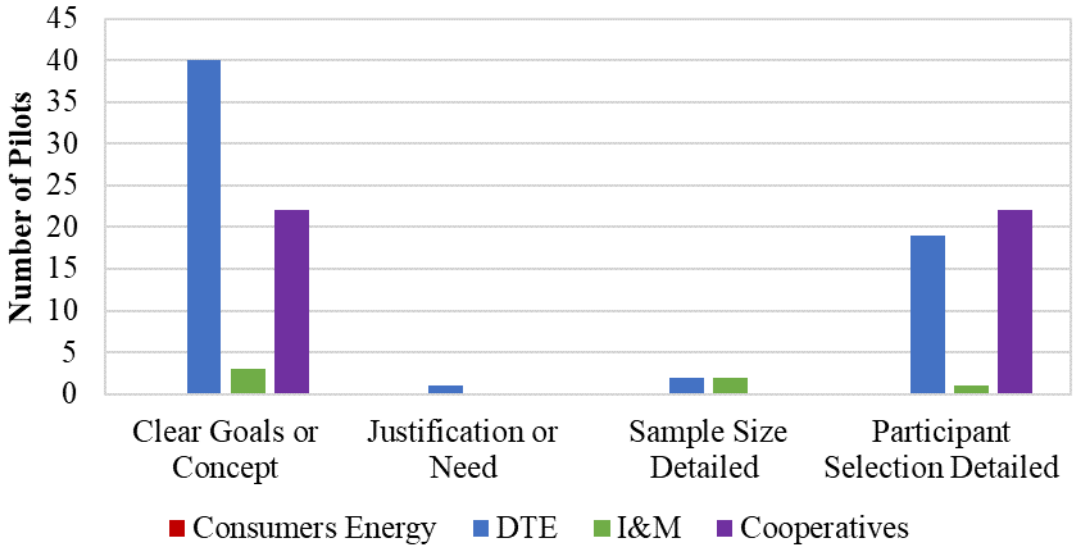

Figure 11. MPSC EWR Pilot Review – Pilots in Dataset Providing Pilot Design Information

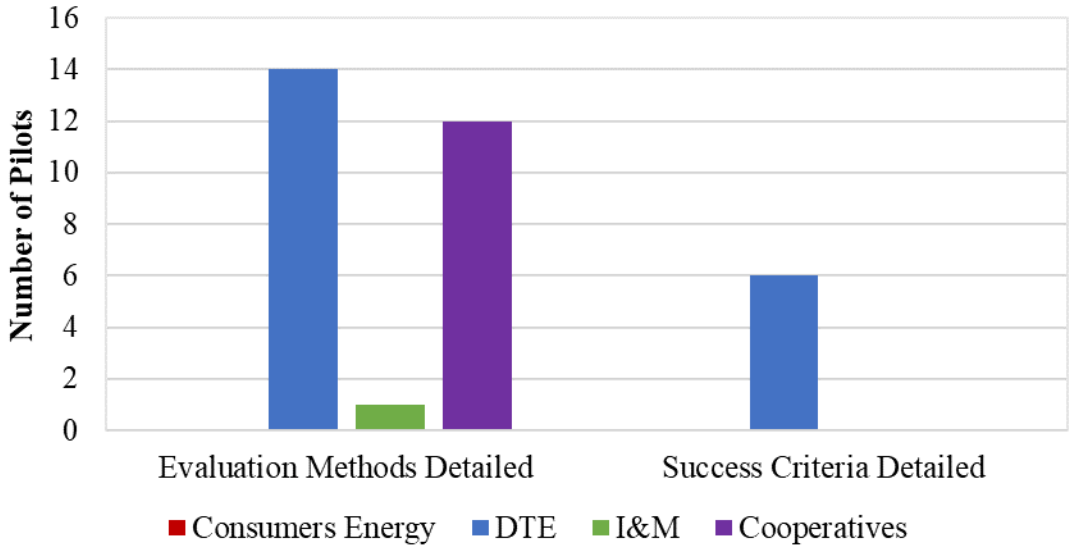

Figure 12. MPSC EWR Pilot Review – Pilots Providing Evaluation and Success Information

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 EWR pilot information, locating EWR pilot information 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 the remote meetings. For stakeholders interested in sharing their thoughts on

[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

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.

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, 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.

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 Services 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, Steve 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.

With the various definitions proposed above, Staff recommends the following as a broad definition of "pilot": *A pilot is a limited duration experiment to determine the impact of an intervention on one or more outcomes of interest.*

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 through 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 generally leads to pilots with 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). Only treatments and functionalities intended to be offered as full-scale development should be tested in pilot programs (Sergici, 2020).

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 from 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 the need for a novel pilot, 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 the testing of 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 Massachusetts Clean-Peak Standard, 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 order to enable extrapolation of larger lessons, though sometimes specific pilots will experience challenges. 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 (Padula, 2020). For example, there may be city and township codes that prevent pilot project activities. Many cities have moratoriums on erecting additional wind farms, which prevents completion of pilots that include adding new wind resources to a community. These regulations may present challenges to a pilot that cannot be overcome by the Commission.

During meetings, stakeholders emphasized the importance of bringing project stakeholders, such as communities and academics, into 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 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. A number of the programs also did not undergo independent third-party evaluations (Dougherty, Henderson, Dwelley, and Jayaraman, 2015).

The evaluation plan, much like the pilot itself, must have a narrow focus(Cappers, 2020). 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 aide in developing 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 flexibility 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(George & Bell, 2020).

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 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 3 for descriptions of these pilot designs.

Though Todd and Sergici agree RCTs are the gold standard for pilots (Sergici, 2020; Todd-Blick, 2020), Sergici believes randomized encouragement design (RED) also meets the gold standard (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 3. 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 by 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 design to detect statistically significant impact, which increases pilot implementation costs
Random Sampling with Matched Control Group	Recruits treated customers from randomly selected sample. Uses regression analysis to	Strikes balance between statistically valid results and	

	identify and match customers from rest of population that are most similar to treatment customers	manageable level of pilot participants	

Note: Table adapted from Sergici (2020).

Sergici suggests communication between pilot designers and marketing teams occur frequently to ensure participant recruitment functions as planned (2020). It is acceptable to adjust pilots as needed during the implementation process, but design and evaluation experts must both provide input in the process 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. False positives 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 therefore 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 for the same reason. 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). Engaging the public prior to beginning pilot programs and throughout pilot implementation is important and appropriate especially when pilots are funded by rate payers. 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 limited only to qualifying customers (Cira-Reyes et al., 2020; Grocoff & Washington, 2020). The answers to what pilots are needed often depends on *who* is asked. For instance, a targeted neighborhood in an affluent community of DTE's service territory such as Ann Arbor, would likely have very different needs and 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). Determining the impact of socioeconomic factors on pilots results is currently difficult to measure.

Stakeholders strongly supported the importance of stakeholder input and outreach in developing pilot programs (See Appendix E.3). While stakeholder engagement is important, it must 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.

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 faced by low income customers as well as by people 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 people 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 people 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, 2020).

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 people 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 communities of color members. As such, members of underserved communities may not engage with the 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 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, including 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 their 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 regarding 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. 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).

Utilities generate and share data-driven results from numerous pilots each year (Farrell, 2020; Kiley, Prentice, & McGraw, 2020; Mueller, 2020; Walter, 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 the quarterly reports that are filed (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, not ensuring that 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. Stakeholders also recommend that regulators 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. His team had access to the SGIG data and conducted analyses to gain valuable programmatic insights (Cappers, 2020). However, to conduct these types of studies and evaluations, researchers need access to utility data. Public access to pilot data would support this type 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 (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 Smart Grid Investment Grants. Cappers recommends that the MPSC examine and address any FIOA 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 as 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 uphold the data privacy and data accessibility rules approved in 2017 (Consumers Energy et al., 2020). May 28 panelists 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. The majority of 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). Such a system would 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 (Faruqui, 2020).

1. Design cost-reflective rates but make sure they are customer friendly; consider offering choices.
2. Learn how customers think and market the rates using the customer's language.
3. Educate customers on how to benefit from the rates.
4. Use enabling technologies and behavioral messaging to enhance the price signal.
5. 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.
- 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 checklists 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 pilot programs.

4.6.1 Utilize Michigan Resources

Stakeholders expressed interest in future pilots utilizing Michigan resources, whether it be existing energy infrastructure or in-state resources and talent.

Stakeholders are interested in pilots utilizing Michigan businesses and talent to magnify the economic impacts of pilots in the state (Fingland & Jaques, 2020; Grocoff & Washington, 2020). There is interest in cultivating Michigan's energy innovation environment through developing targeted technology initiatives and partnerships with industry leaders. There was also interest in 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 have yielded important insights, but there is no platform connecting interested talent with the pilot projects that government agencies plan to study. 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, wind energy generation by leveraging Michigan resources and energy infrastructure. Joe Tesar (Quantalux) suggests the limited duration 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, 2020, 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 more pilots focus specifically for 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 expressed interest in 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) effects on results.

A systems approach to evaluate utility pilots will likely cause different utility solutions to be selected for full implementation. Lessons from Drawdown Georgia, where promising solutions of 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 the 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 take advantage of distributed energy resource (DER) changes so DERs can be integrated 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 (Faruqui, 2020). 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).

Pilot projects are a key part of grid modernization in the U.S. 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 wildly in cost, scope, and location. Since it can take several years if the system is not properly optimized to handle many varied pilot programs, Tom Stanton (National Regulatory Research Institute) 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. Innovative 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 innovative 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 innovative 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.
- An experience regulatory team to identify potential value and flaws and respond rapidly to innovator questions.
- 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 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).

Once a filing is made in the New York REV process, 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 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 – e.g. City codes.
- Limit the number of policies and principles attempting to be addressed in one project to ease the execution and evaluation – be realistic.
- 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 the 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). Douglas Jester presented several questions for the Commission to address future pilot projects based on relevance, planning, and overall benefit to society (Jester, 2020). Steve 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 trail-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, and
  - provide to make pilot adjustments that may require 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 four main recommendations. The first provides a definition of the term "pilot." The second focuses on objective criteria for evaluating pilot projects. The third focuses on a pilot data repository and the last recommendation focuses on future pilot areas. All are detailed below.

5.1 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 definition for pilots 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 that it is clear when the proposed objective criteria apply. Based on input from workgroup speakers and stakeholders, Staff recommends the following definition of pilot:

> *A pilot is a limited duration experiment to determine the impact of an intervention 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.

5.2 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 in its work 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 in the country 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.

1. ***Clear pilot need and goals.***
    a. Clear 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 clearly detailed.

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

Staff recommends a comprehensive pilot plan submitted to Staff with all of 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.

5.3 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 always be designed and implemented at a later date.

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. Some stakeholders expressed difficulties in reaching out to utility contacts to share relevant technologies or ideas. In addition to the information above, the directory page could also include a section regarding future pilot areas of interest and pertinent contacts by utility. This will further support interested third parties in sharing pertinent technologies or ideas with utilities.

5.4 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, Governor, or Legislature. 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.

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 adoption of a broad definition of "pilot" for the purpose of MPSC efforts to encompass the wide variety of pilot topics explored. Second, Staff recommends objective criteria for evaluating pilot best practices when pilots are proposed in future rate cases. These objective criteria are intended to assess the reasonableness, prudency, and public interest impact of pilot investments. Third, Staff recommends the establishment 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. Lastly, Staff recommends the Commission, Governor, or Legislature establish and promote foundational goals with clear metrics that can direct future energy pilot efforts.

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 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.

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Appendix A: Stakeholder Meeting Summaries by Date

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

Commissioner Tremaine Phillips and Anne Armstrong-Cusack provided opening statements to kick-off the workgroup activities. Tom Stanton (National Regulatory Research Institute (NRRI)) presented a national overview of state grid modernization programs and actions, including pilot projects, in nearly 20 states. He also 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 past Commission approved pilots since 2008, and Utility Survey, to learn from past and ongoing utility pilots. Consumers Energy, DTE, and I&M representatives discussed their pilot definitions and pilot processes, followed by a presentation by Annika Todd-Blick (Lawrence Berkeley National Lab) on pilot best practices. Nekabari Goka (Oracle) shared his pilot definition and best practices pertaining to customer experience pilots.

Presentations regarding feedback on workgroup process and content were next. Stakeholders heard from Consumers Energy, DTE, and I&M representatives as well as Jeremy Kraft (EMI Consulting) and Amy Ellsworth (Cadmus). Lastly, Staff moderated a discussion regarding workgroup process and content.

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

The second stakeholder meeting was the first conducted via teleconference only. 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)

In the third stakeholder meeting, Sanem Sergici (Brattle Group) and Stephen George (Nextant) discussed pilot design and best practices. Ben Dueweke (Walker-Miller Energy Services) gave an overview of some pilot best practices distilled from Detroit community-based energy waste reduction project focused on intentional community engagement.

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

In the fourth stakeholder meeting, 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)

In the fifth stakeholder meeting, 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 (MiEIBC), 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)

In the sixth meeting, 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 to this final stakeholder meeting, which focused on maximizing customer benefit from the clean energy transition. 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. After a beak, another 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 Emerging Technologies, followed by "Pilot Program Importance and Best Practices" from Sean Williams (CLEAResult). After a presentation by Joy Wang (MPSC) on Pilot Ideas from other MI Power Grid Workgroups, Marilyn Brown (Georgia Institute of Technology) related strategies for reducing carbon emissions in Michigan based on Georgia successes. Anne Armstrong-Cusack 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.

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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	

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Appendix B-3. April 30, 2020 Stakeholder Meeting

GRETCHEN WHITMER
GOVERNOR

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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	

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Appendix B-4. May 14, 2020 Stakeholder Meeting

GRETCHEN WHITMER
GOVERNOR

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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	

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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	

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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	

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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
○	○	○	○	○

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
○	○	○	○	○

Appendix D: Stakeholder Survey, continued

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.

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Appendix D: Stakeholder Survey, continued

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?

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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: Comments on Draft Staff Report