

Direct Testimony and Schedules
Michael C. Gersack

Before the Minnesota Public Utilities Commission
State of Minnesota

In the Matter of the Application of Northern States Power Company
for Authority to Increase Rates for Electric Service in Minnesota

Docket No. E002/GR-19-564
Exhibit____(MCG-1)

AGIS Customer Experience and Policy

November 1, 2019

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1 **I. INTRODUCTION**

2
3 Q. PLEASE STATE YOUR NAME AND OCCUPATION.

4 A. My name is Michael C. Gersack. I am Vice President of Innovation and
5 Transformation for Xcel Energy Services Inc. (XES), which provides services
6 to Northern States Power Company – Minnesota (NSPM or the Company).

7
8 Q. PLEASE SUMMARIZE YOUR QUALIFICATIONS AND EXPERIENCE.

9 A. I have more than 25 years of experience in the areas of customer operations,
10 accounting, and finance. In my current position, I am responsible for leading
11 our Innovation & Transformation Office that governs and drives the
12 successful implementation of critical programs or projects that focus on
13 efficiency, operational effectiveness and innovation, and enable the Company
14 to continuously improve and transform. Our ITO includes the following
15 Centers of Excellence: Project Management Office; Innovation; Process
16 Management; Data Strategy and Governance; and Change Management. I was
17 previously Vice President of Customer Care, where I was responsible for the
18 overall business performance of our customer operations including meter
19 reading, billing, credit, remittance processing, and customer contact center
20 functions. Prior to this, I held various operational, accounting and financial
21 positions supporting Xcel Energy’s distribution, marketing, transmission, and
22 customer service functions. Before joining Xcel Energy, I held similar
23 positions with Kinder Morgan (KN Energy). My resume is provided as
24 Exhibit____(MCG-1), Schedule 1.

25
26 Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

1 A. The purpose of my testimony is to provide the overview of the Company's
2 plans to transform the customer experience through the investments that are
3 proposed as part of the Company's Advanced Grid Intelligence and Security
4 (AGIS) initiative. My Executive Summary summarizes the Company's
5 support for the AGIS initiative in my testimony and the testimony of other
6 witnesses in this rate case. I also provide an overview of the Company's grid
7 modernization efforts to date, outline the Company's strategic goals and
8 identify the current state of the customer experience and the distribution
9 system. I describe, at a high level, the work required to implement each
10 component of the AGIS initiative for which we are requesting cost recovery in
11 this proceeding, contemporaneous with the requests in our simultaneous
12 Integrated Distribution Plan (IDP) filing. I outline the Company's proposed
13 capital investments and operations and maintenance (O&M) costs for the core
14 components of the AGIS initiative. I also summarize the timing of
15 implementation of these components from both a system and customer
16 perspective, and explain in detail the customer experience that will result from
17 our work. I also discuss the Company's planned outreach efforts to help
18 educate customers on what to expect from AGIS and how the new
19 functionality will benefit them.

20
21 I also summarize the cost and benefits analysis that the Company has
22 conducted with respect to the AGIS components, while also emphasizing the
23 benefits that are qualitative and, by definition, non-quantifiable. I also provide
24 a bill impact analysis for the components of the AGIS initiative. Lastly, I
25 speak to the Company's plans for progress metrics and reporting with respect
26 to the AGIS initiative.

27

1 Q. HOW IS YOUR TESTIMONY ORGANIZED?

2 A. I present my testimony in the following sections:

- 3 • *Section II* – Executive Summary
- 4 • *Section III* – Grid Modernization Background
- 5 • *Section IV* – Drivers of the AGIS Strategy
- 6 • *Section V* – AGIS Components and Implementation Strategy
- 7 • *Section VI* – AGIS and the Customer Experience
- 8 • *Section VII* – Prudence of the AGIS Investments
- 9 • *Section VIII* – Bill Impacts
- 10 • *Section IX* – AGIS Metrics and Reporting
- 11 • *Section X* – Conclusion

12

13

II. EXECUTIVE SUMMARY

14

A. Introduction to the AGIS Initiative

15

16 Q. PLEASE EXPLAIN XCEL ENERGY'S APPROACH TO DISTRIBUTION SYSTEM
17 PLANNING, IN GENERAL.

18

19 A. Xcel Energy has a 100-year track record of outstanding service to our
20 customers and communities – delivering safe, reliable, and affordable energy.
21 And while we remain focused on those fundamentals, we are also looking to
22 the future and have a vision for an advanced grid that will provide both
23 customer and operational benefits for many years to come. Our grid
24 modernization plan is designed to maximize customer value, ensure the
25 fundamentals of our distribution business remain sound, and maintain the
26 flexibility needed as technology and our customers' expectations continue to
evolve.

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We are also constantly assessing our customers’ experience, including what they want and need from their electric and gas utility. We have learned that customers want access to actionable information, more choice and greater control of their energy use – and they expect a smarter, simpler, and more seamless experience. In order to meet that need, we need a smarter grid. We therefore plan to integrate modern customer experience strategies with advanced grid platforms and technologies to enable intelligent grid operations, smarter networks and meters, and optimized products and services for our customers.

Q. WHAT IS AGIS?

A. The AGIS initiative is our long-term strategic plan to transform our electric distribution system to address aging meter technology, meet changing customer demands, enhance transparency into the distribution and to system data, to promote efficiency, and reliability, and to safely integrate more distributed resources. The AGIS initiative consists of multiple elements that work together to create a more modern and advanced distribution grid.

Q. WHAT ARE THE COMPONENTS OR ELEMENTS OF AGIS?

A. The core components of AGIS are the Advanced Distribution Management System (ADMS); Advanced Metering Infrastructure (AMI); and the Field Area Network (FAN). ADMS is underway, with costs being recovered in the TCR Rider. In this case, we propose to implement AMI, FAN, and two advanced applications that we believe will provide substantial benefits to customers: Integrated Volt-VAr Optimization (IVVO); and Fault Location Isolation and Service Restoration (FLISR). More specifically:

- 1 • *Advanced Distribution Management System (ADMS)* is the backbone of the
2 AGIS initiative, consisting of a real-time operating system that enables
3 enhanced visibility into the distribution power grid and controls
4 advanced field devices.
- 5 • *Advanced Metering Infrastructure (AMI)* is the Company’s proposed
6 metering solution, consisting of an integrated system of advanced
7 meters, communication networks, and data processing and
8 management systems that enables secure two-way communication
9 between Xcel Energy’s business and data systems and customer meters.
- 10 • *Field Area Network (FAN)* is a private, secure, flexible two-way
11 communication network that provides wireless communications across
12 Xcel Energy’s service area – to, from, and among, field devices and our
13 information systems.
- 14 • *Fault Location, Isolation, and Service Restoration (FLISR)* is an ADMS
15 application that improves customers’ reliability experience, reducing the
16 duration of outages and number of customers affected by them. FLISR
17 takes the form of distribution automation and involves the deployment
18 of automated switching devices that work to detect issues on our
19 system, isolate them, and automatically restore power.
- 20 • *Integrated Volt VAr Optimization (IVVO)* is an ADMS application that
21 uses specific field devices to optimize voltage as power travels from
22 substations to customers, reducing system losses and may result in
23 energy savings for customers.

24
25 Of course, protective cyber security and information technology (IT) support
26 underlie all these components, as they are essential to operating a secure,
27 technologically-advanced grid in today’s world.

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B. Drivers of the AGIS Initiative

Q. WHY IS THE COMPANY IMPLEMENTING AGIS AT THIS TIME?

A. NSPM has made incremental modernization efforts for the distribution system over many years, striving to maintain a grid that is as reliable and efficient as it could be with the technology it currently employs. However, our current one-way meters are nearing the end of their lives. With meter replacement a near-term reality, now is the right time to begin a more significant advancement of the grid through our AGIS initiative – of which AMI meters are the largest component. Other drivers impacting the timing of the AGIS transition include:

- The Company’s strategic priorities to lead the clean energy transition, enhance the customer experience, and keep bills affordable;
- The Company’s desire to meet the growing needs and expectations of our customers;
- Current distribution system needs; and
- Commission policy and direction, and stakeholder input relative to customer offerings, performance, and technological capabilities of the grid.

Q. BEFORE DISCUSSING EACH DRIVER IN TURN, PLEASE DESCRIBE THE COMPANY’S OVERALL APPROACH TO IDENTIFYING AND SELECTING THE COMPONENTS OF THE AGIS INITIATIVE.

A. Over the last several years, the Company has experienced a variety of converging needs and opportunities related to distribution grid modernization – some driven by internal system needs, others by industry direction, and still others by customers and other stakeholder considerations. The Company’s

1 extensive assessments of these multi-faceted needs, as well as the alternatives
2 to meet them, are described in detail in the testimony of Company witnesses
3 Ms. Bloch, Mr. Cardenas, and Mr. Harkness. As one example, Ms. Bloch and
4 Mr. Cardenas explain the status of the current meters on our system, and Ms.
5 Bloch discusses the extensive planning, information gathering, RFP processes,
6 and consideration of alternate vendors, devices, systems, and programs that
7 we undertook prior to landing on our current AMI plan. Mr. Harkness
8 explains the work completed to select the appropriate IT solutions. We
9 compared the capabilities, costs, benefits, and limitations of a variety of
10 solutions, as well as the costs versus benefits of our preferred solutions, and
11 ultimately propose an overall AGIS package that I believe delivers on the
12 promise of grid advancement.

13
14 Q. PLEASE DISCUSS THE COMPANY'S STRATEGIC PRIORITIES AND HOW THEY ARE
15 DRIVING THE AGIS INVESTMENTS.

16 A. We are working every day to lead the transition to a clean energy future,
17 enhance our customers' experience with their utility, and keep bills low. The
18 AGIS initiative advances each of these priorities. As I describe in more detail
19 throughout my testimony, our customers can be partners in a more
20 environmentally sound future, especially if they are empowered with better
21 information and data to manage their energy usage and make conservation-
22 friendly choices. AMI and the associated components of the AGIS initiative
23 are critical to these efforts. Likewise, IVVO has the potential to act as a
24 demand side management-type tool with carbon reduction and energy savings
25 benefits without requiring any action from customers. Distributed energy
26 resources (DER) are also a key to this clean energy future, and two-way
27 communications on the distribution grid, down to the meter level, are

1 necessary to accommodate increased levels of DER on the system. Thus,
2 while the AGIS initiative provides direct benefits to all of our customers
3 (beginning with implementation and over the long term), it also enables
4 environmental benefits that will be provided for both customers and non-
5 customers alike.

6
7 Further, customers are demanding more optionality and increasing levels of
8 service from all their service providers – including us. The AGIS initiative is
9 intended to create better interfaces with customers, provide them with better
10 information and more choices, and thus improve their overall experience.
11 Coupled with efforts to improve the digital platforms through which we
12 interact with customers, improved energy management, control, conservation,
13 and bill management are all available with a more interactive, advanced
14 distribution system. And it goes without saying that continually enhancing our
15 customers’ reliability experience is at the core of quality electric service.

16
17 Finally, our proposed AGIS initiative offers our customers opportunities to
18 better control and manage their monthly bills by providing more timely and
19 granular energy usage data and enabling advanced rate design.

20
21 Q. WHAT ARE THE CHANGING CUSTOMER NEEDS AND EXPECTATIONS DRIVING
22 THE COMPANY’S AGIS INVESTMENTS?

23 A. Influenced by other services, like Amazon, customers have come to expect
24 more from their energy providers than in the past, including greater choices
25 and levels of service, as well as greater control over their energy sources and
26 their energy use. Customers also expect greater functionality and interaction
27 in how those services are delivered. Technologies that customers can use to

1 control their energy usage, such as smart thermostats, electric vehicle (EV)
2 chargers, smart home devices, and even smart phones and energy-related
3 digital applications, are evolving at a fast rate.

4
5 Q. HOW DOES AGIS ENABLE THE COMPANY TO MEET EVOLVING CUSTOMER
6 EXPECTATIONS?

7 A. While Xcel Energy customers today have access to a multitude of energy
8 efficiency and demand management programs, renewable energy choices, and
9 billing options, there is a limit to what we can offer without taking advantage
10 of the new technology that has emerged around grid advancement. Smart
11 electric meters can now more easily and flexibly gather more detailed
12 information about customer energy usage, which utilities can use to help
13 customers better understand and manage their usage. Other advanced
14 equipment on the grid can detect, communicate, and respond in real time to
15 circumstances that would normally result in power outages. Grid operators
16 can also get improved data to better and more proactively plan and operate
17 the grid. These advancements form the foundation for a flexible grid
18 environment that helps support two-way power flows from customer-
19 connected devices or generating resources (such as rooftop solar) and
20 provides utilities with a greater ability to adapt to future developments.

21
22 Q. WHAT ARE THE SYSTEM NEEDS THAT MAKE NOW THE RIGHT TIME FOR THE
23 COMPANY TO IMPLEMENT THE AGIS INITIATIVE?

24 A. There are a variety of needs. Like other electric utilities, our current
25 distribution system is based on one-way flow of information on much of our
26 system, which means that beyond the distribution substation, the Company
27 has little insight into the workings of the distribution system as it relates to

1 outages, voltage levels experienced by the customer, and DER operations.
2 Company witness Ms. Kelly Bloch describes this in further detail. Additional
3 components that integrate with ADMS and advanced meters are necessary to
4 better manage and shorten outages, and to maximize the voltage management
5 on our system.

6
7 In addition, our current automated meter reading (AMR) technology in
8 Minnesota is nearing end of life and our meter reading services vendor,
9 Landis+Gyr (Cellnet) has informed the Company that it will no longer
10 manufacture replacement parts for this system after 2022. In fact, we are the
11 last Cellnet customer still using this technology. Further, our current contract
12 with Cellnet for meter reading services expires at the end of 2025. While we
13 have maximized the value of this AMR system that has provided efficient
14 meter reading services for nearly 30 years, we now have the opportunity to
15 transition to AMI, a proven meter technology. AMI will allow us the ability to
16 expand the use of our meter system beyond basic billing functions for the
17 benefit of our customers.

18
19 Q. TO WHAT EXTENT IS THE COMPANY'S AMI PROPOSAL ALIGNED WITH THE
20 INDUSTRY?

21 A. AMR technology is becoming increasingly outdated and the progressively
22 complex needs of the distribution system require movement to technology
23 that can accommodate these needs. As stated in the United States Department
24 of Energy (DOE), Office of Electricity's November 2018 Smart Grid System
25 Report to Congress, "[f]rom 2007 to 2016, the number of advanced meters
26 has grown ten-fold. About 70.8 million meters out of a total of 151.3 million
27 meters were smart meters as of 2016, representing about 47 percent of U.S.

1 electricity customers. Bloomberg estimates that number has risen to 51
2 percent by the start of 2018. This is a significant increase compared to 14
3 percent of customers with smart meters in 2010 and only 2 percent in 2007.”¹

4
5 Xcel Energy has always performed well with respect to system reliability,
6 management, and customer service, but in light of the prevalence of advanced
7 meters and smart grid technologies, the Company must make similar
8 investments to ensure continuing alignment with industry direction and
9 customer expectations.

10
11 Q. ARE THERE BROADER INFRASTRUCTURE NEEDS THAT ARE FACTORED INTO
12 THE COMPANY’S AGIS STRATEGY?

13 A. Yes. The DOE Smart Grid System Report has recognized the broader need
14 for attention to distribution infrastructure nationwide:

15 Our [country’s] electric infrastructure is aging and it is being pushed
16 to do more than it was originally designed to do. Modernizing the
17 grid to make it “smarter” and more resilient through the use of
18 cutting-edge technologies, equipment, and controls that
19 communicate and work together to deliver electricity more reliably
20 and efficiently can greatly reduce the frequency and duration of
21 power outages, reduce storm impacts, and restore service faster
22 when outages occur. Consumers can better manage their own
23 energy consumption and costs because they have easier access to
24 their own data. Utilities also benefit from a modernized grid,
25 including improved security, reduced peak loads, increased
26 integration of renewables, and lower operational costs.

27
28 “Smart grid” technologies are made possible by two-way
29 communication technologies, control systems, and computer
30 processing. These advanced technologies include advanced

1

https://www.energy.gov/sites/prod/files/2019/02/f59/Smart%20Grid%20System%20Report%20November%202018_1.pdf, as of October 1, 2019 (internal citations omitted) (DOE Smart Grid System Report).

1 sensors... that allow operators to assess grid stability, advanced
2 digital meters that give consumers better information and
3 automatically report outages, relays that sense and recover from
4 faults in the substation automatically, automated feeder switches
5 that re-route power around problems, and batteries that store excess
6 energy and make it available later to the grid to meet customer
7 demand.²
8

9 It is consistent with these broader industry needs that we are implementing
10 ADMS at this time and that our existing AMR meters are nearing the end of
11 their life. And, as noted earlier, our customers are also demanding more
12 optionality, environmentally-sound investments, more control over their
13 energy usage, and better outage management and communications.
14

15 Q. HAS THE COMPANY CONSIDERED COMMISSION AND STAKEHOLDER INPUT IN
16 FORMING ITS GRID STRATEGY?

17 A. Yes. We have applied Commission guidance and stakeholder feedback
18 gleaned through regulatory proceedings and Commission- and Company-
19 sponsored stakeholder processes around grid modernization, DER hosting
20 capacity, integrated distribution system planning, our integrated resource plan,
21 and performance metrics for the Company's electric operations. We also
22 considered the Commission's guidance and stakeholder feedback associated
23 with the Company's proposed Time of Use (TOU) pilot and our EV pilot
24 proposals. All of this guidance and feedback helped shape our proposal in
25 terms of the advanced grid capabilities, how we prioritized the advanced
26 applications, and how we evaluated the costs and benefits of the various AGIS
27 components.
28

² <https://www.energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid>, as of Oct. 1, 2019.

1 Q. IN LIGHT OF COMMISSION POLICY DIRECTIONS, ARE THERE OTHER STRATEGIC
2 REASONS WHY THE COMPONENTS OF THE AGIS INITIATIVE ARE IMPORTANT
3 AT THIS TIME?

4 A. Yes. Various Commission policies and specific goals of each of the efforts
5 described above are supported or enabled by advanced grid technologies. We
6 have considered these policies, goals, and the stakeholder input as we
7 developed our overall strategy and specific project plans for AGIS
8 implementation. I discuss this further in Section IV, along with other drivers
9 of our AGIS strategy.

10

11 Further, as the prevalence of DER continues to rise, the ability to manage
12 these resources requires visibility into the grid and a more resilient and
13 responsive grid. As the DOE Smart Grid Report stated, grid advancement is
14 necessary to support “the increasing presence of renewable generation and the
15 proliferation of customer- and merchant-owned DERs [that] are introducing
16 significantly greater levels of variability and uncertainty in both the supply of
17 electricity and the demand for it. Generation and load profiles, which have
18 been predictable in the past, can now vary instantaneously and are subject to
19 the behavior of consumers where DERs are present.”³ Enhanced grid
20 management through ADMS, meters with two-way communications that act
21 as sensors, and greater voltage optimization will all support our ability to host
22 increasing levels of DERs.

23

24 Given these circumstances and the additional customer and system benefits
25 enabled by advanced grid technology, the Company determined now is the
26 appropriate time to pursue a targeted AGIS initiative that will address system

³ DOE Smart Grid Report at p. 5.

1 needs, customer needs, and our overall strategic priorities as a Company to
2 lead the clean energy transition, enhance the customer experience, and keep
3 bills low.

4
5 **C. AGIS Implementation**

6 Q. WHAT PORTIONS OF THE AGIS INITIATIVE ARE UNDERWAY?

7 A. With the Commission's certification and approval of our first year of costs,
8 the ADMS is underway and scheduled to go into service in 2020. We are also
9 in the process of implementing our TOU pilot, consistent with the
10 Commission's Order in Docket No. E002/M-17-775, certifying it as a
11 distribution project under Minn. Stat. § 216B.2425 (*i.e.*, a grid modernization
12 project). This pilot is intended to study time of use rates and how to
13 maximize their value. This limited deployment of AMI meters and the FAN
14 communications network in connection with the TOU pilot is a part of the
15 overall AGIS initiative, and has been considered as we have developed plans
16 for full deployment of advanced grid technologies. Likewise, we have
17 conducted system research and testing around FLISR and IVVO, as discussed
18 by Company witness Ms. Kelly Bloch.

19
20 Q. WHAT IS THE TIMING OF OVERALL AGIS IMPLEMENTATION?

21 A. Implementation of the components of the AGIS initiative will occur over
22 several years and be substantially complete by 2024, with FLISR
23 implementation expected to continue through approximately 2028. As such, a
24 large portion of AMI, FLISR, IVVO, and FAN work will be undertaken and
25 placed in service during the multi-year rate plan (MYRP) period, and are
26 included in the Company's rate request. Our implementation timeline is set
27 forth in Table 1, below:

1
2 **Table 1**

3

Program	Implementation Timeline
ADMS	In-service 2020
AMI	Meter roll-out 2021-2024
FAN	Deployment 2021-2024 (preceding AMI deployment by approximately six months)
FLISR	Limited testing 2020; Implementation 2020-2028
IVVO	Limited testing 2021; Implementation 2021-2024

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12 That said, the grid modernization effort is ongoing by nature and we will
13 continue to maintain the system as well as leverage evolving technology,
14 platforms and optionality as appropriate over time. Likewise, we understand
15 that the Commission’s IDP requirements contemplate five- and ten-year
16 outlooks. As such, our discussion of AGIS costs and benefits includes but also
17 extends beyond the MYRP timeframe, and our cost-benefit analysis (CBA)
18 (described in Section VI of my Direct Testimony) runs through the lifecycle of
19 the assets based on the information currently known (as with any integrated
20 long-range plan).

21
22 Given the longer term outlook required in the IDP filing, I also discuss
23 potential future AGIS investments that are not planned for the MYRP. We
24 are not seeking recovery or certification of these investments in this case and
25 do not have an implementation schedule at this time. However, I discuss
26 them to provide a view of potential future functionality that today’s
27 investment in the advanced grid will enable.

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Q. PLEASE EXPLAIN IN MORE DETAIL HOW THE COMPANY’S RATE CASE DISCUSSION OF THE AGIS INITIATIVE AND IDP FILINGS INTERRELATE.

A. The Company is filing its IDP concurrently with this rate case filing. The IDP would typically include the Company’s grid modernization report, while a rate case filing typically focuses on the test year or MYRP. In this case, however, while we focus on investments during the MYRP period as the elements for which are seeking cost recovery, we also introduce longer-range plans to provide context for our overall distribution system vision. For example, in my testimony, I discuss the core components of AGIS – AMI, the FAN, FLISR, and IVVO – and the Company’s building block approach to deploying these components. I also discuss ADMS as part of our overall strategy and distribution planning, even though ADMS has been previously certified by the Commission, and the first year of costs were recently approved for recovery under our Transmission Cost Recovery (TCR) Rider.

Together, this filing and the IDP respond to the Commission’s direction to bring the Company’s overall vision into focus, including providing extensive detail regarding AGIS and distribution strategies as well as specifics around implementation and planned outcomes.

Q. WHAT ARE THE OVERALL ANTICIPATED COSTS OF THE AGIS INITIATIVE?

A. The Company anticipates incurring capital expenditures totaling \$524 million and O&M costs totaling \$152 million for the overall AGIS initiative, exclusive of ADMS.

Table 2
Total AGIS Capital Expenditures
NSPM – Total Company Electric
(Dollars in Millions)

AGIS Program	Rate Case Period			5-Year Period	10-Year Period
	2020	2021	2022	2023-2024	2025-2029*
AMI	\$14.0	\$28.9	\$144.0	\$185.2	\$15.0
FAN	\$14.7	\$37.3	\$36.8	\$3.8	\$0.0
FLISR	\$3.5	\$8.6	\$6.6	\$18.8	\$29.7
IVVO	\$0.1	\$6.5	\$9.8	\$18.6	\$0.0
Total	\$32.3	\$81.3	\$197.2	\$226.4	\$44.7

*Period may include additional assumptions, including inflation and labor cost increases, that are not part of the capital budget in periods 2020-2024.

Table 3
Total AGIS O&M
NSPM – Total Company Electric
(Dollars in Millions)

AGIS Program	Rate Case Period			5-Year Period	10-Year Period
	2020	2021	2022	2023-2024	2025-2029*
AMI	\$6.6	\$16.4	\$14.1	\$25.2	\$67.2
FAN	\$0.1	\$2.3	\$1.5	\$0.5	\$8.6
FLISR	\$0.2	\$0.4	\$0.3	\$3.3	\$2.5
IVVO	\$0.0	\$0.4	\$0.8	\$0.6	\$0.8
Total	\$6.9	\$19.5	\$16.7	\$29.4	\$79.1

*Period may include additional assumptions, including inflation and labor cost increases, that are not part of the capital budget in periods 2020-2024.

1
2 Q. WHAT ARE THE COMPANY'S SPECIFIC REQUESTS OF THE COMMISSION WITH
3 RESPECT TO THE AGIS INITIATIVE?

4 A. We have two primary requests in this proceeding and in the IDP. First, we
5 request approval to recover the costs of capital investments and O&M
6 expense for the AGIS components that we propose to implement during the
7 2020-2022 term of the MYRP. We are proposing full AMI and FAN
8 implementation, as well as implementation of FLISR and IVVO. The
9 Company anticipates incurring the following capital additions and O&M costs
10 for the AGIS initiative during the 2020-2022 period of the MYRP:

11
12 **Table 4**
13 **Capital Additions for the AGIS Components (2020-2022, includes AFUDC)**
14 **\$ in Millions – Minnesota**

15

AGIS Component	2020	2021	2022
AMI	\$16.0	\$27.9	\$119.8
FAN	\$8.3	\$21.3	\$42.0
FLISR	\$3.4	\$8.4	\$6.4
IVVO	-	\$5.7	\$8.6
Total	\$27.7	\$63.3	\$176.8

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Table 5
O&M for the AGIS Components (2020-2022)
\$ in Millions – NSPM

Component	2020	2021	2022
AMI	\$6.6	\$16.4	\$14.1
FAN	\$0.1	\$2.3	\$1.5
FLISR	\$0.2	\$0.4	\$0.3
IVVO	-	\$0.4	\$0.8
Total	\$6.9	\$19.5	\$16.7

Second, because the AGIS implementation period extends beyond the term of our proposed MYRP, we are requesting that the Commission certify the AGIS projects overall, so that the Company would be allowed to request recovery of cost for 2023 and later in subsequent rider filings based on certification via this proceeding and/or the concurrent IDP filing. This is consistent with other requests for certification in the grid modernization and IDP filings, where certification does not guarantee cost recovery, but enables the opportunity for the Company to request recovery of costs in a subsequent rider filing. Certification of AGIS projects will provide a cost recovery option in the event the Company would not otherwise file a general rate case immediately following the conclusion of this MYRP period.

- Q. DOES THE COMPANY PRESENT DETAILED SUPPORT FOR THESE COSTS, AND FOR THE QUANTITATIVE AND QUALITATIVE BENEFITS ASSOCIATED WITH THEM?
- A. Yes. As I describe below, the Company presents a detailed cost-benefit analysis for each AGIS component – including both quantitative and

1 qualitative support. Additionally, we provide detailed information to support
2 the proposed investments for each year of the MYRP.

3
4 Q. WHY DOES THE COMPANY BELIEVE BOTH MYRP RATE RECOVERY AND
5 CERTIFICATION FOR POTENTIAL TCR RECOVERY ARE APPROPRIATE?

6 A. We believe both MYRP cost recovery and certification are appropriate
7 because of the extensive amount of support and analysis we are providing in
8 this case – including everything required for both the MYRP and the IDP.
9 The witnesses supporting the AGIS initiative provide support for costs during
10 the MYRP term as well as for AGIS implementation beyond 2022. These
11 witnesses discuss in detail the anticipated work to be done, the expected
12 implementation timelines, and the reasonableness of underlying assumptions
13 for planning and cost-benefit analysis purposes. Given the complete
14 information we provide on overall AGIS implementation and costs, we
15 believe granting cost recovery during the MYRP and certification of the AGIS
16 projects beyond the MYRP is appropriate in this case.

17
18 **D. Witness Support for the Proposed AGIS Initiative**

19 Q. WHAT INFORMATION DO YOU PROVIDE IN THIS SECTION OF YOUR EXECUTIVE
20 SUMMARY?

21 A. Below I describe the business areas involved in implementing the AGIS
22 initiative, identify the witnesses supporting AGIS, and provide an overview of
23 the topics covered by each. Because the large majority of information
24 necessary to support the AGIS initiative in this rate case and in the concurrent
25 IDP is contained in this rate case filing, this section of my Direct Testimony
26 provides a roadmap to help navigate the extensive information and testimony
27 we provide on the AGIS initiative.

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We have made every effort here to identify the location of specific topics and information to aid the reader. Exhibit___(MCG-1), Schedule 2 is the AGIS Completeness List, which identifies specific filing requirements and where the information is located. In my testimony I provide a higher-level roadmap.

Q. WHAT AREAS OF THE COMPANY ARE INVOLVED IN IMPLEMENTING AND SUPPORTING THE AGIS INITIATIVE?

A. The AGIS initiative is supported by and affects many operating and customer service areas of our business. In particular:

- Our Distribution Operations business area is responsible for the planning, implementation, and operations of the various advanced grid components. At a high level, this can be thought of as installing, maintaining, operating, and protecting the foundational hardware and support components of AGIS on the distribution system.
- The Business Systems area is responsible for the hardware and software systems necessary to deploy and secure the AGIS components from an information technology (IT) perspective. Business Systems is also responsible for implementation of the IT platform that will enable the Company to interface with customers through various portals, and to provide customers access to additional information, products, and services that will be possible through the advanced grid initiative. Business Systems also works hand-in-hand with our security team to protect the Company’s software systems from cyber attacks.
- Customer Care is responsible for meter reading, billing, credit, remittance processing, and customer contact center functions. The Customer Care team will manage customer questions and concerns as

1 the AGIS initiative is being deployed, as well as the new billing options
2 and programs that will be made available.

3
4 Other customer-facing teams are also heavily involved. Customer Solutions is
5 responsible for development and implementation of those customer-facing
6 online and mobile applications, as well as new products and services, that will
7 be enabled by the advanced grid capabilities. Our Customer Insights group is
8 responsible for survey and research efforts necessary to determine the needs
9 and preferences of our customers with respect to development of new
10 products and services, as well as to measure customer satisfaction with new
11 products, services, or advanced grid capabilities. Corporate Communications
12 is responsible for the customer education and communications related to
13 implementation of new technologies and products and services related to
14 advanced grid capabilities. In short, the AGIS initiative will touch many areas
15 of both NSPM and Xcel Energy as a whole.

16
17 Q. WHICH COMPANY WITNESSES ARE PROVIDING TESTIMONY IN THIS CASE TO
18 SUPPORT THE COMPONENTS OF THE AGIS INITIATIVE?

19 A. As noted in the introduction to my direct testimony, the Company is
20 presenting five witnesses who provide Direct Testimony and accompanying
21 schedules supporting our request for approval of the capital and O&M
22 budgets for the specific components of AGIS included in this case, as well as
23 support for the broader Integrated Distribution Plan being filed concurrently
24 with this case. These witnesses' respective topics are as follows:

- 25 • My testimony presents the overview of the AGIS initiative, the
26 background on our efforts to date, an explanation of governance as it
27 relates to the AGIS initiative, a discussion of the customer experience

1 upon implementation, an explanation of our customer outreach and
2 progress metrics proposals, and an overview of the cost-benefit
3 analyses as well as customer bill impacts.

- 4 • *Kelly A. Bloch*, Regional Vice President of Distribution Operations,
5 addresses the AGIS initiative from the Distribution perspective, and
6 specifically identifies those costs and benefits that derive from the
7 Distribution portion of the business. Her testimony details the business
8 case for AMI, FLISR, and IVVO, and provides extensive discussion of
9 these technologies, alternatives considered, and supporting cost and
10 benefit detail.
- 11 • *David C. Harkness*, Senior Vice President of Customer Solutions for
12 XES, addresses the AGIS initiative from the Business Systems (IT)
13 perspective, focusing on integration of the hardware and software
14 necessary for the AGIS elements to function together and with existing
15 Company systems. Mr. Harkness also details the business case for the
16 FAN strategy and project management, as well as alternatives
17 considered and supporting cost detail. Mr. Harkness also discusses
18 cyber security for the AGIS initiative, as well as the costs and benefits
19 of the IT hardware and software systems necessary to deploy each of
20 the AGIS components.
- 21 • *Christopher C. Cardenas*, Vice President of Customer Care for XES,
22 explains the current status of the expiring Cellnet contract for wireless
23 metering, meter change and billing impacts and options as AMI meters
24 are deployed, and potential tariff changes the Company plans to pursue
25 in the future. Mr. Cardenas also describes certain cost savings and
26 customer benefits associated with moving away from our current meter
27 reading system.

- 1 • *Ravikrishna Duggirala*, Director of Risk Strategy for XES, supports the
2 Company's cost-benefit model for the individual core AGIS
3 components as well as the overall AGIS initiative. Dr. Duggirala
4 explains the structure of the model, how inputs received from other
5 business areas were utilized, and the results of the analyses. Lastly, Dr.
6 Duggirala explains the limitations of any cost-benefit modeling.

7
8 Q. CAN YOU IDENTIFY THE NSPM TESTIMONY SUPPORTING THE SELECTION OF
9 AND COSTS FOR THE COMPONENTS OF THE AGIS INITIATIVE?

10 A. Yes. Because the costs of the AGIS initiative reside in our Distribution and
11 Business Systems budgets, Ms. Bloch and Mr. Harkness support the costs of
12 the AGIS components and most aspects of our initiative's development. As
13 set forth in Table 6 below, Ms. Bloch supports the selection of meters and the
14 FLISR and IVVO field devices and associated implementation; whereas Mr.
15 Harkness describes the associated software, hardware, security, and overall IT
16 integration.

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Table 6
AGIS Program Witness Support

AGIS Program	Component	Witness
AMI	IT Integration and head end application	Harkness Direct, Section V(E)(3)
	Meters and deployment	Bloch Direct, Section V(D)
FAN	IT Integration and deployment	Harkness Direct, Section V(E)(4)
	Installation of pole-mounted devices	Bloch Direct, Section V(E)
FLISR	System development	Harkness Direct, Section V(E)(5)
	Advanced application and field devices	Bloch Direct, Section V(F)
IVVO	System development	Harkness Direct, Section V(E)(6)
	Advanced application and field devices	Bloch Direct, Section V(G)

In addition, I support program management for the AGIS initiative in Section V.D of my Direct Testimony, as well as the Company's customer outreach plans in Section VI.E of my Direct Testimony.

- Q. PLEASE SUMMARIZE THE BENEFITS OF THE AGIS INITIATIVE AND PROVIDE THE WITNESS RESPONSIBLE FOR SUPPORTING EACH.
- A. Overall, the AGIS initiative consists of multiple programs that work together to improve and update our distribution system in many ways. At a system-wide level, we will move from the predominantly one-way system that

1 currently exists to an integrated system of centralized and decentralized energy
2 resources that are connected and optimized through communications systems
3 that share information from across the distribution grid. The advanced grid
4 will leverage automation, real-time monitoring, and communication to locate
5 and isolate disruptions in the system and improve safety, efficiency, and
6 reliability of the system. The advanced grid will also enable greater customer
7 choice by allowing customers to adopt new products, services, technologies,
8 and applications, including access to timely energy usage data and more
9 options for managing their usage. The advanced grid will be more secure, and
10 address cyber and physical threats to the extent possible. Additionally, the
11 advanced grid will allow the Company to manage the increasing amount of
12 DER entering our system.

13
14 Ms. Bloch, Dr. Duggirala, and Mr. Cardenas support the benefits of AMI
15 overall and with respect to specific individual benefits. While the IT work is
16 necessary to both implement the AGIS initiative and ensure appropriate
17 security measures, IT by itself does not provide independent benefits;
18 therefore, Mr. Harkness's testimony is limited to a discussion of costs.

19
20 Benefits of the AGIS initiative are many and varied, but the types of benefit
21 and supporting witnesses can be summarized as follows:
22

1 **Table 7**

2 **Summary of Benefits for AGIS Components**

3

Benefit	Supporting Witness
AMI	
Distribution System Management Efficiency	Bloch Direct, Section V(D)(4)(a)(1)
Outage Management Efficiency	Bloch Direct, Section V(D)(4)(a)(2)
Avoided Meter Purchases for Failed Meters	Bloch Direct, Section V(D)(4)(a)(3)
Avoided Capital for Alternative Meter Reading System	Bloch Direct, Section V(D)(4)(a)(4)
Avoided O&M Meter Reading Cost for Alternative Meter Reading System	Cardenas Direct, Section V(F)
Reduction in Field & Meter Services	Bloch Direct, Section V(D)(4)(b)(1)
Improved Distribution System Spend Efficiency	Bloch Direct, Section V(D)(4)(b)(2)
Outage Management Efficiency	Bloch Direct, Section V(D)(4)(b)(3)
Customer Outage Reduction	Bloch Direct, Section V(D)(4)(c)
Reduction in Energy Theft	Cardenas Direct, Section V(F)
Reduced Consumption Inactive Premise	Cardenas Direct, Section V(F)
Reduced Uncollectible/Bad Debt	Cardenas Direct, Section V(F)
Critical Peak Pricing	Duggirala Direct, Section II(B)(1)
TOU Customer Price Signals	Duggirala Direct, Section II(B)(1)
Reduced Carbon Dioxide Emissions	Duggirala Direct, Section II(B)(1)
Improved Customer Choice and Experience	Gersack Direct, Section VI and Schedule 3
Enhanced DER Integration	Bloch Direct, Section V(D)(4)(d)(1)
Environmental Benefits of Enhanced Energy Efficiency	Bloch Direct, Section V(D)(4)(d)(2)
Improved Safety to Both Customers and Company Employees	Bloch Direct, V(D)(4)(d)(3)
Improvements in Power Quality	Bloch Direct, V(D)(4)(d)(4)

27

Benefit	Supporting Witness
FLISR	
Customer Minutes Outage –Savings	Bloch Direct, Section V(F)(5)(a)(1)
Outage Patrol Time Savings	Bloch Direct, Section V(F)(5)(a)(2)
Improved ability to plan distribution system needs	Bloch Direct, Section V(F)(5)(b)
Overall Customer Satisfaction with Utility Service	Gersack Direct, Section VII(B)
IVVO	
Fuel savings (Energy Reduction)	Bloch Direct, Section V(G)(4)(a)(1)
Fuel Savings (Line Losses)	Bloch Direct, Section V(G)(4)(a)(2)
Avoided Capacity Costs	Bloch Direct, Section V(G)(4)(a)(3)
Reduced Carbon Dioxide Emissions	Duggirala Direct, Section II(B)(3)
Customer bill savings for customers with feeders with IVVO assets	Bloch Direct, Section V(G)(4)(b)
Greater Efficiencies from the Customer’s Personal Electrical Devices	Bloch Direct, Section V(G)(4)(b)
Increased Hosting Capacity for Distributed Energy Resources.	Bloch Direct, Section V(G)(4)(b)

17 Q. DID THE COMPANY ALSO PREPARE COMPARISONS OF THE COSTS AND
18 BENEFITS OF THESE COMPONENTS, OR ALTERNATIVES COMPARISONS?

19 A. Yes – we provide both. As noted above, the Company conducted a CBA for
20 each of the AGIS components and on a consolidated basis. The CBA
21 provides one point of reference to assess the investments in the broader
22 context of the goals of AMI, FLISR, and IVVO implementation, the current
23 qualitative benefits they offer, Commission policy goals, and the opportunities
24 for future customer benefits. The witnesses noted above provide the inputs
25 to the CBA for each component and for the consolidated AGIS initiative, and
26 Dr. Duggirala presents the overall model.

1 Additionally, Dr. Duggirala presents “Least-Cost/Best-Fit” analyses with
2 respect to the costs/benefits of AMI and manual reading or drive-by AMR
3 solutions; as well as for the costs of FAN versus cellular communications and
4 dedicated AMI network alternatives.

5
6 Q. WHAT DOES THE COMPANY CONCLUDE WITH RESPECT TO THE RELATIVE
7 COSTS AND BENEFITS – BOTH QUANTITATIVE AND QUALITATIVE – FOR THE
8 AGIS INITIATIVE?

9 A. The CBA results indicate that the consolidated quantifiable costs and benefits
10 of the AGIS initiative total 0.87 in our baseline scenario, or 1.03 under a high
11 benefit/no contingency scenario. Thus the combined components do not
12 reach 1.0 (equal quantifiable benefits and costs) under our baseline scenario.
13 However, the baseline benefit-to-cost ratio for the overall AGIS initiative
14 approaches 1.0 even before we factor in qualitative benefits such as customer
15 satisfaction and certain operational and power quality improvements, as well
16 as safety enhancements.

17
18 We note that while the CBA, by itself, does not show that quantifiable benefits
19 are equal to quantifiable costs, we would not necessarily expect that result.
20 We are proposing an initiative to both replace fundamental components of
21 our system that are approaching end of life, and to add capabilities for our
22 customers now (and in the future) to address a future that includes greater
23 DER, distributed intelligence, and greater customer engagement. We would
24 not expect to save money (on a net basis) when investing in these kinds of
25 technologies, but we believe the total value of the initiative significantly
26 outpaces the cost of the investments. For these reasons, the AGIS
27 investments are prudent based on the need for the investments to serve

1 customers, as well as consideration of the customer-facing benefits,
2 efficiencies, and system benefits they provide.

3
4 **E. Roadmap to AGIS Policy Testimony**

5 Q. WITH THAT BACKGROUND, PLEASE SUMMARIZE THE REMAINDER OF YOUR
6 TESTIMONY.

7 A. In my testimony, I first provide background on grid modernization in
8 Minnesota and discuss how our request in this case relates to our IDP filed
9 concurrently with the Commission on November 1, 2019, in order to establish
10 a backdrop for the Company's view of the future of the grid. I then identify
11 the Company's overall strategic goals, focusing on the environment, the
12 customer experience, and cost of service. I also identify customer
13 expectations and wishes for the future of electric service based on extensive
14 Company research, focusing on how these expectations relate to the future of
15 the distribution system.

16
17 I then describe the Company's long-term strategic plan to use technological
18 advances to transform our distribution system to meet changing customer
19 demands, to enhance efficiency, and reliability, and security, to safely integrate
20 more distributed energy resources, and explain how that plan is aligned with
21 core Company goals. I highlight the reasons now is the right time to
22 undertake these initiatives – including our meters nearing end of life and the
23 expiration of our meter reading contract with Cellnet – and discuss the key
24 goals of AGIS and how they are consistent with Xcel Energy's strategic
25 priorities.

26

1 I then address the scope of the core components of AGIS that are included in
2 this case, outlining the function, benefits, alternatives considered, timing of
3 implementation, and costs of each. I defer to other Company witnesses to
4 flesh out these components, costs, and benefit assumptions in more detail.

5
6 Next, I discuss in detail the current customer experience compared to what
7 will be different when the distribution system is transformed and advanced. I
8 also provide our customer and community outreach plan for the AGIS
9 initiative, designed to educate and inform customers about our progress,
10 impacts they will experience during and after implementation, and advanced
11 grid capabilities that will provide the basis for additional opportunities and
12 services for our customers. I also discuss indicators of progress and success,
13 and how the Company will measure and report on progress and outcomes of
14 the AGIS initiative.

15
16 Finally, I describe why AGIS, and thus the foundational elements included in
17 this case, are in the public interest. I introduce the cost benchmarking and
18 cost-benefit analyses we have undertaken, which are specifically supported and
19 presented in detail in the Direct Testimony of Dr. Duggirala. I explain both
20 the value and the inherent limitations of any cost-benefit analysis. I also
21 summarize the quantitative and qualitative benefits of the AGIS initiative,
22 explaining how the benefits of certain components of AGIS are not limited to
23 quantifiable items; they will also update aging systems, improve our customers'
24 overall experience and satisfaction, position the Company for future grid
25 developments, and help achieve broader energy goals.

26

1 Q. DO YOU PROVIDE OTHER INFORMATION TO SUPPORT YOUR OWN DISCUSSION
2 OF THE COMPANY’S AGIS IMPLEMENTATION STRATEGY WITH RESPECT TO
3 THE CUSTOMER EXPERIENCE?

4 A. Yes. Provided as Exhibit___(MCG-1), Schedule 3 is the Company’s *Advanced*
5 *Grid Customer Strategy*. This document the details the Company’s AGIS
6 strategy and plans to enhance the customer experience. The document
7 includes, among other things, background on our customer surveys and
8 research efforts that have informed our AGIS strategy, and details on the
9 technologies and customer benefits of each AGIS component.

10

11 To help stakeholders further visualize our plans, the Company also prepared a
12 brief video⁴ entitled *Building the Future* to illustrate the advanced grid
13 technologies and benefits and illustrate multiple situations where additional
14 data and capabilities with respect to the distribution grid will facilitate a better,
15 smoother, and more agile customer experience. While not as dynamic as the
16 video itself, I have attached illustrations from this video as Exhibit___(MCG-
17 1), Schedule 4 to my Direct Testimony.

18

19 Q. WHAT ARE YOUR RECOMMENDATIONS WITH RESPECT TO THE AGIS
20 INITIATIVE?

21 A. I recommend that the Commission approve our proposed AGIS investments
22 for the term of the MYRP, and certify the components of the Company’s
23 long-term AGIS plan (AMI, FLISR, IVVO, and the FAN) for potential future
24 cost recovery in the TCR rider.

25

⁴ <https://youtu.be/HoQoHFdF7kc>

1 and the first year of costs were recently approved to be recovered under the
2 TCR Rider.⁶

3
4 Q. DID THE COMPANY REQUEST AND RECEIVE CERTIFICATION FOR ANY
5 INITIATIVES IN ITS SUBSEQUENT GRID MODERNIZATION REPORT?

6 A. Yes. In its 2017 Distribution Grid Modernization report,⁷ the Company
7 sought and received certification for a TOU rate under a new pilot program.⁸
8 The TOU pilot implements new residential TOU rates in two communities in
9 the Twin Cities metropolitan area, and provides participants with increased
10 energy usage information, education, and support to encourage shifting energy
11 usage to daily periods when the system is experiencing low load conditions.
12 To support the TOU pilot, we will deploy both AMI meters and the necessary
13 FAN communications in the participating communities.

14
15 The goals of the pilot program are to study adequate price signals to reduce
16 peak demand, identify effective customer engagement strategies, understand
17 customer impacts by segment, and support demand response goals. In its
18 Order, the Commission certified the TOU pilot as consistent with statutory
19 requirements, noting that the pilot program will allow the Company and its
20 customers to learn more about the TOU rate. The limited deployment of
21 FAN and AMI through the TOU pilot will also allow the Company an
22 opportunity to measure and verify key assumptions regarding customer
23 behavior in advance of the planned wider rollout of both initiatives.
24 Customer engagement and installation of both FAN and AMI in connection
25 with the TOU pilot began in 2019.

⁶ See the Commission's Order dated September 27, 2019 in Docket No. E002/M-17-797.

⁷ See Docket No. E002/M-17-776.

⁸ See Docket No. E002/M-17-775.

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Q. DURING THE PERIOD YOU DISCUSS ABOVE, WERE THERE OTHER PROCEEDINGS ON GRID MODERNIZATION IN MINNESOTA?

A. Yes. In 2015, after enactment of the new grid modernization statute noted above, the Commission opened an investigatory docket on grid modernization⁹ and issued the *March 2016 Staff Report on Grid Modernization*. Of various potential options outlined in the Staff Report, the Commission supported examining distribution system planning as the most reasonable and actionable way to assist in the forthcoming grid evolution. The Commission also supported the staff-proposed guiding principles as its Planning Objectives, as follows:

- Maintain and enhance the safety, security, reliability, and resilience of the electricity grid at fair and reasonable costs, consistent with the state’s energy policies;
- Enable greater customer engagement, empowerment, and options for energy services;
- Move toward the creation of efficient, cost-effective, accessible grid platforms for new products, new services, and opportunities for adoption of new distributed technologies; and
- Ensure optimized utilization of electricity grid assets and resources to minimize total system costs.

During this proceeding, the Commission conducted a workshop seeking stakeholder input on a Minnesota-based distribution system planning framework. The Commission also accepted comments and replies seeking to understand how utilities currently plan their systems, the status of current-year

⁹ See Docket No. E999/CI-15-556.

1 utility plans, and recommendations for improvements to present planning
2 practices.

3
4 The Commission then established individual utility IDP dockets,¹⁰ where Staff
5 and the utilities worked on proposed IDP filing requirements, with a comment
6 and reply period for stakeholder input. The Commission determined final
7 IDP requirements for Xcel Energy at its August 9, 2018 hearing, and issued its
8 Order on August 30, 2018. Like development of the IDP requirements, the
9 Order acknowledges IDP as envisioned by the planning objectives will be an
10 iterative process – set in motion with the Company’s initial IDP.

11
12 Xcel Energy’s first IDP was filed November 1, 2018, and is due annually
13 thereafter. The biennial grid modernization reports discussed above are now
14 combined with the annual IDP filings.

15
16 Q. HOW DOES THE COMPANY’S RATE CASE REQUEST RELATE TO THE COMPANY’S
17 MOST RECENT IDP FILED ON NOVEMBER 1, 2019?

18 A. The annual IDP filing addresses distribution system planning overall.
19 Through the IDP, the Company is also allowed to request certification of
20 specific projects that meet statutory requirement for grid modernization
21 projects, which then allows the Company to subsequently request recovery of
22 the costs of those projects under the TCR Rider. This year, the Company is
23 filing its IDP and this rate case concurrently on November 1, 2019. As such,
24 while the IDP addresses the AGIS initiative in the discussion of overall
25 distribution system planning, the Company is requesting approval to include in
26 base rates the costs of the AGIS components implemented during the term of

¹⁰ Xcel Energy’s IDP filing requirements were developed in Docket No. E002/CI-18-251.

1 the multi-year rate plan. These components include AMI, the FAN, FLISR,
2 and IVVO.

3
4 Further, because ADMS cost recovery has been approved under the TCR
5 Rider, and the ADMS implementation process is at an advanced stage, we
6 propose to continue recovery of the ADMS costs under the TCR Rider.
7 While the costs of the TOU pilot were also certified for potential recovery
8 under the TCR Rider, we are requesting that TOU pilot costs incurred during
9 the MYRP be included in base rates to align with the stage of the pilot and
10 future AMI efforts. Our testimony in this case and our IDP filing provide the
11 support for these cost recovery proposals.

12
13 Additionally, through the IDP proceedings, the Commission has issued
14 requirements around the level and types of information that are expected to
15 be included in any future request to proceed with AGIS initiative components.
16 As a result, this rate case testimony provides the 2020-2022 multi-year rate
17 plan capital and O&M expenditures for the AGIS initiative in the broader
18 context of our longer-term AGIS strategy. The information in this case also
19 supports our request for certification of the AGIS projects for potential future
20 rider recovery.

21
22 Q. HOW IS THE COMPANY ILLUSTRATING ITS COMPLIANCE WITH BOTH RATE CASE
23 AND IDP REQUIREMENTS THROUGH ITS COMPLEMENTARY NOVEMBER 1, 2019
24 FILINGS?

25 A. In our last IDP filed in November 2018, we noted that we intended to bring
26 the costs and benefits associated with specific grid modernization projects to
27 the Commission for approval through either a future certification request in

1 the grid modernization/IDP filings or through a general rate case. Several
2 additional requirements have been established in the Commission's most
3 recent TCR Order.

4
5 Our request for rate recovery for AGIS initiatives in this case includes the
6 information required by the Commission, as noted in my testimony and the
7 Direct Testimony of the other witnesses supporting AGIS projects in this
8 case. In the attached Schedule 2, I provide the AGIS Completeness List,
9 which identifies the filing requirements for future Xcel Energy grid
10 modernization projects in Minnesota, and specifies where we have provided
11 this information in our direct testimony in this case. This schedule also
12 identifies where information is provided solely in the IDP rather than this rate
13 case, to provide a holistic view of the information provided in the two
14 complementary dockets.

15 16 **IV. DRIVERS OF THE AGIS STRATEGY**

17
18 Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

19 A. In this section of my testimony, I explain why the AGIS initiative is a
20 necessary and appropriate step for the Company, as it is aligned not only with
21 Xcel Energy's strategic priorities to meet customers' current and forward-
22 looking expectations and service needs but also the needs of the existing
23 NSPM distribution system as well as the objectives that emerged from the
24 Commission-led grid modernization planning process. Indeed, the AGIS
25 initiative supports Commission policy and reflects our previous work with
26 stakeholders relative to customer offerings, performance, and technological
27 capabilities of the grid. I further describe the current customer experience

1 with the Company's electric service delivery. In this way, I establish the
2 reasons we have developed and propose to continue pursuing the AGIS
3 initiative.

4
5 Q. WHAT ARE THE SPECIFIC DRIVERS BEHIND THE NEED FOR AGIS
6 IMPLEMENTATION AT THIS TIME?

7 A. The need to modernize the grid is driven by

- 8 • the Company's overall strategic priorities;
- 9 • changing customer needs and preferences;
- 10 • distribution system needs; and
- 11 • Commission policy and stakeholder input.

12
13 Our goal with AGIS implementation is to use new technologies to transform
14 the customer experience to meet the increasing customer demands for
15 additional energy usage data as well as new products and services that will
16 provide opportunities for customers to use that information to control usage.

17
18 In addition, there are system needs related to aging technology that make now
19 the right time for the Company to implement the elements of the AGIS
20 initiative. We have already begun ADMS implementation and will need to
21 replace our current AMR infrastructure in the near term to maximize that
22 investment in ADMS and avoid end of life issues with our current meters.

23
24 Our AGIS initiative has also been informed by Commission policy and our
25 previous work with stakeholders in various proceedings related to distribution
26 grid planning, advanced rate design, and performance-based metrics.

27 In this section of my testimony, I discuss each of these drivers.

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A. The Company’s Strategic Priorities

Q. WHAT ARE THE COMPANY’S OVERARCHING STRATEGIC PRIORITIES FOR ITS CUSTOMERS AND ITS BUSINESSES?

A. As described by Company witness Mr. Gregory Chamberlain, Xcel Energy presently has three overall strategic priorities, which are as follows:

- Lead the Clean Energy Transition – Decarbonize the energy sector by retiring fossil fuel resources and replacing them with cost-effective and carbon-free resources.
- Enhance the Customer Experience – Deliver personalized products and services that meet our customer’s lifestyle needs and offer them a personalized and contemporary customer experience.
- Keep Bills Low – Drive costs from generation, transmission, and distribution, and continue to deliver safe, reliable, affordable, and sustainable electric and gas services.

Q. HOW DOES AGIS IMPLEMENTATION SUPPORT EACH OF THESE STRATEGIC PRIORITIES?

A. First, AGIS will improve our ability to maximize environmental and conservation goals. By implementing the advanced grid technologies that provide for two-way communications, there will be significant improvement in the Company’s ability to collect system data, manage distributed energy resources, and track outages and power quality issues. This insight into the distribution grid will enhance our ability to deliver on clean energy goals and support increased DER.

1 With two-way communications and an integrated distribution system with
2 ADMS, we will be able to provide the kinds of data and insights to our
3 customers that would facilitate their own efforts around and understanding of
4 energy efficiency, cost management, and beneficial electrification. Similarly,
5 AGIS will improve our outage and restoration performance in two ways.
6 Specifically, two-way communication and fault location capabilities will allow
7 the Company to: (1) provide timely and accurate communications to
8 customers about outages and restorations; and (2) to isolate faults and restore
9 power to customers in an automated fashion where possible.

10
11 While the short-term solution with the least impact on bills is to maintain the
12 distribution system status quo (“do nothing”), this is not a realistic option for
13 any extended period. First, technology is constantly evolving and improving,
14 and customer expectations for interactions with their service providers – both
15 utility and non-utility – are evolving as well. Second, the Company’s grid, as
16 currently constituted, cannot be maintained at status quo because certain
17 components are near the end of life and will not be supported in the near
18 future. Finally, the AGIS initiative brings long-term value for customers.
19 Accordingly, my testimony recommends taking the longer, more strategic
20 view, in order to position the Company to continue its environmental
21 leadership, bring the customer experience in line with customer expectations,
22 and help manage reliability and bill impacts over time.

23
24 Q. DOESN’T IMPLEMENTATION OF ADMS ACCOMPLISH THESE GOALS?

25 A. No, not by itself. ADMS helps with these issues, but it is only a start – ADMS
26 is the necessary backbone for addressing the core issues facing our system.
27 Even with ADMS, our current system is limited because it lacks the ability to

1 manage two-way communications and does not provide the level of insight
2 into the distribution system that will be necessary to enhance our ability to
3 deliver on clean energy goals and support increased DER as we move into the
4 future. Likewise, AMI meters themselves, supported by FAN
5 communications, are a foundational aspect of better outage and usage data,
6 but require additional technology to enable the Company and customers to
7 use that data and integrate it with other utility systems. As such, a more
8 comprehensive strategy is needed to serve the Company's strategic vision –
9 which, in the end, is all about the quality of service to our customers.

10
11 Q. IS THE AGIS INITIATIVE THE COMPANY'S ONLY PLAN TO MEET THESE XCEL
12 ENERGY STRATEGIC PRIORITIES?

13 A. No. As discussed by Company witness Mr. Chamberlain, the AGIS initiative
14 is a key part of a broader strategic vision. The AGIS initiative is specific to the
15 distribution grid and associated information technology systems, the utility
16 customer's experience is affected by a much broader array of services and
17 capabilities.

18
19 For example, in conjunction with the AGIS initiative, the Company is
20 embarking on a Customer Experience transformation, which is intended to
21 update the Company's digital channel platforms (MyAccount and the mobile
22 application, for example), and our customer resource management systems to
23 ensure a better, more modern customer experience. Mr. Harkness discusses
24 the Customer Experience efforts in more detail in his Direct Testimony.
25 These are not specific to the AGIS initiative, but rather complement it to
26 bring the utility's interfaces up to date and meet existing and evolving
27 customer expectations. In other words, the Company is thinking holistically

1 about the customer experience, with AGIS serving an important piece of that
2 strategy.

3
4 **B. Changing Customer Needs and Preferences**

5 Q. HOW ARE CHANGING CUSTOMER NEEDS AND PREFERENCES DRIVING THE
6 NEED FOR AGIS IMPLEMENTATION?

7 A. The needs and preferences of customers continue to evolve in the digital age,
8 with increasing dependence on information and the connectivity of digital
9 devices. While incremental modernization efforts have taken place on the
10 distribution system over many years, and we have used these investments to
11 provide reliable power for decades, we (along with the broader industry, as
12 noted earlier in my testimony) believe now is the right time to begin a more
13 significant advancement of the grid. Technological advances now make it
14 possible to meet growing customer expectations for a more robust, reliable,
15 and resilient system, as well as customer desire for more insight and visibility
16 into the energy choices they are making.

17
18 Q. CAN YOU PROVIDE SOME EXAMPLES OF THESE GROWING CUSTOMER
19 EXPECTATIONS?

20 A. Yes. Customers are increasingly savvy when it comes to smartphone
21 applications and sophisticated websites. They are accustomed to engaging
22 electronically to manage their accounts, resources, and service needs across
23 many industries. Without advanced meters that can provide regular usage
24 data, it is not possible to bring the energy industry along that same curve by
25 developing sophisticated energy management and conservation tools such as
26 TOU rates, nor the applications and web-based tools that allow the customer
27 to observe and manage their consumption. The improved interactions with

1 the utility, outage response, and control over their energy usage and bills that
2 our customers want begins with foundational advanced grid initiatives that we
3 are seeking recovery of in this case. By way of example, approximately 2/3
4 (66 percent) of our NSPM customers surveyed over the past 12 months
5 through August of 2019 said they want to be able to control their energy use
6 when not at home. Customers expect to be able to turn lights on and off
7 remotely, for example, but have no remote insight into how much energy they
8 are actually using at this time. Further, 44 percent of NSPM customers over
9 the same time period said they want alerts when their monthly usage or bill
10 amount goes over a preset amount. These services require advanced metering
11 and more timely usage data in order to provide these services and controls to
12 our customers.

13
14 Q. DOES THE COMPANY CURRENTLY HAVE DIGITAL CHANNELS TO PROVIDE
15 ENERGY USAGE INFORMATION TO CUSTOMERS?

16 A. Yes. Currently, the Company has a web portal, called MyAccount, where
17 customers may obtain energy usage and billing information. We provide
18 customers with energy usage information through the MyEnergy portion of
19 MyAccount; however, the information in this portal is primarily limited to a
20 comparison of monthly energy usage versus weather trends and general
21 recommendations about how to reduce energy consumption. This portal also
22 provides Green Button Download, which enables customers to download
23 their energy usage data. While helpful information, it is not the sort of
24 personalized data and insight our customers are seeking, and we have largely
25 reached the limits on the level of data and customer engagement we can
26 provide with our current systems.

27

1 Today, the Company receives energy usage data on a monthly basis, and this
2 customer data is limited only to energy (kWh) consumption during the read
3 period (typically the most recent 30 days). We cannot obtain data regarding
4 the time when customers consume energy, the demand (kW) an individual
5 places on the grid, or what end-use technologies contribute to the energy
6 consumption. Customers receive information only on their aggregate monthly
7 energy usage via a monthly bill.

8
9 Q. CAN YOU EXPAND ON HOW THE FUNCTIONALITY OF THE CURRENT GRID
10 IMPACTS THE CUSTOMER EXPERIENCE?

11 A. Yes. First, the most direct impact that current system functionality has on the
12 customer experience is during an outage. Today, the Company has limited
13 insight into an outage on certain portions of our system. Typically, we cannot
14 anticipate an outage and, in most of our service territory and for outages
15 below the feeder level, do not know when an outage occurs unless a customer
16 contacts us. We also have limited insight into what caused an outage after it is
17 identified, cannot pinpoint the location of an outage easily or quickly, and
18 cannot definitively notify a customer when an outage has been restored.
19 Outages and the Company's ability to restore power and provide timely and
20 accurate communications have a large impact on our customers' day-to-day
21 lives and the quality of service they receive. This is a fundamental aspect of
22 our service that we seek to improve through the AGIS initiative.

23
24 In addition, the lack of data detail and timeliness of energy usage information
25 is an impediment to empowering customers to see and respond to their own
26 energy usage, and therefore exercise more power over both conservation
27 efforts and their bills. The current system limits the Company's ability to

1 provide such information to customers to better inform their decisions about
2 their own energy usage and its impacts. Our customers increasingly want
3 additional information and energy options that are not provided with the basic
4 functionality of our current systems.

5
6 Q. DOESN'T THE COMPANY CURRENTLY OFFER PROGRAMS FOR CUSTOMERS TO
7 MAKE DECISIONS ABOUT THEIR ENERGY USAGE?

8 A. Yes, we do offer a significant number of optional programs for customers
9 today, between our renewable choice and CIP/Demand Management
10 programs, but these are essentially self-service programs. While we work hard
11 to facilitate customer engagement in these programs, a customer must make
12 an active effort to engage in the programs and manage the process. Further,
13 the current system does not provide the information necessary to enable the
14 Company to provide specific and personalized advice and recommendations
15 to customers. Rather, we provide general recommendations that tend to work
16 for the average customer under typical conditions – but we know that is not
17 the reality and we are missing opportunities to enhance the customer
18 experience. Each customer is different with respect to both goals and current
19 situations, and we need more customer-specific data and data management
20 tools to provide the level of service customers are seeking.

21
22 Q. HOW DID THE COMPANY DEVELOP ITS STRATEGY FOR MEETING THE
23 CHANGING CUSTOMER NEEDS AND PREFERENCES YOU MENTIONED ABOVE?

24 A. First we worked to understand our customers' preferences and what they
25 think about the benefits and value of an advanced grid investment. To that
26 end, the Company conducted primary research through customer focus
27 groups and surveys. To supplement these research efforts, the Company also

1 reviewed secondary sources, such as the Smart Energy Consumer
2 Collaborative and GTM Research, as well as other utility advanced grid plans.
3 These research efforts are also discussed in detail in Schedule 3.

4
5 Q. CAN YOU PROVIDE ADDITIONAL INFORMATION ON THE SPECIFIC RESEARCH
6 THE COMPANY CONDUCTED REGARDING CUSTOMER PREFERENCES AND
7 INTEREST IN THE CAPABILITIES PROVIDED BY ADVANCED GRID
8 TECHNOLOGIES?

9 A. Schedule 3 identifies the Company's primary research through customer
10 surveys and focus groups, and its secondary research sources as well as other
11 utility advanced grid plans. Below is a summary of surveys and studies that
12 provided key findings to support our customer strategy with respect to the
13 AGIS initiative.

- 14 • *Grid Edge Product Survey* – This survey was conducted to gauge
15 customers' opinions and interest toward several proposed product and
16 service concepts that may become available after AGIS deployment, as
17 well as willingness to engage in new services and customers' levels of
18 price sensitivity.
- 19 • *Advanced Meter Focus Groups* –The goal of these customer focus groups
20 was to capture customer understanding, perception, and attitudes
21 toward advanced meters, as well as to understand customer
22 expectations of the services enabled by advanced metering. We also
23 sought to understand customer preferences for communications around
24 the deployment and implementation of new meters.
- 25 • *2018 MN Smart Meter Survey* – The objective of this survey was to
26 quantify familiarity and perceived value of smart meters, gauging the
27 potential value of AMI-related benefits to customers, preferences for

1 AMI enabled data, and communications about future smart meter
2 plans.

- 3 • *Residential Relationship Study* – This monthly survey is intended to
4 determine the pulse of our customers’ opinions and satisfaction with
5 service. Included in the monthly survey are questions which gauge
6 customers’ interest in new products and attitudes of and practices
7 around energy usage.

8
9 In addition to Xcel Energy’s research efforts described above, the following
10 secondary sources were used to inform our customer strategy around advance
11 grid capabilities:

- 12 • JD Power Electric Residential Study;
- 13 • E Source, *E Design 2020 Small Medium Business Ethnographic Research*;
- 14 • Department for Business, Energy & Industrial Strategy (U.K.), *Smart*
15 *Meter Customer Experience Study: Post-Installation Survey Report*;
- 16 • U.S. Department of Energy, *Advanced Metering Infrastructure and Customer*
17 *Systems: Results from the Smart Grid Investment Grant (SGIG) Program*;
- 18 • Smart Grid Consumer Collaborative, *Effective Communication with*
19 *Consumers on the Smart Grid Value Proposition*;
- 20 • Smart Energy Consumer Collaborative, *Understanding Your SMB*
21 *Customers: A Segmentation Approach*; and
- 22 • Chartwell, *Demand Reduction Programs for TOU Customers – Madison Gas &*
23 *Electric Case Study*.

24
25 Q. WHAT ARE THE KEY TAKEAWAYS IDENTIFIED THROUGH THE COMPANY’S
26 RESEARCH EFFORTS RELATED TO ADVANCED GRID CAPABILITIES?

27 A. Key takeaways from the Company’s research include the following:

- 1 • Safety and energy savings are most highly rated in order of importance to
2 customers.¹¹
- 3 • Technology:
- 4 ▪ Customers care about technology and their interactions with
5 their utility. They want to know how the advanced grid will
6 provide benefits related to those technologies and interactions.¹²
- 7 • Reliability:
- 8 ▪ Addressing service interruptions is important to all customer
9 classes.¹³
- 10 ▪ Customers expect that service interruptions will be less frequent,
11 smaller in scope, and shorter in duration.¹⁴
- 12 • Data and Information:
- 13 ▪ Customers expect to receive detailed energy usage information
14 from their utility.¹⁵
- 15 ▪ Provision of information is expected to be personal and
16 frequent.¹⁶
- 17 ▪ Customers expect tools that will help them use information to
18 make decisions about their energy usage.¹⁷

¹¹ Grid Edge Product Survey; Advanced Meter Focus Groups.

¹² Xcel Energy Residential Relationship Study; E Design 2020 Small Medium Business Ethnographic Research.

¹³ 2018 MN Smart Meter Survey; JD Power Electric Residential Study; E Design 2020 Small Medium Business Ethnographic Research.

¹⁴ Advanced Metering Infrastructure and Customer Systems: Results from the Smart Grid Investment Grant Program.

¹⁵ Advanced Meter Focus Groups; JD Power Electric Residential Study; 2019 E Source Gap and Priority Study; Colorado Time of Use Non-Participating Customer Survey.

¹⁶ Advanced Meter Focus Groups; 2018 MN Smart Meter Survey; JD Power Electric Residential Study.

¹⁷ 2018 MN Smart Meter Survey; Xcel Energy Residential Relationship Study; E Design 2020 Small Medium Business Ethnographic Research; Effective Communication with Consumers on the Smart Grid Value Proposition.

- 1 ▪ Customers expect that more information will allow them to
2 better identify opportunities and strategies to save energy and
3 reduce their costs.¹⁸
- 4 • Rate Design:
- 5 ▪ Business customers have more awareness and familiarity with
6 advanced rate designs.¹⁹
- 7 ▪ Residential customers expect the utility to provide them with rate
8 comparison tools and information about new rate designs.²⁰
- 9 • Trust:
- 10 ▪ Building trust is a key component to unlocking value for
11 customers.²¹
- 12 ▪ Trust is best built by identifying solutions and showing results
13 specific to the customers.²²
- 14

15 Q. HOW WOULD YOU SUMMARIZE THESE TAKEAWAYS?

16 A. Customers want certain features of their electric service that are not possible
17 without a more advanced grid. These include more detailed and timely
18 information about their energy use, improved reliability and outage
19 restoration, and the ability to remotely control their energy usage.

20

21 Q. CAN THE COMPANY’S CURRENT METERS AND SYSTEMS MEET THESE CUSTOMER
22 EXPECTATIONS?

¹⁸ Advanced Meter Focus Groups; 2018 MN Smart Meter Survey; MN Time of Use Rate Study; E Design 2020 Small Medium Business Ethnographic Research.

¹⁹ 2019 E Source Gap & Priority Study; 2018 MN Smart Meter Survey.

²⁰ Colorado Time of Use Non-Participating Customer Survey; MN Time of Use Rate Study; MN Time of Use Behavioral Focus Groups; 2018 MN Smart Meter Survey.

²¹ MN Time of Use Behavioral Focus Groups; E Design 2020 Small Medium Business Ethnographic Research.

²² E Design 2020 Small Medium Business Ethnographic Research; Advanced Meter Focus Groups.

1 A. Only to an extent. Without investments in the advanced grid through AMI,
2 the FAN, and ADMS we will not have the tools necessary to meet these
3 concrete customer expectations. Our system, as currently constituted, can
4 only provide customers with the following limited information:

- 5 • Monthly, whole premise consumption data;
- 6 • General recommendations about how they use their energy – because
7 we lack detailed customer energy usage profiles and disaggregation of
8 their energy usage; and
- 9 • Limited information about the existence of an outage and the status of
10 a restoration – because our systems do not report when all outages
11 occur, cannot “self-heal,” and cannot automatically identify the cause of
12 an outage.

13
14 Q. WHAT DID YOU LEARN ABOUT CUSTOMERS’ EXPECTATIONS FOR THE COSTS OF
15 DEVELOPING THE SYSTEMS THAT WILL ACCOMPLISH THESE GOALS?

16 A. Generally, our research showed that customers need more information to
17 understand the costs and benefits of our proposed investments in the
18 advanced grid. Specifically:

- 19 • Customers believe certain safety features should be provided at no
20 cost.²³
- 21 • Customers need specific information about what the cost of the
22 advanced grid is and how it will impact them.²⁴
- 23 • Customer willingness to pay is tied to customer awareness of the
24 technology and its benefits. Business customers are more familiar with
25 the benefits and more willing to pay.²⁵

²³ Grid Edge Product Survey; Advanced Meter Focus Groups.

²⁴ Advanced Meter Focus Groups; Colorado Time of Use Non-Participating Customer Survey; Minnesota Time of Use Rate Study Grid Edge Product Survey.

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Q. CAN YOU PROVIDE ADDITIONAL INFORMATION ABOUT CUSTOMERS' EXPECTATIONS WITH RESPECT TO COSTS?

A. Yes. In our MN Smart Meter Survey, we found that awareness of “smart meters” is low among our residential customers (15 percent) and twice as high among our business customers (30 percent). This same survey found that only 13 percent of residential customers and 36 percent of business customers understood that the cost of smart meters corresponds to more value than our existing meters. This low level of awareness indicates customers are not familiar with what a smart meter is or what the benefits are likely to be. This lack of awareness was also borne out in our Advanced Meter Focus Groups which found that customers were unclear about the basic functionality of advanced meters.

As I previously discussed, while many customers are interested in the benefits of advanced meters, such as control over their energy usage, more information about their energy usage, greater reliability, and environmental benefits, customers do not fully understand the technology or how advanced meters are critical to enabling these benefits. This leads us to conclude that customer education is needed for customers to understand AMI metering and how it relates to the needed technology and associated benefits. Our communications and education plan discussed in Section VI(E) was designed to address this need.

Q. DID THE COMPANY’S RESEARCH PROVIDE ANY OTHER INSIGHT RELATED TO CUSTOMER COMMUNICATIONS AND EDUCATION?

1 A. Yes. Through our Advanced Meter Focus Groups, we also identified that
2 customers would prefer to learn about the meters approximately 2-3 months
3 prior to installation. Education and awareness information is also best
4 provided through multiple channels as not all customers will receive or digest
5 the information the same way. We have taken these considerations and built
6 them into our Customer and Community Outreach plans which I detail below.

7
8 Q. HOW DID CUSTOMER CONSIDERATIONS AFFECT THE COMPANY'S
9 DEVELOPMENT OF THE AGIS INITIATIVE?

10 A. As I noted above, customers expect more resources to help manage their
11 energy usage and want more information about outages. Our investments in
12 the advanced grid are specifically designed to deliver on these expectations.
13 Our investments in AMI, the FAN, and ADMS will reduce the number of
14 minutes customers are out, potentially reduce the number of outages that
15 occur, and allow us to better communicate with our customers about the
16 status of an outage restoration. Similarly, more granular energy usage
17 information, including the timing of when energy is used, what the specific
18 drivers of a customer's energy usage are, and personalized advice on how to
19 change their behavior to reduce their energy usage are only enabled because
20 we will have advanced meters capable of providing detailed interval energy
21 usage data that is transmitted across the FAN at hourly or faster intervals.

22
23 Q. HOW DO YOU FACTOR IN THE CONSIDERATIONS OF CUSTOMER COST?

24 A. Keeping bills low is a priority for Xcel Energy, and keeping bills low starts
25 with smart investments. I discuss the prudence of the AGIS investments and
26 the cost-benefit analyses we conducted in Section VII of my testimony, and I
27 discuss the estimated customer bill impacts in Section VIII. We took a

1 conservative approach in our cost-benefit analyses to ensure that costs were
2 not understated and expected quantifiable benefits were not overstated.
3 However, in addition to considering costs and quantifiable benefits, we also
4 considered the non-quantifiable customer benefits as we developed our
5 strategy for investments in advanced grid technologies. For example,
6 customer expectations for more detailed and timely information is one factor
7 driving our customer strategy. Similarly, although not quantifiable,
8 improvements in overall customer satisfaction, power quality, safety are
9 important considerations. We have also considered the benefits of our
10 advanced grid investments over the longer term, as they will provide the
11 flexibility that will allow the Company to respond to evolving customer
12 expectations and technology advancements in the future.

13
14 Q. WERE YOUR RESEARCH FINDINGS USED TO DEVELOP THE COMPANY'S
15 ADVANCED GRID STRATEGY IN ANY OTHER RESPECT?

16 A. Yes. Results of our research efforts were also used to inform our customer
17 education and communications plan related to the implementation of
18 advanced metering. Our education plan and outreach efforts are discussed
19 further in Section V.C of my testimony.

20
21 Q. WERE CUSTOMER NEEDS THE ONLY FACTORS IN THE COMPANY'S
22 DEVELOPMENT OF THE AGIS STRATEGY?

23 A. No. We also leveraged our internal expertise with respect to utility
24 distribution systems and the Company's systems, in particular, to determine
25 the needs of our distribution grid. We have also looked to broader industry
26 information, which reflects the degree to which advanced grid technology has
27 matured in recent years and demonstrates a clear trend toward its adoption.

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C. System Needs

Q. ARE THERE PARTICULAR DISTRIBUTION SYSTEM NEEDS THAT FURTHER CONTRIBUTED TO THE NEED FOR AN ADVANCED GRID INITIATIVE?

A. Yes. Our NSPM distribution grid has several intersectional needs that have driven the development of the AGIS initiative. Like other electric utilities, our current distribution system is based on aging technologies. While appropriate when implemented, multiple components of the distribution system either must be replaced in the near term or they have limited capabilities that simply do not meet the needs and expectations for the system going forward. Further, additional components that integrate with ADMS and advanced meters are necessary to better manage and shorten outages, and to maximize the voltage management on our system. I provide an overview of these needs in this section of my testimony.

Q. WHAT SPECIFIC SYSTEM REQUIREMENTS PROMPTED THE NEED FOR GRID MODERNIZATION?

A. Grid modernization is an issue facing most utilities in Minnesota in varying respects, as evidenced by the Commission’s specific proceeding examining the issue. NSPM is no different. The current one-way flow of information on our system means that beyond the distribution substation, the Company has little insight into the workings of the distribution system as it relates to outages or voltage levels experienced by the customer. As further outlined by Company witness Ms. Bloch, the current system is not capable of the two-way communication necessary to identify outages, gather and manage customer data more frequently, support increasing levels of DER, nor optimize voltage levels and identify faults in an automated, responsive, and proactive way.

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Q. CAN YOU PROVIDE SOME ADDITIONAL EXAMPLES OF THE EXISTING LIMITATIONS YOU HAVE IDENTIFIED WITH THE COMPANY’S CURRENT METERS?

A. Yes. Without two-way communications, we have limited visibility into what is happening with a particular meter. This means we are missing the ability to provide either timely energy usage data to our customers, or recommendations about how they use their energy. We cannot always identify meter tampering, the shift of a premise to a different user, or other issues without physically visiting a meter. And, as previously noted, we have limited information about the existence of an outage and the status of a restoration – because our systems do not report when an outage occurs.

Q. HOW DOES THE CURRENT SYSTEM LIMIT THE COMPANY’S ABILITY TO IDENTIFY AND RESPOND TO OUTAGES?

A. Because the Company does not have visibility into the system beyond the substation level, the Company primarily gains outage information through customer calling about an outage at the home or business. The Company then analyzes the locations of the outage calls to determine what aspect of the distribution system lost power. It can be frustrating for a customer to have to identify an outage, rather than relying on its electric utility to do so. Ultimately to obtain information regarding outages and storm damaged facilities, the Company must send workers into the field to gather this information manually.

In addition, this lack of two-way communication and fault location capabilities limits the Company’s ability to isolate faults and restore power to customers in

1 an automated fashion where possible. These are advanced grid capabilities
2 that FLISR will provide.

3
4 Q. DOES THE COMPANY'S CURRENT COMMUNICATIONS NETWORK LIMIT THE
5 CAPABILITIES OF ITS EXISTING DISTRIBUTION SYSTEM?

6 A. Yes. The Company's current communication network is the Wide Area
7 Network (WAN). The WAN provides high-speed, two-way communications
8 capabilities and connectivity in a secure and reliable manner between Xcel
9 Energy's core data centers and its service centers, generating stations, and
10 substations. However, the WAN is not able to provide communications to
11 support AMI meters or facilitate the operation of FLISR and IVVO.
12 Leveraging the existing WAN, the primary function of FAN mesh network is
13 to enable the communications between the intelligent devices deployed across
14 the distribution system – up to and including meters at customers' homes and
15 businesses. These advanced applications cannot be supported with the
16 Company's current communication network.

17
18 Further, the WAN does not allow the Company to monitor and manage
19 impacts of distributed energy resources (for example, solar resources) and
20 other events occurring on the grid in a timely manner. The FAN, however,
21 provides capabilities to monitor and assess impacts closer to the field devices
22 themselves, enhancing the Company's ability to integrate more distributed
23 resources

24
25 Q. DOES THE LIMITED AMOUNT OF INSIGHT INTO THE DISTRIBUTION SYSTEM
26 IMPACT OTHER OPERATIONS?

1 A. Yes. The limited visibility and control of devices on the system also translates
2 to a lack of ability to efficiently manage the voltage level on the system. The
3 current system design does not inform the Company if the end-use customer
4 is outside of an allowable voltage range; therefore, like the need for outage
5 notifications from customers noted above, the Company can only obtain
6 information on voltage variation if the customer calls to complain about
7 conditions that indicate their voltage may be outside of the range.
8 Additionally, lacking the ability to efficiently manage and optimize voltage
9 levels diminishes our DSM options. The addition of the IVVO component of
10 ADMS will address these limitations.

11

12 Q. ARE THERE CURRENT SYSTEM LIMITATIONS THAT AFFECT THE INTEGRATION
13 OF DER ON THE COMPANY'S SYSTEM?

14 A. Yes. Currently, Xcel Energy does not have the granularity necessary to
15 dynamically forecast the impact of distributed resources, such as private solar
16 and batteries, on the system and our customers. Additionally, the system was
17 designed for known system loads, and while we are able to host significant
18 DER on most of the grid, limitations exist – especially when larger quantities
19 of distributed generation are proposed.

20

21 Q. WILL INVESTMENTS IN AGIS IMPROVE THE INTEGRATION OF DERs ON THE
22 COMPANY'S SYSTEM?

23 A. Yes. Investments in AMI, ADMS, IVVO, and the FAN will improve DER
24 integration and enable the Company to better manage DER. The investment
25 in these AGIS components will provide us the tools to understand the details
26 of how and when customers use and produce energy. We can then use this
27 information to better analyze and operate the local distribution system.

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Q. HOW WILL AMI (AND ADMS) ENABLE GREATER DISTRIBUTED GENERATION INTEGRATION?

A. AMI will provide the detailed data on the flow of energy to and from customers, as well as voltage, current, and power quality data from the AMI meter to ADMS. With this information, as Ms. Bloch discusses, system operators will be able to facilitate the integration of greater amounts of distributed generation on to the system.

Additionally, with this data, we will be able to identify any voltage problems caused by solar DERs or a potential transformer overload due to DERs. Coupled with IVVO capabilities, this will allow the Company to enable distributed resources while at the same time maintaining reliability and power quality for each of our customers.

Further, AMI will enable the creation of more accurate load profiles which are used by ADMS to create better system models for planning and operational purposes.

Finally, AMI meters have bi-directional capabilities that can be utilized by our DER net metered customers, without the need for installation of a different meter, which is currently the case.

Q. HOW WILL IVVO INCREASE THE SYSTEM’S ABILITY TO HOST DER?

A. As DER penetration increases, the Company will need to manage the DER’s influence on voltage through distribution system voltage control. IVVO will enable the Company to optimize voltage across a feeder where DER is

1 present, and potentially high-voltage situations may occur as a result of DER
2 injection. In this way, IVVO will support the ability for additional distributed
3 resources to be hosted on the system.

4
5 Q. HOW WILL THE FAN INCREASE THE SYSTEM'S ABILITY TO HOST DER?

6 A. As the underlying network that supports the two-way communications of the
7 advanced grid, the FAN supports the AMI meter and IVVO capabilities
8 described above that enable additional DER on the system.

9
10 Q. ARE THERE ADDITIONAL CIRCUMSTANCES THAT ARE DRIVING THE NEED FOR
11 GRID MODERNIZATION?

12 A. Yes. On top of the considerations above, we are facing aging systems even
13 for their current functionality. For example, our Automated Meter Reading
14 (AMR) contract is coming to an end in at the end of 2025, and we have a
15 number of AMR meters that are nearing the end of their useful lives in the
16 early 2020s. All of these considerations factor into the need for a more
17 advanced, responsive grid.

18
19 Q. CAN YOU OUTLINE THE AMR CONTRACT EXPIRATION THAT RESULTS IN THE
20 NEED TO REPLACE AMR IN THE NEAR TERM?

21 A. Yes. Our present AMR system has delivered substantial value for customers
22 since it was implemented in the mid-1990s. Our vendor has announced that
23 they will no longer be manufacturing replacement parts for this proprietary
24 system past 2022. Further, our current AMR meter reading contract expires in
25 2025 with the possibility to extend this contract for one additional year at a
26 substantial cost. Company witness Mr. Cardenas provides additional details
27 on our current AMR contract in his testimony.

1

2 Q. IS THIS CONSISTENT WITH THE STATE OF AMR TECHNOLOGY ACROSS THE
3 UNITED STATES?

4 A. Yes, very much so. At the same time our AMR technology is reaching the end
5 of its life, the AMI technology and market have matured, which has driven
6 many other vendors to also discontinue support of AMR. According to the
7 U.S. Energy Information Administration, AMI adoption surpassed AMR in
8 2012, and the gap has widened as AMR rollouts have remained flat.²⁶ The
9 state of the industry, combined with the state of our existing technology,
10 requires us to make choices now about how to move forward with our
11 metering options.

12

13 Q. WHAT DO YOU CONCLUDE WITH RESPECT TO THE CURRENT STATE OF THE
14 COMPANY'S DISTRIBUTION GRID?

15 A. The technology available to operate electric grids has significantly advanced, at
16 the same time our customers' expectations have increased substantially. It is
17 now possible to implement equipment and systems that will provide the
18 Company with real-time visibility into the grid that we currently lack. While
19 the Company has implemented some of these technologies, it is time to
20 expand the advancing technology to our entire electric grid. As I discuss in the
21 next section of my testimony, the Company's AGIS initiative comprises the
22 Company's strategy for meeting these needs in the years ahead.

23

24 **D. Commission Policy and Stakeholder Input**

25 Q. HOW HAVE COMMISSION POLICY AND STAKEHOLDER INPUT INFORMED
26 DEVELOPMENT OF THE COMPANY'S GRID STRATEGY?

²⁶ Source: <https://www.eia.gov/todayinenergy/detail.php?id=34012>. Ms. Block provides additional discussion in her testimony.

1 A. Since 2015, the Company has provided information and engaged in extensive
2 stakeholder processes around grid modernization, DER hosting capacity, and
3 integrated distribution system planning. Additionally, the Company's
4 residential TOU pilot was informed by and incorporated stakeholder input in
5 that proceeding. Further, the docket initiated to identify performance metrics
6 and potential incentives for the Company's electric utility operations included
7 a robust stakeholder process. Reporting on some of the metrics identified will
8 be enabled or enhanced through the advanced grid capabilities resulting from
9 AGIS implementation. I discuss each of these topics below, highlighting the
10 Commission policies, goals, and stakeholder input that the Company has
11 considered in developing our AGIS implementation strategy.

12
13 Q. PLEASE DESCRIBE THE COMMISSION POLICIES AND GOALS AROUND GRID
14 MODERNIZATION AND INTEGRATED DISTRIBUTION SYSTEM PLANNING.

15 A. The Company filed its first grid modernization report in 2015 in compliance
16 with a new Minnesota statute.²⁷ In March 2016, the Commission released the
17 *Staff Report on Grid Modernization* (Staff Report). The Staff Report outlined a
18 phased process and potential options for the Commission to pursue in its
19 investigation into the state's grid modernization efforts. At that time, the
20 Commission supported distribution system planning as the most reasonable
21 and actionable way for the Commission to assist in the forthcoming grid
22 evolutions. The Commission agreed with the creation of a comprehensive,
23 coordinated, transparent, and integrated distribution system planning process
24 in Minnesota and agreed with the staff proposed principles to guide further
25 work as follows:

²⁷ Minn. Stat. § 216B.2425, subs. 2(e) and 8.

- 1 • Maintain and enhance the safety, security, reliability, and resilience of
- 2 the electricity grid at fair and reasonable costs, consistent with the
- 3 state’s energy policies;
- 4 • Enable greater customer engagement, empowerment, and options for
- 5 energy services;
- 6 • Move toward the creation of efficient, cost-effective, accessible grid
- 7 platforms for new products, new services, and opportunities for
- 8 adoption of new distributed technologies; and
- 9 • Ensure optimized utilization of electricity grid assets and resources to
- 10 minimize total system costs.

11
12 Q. WHAT STAKEHOLDER PROCESSES INFORMED THE DEVELOPMENT OF GRID
13 MODERNIZATION PLANS AND THE IDP PROCESS?

14 A. The Commission conducted a comprehensive stakeholder process that
15 included written comments and workshops, where it solicited input and
16 explored many topic areas and aspects of grid modernization and distribution
17 system planning. After issuing the Staff Report, the Commission conducted a
18 workshop and initiated a comments and replies process seeking to understand
19 how utilities currently plan their systems, the status of current-year utility
20 plans, and recommendations for improvements to present planning practices.

21
22 The Commission then established individual utility IDP dockets,²⁸ where Staff
23 and the utilities worked on proposed IDP filing requirements, with a
24 comment and reply period for stakeholder input. From this process, the
25 Commission determined final IDP requirements for Xcel Energy.²⁹ In

²⁸ Xcel Energy’s IDP filing requirements were developed in Docket No. E002/CI-18-251.

²⁹ See the Commission’s August 30, 2018 Order in Docket No. E002/CI-18-251.

1 addition to the grid modernization principles listed above, the final IDP
2 Planning Objectives include:

- 3 • Provide the Commission with the information necessary to understand
4 Xcel Energy's short-term and long-term distribution system plans, the
5 costs and benefits of specific investments, and a comprehensive
6 analysis of ratepayer cost and value.

7
8 The Company's 2019 IDP is being filed concurrently with this rate case. As
9 part of the annual IDP process, the Company engages with stakeholders to
10 share at a minimum, its budgets and investment plans, DER and load
11 forecasts, and its 5-year action plan. The Company additionally held stakeholder
12 workshops leading up to its 2019 IDP to discuss its non-wires alternatives
13 analysis and its advanced grid cost-benefit analysis CBA framework.

14
15 Q. HOW DOES THE COMPANY'S AGIS STRATEGY INCORPORATE THE POLICIES,
16 GOALS, OBJECTIVES, AND STAKEHOLDER INPUT DESCRIBED ABOVE?

17 A. Our AGIS implementation strategy and project components are closely tied to
18 what we have heard from the Commission and stakeholders through the grid
19 modernization and IDP efforts and as such, considers the inherent Planning
20 Objectives, filing requirements, and stakeholder input. For example, we have
21 added an IVVO component to our proposal, which is a direct result of the
22 feedback we received in response to our recent grid modernization reports.
23 Our AGIS testimony in this case addresses the Planning Objectives described
24 above, and provides the necessary information to demonstrate the costs and
25 operational and customer benefits of each AGIS component, as well as the
26 long-term value of advanced grid capabilities in supporting Commission

1 policies and objectives including those related to carbon reductions and
2 additional DER integration.

3
4 Q. WHAT IS THE COMPANY'S UNDERSTANDING OF COMMISSION POLICIES AND
5 GOALS AROUND HOSTING CAPACITY AND DER INTEGRATION.

6 A. As articulated in the IDP Planning Objectives noted above, we understand
7 that distribution grid planning should move toward the creation of efficient,
8 cost-effective, accessible grid platforms for new products, new services, *and*
9 *opportunities for adoption of new distributed technologies*. The statute noted above also
10 requires Xcel Energy to file hosting capacity reports in conjunction with its
11 grid modernization reports (now submitted with the annual IDP filings). In
12 the Company's first hosting capacity report,³⁰ we noted that we recognize
13 hosting capacity as a key element in the future of distribution system planning
14 and anticipate advanced grid capabilities will have the potential to further
15 enable DER integration. As such, we continue to engage with stakeholders on
16 hosting capacity and integration of increased DER.

17
18 Q. HOW DOES THE COMPANY'S AGIS STRATEGY INCORPORATE THE
19 COMMISSION POLICY AND STAKEHOLDER INPUT AROUND OPPORTUNITIES FOR
20 ADOPTION OF NEW DISTRIBUTED TECHNOLOGIES?

21 A. Our AGIS implementation strategy is designed to support further DER
22 integration on our system, specifically through ADMS coupled with the
23 detailed data provided by AMI meters and the IVVO voltage control
24 capabilities (all supported through the two-way communications enabled by
25 the FAN). As I discussed earlier in Section C, these components will provide
26 the Company the visibility needed to understand and integrate additional DER

³⁰ See the Distribution System Study filed December 1, 2016, in Docket No. E002/M-15-962.

1 on a feeder and tools to manage any voltage issues once DER (like solar
2 generation) is installed on a feeder. In this way AGIS supports further DER
3 integration on our system.
4

5 Q. WHAT IS THE COMPANY'S UNDERSTANDING OF COMMISSION POLICIES AND
6 GOALS AROUND TOU RATES?

7 A. We believe the Commissions policies around TOU rates are partially
8 articulated in several of the IDP Planning Objectives, including: *Enable greater*
9 *customer engagement, empowerment, and options for energy services.* In addition, TOU
10 rates support policy objectives on carbon reduction and goals to reduce peak
11 demand on the system. As articulated in our TOU pilot proceeding, the goals
12 of the pilot program are to study adequate price signals to reduce peak
13 demand, identify effective customer engagement strategies, understand
14 customer impacts by segment, and support demand response goals.
15

16 Q. WHAT STAKEHOLDER PROCESSES INFORMED THE DEVELOPMENT OF THE
17 COMPANY'S TOU PILOT PROGRAM?

18 A. The Company met with key stakeholders to gather feedback and present
19 preliminary plans in advance of its final residential TOU pilot proposal. Xcel
20 Energy established a framework and identified preliminary objectives as the
21 basis of a stakeholder process through which the Company received input on
22 the design of the pilot and made further refinements. Stakeholder input
23 informed the features of the Company's pilot, including the criteria for
24 participation, the design of the customer experience, the desired learnings
25 from the study, and other important elements that shaped the Company's
26 approach.
27

1 Q. HOW DOES THE COMPANY'S AGIS STRATEGY ADDRESS THE COMMISSION
2 POLICIES AND STAKEHOLDER INPUT AROUND TOU RATES?

3 A. The pilot will implement new residential TOU rates in two geographic areas,
4 providing participants with increased energy usage information, education, and
5 support to encourage shifting energy usage to daily periods when the system is
6 experiencing low load conditions. TOU rates for our residential customers are
7 enabled through deployment of both AMI meters and the necessary FAN
8 communications in the participating communities. The limited deployment of
9 these AGIS components in connection with the TOU pilot began in 2019.

10

11 Q. WHAT ARE THE COMMISSION'S STATED GOALS WITH RESPECT TO
12 PERFORMANCE METRICS AND POTENTIAL INCENTIVES?

13 A. In the docket initiated to identify performance metrics and potential incentives
14 for the Company's electric utility operations, the Commission initially set forth
15 the following regulatory policy goals in its January 8, 2019 Order,³¹ to promote
16 the public interest by ensuring:

- 17 • Environmental protection;
- 18 • Adequate, efficient, and reasonable service;
- 19 • Reasonable rates; and
- 20 • Opportunity for utilities to earn a reasonable return.

21

22 The outcomes identified in the order were: affordability; reliability, including
23 both customer and system-wide perspectives; customer service quality,
24 including satisfaction, engagement and empowerment; environmental
25 performance, including carbon reductions and beneficial electrification; and
26 cost-effective alignment of generation and load, including demand response.

³¹ See Docket No. E002/CI-17-401.

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Q. WHAT STAKEHOLDER PROCESSES INFORMED THE DEVELOPMENT OF THE PERFORMANCE METRICS?

A. The Commission conducted a robust stakeholder process, including two meetings, with a goal of engaging stakeholders in discussing potential metric topics. The Commission also accepted comments and replies seeking input on proposed metrics, measurement of metrics, alignment with outcomes, goals, and principles established in the January order. After determining the metrics in a September 2019 Order, the Commission also required the Company to continue to collaborate with interested parties proposals for calculating, verifying, and reporting each of the metrics.

Q. CAN YOU HIGHLIGHT SOME OF THE STAKEHOLDER INPUT ON DEVELOPMENT OF THE PERFORMANCE METRICS?

A. Yes. The Department of Commerce (Department) indicated in its June 4, 2019 Reply Comments that its policy objectives largely align with the goals and objectives set forth by the Commission.³² Additionally, the Department expressed interests in: decarbonization and beneficial electrification; rate stability; and responding to customer desires.

Q. WHAT ARE THE STATED OUTCOMES AND METRICS RESULTING FROM THIS PROCEEDING?

A. In its Order dated September, 18, 2019, the Commission set forth metrics in the following categories:

- Environmental performance, including carbon reductions and beneficial electrification;

³² See Department of Commerce Reply Comments, June 4, 2019, Docket No E002/CI-17-401.

- 1 • Reliability, including both customer and system-wide perspectives;
- 2 • Affordability;
- 3 • Customer service quality, including satisfaction, engagement, and
- 4 empowerment; and
- 5 • Cost effective alignment of generation and load, including demand
- 6 response.

7

8 Q. HOW DOES AGIS IMPLEMENTATION SUPPORT THE COMMISSION’S POLICY
9 GOALS AND INCORPORATE STAKEHOLDER FEEDBACK DESCRIBED ABOVE?

10 A. Among other things, the Company’s AGIS proposal provides foundational
11 capabilities to develop and offer flexible, advanced rates and new products
12 and services that we expect will contribute to improved environmental
13 performance, increased customer satisfaction, engagement and empowerment,
14 and cost-effective alignment of generation and load. It will also improve our
15 overall reliability and the customer reliability experience – and improve the
16 efficiency of the system, which may also result in energy savings for
17 customers. For example, while the Commission established desired goals,
18 outcomes, and principles for the metric design in its January 2019 Order
19 (described above), in later determining specific metrics (September 2019
20 Order), the Commission recognized that additional work and technology
21 infrastructure, particularly the installation of AMI, may be needed before
22 certain reliability metrics could be widely implemented. The metrics identified
23 in the Commission’s Order include MAIFI, locational reliability, and power
24 quality – all of which would be enabled by our AGIS proposal in this case.

25

26 Q. WHAT OTHER COMMISSION AND STAKEHOLDER INPUT INFLUENCED THE
27 COMPANY’S AGIS PROPOSAL?

1 A. In May 2019, the Company held a stakeholder workshop focused on the cost-
2 benefit analysis framework for its advanced grid investments. We have
3 incorporated the key aspects of the feedback we received from stakeholders,
4 as follows:

- 5 • Clearly articulate the assumptions and the level of certainty/ uncertainty
6 behind them;
- 7 • Articulate the dependencies (or non-) between different advanced grid
8 investments;
- 9 • Consider framing in concert with the performance metrics proceeding
10 outcomes;
- 11 • Prioritize investments – i.e., what comes after the foundational
12 components;
- 13 • Demonstrate innovation and creativity around the customer value
14 proposition; and,
- 15 • Differentiate between easy-to-quantify and hard-to-quantify benefits for
16 customers.

17
18 In addition, the Commission’s September 27, 2019 Order in our most recent
19 TCR Rider proceeding³³ provided additional guidance for the cost-benefit
20 analyses for any future requests for cost recovery for AGIS investments. We
21 have addressed these requirements in our CBAs presented with this filing.
22

23 Q. CAN YOU SUMMARIZE HOW COMMISSION POLICY AND STAKEHOLDER INPUT
24 INFORMED DEVELOPMENT OF THE COMPANY’S GRID STRATEGY?

25 A. Yes. These topics have been a particular focus not only for the Company but
26 for the Commission and stakeholders in Minnesota. The Commission policies

³³ Docket No. E002/M-17-797.

1 and goals developed through these proceedings focus on the future of
2 distribution systems and how advanced grid capabilities will support
3 Commission and state policy goals, including carbon reduction and DER
4 integration, and provide benefits for customers.

5 6 **V. AGIS COMPONENTS AND IMPLEMENTATION STRATEGY**

7 8 **A. AGIS Component Selection**

9 Q. IN LIGHT OF THESE DRIVERS, PLEASE SUMMARIZE THE COMPANY'S VISION FOR
10 THE FUTURE OF THE ELECTRIC DISTRIBUTION GRID.

11 A. The Company envisions moving from the predominantly one-way system that
12 currently exists to an integrated system of centralized and decentralized energy
13 resources that are connected and optimized through communications systems
14 that share information from across the distribution grid. The advanced grid
15 will leverage automation, real-time monitoring, and communication to locate
16 and isolate disruptions in the system and improve safety, efficiency, and
17 reliability of the system. The advanced grid will enable greater customer choice
18 by allowing customers to adopt new products, services, technologies, and
19 applications, including access to timely energy usage data and more options
20 for managing their usage. Additionally, the advanced grid will provide timely
21 and accurate information that will allow the Company to manage the
22 increasing amount of DER entering our system. This will be accomplished
23 through the Company's AGIS initiative, which consists of multiple programs
24 that work together to improve and update our distribution system.

1 Q. CAN YOU PROVIDE AN OVERVIEW OF THE COMPONENTS OF THE AGIS
2 INITIATIVE IN MORE DETAIL?

3 A. Yes. The components of our AGIS plan include:

4 • Advanced Distribution Management System (ADMS) provides the foundational
5 system for operational hardware and software applications. It acts as a
6 centralized decision support system that assists control room personnel,
7 field operating personnel, and engineers with the monitoring, control and
8 optimization of the electric distribution grid. In turn, ADMS provides
9 greater visibility into an increasingly complex electric distribution grid and
10 operating advanced grid applications. The result is near real-time
11 calculations of the state of the network, including factors such as voltages,
12 currents, real and reactive power, amps, voltage drops, and losses.

13

14 ADMS was initially certified by the Commission in 2016 as part of our
15 2015 Biennial Grid Modernization Report,³⁴ and the first year of ADMS
16 costs have been approved for recovery under our TCR Rider.³⁵ Likewise,
17 ADMS would be necessary regardless of other components of AGIS due
18 to the need for a modern, integrated, two-way distribution system and the
19 increasing use of distributed energy resources (DERs). ADMS also
20 includes the Geographic Information System (GIS), which is a
21 foundational data repository that provides location and specification
22 information for all of the physical assets that make up the distribution
23 system. ADMS uses this information to maintain the as-operated electrical
24 model and advanced applications.

25

³⁴ See Docket No. E002/M-15-962.

³⁵ See Docket No. E002/M-17-797.

- 1 • Advanced Meter Infrastructure (AMI) is a system of advanced meters,
2 communication networks, and data processing and management systems
3 that enables secure two-way communication between Xcel Energy’s
4 business and operational data systems and customer meters. AMI provides
5 a central source of information that is shared through the communications
6 network with many components of an intelligent grid design. AMI enables
7 near real-time monitoring and communication between the meter and
8 ADMS about, among other things, energy usage and outages. The AMI
9 meter itself functions as a sensor that, along with other intelligent field
10 devices, will provide the Company with the necessary information to
11 continually monitor and make the necessary adjustments to the system.
12 AMI is a necessary first step to better customer data, enhanced customer
13 service, and the addition of applications and services for future energy
14 management and optionality.
- 15 • Field Area Network (FAN) is the communications network that will enable
16 communications between the existing communications infrastructure at the
17 Company’s substations, ADMS, meters, and the new intelligent field
18 devices associated with advanced grid applications. With its embedded
19 communication module, the AMI meter itself is a part of the FAN
20 communication network.
- 21 • Fault Location Isolation and Service Restoration (FLISR) is also an additional
22 component of ADMS. FLISR is wholly different from IVVO, however,
23 in that it involves software and automated switching devices that locate
24 and isolate faults, thereby reducing the frequency and duration of
25 customer outages. Specifically, these automated switching devices detect
26 feeder mainline faults, isolate the fault by opening section switches, and

1 restore power to unfaulted sections by closing tie switches to adjacent
2 feeders as necessary.

- 3 • Integrated Volt-VAr Optimization (IVVO) is an application that is built
4 onto ADMS. IVVO automates and optimizes the operation of the
5 distribution voltage regulating and VAr control devices, to in turn reduce
6 electrical losses, electrical demand, and energy consumption. In addition
7 to automating and improving voltage management and power quality,
8 IVVO provides increased distribution system capacity to host DER.

9
10 Q. WHY DID THE COMPANY OBTAIN APPROVAL FOR ADMS BEFORE SETTLING ON
11 OTHER AGIS COMPONENTS?

12 A. Implementation of ADMS is the foundation for all other advanced grid
13 components. ADMS will enable the Company to implement advanced grid
14 technologies necessary in the near term, and will allow the Company to take
15 advantage of future capabilities that will result from rapid advances in smart
16 grid technologies. Specifically, ADMS is a necessary upgrade to our
17 distribution system that will utilize an enhanced distribution grid model to
18 consolidate substations, feeders, taps, and services into a single user interface
19 that more accurately represents the entire distribution grid. GIS is an integral
20 part of ADMS, and ADMS will maintain the as-operated GIS electrical model
21 and advanced applications in near real-time. This model will provide the
22 Company with greater visibility into the distribution system and provide
23 information about the system at a more granular level. ADMS will allow the
24 Company to monitor and control power flow from substations to the edge of
25 the grid. The improved capability over today's systems will enable multiple
26 grid performance objectives to be realized over the entire grid.

27

1 Q. WHY IS THE COMPANY PROPOSING TO MOVE FROM AMR TO AMI
2 TECHNOLOGY?

3 A. As previously noted, there are several reasons. First, we needed to explore
4 options to address the expiration of the Cellnet contract and the pending
5 obsolescence of our AMR meters. We explored multiple metering options, as
6 described by Company witness Ms. Bloch. Operationally, AMR meters have
7 limited functionality and are not considered modern technology. In contrast,
8 advanced meters provide substantial near real-time data that can be used to
9 improve the Company's ability to monitor, operate, and maintain the
10 distribution grid. Advanced meters can be used to verify power outages and
11 service restoration. Improved reliability monitoring can lead to improved
12 outage response, proper protection system analysis and ultimately reduce or
13 eliminate outages. Advanced meters can also provide improved voltage
14 monitoring and management, support better load studies and analysis resulting
15 in improved planning and design, and be used to support additional systems
16 such as an ADMS with applications like IVVO that will promote energy
17 efficiency and peak shaving and FLISR that will allow us to locate, isolate, and
18 remedy faults much faster than our current system options. Additionally, as
19 described in our past TOU pilot filings, advanced meters will also unlock the
20 potential for new rate designs that cannot be supported by the Company's
21 current AMR meters. The benefits of AMI meters are discussed in more detail
22 in the Direct Testimony of Ms. Bloch.

23

24 Q. WHY IS THE COMPANY PROPOSING TO IMPLEMENT FLISR TECHNOLOGY?

25 A. The Company is implementing FLISR because it will continue to improve
26 reliability for our customers. FLISR is a technology that, in most cases, will
27 allow the Company to understand when a fault event occurred and allow the

1 Company to reconfigure the system more quickly than we are able to today.
2 This application reduces the number of customers that experience an outage
3 for a prolonged period of time in the event of a fault.
4

5 Q. WHY IS THE COMPANY PROPOSING TO IMPLEMENT IVVO TECHNOLOGY?

6 A. The current distribution system has the capability to monitor voltages at the
7 substation but does not have the capability to allow the Company to
8 constantly monitor voltage levels throughout its feeders to the customer
9 premise. As a result, the Company must often operate the system at a higher
10 voltage than what would otherwise be required to ensure the appropriate
11 voltage at the end of a long feeder. The Company's proposed IVVO
12 application will allow voltage to be monitored along the entire length of the
13 feeder and at selected end points (rather than only at the substation). This
14 insight into the voltage levels will allow the Company to utilize lower voltages
15 across the entire feeder at most times. This will result in reduction in
16 distribution electrical losses; reduction in electrical demand; reduction in
17 energy consumption; and increased capacity to host DER. Fundamentally, the
18 IVVO is a demand side management (DSM) tool that controls voltage without
19 requiring behavioral changes from customers.
20

21 Q. WHY IS THE COMPANY PROPOSING TO IMPLEMENT THE FAN?

22 A. The integrated components of our AGIS initiative require an integrated,
23 secure communication system that involves the FAN and the advanced
24 meters. The mesh network allows the advanced meter to communicate its
25 measurement data, power status, voltage current, usage history, and peak
26 demand information back to the Company. Additionally, the FAN integrates
27 with IVVO and FLISR because the advanced meters voltage information and

1 service interruption information is communicated to the Company via the
2 FAN.

3
4 Below I provide an overview of the individual components of the AGIS
5 initiative.

6
7 1. *AMI*

8 Q. WHAT ARE THE UNDERLYING COMPONENTS OF AMI, AT A HIGH LEVEL?

9 A. The AMI infrastructure itself consists of new meters and associated hardware
10 and software. The components of the advanced meter include: (1) the meter
11 itself (responsible for measurements and storage of interval energy
12 consumption and demand data); (2) an embedded two-way radio frequency
13 communication module (responsible for transmitting measured data and event
14 data available to backend applications); (3) embedded Distributed Intelligence
15 capabilities; and (4) an internal service switch (to support remote connection
16 and disconnection of service).

17
18 The AMI meters measure, store, and transmit meter data, including energy
19 usage data from customer locations. The advanced meters can also measure
20 values such as voltage, current, frequency. Additionally, these meters detect
21 outage and restoration events, detect tampering and energy theft events, and
22 perform meter diagnostics.

23
24 Q. WHAT IS THE DISTRIBUTED INTELLIGENCE COMPONENT OF THE ADVANCED
25 METER?

26 A. Distributed Intelligence is an operating system that allows for the installation
27 of a wide-range of potential applications – including grid-facing applications,

1 or those the utility operates and with which the customer interfaces. These
2 applications will have the potential to enhance the customer experience not
3 only by improving the energy usage information and control that a customer
4 has but by introducing new ways to manage the grid.

5
6 Today, the potential for applications is broad and we're working with our
7 meter vendor to better define the long-term vision for how the Distributed
8 Intelligence platform will be deployed. Potential use cases for these new
9 applications include:

- 10 • Virtual Energy Audits: A remote assessment of the customer's energy
11 usage conducted and compared to an expected baseline with
12 recommendations on how to improve performance;
- 13 • Virtual Sub-Metering: The replacement of on-site metering equipment
14 for end-use technologies such as electric vehicles that are on a separate
15 electric rate;
- 16 • Smart Thermostat Support: The meter can communicate with the
17 customer's smart thermostat to optimize the operation of the air
18 conditioner; and
- 19 • Green Notifications: Messaging provided to the customer that notifies
20 them of periods of high renewable energy on the system that will allow
21 them to cycle their energy usage to align with cleaner energy.

22
23 The contract with our meter vendor includes the license costs for four
24 applications. Working with our meter vendor we will identify the appropriate
25 applications for mass deployment. These applications may be customer-facing,
26 similar to those described above, or grid-facing, meaning Xcel Energy
27 interacts with the applications. For these customer-facing applications, we

1 envision engaging the customer through the portal currently called
2 MyAccount. Applications may also be made available as customers participate
3 in new products and services such as our energy efficiency offerings.
4

5 Q. HOW IS THE COMPANY PROCURING AND INSTALLING THE ADVANCED
6 METERS?

7 A. Xcel Energy issued a Request for Proposal (RFP) in March 2018 to select a
8 meter vendor that could provide an AMI meter, project management, and
9 installation services. The Company selected Itron, and a contract was
10 executed on September 1, 2019. Itron was selected for a number of reasons,
11 including that they provided the lowest cost and best overall value for an
12 offering that included distributed intelligence technology and met Xcel
13 Energy's deployment schedule. Ms. Bloch describes the AMI RFP and
14 selection process in her testimony. By selecting Itron, we also ensure a single
15 vendor solution, as Itron was previously selected to provide the FAN network
16 and AMI software, as discussed by Mr. Harkness.
17

18 The Company and Itron are committed to working together during AMI
19 implementation to ensure our customers receive excellent service, and will
20 provide coordinated support and address all customer inquiries and any issues
21 that may arise. Mr. Cardenas discusses these plans, as well as customer service
22 tracking and reporting, in his testimony.
23

24 Q. WHAT WORK IS REQUIRED TO IMPLEMENT AMI METERS?

25 A. We must install the AMI meter hardware, as well as software necessary to
26 integrate the "smart meters" across the NSP system. This requires meter
27 development and installation in coordination with our meter contractor, Itron.

1 Additionally, as Company witness Mr. Harkness describes, new metering
2 technology requires integration with multiple existing Company systems, as
3 well as security protections. This work is complex and requires multiple years
4 of planning, design, and implementation, such that we cannot wait until our
5 AMR technology is no longer supported to begin the process. Further, even
6 as it stands, we are behind our industry peers in taking steps to move away
7 from AMR and to AMI technology.

8
9 Once meters and associated software and hardware are implemented,
10 additional work is needed to build the digital platforms for our customers.

11
12 Our work around meter installation and use of the associated capabilities also
13 requires customer education, outreach, and support, as I describe in Section
14 V.C. of my testimony.

15
16 Q. WHAT IS THE COMPANY'S CURRENT PLAN FOR AMI IMPLEMENTATION IN
17 CONNECTION WITH THE TOU PILOT?

18 A. We have begun the limited AMI deployment for our TOU pilot. Installation
19 of AMI in connection with the pilot began in 2019 and will be completed
20 during the first quarter of 2020, with TOU pilot launch scheduled for April
21 2020.

22
23 Q. WHAT IS THE COMPANY'S PLAN FOR FULL AMI IMPLEMENTATION FOR ALL
24 CUSTOMERS?

25 A. Our present AMI plan for Minnesota is to complete the installation of AMI
26 meters in 2024, in anticipation of the end of the support for AMR meters and
27 the end of our present service agreement. Company witnesses Ms. Bloch, Mr.

1 Harkness, and Mr. Cardenas describe the implementation plan in more detail.
2 I note that our TOU pilot is not intended to validate our plan for full roll-out
3 of AMI to all customers. Rather, the TOU pilot is intended to study the TOU
4 rate and its impacts specifically, particularly with respect to the more timely
5 information and advanced rate design options provided by advanced meters.
6 In other words, it is not necessary for us to conclude the TOU pilot prior to
7 full implementation of AMI.

8
9 2. FAN

10 Q. WHY IS A FAN THE RIGHT TYPE OF COMMUNICATIONS NETWORK FOR THE
11 COMPANY AND ITS CUSTOMERS?

12 A. The FAN is a private, Company-owned network that will securely and reliably
13 address the need for increased communication capacity that arises from
14 distribution grid advancements. The advantages of the FAN over other
15 alternatives include that a Company-owned network solution enhances
16 security against cyber threats by reducing the use of third party networks, the
17 use of public networks (*i.e.*, cellular), and the reliance on external entities for
18 communications support. Further, developing the FAN as an internal private
19 network allows us to implement our cyber security measures into the design at
20 all levels. In addition, the private network solution allows NSPM to utilize the
21 network's full bandwidth and all capacity is dedicated to the Company's use,
22 which is particularly critical during emergency and outage situations. The
23 FAN also integrates with the communication systems used for current
24 components of our distribution system. Overall, the FAN provides for
25 greater security and efficiency and avoids requiring the Company to incur
26 monthly usage fees that would otherwise be paid to private vendors.

27

1 Q. IS OUR SELECTION OF THE FAN APPROACH CONSISTENT WITH WHAT OTHER
2 UTILITIES HAVE DONE?

3 A. Yes. Our proposed FAN is consistent with developments within the electric
4 utility industry, and current industry standards that have been adopted by
5 vendors, organizations, and other electric utility companies. We actively
6 participate with industry standards organizations and alliances – such as the
7 Electric Power Research Institute (EPRI) and the Institute of Electrical and
8 Electronics Engineers (IEEE) – to ensure that our requirements and
9 assumptions are aligned with the standards and products being deployed
10 throughout the industry. Mr. Harkness discusses this further in his testimony.

11

12 Q. WHAT ARE THE UNDERLYING COMPONENTS OF THE FAN, AT A HIGH LEVEL?

13 A. The FAN will consist of two separate wireless technologies: (a) a lower-speed
14 Wireless Smart Utility Network (WiSUN) mesh network; and (b) a high-speed
15 point-to-multipoint Worldwide Interoperability for Microwave Access
16 (WiMAX) network.

17

18 The WiSUN component transfers information between meters and transmits
19 data over the mesh network to an access point device that transitions the data
20 from the mesh network to the WiMAX tier of the FAN or in some cases
21 directly to the Company's Wide Area Network (WAN) currently in place. I
22 also note that in addition to their metering function, the advanced meters will
23 have embedded communication modules that will allow the devices to
24 communicate as part of the WiSUN network.

25

26 Q. CAN YOU SUMMARIZE THE WORK AND TIMELINES FOR FAN
27 IMPLEMENTATION?

1 A. Deployment of the FAN occurs slightly ahead of AMI installation to provide
2 the necessary communications for advanced meter operations. We have
3 already begun the limited deployment in connection with the TOU pilot,
4 which will be completed in the first quarter of 2020. We anticipate full FAN
5 deployment will begin in 2020 to ensure network readiness when AMI meters
6 and other devices are deployed. Mr. Harkness and Ms. Bloch provide details
7 related to the FAN device installation.

8
9 During the installation of FAN equipment, Business Systems will work
10 concurrently on integration of the FAN with the Company's other systems.
11 The IT integration work is described in the testimony of Mr. Harkness. To
12 support the TOU pilot, Business Systems has begun to deploy WiMAX base
13 stations in three substations, and the equipment necessary to enable the
14 functioning of those base stations. Business Systems has also conducted field
15 coverage studies to ensure the FAN will provide adequate coverage for both
16 the TOU pilot as well as full deployment of meters and other devices in those
17 areas. Work related to full FAN deployment will continue in 2020, and full
18 FAN implementation is expected to be completed in 2024.

19
20 Q. ARE THERE OTHER BENEFITS OF IMPLEMENTING THE FAN?

21 A. Yes. Having a secure two-way communication network on the system
22 provides for communications not only between ADMS and AMI, but it allows
23 for communications between and among any other new intelligent field
24 devices associated with advanced grid applications. Like ADMS, the FAN is a
25 support network that enables other components of the AGIS initiative (AMI,
26 IVVO, FLISR) to provide customer benefits. Company witness Mr. Harkness
27 describes the strategy and costs for the FAN in more detail.

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3. *FLISR*

Q. HOW WILL THE FLISR COMPONENT WORK WITHIN THE AGIS INITIATIVE?

A. Implementation of FLISR will enable automated capabilities to locate and isolate faults, thereby reducing the frequency and duration of customer outages. FLISR also results in cost savings by enabling the Company to more efficiently restore power with the use of fewer resources. While we currently have small-scale automation programs across our distribution system, those systems are becoming outdated and have limited ability to communicate with other components of our system. In contrast, FLISR will be fully integrated with ADMS and will be able to use the FAN network communications. Additionally, while the Company continually focuses on process improvements, these efforts around outage restoration and communications are likely to result in only limited incremental improvement in those areas. FLISR, on the other hand, will transform the process by which the Company is made aware of and responds to outages, as well as the customer experience related to outages and system reliability. Ms. Bloch discusses FLISR implementation and benefits further in her testimony.

Q. WHAT ARE THE COMPONENTS OF FLISR, AT A HIGH LEVEL?

- A. There are four principal components of FLISR:
- Reclosers are pole-mounted reclosing and switching devices that have monitoring, communication, and control capabilities.
 - Automated overhead switches are overhead remote switching devices that serve to isolate faults on the system.

- 1 • Automated switch cabinets are pad mounted switching devices that
2 perform functions similar to the automated overhead switches but for
3 underground feeders.
- 4 • Substation relays function primarily to monitor the status of the
5 distribution system and initiate a command to open the breaker in the
6 event of a fault on the system. These relays can also capture important
7 fault information which will be sent to ADMS.

8
9 Q. CAN YOU SUMMARIZE THE WORK AND TIMELINES FOR FLISR
10 IMPLEMENTATION?

11 A. In 2020, we plan limited installation of FLISR for testing purposes. FLISR
12 will be deployed to a small area in conjunction with ADMS to validate
13 capabilities. Following testing, we will begin FLISR roll-out using selected,
14 targeted deployment to maximize benefits and reduce installation costs. The
15 current FLISR project will cover 208 feeders benefiting approximately 350,000
16 customers by 2028. Ms. Bloch provides additional implementation details in
17 her testimony.

18
19 Q. WHAT OTHER BENEFITS ARE PROVIDED THROUGH IMPLEMENTATION OF
20 FLISR?

21 A. In addition to the improved system reliability and customer satisfaction and
22 cost reductions discussed above, FLISR also provides benefits through
23 increased visibility into the distribution systems. The ability to see system load
24 in real-time and operate devices remotely has benefits for operating the system
25 during our peak summer season and for construction purposes. This visibility
26 also provides improved data for system planning purposes that, when

1 combined with other system data, can enhance planning and design for the
2 future. Ms. Bloch describes these benefits in more detail.

3
4 4. *IVVO*

5 Q. WHY IS THE COMPANY PROPOSING TO IMPLEMENT THE IVVO COMPONENT
6 OF THE AGIS INITIATIVE?

7 A. IVVO serves to automate the optimization of distribution system voltage,
8 providing capabilities that are not available on our current system. Managing
9 the overall voltage profile of distribution system feeders provides benefits in
10 reducing line losses, demand, and energy consumption, while ensuring that
11 voltage levels are adequate for providing safe and reliable power to customers.
12 Voltage management is becoming increasingly important because customers'
13 energy consumption is more dynamic than ever, with on-site solar, batteries,
14 electric vehicles, smart appliances, smart thermostats, and many more
15 electronic devices. The voltage optimization capabilities of the advanced grid
16 will enable not only improved power quality and cost savings attributed to the
17 benefits noted above, but will also increase our ability to host distributed
18 energy resources (DER).

19
20 Q. WHAT ARE THE COMPONENTS OF IVVO, AT A HIGH LEVEL?

21 A. There are four primary components of IVVO:

- 22 • Capacitors, a stock component used by the Company. We were able to
23 use our existing equipment standards to support deployment.
- 24 • Secondary static VAR compensators (SVC) are a relatively new
25 technology introduced to Xcel Energy's distribution system, and have
26 been successfully tested implemented in our Colorado service territory.

- 1 • Voltage and current sensing devices are essentially meters that will be
2 installed on feeders to provide monitoring of voltage and current.
- 3 • Load tap changers (LTC) are installed at the substation and function as
4 the local controller to raise or lower the voltage, to optimize voltage
5 levels based on the demand of the demand of the substation
6 transformer.

7

8 The Grid Edge Management System (GEMS) is a software application that
9 will be used to communicate between ADMS and the SVCs to improve
10 customer voltages and achieve full value of IVVO implementation.

11

12 Q. CAN YOU SUMMARIZE THE WORK AND TIMELINES FOR IVVO
13 IMPLEMENTATION?

14 A. In 2021, we plan limited installation of IVVO for testing purposes on seven
15 distribution feeders (one transformer area). This will occur as part of the
16 installation of ADMS in that area. Following testing, we plan to begin full
17 implementation of IVVO on 189 feeders serving approximately 224,000
18 customers. This work is anticipated to be completed in 2024.

19

20 Q. WOULD THE COMPANY BE ABLE TO ACHIEVE THE BENEFITS DESCRIBED
21 ABOVE WITHOUT IMPLEMENTATION OF IVVO?

22 A. To some extent, yes. While there are alternative paths to achieve certain of
23 the benefits described above, IVVO consolidates capabilities that will result in
24 benefits in a variety of areas. For example, energy savings could be increased
25 through DSM programs. These are voluntary programs that require
26 customers to take affirmative actions in order to reduce their energy usage. In
27 contrast, IVVO enables continuous energy savings on all feeders across our

1 system where IVVO has been installed. Further, pursuing DSM programs
2 exclusively without IVVO implementation, we would be forgoing increased
3 DER hosting capacity. Company witness Ms. Bloch describes IVVO
4 alternatives, selection process, and benefits in more detail.

5
6 **B. Overall AGIS Implementation**

7 Q. WHAT IS THE CURRENT STAGE OF THE AGIS INITIATIVE IMPLEMENTATION?

8 A. Overall, the deployment of AGIS has already begun with the implementation
9 of the ADMS system and deployment of the FAN and AMI meters to support
10 the time-of-use pilot. ADMS implementation is expected to be complete in
11 the second quarter on 2020.

12
13 Q. CAN YOU PROVIDE A SUMMARY TIMELINE VIEW OF AGIS DEPLOYMENT?

14 A. Yes. Table 8 below provides an overview of the deployment timeline for the
15 various components of the AGIS initiative.

Table 8
Deployment Timeline

Program	Implementation Timeline
ADMS	In-service 2020
AMI	Meter roll-out 2021-2024
FAN	Deployment 2021-2024 (preceding AMI deployment approximately six months)
FLISR	Limited testing 2020; Implementation 2020-2028
IVVO	Limited testing 2021; Implementation 2021-2024

- 11
- 12 Q. CAN YOU ILLUSTRATE THE IMPLEMENTATION PLAN FOR AGIS IN MORE
13 DETAIL, BOTH THROUGH THE END OF THE MYRP AND FOR THE OVERALL
14 PLANNING AND IMPLEMENTATION HORIZONS?
- 15 A. Yes. The AGIS Implementation and Customer Experience Timeline provided
16 as Exhibit___(MCG-1), Schedule 5 illustrates AGIS implementation for the
17 period 2019 through 2030.
- 18
- 19 Q. HOW DOES AGIS IMPLEMENTATION IN MINNESOTA ALIGN WITH OTHER
20 JURISDICTIONS SERVED BY THE COMPANY?
- 21 A. AGIS is an enterprise-wide initiative in several respects, as our ADMS is
22 serving several jurisdictions and our planning for other components of the
23 AGIS initiative is being conducted on an enterprise-wide basis. For example,
24 we are taking into account the needs of multiple jurisdictions we serve when
25 planning for IT needs and undertaking vendor selection and negotiations for
26 the components of the AGIS initiative. We will therefore have shared assets
27 between jurisdictions, as is typical for an initiative like this. However, we also

1 must also tailor our AGIS initiative planning to the unique requirements and
2 needs of each area we serve – both from regulatory and operational
3 perspectives. For example, we were required to obtain a Certificate of Public
4 Convenience and Necessity to pursue certain components of the AGIS
5 initiative in Colorado, whereas we have different IDP and rate case
6 requirements in Minnesota. The jurisdictions we serve will also have varying
7 requirements for implementation of certain attributes of the system (like
8 remote connections, as discussed by Mr. Cardenas). Our approach for this
9 rate case is tailored to the Minnesota jurisdiction.

10
11 **C. Alternatives to the AGIS Initiative**

12 Q. DID THE COMPANY CONSIDER ALTERNATIVES TO THE AGIS INITIATIVE?

13 A. Yes. The Company has considered alternatives for the various components of
14 the AGIS initiative on many levels. By that I mean that we have not only
15 considered options as part of our overall strategic planning, but also compared
16 options within that plan for each component and device through information
17 gathering, vendor discussions, Requests for Information, Requests for
18 Proposals, and vendor contract negotiations. With respect to the component-
19 based alternatives, we have considered not only whether to move forward
20 with AMI vs. AMR or a FAN versus a cellular network, but also different
21 types of AMI meters and systems, different device options, and different
22 functionalities, and different support and security considerations. While I
23 discuss system-wide and policy options, the individual technical alternatives to
24 each individual AGIS component – as well as the process to whittle down our

1 options to specific systems, vendors, and devices – are discussed by Company
2 witnesses Mr. Harkness and Ms. Bloch.³⁶

3
4 Q. DID THE COMPANY CONSIDER TAKING NO ACTION AS ONE ALTERNATIVE TO
5 PURSUING THE AGIS PROGRAMS?

6 A. Yes. From an overall system perspective, theoretically one alternative is to do
7 nothing and maintain the current distribution system. However, the Company
8 has determined that “doing nothing” is not a viable option.

9
10 Q. WHY IS TAKING NO ACTION NOT CONSIDERED A VIABLE OPTION?

11 A. There are several reasons. First, NSPM does not have the option to avoid
12 investments in the distribution system because, as I describe above, the
13 Company’s existing technology is reaching the end of its life and will need to
14 be replaced. Replacement parts will no longer be available after 2022 and our
15 meter reading contract expires in 2025. Given that we need metering to
16 function as a business and that vendors are choosing not to support or
17 continue to manufacture AMR meters, there is truly no “do nothing” option.
18 We believe this reality is understood by the Commission and our other
19 regulators and stakeholders. Indeed, the Company has previously received
20 Commission permission to implement ADMS as a reasonable initial approach
21 to modernizing the distribution grid; as such, a foundational piece of grid
22 advancement is already underway. It does not make sense to stop there.

23
24 Second, AMR meters do not provide the functionality needed for a modern
25 utility. The communication technology currently employed is limited to

³⁶ The Company’s RFPs related to the AGIS projects are provided on the AGIS supporting files compact disk provided with Vol. 2B.

1 supporting only the current infrastructure, and many of these communications
2 networks have reached technical obsolescence. Additionally, the current
3 system does not provide visibility into the grid or the ability to manage and
4 optimize voltage that would enable increased DER, which is anticipated to
5 continue to increase at a rapid rate.

6
7 Third, the “do nothing” approach ignores customers’ stated expectations. For
8 example, customers want the ability to access timely energy usage information
9 in order to empower them to make decisions that affect their power usage.
10 AMI metering is necessary to accomplish this objective. As a further example,
11 few customers are likely aware of how heavily we must rely on them to
12 identify outage locations or how manual our fault location is or how voltage is
13 maintained at levels to avoid systemic power quality issues rather than at
14 optimized levels. AMI, FLISR, and IVVO go a long way to addressing these
15 issues, and will improve service to customers who care about choice,
16 reliability, outage restoration, and energy conservation.

17
18 Q. DID THE COMPANY CONSIDER SIMPLY EXTENDING USE OF THE CURRENT
19 METERS FOR SOME LONGER PERIOD OF TIME?

20 A. Yes. As Ms. Bloch describes, while the Company could conceivably continue
21 to maintain its existing AMR meters, many of these meters were installed in
22 the 1990s are between 20 to 30 years old. Due to their age, we expect that
23 these meters may begin to experience mechanical issues in the coming years
24 and we will not be able to get meter replacement parts after the end of 2022.

25

1 Further, with our Cellnet meter reading contract expiring at the end of 2025,
2 we need to have an advance plan for either new meters or new meter reading
3 that could be implemented by that time.
4

5 Q. DID THE COMPANY CONSIDER DSM PROGRAMS AS ALTERNATIVES TO THE
6 RELEVANT COMPONENTS OF AGIS?

7 A. Yes, but AGIS and other DSM programs are not mutually exclusive, and the
8 technology of the AGIS initiative is necessary to some forms of DSM. For
9 example, IVVO is an efficient way to lower voltage on the electric grid
10 because it creates benefits without customer action, and does not rely on a
11 subset of customers to voluntarily act to lower voltage at peak periods.
12 Further, as Ms. Bloch describes in more detail, the ability to monitor voltage
13 across the entire grid enables lower voltage. It can be likened to a ‘wholesale
14 level’ of DSM. Similarly, AMI meters are necessary to eventually facilitate
15 providing timely, automated usage information for customers and time-of-use
16 rates. The technology we plan to employ through AGIS is necessary to these
17 DSM efforts but does not preclude other efforts. In fact, they complement
18 our CIP and demand response efforts.
19

20 Q. DID THE COMPANY CONSIDER A SYSTEM-WIDE APPROACH TO UPGRADING
21 THE DISTRIBUTION SYSTEM THAT DOES NOT REQUIRE THE IMPLEMENTATION
22 OF INTEGRATED APPLICATIONS?

23 A. Yes. Ultimately each component of the AGIS initiative could have been
24 completed through a stand-alone application. For example, the Company
25 considered the use of independent sensors to measure voltage instead of AMI
26 and advanced meters. However, AMI and advanced meters were selected over
27 independent sensors because AMI is not a stand-alone system and, as Ms.

1 Bloch describes, the advanced meters provide a multitude of benefits in
2 addition to being voltage sensors. While independent sensors only perform
3 the specific function of measuring voltage, advanced meters provided the
4 capabilities necessary for the Company to achieve visibility into an individual
5 customer's status. AMI and advanced meters constitute the only solution that
6 provides the Company with the visibility into the status of the electric grid at
7 the customer level.

8
9 Similarly, the components of IVVO and FLISR were chosen based on their
10 ability to interact with each other and provide an integrated solution to
11 address voltage and fault regulation and correction. Because independent
12 components could not achieve the same outcomes, stand-alone options were
13 discarded.

14
15 Q. DID NSPM CONSIDER OTHER SYSTEM-WIDE APPROACHES?

16 A. Yes. We also evaluated the options of implementing only certain aspects of
17 AGIS, and could focus on the implementation of AMI and the FAN at this
18 time and defer FLISR and/or IVVO to a later date.

19
20 We do not recommend this approach, however. As described later in my
21 testimony and in Ms. Bloch and Mr. Harkness's testimony, all of the
22 components of the AGIS initiative essentially layer on top of each other with
23 each one providing a solid foundation for the next. For example, the
24 deployment of FAN, which will enable two-way communications with devices
25 in the field, is a necessary foundational element that must be in place before
26 AMI meters can be fully functional. Likewise, AMI meters must be in place to
27 support applications like IVVO and FLISR. The ADMS provides the

1 foundation for all of these elements. Consequently, our overall distribution
2 advancement program consists of a strategically-developed set of components
3 that are designed to function together.

4
5 Q. COULD IVVO AND FLISR BE DELAYED INTO THE FUTURE, TO PACE
6 INVESTMENTS DIFFERENTLY THAN THE COMPANY HAS PROPOSED?

7 A. Yes, this is a possible path, although we do not recommend it. While FLISR
8 and IVVO are additional capabilities rather than replacements for aging
9 technology, we believe there will be some incremental cost efficiencies due to
10 implementing them at the same time as AMI and the FAN. Perhaps just as
11 importantly, the costs of these devices and installation are more likely to
12 increase in the future due to inflation, so there is little to be gained from delay.
13 We would likely be delaying the benefits of this work and at the same time
14 creating higher costs at the time of implementation, losing the value of the
15 work already done to investigate and plan for these components, or both.

16
17 Q. ARE THERE OTHER ALTERNATIVES THAT WOULD PROVIDE THE SAME RESULTS
18 AS THE AGIS APPROACH?

19 A. No. As I describe above, the other available options are individual
20 technologies that would not promote an integrated system. The ADMS
21 provides a network model of the electric distribution grid that enables and
22 indeed is essential to integrating each component of an advanced grid to work
23 with each other. A FAN communication network keeps that model updated.
24 To try to update the distribution grid with independent systems would create
25 an environment in which it would be virtually impossible to manually
26 integrate the information gathered by each system. The components selected

1 as part of the AGIS initiative are the correct components to bring NSPM's
2 distribution grid into the future.

3
4 Q. WHAT WOULD THE COMPANY DO IF ITS AGIS PROPOSALS ARE NOT
5 APPROVED?

6 A. For metering in particular, we would have some very difficult choices to make.
7 We would need to manage the meters we have farther into the future,
8 potentially without access to repair parts and without vendor support. In
9 doing so, we would risk falling behind our peers in several areas, and the
10 experience and satisfaction of our customers will suffer as a result. We would
11 need to make investments in our existing meters to keep them going longer,
12 which could include hiring meter readers when the Cellnet contract expires.
13 We considered purchasing the Cellnet technology, but determined the contract
14 would be at market value of the system including field devices, plus costs for
15 professional services to support the aging software. Additionally, the software
16 is almost 20 years old and not designed to run on newer servers, and we would
17 not be able to purchase replacement meters or modules after 2022. This
18 solution does not address many of our concerns.

19
20 Q. ARE THERE OTHER ADVANCED GRID COMPONENTS THAT MAY BE
21 IMPLEMENTED IN THE FUTURE?

22 A. Yes. While it is not possible to anticipate all possible technological
23 innovations that may be available in the future, the Company is already
24 looking to maximize the AGIS investments beyond what can be delivered on
25 "Day 1". For example, we know that we will have the option to build
26 additional customer applications and interfaces once we observe how our
27 customers begin to use our AGIS "Day 1" capabilities. Beyond the

1 foundational AGIS components necessary to add future capabilities, we are
2 planning to implement the Distributed Energy Resources Management System
3 (DERMS) in the 2024-2025 timeframe to further expand our ability to host
4 and manage distributed energy resources.

5
6 Q. WHAT IS DERMS?

7 A. DERMS is a control system that will provide improved awareness of DER
8 impacts to power-flow on the grid. DERMS allows for the integration of
9 DER and demand response with full visibility and control, and at the same
10 time enables the Company to maximize localized and system-wide benefits
11 and value for our customers. DERMS will be important to support and
12 manage DERs as they continue to grow, but is not as immediately critical to
13 system management as replacing our meters or improving our outage
14 response. Rather, it is a building block we expect and anticipate adding in the
15 future.

16
17 Q. WHY IS THE COMPANY NOT BRINGING FORWARD A DERMS PROJECT RIGHT
18 NOW?

19 A. While DERMS will become necessary in the near future, more time is needed
20 for research and development activities to occur in this space. The Company
21 will continue monitoring developments, monitoring operational and market
22 needs, begin crafting requirements, and refine our forecasting to deploy
23 DERMS. The penetration of DER, while increasing, has not yet reached the
24 point where a DERMS is required. We expect that the needs of Minnesota
25 will align with the further maturation of DERMS product offerings, such that
26 a future investment in this functionality will ultimately prove prudent and
27 beneficial to all.

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Q. IN SUM, WHY ARE AMI, THE FAN, FLISR, AND IVVO THE RIGHT PACKAGE FOR THE COMMISSION TO APPROVE AT THIS TIME?

A. Given the need to replace our existing AMR meters that are nearing end of life, now is the right time to implement AMI and the FAN communications network. These technological advances now make it possible to meet growing customer expectations for a more robust, reliable, and resilient system, as well as customer desire for more insight and visibility into the energy choices they are making. Further, implementing FLISR and IVVO at this time will enable the reliability and energy reduction benefits at a lower cost than if the Company waits to deploy these systems in the future. The Company’s targeted AGIS initiative will address system needs, customer needs, and our overall strategic priorities as a Company to lead the clean energy transition, enhance the customer experience, and keep bills low.

D. AGIS Governance

1. Governance Structure

Q. WHAT IS THE COMPANY’S GOVERNANCE STRUCTURE FOR THE AGIS INITIATIVE?

A. A robust governance structure is necessary for any project of this size and scope, especially considering the technical and integrated nature of AGIS, the various operating and customer service areas of our business that support the initiative, and the coordination necessary to deliver value for our customers as we implement AGIS in Minnesota. The Company has established a tiered governance structure for the AGIS initiative to provide the necessary controls and oversight that will enable us to achieve the desired customer and business outcomes. The program sponsors are responsible for approval of the overall

1 strategy and funding as well as the overall program results. The program
2 sponsors have instituted an executive level Integration Council, to ensure
3 alignment of the enterprise vision and drive cross-workstream integration of
4 the AGIS initiative. This council resolves execution issues and risks, and
5 provides enterprise visibility to the design, program management, change
6 management, and benefits realization anticipated from AGIS implementation.
7 Any proposed changes are individually documented and brought to a change
8 control meeting composed of program management leadership. The program
9 management leaders can approve administrative and low impact changes to
10 the initiative. Any significant changes to costs, benefits, scope, schedule, or
11 resources are elevated to the Integration Council for review and approval to
12 provide a consistent approach across the initiative.

13
14 Q. HOW WILL THIS STRUCTURE ENSURE APPROPRIATE OVERSIGHT OF AGIS
15 IMPLEMENTATION?

16 A. Any significant changes to costs, benefits, scope, schedule, and resources are
17 elevated to the Integration Council from the program management leadership
18 team to provide a consistent approach across the initiative. Program leaders
19 ensure that when risks and issues are identified that could affect costs,
20 benefits, scope, schedule, or resources, they are documented and resolved.
21 Any risks, issues or changes that meet predetermined thresholds are then
22 elevated to the Integration Council and, if necessary, to the sponsors for
23 appropriate resolution. This hierarchy of approvals ensures that scope,
24 schedule and costs are documented and controlled in order to align with
25 customer and Company check as the initiative proceeds.

26

1 2. *Program Management*

2 Q. WHAT IS PROGRAM MANAGEMENT?

3 A. Program management is an organizational effort designed to coordinate all
4 projects necessary to incorporate the AGIS initiative into the current
5 distribution system. Large, complex projects like AGIS must have established
6 program management controls in order to ensure the effective use of
7 resources, and thus optimal costs for the scope and benefits intended. There
8 are various aspects of program management, some that are specific to a
9 particular business area, and other applicable across all functional areas
10 involved in implementation.

11
12 Coordination of projects through program management is driven through
13 common project planning, governance, budgeting, and execution metrics
14 methodology. Program management also provides essential corporate
15 resources to ensure that the various individual AGIS projects are completed
16 successfully. The program management team will coordinate the work
17 required for the individual projects that will build the assets that make up the
18 overall AGIS initiative. The program management team is also responsible
19 for financial analysis and control, accounting, contract management, resource
20 management, initiative governance, communications, and administrative
21 assistance for each individual project and the overall AGIS initiative. The
22 program management team will also track results, identify and determine if
23 remedial action is necessary to keep the AGIS initiative on track, and monitor
24 interdependencies between individual projects.

25
26 Given the size of this initiative, significant program management oversight is
27 needed on a frequent and ongoing basis due to the highly interrelated and

1 interdependent nature of the many components of the AGIS initiative at the
2 individual project level. The project planning life cycle is broken into phases;
3 Strategy, Planning, Initiation, Blueprinting, Design, Build, Test, Deploy,
4 Warranty. Once a project has been initiated, each phase of the project's health
5 is peer reviewed on a weekly basis. The weekly review includes, schedule,
6 milestone, issues, risk, and budget. The Project Management office conducts
7 a peer review of the overall AGIS budget on a monthly basis and provides the
8 results to the Integration Council. Exhibit____(MCG-1), Schedule 6 provides
9 the project management costs discussed in this section.

10
11 Q. PLEASE DESCRIBE THE COSTS ASSOCIATED WITH AGIS PROGRAM
12 MANAGEMENT.

13 A. The AGIS budget includes program management costs for AMI and IVVO
14 for 2019 through 2025, when advanced meter deployment and installation of
15 IVVO devices will be substantially completed. The program management
16 costs are discussed together below. Schedule 6 provides program
17 management costs separately for AMI and IVVO.

18
19 We have estimated the total of AGIS program management capital costs for
20 the MYRP period 2020-2022 will be approximately \$20.3 million, or \$30.0
21 million for 2019 through 2025. These capital expenditures are for work
22 necessary throughout the development, deployment, and conclusion of
23 implementing the AGIS components. We have estimated approximately \$10.7
24 million will be attributable to operations and maintenance (O&M) expenses
25 during the MYRP period (or \$21.1 for 2019-2025). These O&M costs related
26 to strategic program oversight, as well as incremental corporate services and
27 larger change management needs obtained in direct support of the initiative.

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Q. WHAT ASPECTS OF PROGRAM MANAGEMENT ARE INCLUDED IN THE AGIS BUDGET?

A. Program management costs include:

- Change Management;
- Environment/Release Management;
- Finance;
- Project Management Organization;
- Security;
- Supply Chain;
- Talent Strategy; and
- Delivery and Execution Leadership.

Change management makes up the largest portion of the program management costs in the AGIS budget.

Q. WHAT IS CHANGE MANAGEMENT?

A. Change management is a systematic approach to effectively executing and managing fundamental organization and process changes, such as when an electric utility implements a significant change to the distribution grid. The implementation of the AGIS initiative will impact and transform the job functions for many of the Company’s employees. In order to manage this transformation and properly engage employees and external stakeholders to ensure a successful transition, a comprehensive change management plan is necessary. In the context of change management, stakeholders include any person, process, or entity that is affected by the implementation of the AGIS initiative. The three main elements of change management– prepare, manage

1 and sustain – each involve significant detailed analysis, action and
2 documentation. The AGIS initiative has a dedicated team to ensuring that
3 there is an appropriate overall change management plan in place, and that the
4 plan is resourced and thoughtfully executed.

5
6 Q. WHAT ARE THE COSTS ASSOCIATED WITH AGIS CHANGE MANAGEMENT.

7 A. We have estimated change management costs for 2020-2022 to be
8 approximately \$10.2 million. Approximately \$4.4 million of that estimate will
9 be capitalized. These capital costs are for work throughout the development,
10 deployment, and conclusion of on implementing the AGIS components.
11 Specific tasks that will be capitalized are those that relate directly to design and
12 deployment of assets, such as, but not limited to, the development of key
13 design decisions, training development, functional alignment, integration
14 reviews, program architecture documentation, technical change management,
15 managing quality, and performing independent deliverable reviews.
16 Approximately \$7.5 million will be attributable to O&M expenses. These
17 O&M costs are related to strategic program oversight, communications and
18 customer training, as well as incremental corporate services obtained in direct
19 support of the initiative.

20
21 Q. PLEASE DESCRIBE THE OTHER COSTS RELATED TO AGIS PROGRAM
22 MANAGEMENT AND HOW THOSE COSTS WERE DEVELOPED.

23 A. The other program management costs associated with AGIS implementation
24 are described in below. As a general note, these functions will be performed
25 using a combination of internal employees and external consultants, and the
26 costs forecasts related to work performed by internal employees is incremental
27 to the general corporate budget forecasts. These costs were estimated based

1 upon experience in deployment of the AGIS technology in Colorado, focused
2 on the incremental requirements related to Minnesota functionality and
3 scalability performance. I also note below where additional considerations
4 were used in developing the specific cost forecasts.

- 5 • *Environment/Release Management:* These costs are related to performance
6 and operating tests on the AGIS technology prior to deployment. This
7 includes identification and remediation of issues in the
8 software/hardware deployment and performance testing on the
9 scalability requirements of certain AGIS technology.
- 10 • *Finance:* These costs include providing forecasting, budgeting, and
11 reporting on the financial performance of the projects and the AGIS
12 initiative. This includes internal reporting on monthly metrics and
13 providing support in regulatory filings. While these costs were
14 estimated based upon the current required financial needs in supporting
15 AGIS implementation in Colorado, current Minnesota jurisdictional
16 reporting requirements were also considered.
- 17 • *Project Management Organization:* These costs are related to governance
18 activities for the projects and the overall AGIS initiative. This includes
19 reporting on current project status, requirements for project change
20 requests, and control of policies and guidelines designed to effectively
21 govern the projects and AGIS initiative.
- 22 • *Security:* These costs are for work related to identifying security threats
23 and issues on the AGIS technology prior to deployment. This includes
24 identification and remediation of security threats in the
25 software/hardware deployment and continuing requirements for
26 effective cyber security programs. Security requirements for the AGIS

1 initiative follow the corporate strategy and process as outlined in Mr.
2 Harkness' testimony.

- 3 • *Supply Chain:* These costs include providing centralized supply chain
4 support, including negotiation of large strategic contracts. Costs were
5 estimated based upon experience in providing support for the Colorado
6 AGIS initiative, and are specific to the expectations of contracts
7 required in Minnesota
- 8 • *Talent Strategy:* These costs include providing support in staffing and
9 alignment of the project and initiative teams. This includes alignment
10 with long term strategic priorities and staffing levels designed around
11 the implementation of the AGIS technology.
- 12 • *Delivery and Execution Management:* These costs include project and
13 initiative leadership through the design, build, and deployment phases
14 of the AGIS initiative. Delivery and Execution Leadership will provide
15 the oversight and alignment of the project and initiative objectives to
16 the strategic priorities of the Company and the Commission.

17
18 Q. ARE PROGRAM MANAGEMENT COSTS REASONABLE?

19 A. Yes. The Company determined the costs based on the need to build a
20 program management team that will consist of internal employees, as well as
21 the engagement of consultants. This approach is based on the Company's
22 experience with program management, and is consistent with its recent
23 experience implementing the new general ledger and work and asset
24 management systems. The costs identified in my testimony are those that
25 were allocated to the AGIS components.

26

1 Q. DID THE COMPANY DEVELOP CONTINGENCIES FOR PROGRAM
2 MANAGEMENT?

3 A. Yes. The contingency for 2019 through 2025 for both program and change
4 management is \$1.3 million in capital and \$1.0 million for O&M, or
5 approximately 5 percent of total costs. These contingencies are less than the
6 overall contingencies estimated for design, deployment, and operations of the
7 other components of the initiative. They reflect the uncertainty around the
8 costs that will be necessary for program management, which may not be fully
9 known until the AGIS program is approved and final requirements for
10 implementation in Minnesota are known. Until design and engineering are
11 complete, contingencies are necessary to account for the unknowns that are
12 likely to develop during the processes and through the installation and
13 operations phase. The contingencies for program management are consistent
14 with the contingencies proposed for the overall AGIS initiative, as described
15 further in Section VII.

16

17 **VI. AGIS AND THE CUSTOMER EXPERIENCE**

18

19 Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

20 A. In this section, I discuss the overall NSPM customer experience currently,
21 compared to what will be different for customers upon AGIS implementation.
22 To illustrate the impacts and customer benefits, I provide a timeline and
23 discussion of how advanced grid capabilities will be rolled out and experienced
24 by customers. In addition, I describe future opportunities that will be made
25 possible by the AGIS initiative and discuss to what extent additional
26 regulatory proceedings may be necessary to implement those opportunities.

27

1 I then discuss our customer and community outreach strategy for AMI and
2 the associated functions, and present our Customer Education and
3 Communication Plan related to the roll-out of AGIS initiatives over the
4 implementation period.

5
6 Schedule 3 provides additional discussion and details related to the Company's
7 customer strategy with respect to the advanced grid capabilities and
8 implementation, including background on our customer surveys and research
9 efforts that have informed our AGIS strategy, and details on the technologies
10 and customer benefits of each AGIS component. The document also
11 provides timeline discussions of the customer experience from pre-
12 deployment, through the deployment and installation phase, and post-
13 deployment when new customer products and services will be implemented.
14 The document also discusses our customer outreach and education plan, as
15 well as data privacy and security considerations.

16
17 **A. The Customer Experience**

18 Q. WHAT IS THE COMPANY'S VISION FOR THE FUTURE CUSTOMER EXPERIENCE?

19 A. The Company's vision is to further empower customers with timely and
20 relevant information so they are more aware of their energy usage and its
21 impacts, and can make better decisions about how and when they use energy.
22 This will give customers greater opportunity to control their energy costs and
23 reduce their environmental impact, two issues that rate highly with customers.
24 In the future, the customer experience will require less direct engagement
25 from customers yet will be a stronger partnership between customers and Xcel
26 Energy. To meet this vision, we need to understand our customers' needs,

1 design products and services to meet their individual needs, and seamlessly
2 execute in ways that meet customer priorities.

3
4 Q. HOW WILL AGIS IMPLEMENTATION ENHANCE THE CUSTOMER EXPERIENCE
5 COMPARED TO THE CAPABILITIES OF TODAY'S DISTRIBUTION SYSTEM?

6 A. First, the advanced grid will be able to provide data and information that is
7 simply not available with our current system and AMR technology. This is
8 not just an incremental step compared to the data provided by our current
9 metering and distribution system technologies; rather, the advanced grid will
10 provide vastly different information with a level of granularity that can impact
11 customers' energy usage decisions, as well as increase reliability and improve
12 the safety and security of the grid.

13
14 Q. CAN YOU SUMMARIZE HOW EACH OF THE CORE ELEMENTS OF AGIS IMPACT
15 THE CUSTOMER EXPERIENCE?

16 A. Yes. Each of the core elements of AGIS (AMI, the FAN, ADMS, FLISR, and
17 IVVO) adds to the customer experience in a specific way, but each is also
18 interdependent upon the others to ensure that maximum benefits can be
19 realized.

20
21 AMI provides the customer-level data that will enable an improved customer
22 experience. AMI provides the timely and detailed energy usage data needed to
23 better inform customers thereby empowering them to better manage their
24 energy costs. AMI also provides additional outage information, because the
25 Company will know when a meter stops communicating through the FAN,
26 which is an indication that an outage has occurred. Once contact with an
27 advanced meter is lost, we can proactively notify a customer that an outage

1 has occurred. Additionally, we can tell when a meter is back in service, which
2 allows us to send accurate notifications to customers about the resolution of
3 an outage.

4
5 The FAN can be viewed as the nervous system of the AGIS system as it
6 transmits information both to and from the advanced meter. This two-way
7 communication is necessary to allow the meter to transmit data about energy
8 usage or outages back to the Company's meter data management and ADMS
9 systems.

10
11 FLISR and IVVO, which are additions to the ADMS, help us improve service
12 reliability and quality. FLISR is a critical investment to improve the outage
13 experience because FLISR devices can identify outages and can be used to
14 proactively restore power through automatic switching and help isolate
15 outages so field service crews can be more efficiently dispatched. FLISR is
16 expected to reduce the duration of many outages thereby minimizing the
17 impact customers experience.

18
19 Power quality, the level of voltage on the system, generally affects all
20 customers because unnecessarily high voltage on the system or a feeder both
21 wastes energy and can have a detrimental effect on customer's end-use
22 technologies. ADMS and the IVVO application will allow us to better
23 manage the voltage levels on our system thereby reducing energy usage and
24 the associated cost and improving the voltage range on our grid, which
25 improves the efficiency and life of customer technologies.

26

1 Q. HOW DOES THE TOU PILOT INFORM THE EVOLUTION OF THE CUSTOMER
2 EXPERIENCE?

3 A. As previously noted, the TOU pilot will be underway in 2020 and is expected
4 to conclude in 2022. The goals of the TOU pilot are to study adequate price
5 signals to reduce peak demand, identify effective customer engagement
6 strategies, understand customer impacts by segment, and support demand
7 response goals. Learnings from this pilot will inform the design of future
8 advanced rates the Company would propose, such as a full TOU rate for
9 residential customers, or other pricing options.

10

11 While we do not yet know the pilot outcomes with respect to the pilot rate
12 design and price signals yet, with this pilot, we are developing a digital
13 platform to provide more granular and timely information to customers about
14 their energy usage. We have partnered with a third-party to reimagine how we
15 deliver this energy usage information to our customers. For TOU pilot
16 customers, we intend to provide at least hourly interval data to customers on a
17 prior day basis. This will allow customers to see how their energy usage tracks
18 throughout the day as well as the cost of their energy during that time. We
19 will offer disaggregation information that identifies the appliances or devices
20 using energy in a home so customers can make more informed decisions
21 about how their behavior impacts energy usage, and the best places are to start
22 making changes. We expect to explore how to maximize advanced rate
23 designs that benefit from more timely usage information coming from the
24 advanced meter. We also expect to include demand response messaging that
25 will proactively alert customers about high demand days and encourage them
26 to take actions to change their behavior helping them save money on their
27 bills and also reduce constraints on the grid.

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These new services to be offered through the TOU pilot will be used as a template for the information to be available to customers via the web portal once an AMI meter has been installed. In other words, even though a full residential TOU rate may not be implemented to coincide with deployment of the first AMI meters in 2021, we will use the initial experience with our TOU pilot customers to better inform how we deliver new information to our customers and what channels and strategies work the best. In the future, the TOU pilot learnings will inform our rate design based on feedback we receive from TOU customers and operational results of the pilot.

Q. HOW DOES THE AGIS DEPLOYMENT TIMELINE ALIGN WITH THE ROLL-OUT OF NEW OR ENHANCED PRODUCTS AND SERVICES FOR CUSTOMERS?

A. As a general overview, impacts to the system and the customer experience will evolve as we implement AGIS components and take full advantage of the advanced grid capabilities over time. Our customer experience investments are beginning today. We are actively researching and designing new products and services that will be enabled by AGIS investments and innovating on existing products and services that can be improved by AGIS. We are also talking to our customers about what their expectations are now and in the future and how we can best meet those expectations.

Schedule 5 provides our AGIS implementation timeline, illustrating the products and services we anticipate deploying. Complimentary to this is Exhibit___(MCG-1), Schedule 7, which provides a summary of the products and services identified in the timeline. Schedule 7 also identifies how these

1 products and services align with the Company's strategic priorities to lead the
2 clean energy transition, enhance the customer experience, and keep bills low.

3
4 Generally, we consider implementation of new offerings in three phases:

- 5 • *Day 1*, coincident with the installation of advanced meters beginning in
6 2021. The Day 1 experience described below encompasses the
7 capabilities that will be enabled and new information that will be
8 available to customers once an advanced meter has been installed. I
9 note, however, that the Day 1 experience for the first customer to
10 receive an advanced meter in 2021 will be different than for a customer
11 who receives an advanced meter later in the deployment phase. This is
12 because the Company will be rolling out new products and services in
13 the near term during the actual meter deployment phase. The Day 1
14 experience will be more robust and further enhanced with later meter
15 deployments as we implement new products and services.
- 16 • *Near Term*, through 2025, describes the period when the Company will
17 be developing, requesting Commission approvals (where necessary),
18 and implementing new products and services for customers.
- 19 • *Long Term*, through 2030, describes future products and services the
20 Company envisions implementing to realize additional capabilities that
21 are enabled by the advanced grid. The Company will be flexible during
22 this period, and any new products and rate design will be informed by
23 prior experience, changing customer needs and expectations, and
24 evolving technologies.

25
26 Q. WILL FUTURE FILINGS BE REQUIRED RELATED TO NEW PRODUCTS AND
27 SERVICES TO ENABLE SOME ADVANCED GRID BENEFITS?

1 A. Yes. We recognize that many new products, services, or rate offerings – such
2 as a full residential time of use rate – will require additional filings with the
3 Commission and may involve a stakeholder engagement process to inform
4 development. I discuss these additional capabilities and rate offerings below,
5 including outlines of the development and approval processes.

6
7 **B. Day 1**

8 *1. Overview*

9 Q. PLEASE FURTHER DEFINE THE DAY 1 PERIOD.

10 A. As stated above, Day 1 coincides with the beginning of advanced meter
11 deployment in 2021. Some of the services and information will be available to
12 customers immediately upon installation of the AMI meter, while others will
13 be implemented and available as additional meters are installed, as the
14 Company initiates new product and service offerings, and as additional devices
15 are deployed, building a larger base for advanced grid operations.

16
17 Q. PLEASE SUMMARIZE THE COMPANY’S VISION FOR THE DAY 1 EXPERIENCE.

18 A. The Day 1 experience will be heavily focused on “getting the basics right.”
19 Basics include things like accurately billing customers with the data received
20 from the smart meter, ensuring the Company’s website and customer portal
21 are correctly displaying the interval data received from the smart meter, and
22 ensuring there is a robust communications with customers about meter
23 installations. These foundational elements of AGIS implementation also
24 double as the primary touchpoints of service we have with customers.

25
26 While focusing on getting the basics right we also intend to deploy new
27 products and services in areas where the cost-benefit is the highest or where

1 the satisfaction value is highest for our customers. In particular, the Day 1
2 experience will be include an improved outage experience, an enhanced digital
3 experience, and new energy savings programs. I discuss each of these projects
4 below.

5
6 2. *Outages and Reliability*

7 Q. WHAT ARE CUSTOMER EXPECTATIONS WITH RESPECT TO OUTAGE DATA AND
8 SYSTEM RELIABILITY?

9 A. As noted earlier, our customer research efforts show that:

- 10 • addressing service interruptions is important to all customer classes;
11 • customers expect more accurate and timely information related to
12 outages; and
13 • customers expect that service interruptions will be less frequent, smaller
14 in scope, and shorter in duration.

15
16 a. *Outage Notification*

17 Q. HOW DO CUSTOMERS RECEIVE OUTAGE NOTIFICATIONS TODAY?

18 A. Today, we have a mobile app, and customers can receive outage notifications
19 that include estimated restoration times. Customers also receive
20 confirmations when our records reflect that the outages have been resolved,
21 and they can receive these via their preferred communication channel, wither
22 text, email, or phone. While we have made advances on our grid and with the
23 service we offer our customers – and these and other products and services
24 have provided our customers with significant value over many years – we have
25 room for improvement in our communications with customers and especially
26 with restoration time estimates.

27

1 Q. HOW DOES AGIS IMPLEMENTATION ENABLE THE COMPANY TO PROVIDE
2 TIMELY OUTAGE INFORMATION?

3 A. The AMI meters detect outage and restoration events, this real-time
4 information is then transmitted through the meter's radio frequency
5 communication module, through the FAN, and is received by the AMI
6 operating software system that is used to send and receive information from
7 an AMI-capable meter. With AMI, the Company will know when momentary
8 or nested outages³⁷ occur because the advance meters will no longer
9 communicate through the FAN back to the Company.

10

11 This improved awareness will allow for the Company to proactively notify
12 customers of an outage, instead of relying on customers to notify the
13 Company. In addition, with improved awareness and expected reduced
14 restoration scopes (as discussed in the next section), the Company will be able
15 to provide customers with more timely and accurate information about their
16 outages. Today, customers are provided general updates and asked to confirm
17 if their power has been restored. With the advanced grid capabilities, the
18 Company can remotely confirm restoration of power.

19

20 Q. HOW WILL THE COMPANY COMMUNICATE OUTAGE NOTIFICATIONS TO
21 CUSTOMERS?

22 A. As part of the Day 1 experience, we do not anticipate significant changes to
23 *how* customers receive outage notifications; the significant difference will be in
24 the Company's ability to proactively communicate with customers, provide
25 more timely notifications, and provide more accurate restoration time
26 estimates. By default, all customers with a valid email address in our system

³⁷ Storms often result in multiple failures. When we repair and reenergize a section, but a subset remains out due to a second fault, that outage is referred to as a "nested" outage.

1 will receive outage notifications via email. However, we will take steps to
2 encourage customers to update their preferences in order to receive
3 notifications in the way they prefer most. We will also begin enabling
4 notifications through our mobile application for customers that prefer this
5 communication channel.

6
7 b. System Reliability Improvements

8 Q. WHAT CAPABILITIES RELATED TO OUTAGE RESTORATION DOES THE
9 ADVANCED GRID PROVIDE?

10 A. As described in the previous section, through ADMS, AMI, the FAN, and
11 FLISR implementation, AGIS enables outage identification in real time and
12 enhances capabilities for faster outage resolution. These improvements will
13 begin as we begin to install FLISR devices in 2020. Customers on FLISR-
14 enabled feeders will begin to see improvements, with improvement growing as
15 we install FLISR on additional feeders over time.

16
17 Q. HOW DO THESE AGIS CAPABILITIES IMPROVE SYSTEM RELIABILITY
18 EXPERIENCED BY CUSTOMERS?

19 A. First, as noted above, AMI can provide initial notice of an outage to the
20 Company. This immediate notification can play a role in reduced response
21 times. Once an outage has been noted, ADMS supports operators in
22 determining optimal solutions faster during outage restoration through
23 utilization of the network model, load flow calculations, and advanced analysis
24 tools. ADMS, in conjunction with automated grid components, can improve
25 reliability in terms of both reducing the number of outages and minimizing
26 outage time. The FLISR application, which calculates the possible locations
27 of the outage cause and including automated switching devices, can reduce the

1 frequency and duration of customer outages. These automated switching
2 devices detect feeder mainline faults, isolate the fault by opening section
3 switches, and restore power to unfaulted sections by closing tie switches to
4 adjacent feeders as necessary

5
6 Q. WILL THE IMPACT OF ADVANCED GRID BE REFLECTED IN THE COMPANY'S
7 RELIABILITY METRICS?

8 A. Yes. Operationally, we expect improvements in the System Average
9 Interruption Duration Index (SAIDI) when AGIS is fully implemented and
10 the Company adapts its process to more efficiently respond to outages.
11 However, because our current system is unable to track momentary service
12 interruptions, there is a likelihood that the number of outages may increase as
13 the advanced grid technology will enable the Company to track momentary
14 outages. This may increase the System Average Interruption Frequency Index
15 (SAIFI). I also note that because we will now be able to capture momentary
16 outages that otherwise would go unnoticed if not observed and reported by a
17 customer, we will be able to report MAIFI statistics, which are another
18 measure of service quality for our customers.

19
20 Q. DOES THE COMPANY CURRENTLY REPORT ON THESE RELIABILITY METRICS?

21 A. Yes. We report service quality and reliability metrics under Minn. Rule 7826
22 and as required by our tariff governing service quality.³⁸ I also note that
23 SAIFI and SAIDI have penalties attached according to established thresholds
24 and past performance. With SAIFI and SAIDI impacts and the ability to
25 report MAIFI as a result of AGIS implementation, new baselines for these
26 metrics may need to be established over time through a Commission-

³⁸ See the Company's Minnesota Electric Rate Book, Section 6, General Rules and Regulations, Subsection 1.9, Service Quality.

1 approved process. I provide an overview of our service quality tariff and
2 metrics in Section VIII, identifying how the Company expects AGIS may
3 affect our performance and reporting under the Minn. Rule 7826 and our
4 service quality tariff. Specific information as it relates to reliability
5 performance is discussed in detail in the Direct Testimony of Ms. Bloch. The
6 other service quality metrics related to billing and customer service are
7 discussed in detail in the Direct Testimony of Mr. Cardenas.

8
9 *3. Digital Experience Improvements*

10 *a. Customer Portal*

11 Q. PLEASE DESCRIBE THE CURRENT CUSTOMER PORTAL EXPERIENCE?

12 A. Today, customer's access the customer portal through MyAccount.
13 MyAccount provides customers with the ability to enroll in certain programs,
14 review their usage and bill information, receive updates on outages, and
15 personalize their communications preferences.

16
17 This experience covers many of the primary interactions a customer will have
18 with Xcel Energy. However, the information provided in the customer portal
19 is limited by the information that we have available today. As I have discussed
20 above, our current system and metering technology is limited in the detail and
21 timeliness of the data it provides. As we upgrade our system we will integrate
22 this new information into an enhanced customer portal experience.

23
24 Q. HOW WILL THE PORTAL EXPERIENCE CHANGE?

25 A. The enhanced customer portal will provide customers with more detailed
26 energy usage information. At a minimum, customers will be able to see in the
27 portal their hourly intervals available the next day. This display of AMI-

1 enabled energy usage data will also be supplemented with new tools such as
2 disaggregated energy usage details and opt-in alerts and notifications that are
3 personalized to the customer's energy usage and billing preferences. These
4 initial enhancements to the customer portal will help empower customers with
5 better information about their energy usage and more tools to make decisions
6 that can help them control their energy usage. Over time, we expect to further
7 enhance the detail and quality of this data with new products and services and
8 more frequent updates to displayed data. Ultimately, the Company believes
9 that on-demand meter reads through the customer portal will be added.

10
11 Q. WHAT IS THE COMPANY DOING TO PREPARE FOR THE PORTAL
12 ENHANCEMENTS ON DAY 1?

13 A. We are currently conducting a full review of the look, feel, and organization of
14 the customer portal. Generally, we are exploring ways to streamline customer
15 use of the portal, to keep customers engaged, and present relevant
16 information more directly. We are also working to better align the mobile and
17 web experiences so that customers do not experience significantly different
18 interactions between the two. Company witness Mr. Harkness addresses this
19 in his Direct Testimony.

20
21 In summary, on Day 1, we expect to provide customers with a better portal
22 experience that displays more detailed information that is more relevant to
23 each customer, and keeps them more engaged and knowledgeable about their
24 energy usage. It will also allow customers to opt-in to new types of
25 notifications and communications.

26

1 b. Notifications and Communications

2 Q. WHAT ARE CUSTOMER EXPECTATIONS WITH RESPECT TO ENERGY USAGE
3 DATA?

4 A. As noted earlier, key findings from research efforts show that customers
5 expect that more energy usage data will allow them to better identify
6 opportunities and strategies to save energy and reduce their costs. Customers
7 also expect:

- 8 • to receive detailed information from their utility;
- 9 • that provision of information is personal and frequent; and
- 10 • that the Company will provide tools to help them use information to
11 make decisions about their energy usage.

12
13 Q. HOW DOES THE CURRENT SYSTEM LIMIT THE TRANSFER OF ENERGY USAGE
14 INFORMATION BETWEEN THE COMPANY AND THE CUSTOMER?

15 A. Our current distribution system and metering technology primarily allow for
16 one-way communication that can generally only provide customers with usage
17 information on a monthly basis through the Company's billing system.

18
19 Q. HOW DOES AGIS ENABLE ACCESS TO AND USE OF TIMELY ENERGY USAGE
20 DATA?

21 A. The AGIS components necessary to enable timely energy usage are ADMS (as
22 the foundational component necessary to enable advanced meter
23 applications), AMI, and the FAN. Implementation of AMI and FAN will
24 provide the real-time energy usage data and the foundation for new products
25 and services that will enable customers to use that data to make decisions
26 about their energy usage. The FAN, as the communication system for the
27 advanced grid, will allow for transmission of data both to and from the meter.

1 This data can be built into digital experience channels to provide customers
2 with more timely and accurate updates about their energy usage, thereby
3 providing the ability for customers to better manage their energy usage and
4 costs.

5
6 Q. WHAT ARE THE COMPANY'S PLANS WITH RESPECT TO THE CAPABILITIES OF
7 THE ADVANCED GRID TO SUPPORT NEW INFORMATION AND DATA?

8 A. As part of the Day 1 experience, the Company will provide customers with
9 more information about their energy usage. As discussed above, much of this
10 information will be provided through the enhanced customer portal as digital
11 experiences like the customer portal are the way customers increasingly
12 interact with data and information. Some ways that we will share this data and
13 information may include energy usage dashboards, energy usage alerts, and
14 advisory tools..

15
16 Q. PLEASE SUMMARIZE THE COMPANY'S VISION FOR DASHBOARDS, ALERTS, AND
17 ADVISORY TOOLS.

18 A. Dashboards will allow customers to customize the information that they see
19 when they access their account through the web or mobile device. Customers
20 will be able to see how devices use energy and what impact that has on their
21 consumption, how their energy trends over time, and how their energy
22 compares to external factors such as the weather. Dashboards can also
23 incorporate comparisons such as to aggregated customers, like our Home
24 Energy Reports do today, or to an individual customer's historic energy usage.
25 These dashboards will be an enhancement to the dashboard service the
26 Company currently offers, MyEnergy, by allowing for customization as well as
27 incorporating more detailed data made available through AMI.

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Alerts are a new function made available because of our ability to receive timely data through AMI and the FAN. Customers will be able to set thresholds for their usage or bills and the Company will proactively send alerts to customers when their energy usage is on track to exceed those thresholds. Alerts may also include helpful and personalized advice for customers to help them change their behavior before it's too late and they receive a unexpectedly high bill. Other types of alerts will focus on behavioral changes customers can make as we notify them of high peak energy usage days, such as a critical peak day. While these alerts may or may not have a financial incentive associated with them, providing customers with the information is likely to induce some type of behavioral change due to other intrinsic factors such as care for the environment.

Finally, advisory tools will analyze a customer's energy usage data and identify ways that customers can change their behavior or act to reduce their energy usage or more efficiently use energy. For example, one advisory tool may analyze a customer's energy usage relative to the costs associated with an advanced rate such as a time-of-use rate. The "advisor" may integrate with other products and services, such as disaggregation which is discussed below, to provide recommendations targeted towards specific appliances that the customer regularly uses. Alternatively, the advisor may suggest new rates or programs that help the customer manage their energy usage through price signals or direct control.

Provision of this data and enhanced communications with customers will not require additional filings for approval by the Commission. However, we will

1 keep the Commission and stakeholders informed of customer usage and
2 satisfaction with these new capabilities. I discuss our proposed AGIS metric
3 and reporting in Section VII.

4
5 *4. Energy Savings Programs*

6 Q. HOW WILL AGIS INVESTMENTS ENABLE OR ENHANCE NEW DEMAND-SIDE
7 MANAGEMENT (DSM) PROGRAMS?

8 A. The more detailed and timely data that our AGIS investments provide can
9 help enable or enhance programs in a number of ways. First, as we have more
10 information we can use that to update our program designs and marketing
11 tactics. We will have better insight into how and when customers use their
12 energy which will allow us to better market and segment our customers. This
13 means our communications will be more relevant as I discussed above. Just as
14 important will be new products and services that support our DSM goals.
15 These may include, Home Area Networks, Green Button Connect My Data,
16 and traditional energy efficiency, demand response, and demand management
17 programs.

18
19 Q. WHAT ARE THE COMPANY'S PLANS WITH RESPECT TO THE GREEN BUTTON
20 CONNECT AND HAN PRODUCTS?

21 A. Green Button Connect (GBC) and Home Area Network (HAN) functionality
22 are enabled by the advanced meter and are two products that may be included
23 in the Day 1 experience. GBC allows customers to share their energy usage
24 data seamlessly with their approved third-parties. This is an enhancement to
25 the existing system, Green Button Download, because it allows a customer to
26 share their data regularly with a third-party without needing to take proactive
27 action to share that data. For customers with third-party services that help

1 them manage their energy usage this will allow them to work with their chosen
2 third-party to more effectively manage their energy.

3
4 HANs vary in the benefits they provide and can be as simple as a dashboard
5 that communicates with the meter to provide real-time energy usage or more
6 complicated networks of devices that are receiving energy usage data from the
7 meter and adjusting operations based on that information.

8
9 Q. WHAT ARE THE COMPANY’S PLANS WITH RESPECT TO TRADITIONAL DSM
10 PROGRAMS?

11 A. We are developing multiple new programs for Day 1 deployment. These
12 include:

- 13 • virtual energy audits;
- 14 • whole facility monitoring and continuous commissioning; and
- 15 • Enhanced Saver’s Switch.

16
17 Virtual energy audits will provide customers reports of their energy usage
18 relative to a baseline or general customer comparison. This audit is similar to
19 the “Neighbor Comparison” that is provided with the Company’s “Home
20 Energy Reports” but because of new capabilities from AGIS – specifically
21 AMI and the FAN, we can provide this service more frequently for customers.
22 We can also rely on the more detailed data provided by service such as
23 disaggregation to provide more specific details on how their energy usage
24 compares to a baseline.

25
26 Whole facility monitoring programs will use the detailed data provided by
27 AMI to better integrate with energy management systems. This will allow

1 customers to get more timely and accurate feedback on how adjustments to
2 their business processes and energy management systems impact their energy
3 usage. For customers on certain types of advanced rates, this more timely and
4 accurate feedback can be critical to ensuring they don't have an unexpectedly
5 high bill or fail to meet energy curtailment requirements during demand
6 response events.

7
8 Finally, Enhanced Saver's Switch is an upgrade to the existing Saver's Switch
9 technology that allows for two-way communication between the Company
10 and the Saver's Switch. This two-way communication utilizes the FAN to
11 more reliably send signals to the switch and the switch can then send a signal
12 back indicating it is active and receiving messages. This will result in more
13 accurate forecasts or demand response savings and can enabled improved
14 maintenance of the switch system to focus on disabled or broken switches
15 first. While this program may not have a direct impact on customers like an
16 audit or monitoring program may, the improvement in switch responsiveness
17 will have indirect benefits because we can more accurately forecast the
18 resources we need to require helping avoid high cost peak generation.

19
20 **C. Near Term**

21 *1. Overview*

22 Q. PLEASE SUMMARIZE THE COMPANY'S VISION FOR THE NEAR TERM CUSTOMER
23 EXPERIENCE.

24 A. As defined above, the near term encompasses the period through 2025.
25 During this time, we plan to:

- 26 • Continue innovating on existing products and services;
- 27 • Begin offering new advanced rate designs;

- 1 • Expand the capabilities of the advanced meter to utilize the Distributed
2 Intelligence platform discussed earlier in my testimony; and
- 3 • Better integrate DERs on the system.

4
5 Continual innovation has long been a core requirement of our customer
6 programs; however, with the rapid pace of technology advancements –
7 including Distributed Intelligence – and the increasing amount and
8 sophistication of data we have it will become more important. We will need
9 to reconsider the ways our customers interact, what the most effective way to
10 interact with them is, and how to use the data we must most cost-effectively
11 offer products and services. I will discuss the other plans in more detail
12 below.

13
14 2. *Advanced Rate Designs and Billing Options*

15 Q. WHAT ARE THE COMPANY'S PLANS WITH RESPECT TO THE CAPABILITIES OF
16 THE ADVANCED GRID TO SUPPORT ADVANCED RATE DESIGNS?

17 A. The Company generally supports advanced rate designs, such as a TOU rates,
18 because advanced rate designs can help customers manage their energy usage
19 and environmental impacts. As our customer research has shown, managing
20 costs and minimizing environmental impacts are important factors in
21 customer satisfaction.

22
23 We have long experience with time-of-use and other advanced rate designs in
24 Minnesota and across our other service territories. However, beginning in
25 April 2020, we will pilot a new time-of-use rate with residential customers in
26 two areas in the Twin Cities metropolitan area. This pilot will provide us with
27 an opportunity to better understand how customer react to a four-part rate

1 (off peak, two shoulder peaks, and an on-peak period) as well as test tools and
2 resources that may help customers adjust their energy usage to keep their bills
3 low and better control their energy costs. The learnings from this pilot, with
4 respect to both the rate and new products and services, will help inform our
5 plans for advanced rates in the future. In addition, the Company is proposing
6 a new time-of-use rate for the commercial and industrial customers served
7 under the current General Time-of-Day tariff. Implementation of this
8 General TOU rate will require the installation of AMI meters. Company
9 witness Mr. Lon M. Huber provides details on this proposed rate in his
10 testimony.

11
12 Q. WHAT OTHER TYPES OF ADVANCED RATE DESIGNS OR BILLING OPTIONS
13 MIGHT BE ENABLED BY THE AGIS INVESTMENT?

14 A. One billing option the Company is investigating is the option for customers to
15 “pre-pay.” A pre-pay system allows a customer to purchase a set amount of
16 energy each month which can help customers manage within a budget.
17 Because our investments in AMI and the FAN will provide more detailed and
18 timely energy usage information a customer can monitor their usage towards
19 the “pre-pay” amount regularly. Similarly, the Company can track the usage,
20 relative to the budget, and send the customer regular notifications about their
21 energy usage balance and ways to reduce their reduce to remain on the budget.

22
23 Other advanced rate designs may include critical peak pricing or technology
24 specific rates. Critical peak pricing can be used to signal when energy prices
25 are extremely high – for example, on a hot summer day. During these periods
26 the energy price may increase significantly, and the price signal sent to
27 customers would encourage them to shift their energy usage to a non-peak

1 period or pay a higher price. There are a variety of peak demand rate design
2 structures the Company may explore, such as peak time rebates. Similarly,
3 technology specific rates may encourage customers to not use certain end-uses
4 during periods of the day when demand is higher. For example, an EV TOU
5 rate may encourage customers to charge electric vehicles off peak but may also
6 include incentives or signals for customers to not charge at the same time.
7 Investments in the FAN and AMI will allows us to send and receive the data
8 we need in order to manage these types of rates and provide customers with
9 detailed information about how to respond to these signals.

10
11 Q. WHAT ARE THE COMPANY'S PLANS RELATED TO THE CAPABILITIES OF THE
12 ADVANCED GRID TO SUPPORT REMOTE CONNECTION AND DISCONNECTION
13 SERVICES?

14 A. As I noted above, the advanced grid enables remote connection and
15 disconnection capabilities. There are both customer benefits and costs savings
16 related to these capabilities. However, any changes to our provision of these
17 services to customers will require filings with the Commission for approval.
18 These proceedings will allow for full review of the proposed services by the
19 Commission and stakeholders. Mr. Cardenas addresses remote connection
20 and disconnection and the necessary future filings in his testimony.

21
22 *3. Distributed Intelligence*

23 Q. PLEASE SUMMARIZE THE DISTRIBUTED INTELLIGENCE PLATFORM.

24 A. Distributed Intelligence refers to the Linux-based operating system built
25 directly into the meter. This operating system provides the meter with the
26 ability to conduct localized computing, analysis, and data processing. This
27 work is done through applications that are installed by Xcel Energy on the

1 meter. These applications may be customer-facing, meaning the customer
2 directly interacts with them, or grid-facing – meaning, Xcel Energy interacts
3 with the applications. Ms. Bloch discusses the technology behind the DI
4 platform further in her Direct Testimony.

5
6 Q. WHAT ARE SOME OF THE FUNCTIONALITIES OR APPLICATIONS THAT HAVE
7 BEEN ENVISIONED FOR THE DI PLATFORM?

8 A. We are actively considering a number of potential applications such as:

- 9 • Virtual Submetering – this application meters an end-use technology,
10 such as an EV, in lieu of a physical submeter installation. This virtual
11 metering reduces costs and can allow for submetered technologies to be
12 billed on a different rate than the primary meter.
- 13 • Smart Feeder Restoration – when there is insufficient capacity to
14 immediately restore all of the service to a feeder this application will
15 sequentially restore power to critical loads (*e.g.* a hospital or fire station)
16 first.
- 17 • Power Quality Analysis – this application can provide a regular or on-
18 demand analysis of the quality of the power coming into a premise and
19 on-site. If anomalies in the quality are detected it can advise the
20 customer on next steps to address the potential anomalies.
- 21 • Green Notifications – this application may alert customers about the
22 status of carbon free electricity on the system. This type of notification,
23 relying on system data, would encourage customers to shift their energy
24 usage during these periods to reduce their carbon footprint.

25
26 Because the Distributed Intelligence platform is a newer technology, we
27 continue to research and collaborate with our vendor partner we expect to

1 identify additional use cases and applications for use with the DI platform. We
2 also expect to have robust engagement with other third-parties to develop
3 additional use cases.

4
5 Q. HOW WILL APPLICATIONS FOR THE DI PLATFORM BE DEPLOYED?

6 A. Application deployment will be managed by Xcel energy in order to ensure
7 that all applications meet our strict cybersecurity and technical requirements.
8 Because these applications are installed directly on the meter there is serious
9 risk to allowing open access to the meter. However, we are committed to
10 offering a broad suite of applications that offer customer and grid benefits.
11 How these applications are made available will vary as some may be offered as
12 standalone products while others are offering as a package with participation
13 in other programs. Grid facing applications will not be made available to
14 customers but instead managed internally by Xcel Energy departments that
15 need the functionality they provide for grid management.

16
17 *4. DER Integration*

18 Q. WHAT IS THE COMPANY'S CURRENT EXPERIENCE WITH THE INTEGRATION OF
19 DERs?

20 A. Today, we interface with all types of DERs – DSM, EVs, solar, and batteries.
21 In some cases, we have over 20 years of experience managing DERs on our
22 system and have developed effective policies to ensure DERs provide
23 customer and grid benefits without impacting safety and reliability. Without
24 quality, granular data, we must manage the integration of DER conservatively.
25 Access to more granular data will result in a more accurate analyses of DER
26 impacts and a more refined approach to DER integration.

27

1 Q. HOW WILL THE AGIS INVESTMENTS IMPROVE THE COMPANY'S ABILITY TO
2 INTEGRATE DERs?

3 A. AGIS investments will allow us to better understand the grid and impacts that
4 DERs have to it. With this information we can conduct more accurate
5 analyses of the impacts of DERs and track the impacts in near real time. This
6 will allow us to integrate more DERs and in the future manage DERs in a
7 collaborative way to ensure we maximize their benefit to the system. AGIS
8 investments that are critical to this are the ADMS platform and AMI. In the
9 future DERMS may also help integrate and manage DERs more efficiently.

10

11 Q. WHAT BENEFITS WILL DER INTEGRATION HAVE FOR CUSTOMERS?

12 A. In addition to better system management which will yield lower operating
13 costs we also expect that we will be able to accommodate more DERs on the
14 system providing customers with more access to new technologies that have
15 environmental, energy saving, and customer satisfaction benefits. With our
16 commitment to a 100 percent carbon free future we fully realize the value that
17 DERs can provide to meeting this ambitious goal and we can only meet this
18 goal by maximizing the value that all potential resources can provide. Ms.
19 Bloch discussed DER integration, including our plans for EVs, further in her
20 Direct Testimony.

21

22 **D. Long Term**

23 Q. PLEASE DESCRIBE THE CUSTOMER EXPERIENCE DURING THE LONGER TERM
24 PERIOD (THROUGH 2030).

25 A. We cannot definitively say what will happen during this period because of the
26 unknowns with technological advancement and how customer expectations
27 will change. However, at this time we envision a transformation in how we do

1 business with our customers. This will be punctuated by more sophisticated
2 products and services that begin to integrate multiple customer systems into
3 broader grid management. This aggregation of systems will allow for more
4 flexibility in grid management.

5
6 We will work with our customers to become an orchestrator of the grid
7 helping individuals and communities achieve broad energy goals. This
8 orchestration role will relieve the customer of much of the burden of
9 management around their energy goals. Xcel Energy will understand, in
10 greater detail, our customers' expectations and goals and will work with third-
11 parties to achieve those goals with minimal effort from customers.

12
13 Q. WHAT IS THE ROLE THAT THE AGIS INVESTMENTS WILL PLAY IN SUPPORTING
14 CHANGES TO THE CUSTOMER EXPERIENCE DURING THIS PERIOD?

15 A. ADMS, the FAN, and AMI provide the foundational tools we need to help
16 manage the grid and integrate increasing levels of DERs on the system. As
17 new applications in ADMS and the DI platform are introduced we can more
18 efficiently manage the grid because the computing power is more local thereby
19 reducing the response time to a system need. The functional ability of our
20 AGIS components to process information more quickly, more reliably, and
21 more accurately will support not only support these customer experience
22 investments but remain capable of supporting investments over the long term.

23
24 In the future, additional AGIS investments may be necessary to further the
25 integration of more DER as customers introduce more electric end-use
26 technologies (EVs, electrically heated homes, and other DERs) to the grid.
27 One such investment may be in the aforementioned DERMS.

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Q. WHAT DO YOU BELIEVE WILL BE THE OUTCOME IF THE COMPANY DOES NOT MAKE INVESTMENTS IN ADVANCED GRID CAPABILITIES?

A. Without advanced grid capabilities, the Company’s ability to meet evolving customer expectations will be limited. Although we have and will continue to strive to provide the services and information our customers expect, our current system technology does not support two-way communications, or the granular energy usage data that will enable the Company to roll out advanced rates, and realize the energy and cost savings they can provide.

Q. OVERALL, CAN YOU SUMMARIZE WHAT WILL BE DIFFERENT FOR CUSTOMERS UPON IMPLEMENTATION OF AGIS?

A. Upon the implementation of AGIS, customers will begin to see benefits in reduced outage times and new products and services to help control their energy usage. With reduced outage times will also come the ability to better inform customers about the status of their outage. Not knowing why you’re out and when you will be restored is frustrating for customers. With the investments in AGIS we’ll be able to provide customers with more accurate timelines for restoration keeping them better informed about their status. We’ll also be able to proactively identify and restore customers rather than wait for a customer to contact us as our current technology requires.

With new products and services, we’ll be able to offer customers a range of new ways to control their energy usage. Advanced rate designs, such as time-of-use, critical peak, and technology specific rates will be possible without additional metering. We will also be able to use the more detailed data provided by the customer’s meter to personalize the recommendations and

1 information we provide them. This will help customers make more informed
2 decisions about what steps to take rather than rely on general energy efficiency
3 recommendations that we provide today and may not always be actionable or
4 insightful to an individual.

5
6 Over time, we'll also be able to use our advancements in AGIS to better align
7 programs and use the Distributed Intelligence platform to provide new,
8 seamless interactions. Better alignment and new ways of engaging customers
9 can keep them more involved in their energy usage and give them more
10 control in ways – such as a mobile devices – that are increasingly prioritized.

11
12 Even with uncertainty around the long-term future customer experience, the
13 Company remains committed to understanding customers' preferences and
14 considerations regarding the benefits and value of advanced grid investment as
15 technologies evolve and new technologies become available over time. Our
16 investments in how we understand and work with our customers, combined
17 with the foundational investments in the grid through our AGIS initiative, will
18 provide us with the resources we need to adapt quickly to changes in
19 technology and customer expectations.

20
21 **E. Customer and Community Outreach**

22 Q. HAS THE COMPANY DEVELOPED A DETAILED PLAN FOR CUSTOMER AND
23 COMMUNITY OUTREACH RELATED TO AGIS IMPLEMENTATION?

24 A. Yes. The Company has developed a detailed Customer Education and
25 Communication Plan (Communication Plan), which is provided as
26 Exhibit___(MCG-1), Schedule 8. This plan details the communications

1 strategies, messages, and tactics to be executed in three phases to match the
2 customer's experience as we implement advanced grid capabilities.

3
4 Q. HOW WAS THE EDUCATION PLAN DEVELOPED?

5 A. We developed our Communication Plan based on (1) the Company's
6 experience with advanced meter pilots and advanced grid technology
7 initiatives for NSPM as well as other Xcel Energy operating companies; (2)
8 examination of communication and outreach best practices among other
9 utilities with advanced grid and advanced meter deployment experience; and
10 (3) customer research efforts.

11
12 Q. WHAT SPECIFIC RESEARCH DID THE COMPANY CONDUCT TO DEVELOP ITS
13 AGIS OUTREACH STRATEGY?

14 A. Xcel Energy has conducted qualitative customer research through focus
15 groups in Minnesota and throughout the service territory of its other
16 operating companies. The results of this research have informed message
17 development and the strategic updates to this plan. Objectives of this
18 research included exploring customers' understanding of advanced meters,
19 perceived benefits and drawbacks of advanced meters, both positive and
20 negative expectations about moving to advanced meters, what barriers may
21 arise and how to address them, and customer preferences for information and
22 communication methods.

23
24 Q. WHAT ARE THE KEY LESSONS LEARNED, BEST PRACTICES, AND TAKEAWAYS
25 FROM THE CUSTOMER RESEARCH EFFORTS?

1 A. The lessons learned, best practices, and results of our customer research
2 efforts are outlined in the Communication Plan. Key takeaways that we have
3 considered in the development of our AGIS outreach strategy include:

- 4 • Customers want to hear from Xcel Energy about the transition to the
5 new meters at least two or three months in advance of installation via a
6 multi-channel approach.
- 7 • Customers believe the new meters could help them save money by
8 providing more detailed usage information, which they perceive as
9 empowering.
- 10 • The potential cost of the new meters is the top barrier that Xcel Energy
11 needs to address.

12
13 I note that our research also shows that customers better understand the term
14 “smart meter” as opposed to “advanced meter” or “AMI.” We therefore used
15 “smart meter” in our customer education planning to make the information
16 more accessible, whereas “AMI” is used throughout our AGIS discussions
17 because it is the more correct technical and industry term.

18
19 Q. PLEASE OUTLINE THE COMPANY’S EDUCATION PLAN.

20 A. Our comprehensive Communication Plan provides the strategies, messaging,
21 and tactics that will be executed in three phases to match the customer
22 journey as we move through AMI meter installation and implementation of
23 advanced grid capabilities. While the Communication Plan focuses primarily
24 on the customer experience, the plan also details our efforts with respect to
25 other key audiences that will help support customer awareness, understanding,
26 and engagement through this transition. These audiences include: (1)
27 community leaders and elected officials; (2) our Customer Care agents; and (3)

1 all Company employees. Our plan also identifies how we will communicate
2 with different customer groups, and details any communications
3 considerations relative to specific customer segments, such as low-income or
4 non-English speaking customers.

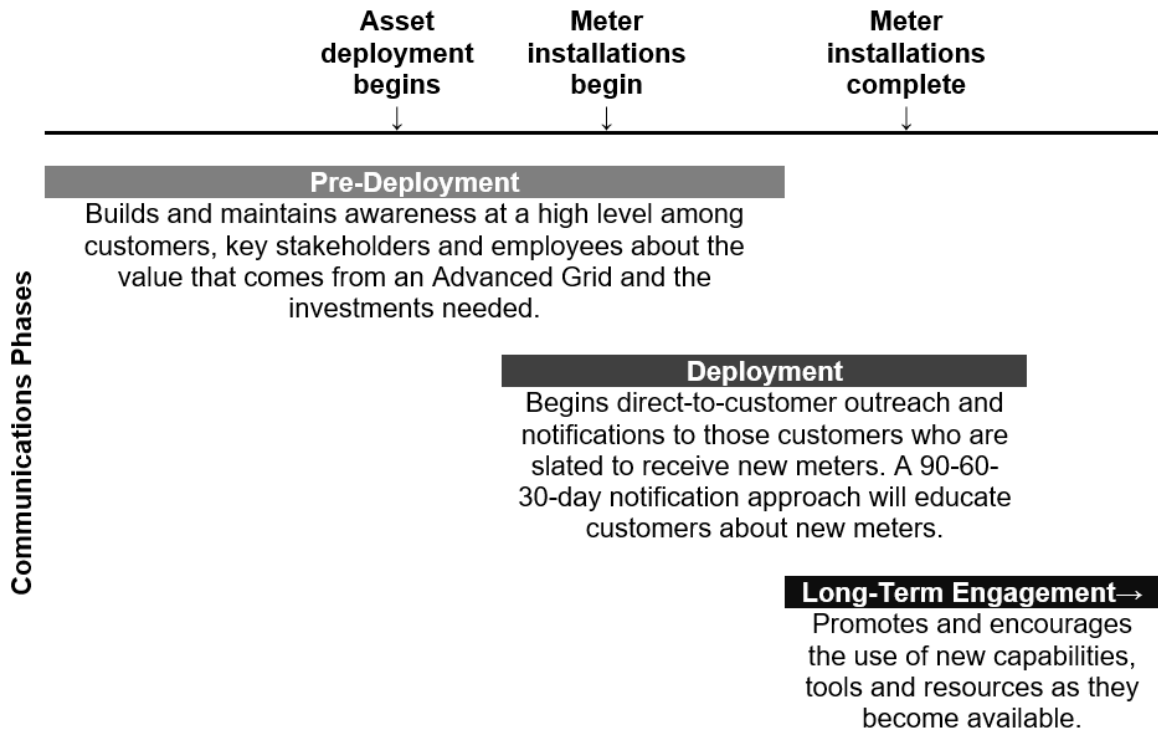
5
6 The overall goals of the plan are to:

- 7 • Ensure a smooth, integrated experience for all customers;
- 8 • Provide customers with relevant, up-to-date, practical information
9 about new meters and programs through multiple channels; and
- 10 • Minimize confusion through proactive, multi-channel communications.

11
12 Our phased approach will coincide with meter deployment and advance grid
13 capabilities as they are phased in over the next five years.

14

Figure 1



1. *Pre-Deployment Phase*

Q. PLEASE DESCRIBE THE PRE-DEPLOYMENT PHASE OF THE COMPANY'S EDUCATION PLAN.

A. The pre-deployment phase focuses on building and maintaining awareness of advanced grid capabilities at a high level among customers, key stakeholders, and employees. This will include communication and education about the value that comes from an advanced grid and the investments needed. Advanced grid will be presented as one of the Company's platforms for bringing innovative technological solutions to enhance the customer experience. The pre-deployment phase is designed to set the stage for meter installation, and will in late 2020, before AMI installations will begin, and continuing through mid-2023 in order to maintain awareness.

1 Q. WHAT ARE THE KEY OBJECTIVES DURING PRE-DEPLOYMENT?

2 A. Key objectives during this phase include:

- 3 • Create customer and stakeholder awareness about the overall benefits
4 of the advanced grid;
- 5 • Explain why we are making this investment, focusing on tangible
6 customer benefits;
- 7 • Educate and train employees to equip them with tools and resources
8 necessary to engage with customers and stakeholders;
- 9 • Build customer interest in the change by explaining the benefits of
10 advanced meters and the tools and options they enable; and
- 11 • Proactively address customer concerns and questions.

12

13 Q. WHAT ARE THE COMPANY'S SPECIFIC PLANS FOR COMMUNICATIONS AND
14 EDUCATION EFFORTS RELATED TO ADVANCED GRID AWARENESS?

15 A. The Company has developed an integrated, expansive, and multi-channel
16 approach to build awareness of advanced grid capabilities and to set the stage
17 for AMI meter installations. We will build awareness by leveraging a variety to
18 channels in order to reach as many customers as possible. Channels include
19 XcelEnergy.com, social media, traditional media outreach, mass advertising,
20 and community events. The attached Education Plan provides the details of
21 the messages, communication channels, and materials that are being
22 developed for each of the four key audiences.

23

1 2. *Deployment Phase*

2 Q. PLEASE DESCRIBE THE COMPANY’S EDUCATION PLAN DURING THE
3 DEPLOYMENT PHASE.

4 A. The deployment phase focuses on education related to AMI meter installation.
5 During this phase, we will begin direct-to-customer outreach and notifications
6 to those customers who are slated to receive new meters. A 90-60-30-day
7 notification approach will educate target audiences on the new meters, how
8 they will be deployed and installed, and their benefits. While messaging and
9 content will focus on meter installation, all communications will speak to the
10 broader value and benefits of the advanced grid. This phase will also set the
11 stage for the communications plan over the longer term by collecting
12 customer information and preferences that can be used as new capabilities are
13 enabled and to create deeper long-term customer relationships.

14
15 Q. WHAT ARE THE KEY OBJECTIVES OF THE DEPLOYMENT PHASE?

16 A. Key objectives during this phase include:

- 17 • Provide practical and timely information and notifications about the
18 deployment, installation, and opt-out processes;
- 19 • Provide clear information on the opt-out process and associated costs,
20 including how to take action;
- 21 • Leverage a messaging hierarchy to reiterate high-level benefits of
22 advanced metering; and
- 23 • Further develop tools and resources for employees to use during
24 proactive discussions with customers and stakeholders.

25
26 Q. WHAT ARE THE COMPANY’S SPECIFIC PLANS FOR COMMUNICATIONS AND
27 EDUCATION EFFORTS RELATED TO METER INSTALLATIONS?

1 A. Communication efforts during this phase will provide practical, specific
2 information to customers about meter deployment. Customers will receive
3 notifications about their new meters 90 days, 60 days, and 30 days prior to
4 meter installation through various channels to ensure all customers receive
5 adequate notification. Where possible, materials will be personalized with the
6 most relevant and up-to-date deployment information. The communications
7 plan also provides for a phone call seven days before installation, and a follow-
8 up communication after installation. The attached Education Plan provides
9 the details related to timing and methods for the installation notifications, and
10 the details of the messages, communication channels, and materials that are
11 being developed for each of the four key audiences. The Education Plan also
12 includes sample materials for meter installation communications.

13
14 Q. HOW WILL THE EDUCATION PLAN INCORPORATE DETAILS WITH RESPECT TO
15 CUSTOMER INTERACTIONS WITH THE METER INSTALLATION VENDOR?

16 A. The Company and the meter installation vendor will work together to provide
17 coordinated support and address all customer inquiries and any issues that
18 may arise. The meter installation vendor will be a key point of contact for the
19 Company's customers during the meter installation process and will have a
20 dedicated call center phone number for Xcel Energy's customers. Mr.
21 Cardenas provides additional detail in his testimony. We will work closely
22 with Customer Care to ensure the communications and materials we will
23 provide to customers prior to and during the installation will include clear
24 directions and contact information so any questions or issues will be resolved
25 as quickly as possible.

26

1 Q. ALTHOUGH AMI TECHNOLOGY AND ADVANCED GRID CAPABILITIES WILL
2 ENABLE THE NEW AND ENHANCED PRODUCTS AND SERVICES FOR CUSTOMERS,
3 WILL CUSTOMERS BE ABLE TO OPT OUT OF RECEIVING AN ADVANCED METER?

4 A. Yes. The Company believes that customer should have the choice to opt-out
5 of receiving an advanced meter. However, the Company can provide the
6 greatest benefits for our customers by deploying advanced meters consistently
7 across our service territory. The Company will provide information on the
8 benefits enabled by advanced metering while also providing clear information
9 on the opportunity to decline the installation of an advanced meter or have an
10 advanced meter removed at any time.

11

12 Q. HAS THE COMPANY DEVELOPED A FRAMEWORK FOR CUSTOMER OPT-OUTS?

13 A. Yes. We have developed a framework under which a customer may opt-out
14 of advanced meter installation. In his testimony, Mr. Cardenas details the opt-
15 out framework that the Company will propose in a separate filing submitted to
16 the Commission. Once the opt-out provisions are finalized and approved by
17 the Commission, we will ensure the process details, costs, tariff sheets, and
18 any other necessary information and materials are incorporated into our
19 customer communications plan.

20

21 Q. GIVEN THE BENEFITS OF AMI, HOW DOES THE COMPANY PROPOSE TO
22 MINIMIZE THE POTENTIAL FOR CUSTOMER OPT-OUTS FOR ADVANCED METERS?

23 A. It is important to have a concentration of advanced meters to achieve the
24 benefits of better identifying outage locations and of making time-of-use or
25 other conservation-incentive rates widely available. It is also necessary to
26 broadly deploy advanced meters to capture the benefits of reduced home visits
27 and fewer meter reading costs. The Company's customer education and

1 awareness campaign is designed to address many of the questions or concerns
2 that customers have with advanced meters including privacy and safety.
3 Communications will also discuss the benefits that an advanced meter
4 provides including opportunities to reduce energy costs and improve their
5 environmental impact. Customer care representatives will also be trained to
6 address customer questions and concerns. The Company believes the most
7 effective way to reduce the potential for customer opt-outs is to provide
8 proactive, informative education to ensure customer questions and concerns
9 are fully understood and addressed by the Company.

10
11 Q. WILL CUSTOMERS BE ABLE TO OPT OUT OF TARGETED MARKETING THAT MAY
12 BE ENABLED BY THE ADVANCED GRID TECHNOLOGIES?

13 A. Yes. With advanced metering technology, the Company will be able to
14 provide customers with enhanced energy usage data, including interval data,
15 and will have the ability to disaggregate some end-use technologies from the
16 customer's total energy usage. This information can be used to better market
17 products and services that save money to customers and to improve a
18 customer's awareness of their energy usage. However, we recognize that some
19 customers may not want to receive targeted marketing, and the Company will
20 provide customers the choice to opt-out of receiving this information. This
21 option is similar to a customer's choice to opt-out of the Company's current
22 Home Energy Report or to select how they receive notifications today. In the
23 future, the Company expects to be able to provide customers more choice
24 around how they receive communications to better reflect their preferences.

25

1 3. *Long Term Engagement Phase*

2 Q. PLEASE DESCRIBE THE COMPANY'S EDUCATION PLAN OVER THE LONGER
3 TERM.

4 A. After AMI deployment, will promote and encourage the use of new advanced
5 grid capabilities, tools, and resources as they become available.
6 Communications will not only highlight the features of new tools and
7 resources, but the broader benefits they can provide, such as:

- 8 • *Economic benefits:* With more information on energy consumption and
9 more choices about how and when they use energy via possible future
10 rate options, consumers may be able to save money as a result of
11 advanced grid-enabled programs and technologies.
- 12 • *Environmental benefits:* The advanced grid enables the incorporation of
13 greater amounts of renewable generation, gives customers more
14 opportunities to make more environmentally conscious choices, and
15 can also reduce the need to rely on fossil fuel generation.
- 16 • *Reliability benefits:* Grid-side intelligence offered by advanced grid
17 technology can reduce the frequency and duration of outages while
18 providing better information for customers when outages do occur.

19
20 This phase will also leverage customer information and preferences gathered
21 during the deployment phase to provide a seamless experience for all
22 customers via their preferred channels.

23
24 Q. WHAT ARE THE KEY OBJECTIVES OF POST-DEPLOYMENT CUSTOMER
25 COMMUNICATIONS?

26 A. Key objectives during this phase include:

- 1 • Educate customers on new capabilities, tools, and resources as they
- 2 become available.
- 3 • Develop and execute a customer campaign to follow the customer
- 4 journey and encourage adoption of new capabilities, tools and
- 5 resources.
- 6 • Leverage a messaging hierarchy to reiterate high-level benefits of the
- 7 advanced grid and advanced metering.
- 8 • Evaluate and refine messages and tactics to continuously improve and
- 9 ensure the best possible customer experience.

10
11 Q. WHAT ARE THE COMPANY'S SPECIFIC PLANS FOR COMMUNICATIONS AND
12 EDUCATION EFFORTS RELATED CUSTOMER ENGAGEMENT IN ADVANCED GRID
13 CAPABILITIES?

14 A. A multi-channel approach will reach customers via their preferred channels
15 and include tailored messages to move them along in the engagement journey.
16 The attached Education Plan provides the details of the messages,
17 communication channels, and materials that are being developed for each of
18 the four key audiences. In addition, I note that we will also develop the
19 necessary materials and communications plans for any advanced rate design or
20 service offerings that will be enabled by advanced grid capabilities. As
21 discussed above, such offerings – such as a full residential time of use rate –
22 will go through an approval process at the Commission and may involve a
23 stakeholder engagement process to inform development.

24
25 4. *Customized Communications*

26 Q. WHAT ARE THE COMPANY'S PLANS FOR CUSTOMIZED COMMUNICATIONS FOR
27 FIXED AND LOW-INCOME CUSTOMERS?

1 A. Customized communications will recognize and proactively address cost
2 concerns among low-income households, seniors, and vulnerable customer
3 populations. We will engage community leaders, influencers, and
4 representatives of these communities in the development and deployment of
5 our educational efforts. Messages will address how customers on fixed or
6 limited budgets can take advantage of personal energy use information that
7 may allow them to better manage their energy costs. Outreach will also focus
8 on increasing these customers' participation rates in energy efficiency and
9 conservation programs, and cross-marketing the state's energy assistance
10 programs. Communication and education materials that could be customized
11 for this segment of customers may include:

- 12 • FAQs and fact sheets to address specific concerns and needs.
- 13 • Talking points and scheduled briefings with consumer advocacy groups
14 and nonprofit groups who serve these populations.
- 15 • Customized presentations for community relations staff to share with
16 their community leaders.
- 17 • Outreach to organizations serving seniors, low-income, and other
18 vulnerable customer segments, with an emphasis on providing ready-to-
19 use materials that can be distributed via their communication channels,
20 online resources, events, meetings, and social media platforms.

21
22 Q. WHAT ARE THE COMPANY'S PLANS FOR CUSTOMIZED COMMUNICATIONS FOR
23 NON-ENGLISH SPEAKING CUSTOMERS?

24 A. According the U.S. Census Bureau's American Community Survey (ACS), in
25 2017, 11.3 percent of Minnesotans spoke a language other than English at
26 home. After English, the most common language spoken at home is Spanish,

1 with close to 200,000 speakers.³⁹ As such, the Company's website
2 (xcelenergy.com) will include material related to the advanced grid in Spanish.

3
4 Q. WHAT ARE THE COMPANY'S PLANS FOR CUSTOMIZED COMMUNICATIONS FOR
5 CUSTOMERS WITH LIFE-SUPPORTING EQUIPMENT?

6 A. Prior to any direct communication regarding meter installation, the Customer
7 Contact Center will proactively reach out to customers who rely on life-
8 supporting equipment in their homes. These customers will have the option
9 to opt out of the new meter, or make an installation appointment and have a
10 bridge installed to avoid a service interruption.

11
12 Q. WHAT ARE THE COMPANY'S PLANS TO ENSURE COMMUNICATIONS ARE
13 ACCESSIBLE FOR ALL CUSTOMERS?

14 A. The Company has a number of options in place to assist customers and
15 ensure accessibility for all.

- 16 • Deaf or hearing-impaired customers can dial 711 to be connected with
17 the state transfer relay service. This service allows callers to
18 communicate with text-telephone (TTY) users. This service is available
19 24/7 and is confidential.
- 20 • The company's Contact Center can make outbound calls using TTY
21 technology.
- 22 • Any residential customer may request a large print bill statement.
- 23 • Customer emails and our website and online tools are continually
24 reviewed, and we make improvements to ensure accessibility.

25

³⁹ U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates,
https://factfinder.census.gov/bkmk/table/1.0/en/ACS/17_5YR/B16001/0400000US27.

1 Q. WHAT ARE THE COMPANY'S PLANS FOR COMMUNICATION AND EDUCATION
2 EFFORTS FOR COMMERCIAL AND INDUSTRIAL (C&I) CUSTOMERS?

3 A. We expect our broad awareness communications will be applicable to small
4 C&I customers as well, but we will also provide customized 90, 60, and 30-day
5 meter install notifications for those customers. The content of these
6 communications will vary depending on the customer's current tariff to ensure
7 they receive the most relevant information. The Company has dedicated
8 account managers for large C&I customers, who will help ensure a smooth
9 experience before, during, and after meter installation.

10

11 Q. WHAT ARE THE COMPANY'S PLANS TO ENSURE CUSTOMERS ARE INFORMED OF
12 THEIR CHOICES RELATIVE TO OPTING-OUT OF ADVANCED METER
13 INSTALLATION?

14 A. As I discussed earlier, the Company believes customers should have the
15 choice to opt-out of receiving an advanced meter. To that end, our
16 communications and education materials will clearly inform customers of the
17 opt-out process, the associated costs, and how to take action. The Company
18 will clearly provide customers with the opportunity to decline the installation
19 of an advanced meter or have an advanced meter removed at any time.

20

21 As also noted earlier, we have developed a framework under which a customer
22 may opt-out of advanced meter installation; however, we are not seeking
23 approval of specific opt-out provisions at this time. Mr. Cardenas discusses
24 the opt-out framework in his testimony. We will work with Customer Care as
25 these opt-out provisions and options are finalized to develop the
26 communication channels and materials to clearly present these options to
27 customers.

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Q. HOW DOES THE COMPANY PROPOSE TO MINIMIZE THE POTENTIAL FOR CUSTOMER OPT-OUTS FOR ADVANCED METERS?

A. As discussed throughout my testimony, the Company can provide the greatest benefits for our customers by deploying advanced meters consistently across our service territory, thus it is in our customers' interests for us to minimize opt-outs for advanced meter installation. Our Education Plan is designed to address many of the questions or concerns that customers have with advanced meters, including privacy and safety. Communications will also discuss the benefits that an advanced meter provides, including opportunities to reduce energy costs and improve their environmental impact. Customer Care representatives will also be trained to address customer questions and concerns. The Company believes the most effective way to reduce the potential for customer opt-outs is to provide proactive, informative, and meaningful education to ensure customer questions and concerns are fully understood and addressed by the Company.

Q. HOW WILL THE COMPANY DETERMINE WHETHER THE CUSTOMER COMMUNICATION EFFORTS HAVE BEEN SUCCESSFUL?

A. In Section VIII below, I discuss our proposed progress metrics, which will be based on operational metrics as well as customer surveys. I also discuss how we will report the information on our customer communications and education efforts.

Q. ARE THE COSTS RELATED TO EXECUTION OF THE EDUCATION PLAN INCLUDED IN THIS CASE?

1 A. Yes. The costs related to the AGIS Education Plan total approximately \$6.3
2 million over the implementation timeline discussed above. These costs are
3 included in the overall AGIS program management budget in Distribution
4 Operations, as presented in Ms. Bloch's testimony. I also discuss the
5 development of program management cost forecasts in Section V.D.2.

6
7 **VII. PRUDENCE OF THE AGIS INVESTMENTS**
8

9 Q. WHAT INFORMATION DO YOU PROVIDE IN THIS SECTION OF YOUR
10 TESTIMONY?

11 A. In this section I provide an overview and summarize the results of the
12 Company's analyses of the quantitative and qualitative cost and benefits of the
13 various components of the AGIS initiative, as well as of the consolidated
14 program. I also discuss the purpose and limitations of a strictly quantitative
15 cost-benefit analysis and present the qualitative benefits of AGIS
16 implementation that should also be considered. Company witness Dr.
17 Duggirala provides a detailed discussion of the Company's cost-benefit
18 analyses in his Direct Testimony, both with respect to the Company's cost-
19 benefit model and least-cost/best fit analyses.

20
21 **A. The Company's Cost Benefit Analysis**

22 *1. Overview of AGIS Cost-Benefit Analysis*

23 Q. DID THE COMPANY UNDERTAKE A COST-BENEFIT ANALYSIS TO ASSESS THE
24 QUANTITATIVE COSTS AND BENEFITS OF THE AGIS INITIATIVE?

25 A. Yes. The Company conducted separate detailed cost-benefit analyses (CBAs)
26 for each of the following components of the AGIS initiative: AMI, FLISR,
27 and IVVO, with costs of the FAN (which is a supporting component that

1 does not provide standalone measurable benefits) incorporated into each
2 analysis of the other components. The Company provides resulting benefit-
3 to-cost ratios for each of these components individually, as well as a total
4 AGIS CBA, both with and without contingency amounts. While the
5 Company expects to use some component of the contingency amounts, by
6 definition the total amount of contingency the Company will use is not fully
7 predictable at this time. Therefore, we show totals with and without
8 contingency to illustrate the outer boundaries of benefit-to-cost ratio ranges.

9
10 Q. WHAT IS THE PURPOSE OF THE CBA?

11 A. A CBA is one tool to evaluate potential quantifiable costs and benefits of the
12 core AGIS components, including AMI, FLISR, and IVVO, and supporting
13 FAN costs. It can capture most costs (which are in themselves quantifiable),
14 but only compares quantifiable projected benefits, such as O&M and capital
15 expenditures savings and known quantifiable societal benefits.

16
17 Q. DOES THE COMPANY RELY PRIMARILY OR EXCLUSIVELY ON CBAS TO
18 APPROVE OR REJECT PROJECTS LIKE THE AGIS INITIATIVE?

19 A. No. While we utilize CBAs as one tool to assess larger projects, we are always
20 cognizant of the limits of a CBA. A cost-benefit model cannot capture other
21 benefits that cannot be quantified, such as customer satisfaction, power
22 quality, improved safety, and the like. As a result, the CBA is a useful tool but
23 does not provide a complete picture of the costs and benefits of any given
24 program.

25
26 Those modeling limitations become even more pronounced where, as here, a
27 large portion of the costs of the AGIS initiative are unavoidable because they

1 are associated with addressing aging metering assets that are central to core
2 utility functioning. Given the issues with our existing meters noted earlier in
3 my testimony and discussed in detail in the testimony of Mr. Cardenas and
4 Ms. Bloch, the question is less whether to pursue a metering solution at all,
5 and more whether to pursue more current technology to align with the
6 industry and system needs, which can also offer our customers functionality
7 they have come to expect from their service providers.

8
9 Q. WHAT IS THE COMPANY'S OVERALL APPROACH TO THE AGIS CBA?

10 A. Our overall approach for the CBA is to provide a customer-focused,
11 conservative look at the AGIS investments. In other words, we have
12 incorporated estimated customer benefits enabled by the advanced grid, but
13 have used conservative estimates to avoid overstating these benefits.
14 Likewise, we have include our current cost estimates, both with and without
15 contingencies, to provide the range of results for consideration. The CBA
16 covers the life of the proposed assets, rather than just the MYRP period, in
17 order to examine values for the overall AGIS initiative beyond the MYRP
18 term. Dr. Duggirala provides further discussion on the CBA design.

19
20 Q. PLEASE DESCRIBE THE OUTPUTS OF THE CBA AT A HIGH LEVEL.

21 A. At a high level, the CBAs present the net present value of costs and benefits
22 on a 2019 base year net present value (NPV) basis. From a benefit-to-cost
23 ratio perspective, a ratio greater than one (1) indicates the quantifiable benefits
24 that can be converted to dollar values exceed the costs, and vice-versa. Of
25 course, as previously noted, the benefit-to-cost ratio excludes qualitative
26 benefits and other considerations such as the business's dependence on the

1 systems being evaluated. As a result, it is not surprising that some of our
2 benefit-to-cost ratios for AGIS components exceed 1.0, while others do not.

3
4 Q. HOW DID THE COMPANY DEVELOP THE COST INPUTS FOR THIS ANALYSIS?

5 A. At a high level, the Company developed the cost inputs by relying on subject
6 matter experts in our various areas of the Company to assess the hardware,
7 software, labor, and processes necessary to implement the various programs
8 of the AGIS initiative. Cost development was based on such items including,
9 but not limited to, RFPs, contracts, labor rates, company experience, and
10 other pricing efforts.

11
12 Q. WHAT BUSINESS AREAS DEVELOPED COST INPUTS FOR THE CBA?

13 A. Primarily, our Distribution and Business Systems organizations developed the
14 cost inputs for the CBA. The overall AGIS budget is split between these two
15 business areas, as they are responsible for implementing the technologies and
16 systems for the AGIS initiative. Information supporting the capital
17 investments and O&M expenses related to the AGIS initiative is provided in
18 the direct testimony of Ms. Bloch and Mr. Harkness. Their testimonies
19 address both the specific costs included the multi-year rate plan period as well
20 as the development of cost inputs for the CBA.

21
22 Q. ARE THERE COSTS NECESSARY FOR AGIS IMPLEMENTATION THAT ARE
23 RELATED TO AREAS OF OPERATION OTHER THAN DISTRIBUTION AND
24 BUSINESS SYSTEMS?

25 A. Yes. Like any other project of this size and scope, the AGIS initiative touches
26 many areas of our business, and there are costs necessary for overall program
27 management that are not developed by Distribution or Business Systems. For

1 example, in Section D.2. above, I provided the costs for Program
2 Management. Other program management cost inputs that are necessary for
3 delivery of the overall AGIS project were developed for business areas such as
4 Supply Chain, Finance, and Human Resources. These program management
5 costs are all reflected in the Distribution or Business Systems budgets, either
6 by direct assignment to, or allocation among, the appropriate AGIS
7 components. I also identified the costs for execution of our Customer
8 Education and Communications Plan as we install AMI meters and implement
9 advanced grid capabilities. While these costs were developed by Corporate
10 Communications, they are accounted for in the overall AGIS budget within
11 Distribution.

12
13 Q. PLEASE FURTHER DESCRIBE THE CONTINGENCY AMOUNTS INCLUDED IN THE
14 CBAs.

15 A. The costs associated with AMI, FAN, FLISR, and IVVO installation, and the
16 necessary IT integration, include contingency amounts, which are detailed
17 further in the Direct Testimony of Company witnesses Mr. Harkness and Ms.
18 Bloch. These estimates appropriately reflect corresponding risk allowances
19 and contingencies for inherent uncertainties associated with budget estimates
20 at the current stage of project development and approval. Consistent with our
21 conservative approach, we have reflected these contingencies in our CBAs.

22
23 Q. WHY DOES THE COMPANY BELIEVE THAT UTILIZING SUCH CONTINGENCIES IS
24 APPROPRIATE?

25 A. Using contingencies is consistent with project planning practices, especially for
26 large technology projects that implement new technologies and require major
27 changes to enterprise IT systems. Further, the size, scope, and complexity of

1 the AGIS initiative, as well as the multi-year implementation schedule,
2 warrants the use of budget contingencies. While we have undertaken initial
3 planning, benchmarking, and research, and have based our budget estimates
4 on all known design and installation details, there remain uncertainties with
5 respect to specific Minnesota requirements that will not be known until after
6 Commission approval of the projects, and unknowns that may develop
7 through the installation phases.

8
9 Further, while we believe the budgets including contingency amounts
10 appropriately account for certain costs that may be incurred but are currently
11 unknown, we do not look at the contingency amounts as additional budget
12 dollars that can simply be used in any way for project implementation. Rather,
13 use of any of the contingency amounts would only occur if cost changes are
14 determined to be necessary, and changes have gone through the appropriate
15 review and approval processes described in Section V.D of my Direct
16 Testimony. As described, the Company has implemented a robust AGIS
17 governance process to ensure the project is implemented and provides value
18 for our customers.

19
20 Q. WHAT IS THE CONTINGENCY PERCENTAGE FOR THE AGIS INITIATIVE
21 OVERALL?

22 A. The AGIS initiative capital budget forecast for the period 2020-2025 includes
23 an overall contingency percentage of approximately 26 percent, with individual
24 component contingencies varying depending on the complexity, size, and
25 scope of work (as discussed by Ms. Bloch and Mr. Harkness).

26

1 Q. IS THIS CONSISTENT WITH CONTINGENCY LEVELS FOR OTHER COMPANY
2 PROJECTS AND THOSE USED ACROSS THE INDUSTRY?

3 A. Yes. The Company includes contingency amounts for large projects that are
4 appropriate to the stage of development and scope of the project. A 26
5 percent overall contingency AGIS at this stage of project development is very
6 much in line with industry standards for large technical and IT projects that
7 span multiple years, and is appropriate for the complexity, size, and integrated
8 nature of the AGIS project.

9

10 Q. ARE THERE INDUSTRY GUIDELINES FOR ESTABLISHING CONTINGENCY
11 AMOUNTS FOR CAPITAL PROJECT ESTIMATES?

12 A. Yes. The Association for the Advancement of Cost Engineering (AACE
13 International) is the leading professional society for cost estimators, cost
14 engineers, schedulers, project managers, and project control specialists.
15 AACE International recommends a combination of project and process
16 contingencies for large capital projects. Project contingency recommendations
17 are based on the level of project definition at the time the estimate is
18 developed, with a range of recommended contingencies between 5 and 50
19 percent. Process contingency recommendations are based on the
20 programmatic or technical uniqueness and complexity of the project, with a
21 recommended range of contingencies between 0 and 40 percent (or more).

22

23 Q. HOW DO THE CONTINGENCY BUDGETS FOR EACH OF THE AGIS COMPONENTS
24 FACTOR INTO THE OVERALL CONTINGENCY AMOUNT?

25 A. As previously noted, contingency levels vary between the individual AGIS
26 components because they are based on the current stage of project
27 development, outstanding contract finalizations, and the specific scope of

1 work and integrations necessary for the individual projects. The overall capital
2 contingency levels for each of the AGIS components for the period 2020-
3 2025 are shown in the Table 9 below.

4
5 **Table 9**

6

AGIS Project Contingencies			
AGIS Program	Business Systems	Distribution	Combined
AMI	37%	26%	27%
FAN	45%	0%	39%
FLISR	24%	12%	14%
IVVO	10%	10%	10%

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12 Q. ARE THESE CONTINGENCY LEVELS FLAT WITHIN EACH AGIS COMPONENT?

13 A. No. Just as the overall contingency levels vary between the different AGIS
14 components, the contingency levels also vary between the Distribution and
15 Business Systems budgets for the same AGIS component. This is due to the
16 differences between IT and Distribution work, and helps to ensure reasonable
17 contingency amounts that are tailored to the individual components and work
18 to be done. For example, IT projects generally have a higher contingency for
19 several reasons, including the unknowns around the integrations with new and
20 legacy systems, and necessary security controls that may evolve over the
21 course of project implementation, to name a few. Mr. Harkness and Ms.
22 Bloch discuss the reasons contingencies for their work on each AGIS
23 component is needed and why these estimate are reasonable given the specific
24 project scopes and stages of project development.

25

1 Q. DOES THE INCLUSION OF A CONTINGENCY AMOUNT IN A CBA OR INITIAL
2 BUDGET MEAN 100 PERCENT OF THE CONTINGENCIES MUST BE CONSUMED
3 THROUGH THE PROJECT?

4 A. No. In this case, the Company worked to develop a conservative budget to
5 provide a fair view of potential costs and benefits. If the Company does not
6 utilize all of the contingencies in order to realize the benefits of the advanced
7 grid, the benefit-to-cost ratio of these programs will only improve.

8

9 Q. HOW WILL THE COMMISSION BE INFORMED OF PROJECT COSTS AND WHETHER
10 CONTINGENCY AMOUNTS ARE BEING USED, AND TO WHAT EXTENT, DURING
11 THE COURSE OF THE MULTI-YEAR RATE PLAN?

12 A. The Company is requesting approval in this proceeding to recover these
13 amounts in base rates, but also for certification of these programs to provide
14 the opportunity for the Company to request cost recovery in the TCR Rider
15 after the end of the MYRP. Annual filings will enable the Commission to see
16 what amounts are being spent and on what items. Likewise, the Company has
17 proposed a capital true-up through Company witness Ms. Amy Liberkowski,
18 and is proposing regular AGIS filings with the Commission as I describe later
19 in my testimony. Each of these methods will provide the Commission with
20 insight into the progress and costs around the AGIS initiative.

21

22 Q. HOW DID THE COMPANY DEVELOP THE BENEFIT INPUTS FOR THIS ANALYSIS?

23 A. Benefits inputs were developed by synchronizing the programs' technical
24 capabilities, Company expectations, prior experience, alternatives, and
25 Commission approved values where available. Where applicable, Ms. Bloch
26 and Mr. Harkness discuss quantifiable benefits for Distribution and Business
27 Systems, respectively. Mr. Cardenas identifies benefits related to customer

1 care, such as reduced bad debt expense and meter reading. Dr. Duggirala
2 discusses certain broader AMI benefits around load flexibility.

3
4 Q. WHAT TIME PERIOD DOES THE COMPANY'S CBA EXAMINE?

5 A. While implementation of the foundational AGIS components is expected to
6 be completed by approximately 2025, the CBA examines the time periods that
7 match either the expected life of the installed asset (AMI meters), or the
8 period up to full book depreciation of the assets (IVVO and FLISR
9 components). For AMI, the CBA covers is a 15-year project life, which is the
10 expected life of the advanced meter equipment. The CBAs for IVVO and
11 FLISR cover a 20-year project life, after which the equipment will be fully
12 depreciated. Company witness Ms. Bloch describes the meter and device
13 useful lives in her Direct Testimony.

14
15 Q. EARLIER YOU IDENTIFIED AMI, FLISR, AND IVVO AS INCLUDED IN THE
16 CBA. HOW DO THE OTHER ASPECTS OF THE AGIS INITIATIVE – NAMELY,
17 ADMS, THE TOU PILOT, AND THE FAN – FACTOR INTO THE CBA?

18 A. As I noted earlier, ADMS was separately certified for implementation via the
19 Company's TCR Rider. In the certification proceedings, ADMS was approved
20 as necessary regardless of any future advanced grid initiatives the Company
21 would undertake. Further, the purpose of the CBA is primarily to provide one
22 tool to evaluate the potential costs and quantifiable benefits of potential future
23 grid modernization functionality. As such, ADMS costs are not part of the
24 CBA.

25
26 However, installation of the FAN is necessary for AMI, FLISR, and IVVO
27 implementation, respectively. The FAN does not provide benefits in its own

1 right; therefore, all FAN costs are accounted for in the CBAs, where the
2 associated portion of FAN is allocated into the costs for those individual
3 components.

4
5 Finally, although the TOU pilot was previously approved, some of the work
6 completed for the pilot will carry over to the broader AGIS initiative.
7 Therefore, we have included TOU pilot costs in the AMI and consolidated
8 CBA. However, the primary purpose of the TOU pilot is not to bring
9 quantifiable benefits or cost-savings to customers, but rather to learn more
10 about the capabilities and how to maximize the value of advanced metering
11 technology. As such, the TOU pilot has a minor impact on the cost side of
12 the benefit-to-cost ratio for AMI and the overall initiative (about 0.2 points),
13 but no material quantifiable benefits.

14
15 Q. WHAT ARE THE RESULTS OF THE COMPANY'S AGIS CBA?

16 A. As discussed in detail in Dr. Duggirala's testimony, AMI, FLISR, and IVVO
17 have the following approximate quantitative benefit-to-cost ratios for each
18 component, shown here with and without contingency amounts:

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Table 10
AMI Benefit-to-Cost Ratio

<u>NSPM-AMI-NPV</u>	Total (\$MM)
Benefits:	446
O&M Benefits	53
Other Benefits	203
CAP Benefits	190
Costs:	(538)
O&M Expense	(179)
Change in Revenue Requirements	(359)
Benefit/Cost Ratio	0.83
Benefit/Cost Ratio (no contingencies)	0.99

Table 11
FLISR Benefit-to-Cost Ratio

<u>NSPM FLISR- NPV</u>	Total (\$MM)
Benefits:	103
O&M Benefits	0
Customer Benefits	103
Costs:	(79)
O&M Expense	(5)
Change in Revenue Requirements	(74)
Benefit/Cost Ratio	1.31
Benefit/Cost Ratio (no contingencies)	1.53

Table 12
IVVO Benefit to Cost Ratio

<u>NSPM IVVO- NPV</u>	Total (\$MM)
Benefits:	22
Other Benefits	19
CAP Benefits	3
Costs:	(39)
O&M Expense	(2)
Change in Revenue Requirement	(37)
Benefit/Cost Ratio (CVR 1.25% energy; 0.7% capacity)	0.57
Benefit/Cost Ratio (no contingencies)	0.61
Low Benefit Sensitivity:	
Benefit/Cost Ratio (CVR 1% energy; 0.6% capacity)	0.46
Benefit/Cost Ratio (no contingencies)	0.49
High Benefit Sensitivity:	
Benefit/Cost Ratio (CVR 1.5% energy; 0.8% capacity)	0.67
Benefit/Cost Ratio (no contingencies)	0.72

21 Q. WHY DO YOU SHOW AN ADDITIONAL RANGE OF IVVO BENEFIT-TO-COST
22 RATIOS?

23 A. As Ms. Bloch and Dr. Duggirala explain, the Company is deploying IVVO to
24 a core area, and does not have widespread data on the likely results of IVVO
25 implementation. However, we understand that many of our stakeholders are
26 particularly interested in IVVO deployment. Our engineers feel confident
27 they can achieve 1.0 percent energy savings and may be able to achieve 1.5

1 percent through voltage optimization; in light of the uncertainty and interest,
2 we have utilized a 1.25 percent mid-range energy savings level to show a range
3 of potential outcomes. Our baseline benefit-to-cost ratio overall assumes 1.25
4 percent energy savings, 0.7 percent capacity savings, and that we will need to
5 utilize the IVVO contingency amounts.

6
7 Q. WHAT ARE THE RESULTS OF THE CBA FOR THE AGIS INITIATIVE ON A
8 CONSOLIDATED BASIS?

9 A. On a consolidated basis, the CBA results show a benefit-to-cost ratio for the
10 overall AGIS initiative of between 0.86 and 1.03, with 0.87 as our baseline
11 benefit-to-cost ratio, as set forth in Table 13 below.

12

1 **Table 13**

2 **AGIS Initiative Combined Cost-Benefit Ratio**

<u>NSPM -AMI, FLISR, IVVO-NPV</u>	Total (\$MM)
Benefits:	571
O&M Benefits	53
Other Benefits	222
Customer Benefits	103
Capital Benefits	193
Costs:	(656)
O&M Expense	(186)
Change in Revenue Requirement	(470)
<u>Baseline Benefit-Cost Ratio</u> (IVVO CVR 1.25% energy, 0.7% capacity, with contingencies)	<u>0.87</u>
<u>High Benefit/No Contingency Sensitivity</u> (IVVO CVR 1.5% energy/0.8% capacity, no contingency)	1.03
<u>Lower Benefit/With Contingency Sensitivity</u> (IVVO CVR 1.0% energy/0.6% capacity, with contingencies)	0.86

18
19 Q. WHAT DOES THIS COMBINED RATIO INDICATE?

20 A. These ratios indicate that the quantifiable costs and benefits of the AGIS
21 initiative do not reach 1.0 (equal benefits and costs) in their own right, but
22 approach 1.0 even before we factor in qualitative benefits such as customer
23 satisfaction, power quality, safety, and the like. In other words, the CBA, by
24 itself, does not show that quantifiable benefits are equal to quantifiable costs;
25 however, we would not necessarily expect it to when we are proposing this
26 equipment not to avoid investments or to increase efficiency, but rather to
27 replace a fundamental component of our system that is approaching

1 obsolescence while adding capabilities for our customers and for a future that
2 includes greater DER, distributed intelligence, artificial intelligence, and
3 greater customer engagement with all facets of their life. We would not expect
4 to save money (on a net basis) when investing in these kinds of technologies. I
5 discuss the purpose and limitations of the CBA, as well as the unquantifiable
6 qualitative benefits, further in the next section of my testimony.

7
8 2. *Role of the CBA in AGIS Evaluation*

9 Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR TESTIMONY?

10 A. In this section of my testimony, I expand upon the purpose and limitations of
11 a CBA from a policy perspective. While Dr. Duggirala discusses this subject
12 from the perspective of the model itself, I provide the broader business
13 considerations around the efficacy – and limitations – of any quantitative
14 assessment tool.

15
16 Q. WHY IS IT IMPORTANT FOR THE COMMISSION TO EVALUATE QUALITATIVE
17 BENEFITS AND FUTURE CUSTOMER OPTIONS THAT COULD NOT BE BUILT INTO
18 A CBA?

19 A. We recognize that it is difficult to put a numeric value on future opportunity
20 and non-monetary benefits, and that evaluating these possibilities can be a
21 challenge. However, the trends in the utility industry and the efforts of other
22 states to advance their distribution grids, described in this testimony and in
23 industry-wide resources like the Department of Energy’s Smart Grid effort,
24 verify the importance of bringing utilities’ distribution grids into the future.
25 Without AGIS, the Company will soon be behind in managing to customer
26 expectations, supporting DER, employing future technologies, maintaining
27 reliability goals and expectations, and fully capturing DSM opportunities.

1 AGIS is therefore both a fundamental part of the Company's strategic plans to
2 meet and exceed customer expectations as well as a standalone requirement
3 for a robust and resilient distribution grid.
4

5 Q. SHOULD THE DECISION OF WHETHER TO APPROVE COST RECOVERY OF THE
6 AGIS COMPONENTS DEPEND SOLELY ON THE OUTCOME OF THE
7 QUANTITATIVE CBA?

8 A. No. That would be an overly-narrow perspective that does not take into
9 account the broader context of AMI, IVVO, and FLISR, the place of AGIS in
10 the Company's overall strategic plans, or future opportunities that the
11 advanced grid can create for customers. Company witness Dr. Duggirala
12 discusses both the purpose and limitations of a quantitative CBA in his
13 testimony. More specifically, a CBA can only capture that which can be
14 quantified or measured. Most costs, by definition, can be quantified. Other
15 benefits of a project, including customer satisfaction, the secondary effects of
16 lost productivity, business, or consumables on customers due to electric
17 outages, and human health and safety are not fully quantifiable or quantifiable
18 at all.
19

20 Q. IS THE OUTCOME OF A CBA THE ONLY STANDARD BY WHICH COST RECOVERY
21 MUST BE JUDGED IN MINNESOTA?

22 A. No. Certainly balancing the costs and benefits of any project is an important
23 consideration, which we do not discount. However, it is not the only
24 consideration. In Minnesota, the Commission has approved project costs
25 based on the need for the investments to serve customers, customer-facing
26 benefits, efficiencies, system benefits, avoiding obsolescence, and for other

1 reasons. The test is always whether the investment is just and reasonable –
2 not whether dollar savings are greater than the price of the project.

3
4 Q. ULTIMATELY, WHAT DO YOU RECOMMEND IS THE PROPER PERSPECTIVE ON
5 THE CBA?

6 A. I recommend that the Commission review the CBA, but do so in the broader
7 context of the goals of AMI, FLISR, and IVVO implementation, the current
8 qualitative benefits they offer, Commission policy goals, and the opportunities
9 for future customer benefits.

10
11 **B. Qualitative Benefits of AGIS**

12 Q. IF THE COMMISSION SHOULD NOT RELY SOLELY ON A CBA TO ASSESS A
13 PROJECT'S REASONABLENESS AND VALUE, WHAT SHOULD IT RELY UPON?

14 A. The Commission should consider a wide variety of factors, that include (but
15 may not be limited to):

- 16 • The overall need for the proposed investments for the utility to run its
17 business (as described above in my testimony, and in the testimony of
18 Ms. Bloch and Mr. Cardenas);
- 19 • The value of the investments in meeting Commission policy goals
20 (described in my testimony and Ms. Bloch's and Dr. Duggirala's
21 testimony);
- 22 • The benefits of the investment – both qualitative and quantitative – to
23 the utility's customers (described in each piece of the AGIS testimony);
- 24 • The cost impact of the investments on the customer (discussed later in
25 my testimony);
- 26 • The alternatives available to and considered by the Company (discussed
27 earlier in my testimony on a holistic level, and discussed by Ms. Bloch

1 and Mr. Harkness with respect to the alternatives to individual
2 components, component types, and vendors); and

- 3 • The amount and quality of due diligence undertaken by the Company in
4 selecting both the investments it is pursuing and the vendors and
5 project scoping proposed (discussed throughout our AGIS testimony).

6
7 Q. CAN YOU PROVIDE AN OVERVIEW OF THE QUALITATIVE BENEFITS TO BE
8 CONSIDERED AS PART OF THE EVALUATION OF THE AGIS COMPONENTS?

9 A. Yes. From a policy perspective, the unquantifiable benefits of advancing the
10 distribution grid are difficult to overstate. Safety, reliability, and customer
11 satisfaction are vital to our role as a public utility. Each is enhanced by the
12 AGIS initiative, as I describe earlier in my testimony and as Ms. Bloch and Mr.
13 Cardenas describe in more detail. A more automated, insightful, and
14 transparent grid supports greater customer empowerment and employee
15 safety, as discussed by Company witness Ms. Bloch. Similarly, Ms. Bloch also
16 explains that the advanced technologies associated with the AGIS initiative
17 support ongoing quality SAIDI and SAIFI measurements, along with
18 improved ability to measure MAIFI. Nor can the utility keep up with greater
19 customer demand for distributed energy resources without investing in the
20 advanced grid technologies necessary to support these resources.

21
22 In addition, giving customers choice and control over their energy usage by
23 providing greater insight to customers; giving customers greater input into the
24 types of energy they use by supporting distributed energy resources; and
25 empowering customers to make good choices about their impact on the
26 environment are important pieces of both building customer satisfaction and
27 managing electric demand.

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Perhaps most importantly, there are simply limitations to our current system that frustrate customers and cannot be resolved without aspects of the AGIS initiative. In many cases, without AMI metering technology we have limited ability to identify outages without relying on the customer. The AGIS initiative will allow us to improve reliability by automating fault response and identifying more issues beyond the substation. Two-way communication and additional devices will allow us to enhance voltage optimization and better support distributed energy resources. It further allows us to look to the future, and to emerging capabilities like distributed intelligence, more customer application and interface technology, and additional energy sources through a modernized distribution grid. All of these benefits relate largely to customer satisfaction and future-proofing the distribution grid – benefits that are difficult or impossible to quantify.

Q. HOW DOES CUSTOMER OPTIONALITY FURTHER SUPPORT APPROVAL FOR THE AGIS INITIATIVE, INCLUDING THE PROJECT COSTS IN THIS CASE?

A. As noted earlier in my Direct Testimony, empowering customer choice is a key driver of the AGIS initiative as a whole. Digital metering and technologies enable new programs and tools for customers that give them more power over their energy usage. Some of these options, such as the opportunities to receive regular updates about their electricity usage and to tailor their electric usage to reduce their electricity costs, are discussed above. But customer choice goes beyond TOU rates or remote connect/disconnect options.

1 With AMI, the Company has the option to implement budgeting tools and
2 high usage alerts that notify customers if they exceed or approach certain
3 thresholds; to create internet portals that provide greater insight into energy
4 consumption and peak demand; and to develop mobile apps that allow near
5 real-time information access.

6
7 AMI will also support the two-way flow of energy via net metering, further
8 supporting customers' abilities to invest in DER options such as rooftop solar
9 and potential energy storage or battery options, if they should choose to do so.

10
11 Q. HAS THE COMPANY INCORPORATED ANY ASSUMPTIONS ABOUT THESE FUTURE
12 OPTIONALITIES INTO ITS ASSESSMENT OF AMI, FLISR, AND IVVO?

13 A. Yes. As I discussed earlier, the Company envisions implementing a full
14 residential time of use rate by 2024. We anticipate continuing discussion of
15 those options in the Company's TOU pilot proceeding, as we will build on
16 those pilot results and learnings, and engage stakeholders in developing a full
17 residential time of use rate offering. Likewise, the implementation of the
18 advanced meters and associated infrastructure provide an opportunity for
19 customer web portals to access energy usage data on a near real-time basis,
20 and we anticipate building such portals as part of the AGIS initiative.
21 Estimated anticipated reduced consumption and benefits associated with time-
22 of-use rates are incorporated into the Company's CBA.

23
24 Q. WHAT ARE OTHER BENEFITS ASSOCIATED WITH TOU RATES?

25 A. There are several key, quantifiable benefits associated with a time-of-use rate
26 structure. TOU rates result in direct benefits for our customers, by giving
27 customers the tools necessary to keep their bills low. Additionally, TOU rates

1 can help to further goals shared by the Company and stakeholders, such as
2 furthering the clean energy transition in Minnesota. With TOU rates
3 providing customers energy price signals, customers are empowered with
4 information necessary to shift usage to off-peak times – when energy costs are
5 lower and system generation tends to be less carbon intensive. In addition to
6 these direct benefits for all of our customers who have an AMI meter, the
7 environmental benefits enabled by AGIS will be realized for both customers
8 and the public.

9 In the CBA, we did not quantify reductions in carbon dioxide emissions from
10 shifting customers away from consumption during peak periods (and
11 therefore away from reliance on peaking units) toward more average periods,
12 when we can rely more heavily on renewable resources. Instead, we focused
13 on a conservative estimate of benefits we could measure, resulting in
14 significant savings as a result of load flexibility benefits.

15
16 Q. HAS THE COMPANY SUMMARIZED THE CAPABILITIES OF CERTAIN AGIS
17 COMPONENTS IN RELATION TO THE RELATIVE COSTS AND BENEFITS IN ANY
18 OTHER WAY?

19 A. Yes. Dr. Duggirala compares the capabilities of AMI provided by Ms. Bloch
20 to other alternatives, such as manual reading and AMR solutions, while also
21 factoring in incremental cost and benefit information for alternatives
22 (compared to the Company’s current metering solution) where available.
23 This “Least-Cost/Best-Fit” analysis further underscores the significant
24 additional capabilities and higher net costs/benefits of AMI as compared to
25 other metering solutions for which we have pricing information. It also
26 demonstrates that while we do not have specific pricing information for all

1 options (such as manual read meters), the capabilities of older technology are
2 sufficiently limited and outdated as to be incomparable.

3
4 Dr. Duggirala presents a similar comparison of FAN alternatives, including a
5 cellular or dedicated AMI communications network alternative. Mr. Harkness
6 explains why those alternatives are not preferable solutions as compared to the
7 FAN, and Dr. Duggirala summarizes the comparisons in his testimony. In
8 short, a cellular alternative is expected to have approximately the same per-
9 device costs plus additional O&M costs, with less Company control and less
10 security than the FAN. A dedicated AMI alternative would not allow us to
11 utilize the FAN for multiple type of devices, limiting the functionality of the
12 solution. Overall, the capabilities of a secure, flexible, and reliable Field Area
13 Network make this the preferable solution.

14
15 **C. Summary of Prudence of AGIS Investments**

16 Q. PLEASE SUMMARIZE THE COMPANY'S OVERALL APPROACH AND THE RESULTS
17 OF THE AGIS CBA.

18 A. The AGIS CBA provides a customer-focused, conservative look at the AGIS
19 investments. It incorporates conservative estimates of quantifiable customer
20 benefits enabled by the advanced grid. It also incorporates our current cost
21 estimates, both with and without contingencies, to provide a range of results
22 for consideration. Our CBA shows individual and composite benefit-to-cost
23 ratios that approach 1.0 (or exceed 1.0 in the case of FLISR), even before
24 taking into account unquantifiable benefits.

25
26 Q. HOW DOES THE COMPANY'S CBA INFORM THE OVERALL ASSESSMENT OF THE
27 PRUDENCE OF THE AGIS INVESTMENTS?

1 A. By evaluating the costs and quantifiable benefits of AGIS implementation, the
2 Company's AGIS CBA is one tool that informs assessment of the overall
3 prudence of the AGIS strategy and investments. However, a cost-benefit
4 model is limited in that it cannot capture other benefits that cannot be
5 quantified, such as customer satisfaction, power quality, and improved safety.

6
7 The CBA results underscore that our AGIS program is reasonable given the
8 need to replace aging technology, bring our distribution grid into the future,
9 meet customer needs and offer greater customer choice, and take advantage of
10 opportunities to use technology to support demand side management, peak
11 demand reductions, and build a more resilient, responsive grid. With those
12 qualitative considerations and benefits, the Company believes the value of the
13 AGIS initiative and its respective components substantially exceed the costs.

14
15 Q. ULTIMATELY, WHAT DO YOU RECOMMEND WITH RESPECT TO THE PRUDENCE
16 OF THE AGIS INVESTMENTS?

17 A. I recommend that the Commission approve the Company's proposed
18 investments in the AGIS initiative as prudent, and certify them for future cost
19 recovery for the reasons described throughout my testimony – including in
20 this section – and in the testimony of Ms. Bloch, Mr. Harkness, Mr. Cardenas,
21 and Dr. Duggirala.

22
23 **VIII. BILL IMPACTS**

24
25 Q. PLEASE DESCRIBE HOW AGIS INVESTMENTS WILL IMPACT CUSTOMER BILLS.

26 A. Keeping customer bills low is a core strategy of the Company and is a central
27 consideration of the AGIS initiative. As I previously described, the combined

1 AGIS investment will provide significant value to our customers – some of
2 which we can quantify and some that we can't.

3
4 Q. WHAT TYPE OF IMPACT WILL AGIS INVESTMENT HAVE ON CUSTOMER BILLS?

5 A. The impact to a customer's bill will result from the increased revenue
6 requirement due to our investments and O&M spending necessary to
7 implement the AGIS initiative.

8
9 Q. HOW DID THE COMPANY APPROACH ITS ASSESSMENT OF THE BILL IMPACT OF
10 AGIS?

11 A. The Company performed a revenue requirement analysis for 2020 through
12 2024 to illustrate the incremental revenue requirement and estimated bill
13 impact of AGIS implementation. The AGIS revenue requirement calculation
14 is provided as Exhibit___(MCG-1), Schedule 9.⁴⁰ While we did not perform
15 an exhaustive class cost of service model for this subset of investments and
16 O&M expenses, this analysis provides the annual cost of the AGIS initiative
17 overall, and provides an estimate of a monthly bill impact for a typical
18 residential customer.

19
20 Q. HOW DID THE COMPANY SPECIFICALLY CALCULATE THE ESTIMATED BILL
21 IMPACT FOR A TYPICAL RESIDENTIAL CUSTOMER?

22 A. We estimated the bill impact by utilizing a series of allocation assumptions
23 applied to the AGIS costs, using allocators consistent with our 2020 proposed
24 Class Cost of Service Study. Appropriate allocators were applied to
25 distribution capital, distribution O&M, and the remaining costs, to develop an

⁴⁰ The costs included in 2019 are related to the Company's TOU pilot. As described in Section VI, the costs of implementing AMI and FAN in connection with the TOU pilot (in 2019 and 2020) have been included in the AGIS CBA to provide a complete picture of advanced grid investments and costs. We have also included these costs in our bill impact assessment.

1 estimated residential class revenue requirement. We then divided the
2 estimated residential class revenue requirement by the sales forecast for each
3 year, as provided in Company witness Ms. Janell Marks' testimony. This
4 results in an estimated overall cost per kilowatt hour (kWh). We then
5 calculated an estimated bill impact based on the average monthly residential
6 customer usage of 675 kWh. This assessment shows an estimated 2024 AGIS
7 bill impact of approximately \$2.87 per month for an average residential
8 customer.

9
10 While this calculation is not a full class cost of service assessment, it does
11 illustrate an estimated bill impact for a residential customer. We recognize
12 that bill impacts will vary by customer class; however, we believe this
13 approach is informative for purposes of comparing the bill impact of the
14 AGIS initiative to the alternative investment that would be necessary to
15 continue to provide service to our customers.

16
17 Q. WHAT ALTERNATIVE INVESTMENT AND COSTS WOULD BE NECESSARY IF THE
18 COMPANY DOES NOT IMPLEMENT THE AGIS INITIATIVE?

19 A. As described earlier, it is not feasible for the Company to continue to use its
20 current AMR meters because they are nearing end of life, and the Company's
21 contract with Cellnet for meter reading service and support expires at the end
22 of 2025. As such, the Company would, at a minimum, need to invest in new
23 meters and provide meter reading services in order to continue to provide
24 electric service to our customers. This means that even without AGIS
25 implementation, there would be an incremental impact to customers' bills for
26 an alternative metering service.

27

1 Q. HOW DID THE COMPANY CALCULATE THE BILL IMPACT OF THE ALTERNATIVE
2 TO AGIS IMPLEMENTATION?

3 A. In addition to the AGIS revenue requirement, the Company developed a
4 reference case scenario to represent an alternative to our AGIS investments.
5 The reference case reflects the necessary investments and costs if the
6 Company were to pursue a basic AMR drive-by meter reading alternative. Ms.
7 Bloch and Mr. Cardenas discuss AMR meters and provide details on the costs
8 of this alternative. The Company calculated the bill impact by using the
9 revenue requirements for the AMR drive-by alternative and calculated the
10 estimated bill impact as described above. The reference case revenue
11 requirement calculation is provided as Exhibit____(MCG-1), Schedule 10. This
12 assessment shows an estimated bill impact for the AMR drive-by alternative of
13 approximately \$1.51 per month for an average residential customer.

14
15 Q. COULD YOU COMPARE THE TWO CASES?

16 A. Yes. We provide the overall bill impact of the AGIS initiative, but the key
17 comparison is the difference between the estimated bill impact of AGIS
18 implementation versus the basic alternative, as shown in Table 14 below. This
19 Table illustrates the incremental cost of pursuing our AGIS investments,
20 compared to the investments that would otherwise be necessary but would
21 not enable all the quantitative and qualitative benefits of the advanced grid.
22 Table 14 also illustrates that costs of AGIS will be spread over the
23 implementation period, which reasonably manages the cost impact for our
24 customers.

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Table 14

Estimated Residential Monthly Bill Impact

	2020	2021	2022	2023	2024
AGIS	\$0.44	\$1.33	\$1.84	\$2.58	\$2.87
Reference Case	\$.01	\$0.19	\$0.62	\$1.18	\$1.51
Difference	\$0.43	\$1.14	\$1.22	\$1.40	\$1.36

Q. OVERALL, DO YOU BELIEVE THE AGIS INVESTMENTS ARE A GOOD VALUE FOR CUSTOMERS?

A. Yes. While there are costs associated with new technology, the combined AGIS investment will provide significant value to our customers immediately on Day 1 and over the long term.

IX. AGIS METRICS AND REPORTING

Q. WHAT INFORMATION DO YOU PROVIDE IN THIS SECTION OF YOUR TESTIMONY?

A. In this section, I discuss progress metrics and proposed reporting on the AGIS program. Our intent is to provide the Commission and stakeholders comprehensive information on deployment progress for monitoring purposes, and performance and achievement of customer and system benefits as we implement the advanced grid initiatives.

The AGIS initiative will be implemented over a number of years, beginning with customer outreach and education efforts, followed by deployment of the systems and technologies, and then the roll-out of new products and services enabled by the AGIS initiative. Our efforts will also include development and

1 implementation of future products and services that will capture additional
2 benefits of the advanced grid capabilities as customer preferences and
3 technologies evolve over time. This section discusses our proposed progress
4 metrics and reporting chronologically as we move through these phases of
5 AGIS implementation.

6
7 Because we are the first Minnesota utility to propose implementation of these
8 advanced grid components through a broad advanced grid initiative, we
9 believe comprehensive reporting will contribute to and inform the ongoing
10 discussions of distribution planning and the advanced grid among Minnesota
11 stakeholders. Our proposed progress metrics and reporting are discussed
12 below and are also summarized in Exhibit____(MCG-1), Schedule 11.

13
14 Q. ARE YOU PROPOSING A SEPARATE PERIODIC REPORT SPECIFICALLY RELATED
15 TO AGIS?

16 A. Yes. We propose to file an annual report on the AGIS initiative that will
17 include various progress metrics that relate to different areas of our business
18 that are involved in AGIS implementation. We propose to file the AGIS
19 report on May 1 each year, to include reporting for the prior calendar year.
20 Our first AGIS report would be filed May 1, 2022. I note that the content of
21 the report and relevant metrics will change over time as we move through the
22 phases of AGIS implementation.

23
24 Q. WILL OTHER PERIODIC REPORTING BE IMPACTED BY THE AGIS INITIATIVE?

25 A. Yes. AGIS may also impact certain service quality metrics that are included in
26 reporting that is already in place. Specifically, the Company reports service

1 quality metrics under our established Service Quality tariff⁴¹ as well as the
2 Minnesota Rules governing utility service quality.⁴² We propose to continue
3 reporting the service quality metrics in those reports, and intend to address
4 any AGIS impacts to service quality metrics or thresholds in those separate
5 proceedings.

6
7 Q. DO YOU PROPOSE SPECIFIC METRICS RELATED TO FUTURE OPERATIONAL
8 CAPABILITIES OR PRODUCTS AND SERVICES THAT WILL BE ENABLED BY AGIS?

9 A. Not at this time. I discuss below some of the types of information that the
10 Company anticipates filing in the future. However, are currently developing
11 operational reporting solutions, so final details concerning specific metrics and
12 calculations are not yet available. In addition, we recognize that specific
13 metrics or potential performance thresholds might be further developed
14 through later Commission proceedings as the Company proposes new
15 products or services enabled by the advanced grid. For example, the
16 Company would seek approval for a full residential time of use rate in a future
17 proceeding, where detailed metrics and reporting would be informed by
18 stakeholder input and approved by the Commission. We propose to report
19 on metrics developed in those proceedings in the separate future dockets.

20
21 **A. Customer Education and Outreach Metrics**

22 Q. WHAT INFORMATION DO YOU PROPOSE TO TRACK AND REPORT WITH RESPECT
23 TO THE COMPANY'S CUSTOMER EDUCATION AND OUTREACH EFFORTS?

24 A. Because education and awareness are key to customer engagement with
25 advanced grid offering and capabilities, we intend to measure the impact of

⁴¹ See the Company's Minnesota Electric Rate Book, Section 6, General Rules and Regulations, Subsection 1.9, Service Quality.

⁴² See Minn. Rule 7826, Electric Utility Standards on safety, reliability, and service quality.

1 our communications and education efforts around installation of the advanced
2 meters. To answer key questions and assess the overall effectiveness of our
3 efforts, we will track and report on:

- 4 • Customer responses on the adequacy and clarity of our
5 communications prior to installation of advanced meters.

6
7 Q. HOW WILL THE COMPANY MEASURE THIS PERFORMANCE?

8 A. We plan to conduct quarterly customer surveys to ensure our surveys are
9 timely and follow soon after the distribution of meter installation
10 communications. The surveys will continue as installation efforts proceed
11 across our service territory.

12
13 Q. HOW DOES THE COMPANY EXPECT TO USE THESE SURVEY RESULTS?

14 A. We intend to closely monitor these results and modify our communication
15 materials or education plans if these results indicate a modification may be
16 warranted.

17
18 In addition to these survey results, we will be tracking the number of customer
19 who elect to opt out of an advanced meter installation. To the extent the opt-
20 out percentage may be related to the efficacy of our customer materials or
21 education efforts, we will also take that into consideration as we continue to
22 proceed with meter installation across our service territory.

23
24 Q. HOW AND WHEN WILL YOU REPORT ON THE PROGRESS METRICS RELATED TO
25 CUSTOMER EDUCATION AND OUTREACH EFFORTS?

26 A. We intend to begin these surveys in 2021 as we begin AMI installation and will
27 report this information in our annual AGIS report beginning in 2022.

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B. Installation and Deployment Metrics

Q. WHAT INFORMATION DO YOU PROPOSE TO TRACK AND REPORT WITH RESPECT TO DEPLOYMENT AND INSTALLATION OF SYSTEMS AND TECHNOLOGIES?

A. We intend to track and report on installation for all AGIS components. This includes the timing of installation and the following statistics:

- AMI – Number of meters installed;
- FAN – Percentage of FAN deployed;
- FLISR – Number of feeders with FLISR enabled;
- IVVO – Number of feeders with IVVO enabled; and
- Number of customers electing to opt out of AMI installation.

Q. HOW DOES THE COMPANY EXPECT TO USE THIS INFORMATION RELATED TO INSTALLATION AND DEPLOYMENT OF AGIS COMPONENTS?

A. We will track these installation progress metrics to monitor our performance compared to our deployment plan for each component and our forecasted opt-out percentages. We intend to report these metrics to keep the Commission and stakeholders informed of our progress as we install and deploy AGIS equipment and systems.

Monitoring the percentage of customers opting out of advanced meter installation may provide information relative to our customer materials or education efforts. We will take that into consideration as we continue to roll-out meter installation across our service territory and develop future products and services that will utilize AMI capabilities.

Q. HOW AND WHEN WILL YOU REPORT THE INSTALLATION PROGRESS METRICS?

1 A. We intend to measure these installation metrics semi-annually for our internal
2 monitoring purposes, and will report these progress metrics in our annual
3 AGIS report beginning in 2022. This reporting would continue until
4 deployment is completed.

5

6 Q. ARE THERE OTHER METRICS YOU INTEND TO REPORT DURING THE
7 INSTALLATION AND DEPLOYMENT PHASE?

8 A. Yes. We intend to track and report:

- 9 • Number of calls to our Customer Contact Center regarding the AMI
10 meter installations; and
- 11 • Number of complaints regarding AMI installation.

12

13 In addition to tracking our call center metrics, we have developed a robust
14 plan with our meter installation vendor (Itron) around customer
15 communications and service quality, as they will have direct contact with and
16 will receive calls directly from our customers related to meter installation. Mr.
17 Cardenas discusses our plans for the meter installation vendor service quality
18 tracking and reporting. We would include these metrics in our reported
19 information as well. Mr. Cardenas provides details on the tracking
20 mechanism, categories, and methods of reporting for both the Company's and
21 Itron's call centers, as well as any customer complaints.

22

23 Q. HOW AND WHEN WILL YOU REPORT THE COMPANY'S AND ITRON'S CALL
24 CENTER METRICS AND ANY COMPLAINTS REGARDING AMI INSTALLATION?

25 A. As discussed by Mr. Cardenas, these metrics are related to and may impact
26 metrics we report under our established Service Quality tariff and the
27 Minnesota Rules on service quality. We intend to begin reporting this

1 information as part of our annual service quality reporting beginning in 2022.
2 I note, however, that for completeness and monitoring purposes, we would
3 also include this information in our annual AGIS report.
4

5 **C. Post-Implementation Metrics**

6 Q. WHAT INFORMATION DO YOU PROPOSE TO TRACK AND REPORT ONCE AGIS
7 IS IMPLEMENTED?

8 A. Post-implementation, we propose to track and report operational metrics
9 related to AGIS components, certain service quality metrics, and customer
10 engagement and satisfaction as it related to AGIS capabilities. In the near
11 term, this would include metrics related to advanced grid capabilities and
12 services that do not require future regulatory proceedings to enable.
13

14 Q. WHAT OPERATIONAL METRICS DO YOU PROPOSE TO REPORT?

15 A. We propose to report the following operational metrics:

- 16 • Avoided customer minutes out on FLISR-enabled feeders; and
- 17 • Energy reduction due to IVVO (that result in associated cost reduction
18 and reduction in CO₂ emissions).
19

20 Q. HOW DOES TRACKING AND REPORTING CUSTOMER MINUTES OUT REFLECT
21 THE IMPACT OF FLISR?

22 A. We are currently able to track customer minutes out (CMO) as one measure of
23 system reliability. The automated restoration provided by FLISR will reduce
24 customer minutes out (CMO) for customers located on FLISR-enabled
25 feeders. As we begin to install FLISR devices, we will be able to compare
26 CMO to past performance, indicating the extent to which FLISR has reduced
27 CMO. Ms. Bloch provides additional information on the benefits of FLISR,

1 including how the value of reduced CMO is quantified. I note that this
2 reliability metric is not included in our service quality reporting. Other
3 reliability metrics will continue to be addressed in our existing service quality
4 reports, where calculation methodologies and performance thresholds are
5 defined.

6
7 Q. HOW WILL THE COMPANY TRACK AND CALCULATE THE ENERGY REDUCTION
8 DUE TO IVVO, THE ASSOCIATED COST REDUCTION, AND VALUE OF REDUCED
9 CO₂ EMISSIONS?

10 A. IVVO is expected to result in energy reductions due to the voltage reductions
11 enabled by IVVO. In other words, lowering the voltage on a feeder would
12 result in lower energy usage, which would result in lower costs. In addition,
13 line losses are generally a percentage of energy, so reduced energy also results
14 in reduced line losses (and associated costs). Reduced energy usages also
15 means reduced CO₂ emissions. As we begin to install IVVO devices, energy
16 reductions will be calculated based on the voltage on the IVVO-enabled
17 feeder compared to the overall system voltage. With the energy reduction will
18 come cost savings to customers and a reduction in CO₂ emissions. Ms. Bloch
19 provides additional information on the benefits of IVVO, including how the
20 value of these benefits are quantified.

21
22 Q. HOW AND WHEN WILL YOU REPORT THESE OPERATIONAL METRICS?

23 A. We intend to report these operational metrics in our annual AGIS report.
24 With FLISR and IVVO installation beginning in 2021, we would be able to
25 begin this reporting for specific feeders in 2022. This reporting would
26 continue throughout the FLISR and IVVO deployment phases as we install
27 the devices on additional feeders.

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Q. WHAT SERVICE QUALITY METRICS DO YOU PROPOSE TO REPORT?

A. As noted above, certain service quality metrics related to call center response time, meter reading, billing, and reliability may be impacted by AGIS implementation. Ms. Bloch and Mr. Cardenas discuss service quality metrics in their testimony. We propose to report those metrics and address any impacts under the already established reporting structures for our service quality tariff and the Minnesota service quality rules. However, for completeness and monitoring purposes we would include the following information in the annual AGIS report beginning in 2022:

- Percentage of customers with advanced meters that receive estimated bills; and
- Percentage of customers with advanced meters that have made a complaint about inaccurate meter readings.

Q. WHAT CUSTOMER SATISFACTION AND ENGAGEMENT METRICS DO YOU PROPOSE TO REPORT?

A. We propose to report the following metrics in our annual AGIS report beginning in 2022:

- Customer satisfaction with outage-related communications;
- Number of customers with an advanced meter with an active web portal account (MyAccount); and
- Number of unique visits to MyAccount.

Q. WHY DOES THE COMPANY BELIEVE THESE METRICS ARE IMPORTANT?

A. First, the improved visibility into the system and the ability of AMI meters to detect outage and restoration events enables the Company to provide

1 proactive and more timely and accurate communications on outages and
2 expected restoration times. We believe it is important to understand our
3 customers' views on these benefits enabled by the advanced grid as well as to
4 obtain feedback to improve our outage communications.

5
6 Second, the majority of the new information on energy usage provided by
7 advanced metering will be available to customers via the web portal and
8 MyAccount. Tracking our customers' use of the web portal will be useful in
9 determining how to improve presentation of data and how to engage
10 customers in the future as we develop new products and services enabled by
11 the advanced grid.

12 13 **D. Longer-Term Reporting**

14 Q. WHAT TYPES OF AGIS-RELATED OPERATIONAL INFORMATION DOES THE
15 COMPANY ANTICIPATE REPORTING IN THE FUTURE?

16 A. As Mr. Harkness discusses in his testimony, we are currently developing
17 operational reporting solutions, with final details on specific reporting and
18 metrics calculations not yet finalized. Although reporting details are not
19 finalized, some examples of metrics we anticipate being able to report are:

- 20 • Theft / tamper detection and reduction;
- 21 • Reduction in trips due to customer equipment damage;
- 22 • Reduction in "OK on Arrival" outage field trips;
- 23 • Reduction in field trips for voltage investigations;
- 24 • Patrol time reduction; and
- 25 • Outage management efficiency.

26

1 Q. WHAT TYPES OF INFORMATION DO YOU ANTICIPATE REPORTING RELATED TO
2 NEW PRODUCTS AND SERVICES ENABLED BY THE ADVANCED GRID?

3 A. For those new products and services that will require separate Commission
4 approval for implementation, we expect the reporting details and timing will
5 be determined in those separate proceedings, with stakeholder input and at the
6 direction of the Commission. Future reporting will be determined in separate
7 proceedings for any advance rates – like a full residential time-of-use rate – or
8 for other new products such as Green Button Connect. Some examples of
9 the types of reporting we would anticipate for new products and services are:

- 10 • TOU rate – avoided generation/peak demand;
- 11 • TOU rate – deferral of capital investments due to demand reduction;
- 12 • Remote disconnect – reduced consumption on inactive meters;
- 13 • Remote disconnect – reduced uncollectible / bad debt expense;
- 14 • Percentage of customers with AMI that have selected pre-pay billing;
- 15 • Percentage of customers with AMI that receive high bill alerts; and
- 16 • Percentage of customers with AMI that have one or more active
17 advanced applications.

18

19 X. CONCLUSION

20

21 Q. PLEASE SUMMARIZE YOUR TESTIMONY.

22 A. Our distribution grid is the foundation of the service we provide our
23 customers. We are at a point where investment in new technologies to further
24 modernize our grid will return significant value to our customers. Our
25 proposed AGIS initiative supports the Company's vision for an advanced grid
26 that will provide both customer and operational benefits for many years to
27 come and has been informed by:

- 1 • The Company’s strategic priorities to lead the clean energy transition,
2 enhance the customer experience, and keep bills low;
- 3 • The Company’s desire to meet the growing needs and expectations of
4 our customers;
- 5 • Current distribution system needs; and
- 6 • Commission policy and stakeholder input relative to customer
7 offerings, performance, and technical capabilities of the grid.

8
9 Our AGIS initiative will enhance transparency into the distribution system and
10 provide detailed and timely data to promote efficiency, reliability, and enable
11 increased distributed resources on our system. AGIS will also enhance our
12 customers’ experience by providing access to actionable information, more
13 choices, and greater control of their energy use.

14
15 I recommend that the Commission approve our AGIS initiative, including
16 recovery the costs of the capital investments and O&M expense for the AGIS
17 components that we propose to implement during the 2020-2022 term of the
18 MYRP. I also recommend that the Commission certify our proposed AGIS
19 projects overall, so that the Company would have the opportunity to request
20 cost recovery for these programs between rate cases in subsequent rider
21 filings.

22
23 Q. DOES THIS CONCLUDE YOUR TESTIMONY?

24 A. Yes, it does.

Statement of Qualifications

Michael C. Gersack
Vice President, Customer Care
Xcel Energy
1800 Larimer Street, Suite 1500, Denver, Colorado

Current Responsibilities (2019 - Present)

Vice President Innovation and Transformation

Previous Positions

Xcel Energy Inc., Minneapolis

2010 - 2018 Vice President, Customer Care
2007 - 2010 Managing Director, Revenue Cycle Operations
2006 - 2007 Managing Director, Customer Care
2004 - 2006 Managing Director, Customer Care Business Operations
2002 - 2004 Managing Director, Retail Finance, Customer and Field Operations
2000 - 2002 Director, Accounting and Financial Analysis, Retail Operations
1999 - 2000 Manager, Retail Operations Accounting

Kinder Morgan

1998 – 1999 Controller, Enable (joint venture)
1997 – 1998 Manager, Retail Accounting
1996 – 1997 Business Unit Consultant

Energy and Resource Consulting Group

1994 – 1996 Senior Analyst

Education

Bachelor of Science and Masters Degrees in Accounting, University of Denver

Business / Industry Activities

Certified Public Accountant

AGIS Grid Modernization Requirements - 2019

Planning Objectives: The Commission is facilitating comprehensive, coordinated, transparent, integrated distribution plans to: <ul style="list-style-type: none"> · Maintain and enhance the safety, security, reliability, and resilience of the electricity grid, at fair and reasonable costs, consistent with the state's energy policies; · Enable greater customer engagement, empowerment, and options for energy services; · Move toward the creation of efficient, cost-effective, accessible grid platforms for new products, new services, and opportunities for adoption of new distributed technologies; and, · Ensure optimized utilization of electricity grid assets and resources to minimize total system costs. · Provide the Commission with the information necessary to understand Xcel's short-term and long-term distribution system plans, the costs and benefits of specific investments, and a comprehensive analysis of ratepayer cost and value. 			
Source	Requirement/Description	IDP	Rate Case: AGIS
Docket No. E002/CI-18-251 Aug. 30, 2018 Order (Updated to include changes from Jul 16, 2019 Order)	A. Baseline Distribution System and Financial Data: Financial Data		
	26. Historical distribution system spending for the past 5-years, in each category:		
	a. Age-Related Replacements and Asset Renewal b. System Expansion or Upgrades for Capacity c. System Expansion or Upgrades for Reliability and Power Quality d. New Customer Projects and New Revenue e. Grid Modernization and Pilot Projects f. Projects related to local (or other) government-requirements g. Metering h. Other	IDP II (C)	Addressed in IDP
	28. Projected distribution system spending for 5-years into the future for the categories listed above, itemizing any non-traditional distribution projects	IDP II (C)	Gersack II(C) AGIS Expenditures 2020-2029 Gersack V(D)(2) AGIS PM Costs 2020-2029 Bloch V(A) AGIS - Distribuion 2020-2029 Bloch V(D)(5) AMI - Distribution 2020-2029 Bloch V(E)(3) FAN - Distribution 2020-2029 Bloch V(F)(6) FLISR - Distribution 2020-2029 Bloch V(G)(7) IVVO - Distribution 2020-2029 Harkness V(E)(3)(c)(4) AMI - IT 2020-2029 Harkness V(E)(4)(e)(4) FAN - IT 2020-2029 Harkness V(E)(5)(c) FLISR - IT 2020-2029 Harkness V(E)(6)(c) IVVO - IT 2020-2029 Harkness V(E)(7) AGIS - IT 2020-2029 Duggirala Schedules 2, 3, 4
	29. Planned distribution capital projects, including drivers for the project, timeline for improvement, summary of anticipated changes in historic spending. Driver categories should include:		
a. Age-Related Replacements and Asset Renewal b. System Expansion or Upgrades for Capacity c. System Expansion or Upgrades for Reliability and Power Quality d. New Customer Projects and New Revenue e. Grid Modernization and Pilot Projects f. Projects related to local (or other) government-requirements g. Metering h. Other	IDP II (C) and Attachments F1 nd G1	Gersack II(B) Exec Summary - Drivers Gersack IV Drivers of AGIS Strategy Gersack II(C) Exec Summary - Implementation Gersack V(A) Component Implementaion Gersack V(B) Overall Timeline/Implementation Bloch V(A) Projects and Timeline Block V(B) Drivers (Limitations of System) Bloch V(D) AMI Bloch V(E) FAN Bloch V(F) FLISR Bloch V(G) IVVO Harkness V(B)(E) AGIS Overview Harkness V(E)(3) AMI Harkness V(E)(4) FAN Harkness V(E)(5) FLISR Harkness V(E)(6) IVVO	
30. Provide any available cost benefit analysis in which the company evaluated a non-traditional distribution system solution to either a capital or operating upgrade or replacement	IDP VI and Attachment H	Addressed in IDP	

Source	Requirement/Description	IDP	Rate Case: AGIS
Docket No. E002/CI-18-251 Aug. 30, 2018 Order (Updated to include changes from Jul 16, 2019 Order)	D. Long-Term Distribution System Modernization and Infrastructure Investment Plan	IDP XIV	Gersack II Exec Summary Gersack IV Drivers of AGIS Strategy Gersack V AGIS Components and Implementation Gersack VI Customer Experience
	2. Xcel shall provide a 5-year Action Plan as part of a 10-year long-term plan for distribution system developments and investments in grid modernization based on internal business plans and considering the insights gained from the DER futures analysis, hosting capacity analysis, and non-wires alternatives analysis. The 5-year Action Plan should include a detailed discussion of the underlying assumptions (including load growth assumptions) and the costs of distribution system investments planned for the next 5-years (expanding on topics and categories listed above). Xcel should include specifics of the 5-year Action Plan investments. Topics that should be discussed, as appropriate, include at a minimum:		
	· Overview of investment plan: scope, timing, and cost recovery mechanism	IDP II, IX and XIV and Addressed in Rate Case	Gersack II Exec Summary
	· Grid Architecture: Description of steps planned to modernize the utility's grid and tools to help understand the complex interactions that exist in the present and possible future grid scenarios and what utility and customer benefits that could or will arise.	IDP XIV and Addressed in Rate Case	Gersack V AGIS Components and Implementation Bloch V(D) AMI Bloch V(E) FAN Bloch V(F) FLISR Bloch V(G) IVVO Harkness V(E)(3) AMI Harkness V(E)(4) FAN Harkness V(E)(5) FLISR Harkness V(E)(6) IVVO Harkness V(D) Cyber Security Cardenas V(F) Quantifiable Benefits Gersack VI Customer Experience (Benefits)
	· Alternatives analysis of investment proposal: objectives intended with a project, general grid modernization investments considered, alternative cost and functionality analysis (both for the utility and the customer), implementation order options, and considerations made in pursuit of short-term investments. The analysis should be sufficient enough to justify and explain the investment.	Addressed in Rate Case	Gersack V(C) Alternatives to AGIS Bloch V(D)(6) AMI Alternatives Bloch V(F)(7) FLISR Alternatives Bloch V(G)(6) IVVO Alternatives Harkness V(E)(4)(g) FAN Alternatives
	· System interoperability and communications strategy	IDP IX, X and Addressed in Rate Case	Bloch V(D)(7) AMI Interoperability Bloch V(F)(8) FLISR Interoperability Bloch V(G)(7) IVVO Interoperability Harkness V(E)(4) FAN Overview Harkness V(E)(4)(b) FAN Interoperability Harkness V(E)(3)(b) AMI Integration
	· Costs and plans associated with obtaining system data (EE load shapes, PV output profiles with and without battery storage, capacity impacts of DR combined with EE, EV charging profiles, etc.)	IDP XI (F)	Addressed in IDP
	· Interplay of investment with other utility programs (effects on existing utility programs such as demand response, efficiency projects, etc.)	Addressed in Rate Case	Gersack VI(B)(4) Energy Savings Programs
	· Customer anticipated benefit and cost	Addressed in Rate Case	Gersack VII Prudence of AGIS Investments (CBA) Duggirala Overall CBA Costs, Benefits, Results Gersack VIII Bill Impacts <i>Costs and Benefits are also discussed throughout Bloch V (AGIS), Harkness V (AGIS), and Cardenas V (AGIS)</i>
	· Customer data and grid data management plan (how it is planned to be used and/or shared with customers and/or third parties)	Addressed in Rate Case	Gersack VI Customer Experience (overall) Gersack VI(B)(3) Digital Experience (web portal) Gersack Schedule 3 Customer Strategy (Appendix B: Data Access, Privacy, Governance) Harkness V(D) Cyber Security
	· Plans to manage rate or bill impacts, if any	IDP IX and Addressed in Rate Case	Gersack VIII Bill Impacts
· Impacts to net present value of system costs (in NPV RR/MWh or MW)	IDP XIV and Attachment L	Addressed in IDP	

Source	Requirement/Description	IDP	Rate Case: AGIS
<p>Docket No. E002/CI-18-251 Aug. 30, 2018 Order (Updated to include changes from Jul 16, 2019 Order)</p>	<p>· For each grid modernization project in its 5-year Action Plan, Xcel should provide a cost-benefit analysis based on the best information it has at the time and including a discussion of non-quantifiable benefits. Xcel shall include all information used to support its analysis.</p>	<p>IDP IX and Addressed in Rate Case</p>	<p>Gersack VII(A) CBA Gersack VII(B) Qualitative Benefits Duggirala II(B) Quantitative Inputs Duggirala II(C) Results Duggirala IV Qualitative Benefits</p>
	<p>· Status of any existing pilots or potential for new opportunities for grid modernization pilots</p>	<p>IDP XIII</p>	<p>Gersack III Grid Mod Background (Res TOU Pilot) Gersack IV(C)(2) Advanced Rate Design/Billing Options</p>
	<p>3. In addition to the 5-year Action Plan, Xcel shall provide a discussion of its vision for the planning, development, and use of the distribution system over the next 10 years. The 10-year Long-Term Plan discussion should address long-term assumptions (including load growth assumptions), the long-term impact of the 5-year Action Plan investments, what changes are necessary to incorporate DER into future planning processes based on the DER futures analysis, and any other types of changes that may need to take place in the tools and processes Xcel is currently using.</p>	<p>IDP XIV and Addressed in Rate Case</p>	<p>Gersack II Exec Summary Gersack V AGIS Implementation Gersack VI(D) Customer Experience (Long Term) Bloch D(4)(d)(1) AMI Benefits (DER) Bloch G(4)(b) IVVO Benefits (DER)</p>
<p>Docket No. E002/CI-18-251 July 16, 2019 Order</p>	<p>8. Provide all information, analysis and assumptions used to support the cost/benefit ratio for AMI, FAN, and FLISR; and IVVO and CVR cost-benefit analysis as part of its 2019 IDP filing or other future filings.</p>	<p>IDP IX (F) and Addressed in Rate Case</p>	<p>Duggirala Overall - CBA testimony points to the other witnesses who provide detailed cost and benefit forecasts.</p>
<p>Docket No. E002/M-17-797 Sept. 27, 2019 Order</p>	<p>9. If and when Xcel requests cost recovery for Advanced Grid Intelligence and Security investments, the filing must include a business case and comprehensive assessment of qualitative and quantitative benefits to customers, considering, at a minimum, the following:</p>	<p>IDP IX and Addressed in Rate Case</p>	<p>Gersack II Exec Summary Gersack III Grid Mod Background Gersack IV(D) Commission Policy and Stakeholder Input Gersack V(A) AGIS Components Gersack V(B) Overall Implementation Gersack VII(A) CBA Quantified Benefits Gersack VII(B) Qualitative Benefits Bloch V(D) AMI Bloch V(E) FAN Bloch V(F) FLISR Bloch V(G) IVVO Harkness V(E)(3) AMI Harkness V(E)(4) FAN Harkness V(E)(5) FLISR Harkness V(E)(6) IVVO</p>
	<p>A. Scope of Investment</p>		
	<p>1. Investment Description</p>		
	<p>a. Detailed description of proposed investment and project life</p>		
	<p>b. If multiple components, overview of costs and descriptions of each</p>		
	<p>i. Include purpose and role</p>		
	<p>ii. Explain known and potential future use cases for each component</p>		
	<p>iii. Explain known and potential value streams and how each component fits with state policy, statutes, rules and Commission orders</p>		
	<p>iv. Describe beneficiaries of each investment (who, how many, over what time period)</p>		
	<p>c. Articulation of principles, objectives, capability, functionalities, and technologies enabled by investment; and</p>		
<p>d. Interrelation and interdependencies with other existing or future investments, including overlapping costs: scope, amount, timing.</p>			
<p>2. Alternatives considered</p>	<p>Addressed in Rate Case</p>	<p>Gersack V(C) Alternatives to AGIS Bloch V(D)(5) AMI Cost Development (RFP discussion) Bloch V(D)(6) AMI Alternatives Bloch V(F)(6) FLISR Cost Development Bloch V(F)(7) FLISR Alternatives Bloch V(G)(5) IVVO Cost Development Bloch V(G)(6) IVVO Alternatives Harkness V(E)(4)(e) FAN Cost Development Harkness V(E)(4)(g) FAN Alternatives AGIS Supporting files, Vol. 2B (on disc)</p>	
<p>a. If a Request for Proposal was used provide:</p>			
<p>i. The RFP issued, including list of all services or assets scoped in the RFP</p>			
<p>ii. Provide summary of responses</p>			
<p>iii. Provide assessment of bids and factors used for selection</p>			
<p>iv. The scope of offerings or services included in the selected bid</p>			
<p>b. If not, what was used.</p>			
<p>3. Costs</p>	<p>IDP IX and Addressed in Rate Case</p>	<p>Duggirala II(A) Model Structure and Requirements Duggirala Schedules 2, 3, 4, 5</p>	
<p>a. Provide sufficient information to determine what is included in the investment in each of the following categories:</p>			
<p>i. Direct Costs (product, service, customer, project, or activity)</p>			
<p>ii. Indirect Costs</p>			
<p>iii. Tangible Costs</p>			
<p>iv. Intangible Costs</p>			
<p>v. Real Costs</p>			
<p>b. If needed, provide the utility's definition of each category and whether internal or external labor costs are included in the category and the instant petition. If the costs are not included in the petition, include information on where and when those costs will be sought to be recovered.</p>	<p>Addressed in Rate Case</p>	<p>Duggirala II(A) Model Structure and Requirements</p>	
<p>c. If there is overlap or costs included in both categories, outline the overlapping costs and explain.</p>	<p>Addressed in Rate Case</p>	<p>Duggirala II(A) Model Structure and Requirements Duggirala Schedules 2, 3, 4, 5</p>	
<p>d. For each of the cost categories outline whether the investment has been partially approved or included in previous or on-going docket riders, rate cases, or other cost recovery mechanisms or note all costs are included in the instant petition.</p>	<p>IDP II (C)</p>	<p>Gersack II(C) Exec Summary - AGIS Implementation Gersack III Grid Mod Background Bloch V(C) Grid Mod Efforts to Date Harkness V(E)(2) Grid Mod Efforts to Date</p>	

Source	Requirement/Description	IDP	Rate Case: AGIS
Docket No. E002/M-17-797 Sept. 27, 2019 Order	4. Detailed Analysis of the type of proposed or multiple cost effectiveness analysis utilized: a. Least-cost, best-fit (Xcel proposes in IDP Reply comments) b. Utility Cost-test; and c. Integrated Power System and Societal Cost test	Addressed in Rate Case	Duggirala III
	B. Provide a cost benefit analysis for (1) each investment component with overlapping costs or benefits in isolation and (2) each bundled components, as appropriate	IDP IX and Addressed in Rate Case	Duggirala II(C) CBA Results AGIS Supporting files, Vol. 2B (on disc) Gersack VII(A)(1) CBA Overview
	1. Provide Discount Rate Used and Basis; and	Addressed in Rate Case	Duggirala II(A) Model Structure and Requirements
	2. Identify cost categories and benefit categories used (explain metrics), including an explanation of how benefits can be monitored over time and proposal for reporting to Commission:	Addressed in Rate Case	Duggirala II(B) Quantitative Inputs Gersack IX Metrics and Reporting
	a. Identify quantitative costs and qualitative costs: i. Use quantitative methods to address qualitative benefits to the extent possible. ii. Explain system used to assess value and priorities to qualitative benefits (points and/or weighting); and iii. Identify sensitivity ranges on estimates or value	Addressed in Rate Case	Duggirala Overall CBA Costs, Benefits, Results
	b. Include a long-term bill impact analysis	IDP IX and Addressed in Rate Case	Gersack VIII Bill Impacts
	c. Include a reference case/scenario without the project (or group of projects); and	IDP IX and Addressed in Rate Case	Duggirala II(A) Model Structure and Requirements Gersack VIII Bill Impacts
	d. Apply the following principles to ensure the investment analysis has: i. compared with traditional resources or technologies; ii. clearly accounted for state regulatory and policy goals; iii. accounted for all relevant costs and benefits, including those difficult to quantify; iv. provided symmetry across relevant costs and benefits; v. applied a full life-cycle analysis; vi. provided a sufficient incremental and forward-looking view; vii. is transparent; viii. avoided combining or conflating different costs and benefits; ix. discuss customer equity issues, as needed; x. assessed bundles and portfolio where reasonable; and xi. addressed locational and temporal values.	Addressed in Rate Case	<i>The Company has incorporated these principles throughout its analyses, including:</i> Gersack V AGIS Components and Implementation Bloch V(D) AMI Bloch V(E) FAN Bloch V(F) FLISR Bloch V(G) IVVO Harkness V(E)(3) AMI Harkness V(E)(4) FAN Harkness V(E)(5) FLISR Harkness V(E)(6) IVVO Cardenas V(F) Quantifiable Benefits Gersack VI Customer Experience (Benefits) Duggirala Overall CBA Costs, Benefits, Results

ADVANCED GRID CUSTOMER STRATEGY



NOVEMBER 2019



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EXECUTIVE SUMMARY

The electric utility industry is in a time of significant change. Increasing customer expectations and technological advances have reshaped what customers expect from their energy service provider, and how those services are delivered. Technologies that customers can use to control their energy usage, such as smart thermostats, electric vehicle (EV) chargers, smart home devices, and even smart phones, are evolving at a fast rate. Influenced by other services, customers have come to expect more now from their energy providers than in the past, including greater choices and levels of service, as well as greater control over their energy sources and their energy use.

At the same time, major industry technological advances provide new capabilities for utility providers to manage the electric distribution grid and service to customers. Electric meters are now equipped to gather more detailed information about customer energy usage, which utilities can leverage to help customers better understand and manage their usage. Other advanced equipment on the grid can sense, communicate, and respond in real time to circumstances that would normally result in power outages. Grid operators can also get improved data to better and more proactively plan and operate the grid. These advancements form the foundation for a flexible grid environment that helps support two-way power flows from customer-connected devices or generating resources (such as rooftop solar) and provides utilities with a greater ability to adapt to future developments.

Xcel Energy has a 100-year track record of outstanding service to our customers and communities – delivering safe, reliable and affordable energy. At our core, is keeping the lights on for our customers, safely and affordably. We are also planning for the future – and have a vision for where we and our customers want the grid to go. We are taking a measured and thoughtful approach to ensure our customers receive the greatest value, and that the fundamentals of our distribution business remain sound.

Today, Xcel Energy customers have access to a multitude of energy efficiency and demand management programs, renewable energy choices, billing options, a mobile app, and outage notifications that include estimated restoration times. Customers also receive confirmations when our records reflect that the outages have been resolved – and they receive these via their preferred communication channel – text, email, or phone. We have made advances on our grid and with the service we offer our customers – and these and other products and services have provided our customers with significant value over many years.

However, technologies are advancing, as are customer expectations. Customers want access to actionable information, more choice and greater control of their energy use – and they expect a smarter, simpler and more seamless experience. Enhancing the customer experience is critically important, and is one of our three strategic priorities, along with leading the clean energy transition and keeping bills low. We plan to integrate modern customer experience strategies with advanced grid platforms and technologies to enable intelligent grid operations, smarter networks and meters, and optimized products and services for our customers.

While we have made incremental modernization efforts on the distribution system over many years, the time is now to begin a more significant advancement of the grid. This modernization begins with foundational advanced grid initiatives that both provide immediate benefits and new customer offerings while also enabling future systems and customer value. The foundational investments in our AGIS initiative include:

- *Advanced Distribution Management System (ADMS)*. A real-time operating system that enables enhanced visibility into the distribution power grid and controls advanced field devices.

- *Field Area Network (FAN)*. A private, secure two-way communication network that provides wireless communications across Xcel Energy’s service area – to, from, and among, field devices and our information systems.
- *Advanced Metering Infrastructure (AMI)*. AMI is an integrated system of advanced meters, communication networks, and data processing and management systems that enables secure two-way communication between Xcel Energy Energy’s business and operational data systems and customer meters.
- *Fault Location, Isolation, and Service Restoration (FLISR)*. A form of distribution automation that involves the deployment of automated switching devices that work to detect issues on our system, isolate them, and restore power thereby decreasing the duration of and number of customers affected an outage.
- *Integrated Volt VAr Optimization (IVVO)*. An application that uses selected field devices to decrease system losses and optimize voltage as power travels from substations to customers.

We are taking a measured and thoughtful approach to advancing the grid to ensure our customers receive the greatest value, the fundamentals of our distribution business remain sound, and we maintain the flexibility needed as technology and our customers’ expectations continue to evolve.

A. Customer Strategy

This multi-year initiative aims to transform the customer experience by implementing capabilities, technologies, and program management strategies to enable the best-in-class customer experience that our customers now expect. Our customer strategy is focused on shifting the customer experience dynamic to one where little action is required from customers around their basic service and where we offer personalized “packages” that customers can select from to meet their needs – similar to what customers experience when purchasing cable and internet services today. These packages may include options such as demand-side management, renewable energy, rate design, and non-energy services.

Figure 1. Customer Strategy Informed by Customer Expectations



Our implementation of the Advanced Distribution Management System in early 2020 is preparing the grid for increasing levels of DER. It is also paving the way for further grid advancement with Advanced Metering Infrastructure and our ability to leverage the underlying and necessary Field Area Network to reduce customers’ energy costs through Integrated Volt-Var Optimization, improve customers’ reliability experience through Fault Location Isolation and Service Restoration, and more.

Customers will have access to granular energy usage data from our AMI through a customer portal, which we expect to pair with informed insights and helpful tips on how to change their behavior to save energy. Further, the AMI we propose includes a Distributed Intelligence platform, which provides a computer at each customer’s home that can “connect” usage information from the customer’s appliances for further insights – and be updated with new

software applications, much like customers can currently update their mobile devices with applications.

Figure 2. Customer Value through Lifecycle

	Awareness	Start/Stop/Transfer	Billing & Payments	Ongoing Use	Support & Service	Lifestyle & Lifestyle
What do customers expect?	A trusted, responsible source helping customers learn more about environmental initiatives, energy programs and regulations	An intuitive, frictionless experience that doesn't contribute to the stress of moving	Flexibility and options (i.e., variety of payment methods), transparency around monthly costs	Monthly usage insights allowing customers to manage costs; a robust offering of energy efficiency programs aligned to customers' interests	Increased visibility during electric outages and delivery of other services; a service organization that advocates for the customer	A go-to resource for information and solutions regarding renewable energy and smart homes Energy management technology
Examples	AGIS Enabled Experience Integrated communication plan across channels and timeline.	Remote Connect / Disconnect Real-time meter reads	Bill forecasting Bill prepayment	High bill alerts Energy usage goals TOU alerts Disaggregation	Outage ERT accuracy Arch detection	Distributed Energy Resources Home automation/remote monitoring
Customer Value	A feeling of comfort with the changes and timely and relevant communications.	Avoid gaps in service Easier moving experience	Increased bill predictability. Payment flexibility. Better understanding of their monthly bill.	Timely alerts and messages to guide their energy use and add predictability to their bill.	More timely and accurate ERT messages. Predictable home health and safety.	EV, Battery, Solar installation readiness and reduced friction Control over usage in the home.
Business Value	Customer satisfaction Reduced call volume	Reduced truck rolls Accurate meter reads Reduced call volume	Customer satisfaction Reduced B&P call volume	Customer satisfaction Energy savings More predictable load	Customer satisfaction Reliability Reduced call volume	Customer satisfaction Reliability

During this transition to the advanced grid, we will take exceptional care of our customers to educate, inform, and ensure a smooth implementation. We are already developing processes that will ensure accurate, timely bills as customers change over to AMI. We are also developing dedicated, hands-on customer care processes that will provide our customers a single point of contact during implementation – and that will phase customer communications relative to our geographic deployment of AMI meter installation. Meter deployment and advanced meter capabilities will be phased in over the next several years, communications strategies, messages and tactics will be executed in three phases to match the customer journey.

Figure 3. Customer Communications Journey Phases



For example, our customer communications will begin pre-implementation to educate on the possibilities enabled by AMI, as well as customers' ability to opt-out of an AMI meter. As the AMI installation date gets closer, we will inform customers about what to expect with the AMI meter changeover at their homes or businesses. Finally, we will communicate post-AMI installation to reinforce early AMI messaging regarding possibilities and options – also providing practical steps to take advantage of the customer portal or other new or enhanced services available day one.

B. Customer Research

To develop the customer strategy, Xcel Energy committed to understanding customers' preferences, considerations, and thoughts regarding the benefits and value of an advanced grid investment. We gathered this information through primary research, such as focus groups and surveys. We also supplemented our research with information from secondary sources including the Smart Energy Consumer Collaborative, and GTM Research and other utilities' advanced grid plans.

Our key takeaways from these sources are as follows:

- *Consumers care more about technology and enabling improvements than process.* Safety and energy savings rated most highly.
- *Addressing service interruptions are important to all customer classes.* Improved reliability will allow the Company to focus more on other customer priorities.
- *Customers expect that service interruptions will be less frequent in scope and duration.*
- *Customers expect to receive detailed information from their utility.* They expect this information to be personal and frequent.
- *Customers expect more tools and information for them to make decisions about their energy usage.* Customers indicated more information allowed them to better identify opportunities and strategies to save energy and reduce their costs.
- *Business customers have more awareness and familiarity with advanced rate designs.* Residential customers expect the utility to provide them with rate comparison tools and information about new rate designs.
- *Building trust is a key component to unlocking value.* Trust is best built by identifying solutions and showing results specific to the customers
- *Customers expect that there will be a cost associated with the advanced meter but that the meter will also provide benefits over time.*

We have incorporated customer feedback and insights into our customer transition and communication plans – and the work we are doing to develop new and enhanced products and services as enabled by the advanced grid.

C. Advanced Grid Initiative

Fundamentally, we must act to replace our current Automated Meter Reading (AMR) service because our current vendor is sun-setting its AMR technology in the mid-2020s. While this system has provided value to customers for many years through efficient meter reading, we have an opportunity now to seize AMI technologies that are becoming available to maximize value for our customers. As we deploy advanced grid infrastructure, platforms, and technologies we expect three outcomes: (1) a transformed customer experience, (2) improved core operations, and (3) facilitation of future capabilities, which we discuss below.

Transformed customer experience. Our planned advanced grid investments combine to provide greater visibility and insight into customer consumption and behavior. We will use this information to transform the customer experience through new programs and service offerings, engaging digital experiences, enhanced billing and rate options, and timely outage communications.

We will offer options that give customers greater convenience and control to save money, provide access to rates and billing options that suit their budgets and lifestyles, and provide more personalized and actionable communications. As our system more efficiently manages energy flows, we can save customers money by reducing line losses and conserving energy. Smarter meters will be the platform that enables smarter products and services and contributes to improved reliability for our customers. Our customers will have more information to make more effective decisions on their energy use.

We will know more about our customers and our grid – and we will use that information to make more effective recommendations and decisions and continually use new information to develop new solutions. This will serve to help keep our bills low, as customers save money through both their actions and ours. It will also help ensure that our transition to a carbon-free system occurs efficiently – and harnesses the vast potential of all energy resources, from utility-scale to local distributed generation.

Improved core operations and capabilities. Smarter networks will form the backbone of our operations, and our investments will more efficiently and effectively deliver the safe and reliable electricity that our customers expect. We will have the capability to communicate two ways with our meters and other grid devices, sending and receiving information over a secure and reliable network in near-real time.

Our current service is reliable; however, we need to continue to invest in new technologies to maintain performance in the top third of U.S. utilities, particularly as we deliver power from more diverse and distributed resources and as industry standards continue to improve. Our advanced grid investments provide the platform and capabilities to manage the complexities of a more dynamic electric grid through additional monitoring, control, analytics and automation.

Our systems will more efficiently and effectively restore power when outages do occur using automation without the need for human intervention. For those outages that cannot be restored through automation, our systems will be better at identifying where the outage is and what caused it – benefitting customers through less frequent, shorter, and less impactful outages; more effective communication from the Company when they are impacted by an outage; and reduced costs from our more efficient use and management of assets.

Facilitation of future capabilities. The backbone of our investments will also support new developments in smart products and services; in the short term by supporting the display of more frequent energy usage data through the customer portal – and over the long term, allowing for the implementation of more advanced price signals. Designing for interoperability enables a cost-effective approach to technology investments and means we can extend our communications to more grid technologies, customer devices, and third-party systems in a stepwise fashion, which unlocks new offerings and benefits that build on one another. We have planned our advanced grid investments in a building block approach, starting with the foundational systems, in alignment with industry standards and frameworks. By doing so, we sequence the investments to yield the greatest near- and long-term customer value, while preserving the flexibility to adapt to the evolving customer and technology landscape. By adhering to industry standards and designing for interoperability, we are well positioned to adapt to these changes as the needs of our customers and grid evolve.

In planning our advanced grid initiative, we have considered the long-term potential of our ability to meet our obligations to serve and our customers' expectations and needs – ensuring we extract cost-effective value from our investments and remain nimble enough to react to a dynamically changing landscape. The principles we applied to our advanced grid planning include the ability to remotely update hardware and software, security and reliability, and flexible, standards-based service components. We are planning our grid advancement with the future in mind, and to provide both immediate and increasing value for our customers over the long-term.

We are on the forefront of many of the issues and changes underway in the industry and have developed our advanced grid initiative and our customer strategy to address them and harness value for our customers. In addition to transforming the customer experience, these foundational investments will allow us to advance our technical abilities to deliver reliable, safe, and resilient energy that customers value. These foundational investments also lay the groundwork for later years. The secure, resilient communication networks and controllable field devices deployed today through these investments will become more valuable in the future as additional sensors and customer technologies are integrated and coordinated.

Now is the time to modernize the interface where we connect directly with our customers – the distribution system. Technologies have evolved and matured; our peers have successfully implemented these technologies; and, the industry landscape is evolving. We must ensure our system has the necessary capabilities to meet our customers' expectations and needs – and, the flexibility to adapt to an uncertain future.

D. Reporting Metrics

Recognizing the significant investment that the advanced grid initiative requires as well as the fact that we are the first utility in Minnesota to take on this holistic effort, we propose to report on several metrics. These metrics will not only help measure the success of or areas of improvement within the advanced grid initiative, they will also provide progress reports to the Commission and share information and learnings with stakeholders. The proposed metrics are defined in four categories:

1. *Customer Awareness* – measuring the effectiveness of the communications on educating customers about the advanced grid and the potential benefits it entails.
2. *Customer Engagement* – measuring the adoption rates of customers in new products and services that are enabled or enhanced by the advanced grid.
3. *Customer Satisfaction* – measuring how satisfied customers are with the deployment or and services associated with the advanced grid.
4. *System Benefits* – measuring the energy savings benefits associated with products and services enabled or enhanced by the advanced grid.

Reporting of these metrics can keep stakeholders informed of the progress and value that the advanced grid is bringing to customers and also identify areas where Xcel Energy can focus additional resources to improve results. Each metric would have a specific baseline in a steady state. The steady state would occur within 1-2 years of the completion of mass deployment of advanced meters.

E. Conclusion

Xcel Energy's advanced grid initiative supports our vision of a customer experience where customers' needs and preferences are met and the customer effort level is low. We understand what our customers expect and will deliver on those expectations with a seamless experience that both improves their comfort and satisfaction while reducing costs and improving the efficiency of the entire system.

I. INTRODUCTION

Xcel Energy has a 100-year track record of outstanding service to our customers and communities – delivering safe, reliable and affordable energy. Currently, Xcel Energy customers have access to a state-of-the-art storm center, approximately 40 different energy efficiency and demand management programs, multiple renewable energy choices, billing options such as Average Monthly Payment, and a customer portal – MyAccount – that provides them digital access to their energy usage, energy savings recommendations, and benchmarking comparisons with similar customers. We also provide customers with outage notifications that include estimated restoration times – and confirmations when the Company’s information reflects that the outages have been resolved. These have provided our customers with significant value over many years.

However, technologies are advancing, as are customer expectations. While we have done a great job meeting our customers’ needs over time by maximizing the value of our existing infrastructure and technologies – customers want access to more actionable information, more choice and greater control of their energy use – and they expect a smarter, simpler and more seamless experience. Today, connected devices, such as Wi-Fi thermostats, Amazon’s Alexa, and Google Home are becoming more prevalent in customer homes – influencing their perceptions about the ease of getting information conducting transactions. Distributed energy resources (DER) are becoming more cost-effective for customers – and forecasts indicate the potential for rapid growth in electric vehicles and home energy management systems. While there are no guarantees that these forecasts will be realized or that customers see promise in the potential value these technologies may unlock, we expect and want to play a role in spurring adopting of these technologies and ensuring their value is realized. We also look to these technologies to shape the way that we provide service to our customers.

Enhancing the customer experience is critically important, and is one of our three strategic priorities, along with leading the clean energy transition and keeping bills low. We plan to integrate modern customer experience strategies with advanced grid platforms and technologies to enable intelligent grid operations, smarter networks and meters, and optimized products and services for our customers. Combining enhanced experiences with smarter capabilities is a powerful and winning combination for the customers and communities we serve.

Now is the time to modernize the interface where we connect directly with our customers – the distribution system. Technologies have evolved and matured; our peers have successfully implemented these technologies; and, the industry landscape is evolving. We must ensure our system has the necessary capabilities to meet our customers’ expectations and needs – and, the flexibility to adapt to an uncertain future.

II. ADVANCED GRID CUSTOMER STRATEGY

More than a century after the introduction of commercial electricity, the electricity grid and the role of the utility are being reimagined. We are on the cusp of advancing our grid with investments in the things that customers truly value. These investments will allow us to provide comprehensive and customized energy solutions that will help bring about the flexible, distributed, consumer-driven energy system of the future. While we have been incrementally advancing the grid over time, we are poised to embark and intend to complete a transformational set of investments in concert with our over 3 million Upper Midwest customers over the next five years.

Our advanced grid investments will provide the foundation for new products and services or the enhancement of existing products and services. These investments include a communications backbone that will allow us to transmit data to and from advanced meters at every customer's home or business in near real time. We will have more information about customer energy usage that will improve the quality and accuracy of our product and service recommendations. We will build this data into digital experience channels to provide customers with more timely and accurate information about their energy usage. These experiences will drive increased satisfaction and savings for customers as they have better information and as our recommendations become more relevant and actionable. Customers will feel like Xcel Energy is a partner in their energy usage – not just a provider.

The advanced meters we will implement will provide a distributed intelligence platform that is essentially a “computer” at customers' homes and businesses. This computer uses a Linux-based operating system to conduct localized, at the meter computing, analysis, and data processing that provide customers with new tools to help manage their energy usage and provide Xcel Energy with new tools to manage the grid more efficiently.

Automated sensors and controls on the grid will use the advanced grid communications backbone to smooth out the voltage and avert outages for some customers and shorten outages for others. We will delight our customers by knowing and acting without them having to call or take any other action when they lose power. The number of sensors and devices in the field will allow the Company an unprecedented level of information to continually monitor and adjust what will be a dynamic system that includes increasing amounts of distributed energy resources and electric technologies. We will have more information about our distribution grid that will improve our planning and operations – driving efficiencies, lowering costs, providing better service, and increasing customer satisfaction.

A. Customer Strategy

If we want to ensure that our customers benefit from the greater value and opportunity presented by an increasingly complex and challenging energy system, we know we must move away from the traditional one-directional customer relationship. We must instead operate in partnership with customers.

We aspire to be the preferred, trusted provider for our customers by delivering low-cost and reliable electricity and innovative, energy-efficient solutions. We understand that placing the customer at the center of everything we do is vital to the successful realization of the future electric system. Our strategy is therefore focused on shifting the customer experience dynamic to one where little action is required from customers around their basic service – and where we offer personalized “packages” that include options and opportunities in areas such as energy savings and renewable energy, lifestyle-oriented rate designs, and non-energy services – to meet individualized needs and wants.

With the impending introduction of advanced meters, greater system data availability and energy technologies, customers can increasingly decide when and how to consume electricity. Many customer experience improvements will come through foundational

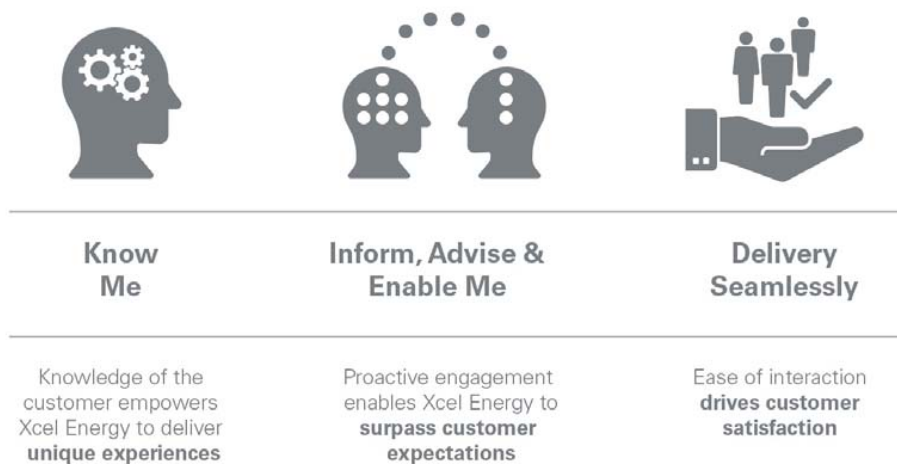
changes to our processes and technology – and our investment in the advanced grid will play a critical role in helping us meet our customers’ expectations throughout their Xcel Energy journey.

Our advanced grid strategy is driven by our strategic priorities:

- Enhance the customer experience;
- Keep bills low; and
- Lead the clean energy transition.

These strategic priorities are driven by our customers’ expectations which are informed by the routine experiences they have outside of the relationship with their energy provider. These customer expectations shape our guiding principles creating the future customer experience:

Figure 4. Customer Experience Guiding Principles



With the advanced grid, there are significant possibilities for Xcel Energy and its customers, but there are also unknowns. Our vision is that the long-term customer experience is one where customers’ needs and preferences are met, and that the level of effort our customers need to take is low. We will understand what our customers expect and deliver on those expectations with a seamless experience that improves their comfort and happiness, while reducing costs and improving the efficiency of the entire system. We discuss our customer research in more detail below.

Through innovation, we will provide our customers with data-driven insights that help identify and deliver the best options, and we will work in collaboration to give them greater control to support their energy goals. We will make this easy by focusing on outcomes, responding with speed, and utilizing digital tools to improve the customer journey experience.

Our commitment to the customer experience is not just an evolution of the current experience. In all of our interactions, we are relying on our broad and in-depth customer research to better understand customer needs, preferences, and expectations and then develop the appropriate processes, products and services, and experiences needed to satisfy those expectations. The following section reviews the research we have done related to customer interest in and knowledge and awareness of advanced meters and the benefits of the advanced grid.

B. Customer Research

To develop our customer strategy, we gathered information about customers' considerations, preferences, and thoughts through primary research such as focus groups and surveys. We also supplemented this research with insights from secondary sources, such as the Smart Energy Consumer Collaborative, GTM Research, and other utilities' advanced grid plans.

Our key takeaways from these sources are as follows:

- *Consumers care more about their technology and enabling improvements from the advanced grid than process.* Safety and energy savings rated most highly. Customers have strong feelings about the cost of the advantages available through advanced meters.
- *Addressing service interruptions is important to all customer classes.* Improved reliability will allow the Company to focus more on other customer priorities.
- *Customers expect that service interruptions will be less frequent and of shorter duration.*
- *Customers expect to receive detailed information from their utility.* They expect this information to be personal and frequent.
- *Customers expect more tools and information for them to make decisions about their energy usage.* Customers indicated more information allowed them to better identify opportunities and strategies to save energy and reduce their costs.
- *Business customers have more awareness and familiarity with advanced rate designs.* Residential customers expect the utility to provide them with rate comparison tools and information about new rate designs.
- *Building trust is a key component to unlocking value.* Trust is best built by identifying solutions and showing results specific to the customers
- *Customers understand that their rates will increase in order to cover the expense of advanced meters but expect that the benefits of the meters will result in their costs being net neutral over time.*

In terms of messaging regarding implementation, customers told us our messaging should be short, specific, and positive. Messages should focus on the benefits of the project not on the process – and begin 2-3 months in advance of any implementation, which will give customers time to conduct their own research if they want. Customers want communications through multiple channels, including those that align with their preferences (email, text, phone). Finally, communications should be clear about any customer costs associated with the installation.

1. Primary Customer Research

The following studies have helped to inform our AGIS plans and deployment.

- *Grid Edge Product Survey* – This survey was conducted in March 2019 with the intent to gauge customers' opinions and interest toward several proposed product and service concepts that may become available after AGIS deployment. Beyond testing for concept interest, willingness to purchase and price sensitivity were also observed.
- *Advanced Meter Focus Groups* – Four residential customer focus groups were held in January 2019 which the goal of capturing customer understanding, perception, and attitudes toward advanced meters, as well as to understand customer expectations of the services enabled by advanced metering. Also included in these focus groups

were learning customer preferences for communications around the deployment and implementation of new meters.

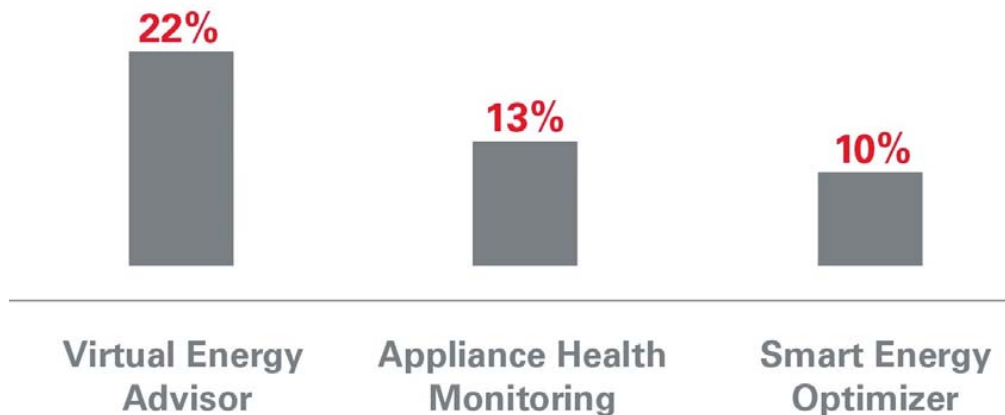
- *2018 MN Smart Meter Survey* – 500 residential and 100 business customers were surveyed in August 2017 with the objective of quantifying familiarity and perceived value of smart meters, gauging the potential value of AMI-related benefits to customers, preferences for AMI enabled data, and communications about future smart meter plans.
- *Residential Relationship Study* – The *Residential Relationship Study* has been conducted monthly since April 2018 in order to determine the pulse of Xcel Energy’s customers’ opinions and satisfaction with service. Included in the monthly survey are questions which gauge customers’ interest in new products and attitudes of and practices around energy usage.
- *Electric Residential Study* – Xcel Energy subscribes to this study, conducted by JD Power, to benchmark the company against peer utilities, to measure customer satisfaction, and to analyze data about customer electric use in their homes.

a. **Grid Edge Product Survey**

We conducted this survey focused on Xcel Energy residential customers in March 2019; we collected 5,119 survey completions, so consider these results robust. We tested multiple product concepts enabled by AMI. Of these concepts we have identified three, listed below, that we believe deliver significant customer value and help achieve our customer driven strategic priorities.

- *Appliance Health Monitoring*: A service that can help customers gain insight into the performance and health of their electric appliances. Xcel Energy would also provide a list of vendors that can offer expert advice and repair options to the subscriber.
- *Virtual Energy Advisor*: This product concept monitors energy consumption in the home via Amazon Echo or Google Home so that customers can control home appliances/electronics from anywhere.
- *Smart Energy Optimizer*: This product concept would connect to customers’ smart home devices via Amazon Echo or Google Home and manage them based on a set budget.

Figure 5. Product/Concept Interest (Top 3 Box)



Key findings of this survey include:

- The product concepts were new at the time of the survey and do not exist in any form today, so education to build awareness and willingness to subscribe is likely necessary.
- Customers under age 45 have higher interest in AMI enabled concepts that are technology driven. 39% of customers under 45 expressed top 3 box interest in a home Virtual Energy Advisor.
- There were no significant differences seen between the larger states (Minnesota and Colorado) and smaller states (Texas, New Mexico, and Wisconsin).

b. Advanced Meter Focus Groups

These focus groups were conducted in Colorado among residential customers in January 2019. In preparation for advanced meter implementation in the coming years, our objective was to understand customer expectations, attitudes, and communications preferences around advanced meters. Key findings of these focus groups include:

- Customers believe that advanced meters will help them save money through detailed, incremental usage data.
- Customers are unclear about the basic functionality of smart or advanced meters and need to be informed before new meters are implemented.
- Customers want to be made aware of advanced meter installation 2-3 months in advance through a multi-channel approach.
- Customers under age 45 prefer to seek out information on a Frequently Asked Questions (FAQ) page or through online media tools.
- A major concern for customers is the potential for increased cost to them for new meters.

c. Minnesota Smart Meter Survey

We conducted this survey in August 2018 among residential and business customers with the intent of identifying customer familiarity with smart meters, value assigned to AMI enabled benefits, and willingness to pay for those benefits. We also sought to understand customer preferences for accessing smart meter data. Key findings include:

- Residential customers value smart meter benefits for power restoration, personalized information, monetary incentives, grid automation/monitoring, and rate comparison tools.
- Awareness is low. Only 15% of residential customers state that they are familiar with smart meters.
- Willingness to pay is tied to awareness of the benefits; 13% of residential customers would be willing to make a small monthly payment to receive advanced meter benefits.
- Digital channels are preferred among residential customers for accessing their advanced meter data.
- Business customers are much more familiar with advanced meters (30%) and are more likely to be willing to pay (36%) for advanced meter benefits.

d. Xcel Energy Residential Relationship Study

This is a proprietary study conducted by Xcel Energy on a monthly basis to determine the pulse of the customer including satisfaction, attitudes, interest in new products or services. In May 2019, we added questions on grid edge products in the survey. Key findings include:

- 43% of respondents would like to be alerted when their energy usage/dollar amount is over a preset amount.
- Energy efficient products and appliances that help reduce energy usage are a popular concept: 42% of respondents currently have or use them, and 35% of respondents are interested in such products.
- Current use of Wi-Fi connected smart thermostats and smart plugs that allow Wi-Fi control of appliances or lighting is still relatively low at 14% and 8% respectively.
- 66% of respondents want to have control of their energy use when not at home.
- 34% of respondents are interested in receiving a notification through a phone app when electricity is available from renewable sources, while 4% currently have or use this type of service.
- Customers are currently lacking the tools to know why their bill may be high; 57% of respondents have the perception that their Xcel Energy bills have increased in the past three years.

e. JD Power Electric Residential Study

Xcel Energy subscribes to this study, which analyzes survey responses from utility customers around the country. JD Power surveys customers regarding their in-home electric usage, perceptions of their utility, and satisfaction their utility. Findings from year-end 2018 include:

- Xcel Energy ranked in the 2nd quartile among its peers for efforts to help manage monthly usage.
- Xcel Energy ended 2018 near the 1st quartile for keeping customers informed about an outage.
- Xcel Energy ranks at the 51st percentile in terms of providing pricing options that meet the needs of customers, which is right at threshold for 2nd quartile.
- Customers want detailed information about their monthly bills and can benefit from advanced meter data. Diagnostics from the study indicate:
 - 91% view their monthly payment amount.
 - 39% view their kilowatt hours used.
 - 27% view price per usage level.
 - 51% review their usage compared to the prior month.
 - 40% review their usage compared to the prior year.

f. Colorado Time of Use Non-Participating Customer Survey

We conducted this survey in December 2017 among customers that were only participating in a traditional rate plan. The objective of this survey was to gain insight in to how customers learn about new pricing plans and how we can improve communications around these plans. Key findings include:

- Familiarity with advanced pricing plans is low:
 - 58% of respondents reported that they would need more specific information about rate plans, including rules and guidelines.
 - 39% said they would need additional examples of practices that would help them save while on a new rate plan.
 - 27% of respondents answered that they did not know enough about new rate plans to switch from their current rate plan.

- In order to learn more about the new rate plans, 46% of respondents answered that they were likely to visit the Xcel Energy website to obtain information.

g. Minnesota Time of Use Rate Study

Similar to the TOU customer survey in Colorado, we conducted this study during the summer of 2017 with Minnesota residential customers to learn more about the level of familiarity, customer opinions, and customer attitudes regarding new rate plans. This study also took a more detailed look at customer habits and practices with energy use willingness to switch to a Time of Use rate plan. Key findings from this study include:

- 93% of respondents had tried to save money on their bills by reducing electricity use in the past; however, 61% had never tried to save money on their bills by shifting use to a different time of day.
- 31% glance at the various costs and other information on their bill; 18% spend several minutes or more reviewing their bill to further understand their costs.
- 60% of respondents either had never heard of the term “time of use rate” or had heard it but did not know what it meant.
- 43% of respondents expressed interest (top 3 box on a 10 point scale) in using less energy during the weekday peak time.
 - The most common reasons for wanting to shift usage out of peak periods was wanting to save money (61% of respondents) and wanting to help protect the environment (43% of respondents).
- Customers largely prefer to receive information about new “Peak and Off-Peak” pilot programs through email.
- Through advanced metering, the information most valued by customers was month-to-month peak usage comparisons, and proportion of on-peak vs. off-peak energy use comparisons.

h. Minnesota Time of Use Behavioral Focus Groups

These focus groups were held in May 2019 among residential customers to gain insight into current customer behavior, and potential future behavior concerning their energy usage. Key findings include:

- Customers are most willing to shift usage of appliances that have the least impact on their quality of life, such as dishwashers and laundry washers/dryers. Customers are less likely to shift energy usage of appliances that have a large impact on their quality of life.
- Most were willing to change some behavior if electric rates went up during peak times.
- Daily schedules, convenience, and comfort are the main barriers to adapting new usage patterns.
- Economic motivators are top of mind, though customers describe environmental motivators as important.
- The younger cohort had more of a tendency to acknowledge social pressures as a motivator for change.
- Third party coverage and reporting is the most trustworthy when it comes to learning about time-of-use plans.
- Online tools and savings tips should be personalized to customers to make them more actionable.

2. *Secondary and External Customer Research*

In addition to conducting primary research, we also rely on external resources to supplement advanced grid planning, which can be seen as having a larger scope since the tendency is to study a topic industry wide rather than by a single utility. Secondary and external customer research serves to provide insight from national and international research organizations and other utilities that have or are in the process of deploying advanced grid plans. We have used the following sources and insights in our advanced grid planning.

a. *E Source: E Design 2020 Small Medium Business Ethnographic Research*

E Source conducted this research in 2018 in order to help utilities understand how to better engage with small and midsize business (SMB) customers through effective programs, services and offerings.¹ In the 2018 study, objectives included developing a better understanding of the SMB landscape, detailing SMB customer wants and needs, and determining ways that utilities can actively partner with these customers for increased satisfaction. Key findings from this research include:

- Utilities should build partnerships with business customers by building trust first.
- Improved infrastructure and availability of data will help SMB customers better monitor their energy usage and find ways to conserve on energy costs.
- Since business customers spend a significant portion of their budget each year on energy costs, bills and charges should be as transparent as possible, and utilities should be easily accessible if there is a question/concern about billing.
- Business owners define their relationship with a utility based on power reliability. Outages have a significant impact on this relationship.
- Businesses need utilities to guide them toward the tools that will allow them to be actively and passively energy efficient.

b. *Department for Business, Energy & Industrial Strategy (U.K.): Smart Meter Customer Experience Study: Post-Installation Survey Report*

The United Kingdom Department for Business, Energy & Industrial Strategy (BEIS) conducted a survey in 2017 focusing on customer experiences before, during, and immediately after smart meters were installed in residential homes. The BEIS also developed steps in the customer journey toward making changes to energy consumption. Findings from this research include:

- 80% of customers surveyed were satisfied with their smart meter; 50% were very satisfied with their smart meter (score 9 or 10 on a 10 point scale).
- Customers that proactively requested smart meter installation were among the most likely to be satisfied and highly likely to recommend smart meters to others.
- Making energy use visible was the primary motivation among respondents for having a smart meter installed.
- Respondents most commonly recalled receiving information in advance of the installation from energy suppliers.
- 67% of households that received an in-home display for their meter reported using it at least once a week to view the amount of energy being used.

¹ ESource is an industry organization focused on advancement of the efficient use of energy. They help utilities and large energy users with critical problems involving energy efficiency, utility customer satisfaction, program design, marketing, customer management, and sustainability by providing syndicated research and counsel.

c. U.S. Department of Energy: *Advanced Metering Infrastructure and Customer Systems: Results from the Smart Grid Investment Grant Program*

The Smart Grid Investment Grant (SGIG) Program, developed under the U.S. DOE is a project aimed at modernizing the electric grid, has invested heavily in deployment of AMI and customer systems technologies. This report outlines key findings from SGIG projects that have implemented AMI and customer systems technologies. This research aids the DOE in accelerating grid modernization and informing decision makers. Key findings from this report include:

- AMI deployment has resulted in reduced cost for metering and billing from fewer truck rolls, labor savings, more accurate and timely billing, fewer customer disputes, and improvements in operational efficiencies.
- New customer tools allow for more control over electricity consumption, costs, and bills.
- Customer bill savings and lower capital expenditures results in reduced peak demand and improved asset utilization.
- Outages are less frequent, restored faster, and less of an inconvenience for customers.

d. Smart Grid Consumer Collaborative: *Effective Communication with Consumers on the Smart Grid Value Proposition*

The Smart Grid Consumer Collaborative (SGCC), now known as the Smart Energy Consumer Collaborative (SECC), conducted a customer survey in 2016 with the intent of capturing feedback that will help utilities effectively communicate with customers about smart grid implementation and values. This report outlines the messaging and methods to which customers were most receptive. Findings from this report include:

- Messages should be short, specific, and positive.
- References to increasing benefits rather than reducing harmful elements are better received by customers.
- Consumers are more interested in tech enabled improvements, less interested in how a utility achieves results.
- Smart grid benefits for consumers are generally grouped in three broad categories: environmental benefits, economic benefits, and reliability benefits.

e. Smart Energy Consumer Collaborative (SECC): *Understanding Your SMB Customers: A Segmentation Approach*

The SECC conducts utility industry research on a wide variety of subjects and customer segments. The SECC conducted this research using segmentation to more clearly define utility-customer relationships and how utilities can be a more active partner for SMB customers. Key findings from this research include:

- During the course of this research, five segments emerged:
 - *Established and Engaged* – Always on the lookout for ways to use energy more effectively and are already partnered with service providers to do so. (15% of SMB market)
 - *Motivated Yet Inactive* – Interested in the idea of energy efficiency, although they have not yet taken the first steps. (17% of SMB market)

- *Interested if Incented* – Energy efficiency is not top of mind. Engaging in new programs and services will require a compelling incentive. (27% of SMB market)
- *Saving and Satisfied* – Have already taken steps to use energy more efficiently and only passively interested in doing more. (13% of SMB market)
- *Decidedly Disengaged* – Have no interest in the idea of energy efficiency and feel there isn't much they can do. (28% of SMB market)
- Size of business matters to engaging with utility in energy efficiency. Across all segments, half of SMBs with more than 50 employees surveyed would “definitely” engage with their utility, if the utility reaches out, on energy efficiency.
- Small- and mid-sized customers vary widely within their industries in terms of size of building, number of employees, and wants and needs from their energy provider.
- 92% of the Established and Engaged have interacted with their utility on energy usage data.
- 68% of the Established and Engaged have interacted with their utility around rate adjustments.
- 86% of the Motivated Yet Inactive segment is interested in usage rates relevant to their business.

f. Chartwell: *Demand Reduction Programs for TOU Customers – Madison Gas & Electric Case Study*

Madison Gas & Electric began an On Demand Savings (ODS) pilot program for commercial & industrial (C&I) customers in 2015, originally targeting 30 customers.² The intent of this pilot was to allow C&I customers to monitor their energy use in real time, reduce overall energy use, and implement practical load shedding or load shifting strategies to reduce their on-peak demand and improve their operational efficiency. The pilot sought to do this by identifying a customers' unique demand profile to suggest the best load shedding and cost saving strategies through use of AMI-enabled technology to provide data to both the customer and utility. Key findings from this report include:

- Customers participating in the initial pilot from 2015-2016 averaged 9% savings in monthly demand charges.
- Between June and September 2016, the average monthly savings was 2,760 kW.
- The average monthly kWh savings for participating customers was 4.5% in the same time period.
- The initial pilot found that nearly 70% of participants changed their thinking about how they use their building automation systems after participating in the pilot program.

g. E Source: *2019 E Source Gap & Priority Study*

Xcel Energy subscribes to this annual study from E Source to better understand small, mid-sized, and large commercial and industrial customers' needs – and how we are meeting those needs. In this study, SMB and large C&I customers are asked about their participation and interest in various energy efficiency programs, utility programs or services, and demand response services that can be offered by their utility. Key findings from this study include:

² The pilot has since been expanded to 50 C&I customers.

- 24% of large C&I customers surveyed currently participate in energy data analytics, strategic energy management, and behavior programs; another 32% are interested in participating in these types of programs.
- 31% of large C&I respondents currently use some form of energy management system, and 25% are interested in this technology.
- 21% of large C&I respondents currently participate in an Xcel Energy power monitoring program or service and 32% are interested in participating.
- Participation in energy data analytics, strategic energy management, and behavior programs is less common among mid-sized businesses. Only 4% currently participate in these types of programs and 19% are interested in participating.

C. Research Applied to our Advanced Grid Implementation

In summary, we have taken the following insights away from this research to shape our advanced grid customer strategy and implementation.

1. Customer Value and Expectations

Customers care more about technology and enabling improvements than process. They have strong feelings about the costs and benefits of advanced meters; however, their awareness and understanding of the costs and benefits may be limited, which has an impact on their perceptions.

Addressing service interruptions is important to all customer classes. Customers expect that service interruptions will be less frequent and of shorter duration. Customers expect to receive detailed information from their utility. This information is expected to be personal and frequent. Customers believe that improved reliability will allow the Company to focus more on other customer priorities.

Customers expect more tools and information for them to make decisions about their energy usage. They indicated that more information would allow them to better identify opportunities and strategies to save energy and reduce their costs.

Business customers have more awareness and familiarity with advanced rate designs. Residential customers expect their utility to provide them with rate comparison tools and information about new rate designs.

Building trust is a key component to unlocking value. Trust is best built by identifying solutions and showing results specific to the customers.

Customers understand that their rates will increase in order to cover the expense of advanced meters but expect that the benefits of the meters will result in their costs being net neutral over time.

2. Customer Education and Outreach

Messaging should be short, specific, and positive. Messages should focus on the benefits of the project, not on the process. Messaging should begin 2-3 months in advance of any implementation. Early messaging gives customers time to conduct their own research, if they want. Messaging should be done through multiple communications channels and align with customer preferences.

Customers under the age of 45 tend to prefer digital communications whereas customers over 45 tend to prefer phone and mail communications. They expect communications to be clear about what the direct and indirect customer costs are. If customers believe there is a

direct charge for the meter at the time of installation they are less likely to support deployment. Benefits can broadly be grouped as environmental, economic, and reliability.

III. ADVANCED GRID INTELLIGENCE AND SECURITY INITIATIVE

While we have made incremental modernization efforts on the distribution system over many years, we must replace our current Advanced Meter Reading (AMR) service. The current vendor of this service will stop supporting and producing the parts required to maintain the system after 2022. While this system has provided value to customers for many years through efficient meter reading, it has limited capability to improve other aspects of our operations.

The need to replace these meters provides us with an opportunity to modernize our distribution system. This modernization begins with foundational advanced grid initiatives that both provide immediate benefits and new customer offerings while also enabling future systems and customer value. The core investments in our AGIS initiative include:

- Advanced Distribution Management System (ADMS);
- Advanced Metering Infrastructure (AMI); and
- Field Area Network (FAN).

In addition, ADMS is already underway and will provide the capability to implement two advanced applications that we believe will provide substantial benefits to customers and are included in our AGIS initiative:

- Fault Location Isolation and Service Restoration (FLISR); and
- Integrated Volt-VAR Optimization (IVVO).

These core investments will provide us with the tools and information we need to improve the management of the grid, meet growing customer expectations, and develop a platform that can provide long term flexibility and value.

To ensure we have made investments that will serve our customers over the long term, we have also planned into our technology the ability to conduct remote upgrades, applied industry leading security practices, and adopted flexible, standards-based service components to ensure interoperability between systems. The following sections will detail our AGIS investment strategy, our commitment to security, and the broad benefits we will deliver for all our customers.

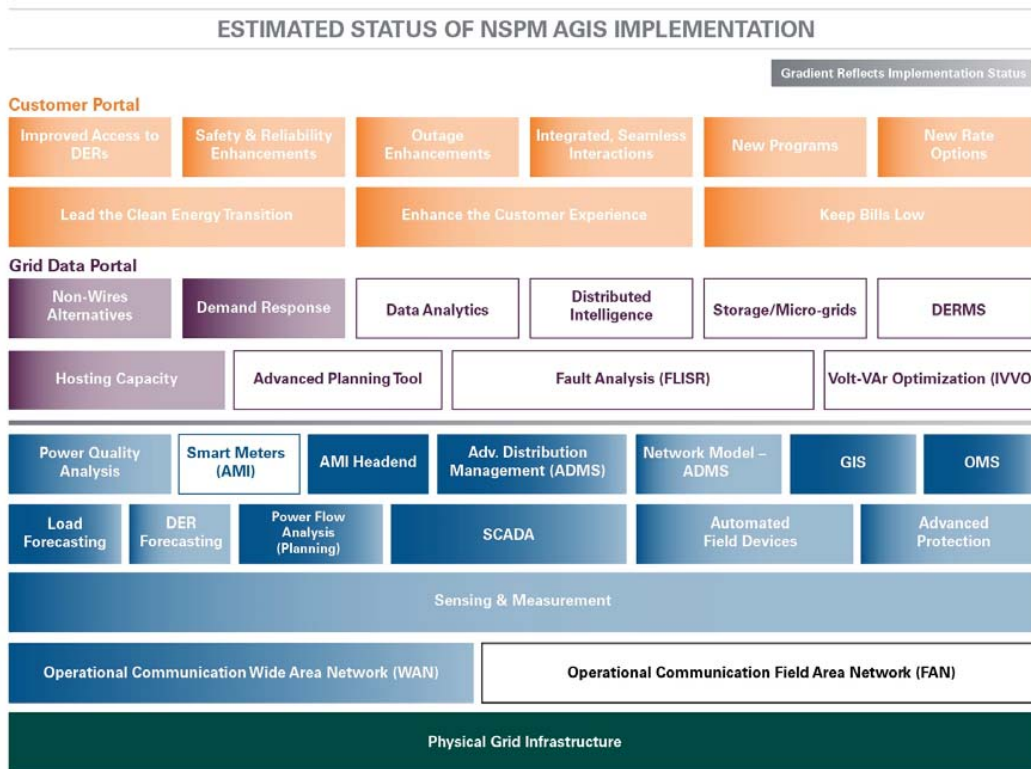
A. Technology Strategy

Unlocking the customer and operational value enabled by AGIS will evolve over time and begins with building a solid foundation. The U.S. DOE's Next Generation DSPx, Volume III provides a good reference for how to consider both the elements of a modern grid and their costs.³

We have taken the DOE's DSPx model and adapted it, as shown in Figure 6 below, to reflect the investments and capabilities that are part of our AGIS vision. This vision is also defined by the feedback and interactions we have had with a broad array of stakeholders and the Minnesota Commission.

³ The DSPx report was sponsored by the U.S. DOE's Office of Electricity Delivery and Energy Reliability. See *Modern Distribution Grid, Volume III: Decision Guide*, U.S. Department of Energy Office of Electricity Delivery and Energy Reliability (June 2017).

Figure 6. Xcel Energy Advanced Grid Approach



The DSPx model begins with the “core components” as the foundation for our advanced grid roadmap. Building on that foundation enables advanced applications that will ultimately support our commitment to enhanced customer experience, keeping bills low, and leading the clean energy transition.

Our implementation of systems and hardware has already begun. As detailed below, this begins with the solid foundation and backbone in ADMS, which is expected to go into service in Minnesota in 2020 – and a limited implementation of the FAN and AMI to support the Minnesota Time of Use (TOU) pilot. This is followed by the deployment of smarter meters with more grid capabilities as we expand the FAN to support the mass deployment of advanced meters. During this timeframe of mass meter deployment, we will begin to implement other advanced grid components such as IVVO and FLISR and implement new products and services to help customers manage their energy usage and keep their bills low.

B. Step 1: Solid Foundation and Backbone

1. Advanced Distribution Management System

ADMS provides the foundational system for advanced grid operational hardware and software applications. The ADMS acts as a centralized decision support system that assists control room personnel, field operating personnel, and engineers with the monitoring, control and optimization of the electric distribution grid. This centralized platform provides greater awareness to our system and our customers. This capability is becoming critical as customer interest in solar, battery storage, electric vehicles, and other emerging technologies continues to grow – increasing the complexity of the electric distribution grid. ADMS also supports advanced applications such as IVVO and FLISR, which can provide further benefits for our customers.

A critical supporting element of the ADMS system is the Geospatial Information System (GIS). This foundational data repository is integrated with ADMS to provide location and other information for all the physical assets that comprise the distribution system. The ADMS uses this information to maintain the as-operated electrical model and operate the advanced applications.

2. *Field Area Network*

The FAN is a private, secure two-way communication network that provides wireless communications across Xcel Energy's service area – to, from, and among field devices and our information systems. It serves multiple business value streams that include, but are not limited to ADMS, IVVO, FLISR, and AMI – and will support future technologies that will unlock additional value for customers. Comprehensive geographic coverage allows Xcel Energy to grow and expand automation opportunities to the benefit of our customers. The FAN can enable future applications that may provide significant advances in situational awareness, operational efficiency, and asset lifecycle management. The FAN may allow for such applications as sensors that monitor assets, heat/temperature, pressure, flow, thermal energy, air quality, acoustic transmissions, vibration, cathodic measurements, environmental, tower lights, and security events.

We began limited implementation of the FAN in 2019 to support the TOU Pilot in Minnesota beginning in 2020. Additional build-out of the FAN to support AMI, FLISR, and IVVO will continue through 2023, which will lay the foundation for the future as we continue to innovate and improve our systems to ensure that we meet customer expectations as they evolve over the next decade or longer.

C. *Step 2: Smarter Meters and Grid Capabilities*

1. *Advanced Meter Infrastructure*

AMI is a foundational element of the AGIS plan because it provides a central source of information that is shared through the FAN with many components of an intelligent grid design. AMI is traditionally known as an integrated system of advanced meters, communication networks, and data processing and management systems. In the past, advanced meters were integrated with a proprietary communications network, and utilities selected a solution that would have trade-offs between meter functionality and communications capabilities. As discussed in above, the FAN we are implementing uses industry standard protocols, rather than a meter vendor's proprietary network. This not only provides important interoperability benefits to the Company and our customers, it also allowed the Company to select the best available advanced meter technology available.

The advanced meter itself is made up of several components – a metrology component (responsible for measurements and storage of interval energy consumption and demand data), an embedded two-way communication module (responsible for transmitting measured data and event data available to external applications), embedded Distributed Intelligence (DI) capabilities, and an internal service switch (to support remote connect and disconnect of single-phase service).

The core function of AMI is to measure customer energy usage so we can provide timely, accurate bills for utility service. New meters are a necessary replacement for our existing AMR, because of the impending discontinuance of our current Cellnet service in 2025. However, the new AMI meters go beyond the historic ability of our AMR meters because they facilitate two-way communications capabilities and more granular customer energy usage detail. This more detailed energy usage data will allow us to provide new rate and billing options. It will also inform many of the customer experiences that we have planned, to better inform and engage our customers.

Additionally, the advanced meters we will deploy will have the ability to conduct localized computing, analysis and data processing. This capability, called Distributed Intelligence (DI), is a Linux-based operating system that conducts localized, at the meter analysis and computing. At a high level, the DI platform allows Xcel Energy to install applications on the meter – similar to how applications are installed on a smart phone. These applications may be customer-facing, meaning the customer directly interacts with them, or grid-facing, meaning Xcel Energy interacts with the applications. Any applications available on the meter will be required to meet our strict technology and data security approvals and controls. Some of the potential use cases for these applications include:

- Improved grid and customer safety and awareness;
- Improved energy usage control and savings;
- Improved insight into power quality;
- Smarter insights about customer data and information; and
- Smarter controls to better manage and integrate customer and utility systems.

Xcel Energy is leading the nation in the deployment of the DI platform. We are working with Itron, our meter vendor to plot a vision for the design, development, and implementation of new meter applications that our customers will manage and interact with through a customer portal. Itron has already begun building a number of applications that can be enabled on the meter. We expect third parties will also develop applications that we can leverage to improve the customer experience – and we will actively partner with those that we believe offer new and innovative ways to transform our business to provide valuable services to our customers. Customers will be able to

AMI provides Xcel Energy and customers with access to timely, accurate, consistent, and granular energy usage data that is necessary to develop personalized insights and that supports informed decision making. With these insights and other data, customers are empowered to make energy usage decision based on their preferences that can reduce their bills. Additionally, the advanced meters will detect and report power outages and when power is restored, detect tampering and energy theft events, and perform meter diagnostics. Finally, the advanced meters will enhance our planning and operational capabilities by measuring values such as voltage, current, frequency, real and reactive power, and certain power quality events such as sags and swells.

In sum, the system visibility and data delivered by the advanced meters we have selected will improve reliability, enable advanced rate designs, and afford opportunities to improve the efficiency of several aspects of our business, and expand our ability to offer customer-facing products and services as a result of the DI platform. We began limited deployment of the AMI meters in 2019 to support the TOU Pilot in Minnesota beginning in 2020. We expect to begin mass deployment of AMI in 2021, with installations continuing through 2024. The following table lists the approximate number of installations per year.

Table 1. Minnesota AMI Implementation Plan

Year	Installation Estimate
2019/2020	17,500 (TOU Pilot)
2021	100,000 – 130,000
2022	550,000 – 650,000
2023	530,000 – 600,000
2024	30,000 – 60,000

In addition to the installation of meters, our AMI implementation requires certain functionalities be implemented to support the metering technology. These implementations will involve the following activities:

- *Systems integration.* This involves integrating a number of existing systems with the new advanced metering headend and meter data management system.
- *Enhanced capabilities.* This includes development of enhanced data reporting through the customer portal, operational analytics, outage management, Green Button Connect My Data, and Home Area Network functionality.
- *Meter deployment.* As we transition to actual meter deployments, we will deploy the DI platform, events processing, and enable FAN functionality.

We will also be continuing to build and refine our next steps with both advanced grid technologies and customer products and services that will leverage those investments.

2. *Robust Customer portal*

Our customer research tells us that customers want more information and need that information to make better decisions. Investments in AMI and the FAN will allow us to meet, and exceed, that expectation by providing us with detailed and timely data. We share that data with our customers through various digital channels including mobile and web applications. Customers will be more informed by this data by increasing their awareness about how and when they use energy. They can then apply that information to how they behave with energy – adjusting their usage to align with lower energy costs or more environmentally friendly periods of generation.

The portal will also offer other features to support customer efforts to save money and control their energy usage including access to DI applications. Applications will be made available, by Xcel Energy, through the customer portal. Applications may be part of the default meter package or customers can opt-in to certain applications. Potential applications could include (but not be limited to) energy usage dashboard with summary information about their energy usage, personalized insights about their energy usage with recommendations on how to save, and disaggregation tools that distill what end-use technologies are using energy.

The customer portal will also allow customers to share their energy usage with third-parties. We understand that our customers have relationships with third-parties and that those relationships provide energy savings and customer experience benefits. We will employ Green Button services to facilitate this exchange of information.

Currently, Xcel Energy employs Green Button Download My Data to facilitate data sharing. This tool allows only one-time data sharing with third-parties. If a customer wishes to share their data using Green Button Download My Data, they log into MyAccount, click Download My Data, and then send the file to the third-party. There is no automated connection for sharing data. Conversely, the Green Button Connect My Data (CMD) standard allows access to third parties to present the data in their application.

In the future, we will enable data sharing through both the Download function and the Green Button CMD tool. The Green Button Alliance⁴ identifies awareness as one of the important factors necessary for customers to be able to change their energy use behaviors and defines CMD as “a way to download or connect to your utility-usage data (electricity, gas, water) to gain better insight of waste and inefficiencies; allowing you to make adjustments to use fewer resources and even save money.”

⁴ <https://www.greenbuttonalliance.org/about#mission>

Data sharing is conducted in a secure environment and only at the authorization of the customer. Personally Identifiable Information (PII) is required to be transmitted in a secured transmission that is separate from the secured data stream used to transmit a customer's energy-usage information (EUI). The receiving application is then required to logically connect the separate data streams. CMD's capabilities expand beyond just consumption data and include the abilities to provide payment data (generation and distribution charges, tariff name, demand charges, third-party charges, administrative adjustments, etc.), summarize billing data across multiple locations, and even to generate monthly billing statements.

3. Outage Management

Customers have come to expect a high level of service from Xcel Energy and outages are one of the critical moments in our customer's experience. With increasing dependence on mobile devices and Wi-Fi outages, even for short duration outages have a significant impact on customer's experience and this experience filters into their broader experience and expectations from Xcel Energy. Long or recurring outages reduce customers' trust in the quality service Xcel Energy and have negative repercussions when customers consider participation in other products and services.

Currently, in most of our service territory and for outages below the feeder level, customers inform the Company that they have an outage. Once aware of the outage, the Company dispatches field workers to investigate the outage and make necessary repairs. Upon completion, the Company sends a follow up communication indicating that the Company believes the customer's outage has been addressed but encouraging the customer to follow up if the outage persists. We know customers generally expect the Company to know when they are out of power and when their service has been restored.

To improve this experience, we will use the benefits of improved grid awareness, provided by ADMS, AMI, and the FAN, and additional insights into the scope of the outages (provided by FLISR, and discussed below) to provide customers with more timely and accurate information about their outage. Immediately after receiving an advanced meter, customers will receive improved communications about outages should they occur. With AMI, the Company will know when momentary or sustained outages occur because the advanced meters will communicate through the FAN back to Xcel Energy. This improved awareness will allow the Company to proactively notify customers of an outage, instead of relying on customers to make contact, which we expect will be satisfying for customers – and may additionally play a role in reduced outage response times.

We expect we will also be able to provide customers with more accurate estimates of restoration timelines and reduce the time field personnel are required to identify, diagnose, and repair an outage by utilizing the abilities of FLISR to restore power automatically thereby reducing the scope of an outage. We will also proactively notify customers of when their power has been restored by verifying the status of an advanced meter remotely. These actions will transform a customer experience currently dependent on significant communication from our customers and evaluation by our field crews to a more streamlined process where customers are informed but not actively engaged.

Operationally, improvements in reliability should be expected as the AGIS project is fully implemented and Xcel Energy updates its processes to more efficiently respond to outages.⁵

⁵ While the customer experience is expected to improve, the Company's reported performance related to certain reliability indices may decline due to the Company's increased visibility into outages and events occurring on the system.

Figure 7. Residential Customer Journey – Outage Notification & Restoration



4. Improved and Actionable Billing Information

Advanced meters enable Xcel Energy to more frequently and granularly track energy usage. The FAN also allows the Company to send and receive more timely energy usage data. The combination of timely and detailed data will enable advanced rate designs, discussed further in the next section, as well as products and services that complement our existing energy efficiency and demand management programs. An example of a new service the Company expects to offer that is enabled only by investments in AMI and the FAN is High Usage Alerts, which we expect to offer upon deployment of the advanced meters.

Optional, high usage alerts will provide messaging to customers when their energy usage is expected to surpass preset limits set by the customer. Proactive messaging to customers, prior to the end of their billing cycle, will offer both a customer experience benefit and energy savings benefit. The customer experience benefit is keeping customers informed of their energy usage so they can change their behavior and avoid a surprisingly high bill. The energy savings benefit is a direct result of this behavior change as customers take actions to shift or reduce usage in order to save money.

Figure 8. Residential Customer Journey – Billing and Payment Options



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5. *Remote Reconnection and Disconnection*

The AMI meters will be equipped with the ability to remotely disconnect or reconnect electric service, which offers potential benefits to our operations and thus customer costs, and the customer experience. We recognize using this functionality in Minnesota will require regulatory approval. We expect to engage stakeholders as a precursor to a regulatory filing where we would propose to use this functionality initially in conjunction with tenancy changes and customer requests associated with seasonal use properties to capture benefits associated with unbillable energy use.

Today, when tenancy changes occur, the meter is not automatically disconnected and any energy costs associated with the unoccupied premise are considered losses. With advanced meters capable of remote disconnection, the Company could disconnect the meter; thereby eliminating energy costs at an unoccupied premise (e.g. a vacant retail location) and upon new tenancy could remotely reconnect service. This eliminates the need for the Company to send field personnel to the location to disconnect and reconnect the devices, improving employee safety, reducing or eliminating the cost for the new tenant customer to reconnect, and reducing or eliminate any unbillable energy use.

Similarly, customers with seasonal homes may want to disconnect service if there are long periods where the home is unused. For example, a summer home that is not used during cold weather months beginning in the late fall through late spring. In lieu of a customer paying for a field employee to visit the customer's site and disconnect and then reconnect the meter, the customer could schedule a remote disconnection aligned with their winterization and reconnection aligned with their opening. This would save the customer the cost of the two trip charges each year, as well as any stray energy usage at an otherwise winterized premise.

In the future, use of remote capabilities associated with non-payment would offer efficiencies and thus reduced costs. For customers dealing with payment issues, the Company makes every effort to engage with them and set up a payment plan that will work with their budget and personal circumstances. When payment plans fail and disconnection for non-payment is appropriate, the Company incurs significant costs to physically disconnect and reconnect service at the customer's home or business. These costs are ultimately borne by both the affected customer, in terms of a reconnection charge, and the entire Minnesota customer base in the form of higher field collection costs and bad debt expense.

We clarify that we are *not* seeking approval of any remote connection or disconnection services at this time. Instead, we intend to engage stakeholders to develop a framework that will inform a proposal for regulatory approval, which we believe will be the best way to align stakeholder interests and ultimately reduce costs to our customers.

D. **Step 3: Smart Applications**

1. *Fault Location Isolation and Service Restoration*

Customer satisfaction depends on how well a company's products or services meet customer expectations, and reliability is one of the foundational components for meeting customer expectations. As electricity becomes more and more entwined with every aspect of day-to-day life, the issue of reliability becomes increasingly important to customers.

FLISR is a form of distribution automation that involves the deployment of automated switching devices that work to detect issues on our system, isolate them, and automatically restore power – thereby decreasing the duration and number of customers affected by an outage. Fault Location Prediction (FLP) is a subset application of FLISR that utilizes equipment information to locate a precise location for an issue on our system. The

combination of FLISR and FLP will enhance our ability to detect issues on our system and restore power to customers. FLISR and FLP rely on three primary components to operate:

- ADMS, for the central control and logic
- FAN, for wireless communications to and among field devices
- Specific intelligent field devices

The common industry metrics to track reliability performance are System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI). While these metrics measure the overall performance of the system, they do not capture the reliability *experience* of each individual customer, because they typically exclude outages from major events such as storms, which can be a significant contributor to a customer's overall reliability experience. FLISR and FLP are expected to improve customers' overall reliability experience – and, in particular, outages occurring as a result of storms or other severe events.

Today, aside from the limited number of early versions of automated switches on our system, crews manually patrol distribution lines to identify the failure location and manually close and open switches to restore power to customers. FLISR and FLP will automate restoration for most customers on the feeder – preventing a sustained outage – and reduce the length of the outage for other all customers on the feeder by providing field crews a more precise location for the failure.

FLISR and FLP have the greatest impact when implemented on the worst performing feeders, where the investment will return the greatest value in terms of reliability improvement for the customers connected to those feeders. In Minnesota, we intend to implement FLISR and FLP on approximately 200 feeders between 2021 and 2028, directly improving reliability for over 250,000 customers, where we expect the number of sustained outages on these

2. Integrated Volt VAr Optimization

Integrated Volt-VAr Optimization, or IVVO, is an advanced application that automates and optimizes the operation of the distribution voltage regulating devices and VAr (reactive power) control devices to achieve operating objectives. These objectives can provide:

- Reduction of distribution electrical losses
- Reduction of electrical demand
- Reduction of energy consumption
- Increased ability to host Distributed Energy Resources

IVVO is an advanced application within ADMS that leverages field devices and the FAN to modify how the Company controls the voltage of the system and enables the Company to optimize the voltage of the system in ways that were not possible previously. Our implementation of IVVO will enable energy and demand savings for customers without requiring any action on their behalf.

The concept of voltage/VAr management or control is essential to electrical utilities' ability to deliver power within appropriate voltage limits so that consumers' equipment operates properly – and to deliver power at an optimal power factor to minimize system losses. These concepts are affected by a variety of technical factors throughout the distribution network, the complexity and dynamic nature of which make the task of managing electrical distribution networks challenging. While voltage regulation and VAr regulation are often referenced in combination (i.e. Volt/VAr control), they are easier to understand if described as two separate, but interrelated concepts.

Voltage Regulation. Feeder voltage regulation refers to the management of voltages on a feeder with varying load conditions. Regardless of nominal operating voltage, a utility distribution system is designed to deliver power to consumers within a predefined voltage range. Under normal conditions, the service and utilization voltages must remain within an industry standard range. When customer load is high, the source voltage at the beginning of the feeders is at the higher end of the range, and the voltages delivered to customers at the end of the feeders are at the lower end of the range.

VAr Regulation. Nearly all power system loads require a combination of real power (watts) and reactive power (VARs). Real power must be supplied by a generator while reactive power can be supplied either by a generator with VAr capabilities, or a local VAr supply, traditionally a capacitor. Delivery of reactive power from a remote VAr supply results in additional feeder voltage drop and losses due to increased current flow, so utilities prefer to deliver reactive power from a local source. Since demand for reactive power is higher during heavy load conditions than light load conditions, VAr supply on a distribution feeder is typically regulated or controlled by switching capacitors on during periods of high demand and off during periods of low demand. As with voltage control, there are both feeder design considerations and operating considerations.

The ADMS that we are in the process of implementing can run the IVVO application in several different operating modes: Voltage Control, Peak Reduction, VAr Control, and Conservation Voltage Reduction (CVR), which we explain below.

- *Voltage Control mode* functions to optimize voltage on the feeder around standard operating voltages – maintaining adequate service voltage for all customers. This mode is generally a secondary operating mode of IVVO, and only used to establish the voltage boundaries within which the other operating modes must stay within. As penetration of DER grows, Voltage Control will become more common as a primary control mode to manage the expanded range of distribution system voltage caused by DER. Traditionally, with only load on a feeder, the Voltage Control objective was to raise voltage at times of heavy load in order for voltage to remain within the acceptable range. With DER causing reverse power flow and raising voltages during times of light loading, voltage control schemes must now both raise and lower voltage.
- *Peak Reduction mode* serves to reduce load only during peak load events. It is a manually triggered mode that reduces system voltage to a targeted value to reduce load on the system for a short duration – typically one or two hours. This peak reduction tool can be used in large operating regions, such as Minnesota as a whole, or tactically by feeder, substation, or other targeted area.
- *VAr Control mode* seeks to reduce system losses and save energy by optimizing power factor on each distribution feeder.
- *CVR mode* seeks energy savings through reduced operating voltages. CVR mode first flattens the load profile along the feeder using capacitors, and then uses the Load Tap Changer (LTC) or Voltage Regulators inside the substation to lower voltage on the feeder. This lowered operating voltage results in small energy savings for most customers on a feeder.

Customer's end-use devices are designed to operate over a range of voltages. Historically, the voltage on the distribution system is toward the high end of the range, which causes devices to consume more energy. The need to have more dynamic voltage management has become more important because customers' energy consumption is more dynamic than ever. Residential customers can have on-site solar, batteries, electric vehicles, smart appliances, smart thermostats, and many more electronic devices.

Since 2010, we have been doing VAr Control through our SmartVAR program in Minnesota, which has provided benefits to the grid and our customers. SmartVAR will be transitioned to our ADMS as that is implemented. Over time, we intend to transition this to IVVO, which will allow for more dynamic voltage control that can improve end-use efficiencies while still maintaining voltage within the acceptable range. This will reduce the voltage level on our system, which we expect will result in energy savings for customers, translating directly into avoided energy costs that our customers would otherwise incur.

Implementing IVVO for our customers requires ADMS to be operational, the FAN and AMI to be deployed, and implementation of some supporting information systems including a Grid Edge Management System (GEMS). As these supporting technologies are deployed, we will implement IVVO on distribution feeders with the highest return and highest probability of success. In total, we intend to deploy IVVO between 2021 and 2024 on over 180 feeders serving over 200,000 customers.

3. *Improved Power Quality*

Power quality, specifically the voltage levels on the distribution system, can have a significant impact on the customer experience. Some of our customers have highly sensitive processes and technologies that perform better at lower voltage levels. Investments in AMI and ADMS with IVVO will help us improve our service quality for customers and therefore improve their customer experience. With AMI, we can monitor the voltage level at a customer's location and identify if voltage levels are too high or low. If voltage levels are determined to be out of line or adjustments can be made, the ADMS and IVVO applications will be used for these adjustments.

Other power quality improvements will include identifying potential power quality issues, such as flickering lights, before they become a negative experience for the customer. Using AMI, we can remotely identify these potential issues rather than send field personnel to conduct a diagnosis. This remote sensing capability reduces the time to address an issue and the likelihood of a customer call or formal complaint. This proactive service reduces the burden on customers to make us aware of issues in our service and helps improve customer satisfaction.

4. *Distributed Intelligence*

As discussed in more detail in the summary of our Advanced Metering Infrastructure investments above, we are at the leading edge of the deployment of the DI platform. With mass meter deployment rapidly approaching we are working with our meter vendor partner to develop conceptual uses for the DI platform that make grid management more efficient. This process will involve ongoing ideation, iteration, and reinvention to ensure that we continually create value from our investment. At this time, we have identified the following grid-facing use cases:

- *Real-Time Granular Voltage Optimization* – Use the edge processors / radios to intercommunicate and 'shout' who is the lowest voltage (compared to only receiving voltage from dedicated meters on the secondary).
- *Undocumented / Unregistered DER Alerts* – Detect if there is a DER behind the meter, even if it is not back feeding.
- *Grid Configuration Status* – Better, real-time grid configuration status, e.g. knowing which phase and transformer every meter is connected to. Edge computing would build on this by providing insights to loads / DERs per feeder / phase which could directly or indirectly (notification to third party or targeted message to premise owner) dispatched to improve grid balancing.
- *Distributed Transformer Load Management* – Modulating customers' devices on a secondary that are contributing to a high load situation on a distribution transformer.

- *Locate Momentary Grid Disturbances* – Uses the high granularity disaggregation capabilities across multiple meters to triangulate the location of a grid disturbance by analyzing the amplitude of the disturbance waveform. Edge meters could detect the anomaly and shout out who has the highest amplitude.
- *Meter By-Pass Detection* – Enhanced functionalities that complement the base capabilities of AMI to detect and remotely disconnect when a meter by-pass is detected.
- *Smart Feeder Restoration* – Occasionally during outage restoration utilities face the situation where capacity is insufficient to restore the next section of a feeder. Smart Feeder Restoration enables the restoration of critical loads, deferring the re-energization of other loads until full capacity is restored, for example, prioritizing restoration for a hospital or a fire station before.. This ability provides for resiliency during emergency situations.

We are also working with our vendor partner to develop customer facing applications that we will make available to customers in the future. Many of these applications are complimentary to many of our existing demand-side management and customer choice programs. They may provide customers with more information about their energy usage through services such as disaggregation, virtual energy audits, or real-time monitoring. Alternatively, they may also provide new services that our current meters and customers programs do not provide such as advanced notifications and alerts about the composition of your energy usage, internet outages, or emergency notifications. The broad categories of how we will transform the customer experience and the types of products and services will offer are detail further in Section IV of this document.

E. Broad Customer and Grid Benefits

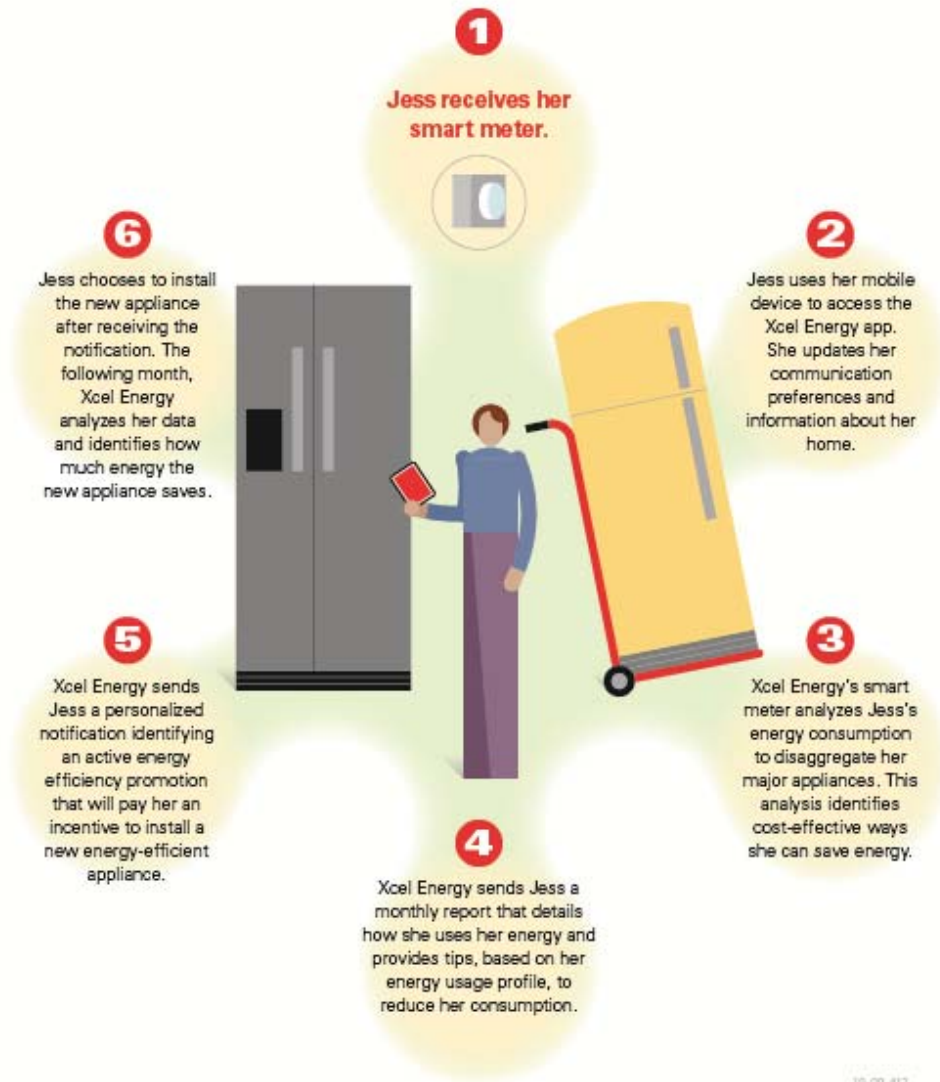
1. Improved Energy Efficiency Options

Today, to encourage customers to make informed energy saving decisions and reduce their monthly bill, we provide general recommendations and energy savings steps they can take – upgrading to a new air conditioner, turning off unused appliances, and installing high efficiency lighting. These messages and tips are general and will not be relevant to all customers. For example, customers who have already replaced an air conditioner or other major appliance – or customers interested in changing their behavior with their air conditioner to save money.

Transforming this customer experience involves targeted deployment of new products and services that build upon foundational advanced grid investments. With more granular data from advanced meters, we will be able to improve our marketing to and segmentation of our customers. This will help identify cost efficiencies in our programs and improve our communications with customers. For example, combining AMI data with disaggregation tools through Distributed Intelligence, we can better target market our customers and provide them more relevant communications about their energy usage. From a customer experience perspective, the more relevant information we share with them the more likely they will be to act upon it.

These might include improved insights and recommendations to customers regarding their energy usage, due to the availability of more granular usage information. These might also include end-use disaggregation – or programs/services that allow the customer to extract end-use and/or appliance level data from their aggregate household usage. These might also include more targeted opportunities for behavioral demand response advanced rate designs. These new products would leverage the benefit of near-real-time, interval-level usage data provided by advanced metering to help customers reduce bills and better achieve their energy goals. The following figures provide an illustrative customer journey that integrates new benefits from the advanced grid.

Figure 9. Residential/Small Business Customer Journey – Insights and Recommendations



2. Demand Response

As part of our Minnesota operations we are committed to delivering resources to help manage the generation, transmission, and distribution systems during both peak and non-peak periods. We define demand response as:

- *Traditional Demand Response* (DR) provides a temporary reduction to system peak. Often these products are referred to as dispatchable resources because the utility may control them directly. This peak reduction has a similar impact on our system as a combustion turbine (CT) because it can be brought on- and off-line quickly for short periods of time as an operational reserve.
- *Non-Traditional DR* provides the opportunity for our customers to plan for and manage their electric demand differently. Compared to traditional methods of peak demand reduction during the hottest days of year, these methods allow customers to shift portions of their electric loads to lower-cost periods of the day when carbon-free generation is highest.

One example of non-traditional DR that will be enabled by our advanced grid investments is Behavioral Demand Response. This is a new product we are developing where the Company provides energy savings messages to customers when energy usage is high. The Company can message customers with general or personalized opportunities, using data provided through advanced meters, to reduce their energy usage. Customers can monitor the impact these decisions have on their energy usage because of timely data communication that is made possible by AMI and the FAN. To engage customers, incentives may be offered on top of their energy savings based upon actions they take. In this case, the Company also expects a customer satisfaction improvement because customers not only save money but are also more informed and in control of their energy usage – two key takeaways identified through our customer research.

One example of traditional demand response that will be enabled by our advanced grid investments is a two-way communicating Saver's Switch. Two-way communication through the FAN provides a more reliable signal than our current use of the Cellnet system and allows us to monitor the status of the Saver's Switch. This proactive identification allows us to improve our maintenance cycles to ensure high levels of response when these switches are called for system needs.

3. Advanced Rate Design

The deployment of advanced meters will provide the information and communications capabilities necessary for the Company to provide customers with more pricing options to improve customer choice and control over their electric bills. AMI will make Time-of-Use (TOU) pricing a feasible option for all customers. By recognizing cost differences throughout the day, between weekdays and weekend days and other types of days, TOU pricing provides both customer and grid rewards for shifting energy usage away from system peaks or making better use of renewable energy resources when they are abundant on the grid. Customers may realize these benefits through reduced energy costs and perhaps a reduced carbon footprint; the Company may realize benefits in the form of avoided infrastructure investments and increased system productivity through a higher load factor.

Advanced rate designs improve the customer experience by giving customers more information and control over their energy usage. Our customer research shows that energy costs are a primary concern for all customers – but also that other factors are important, including a customer's environmental impact, their ability to control their usage and the presentation of options/choice programs. Advanced rates can create opportunities to reduce customers' bills and minimize customers' environmental impact by giving them better signaling about the cost of their energy usage. For example, higher prices during "on-peak"

periods are typically correlated with more expensive and carbon intensive forms of generation whereas “off-peak” periods are typically correlated with renewable energy resources.

Advanced meters include two-way communication capabilities in contrast to the limitations of our current AMR meter infrastructure. This provides the Company the ability to communicate with the meter and any appliances or devices that a customer may choose to “connect” to their meter. With the advanced meters capable of measuring energy usage in short time intervals such as every 15 minutes, it is possible to develop dynamic pricing options that recognize cost differences between different types of days and that provide focused customer incentives for reducing energy usage during the highest system peak times of the year. Dynamic pricing can also be combined with TOU pricing for an even more robust signal to customers.

The advanced meter’s ability to capture and transmit regular energy usage intervals enables us to partner advanced rates with energy usage notifications to provide a more robust customer experience and more opportunities for customers to keep their bills low. More targeted and personalized information about their energy usage empowers customers to control costs and minimize their environmental impact.

The ability to provide a seamless, timely, and detailed view of a customer’s energy usage data is highly contingent upon the implementation of advanced meters and the supporting infrastructure, such as the FAN. Without investments in these new technologies we do not have the ability to effectively and efficiently meet customer expectations for increased control, new opportunities to engage with the energy usage, transparency of costs, and impacts of their energy usage.

4. DER Integration

The adoption of DER, including community solar gardens, behind the meter solar, batteries, electric vehicles, energy efficiency and DR is not likely to slow in the future as costs decline and awareness of the potential benefits of these resources becomes more widespread. As customers adopt increased levels of DER, it is incumbent upon Xcel Energy to improve its ability to accurately forecast the growth of these resources, the impacts they will have on the distribution system, and the cost to implement these resources.

Furthermore, our customer research has shown that customer’s increasingly look to their utility for expert advice and are interested in engaging with the utility as an orchestrator, helping to manage their energy bills and achieve their energy goals. However, in order to achieve individual goals, collective efforts are necessary to maximize efficiency and effectiveness at the individual level.

The increasing prevalence of DER necessitates a more comprehensive integration of DER into the day-to-day operation and planning of the grid to ensure the safe and reliable management and monitoring of the distribution system. While DER can, and currently is being interconnected, this is accomplished with limited visibility and control, which prevents the Company from fully optimizing the system benefits DER can provide. For instance, energy storage could be used to regulate the amount of energy on the system during peak solar production times. In this circumstance, a battery can “absorb” the energy when demand is lower and then dispatch energy from the battery onto the system as demand increases later in the day. Alternatively, ADMS can improve our control and dispatching of demand response (DR) resources. This will help us more precisely manage the level of demand by dispatching the right amount of DR in the appropriate locations.

Investments in AMI and ADMS coupled with the FAN – and in the future, a Distributed Energy Resource Management System (DERMS) – will allow for Xcel Energy integrate DERs into the day-to-day operation and better manage DER. Currently and by necessity,

Xcel Energy takes a conservative approach to the forecasted impact of resources because we do not have the granularity necessary to dynamically forecast the impact of resources such as batteries and solar. With more granular data we can better refine our estimations of the impact of new resources and better integrate more resources on the grid.

In the near term, Xcel energy is investing in an advanced planning tool which will significantly improve our distribution planning capability. The future of DER has uncertainty, and the new tool will allow for planners to explore the impacts of varying DER adoption, along with a host of other factors such as land use planning, weather, socio-economics, and more. This investment will help us identify barriers & opportunities as we and plan the grid of the future.

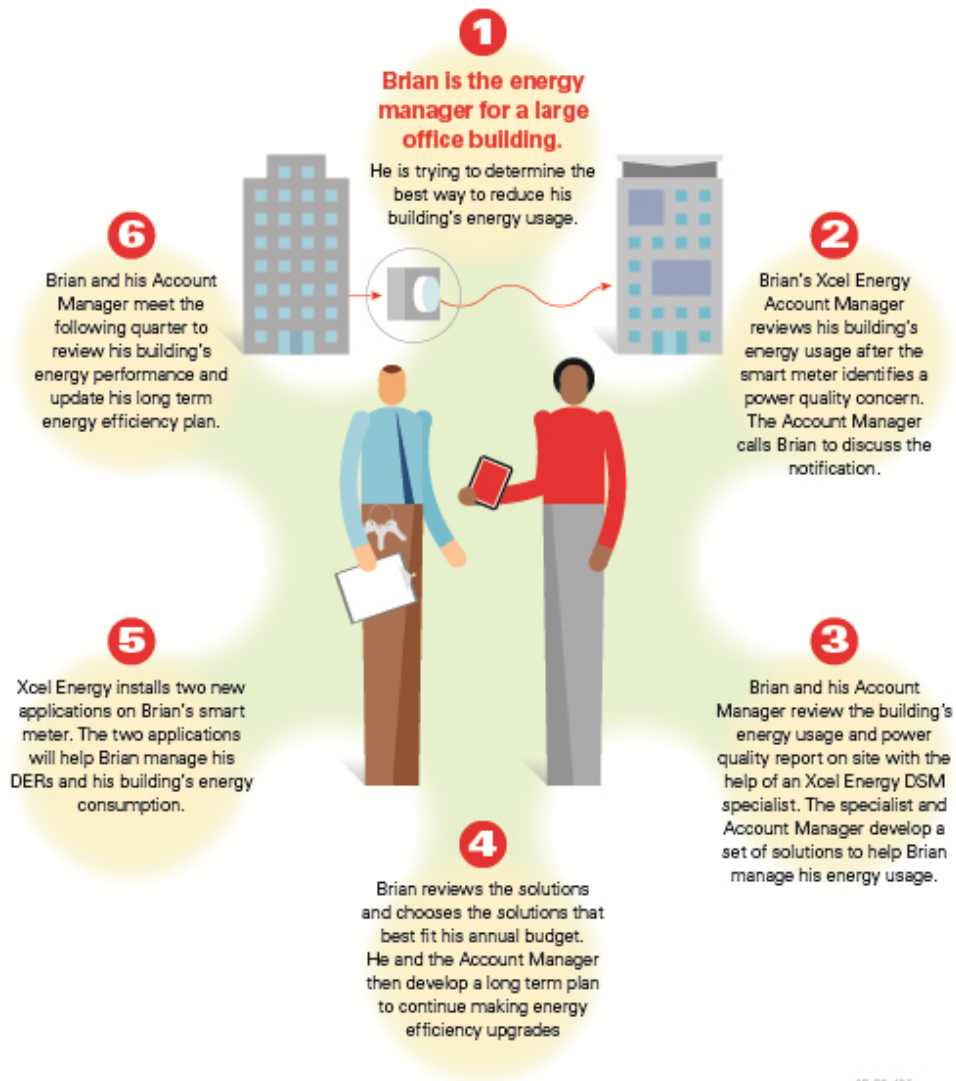
Figure 10. Residential Customer Journey – EV Integration with New Rate Designs



The next step in optimizing DER integration will be provided by a DERMS. Currently in the industry, interested stakeholders are identifying use cases and blueprinting how such systems may work. In the short term, we will work with the industry to define what and how a DERMS might work to provide the most benefit to our customers. By engaging in these discussions, we can help steer the future of DERMS in ways that will provide our customers with the most benefit. In the future, we plan to implement a DERMS, but only after we have successfully laid the foundational pieces of the advanced grid such as ADMS and AMI. If the technological capability continues to progress, we believe that a DERMS deployment will fit into our advanced grid plans around 2025.

Microgrids are another type of DER integration that will be improved by investments in AMI, FAN, ADMS and DERMS. Microgrids are effectively one large DER and the use of these advanced grid investments will allow the system to make more informed decisions, sometimes automatically, about what resources are needed, when they are needed, and the most efficient way to utilize those resources. As cost-effective opportunities present themselves, our distribution investments will allow for more efficient grid services, such as absorbing excess solar energy to be discharged at later periods, while also enabling backup needs power in the case of an emergency.

Figure 11. Commercial Customer Journey – DER and System Integration



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F. Security

The Company has a dedicated Enterprise Security Services (ESS) business unit that encompasses both cyber and physical security, security governance and risk management, and enterprise resilience and continuity services. This combination of services is designed to cover analysis of vendor risks, alignment of the technology with security standards, secure solution design and deployment, integration with Company solutions including user access management and system monitoring and incident response, as well as threat analysis and planning for continuity of business operations in the event of a disruption. The Company's security risk management program provides Company leaders with information about threats and the level of security risks, so that mitigations and responses can be planned that are proportional to the risk.

Overall, while the implementation of the AGIS initiative solves certain existing issues, it also presents different challenges to security than a less advanced grid, and requires its own comprehensive security strategy. It starts with identification and protection of all

components of the intelligent grid, both for the protection of customers and for the reliable and safe delivery of energy to customers. First, devices in the field must be protected. Unlike internal business technology, the distribution components are out in the field and at customers' residences; devices can only be hardened so much, and security must also rely on other controls. For example, detective controls at strategic locations to provide early notification of suspicious behavior or anomalous activity.

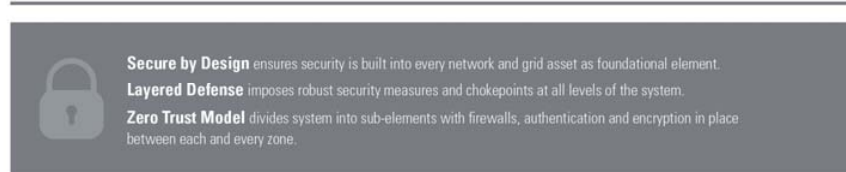
Additionally, although even legacy distribution systems and meters are vulnerable to physical tampering and disabling, adding a communications network – that provides additional capabilities and services to our customers, as well as greater insight into our system – also enhances the potential impact of a security compromise. The addition of a Company-owned FAN is a prudent approach to this concern. A private network allows Company to better control the integrity of the devices on its network and the data exchanged with those devices. The alternative – a public network – would expose the devices to increased risk because the Company would not be in control of the network.

1. *AGIS Security Approach*

As part of our AGIS initiative, we are designing security controls for each component and system implemented. These security risks can be organized into three primary areas: compromise of meters and devices; exploitation of the communications channels; and security lapses once data is within the corporate environment. There are also security risks related to the web portal, as well as future customer applications and new products and services that will be enabled by the advanced grid.

Figure 12. Key Security Components

KEY SECURITY COMPONENTS



First, advanced meters and other networked devices have an integrated network interface card (NIC) that enables them to connect to the FAN. We leverage both physical and cyber security controls to protect NICs from unauthorized access. Second, a compromise of the FAN communications protocols that carry “traffic” to and from the meters and field devices could lead to disruption or alteration of information needed for grid management. Therefore it is paramount to protect the integrity of the communication devices and channels that allow the advanced grid to perform at expected levels. It is also important to implement the correct level of monitoring and alerting, configured to identify potentially anomalous activity, so that both proactive and reactive responses are appropriate and efficient. Third, the primary risk to systems and information that reside within the Company’s corporate environment is from unauthorized access – where a criminal or unqualified employee accesses sensitive data or issues commands to the grid. There are many controls in place to prevent and detect such behavior.

We have based on our controls on a security controls governance framework, which leverages industry best practices including the National Institute of Standards and Technology (NIST), Cyber Security Framework (CSF). The Company’s security policies and standards incorporate regulatory compliance requirements and security controls designed to protect against CIA (Confidentiality, Integrity and Availability) breaches. This framework

serves as the basis for project security requirements as well as periodic internal security technology control assessments.

2. *Cyber Security Overview*

Our cyber security program may best be described in terms of the five categories of controls outlined in the NIST CSF: identify, protect, detect, respond, recover. Combining these adds multiple layers of protection and detection including defenses at each endpoint and throughout the network. Controls within these layers include:

- *Asset management* – maintain an inventory and securely configure assets, so we know what to protect as well as what is authorized to access our networks [“Identify”];
- *Protection* – user access controls, encryption, digital certificates and other controls to ensure the confidentiality, integrity and availability of data [“Protect”];
- *Vulnerability management* – in addition to scanning equipment for known security vulnerabilities, the Company monitors emerging threats [“Detect”];
- *Monitoring and alerting* – identify potentially anomalous activity so that both proactive and reactive responses are appropriate and efficient [“Detect”];
- *Incident response* – analyze information using playbooks and escalate to the Enterprise Command Center, the Company’s 24x7 watch floor operation designed to prepare for, respond to, and recover from any potential hazard that may impact customers, Company assets, operations, or its reputation [“Respond”]; and
- *Disaster recovery and business continuity planning* – to efficiently maintain and restore grid operations in the event of a cyber attack [“Recover”].

We will apply these controls to identify and protect all components of the intelligent grid and help ensure the reliable and safe delivery of energy to our customers.

Endpoint Protection is the installation and/or enablement of protective and detective cyber security controls to thwart malware and external influences from causing unexpected, unwanted or invalid behavior at an endpoint. These were specified as cyber security controls in the AMI vendor selection process, as they are essential to protect the devices and the data that are handled by AMI meters and headend servers.

Access Control is to confirm that only necessary and authorized users have access to the individual devices. This not only includes the devices that are installed on the consumer’s premises, but also the devices that facilitate communication and control of the data flowing to the consumer. There are potentially many avenues of compromise with respect to unauthorized access to devices. This is a key consideration and will be addressed through strong authentication methods, which include multi-factor authentication methods.

Authentication is a method by which a user affirms their identity. In its simplest form, it involves a user ID and password. Where technically feasible, Xcel Energy requires multi-factor authentication so that a user must not only know their password, they must also possess a physical or logical token. This minimizes the ability of an unauthorized user to steal passwords and access our assets and information.

Authorization is the process of determining and configuring the minimum level of access required by a user or an automated system. Granting undue permissions to devices that comprise the intelligent electric distribution system could lead to unauthorized or inadvertent changes and instability. Complying with a least-privilege principle ensures that only necessary and authorized individuals have the ability to make administrative changes.

System and Patch Management addresses the periodic manufacturer updates to software and firmware to improve performance, add features, or address security vulnerabilities. A

robust system patch management process incorporates asset inventories, secure receipt of patches from the vendor, testing and deployment to the field. The Company's threat intelligence and vulnerability management teams monitor for and inform support teams of known security vulnerabilities that require patching. Keeping current with vendor patches helps reduce the possibility that a criminal can use a known exploit to compromise our systems or data.

Data validation is a final defensive layer between the various endpoints. As data is sent from endpoints at consumer premises, data validation at the head-end must take place. If data values received from the consumer endpoint do not fall within a range of expected values, then either the data must be assumed compromised and discarded, or secondary validation must take place to measure the integrity of the data received. This validation will provide yet another level of detection and protection for the intelligent electric distribution system.

3. *FAN Security*

The equipment that makes up the FAN deploys the endpoint protections discussed above. Additional key controls for FAN include the use of firewalls to restrict which systems can interact and what ports and protocols they can use; encryption to minimize the opportunity to intercept and alter data traffic; monitoring and log review as well as response to suspected security events.

Firewalls are placed in multiple areas of the network between the customer meter and the company data center/head end. By default, all traffic through a firewall is blocked, and authorized only after a thorough review and change process. With a firewall, any unauthorized, unregistered devices that attempt to join the network or communicate to/from devices are blocked.

Encryption uses complex mathematical algorithms to obscure data prior to and during its travels through the communications network. It also prevents data from being altered. Only authorized parties to the transaction (sender and receiver) have the "keys" to encrypt and decrypt data.

4. *AMI Data Protection*

As we have described, our Company and AGIS security approach is one of "defense in depth." The advanced meters will be physically sealed and monitored to detect tampering. Meter communications will be encrypted to protect the privacy of our customers, as will the other communications that travel on the company's private FAN from and between the authorized devices that have been registered onto the network. Firewalls control the information that travels in and out of the corporate network. The AMI head-end will validate the integrity of the data received. We will actively monitor the communications path between the meters and the Company data centers to promptly detect and respond to any anomalous activity. Additional monitoring of the head-end system will trigger alerts for investigation.

5. *Company Systems Security*

The Company systems comprising and supporting AGIS reside in data centers with physical access protections – only authorized users are able to enter these locked facilities on company property. Data accessed from the control centers travels from the systems in the company data centers over the corporate network. At the control center, application users must follow the same rules for authentication, authorization, and least privilege.

Data from the intelligent electric distribution network passes through multiple defense-in-depth controls on its way back to the systems in the corporate data centers. Communications will pass through multiple firewalls to ensure that only authorized devices are communicating on authorized ports/protocols. Additionally, a protocol-aware Intrusion

Detection System/Intrusion Prevention System (IDS/IPS) will inspect the traffic to ensure tampering has not been performed on the data packet. Once the data has been delivered to the systems responsible for consuming this information, only authorized processes will have the ability to act upon this information.

The Company segments its networks, so that critical operational systems and information are kept separate from business data and operations including email. This segmentation adds a significant barrier should a criminal compromise a corporate user's account. In addition to using firewalls between networks, the Company requires the use of multi-factor authentication when accessing systems from outside the control center.

We take our responsibility to protect the privacy and security of our customers, grid, and information systems seriously. We have based on our controls on a security controls governance framework, which leverages industry best practices. We will take a defense-in-depth approach that will apply controls at many levels to identify and protect all components of the intelligent grid and help ensure the reliable and safe delivery of energy to our customers. See Appendix B for a summary of our data access, privacy and governance framework.

IV. TRANSFORMED CUSTOMER EXPERIENCE

Rather than simply evolving from our current state, we are revisiting our entire customer experience. Today, customers expect that we *know them* and take a personalized approach to their relationship with us; they expect that we keep them *informed* and use our expertise to *advise* them about what to do and then *enable* them to take those actions; and finally that we *deliver seamless* experiences for them reducing the burden on them to take action.

Figure 13. Customer Experience Priorities



In order to *know* our customers, *inform, advise, and enable* them, and *deliver seamlessly* we are taking time to understand the customer's journey and experience in our program design and execution. This process starts with a commitment to understanding customers' preferences, considerations, and thoughts regarding the benefits and value of an advanced grid investment from their point of view. As detailed above, we conduct robust customer research and continually update that research to ensure we are reactive to our customer's perceptions. It also requires our organization to improve the skills and competencies needed to continuously evolve and iterate our programs more quickly and leverage technology to make interactions more streamlined and enjoyable.

Our investments in the advanced grid will help us meet customer expectations. We have categorized how we expect to meet these expectations in three broad, but interconnected, categories. The categories are at the foundation of how we think about making investments in our customers every day.

- Enhance the Customer Experience

ENHANCE THE CUSTOMER EXPERIENCE

Outages

BEFORE ADVANCED GRID	AFTER ADVANCED GRID
<p>Detecting an outage: The current Electric Management System alerts system operators only to larger system outages. Xcel Energy depends on customers to notify us about outages in their neighborhoods or individual homes.</p>	<p>Detecting an outage: System alerts operators to almost all outages. After major storm repairs are completed, we'll send signals to newer meters to verify that power has been restored.*</p>
<p>Identifying outage location: With no specific location pinpointed, linemen drive or walk along the line – which could be many miles – until they identify the cause of the outage.</p>	<p>Identifying outage location: New technology pinpoints where problem has occurred, allowing grid operators to dispatch linemen to specific location. The result is improved restoration times.</p>
<p>Restoring power: When an object or tree comes in contact with a power line, every customer served by that line – and other lines connected to it – loses power.</p>	<p>Restoring power: Smart devices on the grid can perform automated switching – or keep additional, connected power lines in service – while linemen work on the impacted power line, minimizing the number of affected customers.</p> <p>*Customers should continue to contact us to report an electric outage at 1.800.895.1999.</p>

Setup and Billing

BEFORE ADVANCED GRID	AFTER ADVANCED GRID
<p>Customer billing information: Customers receive their monthly energy use after the end of their monthly billing cycle.</p>	<p>Customer billing information: Through advance metering, customers may access their energy usage the next day.</p>
<p>Accurate Billing: Sometimes customer bills have to be estimated due to access or safety issues until their meters can physically be read.</p>	<p>Accurate Billing: New advanced meters send energy usage information directly to us so customer bills are rarely estimated.</p>
<p>Remote connect/disconnect capability: A technician has to physically connect or disconnect service at a customer's home or office.</p>	<p>Remote connect/disconnect capability: With advanced meters, a customer's service can be remotely connected or disconnected.</p>

- Cleaner, more reliable energy

LEAD THE CLEAN ENERGY TRANSITION



Reliability

BEFORE ADVANCED GRID

System monitoring:

Grid operators rely on linemen and a limited number of alarms to alert them to trouble on a power circuit.

AFTER ADVANCED GRID

System monitoring:

Grid operators receive real-time information from line sensors, intelligent substations, and communication devices so they can proactively prevent and respond to grid issues.



Distributed Energy Resources

BEFORE ADVANCED GRID

Hosting Capacity:

Customer-owned rooftop solar can shutdown at times of over-voltage on feeders.

Openness to New Technology:

Finite utility ability to manage diverse resources limits customer ability to adopt new technology.

AFTER ADVANCED GRID

Hosting Capacity:

Increased situational awareness and control enables both increased hosting capacity for new installations and enhanced uptime for existing systems.

Openness to New Technology:

Improved measurement, visibility and control allows customers to select advanced applications such as batteries and electric vehicles.

- Keep Bills Low

KEEP BILLS LOW



Customer Choice and Control

BEFORE ADVANCED GRID

Customer options:

Customers have limited choices.

AFTER ADVANCED GRID

Customer options:

An Advanced Grid opens the door for more energy-related products and services, including rate design choices for customers such as time-of-use rates, and more energy- and cost-savings programs.

In the following sections, we provide more details on the types of products and services we will offer in the future that fit within these categories. These products and services are currently in development and we have provided an expectation of when we expect to begin delivering on these products and services. However, it is important to reiterate that the anticipated delivery dates are not the final states of these offerings. We will continually innovate and iterate these offerings and incorporate new benefits and opportunities as they become available to us. This may include adapting offerings to incorporate DI capabilities, transitioning traditional opportunities to DI applications, or integrating new technology that is not yet in the market.

A. Enhance the Customer Experience

Outage Enhancements

Product or Service	Customers Affected	Timing
Enhanced Outage Notifications More accurate alerts informing customers about outages in a timely, relevant way. These could include proactive messaging about an outage status, automatic restoration, and restoration confirmation.	Residential Small Business Large C&I	Day 1
Smart Premise Restoration Sequentially restore power to various devices inside the home or business after an outage to reduce the likelihood of voltage or overloading issues, protecting customer system performance as power is restored.	Residential Small Business Large C&I	Future

Integrated, seamless interactions

Product or Service	Customers Affected	Timing
<p>Green Button Download My Data For customers who prefer to perform their own analysis or use their granular usage information for other purposes, data in the standard Green Button protocol will be made available through the Download My Data feature in the customer web portal.</p>	<p>Residential Small Business Large C&I</p>	Day 1
<p>Enhanced Web and Mobile Applications Customer account information along with options to view and pay bills, visualize energy usage and trends, and manage outages will be presented to customers in an integrated and highly personalized format. This is made possible by granular information and analytics as well as a robust customer preference center.</p>	<p>Residential Small Business Large C&I</p>	Day 1
<p>Energy Usage Dashboard Within the new web and mobile customer portals, energy usage dashboards will inform customer about the energy usage of both the overall facility as well as individual devices in a home or business. Compares data to a comprehensive database of similar products to alert to opportunities to save energy and money. Dashboards can be customized to both residential and C&I customer needs (e.g. multi-site data).</p>	<p>Residential Small Business Large C&I</p>	Day 1
<p>Energy Usage Alerts and Notifications Alerts allow customers to be notified with important information in a timely, relevant way. These could include high usage alerts, TOU peak period, Peak Day notification, or goal-based alerts.</p>	<p>Residential Small Business Large C&I</p>	Near Term
<p>Green Button Connect My Data For customers who would like to automatically transmit their usage information to third parties, Green Button Connect My Data will also be available in the customer web portal for ongoing automated transfers.</p>	<p>Residential Small Business Large C&I</p>	Near Term
<p>Personalized Notifications Communication systems will be enhanced to provide timely information to customers in a form that is personalized to their lifestyle and preferences.</p>	<p>Residential Small Business Large C&I</p>	Near Term
<p>Artificial Intelligence Enabled Notifications As artificial intelligence technologies mature and become widely adopted in the market, meters will have the ability to leverage these capabilities to provide heightened interactions which will be customized to the unique needs of each customer.</p>	<p>Residential Small Business Large C&I</p>	Future

Safety & Reliability Enhancements

Product or Service	Customer Affected	Timing
<p>Power Quality Analysis With detailed information collected by the meter relating to power delivery, customers can more accurately and frequently assess their power quality. Over time, analytics of the power quality information can help flag and diagnose potential power quality related items so that customers can proactively manage any possible issues.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Emergency and Safety Notifications The meter will be able to provide customers with emergency management notifications via its analytics and communications capabilities. This can help customers identify potential risks to their energy management systems, security monitoring, and be aware of local emergency notifications that may apply to their general safety and security.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Enhanced Microgrid Integration Where the capability exists for portions of the grid to operate independently of the rest of the surrounding system, the advanced distribution management system will more seamlessly be able to manage the connection of these microgrids.</p>	<p>Residential Small Business Large C&I</p>	<p>Future</p>
<p>Smart Safety Disconnect Detects when a smart inverter has malfunctioned or was improperly installed and has not disconnected from the grid when incoming power has been lost. In this situation, the disconnect inside the meter is automatically tripped to protect the rest of the grid and the customer.</p>	<p>Residential Small Business Large C&I</p>	<p>Future</p>

Product or Service	Customers Affected	Timing
<p>Outage Notifications Alerts allow customers to be notified with important information in a timely, relevant way. These could include proactive messaging about an outage, automatic restoration, and restoration confirmation.</p>	<p>Residential Small Business Large C&I</p>	<p>Day 1</p>
<p>Smart Premise Restoration Sequentially restore power to various devices inside the home or business after an outage to reduce the likelihood of voltage or overloading issues, protecting customer system performance as power is restored.</p>	<p>Residential Small Business Large C&I</p>	<p>Future</p>

B. Lead the Clean Energy Transition

Product or Service	Customers Affected	Timing
<p>Enhanced Access to Battery Storage and Electric Vehicles Through the enhanced visibility and control of the distribution system, greater utilization of storage elements on the grid, including electric batteries and electric vehicles, will be possible. This capability promises to help ensure safe, reliable energy for all customers.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Green Notifications and Controls Customers would be notified when the percentage of electricity generated by renewable services in their area exceeds a certain threshold.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Enhanced DER Enablement Through the enhanced visibility and control of the distribution system, customers will be able to integrate distributed generation resources more seamlessly and potentially at higher levels within a given area.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Demand Management Optimization With more granular consumption information, new demand management programs can be created to enable customers to shift and shed load to respond to needs of the grid on an increasingly real-time basis. With new communication capabilities, the meter will be able to communicate directly with smart devices within homes and businesses. As analytics such as disaggregation and virtual submetering evolve, demand response routines can increase sophistication through optimizing sequence among various demand response resources.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>

C. Keep Bills Low

New Energy Saving Programs

Product or Service	Customers Affected	Timing
<p>Virtual Energy Audits Provides an on-demand or periodic assessment of the energy usage/efficiency of a premise based on actual performance versus expected performance based on various parameters (i.e. size, year, build, occupancy, devices, etc.). With disaggregation and other analytics capabilities made possible by AMI, these audit results will improve over time to provide more accurate and relevant information. Audits may also be used to monitor the health and status of appliances to identify opportunities for customer to reduce maintenance costs and improve energy efficiency.</p>	<p>Residential Small Business Large C&I</p>	<p>Day 1</p>
<p>Whole Facility Monitoring C&I customers with long-term sustainability goals can more easily track progress at the whole facility and sub-system level through integrations between meters and customer-operated energy management systems. This information can be used to verify savings over time for the purposes of demand side management or can be used to alert customers when demand or energy usage projections are expected to exceed threshold amounts over a given period of time.</p>	<p>Small Business Large C&I</p>	<p>Near Term</p>
<p>Enhanced Control Options for Behind the Meter Systems From the smart home to intelligent buildings, AMI meters will be able to communicate more seamlessly with devices and systems within the customer facility. Customers can use this capability to participate in demand response programs as well as to manage facility energy consumption in a more accurate and robust way.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Enhanced Automated Demand Response As the grid evolves, distribution system management can utilize expanded automated demand response capabilities which respond to real time needs of the distribution grid.</p>	<p>Residential Small Business Large C&I</p>	<p>Future</p>

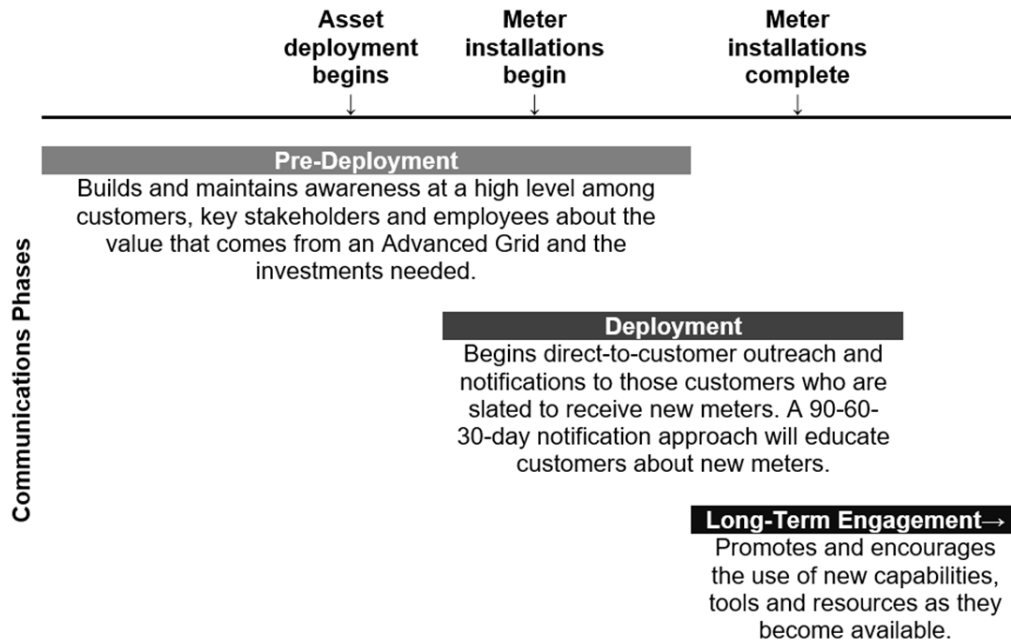
New rate options

Product or Service	Customers Affected	Timing
<p>Rate Advisor With granular usage information and analytics capabilities made possible by AMI, the company will provide a multi-channel approach to educate customers and proactively offer ways to optimize energy usage and cost under existing and new, future rates schemes.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Time Varying Rates With more granular consumption data and more sophisticated meters, rate schedules can be created to better reflect the actual costs on the system at specific times of day. Customers can take advantage of these price signals to manage costs.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Virtual Submetering Instead of installing physical submeters, which are costly and take special wiring and their own communications channels, the main meter could act as a virtual submeter through disaggregation capabilities at the meter.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Smart Rates New rate opportunities including pre-pay and technology specific rates. Rates may rely on local management of the premise level grid or local identification of events. For example, when an EV is plugged in, this could be detected and an EV rate is automatically applied. Another example, would be a flat billing rate with use of the Premise Level Grid Management System (PLGMS) to stay within the agreed to usage levels.</p>	<p>Residential Small Business Large C&I</p>	<p>Future</p>

V. CUSTOMER COMMUNICATIONS STRATEGY AND PLANNING

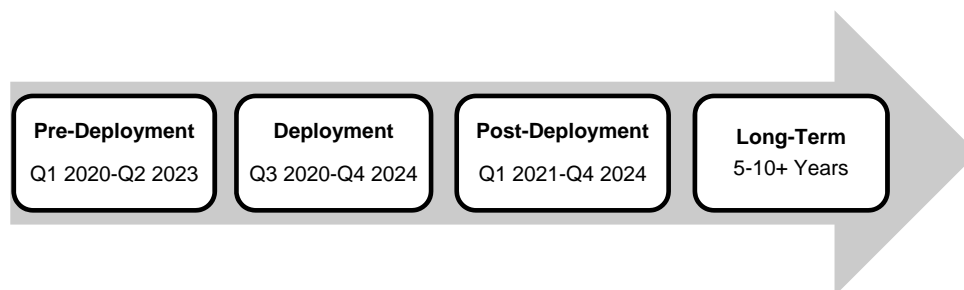
Because meter installation and advanced meter capabilities will be geographically staged over a multi-year timeframe, we will stage our customer communications to align with the value we expect customers to realize through this advanced grid journey.

Figure 14. Customer Communication Phased Implementation



We know from our research that it is important to not overwhelm customers with new products and services as part of their initial experience with advanced meters. For example, our research to-date indicates that customers are not familiar with and don't fully understand how time-of-use pricing works and how to change their behavior to account for this type of pricing. Therefore, as billing becomes ever more complex it is important that customers understand the complexities of their billing before they are introduced to new products and services that may or may not help them control their energy usage.

Figure 15. Customer Communications and Value Realization



A. Pre-Deployment

In this pre-implementation phase, we are building awareness among customers and key stakeholders about the value that comes from an advanced grid and the investments needed. We are communicating the value AGIS is expected to bring to our customers and communities and working to anticipate customers' information needs and questions and

clearly outline how to take action – including how to “opt out” of receiving an advanced meter (see Appendix A for our proposed Opt-Out Framework).

We will also be setting the stage for Day One with customers – and with advanced grid infrastructure, as we will begin installing the FAN approximately six months in advanced of AMI meter deployment.

Table 2. Customer Communications Timeline and Summary

	90 days before meter install	60 days before meter install	30 days before meter install	7 days before meter install	Day of install	Post-install
All customers	Mailer: intro	Mailer: your meter is coming soon	Mailer: meter installation FAQs	Phone call: your meter is coming next week	Install technician door knock	Mailer: success or attempt
					Door hanger: success or attempt	
Opted-in customers (only customers who have opted into these channels will receive these notifications)	Email: what to expect during meter installation	Email: Your meter is coming soon	Email: Your meter is coming soon	Text notification		Email: success or attempt
			My Account banner: Your meter is coming this month	App push notification		My Account banner: success or attempt
Mass communication	Targeted online, print, and out of home advertising			Hyper-targeted social media advertising		
	Community outreach: meter install schedule by neighborhood, informational content about new meters					

This is a critical period where we are working to ensure the foundational customer experience is exceptional, and that customers will not only be satisfied but also active and excited for what comes next.

B. Deployment

Deployment represents the point at which customers have an advanced meter and begin to realize tangible value from our advanced grid investments. Our customer communications will become more specific – with messaging regarding the specific service improvements customer should expect to see, such as:

Improved reliability and faster outage restoration

- New digital energy grid technologies will help us prevent outages to you and your neighbors and, in some cases, enable us to automatically reroute power to shorten or prevent any service interruptions.

- Advanced grid technologies can detect outages at your home or on the larger electric system, helping reduce the time you are without service.
- You'll receive quicker notifications when service is out and more accurate information on when power will be restored.

More options to protect the environment and use new technologies

- The advanced grid will help us provide you with even more clean energy because it will allow us to maximize the use of renewable energy sources such as solar, wind, and hydro.
- Energy use data in near real-time will give you the ability to choose how and when you use technology such as batteries and electric vehicles.

Security you can trust

- Energy use data will be securely transferred electronically from the advanced meter, eliminating the need for manual meter reading or estimates, which also helps reduce costs.
- Protecting your data is extremely important to us. We use multiple layers of defense to ensure all data is secure and protected.

For customers who have received new meters, we will seek feedback to ensure satisfaction with the process. We will also continue to raise awareness about advanced meter features and engage them to take advantage of new capabilities and functions. In this phase, we will focus more on the available Home Area Network and available online tools and resources, such as the online energy usage portal. We will begin to introduce them to more products and services that help reduce energy usage and offer non-energy benefits. Finally, we will also be measuring customer awareness, understanding, interest, participation and satisfaction with the advanced meters and their associated features.

C. Long-Term Engagement

This phase will promote and encourage the use of new Advanced Grid capabilities, tools and resources as they become available. Communications will not only highlight the features of new tools and resources, but also the broader benefits they can provide. This phase will leverage customer information and preferences gathered in Phase II to provide a seamless experience for all customers via their preferred channels.

Key objectives during this phase include:

- Leverage a messaging hierarchy that reiterates high-level benefits of the project while educating customers on new capabilities, tools and resources as they become available.
- Develop and execute a customer nurturing campaign to follow the customer journey and encourage adoption of new capabilities, tools and resources.
- Evaluate and refine messages and tactics to continuously improve and ensure the best possible customer experience.

VI. CONCLUSION

Our distribution grid is the foundation of the service we provide our customers. As our current system ages and technology advances, we are at a point where modernization will return significant value to our customers. Making these investments in our system will enhance transparency into the distribution and to system data, to promote efficiency, and reliability, and to safely integrate more distributed resources. Underlying these goals are the following drivers:

- The Company's strategic priorities to lead the clean energy transition, enhance the customer experience, and keep energy prices affordable;
- The Company's desire to meet the growing needs and expectations of our customers;
- Current distribution system needs; and
- Commission policy and direction, and stakeholder input relative to customer offerings, performance, and technological capabilities of the grid.

If we delay the implementation of a smarter and more advanced grid, we will increasingly find ourselves unable to meet customer expectations and unable to benefit from the advanced in technology includes the benefits brought by DERs. As discussed above, our investments will:

- Provide customers with new products and services to manage their energy use;
- Improve our management and integration of DERs;
- Improve the outage restoration process and the accompanying customer experience; and
- Help maintain stable and reasonable costs for our customers.

APPENDIX A: CUSTOMER OPT OUT FRAMEWORK

The Company believes customers should have the choice to opt-out of receiving an advanced meter. We will therefore provide eligible customers with the opportunity to decline the installation of an advanced meter before initial installation or a request to have an advanced meter removed at any time. However, opt-out requires the Company to maintain its abilities to manually read meters, which involves maintaining supporting information systems and incremental meter reading personnel – meaning the Company will lose both its current efficiencies of reading the meters through AMR and future efficiencies of reading these meters through AMI. Therefore, we believe any opt-out framework should be based on the cost-causation principle to ensure other customers are not subsidizing customers who choose to opt-out of AMI. We outline a framework below that we intend to socialize with stakeholders to gather feedback before proposing an Opt-Out Tariff for inclusion in our Minnesota Electric Rate Book.

Because of the inefficiencies created by the opt-out option, we will work to minimize the numbers of customers choosing to opt-out – starting with our pre-AMI deployment customer education and awareness campaign, which will address many of the questions or concerns that customers typically have with advanced meters, including privacy and safety. Our communications will also discuss the benefits that an advanced meter provides, including opportunities to reduce energy costs and improve their environmental impact. As our pre-deployment communications get underway with customers, our customer service representatives will also be trained to address customer questions and concerns in a transparent and understanding manner.

To ensure no cross-subsidization and consistent with cost-causation principles, we propose that customers opting-out of AMI incur the costs to provide the services necessary to maintain billing and meter reading activities to support that choice. If an eligible customer chooses to decline installation of an AMI meter, that customer will receive a meter that will be capable of recording the customer's interval energy usage – but the meter will not contain a communications network interface card, and therefore the usage must be retrieved manually by a Company meter reader. This will be a change from the current meter reading and billing experience for customers, because we have used an AMR system that, except for unusual circumstances, has nearly negated the need for meter reading field personnel for most customers for approximately 20 years.

We propose that customers be able to decline the installation of AMI at with no upfront charge – only incurring an ongoing cost-based charge to support the ongoing manual meter reading and related processes. If however a customer requests an AMI meter to be removed after its initial installation, we propose to charge a service fee that covers the costs of a field representative to remove the AMI meter and replace it with a non-AMI meter. The ongoing charge for these customers would be the same as for those who decline the installation at the time of initial deployment.

As noted previously, we intend to engage stakeholders with this basic framework along with proposed cost-based upfront and ongoing fees – with a goal of developing a detailed Tariff proposal to submit to the Commission for approval.

APPENDIX B: DATA ACCESS, PRIVACY, GOVERNANCE

The Customer Data and Information Strategy enables the framework for maintaining the integrity and security of our data and information assets throughout its lifecycle. This strategy encompasses the creation, storage, usage, sharing, and disposal phases of data assets. The strategy also ensures Xcel Energy data and information provides business value, minimizes risk, and complies with legal and regulatory requirements.

A. Culture

Xcel Energy's data is managed as an asset of the business. We leverage data to drive more understanding within the business about how data can be employed to improve operational performance, evaluate industry options, and help customers make better decisions. We have robust data privacy and security standards for all data that varies based on the type of data. Our customer strategy is informed by these standards, and as new products, services, and experiences are identified they will comply with these standards. At this time, the expectation is that any customer-specific data derived from AGIS will be treated similar to the way customer-specific data is treated today. The primary difference in the data AGIS will capture is expected to be the granularity of the data – i.e. today's monthly consumption compared to the 5- and 15-minute interval data from AMI.

Everyone who works for Xcel Energy understands their responsibilities for maintaining the integrity and quality of our data assets, complying with data requirements, and keeping the data safe and secure. To ensure that all employees understand the criticality and responsibility of securing data, all employees are required to complete information management training annually.

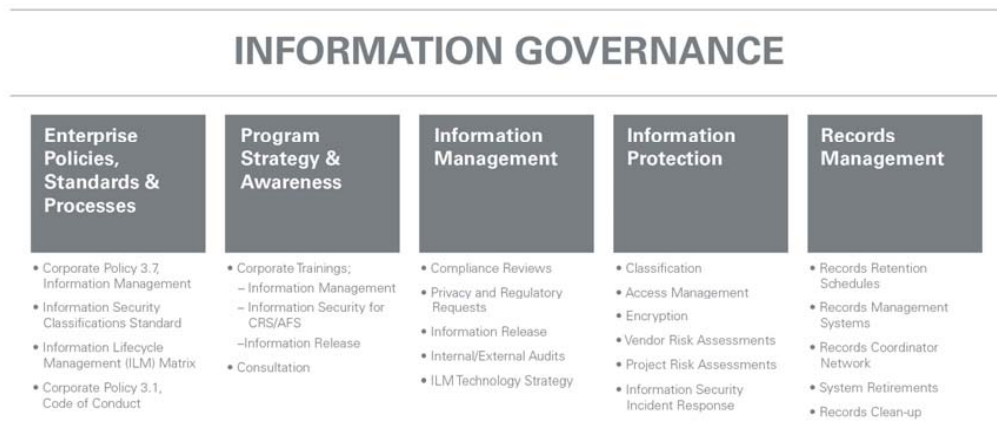
B. Information Governance Framework

Xcel Energy's Enterprise Security Services (ESS) oversees and provides leadership of the information governance policies, procedures, processes and standards. This includes strategic oversight of the creation, collection, use, protection, retention and disposal of all company information in all formats.

Compliance with is a corporate and individual responsibility, and compliance is monitored and evaluated through the corporate governance framework.

The key areas of Information Governance are as follows:

Figure 16. Xcel Energy Information Governance



C. Information Management and Protection

Customers trust that the information Xcel Energy creates, collects, and uses as part of its work to provide regulated utility service to customers is handled properly to avoid the potential for loss, misuse, or harm. Information Management is the policies and procedures that support data quality, data logistics and data integration covering the following lifecycle stages: (1) creation and collection; (2) use; (3) release; (4) disposition.

1. Creation and Collection

Company information is data, facts, and figures generated or received in connection with the transaction of business, and that is categorized as a Record or a Non-Record. Distinguishing between records and non-records is essential to the decision-making process regarding the use, release, and disposition of the information.

- Records are any documentary material, regardless of format, that have been finalized and / or identified on a records retention schedule.
- Non-Records are any documentary material, regardless of format, that has not been identified as a record; non-records include copies of records.

All Company information whether it is a record or non-record is classified into four information security categories based on its value or potential risk. We describe these categories and how we classify customer information below:

Confidential Restricted (CRI). CRI includes information where unauthorized disclosure (inside or outside the company), alteration or destruction has the potential for significant harm to the company, its employees, shareholders or its customers, including: damage to reputation; damage to Bulk Electric System (BES); legal, regulatory, or other sanctions. Data in this classification requires the strongest level of protection. Distribution of CRI must be limited to those with a business need to know and distribution of CRI to any third party must be approved through the approved data release process. Customer CRI includes Personally Identifiable Information (PII), such as Social Security Number (SSN), Driver's license or other government-issued identification numbers, financial account number, any individually identifiable information received directly from a financial institution, individually identifiable biometric data (including, fingerprints, voice print, retina or iris image), first name (or initial) and last name (whether in print or signature) in combination with any one of the following: Date of birth, Mother's maiden name, Digitized or other electronic signature, or DNA profile.

Confidential (CI). CI includes information where unauthorized disclosure (inside or outside the company), alteration or destruction has the potential for harm to the company including: damage to reputation; material productivity loss; impede the organization's operations to the BES; legal, regulatory, or other sanctions. Data in this classification requires protection and may only be distributed to those with a business need to know and distribution of CI to any third party must be approved through the approved data release process. Examples of customer CI include details regarding a customer's account or other Xcel Energy-assigned numbers, energy usage, current charges, and billing records.

Internal (I). Internal information includes information where unauthorized disclosure (inside or outside the company), alteration or destruction is unlikely to cause harm to the company, such as: damage to reputation; significant inconvenience or productivity loss; damage to BES; legal, regulatory, or other sanctions. Data in this classification may not be shared outside the company without prior approval from the information owner. Customer internal information includes aggregated customer energy usage data (CEUD) aggregated to the 15/15 threshold or whole building CEUD aggregated to the 4/50 threshold.

Unsecured (U). Information that may or must be available to the public. Unsecured information includes Xcel Energy's website, and the following documents once published and made available to the general public: SEC filings and FERC filings, brochures, advertisements, press releases, annual reports, bill board advertising, current billing rates. In terms of customer information, once aggregated CEUD is authorized, it becomes unsecured information (example: the Community Energy Reports on the xcelenergy.com website).

2. Use

Our Privacy Policy outlines the ways that we may use the information we obtain about our customers, as follows:⁶

- Assist in establishing an account with Xcel Energy
- Provide, bill, and collect for Xcel Energy products and services
- Communicate with customers, respond to their questions and comments, and provide customer support
- Provide customers access to their information via the My Account site
- Administer customers participation in events, programs, surveys, and other offers and promotions
- Operate, evaluate and improve Xcel Energy's business and the regulated products and services we offer (including developing new products and services, analyzing our products and services, optimizing customer experience on websites, managing our energy distribution system and our communications, reducing costs and improving service accuracy and reliability, and performing accounting, auditing and other internal functions)
- Create aggregated or de-identified energy usage data
- Protect against and prevent fraud, unauthorized transactions, claims and other liabilities, including past due accounts
- Manage risk exposure
- Comply with applicable legal and regulatory requirements

Internally, we base our use parameters on the information security category assigned to the type of information. Employee access to customer CRI or CI is limited to only those

⁶ The Xcel Energy Privacy Policy in its entirety can be found at:
[https://www.XcelEnergy.com/staticfiles/xcel/StaticFiles/xe/Admin/Xcel Energy%20Online%20Privacy%20Policy.pdf](https://www.XcelEnergy.com/staticfiles/xcel/StaticFiles/xe/Admin/Xcel%20Energy%20Online%20Privacy%20Policy.pdf)

employees and contract workers with approved access to our customer system (Customer Resource System or CRS).

Employees with access to customer CRI and/or CI are prohibited from accessing viewing for a non-business reason; accessing or transferring it for personal gain, advantage or any other personal reason; giving access to or transferring it without first obtaining appropriate approvals; downloading, uploading, or saving it on a personally owned computing device; and accessing it from a public computer.

3. Release

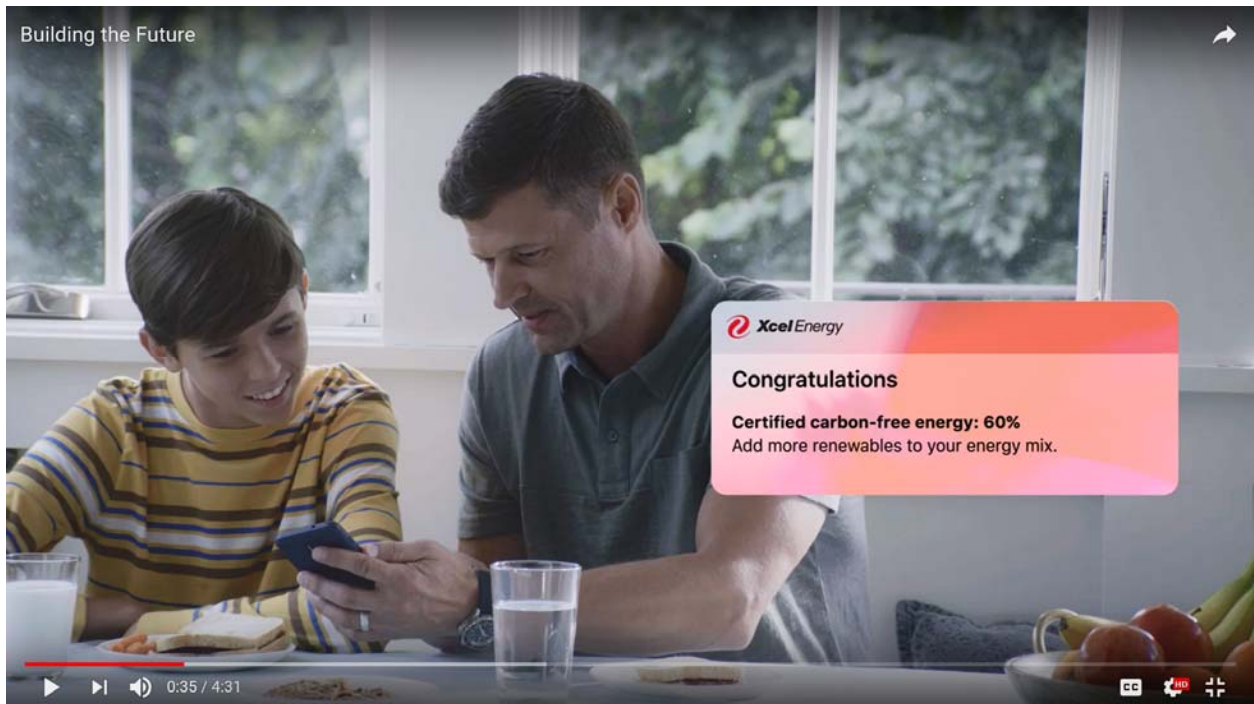
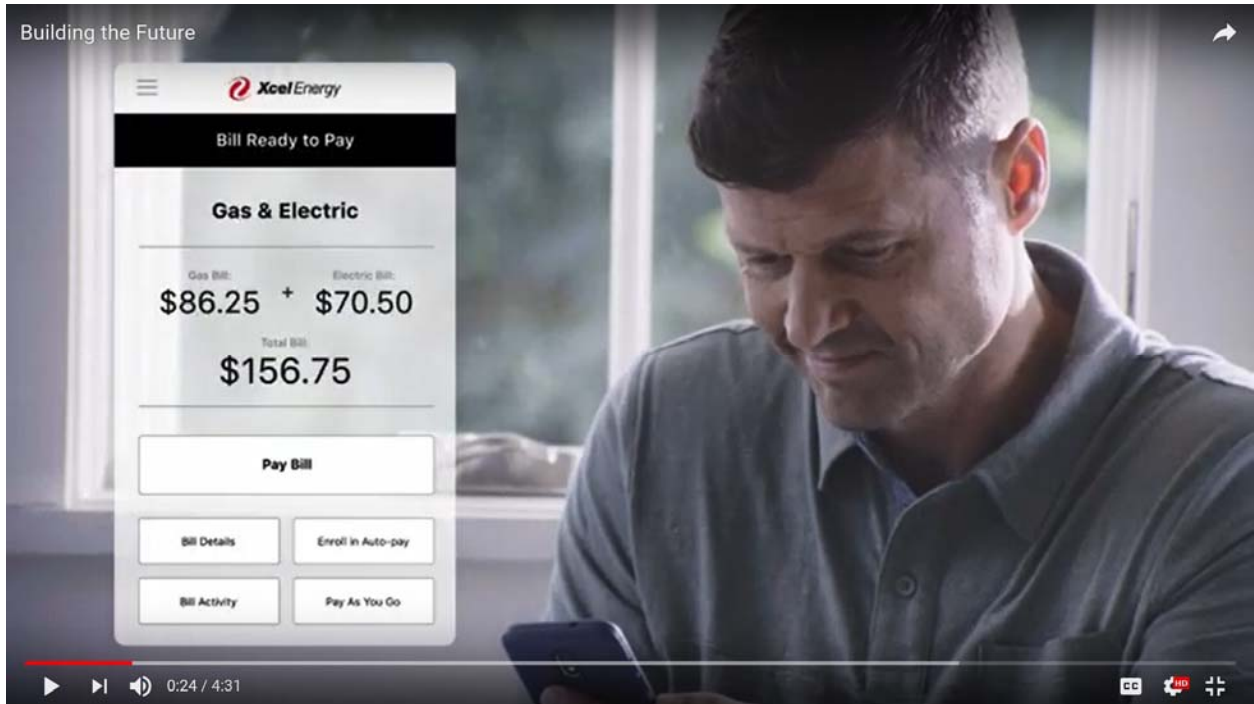
Xcel Energy will only release customer CRI pertaining to an individual to that individual once the identity of the individual has been validated. We will release customer CI to the customer of record upon validating the customer's identity, or to a third party upon receiving a documented and verified consent from the customer of record. We may also disclose customer CI as required or permitted by law or applicable regulations, including to a federal, state or local governmental agency with the power to compel such disclosure, or in response to a subpoena or court order.

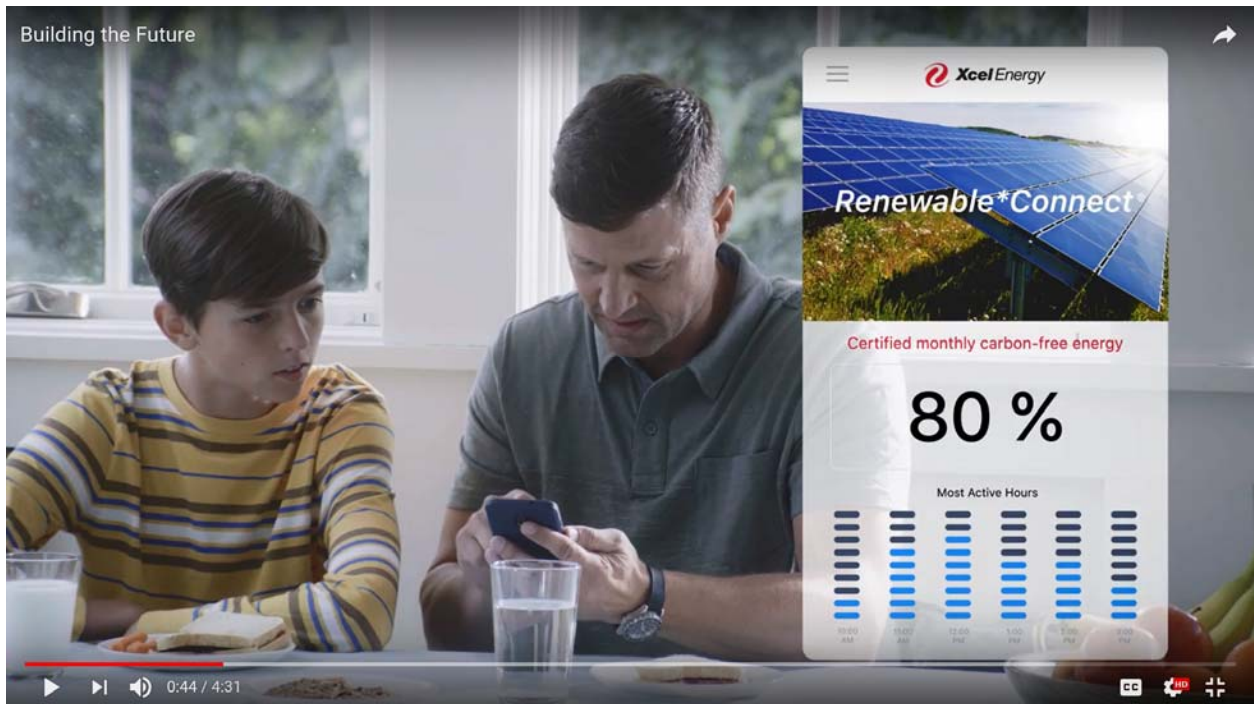
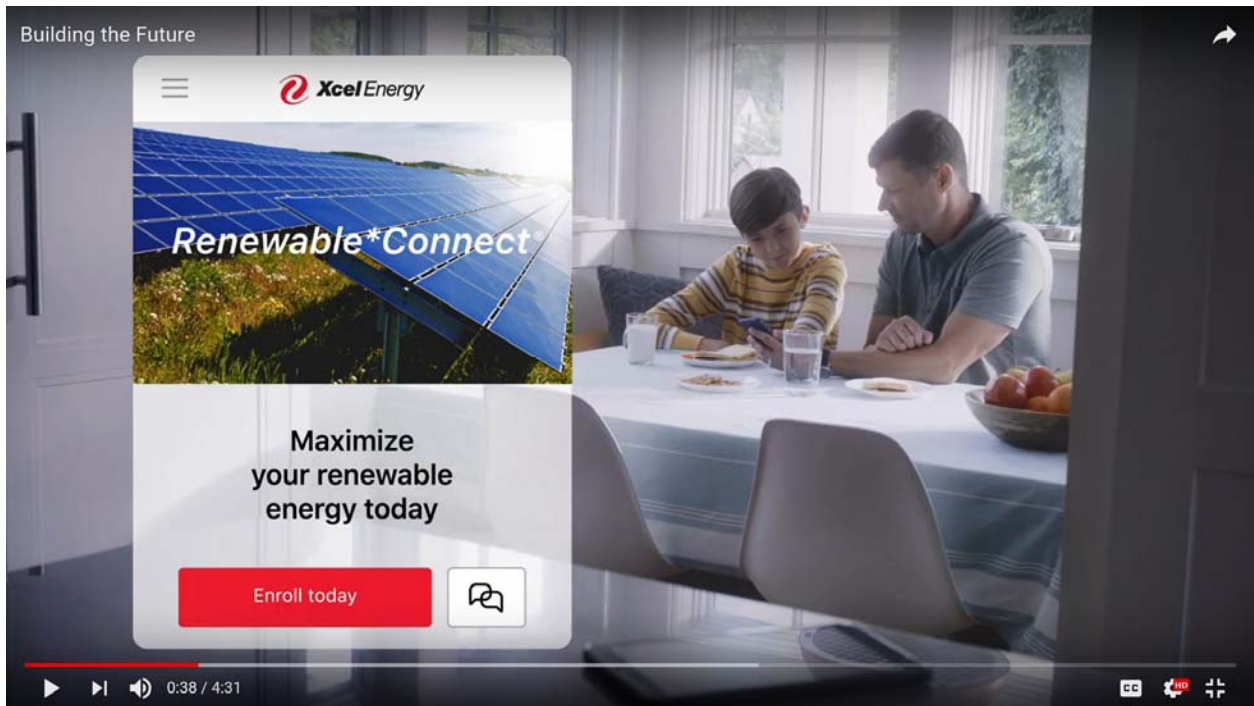
We also release customer information to our contracted agents, when it is necessary for our agent to perform the service(s) specified in an Agreement.⁷ All of our contracted agents go through a security vendor risk assessment (SVRA) screening process intended to provide transparency into security-related risk(s) that could potentially be introduced to Xcel Energy as a direct result of utilizing a third-party vendor's product, service, application, etc. All newly proposed vendor arrangements are subject to the (S)VRA process before a contract is signed. Suppliers are assessed by multiple ESS teams (Security Risk Management, Physical Security, Enterprise Resilience, and Information Governance) to ensure security risk is addressed holistically. We prohibit these service providers from using or disclosing the information we provide them, except as necessary to perform specific services on our behalf or to comply with legal requirements.

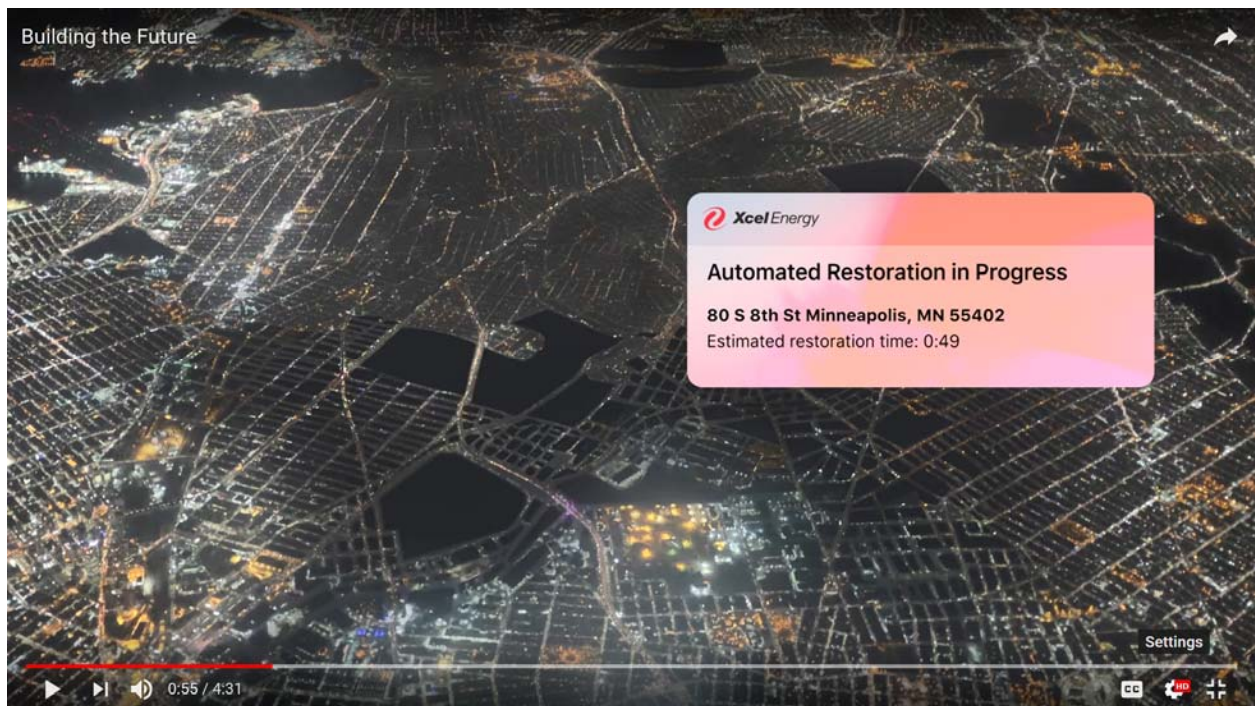
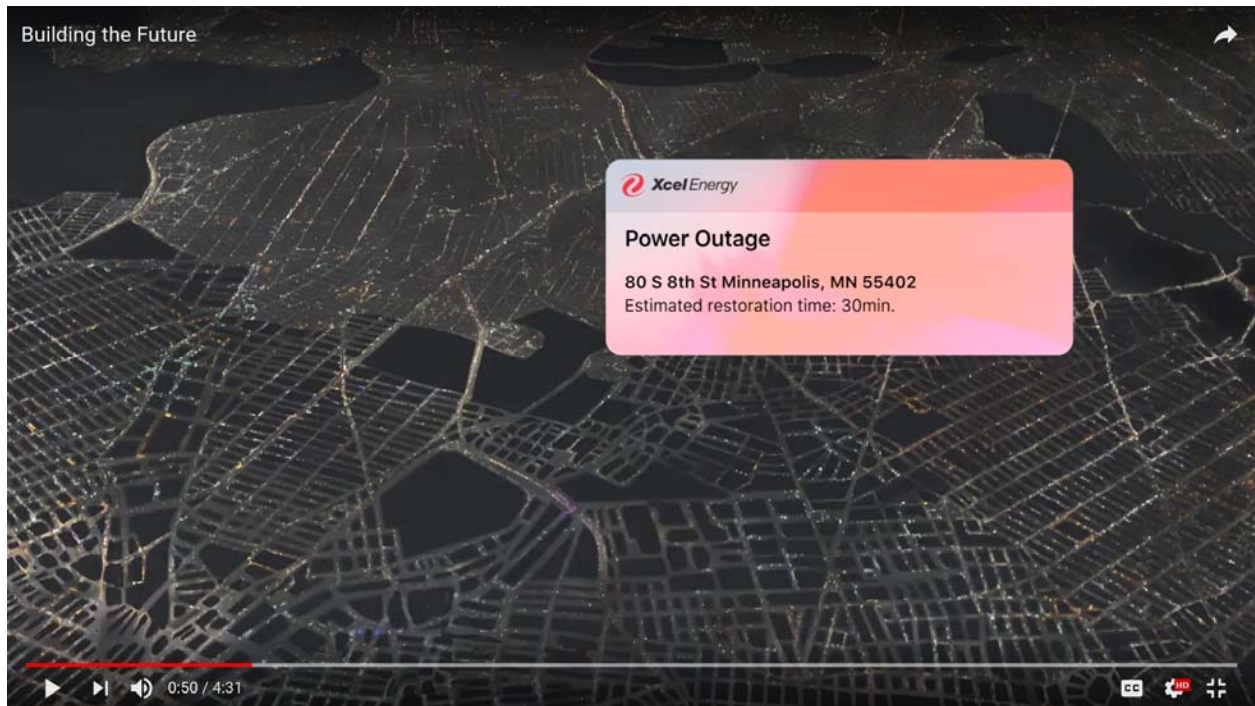
4. Disposition

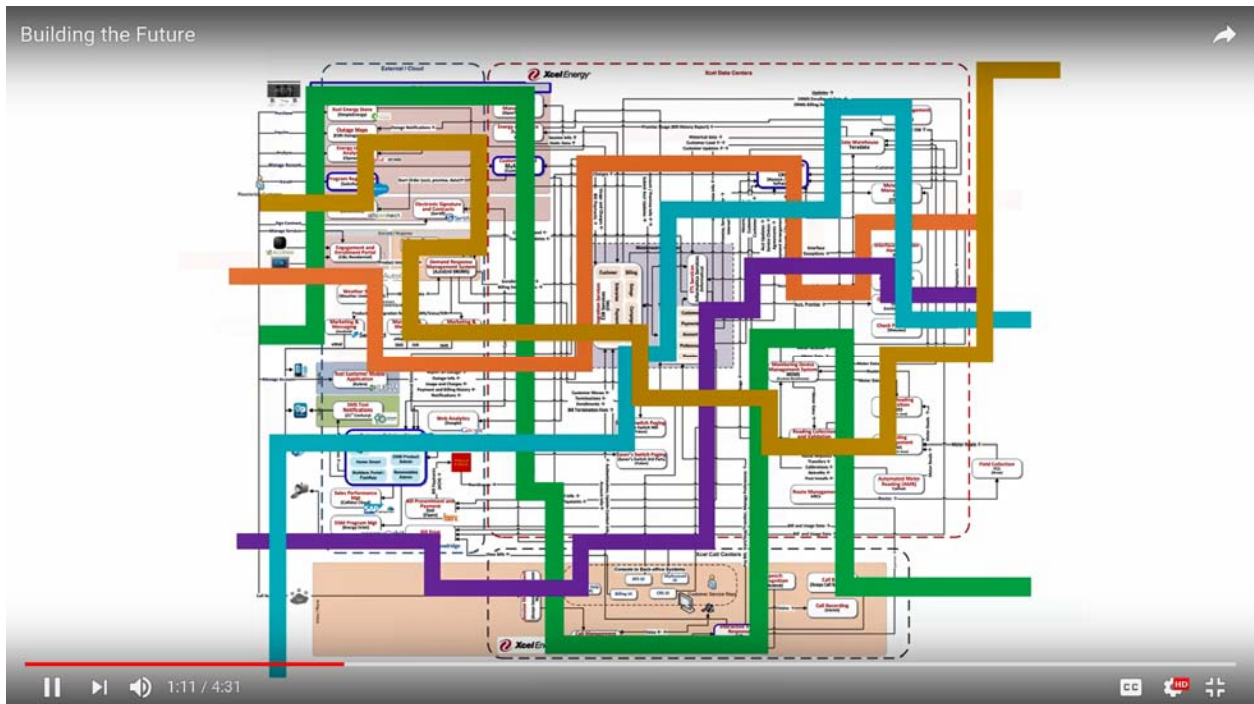
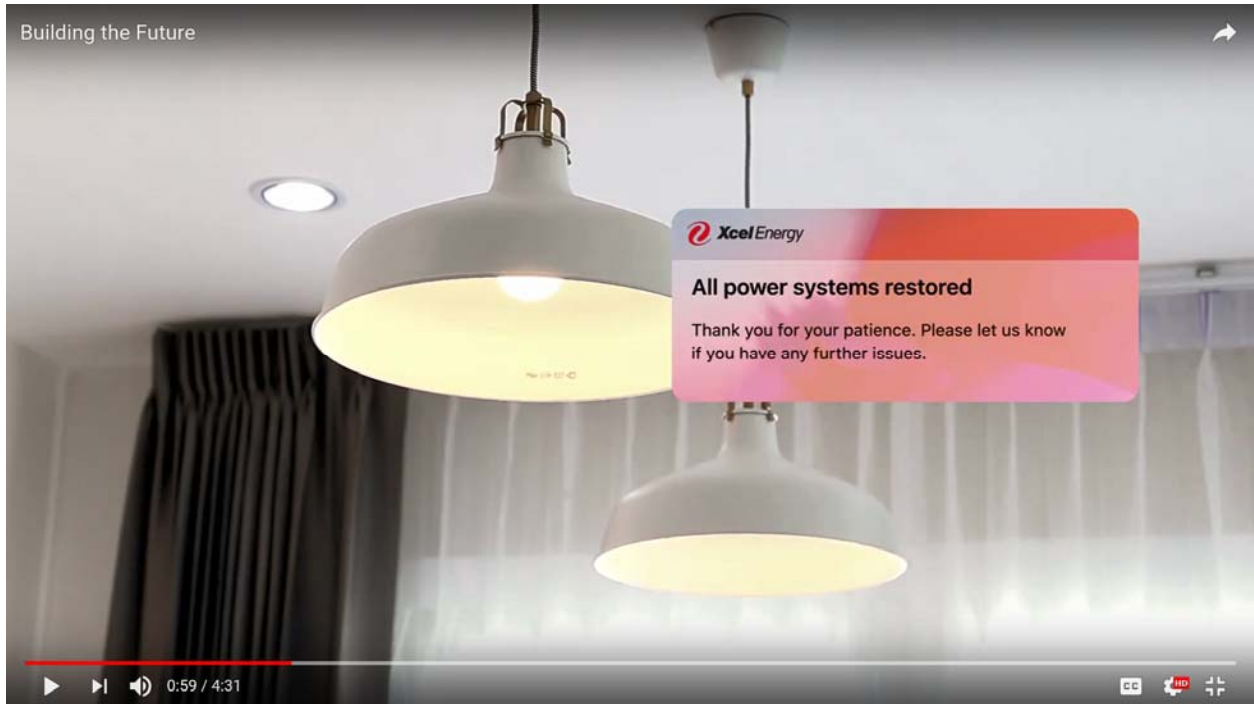
The disposition phase of the information management lifecycle consists of disposal requirements as defined in a records retention schedule. Customer account and billing information, and data from our meters are retained for six years.

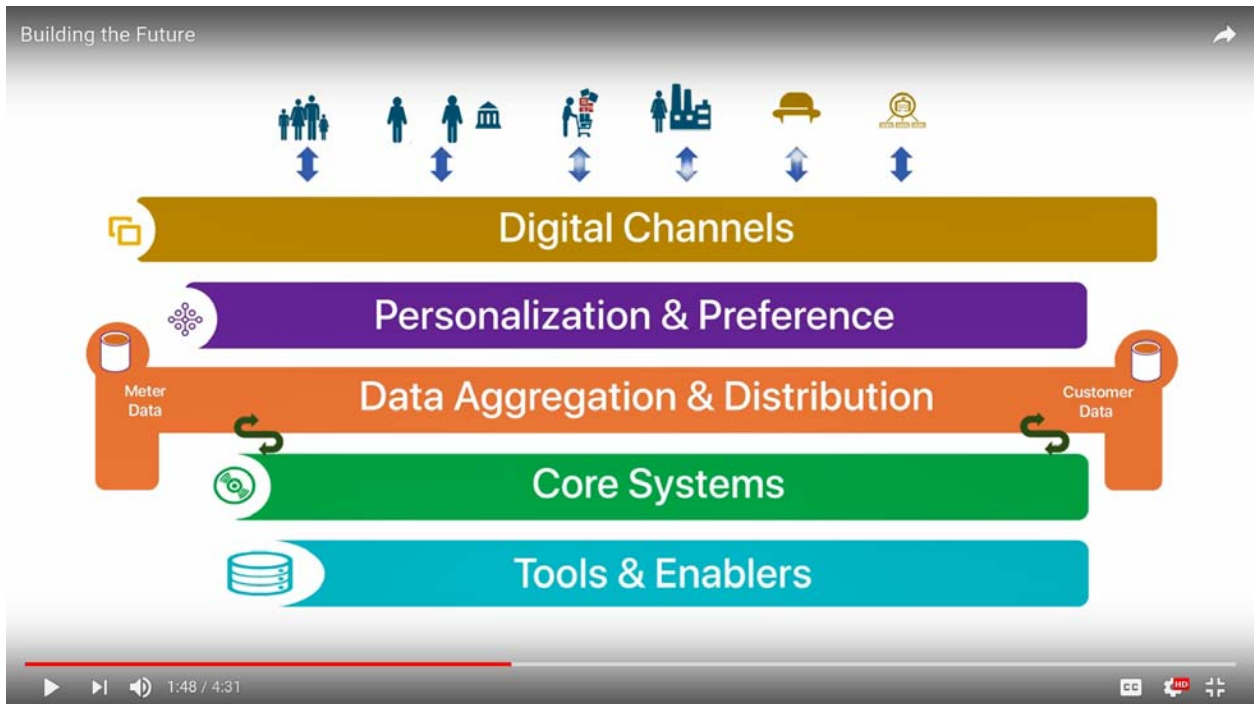
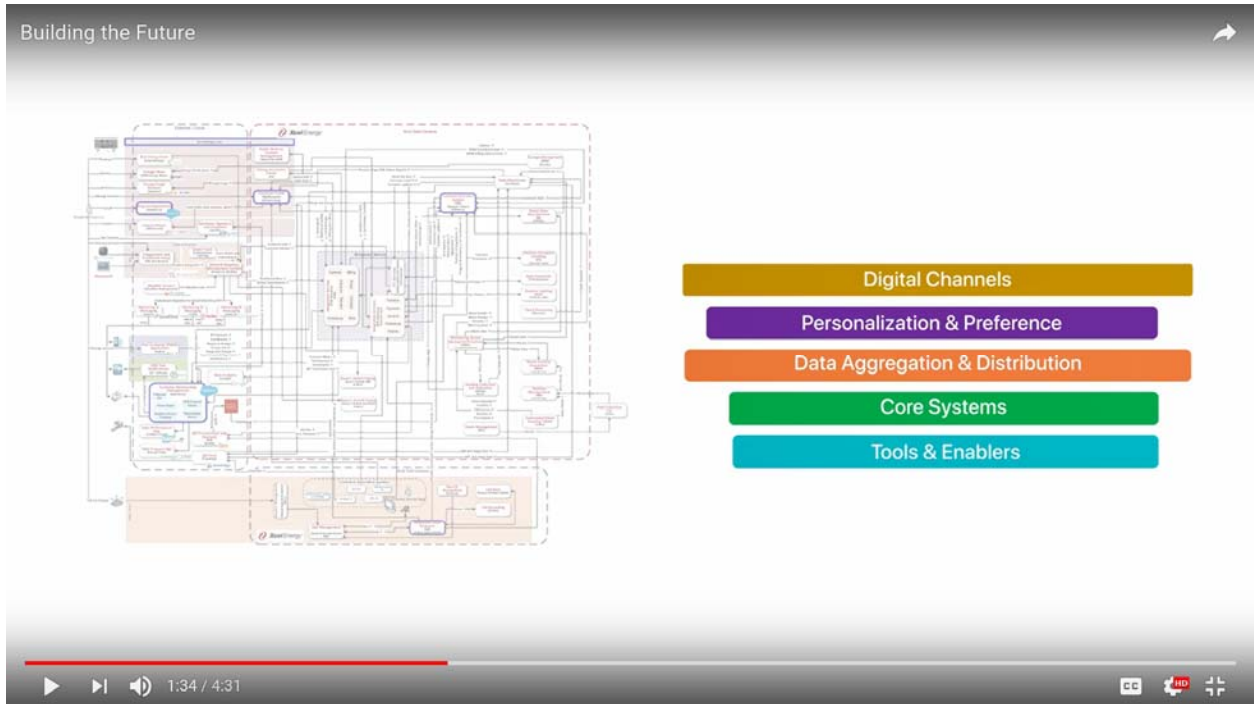
⁷ Contracted Agents are entities with whom we have a contractual relationship to support our provision of regulated utility service, or that directly provide regulated utility service to our customers on our behalf.

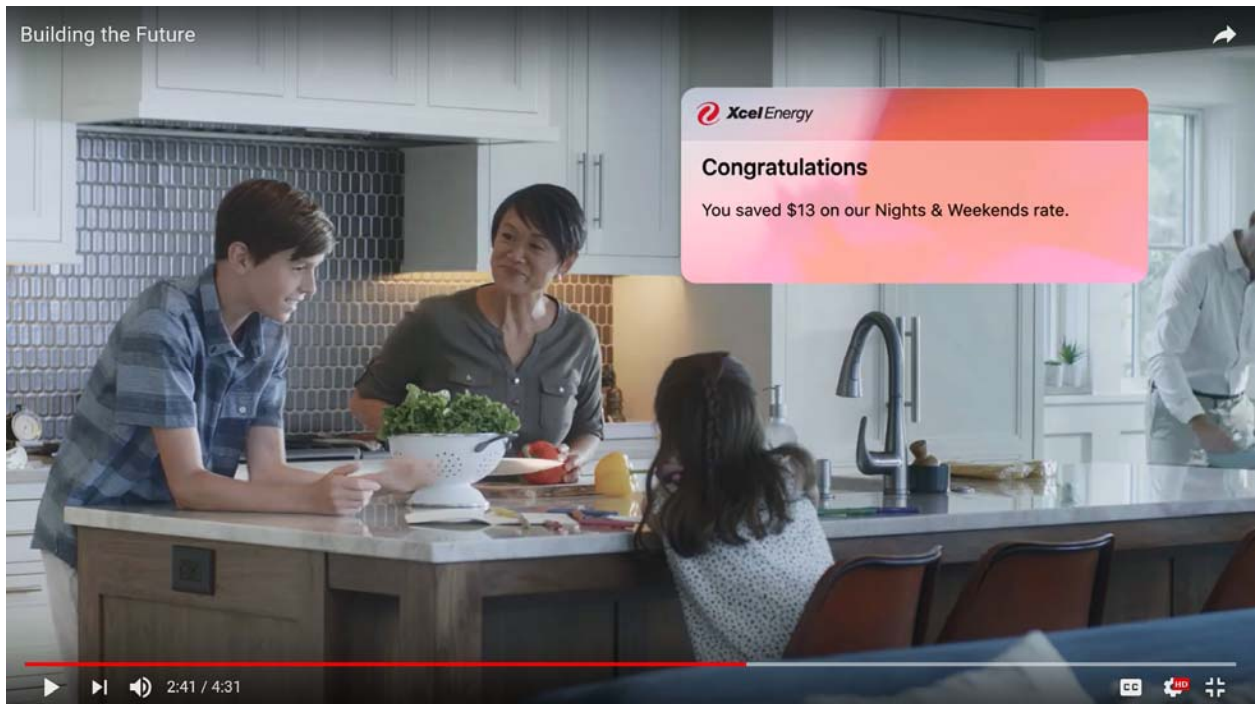
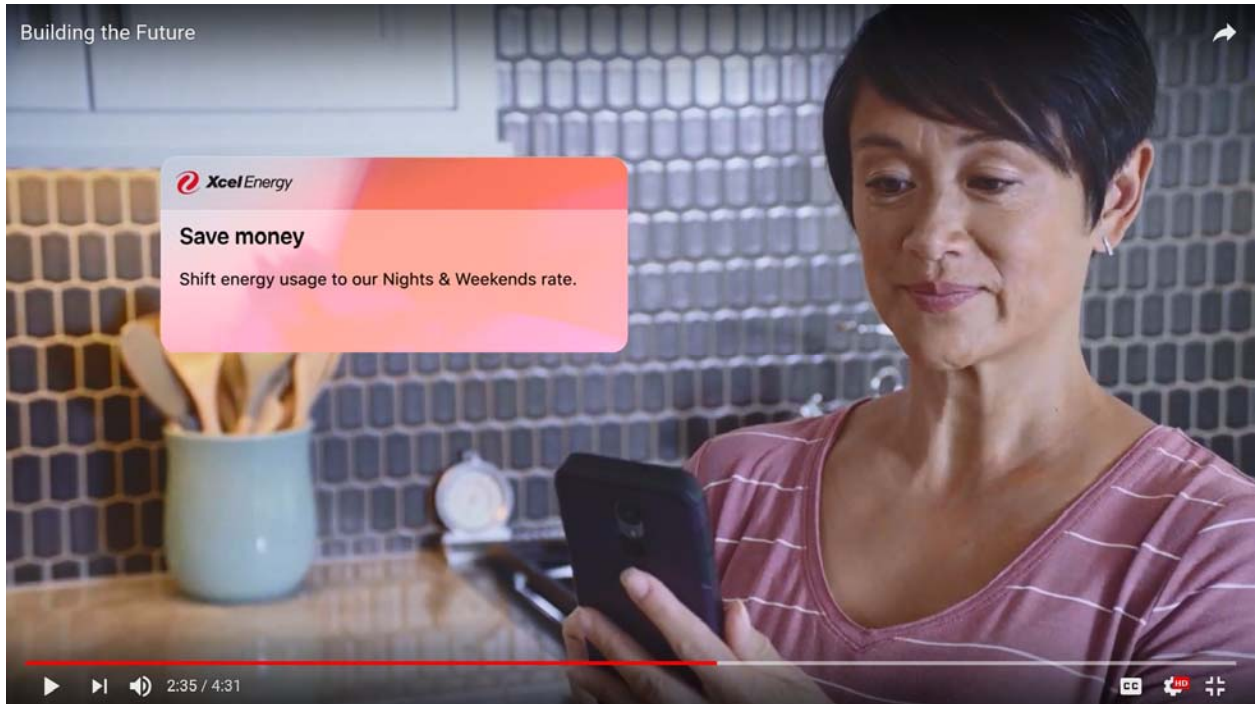


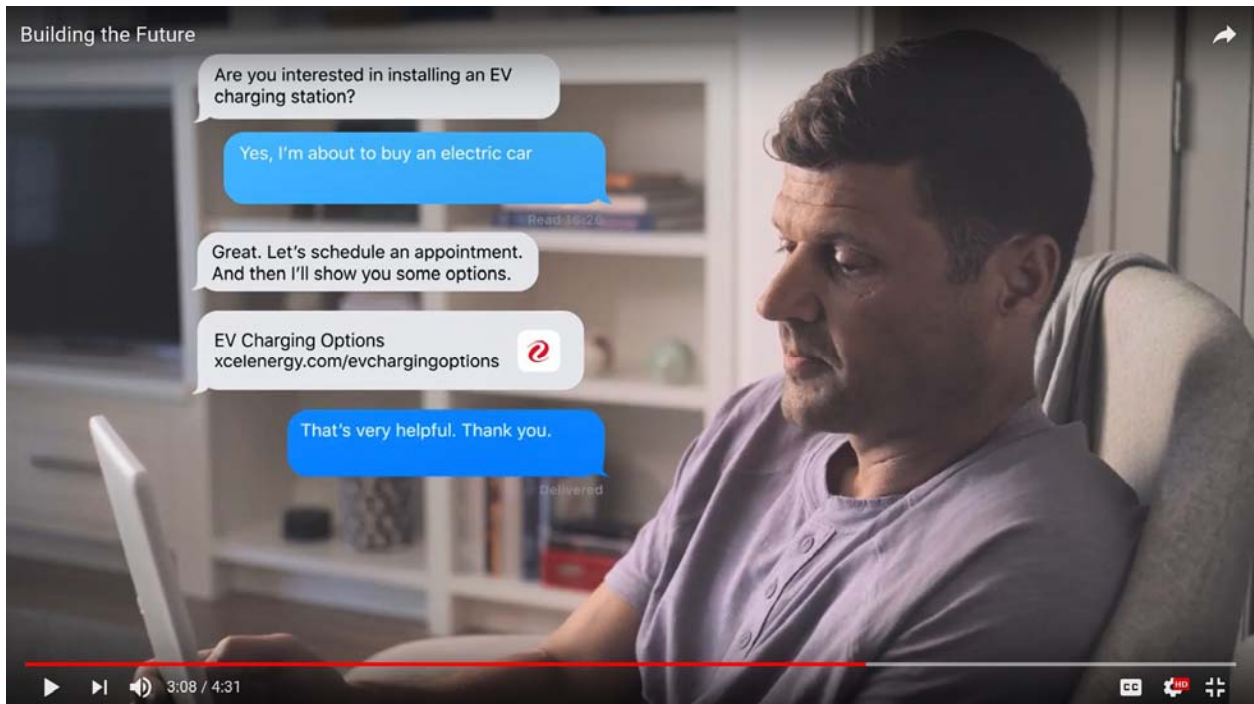
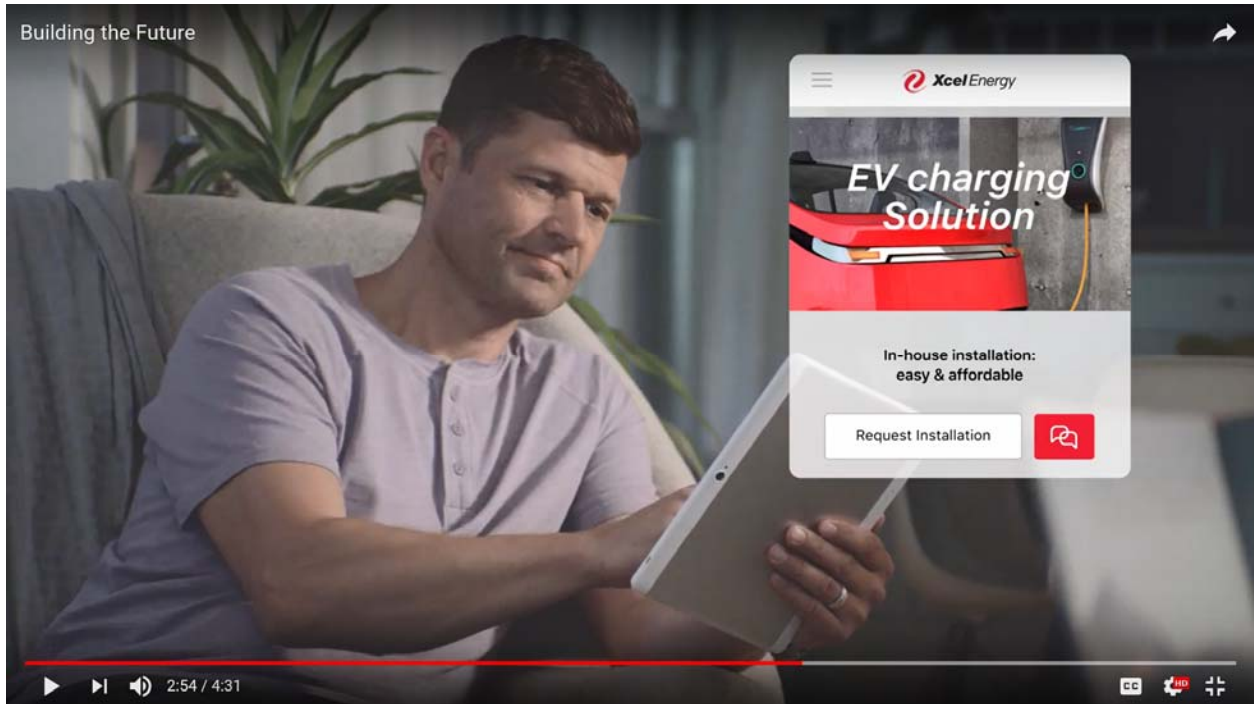


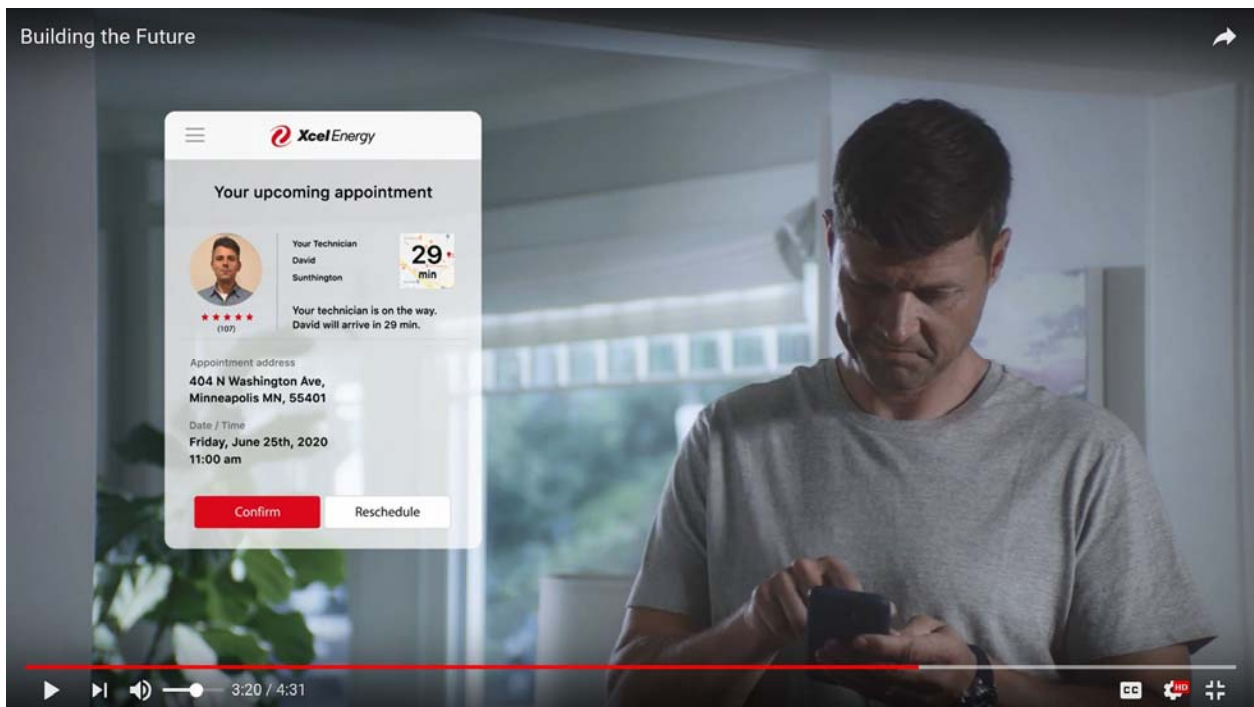
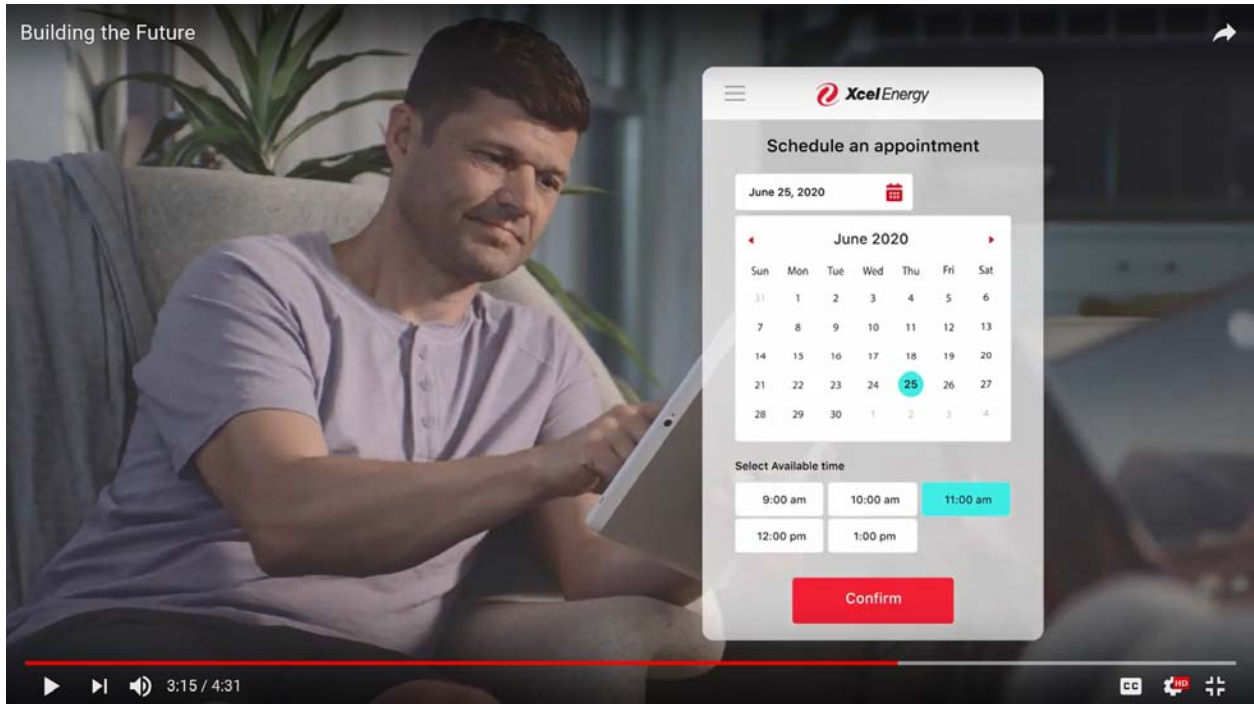


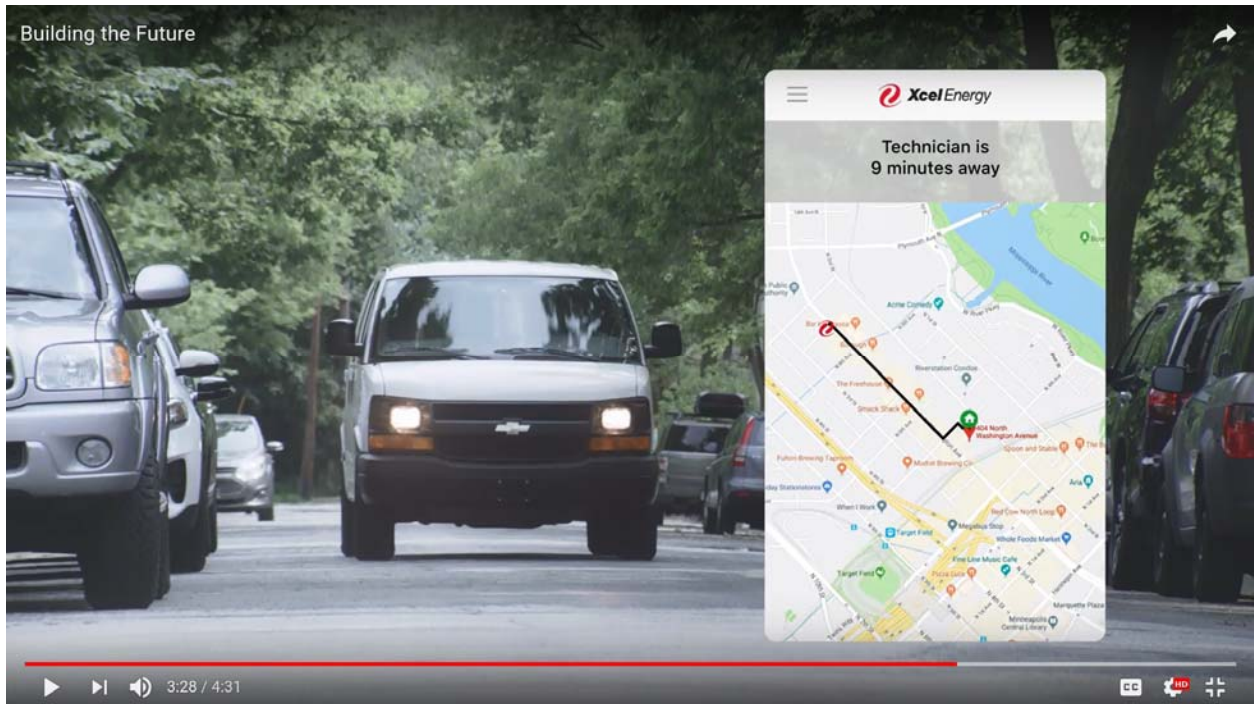
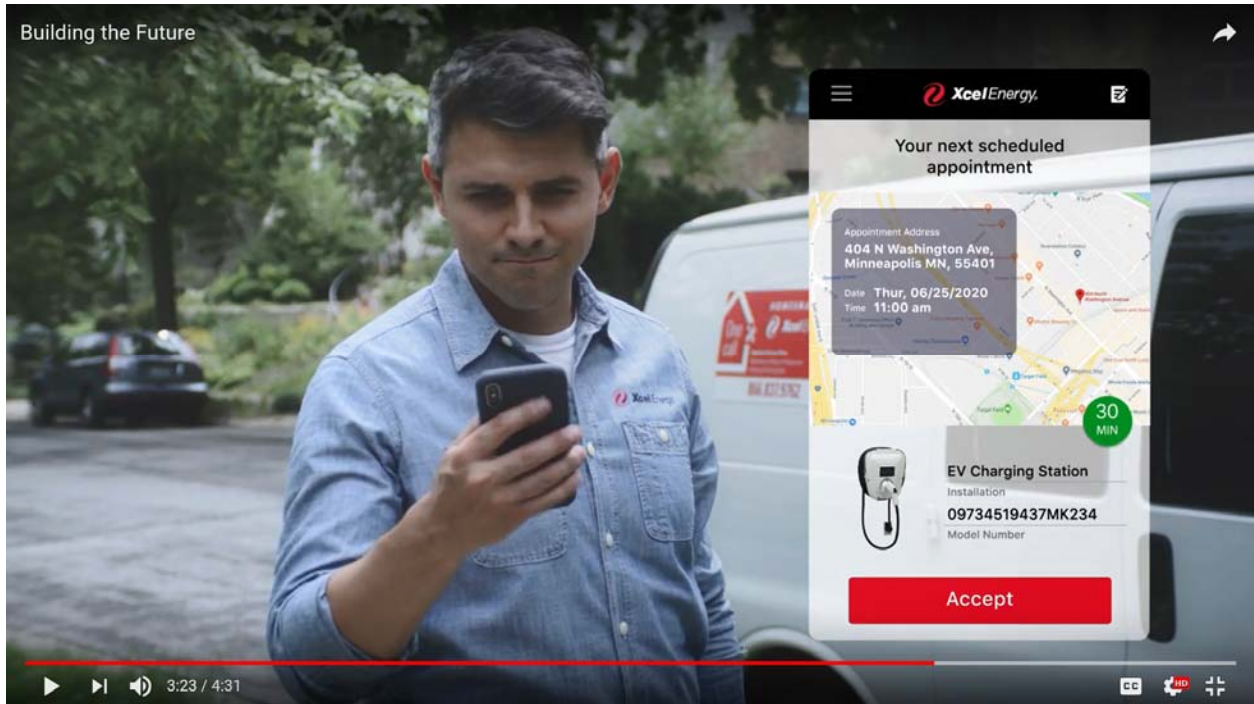


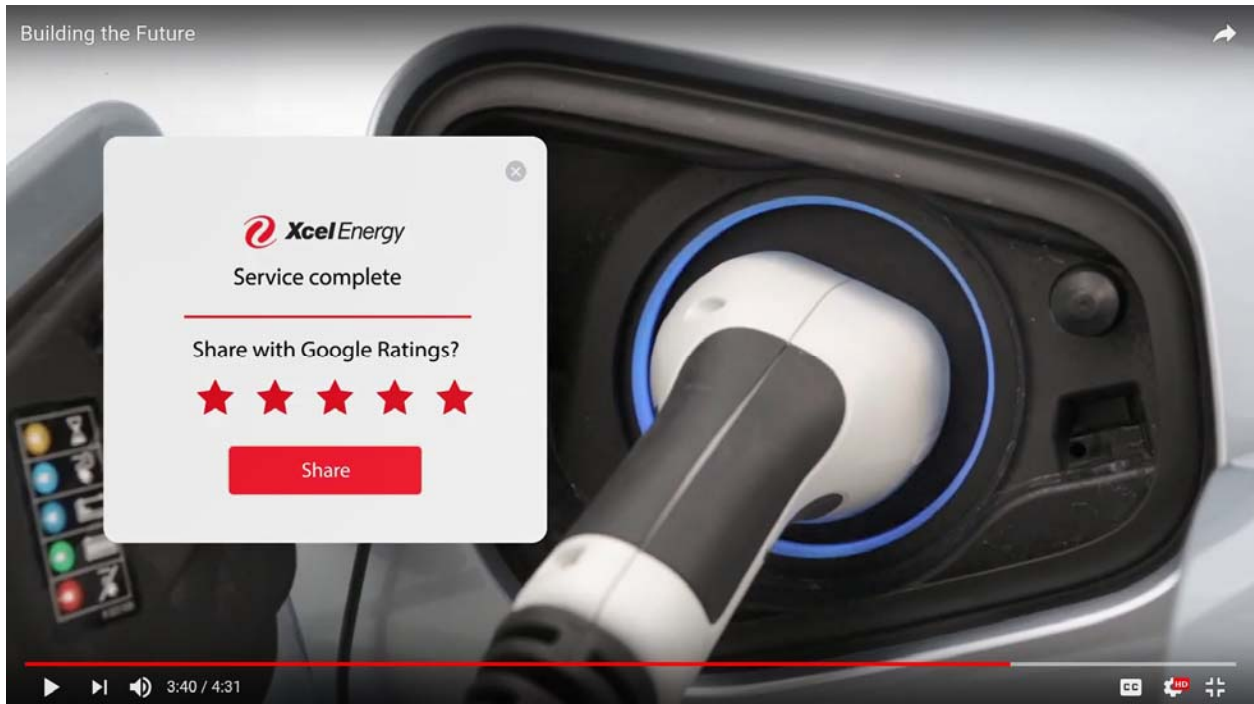
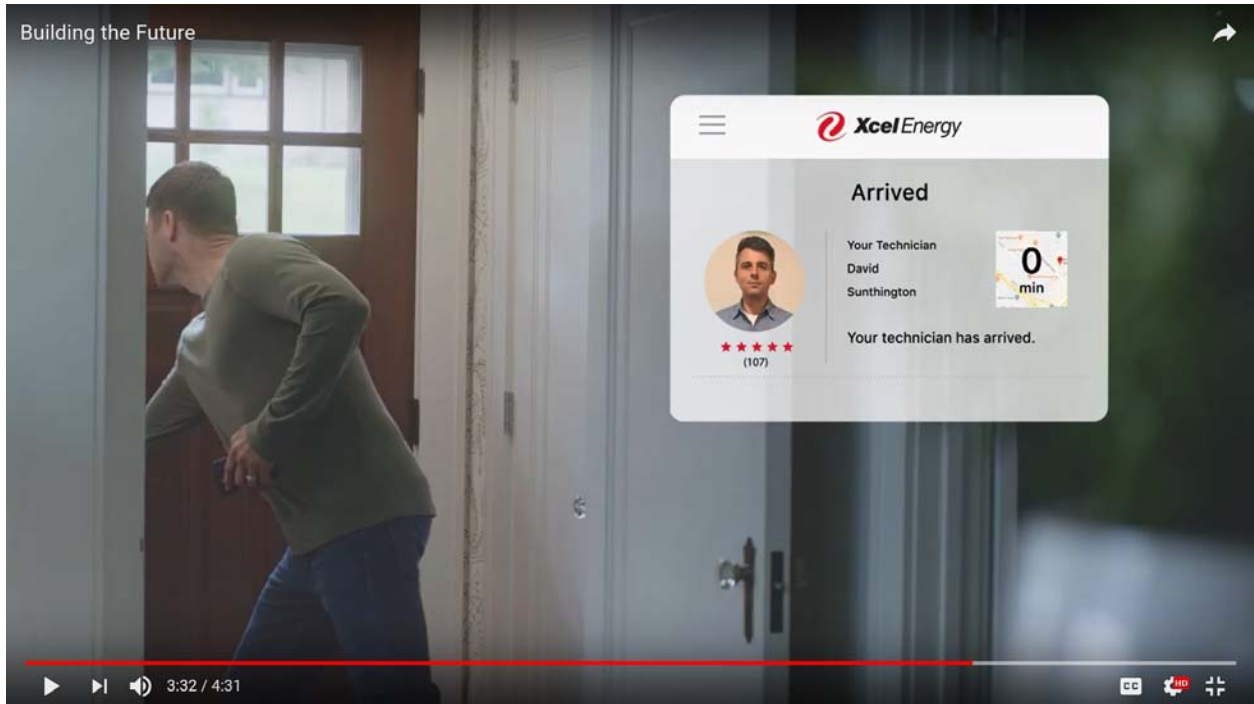


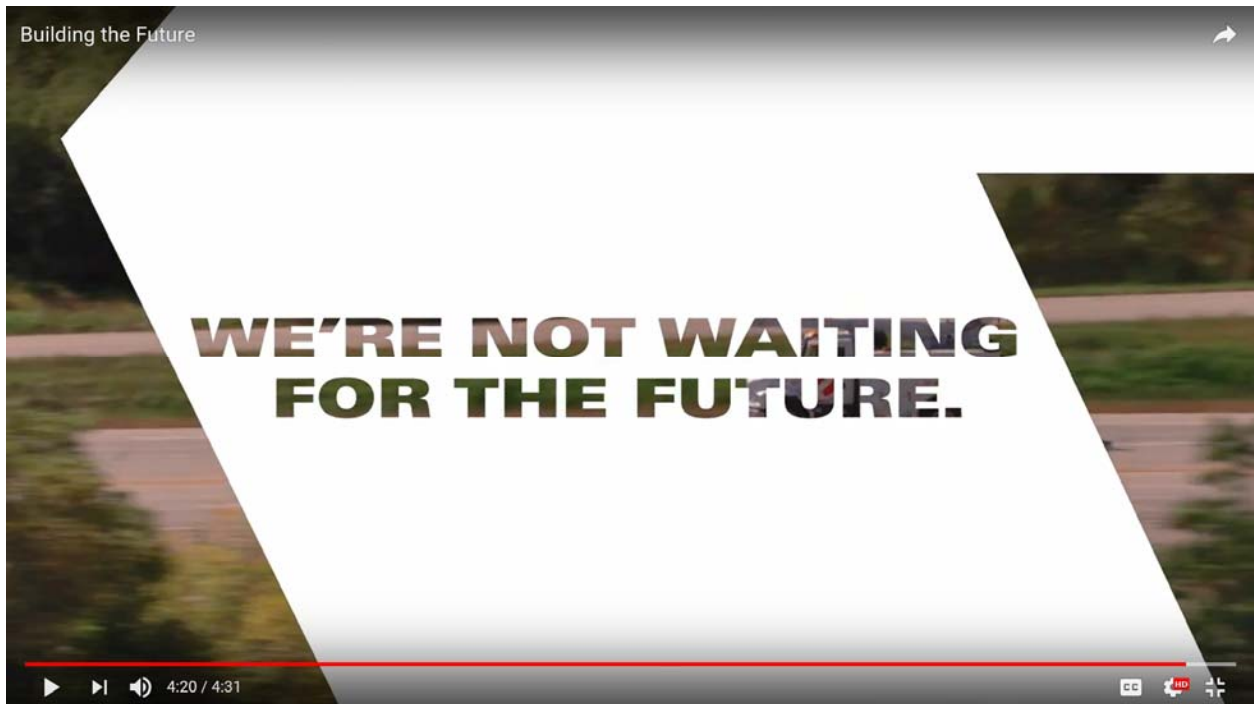
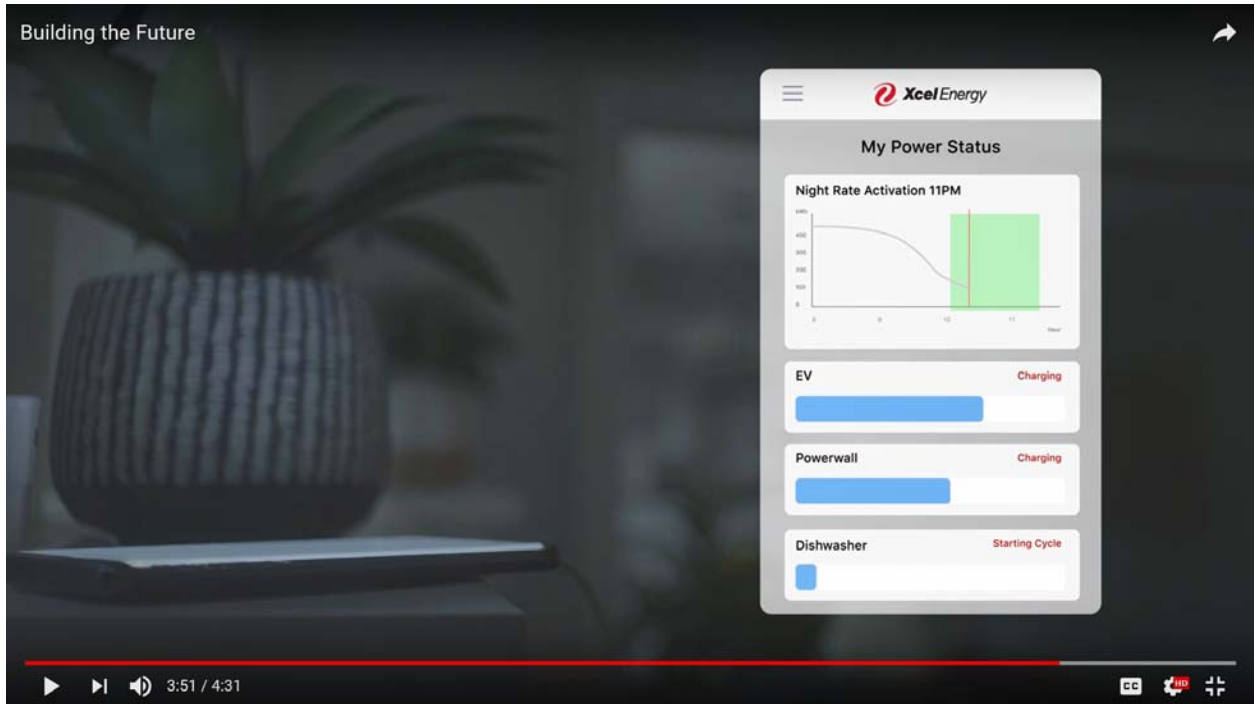










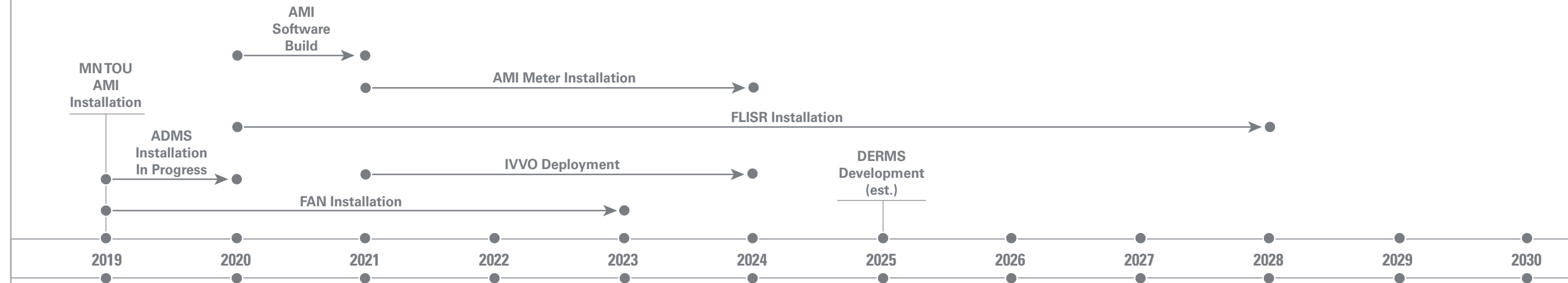




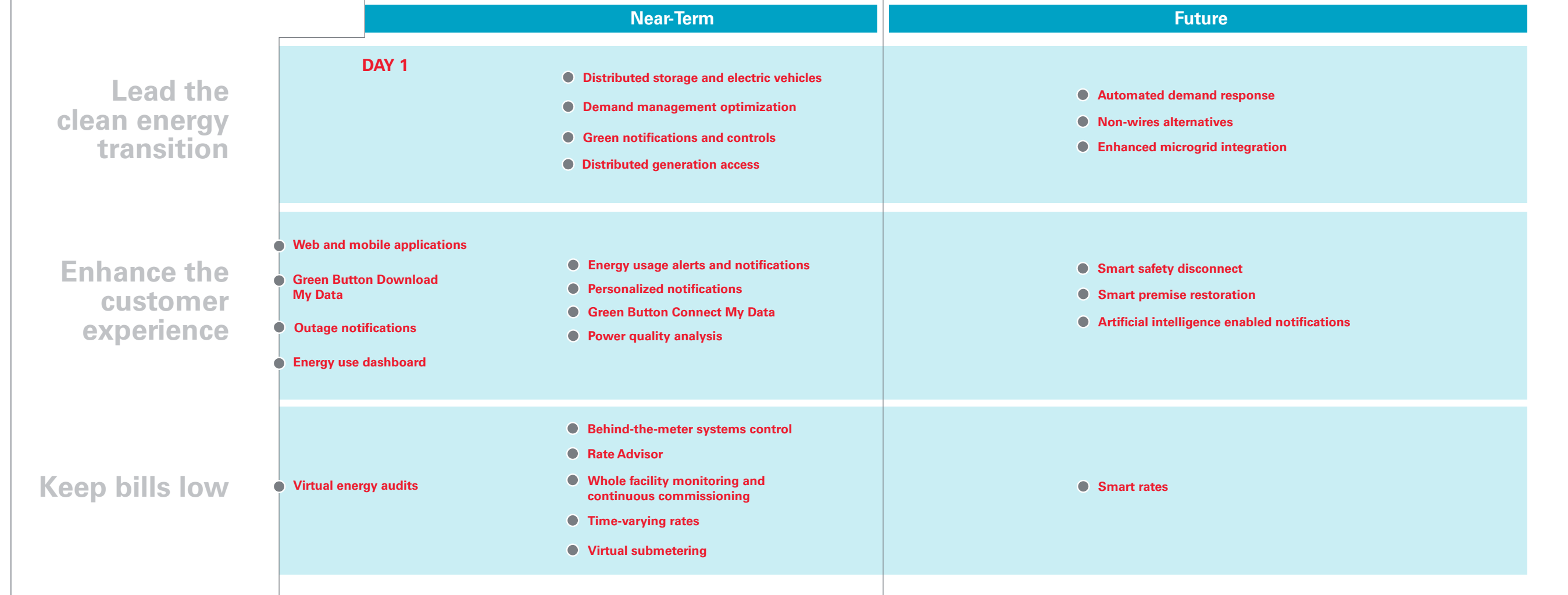


AGIS IMPLEMENTATION & CUSTOMER EXPERIENCE TIMELINE

ASSET DEPLOYMENT



CUSTOMER EXPERIENCE (ESTIMATED INITIAL LAUNCH)



AMI

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	TOTAL	NPV
<i>Total Meters Deployed</i>	10,131	7,368	121,800	630,000	590,000	40,700	13,755	13,890	14,027	14,164	14,304	14,444	14,586	14,729	14,874	15,020	15,168	1,558,960	
CAPITAL COSTS																		TOTAL DISCOUNTED	NSPM-NPV
Program Management																			
Change Management	0	1,000,000	1,035,500	1,072,260	1,110,325	1,149,742	1,190,558	0	0	0	0	0	0	0	0	0	0	6,558,386	4,950,734
Environment/Release Management	0	28,071	2,064,464	2,318,348	1,044,303	355,017	99,666	0	0	0	0	0	0	0	0	0	0	5,909,870	4,617,070
Finance	0	109,959	193,798	194,658	145,467	0	0	0	0	0	0	0	0	0	0	0	0	643,882	516,017
PMO	0	288,790	506,590	508,944	381,346	0	0	0	0	0	0	0	0	0	0	0	0	1,685,670	1,350,955
Security	0	1,105,737	1,144,991	1,185,638	1,227,728	0	0	0	0	0	0	0	0	0	0	0	0	4,664,093	3,748,708
Supply Chain	0	477,703	487,591	497,685	507,987	0	0	0	0	0	0	0	0	0	0	0	0	1,970,966	1,585,917
Talent Strategy	238,852	349,325	361,726	185,901	0	0	0	0	0	0	0	0	0	0	0	0	0	1,135,803	977,689
Delivery and Execution Leadership	0	374,158	1,294,786	1,314,010	667,319	0	0	0	0	0	0	0	0	0	0	0	0	3,650,273	2,916,840
Contingency	11,943	186,687	354,472	363,872	254,224	75,238	64,511	0	0	0	0	0	0	0	0	0	0	1,310,947	1,033,197
TOTAL - Program Management	250,795	3,920,430	7,443,919	7,641,315	5,338,699	1,579,997	1,354,735	0	0	0	0	0	0	0	0	0	0	27,529,891	21,697,127
TOTAL CAPITAL	250,795	3,920,430	7,443,919	7,641,315	5,338,699	1,579,997	1,354,735	0	0	0	0	0	0	0	0	0	0	27,529,891	21,697,127
O&M ITEMS																			
Program Management																			
Change Management	0	1,825,114	2,157,971	3,067,323	3,176,213	2,991,329	1,608,666	0	0	0	0	0	0	0	0	0	0	14,826,616	11,214,681
Environment/Release Management	0	0	22,405	23,200	24,024	24,877	11,794	0	0	0	0	0	0	0	0	0	0	106,300	78,991
Finance	0	32,456	112,027	167,045	216,218	0	0	0	0	0	0	0	0	0	0	0	0	527,746	410,061
PMO	0	79,772	275,346	410,574	531,437	0	0	0	0	0	0	0	0	0	0	0	0	1,297,129	1,007,876
Talent Strategy	37,760	58,651	60,733	0	55,000	0	0	0	0	0	0	0	0	0	0	0	0	212,144	177,898
Delivery and Execution Leadership	0	217,284	510,624	714,661	897,539	0	0	0	0	0	0	0	0	0	0	0	0	2,340,109	1,829,448
Contingency	1,888	110,664	156,955	219,140	245,022	150,810	81,023	0	0	0	0	0	0	0	0	0	0	965,502	735,948
TOTAL - Program Management	39,648	2,323,940	3,296,060	4,601,944	5,145,453	3,167,016	1,701,483	0	0	0	0	0	0	0	0	0	0	20,275,545	15,454,901
TOTAL O&M	39,648	2,323,940	3,296,060	4,601,944	5,145,453	3,167,016	1,701,483	0	0	0	0	0	0	0	0	0	0	20,275,545	15,454,901
GRAND TOTAL CAPITAL & O&M	290,443	6,244,371	10,739,979	12,243,259	10,484,152	4,747,013	3,056,219	0	0	0	0	0	0	0	0	0	0	47,805,436	37,152,028

IVVO

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	TOTAL	NPV	
<i>Feeders enabled with IVVO</i>	0	0	26	43	61	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	189	
CAPITAL COSTS																							
Program Management																							
Organizational Change Management	0	0	468,823	850,715	651,244	553,937	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,524,720	1,909,732
TOTAL - Program Management	0	0	468,823	850,715	651,244	553,937	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,524,720	1,909,732	
TOTAL CAPITAL	0	0	468,823	850,715	651,244	553,937	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,524,720	1,909,732	
O&M ITEMS																							
Business Program Management																							
Organizational Change Management	0	0	156,274	283,572	217,081	184,646	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	841,573	636,577
TOTAL - Program Management	0	0	156,274	283,572	217,081	184,646	0	0	0	0	0	0	0	0	0	0	0	0	0	0	841,573	636,577	
TOTAL O&M	0	0	156,274	283,572	217,081	184,646	0	0	0	0	0	0	0	0	0	0	0	0	0	0	841,573	636,577	
GRAND TOTAL CAPITAL & O&M	0	0	625,097	1,134,287	868,325	738,583	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,366,293	2,546,309	

Products and Services Enabled or Enhanced by AGIS

KEEP BILLS LOW

New Energy Saving Programs

Product or Service	Customers Affected	Timing
<p>Virtual Energy Audits Provides an on-demand or periodic assessment of the energy usage/efficiency of a premise based on actual performance versus expected performance based on various parameters (i.e. size, year, build, occupancy, devices, etc.). With disaggregation and other analytics capabilities made possible by AMI, these audit results will improve over time to provide more accurate and relevant information. Audits may also be used to monitor the health and status of appliances to identify opportunities for customer to reduce maintenance costs and improve energy efficiency.</p>	<p>Residential Small Business Large C&I</p>	<p>Day 1</p>
<p>Whole Facility Monitoring C&I customers with long-term sustainability goals can more easily track progress at the whole facility and sub-system level through integrations between meters and customer-operated energy management systems. This information can be used to verify savings over time for the purposes of demand side management, or can be used to alert customers when demand or energy usage projections are expected to exceed threshold amounts over a given period of time.</p>	<p>Small Business Large C&I</p>	<p>Near Term</p>
<p>Enhanced Control Options for Behind the Meter Systems From the smart home to intelligent buildings, AMI meters will be able to communicate more seamlessly with devices and systems within the customer facility. Customers can use this capability to participate in demand response programs as well as to manage facility energy consumption in a more accurate and robust way.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Enhanced Automated Demand Response As the grid evolves, distribution system management can utilize expanded automated demand response capabilities which respond to real time needs of the distribution grid.</p>	<p>Residential Small Business Large C&I</p>	<p>Future</p>

New rate options

Product or Service	Customers Affected	Timing
Rate Advisor With granular usage information and analytics capabilities made possible by AMI, the company will provide a multi-channel approach to educate customers and proactively offer ways to optimize energy usage and cost under existing and new, future rates schemes.	Residential Small Business Large C&I	Near Term
Time Varying Rates With more granular consumption data and more sophisticated meters, rate schedules can be created to better reflect the actual costs on the system at specific times of day. Customers can take advantage of these price signals to manage costs.	Residential Small Business Large C&I	Near Term
Virtual Submetering Instead of installing physical submeters, which are costly and take special wiring and their own communications channels, the main meter could act as a virtual submeter through disaggregation capabilities at the meter.	Residential Small Business Large C&I	Near Term
Smart Rates New rate opportunities including pre-pay and technology specific rates. Rates may rely on local management of the premise level grid or local identification of events. For example, when an EV is plugged in, this could be detected and an EV rate is automatically applied. Another example, would be a flat billing rate with use of the Premise Level Grid Management System (PLGMS) to stay within the agreed to usage levels.	Residential Small Business Large C&I	Future

ENHANCE THE CUSTOMER EXPERIENCE

Outage Enhancements

Product or Service	Customers Affected	Timing
Enhanced Outage Notifications More accurate alerts informing customers about outages in a timely, relevant way. These could include proactive messaging about an outage status, automatic restoration, and restoration confirmation.	Residential Small Business Large C&I	Day 1
Smart Premise Restoration Sequentially restore power to various devices inside the home or business after an outage to reduce the likelihood of voltage or overloading issues, protecting customer system performance as power is restored.	Residential Small Business Large C&I	Future

Integrated, seamless interactions

Product or Service	Customers Affected	Timing
<p>Green Button Download My Data For customers who prefer to perform their own analysis or use their granular usage information for other purposes, data in the standard Green Button protocol will be made available through the Download My Data feature in the customer web portal.</p>	<p>Residential Small Business Large C&I</p>	<p>Day 1</p>
<p>Enhanced Web and Mobile Applications Customer account information along with options to view and pay bills, visualize energy usage and trends, and manage outages will be presented to customers in an integrated and highly personalized format. This is made possible by granular information and analytics as well as a robust customer preference center.</p>	<p>Residential Small Business Large C&I</p>	<p>Day 1</p>
<p>Energy Usage Dashboard Within the new web and mobile customer portals, energy usage dashboards will inform customer about the energy usage of both the overall facility as well as individual devices in a home or business. Compares data to a comprehensive database of similar products to alert to opportunities to save energy and money. Dashboards can be customized to both residential and C&I customer needs (e.g. multi-site data).</p>	<p>Residential Small Business Large C&I</p>	<p>Day 1</p>
<p>Energy Usage Alerts and Notifications Alerts allow customers to be notified with important information in a timely, relevant way. These could include high usage alerts, TOU peak period, Peak Day notification, or goal-based alerts.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Green Button Connect My Data For customers who would like to automatically transmit their usage information to third parties, Green Button Connect My Data will also be available in the customer web portal for ongoing automated transfers.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Personalized Notifications Communication systems will be enhanced to provide timely information to customers in a form that is personalized to their lifestyle and preferences.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Artificial Intelligence Enabled Notifications As artificial intelligence technologies mature and become widely adopted in the market, meters will have the ability to leverage these capabilities to provide heightened interactions which will be customized to the unique needs of each customer.</p>	<p>Residential Small Business Large C&I</p>	<p>Future</p>

Safety & Reliability Enhancements

Product or Service	Customer Affected	Timing
<p>Power Quality Analysis With detailed information collected by the meter relating to power delivery, customers can more accurately and frequently assess their power quality. Over time, analytics of the power quality information can help flag and diagnose potential power quality related items so that customers can proactively manage any possible issues.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Emergency and Safety Notifications The meter will be able to provide customers with emergency management notifications via its analytics and communications capabilities. This can help customers identify potential risks to their energy management systems, security monitoring, and be aware of local emergency notifications that may apply to their general safety and security.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Enhanced Microgrid Integration Where the capability exists for portions of the grid to operate independently of the rest of the surrounding system, the advanced distribution management system will more seamlessly be able to manage the connection of these microgrids.</p>	<p>Residential Small Business Large C&I</p>	<p>Future</p>
<p>Smart Safety Disconnect Detects when a smart inverter has malfunctioned or was improperly installed and has not disconnected from the grid when incoming power has been lost. In this situation, the disconnect inside the meter is automatically tripped to protect the rest of the grid and the customer.</p>	<p>Residential Small Business Large C&I</p>	<p>Future</p>

LEAD THE CLEAN ENERGY TRANSITION

Product or Service	Customers Affected	Timing
<p>Enhanced Access to Battery Storage and Electric Vehicles Through the enhanced visibility and control of the distribution system, greater utilization of storage elements on the grid, including electric batteries and electric vehicles, will be possible. This capability promises to help ensure safe, reliable energy for all customers.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Green Notifications and Controls Customers would be notified when the percentage of electricity generated by renewable services in their area exceeds a certain threshold.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Enhanced DER Enablement Through the enhanced visibility and control of the distribution system, customers will be able to integrate distributed generation resources more seamlessly and potentially at higher levels within a given area.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>
<p>Demand Management Optimization With more granular consumption information, new demand management programs can be created to enable customers to shift and shed load to respond to needs of the grid on an increasingly real-time basis. With new communication capabilities, the meter will be able to communicate directly with smart devices within homes and businesses. As analytics such as disaggregation and virtual submetering evolve, demand response routines can increase sophistication through optimizing sequence among various demand response resources.</p>	<p>Residential Small Business Large C&I</p>	<p>Near Term</p>

Advanced Grid Customer Education & Communications Plan

1 Summary and Customer Vision

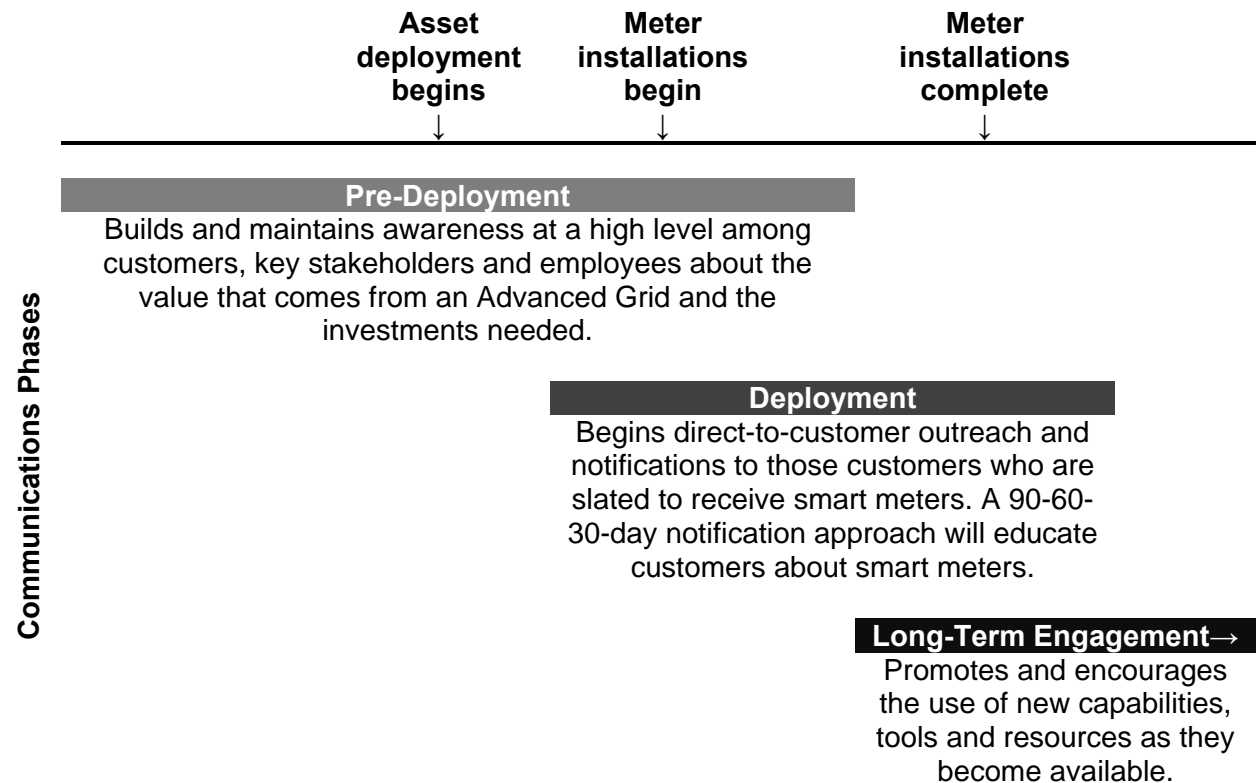
The electric utility industry is in a time of significant change. Increasing customer expectations and technological advances have reshaped what customers expect from their energy service provider, and how those services are delivered and communicated. Enhancing the customer experience is critically important, and is one of our three strategic priorities, along with leading the clean energy transition and keeping bills low. As outlined in the Advanced Grid Customer Strategy (Schedule 3), we plan to integrate modern customer experience strategies with advanced grid platforms and technologies to enable intelligent grid operations, smarter networks and meters, and optimized products and services for our customers.

This Customer Education & Communications Plan is an integral part of our customer experience transformation and Xcel Energy’s Advanced Grid initiative.

2 Education and Communications Phases

Meter deployment and smart meter capabilities will be phased in over the next five-plus years. Communications strategies, messages and tactics will be executed in three phases to match the customer journey.

Figure 1. Communications phases



2.1 Pre-Deployment Phase – Advanced Grid Benefits

This phase builds and maintains awareness at a high level among customers, key stakeholders and employees about the value that comes from an Advanced Grid and the investments needed. Advanced Grid will be presented as one of the company's platforms for bringing innovative tech solutions to transforming the customer experience.

Key objectives during this phase include:

- Create customer and stakeholder awareness about the overall benefits of the advanced grid.
- Explain why we are making this investment, focusing on tangible customer benefits.
- Educate and train employees to equip them with tools and resources necessary to engage with customers and stakeholders.
- Build customer interest in the change by explaining the benefits of smart meters and the tools and options they enable.
- Proactively address customer concerns and questions.

2.1.1 Pre-Deployment Tactics

An integrated, expansive, and multi-channel awareness-building approach, as shown in Table 1, is required to set the stage for smart meter installation communication in the Deployment phase.

Table 1. Pre-deployment tactics

Audience	Messages	Channels	Materials
All customers	<ul style="list-style-type: none"> • Overview of Advanced Grid initiative • Intro to smart meters • Customer benefits • Privacy and security 	<ul style="list-style-type: none"> • xcelenergy.com and blog • Email • Social media • Media outreach • Out of home advertising • Online and print advertising • Bill onserts • Community events and meetings 	<ul style="list-style-type: none"> • Info sheets and brochures • Videos
Community leaders and elected officials	<ul style="list-style-type: none"> • Overview of Advanced Grid initiative • Intro to smart meters • Customer benefits • Deployment plans and processes • Privacy and security 	<ul style="list-style-type: none"> • In-person meetings and discussions with Community Relations Managers • Community events and meetings • Email 	<ul style="list-style-type: none"> • Presentations • Info sheets and brochures • Videos • Talking points
Customer Care agents	<ul style="list-style-type: none"> • Overview of Advanced Grid initiative • Intro to smart meters • Customer benefits • Deployment plans and processes • Privacy and security 	<ul style="list-style-type: none"> • Web-based training • In-person training • Email • Customer Care Quick Reference program 	<ul style="list-style-type: none"> • FAQs • Info sheets and brochures • Videos • Talking points
All employees	<ul style="list-style-type: none"> • Overview of Advanced Grid initiative • Intro to smart meters • Customer benefits • Deployment plans and processes • Privacy and security 	<ul style="list-style-type: none"> • Intranet • Email • In-person meetings or presentations 	<ul style="list-style-type: none"> • Internal news articles • Presentations • Info sheets and brochures • Videos • Talking points

2.1.2 Pre-Deployment Phase Success Metrics

We will measure customer awareness during this phase through existing measures of advertising/awareness campaign recall and through tracking and reporting of customer responses to the following statements:

- Communications on the advanced grid meter installation and initiative were clear and easy to understand.
- Communications encouraged me to seek additional information if needed.

2.2 Deployment Phase – Smart Meter Installation

This phase will begin direct-to-customer outreach and notifications to those customers who are slated to receive smart meters. A 90-60-30-day notification approach will educate target audiences on smart meters, how they will be deployed and installed, and on smart meter benefits. While messaging and content will focus on meter installation, all communications will speak to the broader value and benefits of the Advanced Grid.

This phase will also set the stage for the Long-Term communications phase by collecting customer information and preferences that can be used as new capabilities are enabled and to create deeper customer relationships.

Key objectives during this phase include:

- Provide practical and timely information and notifications about the deployment, installation and opt-out processes.
- Provide clear information on the opt-out process and associated costs, including how to take action.
- Leverage a messaging hierarchy to reiterate high-level benefits of advanced metering.
- Further develop tools and resources for employees to use during proactive discussions with customers and stakeholders.

2.2.1 Deployment Tactics

Most tactics in this phase will be hyper-targeted toward customers with practical information about smart meter deployment. Customers will receive notifications about their smart meters 90 days, 60 days, and 30 days prior to meter installation through various channels to ensure all customers receive adequate notification, as shown in Table 2 below. Where possible, materials will be personalized with the most relevant and up-to-date deployment information.

Table 2. 90-60-30-day communications approach

	90 days before meter install	60 days before meter install	30 days before meter install	7 days before meter install	Day of install	Post-install
All customers	Mailer: intro	Mailer: your meter is coming soon	Mailer: meter installation FAQs	Phone call: your meter is coming next week	Install technician door knock	Mailer: success or attempt
					Door hanger: success or attempt	
Opted-in customers (only customers who have opted into these channels will receive these notifications)	Email: what to expect during meter installation	Email: Your meter is coming soon	Email: Your meter is coming soon	Text notification		Email: success or attempt
			My Account banner: Your meter is coming this month	App push notification		My Account banner: success or attempt
Mass communication	Targeted online, print, and out of home advertising			Hyper-targeted social media advertising		
	Community outreach: meter install schedule by neighborhood, informational content about new meters					

Table 3 describes the 90-60-30-day communications and the additional tactics used during the deployment phase to ensure a consistent and useful customer experience.

Table 3. Deployment tactics

Audience	Messages	Channels	Materials
All customers	<ul style="list-style-type: none"> • Smart meter benefits • Meter installation logistics • Opt-out information • New tools and how to sign up for My Account • Low income protections 	<ul style="list-style-type: none"> • Postcard/mailer (90 days) • Direct mailers and email if available(60 days and 30 days) • Phone call (7 days) • My Account • xcelenergy.com and blog • Targeted email • Targeted social media • Media outreach • Targeted online, print, and out of home advertising • Community events and meetings 	<ul style="list-style-type: none"> • Mailings and emails • Info sheets and brochures • Educational videos • Door hangers • FAQs
Community leaders and elected officials	<ul style="list-style-type: none"> • Smart meter benefits • Meter installation logistics • Opt-out information • Specific meter deployment plans and schedules • Low income protections 	<ul style="list-style-type: none"> • In-person meetings and discussions with Community Relations Managers • Community events and meetings • Email 	<ul style="list-style-type: none"> • Presentations • Info sheets and brochures • Educational videos • Talking points • Deployment plans
Customer Care agents and Meter Installation Vendor	<ul style="list-style-type: none"> • Smart meter benefits • Meter installation logistics • Opt-out information • Specific meter deployment plans and schedules • Low income protections 	<ul style="list-style-type: none"> • Web-based training • In-person training • Email • Customer Care Quick Reference program 	<ul style="list-style-type: none"> • FAQs • Info sheets and brochures • Educational videos • Talking points • Deployment plans
All employees	<ul style="list-style-type: none"> • Smart meter benefits • New tools • Meter installation logistics 	<ul style="list-style-type: none"> • Intranet • Email • In-person meetings or presentations 	<ul style="list-style-type: none"> • Internal news articles • Presentations • Info sheets and brochures • Educational videos • Talking points

2.2.1.1 Pilot example communications

The Minnesota time of use pilot used a 90-60-30-day communication approach to support smart meter installations:

Figure 2. Minnesota pilot 60-day postcard



Technology is advancing in every area of our lives, and Xcel Energy is bringing the world of digital technology to your electric service, too. The first step? A new electric meter at your home.

In about two months, Xcel Energy will replace your current electric meter with a new, upgraded meter. The new meter will allow you to receive more customized information on your energy use so you can make more informed energy decisions. Plus, you will be able to participate in the upcoming Minnesota energy use pilot. We recently sent you information about the pilot, and we'll share more details with you over the coming months. In the meantime, you can learn more at xcelenergy.com/MNPilot.

We'll replace your meter at:

Premise address 1	Premise address 2	Premise address 3
Premise address	Premise address	Premise address
City, MN	City, MN	City, MN

In the next few weeks, we'll send you more information about the meter installation process and what to expect. The meter installation will take about 10 minutes and will be at no cost to you.

Questions? Don't want to participate in the pilot? Visit xcelenergy.com/MNPilot, email inquire@xcelenergy.com, or call us at 800.895.4999.

Lea esta información en español en xcelenergy.com/PilotEsp
Kaga akhri macluumaadkan af Soomaali xcelenergy.com/PilotSoo

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Xcel Energy
414 Nicollet Mall, 401-6
Minneapolis, MN 55401

**POSTAGE
FPO**

**FIRSTNAME LASTNAME
ADDRESS LINE 1
ADDRESS LINE 2
CITY, STATE ZIP**

Figure 3. Minnesota pilot 30-day letter and meter FAQs



2.2.2 Deployment Phase Success Metrics

To answer key questions and assess the overall effectiveness of our efforts, we will track and report customer responses to the following statements:

- Communications on the advanced grid meter installation and initiative were clear and easy to understand.
- Communications answered all of my questions about the meter installation.
- Communications encouraged me to seek additional information if needed.

2.3 Long-Term Engagement Phase – Tools and Resources

This phase will promote and encourage the use of new Advanced Grid capabilities, tools and resources as they become available. Communications will not only highlight the features of new tools and resources, but also the broader benefits they can provide. This phase will leverage customer information and preferences gathered in Phase II to provide a seamless experience for all customers via their preferred channels.

Key objectives during this phase include:

- Leverage a messaging hierarchy that reiterates high-level benefits of the project while educating customers on new capabilities, tools and resources as they become available.
- Develop and execute a customer nurturing campaign to follow the customer journey and encourage adoption of new capabilities, tools and resources.
- Evaluate and refine messages and tactics to continuously improve and ensure the best possible customer experience.

2.3.1 Long-Term Engagement Tactics

A multi-channel approach will reach customers via their preferred channels and include tailored messages to move them along in the engagement journey. Where possible, we will use available data to segment outreach about specific tools and resources. For example, a unique campaign could target only those customers who have not enrolled in My Account.

Table 4. Long-term engagement tactics

Audience	Messages	Channels	Materials
All customers	<ul style="list-style-type: none"> • New tools and how to use them or sign up for My Account • Savings tips and tricks • Testimonials and case studies 	<ul style="list-style-type: none"> • xcelenergy.com and blog • Email • Direct mail • My Account • Social media • Media outreach • Bill onserts • Community events and meetings 	<ul style="list-style-type: none"> • Mailings and emails • Info sheets and brochures • Instructional videos • Case studies • Savings tips
Community leaders and elected officials	<ul style="list-style-type: none"> • Customer benefits • Testimonials and case studies • Successes and results 	<ul style="list-style-type: none"> • In-person meetings and discussions with Community Relations Managers • Community events and meetings • Email 	<ul style="list-style-type: none"> • Presentations • Info sheets and brochures • Videos • Talking points
Customer Care agents	<ul style="list-style-type: none"> • New tools and how to use them or sign up for My Account • Savings tips and tricks 	<ul style="list-style-type: none"> • Web-based training • In-person training • Email • Customer Care Quick Reference program 	<ul style="list-style-type: none"> • FAQs • Info sheets and brochures • How-to videos • Talking points
All employees	<ul style="list-style-type: none"> • Customer benefits • Testimonials and case studies • Successes and results 	<ul style="list-style-type: none"> • Intranet • Email • In-person meetings or presentations 	<ul style="list-style-type: none"> • Internal news articles • Presentations • Info sheets and brochures • Videos • Talking points

2.3.2 Long-Term Phase Success Metrics

The success of long-term communications will largely be measured by the number of customers who enroll in optional programs and services. We will measure:

- The percentage of customers with a smart meter that have one or more active applications
- The percentage of customers with a smart meter that receive high usage alerts

- The percentage of customers with a smart meter that select pre-pay billing
- The number of customers with a smart meter that have My Account
- The number of monthly, unique visits to My Account
- The percentage of customers with a smart meter that access personalized insights

3 Best Practices and Research Results

To build on the company's experience with smart meter pilots and advanced grid technology initiatives through its service territory, Xcel Energy also has examined communication and outreach best practices among other utilities with advanced grid and smart meter deployment experience. We supplemented this research with insights from additional sources, such as the Smart Energy Consumer Collaborative and GTM Research.

Many of these best practices and lessons learned are outlined below, and they have been taken into consideration in the development of this communication plan.

- Treat advanced grid/smart meter implementation as a change management program for employees. Engage with employees throughout the lives of all activities and initiatives.
- Train employees to be ambassadors in the community and leverage employees' existing relationships and involvement in their communities to help disseminate important information. Aim for transparency and a high level of engagement between the customer and customer-facing employees.
- Educate customers before their smart meter deployment by staging communications ahead of key customer contact leading up to the actual installation.
- Use social media to approach smart meter installation as a new technology rollout across specific geographic locations and targeted customer segments.
- Focus communication directly on customers. Do not assume they understand the concept of kilowatt hours, how the utility measures electricity, on- versus off-peak usage, etc. Avoid industry terms and jargon and instead use simple language and a call to action that customers can easily understand.
- Set realistic expectations on smart meter functionality.
- Build an extensive set of FAQs to address issues and concerns. Through active employee change management and education, ensure front-line employees who work directly with customers use these messages and anticipate questions so they can clear up concerns and address issues in an accurate and timely manner.
- Collect customer success stories to make smart meter/advanced grid benefits tangible and understandable.
- Ensure full integration and coordination of field operations, communication/marketing, customer care, and billing.
- Identify customer concerns quickly, elevate to the appropriate level as needed, and resolve concerns swiftly.

3.1 Market Research Results

Xcel Energy has conducted qualitative customer research through focus groups in Minnesota and throughout its service territory.¹ The results of this research have informed message development and the strategic updates to this plan.

The objectives of research were to:

- Explore customers' current understanding of smart meters.
- Understand the perceived benefits and drawbacks of smart meters.
- Explore both positive and negative expectations consumers have about Xcel Energy moving customers to smart meters.
- Explore reactions to different ways of describing smart meters.
- Understand what barriers may arise and how to address them (pre- or post-meter installation).
- Understand how customers want to be communicated with about smart meters, including what they want to know and how they want to receive the information.
- Identify any differences between younger (under age 45) and older customers (45+) on these topics.

At a high level, the key findings of this research were:

Expectations of New Meters

- Customers believe the new meters could help them save money by providing more detailed usage information, which they perceive as empowering.
- That said, they have questions about the new meter's basic functionality that need to be addressed to convince them of the true utility in these devices.
- They are also concerned about possible out of pocket costs, with many wondering whether the new meters could either cost them money upfront or over the long-run.

Communicating the Change

- Customers want to hear from Xcel Energy about the transition to the new meters at least two or three months in advance of installation.
- They want to be contacted via a multi-channel approach, which would include paper mail, mass media, email and phone.
- Younger customers (<45) are more likely to say they would seek information on an FAQ page or watch an online video about the process.
- Overall, customers want the communications to have a high degree of transparency.

¹ Eight Minnesota focus groups were held April 16–17 and May 15–16, 2019. Four Colorado focus groups, held Jan. 22–23, 2019, also informed this plan. All focus group sessions were moderated by an independent third party consultant.

Addressing Barriers

- The potential cost of the new meters is the top barrier that Xcel Energy needs to address. Another way to address barriers is by clearly conveying the reasons why the new meters will benefit customers in the long-run, and by clearly presenting why the company is advancing this technology.

3.2 Customer Messaging and Development

Xcel Energy has developed a carefully constructed message framework using best practices and its own market research. This message framework is essential for successful completion of this plan and the overall transition to smart meters.

Xcel Energy typically develops messages using the following process:

Research

Market research lays the groundwork for message development, incorporating customer message testing, customer panels, focus groups, and utility peer research.

Understanding the Audience

While we will be raising awareness among all our Minnesota customers, smart meter messages will target specific customer market segments to ensure maximum effectiveness and tap into the benefits that customers care about the most.

Language and Tone

Messages will be developed using simple, straight-forward language and practical information that customers can easily understand and act upon. Xcel Energy has worked with its advertising agency of record – Carmichael Lynch – to explore and validate the language and terminology that resonates most with customers.

3.2.1 Overarching Messaging Themes: Customer Benefits & Value Propositions

Because of the significant investment other utilities have made in the advanced grid, consumers today are seeing the benefits. The Smart Energy Consumer Collaborative (SECC) is an independent nonprofit organization consisting of commercial, utility and advocacy organizations that collects information about customers' views and understanding of smart meters and grids. According to SECC's study titled *Effective Communication with Consumers on the Smart Grid Value Proposition*, three distinct value propositions of advanced grids have emerged:

Economic benefits: With more information on energy consumption and more choices about how and when they use energy via possible future rate options, consumers may be able to save money as a result of advanced grid-enabled programs and technologies.

Example messaging theme: Smart meters and the smart grid provide superior energy usage information, which can help consumers save money by enabling them to better manage their electricity use.

Environmental benefits: The advanced grid enables the incorporation of greater amounts of renewable generation, gives customers more opportunities to make more environmentally conscious choices, and can also reduce the need to rely on fossil fuel generation.

Example messaging theme: The smart grid helps reduce greenhouse gas emissions by making it easier to connect renewable energy sources to the electricity grid.

Reliability benefits: Grid-side intelligence offered by advanced grid technology can reduce the frequency and duration of outages while providing better information when outages do occur.

Example messaging theme: A smart grid senses problems and reroutes power automatically. This prevents some outages and reduces the length of those that do occur. It strengthens the resiliency of the power network that serves you.

3.2.2 Sample Customer Messaging

Based on best practices and research results, the company has drafted sample customer messaging.

Elevator speech

Technology is advancing in every area of our lives, and Xcel Energy is bringing the world of digital technology to your electric service too. The next generation of our energy grid—the advanced grid — will help us serve you better. The advanced grid will give customers more of what they expect from Xcel Energy – clean, reliable energy, new ways to save money, and a better experience for you and all of our customers.

New technologies to help you save energy and money

- You will have more access to useful information about your household energy use, which can help you make informed energy decisions that save energy and money.

- You'll also have online tools to help understand your data and make decisions that will help save energy and money.
- In the future, the advanced grid will make it possible for you to choose pricing plans and energy savings options that work best for you.

Improved reliability and faster outage restoration

- New digital energy grid technologies will help us prevent outages to you and your neighbors and, in some cases, enable us to automatically reroute power to shorten any service interruptions.
- Advanced grid technologies can detect outages at your home or on the larger electric system, helping reduce the time you are without service.
- You'll receive quicker notifications when service is out and more accurate information on when power will be restored.

More options to protect the environment and use new technologies

- The advanced grid will help us provide you with even more clean energy because it will allow us to maximize the use of renewable energy sources such as solar, wind, and batteries.
- Energy use data in near real-time will give you the ability to choose how and when you use technology such as batteries and electric vehicles.

Security you can trust

- Energy use data will be securely transferred electronically from the smart meter, eliminating the need for manual meter reading or estimates, which also helps reduce costs.
- Protecting your data is extremely important to us. We use multiple layers of defense to ensure all data is secure and protected.

3.2.3 Addressing Concerns

Our communication materials will attempt to address key issues and possible smart meter concerns, including but not limited to:

- **Radio frequency (RF) emissions.** Smart meters emit low levels of electro- magnetic radiation through their RF communications. Xcel Energy will educate customers to alleviate unfounded concerns around health impacts and interference with other wireless devices.
- **Privacy and security.** The company will assure customers that we take their data privacy seriously by providing information about our data privacy policies. We will also clearly outline steps we take to protect customers' energy use information and personally identifiable information.
- **Accuracy.** Messages will also address the measurement accuracy of smart meters, and let customers know how to contact us if they have billing questions related to their meter readings. Call center agents will be trained to answer questions and assist customers.

- **Deployment expectations.** Communications will help make it easy for customers to properly identify our company employees and know what to expect when meter installers are working at their home or business. This includes special instructions for customers with medical conditions that may have equipment in their homes.
- **Opt-out policies.** The company will address opt-out policies for smart meter technology, and let customers know the proper channels for inquiring about available alternatives.

4 Customer Segments and Communications Considerations

Customers are interested in smart meters and functionality, but broad deployment will require the company to manage expectations and address customer concerns. Success requires the company to anticipate and respond to situations that could affect customers, stakeholders, or the community during smart meter deployment.

While individual customer issues will receive attention, Xcel Energy will also track issues on a broader scale. The company will actively monitor sources where customer issues or concerns may originate, including but not limited to:

- Customer care call centers (both residential and business inquiries)
- Inquiries to company executives, regional leaders, and front-line managers
- Inquiries to field and other employee personnel
- Xcel Energy Community Relations, Account Management, and State and Government Affairs teams
- Media relations
- Minnesota Public Utilities Commissioners and staff
- Community groups and consumer advocacy groups
- Letters, phone calls, social media posts, and emails from customers

We will use existing processes and procedures for handling issues escalated through our Customer Care team.

4.1 Commercial & Industrial Customers

We expect our broad awareness communications will be applicable to small C&I customers as well, but we will also provide customized 90, 60, and 30-day meter install notifications for those customers. The content of these communications will vary depending on the customer's current tariff to ensure they receive the most relevant information. Dedicated account managers for large C&I customers who will help ensure a smooth experience before, during, and after smart meter installation.

4.2 Fixed and Low-Income Customers

Customized communications will recognize and proactively address cost concerns among low-income households, seniors, and vulnerable customer populations. We will engage community leaders, influencers, and representatives of these communities in the development and deployment of our educational efforts. Messages will address how customers on fixed or limited budgets can take advantage of personal energy use information that may allow them to better

manage their energy costs. Outreach will also focus on increasing these customers' participation rates in energy efficiency and conservation programs, and cross-marketing the state's energy assistance programs. Communication and education materials that could be customized for this segment of customers may include:

- FAQs and fact sheets to address specific concerns and needs.
- Talking points and scheduled briefings with consumer advocacy groups and nonprofit groups who serve these populations.
- Customized presentations for community relations staff to share with their community leaders.
- Outreach to organizations serving seniors, low-income, and other vulnerable customer segments, with an emphasis on providing ready-to-use materials that can be distributed via their communication channels, online resources, events, meetings, and social media platforms.

4.3 Non-English-Speaking Customers

The company's service area is expansive and includes a diverse audience spread across the state. According to the U.S. Census Bureau's American Community Survey (ACS), in 2017, 11.3 percent of Minnesotans spoke a language other than English at home. Behind English, the most common language spoken at home is Spanish, with close to 200,000 speakers.² Spanish materials will be available on xcelenergy.com.

4.4 Customers with Life-Supporting Equipment

Prior to any direct communication regarding smart meter installation, the Contact Center will proactively reach out to customers who rely on life-supporting equipment in their homes. These customers will have the option to opt out of the smart meter, make an installation appointment or get a bridge installed to avoid a service interruption.

4.5 Communications Accessibility

The company has a number of options in place to assist customers and ensure accessibility for all.

- Deaf or hearing-impaired customers can dial 711 to be connected with the state transfer relay service. This service allows callers to communicate with text-telephone (TTY) users. This service is available 24/7 and is confidential.
- The company's Contact Center can make outbound calls using TTY technology.
- Any residential customer may request a large print bill statement.
- Customer emails and our website and online tools are constantly being improved to ensure accessibility.

² U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates, https://factfinder.census.gov/bkmk/table/1.0/en/ACS/17_5YR/B16001/0400000US27.

4.6 Customer Choice and Opting Out

The company believes customers should have the choice to opt out of receiving a smart meter. All direct customer communications will clearly overview all customer options and explain the steps required to decline initial installation of a smart meter or request to have their smart meter removed. Communications will include information about any costs associated with opting out of the smart meter.

5 Budget

The forecasted costs (**Table 5**) related to the execution of this plan total approximately \$6.3 million. These estimates are based on actual expenses to date for the Minnesota time of use pilot and for meter deployment in our Colorado service territory. We also gathered additional estimates from vendors to inform the forecast of specific costs. This budget includes external resources and support for this program (i.e., goods and services), but does not include internal resources (i.e., communications personnel).

Table 5. Education & communications plan forecasted budget

Tactic	Estimated cost per piece	Estimated cost for all MN customers
90-day mailer	\$0.90	\$1,170,000.00
60-day postcard	\$0.80	\$1,040,000.00
30-day letter	\$1.00	\$1,300,000.00
Smart meter info sheet	\$0.08	\$104,000.00
Door hanger success	\$0.40	\$520,000.00
Door hanger sorry we missed you	\$0.40	\$520,000.00
Email	\$0.00	\$3,900.00
Targeted digital advertising		\$25,000.00
Paid social		\$85,000.00
Mass advertising		\$350,000.00
Video production		\$20,000.00
Home network/tools education mailer	\$0.90	\$1,170,000.00
Total	\$4.48	\$6,307,900.00

AGIS Progress Metrics Summary
Proposed Reporting Annually May 1
First AGIS Report May 1, 2022

	Description	AGIS Report (Service Quality potential impacts and reporting noted)
Customer Outreach and Education	Survey results of customers on the adequacy and clarity of communications prior to installation of advanced meters.	AGIS
Installation and Deployment	Number of advanced meters installed.	AGIS
	Percentage of FAN deployed.	AGIS
	Number of feeders with FLISR enabled.	AGIS
	Number of feeders with IVVO enabled.	AGIS
	Number of customers electing to opt-out of AMI installation.	AGIS
	Number of calls to Customer Contact Center and meter installation vendor regarding meter installation.	AGIS / SQ
	Number of complaints regarding AMI installation.	AGIS / SQ
Post-Deployment	Avoided Customer Minutes Out due to FLISR installation.	AGIS / SQ
	Energy Reduction (MWh) due to IVVO that result in cost savings and CO ₂ emissions reduction.	AGIS
	Percentage of customers with advanced meters that receive estimated bills.	AGIS / SQ
	Percentage of customers with an advanced meter that have made a complaint of inaccurate meter readings.	AGIS / SQ
	Survey of customer satisfaction with outage related communications.	AGIS
	Number of customers with an advanced meter with an active web portal account.	AGIS
	Number of monthly, unique visits to the web portal (My Account).	AGIS