414 Nicollet Mall
Minneapolis, MN 55401

February 26, 2018

—Via Electronic Filing—

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101

RE: REPLY COMMENTS
BIENNIAL DISTRIBUTION GRID MODERNIZATION REPORT
DOCKET NO. E002/M-17-776

Dear Mr. Wolf:

Northern States Power Company, doing business as Xcel Energy, submits these Reply Comments in response to the Comments received on February 5, 2018 on our Grid Modernization Report.

Pursuant to Minn. Stat. §216.17, subd. 3, we have electronically filed this document with the Minnesota Public Utilities Commission, and copies have been served on all parties on the attached service list. Please contact Jody Londo at jody.l.londo@xcelenergy.com or (612) 330-5601 if you have any questions regarding this filing.

Sincerely,

/s/

BRIA E. SHEA
DIRECTOR, REGULATORY & STRATEGIC ANALYSIS

Enclosures
c: Service Lists

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

Nancy Lange	Chair
Dan Lipschultz	Commissioner
Matthew Schuerger	Commissioner
Katie J. Sieben	Commissioner
John A. Tuma	Commissioner

IN THE MATTER OF XCEL ENERGY'S 2017 GRID MODERNIZATION REPORT UNDER MINN. STAT. § 216B.2425, SUBD. 2(e)	DOCKET NO. E002/M-17-776
	REPLY COMMENTS

OVERVIEW

Northern States Power Company, doing business as Xcel Energy, submits these Reply Comments in response to the Comments received on February 5, 2018 on our 2017 Grid Modernization Report. We appreciate the opportunity to respond to Parties and to provide additional support for our request.

The utility industry is in a time of change. We are in the midst of transitioning our distribution grid from a predominately one-way system to a two-way, interoperable network. At the same time, the speed at which technology, the reliability expectations of our customers, and industry reliability standards are evolving requires us to be responsive and advance the foundations of the distribution system. Recognizing the importance of the changes underway, Minn. Stat. § 216B.2425 was modified in 2015 to provide utilities with an opportunity to identify priority projects that work toward the benefit of grid modernization efforts, obtain rider recovery for those projects to enable grid advancement to proceed at an appropriate pace, and continue the work necessary to achieve a modern distribution grid.

Even more recently, some states, including Minnesota, are moving toward planning processes that seek to understand the broader distribution plans and strategies of their utilities, of which grid modernization is one component. For Xcel Energy, we are beginning to realize our Advanced Grid Intelligence and Security (AGIS) initiative – starting with the implementation of our Advanced Distribution Management System (ADMS), which the Commission certified in 2017 and is on track to be implemented in 2020. Our November 1, 2017 Grid Modernization Report identified a Time of Use (TOU) Rate Pilot and a Fault Location, Isolation, and Service Restoration (FLISR) reliability improvement project – as well as development of the foundational Field

Area Network (FAN) – as priority projects. We also requested the ability to return to the Commission with *annual* Grid Modernization Reports for the foreseeable future – foreshadowing our intent to identify a full Advanced Metering Infrastructure (AMI) implementation as a priority project in November 2018. Together, these components of the AGIS initiative will address a confluence of factors, including rapid technological advances, changing customer needs and preferences, increasing industry reliability standards, emerging distributed energy resources (DER), and policy objectives.

We appreciate parties' general support of certification for our proposed TOU Pilot, and respond to parties' comments on the pilot in that docket.[1] While parties did not dispute the benefits of FLISR, and did not reject FLISR outright, the Department of Commerce, Office of the Attorney General (OAG), and Citizens Utility Board (CUB) did not support certification of FLISR at this time. We acknowledge and appreciate the feedback on our FLISR proposal from parties. We believe the comments are at least somewhat reflective of a certification process that is not yet mature. We are the only utility to have submitted Grid Modernization Reports under Minn. Stat. § 216B.2425, and the Commission has made only one round of certification decisions. Also, parties seem to be anticipating the Commission's intent to establish distribution planning requirements for utilities in Docket No. E999/CI-15-556.

We believe as the certification process matures and additional steps are taken to advance overall grid modernization through the certification process, specific proposals and Commission and stakeholder expectations for those proposals will better align. Understanding that our stakeholders want to continue to enhance understanding of our broader vision and plans of our distribution grid, we believe it is in our customers' best interests to continue to build the clear foundations of grid advancement. In this certification filing, we proposed to implement programs that promise significant benefits, and that squarely align with one of the principles that is most important to our customers – reliability. FLISR not only meets the certification criteria in Minn. Stat. § 216B.2425, it will significantly improve our customers' reliability experience, which customers value as the most important attribute of our service. FLISR will add important intelligence to our system and increase our system visibility into outage events.

We believe the Commission can certify our proposed projects in this proceeding while the distribution planning track of the Commission's generic grid modernization proceeding continues. We are actively involved in that effort, and are additionally

[1] *See* Xcel Energy Reply Comments, Docket No. E002/M-17-775 (February 26, 2018).

evaluating plans that other utilities are submitting in other states to inform our future grid modernization proposals. We will build our future plans to address the feedback we heard in this proceeding, and work with stakeholders to increase transparency as our plans evolve and future filings are made. We respectfully request that the Commission certify FLISR as supplemented by this Reply. We also request that the Commission allow us to return in November 2018 with an AMI certification proposal and annually thereafter through at least 2022.

We look forward to continued dialogue on bringing new capabilities, functions and technologies to the distribution grid. We support the evolution of the grid and anticipate meeting our customers' expanding energy needs at the "speed of value." We also look forward to enhancing our future plans, and engaging with our stakeholders as we build those plans.

Our Reply is organized as follows:

A. FLISR Meets the Statutory Certification Criteria
B. FLISR Promises to Deliver Significant Value to Customers
C. Proper Assessment of Investment Value Must Fit the Circumstances
D. Rider Recovery for Certified Projects is Consistent with Statute and Follows Certification
E. Annual Grid Modernization Reports are Appropriate and Within the Commission's Discretion
F. Third-Party Data Access Must be Balanced with Customer Privacy and Grid Security Interests

REPLY COMMENTS

A. FLISR Meets the Statutory Certification Criteria

We begin with a discussion of the grid modernization certification criteria and FLISR's importance to our customer service capabilities. The OAG comments devote significant attention to the criteria that the Commission should apply in evaluating certification of a distribution grid modernization project. We agree with the OAG that the criteria for certification should first and foremost be guided by the statutory language, and also that it is not necessary to create an exhaustive list of criteria.[2] Rather, given the unique and innovative nature of the grid modernization projects that may be proposed for certification under the Minn. Stat. § 216B.2425, it is important to maintain flexibility and adapt the criteria as needed based on the specific project

[2] OAG Comments at page 8.

under consideration.

Minn. Stat. § 216B.2425, subd. 2(e) provides in part:

> A utility . . . shall identify in its report investments that it considers necessary to modernize the transmission and distribution system by enhancing reliability, improving security against cyber and physical threats, and by increasing energy conservation opportunities by facilitating communication between the utility and its customers through the use of two-way meters, control technologies, energy storage and microgrids, technologies to enable demand response, and other innovative technologies.

The criteria outlined in this statute provide a broad range of types of investments that could qualify for certification. Specifically, so long as a project is needed to "modernize the distribution system" and provides benefits in one or more of the areas outlined in the statute, a project can be considered for certification.

To the extent that OAG's comments imply that the Commission should be bound by specific criteria examined in prior certification decisions, the Commission should reject such a rigid approach. It is notable that the specific criteria to be applied in determining whether projects should be certified is not specifically outlined by the statute. The Commission therefore has discretion to examine each project on a case-by-case basis to determine whether certification is appropriate. The grid modernization projects that will be evaluated under this statute are likely to present a diverse array of goals, issues, and challenges – and the Commission should examine the merits of each project within the broader confines of the legislative goals outlined in Minn. Stat. § 216B.2425. The Commission's decision will be guided by the legislative intent of the statute and the grid modernization goals it outlines.

FLISR fits squarely within the statutory criteria for certification. It will modernize the system by implementing intelligent devices that automate certain system operations and increase system visibility to aid proactive system planning. FLISR will also significantly enhance reliability for customers, which is an express benefit noted in the statute. We have estimated that when complete, FLISR will improve our all-day System Average Interruption Duration Index (SAIDI) by 23 minutes,[3] and will save our customers from experiencing approximately 30 million minutes of outages annually than would have otherwise occurred, but for FLISR.

[3] "All-day" SAIDI differs from "normalized" SAIDI in that it does not remove the effects of storms/ escalated operations – and so more closely represents customers' experience.

B. FLISR Promises to Deliver Significant Value to Customers

The OAG also questions whether FLISR is needed, given the Company's already-strong reliability metrics. While FLISR will improve the Company's performance on industry standard reliability metrics, including SAIDI and System Average Interruption Frequency Index (SAIFI) indices, the OAG observes that the Company has met or exceeded the SAIDI and SAIFI performance thresholds contained in its Quality of Service Plan (QSP) Tariff. Based on this good performance, the OAG questions the need to improve reliability and thus implement FLISR at this time.

While we agree that we have met our QSP SAIDI and SAIFI reliability metrics, the Outage Credits aspect of our QSP Tariff has resulted in payments to customers for certain frequent and long duration outages. We also have not consistently met our reliability goals established as part of our annual service quality reporting under Minnesota Rules. Finally, while we are presently comparing favorably with our peers, we expect that we will not be able to keep pace with rising industry reliability benchmarks and will fall behind relative to our peers without initiatives like AGIS, and specifically projects such as FLISR.

1. Reliability is Essential to Customer Satisfaction

Customer satisfaction greatly depends on whether a product or service meets a customer's expectations. As virtually every sector of the modern economy depends on electricity, and with the rise of personal electronic devices, reliable electric service has become even more important to our customers. We regularly survey our customers to understand their satisfaction with our service, and to learn about what they value with regard to our products, services, and performance. We also glean insights from established sources such as J.D. Power.

The JD Power Electric Utility Customer Satisfaction Study identifies the key factors that drive satisfaction, and how utilities are delivering on those factors. Consistent with past surveys, the 2017 JD Power Electric Utility Residential Customer Satisfaction Study identified Power Quality and Reliability as the most important attributes of satisfaction with utility service. Business customers similarly put the greatest emphasis on Power Quality and Reliability for their satisfaction. JD Power defines Power Quality and Reliability as reliable, quality electric service, prompt restoration when there is an outage, avoidance of brief interruptions and lengthy outages, and good communication about outages when they occur.

The strong tie between reliability and customer satisfaction is further borne out by broader industry studies. For example, in 2013 The Brattle Group published an

article in Public Utilities Fortnightly regarding the results of a study to determine the relationship between customer satisfaction and system reliability. The analysis concluded in part that:

> [I]ndeed, system reliability—as measured by the duration of service interruptions, their frequency, or both—significantly explains customer satisfaction scores. Furthermore, a separate but related regression showed that spending by utilities on their distribution systems was significantly correlated with achieved levels of reliability.[4]

Finally, we discussed the issue of customer satisfaction and expectations – and how customers think about reliability – in response to a specific Commission directive in our April 1, 2016 Annual Service Quality Report under the Minnesota Rules.[5] Based on ongoing research that we conduct with our customers, we outlined that customers value reliable electric service above all else. We also discussed that customers generally accept the notion that their power supply is not perfect, and therefore customers almost equally value communication about an outage throughout its duration. We have discussed the steps we are taking to also improve our outage communications as part of our annual service quality filings – and other filings on related topics, such as our customer preferences filing in Docket No. E,G002/M-17-553 and our initial comments in the performance based rates proceeding in Docket No. E002/CI-17-401.[6] We believe that simply being "good enough" with respect to certain reliability metrics is not the ultimate goal; rather, we should be consistently working to improve customer satisfaction overall, and improving reliability is a key part of this goal.

One of the primary benefits of FLISR, which is not disputed in the Parties' comments, is that it will reduce the numbers of customers who experience a sustained outage, and will shorten the duration of certain sustained outages. FLISR will also provide increased visibility into outage events occurring on the system for our engineering and operations personnel, which will help inform our operations and future management and investments in the system. We plan to target implementation of FLISR in areas where we expect to achieve the greatest reliability improvements –

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[4] William P. Zarakas, Philip Q Hanser, and Kent Diep, *Rates, Reliability, and Region: Customer Satisfaction and Electric Utilities*, PUBLIC UTILITIES FORTNIGHTLY, Jan. 2013, at 52., *also available at* https://www.fortnightly.com/fortnightly/2013/01/rates-reliability-and-region?page=0%2C0.

[5] See Attachment P, *In the Matter of Northern States Power Company's Annual Report on Safety, Reliability, and Service Quality for 2015; and Petition for Approval of Electric Reliability Standards for 2016*, Docket No. E002/M-16-281 (April 1, 2016).

[6] See Xcel Energy Petition, *In the Matter of the Petition of Northern States Power Company for Approval of Tariff Modifications and a Variance from Commission Rules to Implement Customer Driven Operational Changes and Other Tariff Changes*, Docket No. E,G002/M-17-553 (July 14, 2017) and Xcel Energy Comments, *In the Matter of the Commission Investigation to identify and Develop Performance Metrics and Potentially, Incentives for Xcel Energy's Electric Utility Operation*, DOCKET NO. E002/CI-17-401 (December 21, 2017).

overhead areas with high customer density, and areas with a history of more frequent outages as compared to the rest of the system. As a result, it is our expectation that FLISR will provide marked improvement in reliability and aid our ability to better keep customers informed, which will translate into greater customer satisfaction.

2. Industry Reliability Performance is Increasing by Comparison

In addition to meeting customer needs, Xcel Energy must improve reliability performance to maintain its position relative to industry standards and expectations. In contrast to the QSP and Rules-based SAIDI and SAIFI metrics, which have been set based on our past performance, the Institute of Electrical and Electronic Engineers (IEEE) sets benchmarks based on industry-wide utility performance. As electric utilities across the country implement grid modernization projects, these IEEE SAIDI and SAIFI benchmarks will rise with peer utilities' improved performance. By 2020, it is now expected that first quartile SAIDI benchmarks will improve to 84 minutes, and second quartile rankings will be between 94 and 84 minutes.[7] In 2016, we achieved a second quartile ranking with a SAIDI value of 93 minutes. Simply put, without implementation of FLISR and other reliability efforts, we will not be able to keep pace with the rising industry reliability benchmarks, and will fall behind relative to our peers. As such, we respectfully disagree with the OAG that we need not invest in reliability simply because we are doing well under today's metrics.

C. Proper Assessment of Investment Value Must Fit the Circumstances

In this section, we respond to several parties who suggest that more detailed or different analyses are necessary before the Commission certifies FLISR. These suggestions include (i) Any proposed grid modernization investment should not be certified absent a detailed cost-benefit analysis (CBA) that results in a ratio of benefits to costs greater than 1.0 – that is, that the quantifiable benefits of the project exceed its costs; (ii) for our FLISR Value Analysis, the Commission might consider an alternative Customer Minutes Out (CMO) value offered by the Department, which is based on an underperformance penalty in our QSP Tariff rather than on industry research that approximates the impact of an outage event from a customer's perspective; and (iii) the Department's suggestion that the Commission defer its decision on FLISR until we provide a comparative analysis of FLISR to the form of Integrated Volt Var Optimization (IVVO) that we are implementing in our Colorado jurisdiction.

[7] These benchmarks represent storm-normalized results.

1. *A CBA Only Quantifies that which is Quantifiable*

The idea that each project must be accompanied by a CBA[8] with a benefit to cost ratio greater than 1.0 is not new, but it is flawed. Because CBAs are based on a comparison of quantifiable benefits versus costs in dollars, the fundamental implication of this argument is that a project is only valuable if it saves more money than it costs. Put differently, the OAG and the Department appear to be suggesting that FLISR should not move forward unless it reduces costs to customers.

While we agree that CBAs can provide one helpful evaluation tool, by definition a CBA can only quantify that which is quantifiable. It may be possible to estimate the costs of a particular project (including contingencies); however, it is not possible to quantify all potential qualitative benefits. As such, over reliance on CBAs encourages overlooking other, valid considerations, such as: (1) customer satisfaction; (2) customer convenience/inconvenience; (3) employee or customer personal safety; (4) power quality; (5) customer service risks associated with aging systems; (6) strategic advancement of the distribution system to accommodate other customer interests, such as DER; (7) maintaining favorable utility market position with respect to service to customers; and (8) overall impressions of utility service and the regulatory environment in Minnesota. This is especially true for applications like FLISR and its supporting Field Area Network (FAN), which are or relate to foundational capabilities that can be built upon down the road.

Additionally, adopting the assumption that any CBA should result in more quantifiable benefits (i.e., cost savings or avoided costs) than actual costs would preclude the Company from pursuing otherwise worthwhile utility investments. For example, a utility must make reasonable investments in transmission and distribution lines even though such investments contribute to, rather than reduce, the utility's rate base and customer costs; without such investments, the utility cannot function, or cannot effectively carry out its obligation to provide reliable and safe electric service to customers. Investments in reliability often do not result in a quantifiable benefit-to-cost ratio greater than 1.0, as such investments typically improve service and satisfaction rather than reducing costs *per se*.

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[8] Except where otherwise noted, we use the term "CBA" broadly to mean any of several types of quantitative valuation of various costs and benefits associated with a particular proposed project. As discussed later in these Reply Comments, a CBA can take any of a number of forms and have different structures or purposes in different contexts. The FLISR Value Analysis provided in this Certification proceeding, for example, is one specific type of CBA.

Lastly, a difficulty with CBAs in general is that they can be conducted in many different ways and based on many alternatives, and sometimes subjective or conflicting assumptions that also may evolve over time. For example, while our estimates of the likely reductions to outage length that FLISR offers are not contested in the Parties' comments, the Department correctly notes that our analysis of FLISR value vs. costs depends largely on the assumptions one makes regarding the *value* of a CMO. This is true of multiple variables within any CBA. Likewise, the value of a CMO could change based on the information available at the time regarding both projects that are not yet implemented and future conditions that have not yet occurred. While we believe our assumptions are reasonable and that CBAs may present one business case for any particular project or proposal, the Department's very analysis of CMO values demonstrates that CBAs are not a wholly objective evaluation of relevant costs and benefits. Nor should the Commission adopt an approach to CBAs that encourages parties to any given proceeding to drive such analyses to a particular outcome.

Here, we seek certification of FLISR as a reasonable means of not only reducing outage minutes and their quantifiable impact on customers, but also improving our reliability standards and customers' satisfaction with their electric service. Absent FLISR, our ability to isolate, locate, and resolve faults is limited due to: (1) a lack of intelligent field devices that interact with the FAN and ADMS to restore service to a majority of customers on the faulted circuit; and (2) a lack of visibility and information regarding where the fault may have occurred and the type of fault occurring. Overall customer satisfaction tends to decline when customers experience frequent outages and when service is not quickly restored after an outage event. Quantifying these effects is difficult at best, and in any case, very subjective.

Minnesota recognizes that differing tools can be used to measure the benefits of any given project, and has a long history of employing varying tools to evaluate the effectiveness of investments and customer programs. For example, there are several cost-effectiveness tests for utility Conservation Improvement Programs (CIP), which involve weighing benefits and program costs from the following perspectives: (1) participant, (2) ratepayer impact, (3) utility cost, (4) total resource cost, and (5) societal cost. While the program may demonstrate a cost-effective value in one test, it may not in another. Another example of varying CBA approaches are the Present Value Societal Cost (PVSC) and Present Value Revenue Requirements (PVRR) valuations used in Integrated Resource Plans – with the PVSC considering some, less tangible, societal impacts and the PVRR representing actual expected costs.

The same possible range of analyses will likewise need to exist for grid modernization investments. As we note above, some investments will be necessary to effectively

continue carrying out our obligation to provide reliable and safe utility service to customers. The evaluation of a proposed investment must be tailored to properly consider a reasonable view of expected benefits and costs – and allow sufficient flexibility and discretion to weigh intangibles. The Value Analysis we provided for FLISR is one such evaluation.

We are not suggesting that CBAs do not play a role in evaluating projects; we believe they can be one valuable tool. We simply wish to encourage our stakeholders to take a broader view that recognizes both the benefits and limitations of this particular tool, such that approval or disapproval of a proposal depends on all relevant information.

2. The Company's FLISR Value Analysis Relies on a Reasonable Benchmark

In light of the discussion above, it is not surprising that parties may offer differing views of key attributes underlying the value analysis of a particular project. In particular, the Department questions the Company's CMO value underlying our FLISR Value Analysis by pointing out that a different, and much lower, CMO value is implied in the Company's QSP Tariff. Specifically, our tariff provides a one-time $50 bill credit to individual customers when our service falls below the established thresholds, which are for: (1) interruptions lasting 24 hours or more; and/or (2) six or more interruptions in a calendar year.

It is important to recognize, however, that this $50 credit is not intended to compensate a customer for their economic loss due to an outage, nor was the amount of this credit set based on any type of economic evaluation. Rather, the $50 credit is a Company penalty, and intended to compensate customers for the burden imposed by the Company providing below standard service. It was never intended to be a calculus of the value of any particular outage minute or hour to customers.

In contrast, the CMO value we used to estimate the value of implementing FLISR for our customers is based on actual Company reliability data – and work completed by Lawrence Berkeley National Laboratory (LBNL). To establish this value, LBNL created a tool to estimate the value of an interruption from a customer viewpoint called the Interruption Cost Estimate (ICE) Calculator. LBNL bases the value for commercial and industrial customers on their costs due to an outage, and for residential customers, on the amount they would be willing to spend to avoid an outage. It incorporates the studies, analyses, and econometric models done by Freeman, Sullivan & Co., and was designed specifically for use in estimating interruption costs and/or benefits associated with reliability improvements.

Although the CMO value used by the Company in its FLISR Analysis is an estimate, it

is the result of objective work completed by LBNL and is more representative of the actual value of an outage to our customers than the $50 penalty in our QSP Tariff.

3. IVVO and FLISR Offer Different Value Propositions

The Department also suggests that the Commission defer its certification of FLISR until the Company compares FLISR to the form of IVVO as it is being implemented in our Colorado jurisdiction, which includes employing Conservation Voltage Reduction (CVR).[9] This suggestion seems to stem at least partially from the Department's perception of CBA results in our AGIS Certificate of Public Necessity and Convenience (CPCN) in Colorado, as discussed in the Department's comments.

Below, we first address why IVVO is not a substitute for FLISR. Rather, FLISR and IVVO have two very different purposes that are not mutually-exclusive and that have different value propositions for our customers. Next, we clarify some aspects of our IVVO application and CBA in Colorado. We then explain why IVVO with CVR is a different value proposition in Minnesota as compared to Colorado. Finally, we explain that we believe a comparison between IVVO and FLISR is inappropriate, and that the Department's request that the Company complete a full CBA for IVVO before pursuing FLISR would be detrimental to both projects and to our customers.

a. FLISR and IVVO Serve Two Different Customer Needs

First, the Department submits that "the resources the Company has available to implement FLISR may be better used to implement another advanced grid application – IVVO."[10] The Department then suggests it requires more information to make adequate comparisons between FLISR and IVVO to determine which it will recommend the Company should pursue.

At the outset, it is important to clarify that FLISR and IVVO are two different grid advancement programs with different purposes and different costs and benefits to customers. They are not interchangeable, and we have not presented FLISR and IVVO as alternative means to accomplish the same objective. Rather, we seek certification of FLISR as an advanced application that brings particular benefits to customers in its own right.

As described in our initial filing, FLISR is a feeder fault location and service

[9] CVR is a reduction of voltage along the distribution feeder for the purpose of reducing electric power demand and energy.
[10] Department Comments at page 3.

restoration solution that utilizes intelligent field devices, advanced applications, and the FAN to automatically restore service to customers – and more quickly locate, isolate, and respond to outage events it cannot remotely remedy. It results in reliability improvements and operational efficiencies for the benefit of customers. In contrast, IVVO as it is being implemented in Colorado is intended to reduce the variability of voltage levels along feeder lines, while still ensuring the utility provides adequate voltage to meet customer needs. IVVO deals with voltage regulation, whereas FLISR deals with reliability performance and outage response.

The Department points to testimony in our Public Service Company of Colorado (PSCo) Operating Company affiliate's CPCN proceeding stating that FLISR and IVVO are alike in that they are both advanced applications and associated field devices that will support a more advanced grid.[11] However, this discussion was not intended to suggest that IVVO and FLISR are interchangeable; that would be like saying that transmission and distribution systems are interchangeable because both involve poles and lines and deliver energy to customers. In other words, FLISR and IVVO have some similarities to the extent both can bring benefits to the distribution grid and can complement each other; however, they serve very different functions as part of the advanced grid, and fulfill very different purposes on behalf of customers.

The Department also suggests that IVVO presents attractive opportunities for demand side management without requiring customer behavioral changes.[12] We agree that this is one of the benefits of IVVO we identified in Colorado; however, comparing this benefit to FLISR requires one to choose whether conservation (CVR) is more important than reliability (FLISR) or vice versa. As we have discussed previously, we know that customers place greatest value on reliability.

However, we also recognize that both reliability and conservation are important. In this case, there are also other considerations, including technical system design and IVVO efforts we have already undertaken in Minnesota that we believe erode the potential of IVVO in Minnesota as compared to Colorado. We discuss these below.

b. The Company Did Not Present a Positive NPV for IVVO in Colorado

The Department expresses its initial support for IVVO on the grounds that our PSCo presented a "highly developed cost-benefit analysis" in Colorado, and that "[s]ome of [Company witness] Mr. [Samuel J.] Hancock's analyses in his Rebuttal Testimony

[11] Department Comments at page 4 (*referring to Alice Jackson Direct Testimony in Colorado Docket 16A-0588E*).
[12] Department Comments at page 6.

identified a net benefit related to the installation of IVVO in Colorado."[13] This is, unfortunately, a misunderstanding of the analyses Mr. Hancock presented in Colorado. Mr. Hancock's IVVO CBAs in Colorado showed a benefit-to-cost ratio between 0.68 and 0.76 – that is, IVVO capital implementation and O&M costs outweighed quantifiable benefits.[14] The Company's support for IVVO in Colorado was instead based on a combination of its quantitative CBA and qualitative discussion of the need for and benefits of IVVO in that service area.

Likewise, the assumptions within the Colorado IVVO CBA were different than the circumstances occurring in Minnesota. In particular, the Colorado IVVO proposal was integrated with AMI, such that AMI meters would act as sensors that reduced the overall cost and increased the efficacy of the IVVO application.[15] Without AMI, standalone meters would need to be deployed. PSCo did not support a standalone meter approach – and quantified that more than $10 million of additional investment would be needed for that approach, as compared to the AMI "meter as sensor" approach. Without AMI, benefits would likely decline and reduce the overall IVVO benefit-to-cost ratio further below PSCo's assessment that was already less than one.[16] As such, we do not believe it would be beneficial to pursue the same form of IVVO in Minnesota at this time for a number of reasons, including because AMI meters as sensors are not yet available here.

c. IVVO Has a Different Value Proposition in Minnesota than in Colorado

Given the Department's interest in IVVO for Minnesota, we wish to further clarify the important differences between deployment of IVVO in Minnesota and deployment of IVVO in Colorado. We explained in our response to Department

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[13] Department Comments at page 7.

[14] Rebuttal Testimony of Samuel J. Hancock at page 63, lines 13-18 in Colorado Docket No. 16A-0588E. While other parties suggested conservation benefits that Mr. Hancock attempted to quantify for purposes of providing an "apples to apples" cost-benefit comparisons, PSCO did not provide nor support its own IVVO cost-benefit in which the quantifiable benefit-to-cost ratio approached 1.0. Rather, Mr. Hancock stated that "The Company's position represents a middle ground as compared to the various positions of other parties. The Company's position does not result in benefit to cost ratios as high as [another party's], but (consistent with my prior discussion) is higher than the position of Staff for a standalone IVVO implementation."

[15] Rebuttal Testimony of Mr. John Lee at page 40, lines 9-20. Mr. Lee explained that:

> *AMI meters provide voltage sensing functions—measuring and transmitting voltage, current, and power quality data—that will allow the Company to have access to more granular voltage data at the service point or customer meter that will make IVVO more effective. Without AMI meters, the Company would need to deploy stand-alone sensors to implement IVVO, which would also make IVVO less effective as the Company would have to be more conservative with the level of voltage reduction such that it does not result in voltages outside of the [American National Standards Institute ("ANSI") Standard] C84.1 range.*

[16] Mr. Hancock's Rebuttal Testimony in Docket No. 16A-0588E at page 50, lines 12-21.

Information Request No. 1 that voltage optimization *is* part of our AGIS plan for Minnesota; however, we intend to employ it such that it will maximize value to Minnesota customers, which is different than the form of IVVO we are implementing in Colorado. The different approaches are due to both policy and technical system design and operational differences. In light of these differences, we do not believe IVVO as it is being implemented in PSCo is appropriate for the Minnesota system, at least at this time.

More specifically, in Department Information Request No. 1, the Department asked:

> *Xcel Energy discussed the costs and benefits of Integrated Volt-VAr Optimization (IVVO) technology at length in this [Colorado Public Utilities Commission Docket No. 16A-0588E] proceeding. What are the Company's regarding the installation of an IVVO system in Minnesota.*

Based on our understanding that the Department was asking about our plans for IVVO in Minnesota, we responded in pertinent part:[17]

> Since 2010, we have been doing VAr Control through our SmartVAR program in Minnesota, which has provided benefits to the grid and our customers.[18] SmartVAR is presently managed through a specific system and will ultimately be transitioned to our ADMS, where we will technically have the ability to implement other IVVO objectives on the Minnesota system. However, there are important considerations involved in determining IVVO application on the system – some of which are technical, and others are about maximizing value for customers.
>
> While the preliminary analysis we have done on the Minnesota system shows that [Conservation Voltage Reduction or "CVR" mode, which is the proposed mode in which IVVO will operate in Colorado] may deliver energy savings comparable to the PSCo system, our analysis did not examine the breadth of CVR Factors that vary feeder by feeder; rather, it relied on a representative CVR Factor and a simple extrapolation of the Wilson Substation information to the entire Minnesota system.
>
> We know that the different types of voltage control are affected by a variety of factors throughout the distribution network. The following key differences in

[17] See DOC IR-1, provided as Attachment A to these Reply Comments. We note that while our response to DOC IR-1 also references other IR responses, for the sake of brevity we have not appended those additional responses to these Reply Comments.

[18] *See In the Matter of the Petition of Northern States Power Company, a Minnesota Corporation, for Approval of Two Proposed Energy Innovation Corridor Projects in the Central Corridor Utility Zone and Deferred Accounting Treatment for Costs Incurred After January 1, 2010* (Docket No. E002/M-09-1488).

feeder design between Minnesota and Colorado have factored into our decision thus far to deploy IVVO differently in these two operating areas:

- *The system design in Colorado uses shorter feeders with larger conductor to support a denser load.* Larger conductor size has lower impedance, which means that the voltage drop across the wire is reduced – making the system more capable of CVR; higher load density on each feeder means that the net impact from IVVO on a per-feeder basis can be greater. As a result, the PSCo feeder design is more amenable to CVR.

- *The standard substation bus voltage is different.* In PSCo, the standard bus voltage is 125V, which is at the very high end of the ANSI C84.1 standard for distribution voltage. This higher starting voltage allows for a greater range of voltage reduction to be done with IVVO, giving more opportunity for energy savings while maintaining adequate service quality to customers. In the NSP-Minnesota service area, average bus voltage is typically 123.5 volts. This, along with smaller wire size, reduces the potential impact of CVR for Minnesota.

- *AMI is a beneficial component of IVVO.* AMI meters used as 'bellwether' meters are the least cost method to provide voltage inputs to ADMS at key locations across the grid. For IVVO to be successfully and safely operated, voltage endpoints are necessary at ten end points on each feeder; without AMI, this data would need to be gathered in other ways. The preliminary Minnesota analysis we provide with our response to Department Information Request No. 3 shows the use of Voltage Sensors, which are approximately ten times the cost per unit than an AMI meter. Our PSCo implementation of IVVO relies on AMI as a critical part of the deployment to minimize costs and provide the voltage data.

- *Additional considerations.* Our sample set, using a simple average generated from the Wilson Substation pilot, may not be representative of the potentially wide range of CVR Factors existing on the system.[19] This study also did not take into account higher anticipated levels of DER, as we explained in CEO-55, attached as Attachment E to Department Information Request No. 3 in this docket. And, the analysis did not take into consideration the declining use per customer driven by organic and explicit conservation measures; declining customer use diminishes the potential benefits of IVVO.

[19] CVR Factors on NSP-Minnesota feeders vary widely and can range from 0.4 to 1.5, depending on the type of load on the feeder. Commercial and industrial are on the lower end of this range, and highly resistive loads such as old lighting are on the higher end. With the transition to LED lighting and other constant power devices, the CVR Factor is expected to decline year-over-year as customers make the transition to more energy efficient equipment.

> For these reasons, we have not proposed IVVO at this time for Minnesota. As we have expressed over time, we are committed to implementing grid modernization at the speed of value for our customers. For the reasons we have discussed, we believe our customers will realize greater value from the FLISR project and the Time of Use Rate Pilot we have proposed – and continuing to reap the benefits of the present Minnesota IVVO – Voltage Control/SmartVAR functionality.

The discussion in this discovery response continues to hold true, and encapsulates the reasons implementation of IVVO in Colorado do not necessarily encourage that specific form of IVVO for Minnesota.

d. An Updated Minnesota IVVO Value Analysis Would Not Add Value At This Time

While we do not agree that the FLISR vs. IVVO comparison is appropriate, and specifically raises concerns given different circumstances in Minnesota than in Colorado, we wish to address the Department's proposal that an updated IVVO analysis would inform the FLISR evaluation. Much of the difference between the study conducted in Minnesota, as well as the time that would be required to expand and update it, versus the analysis conducted in Colorado stem from different circumstances in the respective states.

The Colorado IVVO project exploration started in 2008, largely in response to significant and explicit interest in IVVO by the Colorado Public Utilities Commission in that timeframe. This was followed by a pilot in the 2010 timeframe and another pilot in 2011. These pilots, a number of years of investigation, and a re-study informed the CBA that was submitted in the Colorado CPCN in 2016.

In contrast, when we performed the IVVO study in Minnesota in 2015, it was developed as a high-level estimate of project costs and benefits based on assumptions and preliminary studies from Colorado (which were refreshed before filing in the Colorado request for approval of IVVO). At the time of this Minnesota study, we did not have cost estimates or fully vetted strategies around our ADMS deployment, the FAN deployment, or the devices that we would use for secondary VAr compensation.

Further, largely because of the greater, more detailed, and more fully-developed data in Colorado, the IVVO CBA in Colorado was based on more detailed examination of specific capital and O&M implementation costs as compared to specific conservation benefits to customers. It was a very different kind of analysis than the high-level analysis conducted in Minnesota in 2015 – particularly given that the Minnesota

system already has SmartVAR and has different feeder configurations and operating voltage – and did not have the same level of policy interest that drove much of the ongoing analyses as we have experienced in Colorado. In short, the analysis was not intended to inform a project selection process, or regulatory proposal. Nor has it been updated given that the Company does not see value in pursuing IVVO in Minnesota at this time.

While a more detailed analysis could eventually be conducted for IVVO, we do not believe it is a worthwhile use of resources to do so at this time. Further, the differences between Minnesota and Colorado's readiness and technical underpinnings for IVVO – and between the value proposition in each state – mean that a great deal more work and time would be required in Minnesota to develop an accurate IVVO CBA or other analysis of its value.

In sum, even if IVVO were an appropriate comparison to FLISR, and even if the comparison were dependent on a more detailed CBA for IVVO, that analysis would require a significant investment of financial and other resources while delaying the benefits of either program to our customers. Additionally, in the end and for the reasons we have discussed, it is not clear whether an IVVO cost-benefit analysis would result in a positive net present value calculation for Minnesota – an outcome that would be consistent with the CBA the Company supported in Colorado. As such, we respectfully disagree with the Department that approval of FLISR should be tied at all to IVVO analyses.

D. Rider Recovery for Certified Projects is Consistent with Statute and Follows Certification

We next turn to certain cost recovery arguments raised by the Parties in their comments. For example, CUB suggests that at least a portion of the costs of distribution projects certified by the Commission under Minn. Stat. § 216B.2425 should be recovered in a general rate case rather than through the Transmission Cost Recovery (TCR) Rider. In support of its position, CUB relies on a 2010 Commission report to the Minnesota legislature on use of riders. This report contains helpful information related to the use of cost recovery riders in Minnesota. In fact, this report was submitted and considered by the Minnesota legislature in 2015 when it approved amendments to the TCR Rider statute that expressly permit rider recovery for distribution facilities that have been certified by the Commission under Minn. Stat. § 216B.2425.

Specifically, Minn. Stat. § 216B.16, subd. 7b allows utilities to seek recovery for certain transmission costs between rate cases through an "automatic annual adjustment"

mechanism or rider. Xcel Energy's rider formed under this statute is known as the TCR Rider. In 2015, the Legislature amended Minn. Stat. § 216B.2425 to require reporting on distribution grid modernization efforts. At the same time, the Legislature also amended Minn. Stat. § 216B.16, subd. 7(b) to expand the TCR Rider to include certain distribution grid investments. As amended, subdivision 7(b) allows the use of the TCR Rider for recovery of several types of distribution costs. Among these are "costs associated with investments in distribution facilities to modernize the utility's grid that have been certified by the Commission under section 216B.2425."[20] As a result, these 2015 amendments provide clear statutory authority for use of the TCR Rider to recovery costs for distribution grid modernization projects certified by the Commission.

Also related to cost recovery, the Department and OAG seek a more detailed demonstration of incremental costs of FLISR over distribution costs already in base rates – and all parties suggest specific cost recovery treatment for certain Company costs or cost reductions. These issues are best addressed in conjunction with the cost recovery petition we would submit after the Commission certifies the projects we have proposed. We note that we made a number of references to advanced grid project costs that were included in our present multiyear rate case that serve to offset the total TOU Pilot and FLISR project costs presented in our certification request. We also said we would detail the impacts in our cost recovery request that will follow Commission certification of the proposed projects.[21]

The record in this proceeding is intended to support certification consistent with the statute, and not cost recovery. Subsequent to Commission certification of the priority projects we propose, we will submit a cost recovery petition where we will have the burden to demonstrate there is no double-recovery of costs between base rates and the TCR Rider, and the mechanics of project cost recovery are established.

E. Annual Grid Modernization Reports are Appropriate and Within the Commission's Discretion

Given the rapid pace of advanced grid technologies, we requested permission to file an additional Grid Modernization Report and certification request on November 1, 2018, and permission to submit annual reports and certifications through at least 2022. The OAG opposed our proposal, stating that such filings are contrary to the statutory language that authorizes only biennial reports, are inconsistent with the Company's agreement to limit the use of riders, and should not be approved until the

[20] Minn. Stat. § 216B.16, subd. 7b(b)(5).
[21] Xcel Energy Grid Modernization Report at pages 10, 13, 19, 23, and 34.

Commission develops grid modernization performance metrics. The Department suggests ratepayers may be harmed by allowing frequent rate increases through the TCR Rider, so recommends the Commission not allow the Company to accelerate the certification and cost recovery process of grid modernization projects unless they have a benefit/cost ratio above one.

1. Annual Filings are not Prohibited by Statute

The Grid Modernization Report and certification process is outlined in Minn. Stat. § 216B.2425. While this statute requires these reports to be submitted by "November 1 of each odd-numbered year" the statute does not prohibit more frequent filings such as the annual filings requested by the Company. The Commission recognized this in its June 28, 2016 Order in our 2015 Biennial Distribution Grid Modernization Report proceeding. In denying certification of the Belle Plaine project based on the record before it, the Commission said it "will allow Xcel to file a separate report and certification request for the project prior to filing its next biennial report under Minn. Stat. § 216B.2425, subd. 2."[22]

Given the rapidly changing nature of distribution technologies, an annual filing will allow the Company to provide more timely information to the Commission about our grid modernization efforts. In addition, annual filings will allow the Company to advance additional grid modernization projects without the delay inherent in biannual reporting and certification. As noted in our initial filing, while we were not prepared to request certification of full AMI and FAN deployments in our most recent November 2017 report, we expect to propose these projects in 2018.

If the Commission does not grant our request for at least a November 1, 2018 filing, this will require our AMI proposal to wait until November 2019. Such a delay would only serve to postpone the implementation and expected benefits of these important and foundational grid modernization projects.

2. Annual Filings will Allow Timely Reporting and Certification of Projects

The OAG's concern that annual Grid Modernization Reports expand the use of riders contrary to our commitments in our multiyear rate plan (MYRP) Settlement Agreement is without merit. Our request for annual filings will not require a new cost recovery rider, nor will it increase the number of projects that we propose for

[22] *See* ORDER CERTIFYING ADVANCED DISTRIBUTION MANAGEMENT SYSTEM (ADMS) PROJECT UNDER MINN. STAT. § 216B.2425 AND REQUIRING DISTRIBUTION STUDY, page 11, Docket No. E002/M-15-962 (June 28, 2016).

certification. Rather, our request will simply allow more timely reporting and certification of necessary distribution grid modernization projects. In addition, it bears noting that as part of the Settlement Agreement in our MYRP, we agreed only to forgo approval for any new riders during the MYRP.[23] The Settlement Agreement allows the Company the ability to continue to use existing riders, including the TCR Rider, that were in place at the time of the Settlement. In fact, the Settlement Agreement expressly notes that the Company's use of the TCR Rider "will include Grid Modernization projects."[24]

Further, these annual reports and any project certifications by the Commission will still require the Company to file a petition for TCR Rider recovery under Minn. Stat. § 216B.16, subd. 7b. While Commission certification provides the Company with assurance that it can proceed with the project and seek recovery under the TCR Rider, as previously noted the Commission will still have the opportunity to review actual costs and expenditures as part of the Company's subsequent TCR filings.

3. Grid Modernization Investments Should Not Wait for Broad Development of Performance Metrics

The OAG further urges the Commission to reject the Company's request for annual grid modernization reports until the Commission adopts performance metrics to judge the performance of these projects. The OAG notes that the Commission is currently considering the adoption of performance metrics for the Company in Docket No. E002/CI-17-401 and that these metrics could be used to judge the benefits achieved from implementation of grid modernization projects. While we are engaged in the performance metric docket and recognize that there may be opportunities to adopt new or different performance metrics, it is not necessary to delay future grid modernization filings pending adoption any such metric.

To the extent that any new performance metric(s) are developed, these metrics will apply after a grid modernization project has been constructed, and would most likely be used to measure the benefits of implementation of the project. More specifically, the OAG acknowledges that these metrics will be targeted on the "operational performance" of grid modernization investments. As a result, these metrics will not alter how the Commission assesses or approves grid modernization projects in the first instance, and therefore it is not necessary to delay future certification filings until

[23] STIPULATION OF SETTLEMENT, *In the Matter of the Application of Northern States Power Company for Authority to Increase Rates for Electric Service in the State of Minnesota*, Docket No. E002/GR-15-826, at 7 and Attachment 3 (Aug. 16, 2016).
[24] *Id.* at Attachment 3.

any such metrics are approved by the Commission. Rather, such undue delay could serve to place Minnesota's grid modernization at odds with the pace of prudent distribution system advancement across the industry.

Not only that, but it is questionable whether there will be a need to adopt new metrics in order to assess the effectiveness of grid modernization projects. There are numerous metrics currently in place, such as SAIDI and SAIFI for reliability, that can be used to evaluate the benefits and effectiveness of FLISR and perhaps other grid modernization projects.

F. Third-Party Data Access Must be Balanced with Customer Privacy and Grid Security Interests

Finally, we address CUB's comments in favor of broader public access to grid and customer usage data. CUB observes that grid modernization allows much more granular data collection both on the performance of the utility's distribution grid and on how customers use energy – and asserts that this data should be made available to the public and to stakeholders.

We take our responsibility to secure and protect our customers' data and information about our grid very seriously. With respect to customer data, while we believe there is an appropriate balance between customer privacy and confidentiality and access to further public policy objectives, we believe *customer control* and *consent* are vital aspects of any privacy paradigm. Therefore, except in very limited circumstances, we will not release individual Customer Energy Usage Data (CEUD) to anyone other than the customer of record unless we receive written, explicit, informed consent from the customer. This aligns with decisions the Commission has made in Docket No. E,G999/CI-12-1344, where it explored a number of aspects of customer data privacy. In its January 19, 2017 Order, the Commission established a definition of CEUD,[25] and prohibited utilities from disclosing CEUD without the customer's consent unless the utility has adequately protected the anonymity of the CEUD.[26] As part of this Order, the Commission also required utilities to submit a description of their CEUD release practices. Please see our customer data aggregation and release policies as submitted in our February 10, 2017 compliance filing in Docket No. E,G999/CI-12-

[25] "For purposes of this docket, the Commission defines *Customer Energy Use Data (CEUD)* as data collected from the utility customer meters that reflects the quantity, quality, or timing of customers' natural gas or electric usage or electricity production."

[26] *See* ORDER GOVERNING DISCLOSURE OF CUSTOMER ENERGY USE DATA TO THIRD PARTIES, REQUIRING FILING OF PRIVACY POLICIES AND COST DATA, AND SOLICITING COMMENTS, Docket No. E,G999/CI-12-1344 (January 19, 2017).

1344 for further details.

In terms of grid data, we believe private or confidential customer data and/or critical distribution information infrastructure information must be protected from public release. As we discussed in our September 21, 2017 Reply Comments in the Commission's grid modernization docket (Docket No. E999/CI-15-556), the issue of access and protection of distribution grid information is largely uncharted territory today. While the Commission has examined customer privacy and confidentiality of CEUD and customer Personally Identifiable Information (PII), it has not examined treatment of distribution grid information. At the national level, *transmission* grid information is guided by the National Institute of Standards and Technology (NIST), North American Electric Reliability Corporation (NERC), and Federal Energy Regulatory Commission (FERC). These existing national regulatory, legal, and industry frameworks unfortunately provide little to no guidance with respect to critical infrastructure data protections and customer privacy and confidentiality considerations as it relates to distribution grid data. To-date for customer and grid data for which there is no specific guidance, we have considered a number of sources, including these, as advisory – and protected the information that we believe is sensitive and therefore non-public.

To the extent the Commission wishes to explore changes to the present treatment of CEUD and other customer information, and/or to forge requirements for distribution grid information, we are happy to participate. We believe these may be appropriate discussions for the broader grid modernization docket, but are not central to FLISR and the TOU Rate Pilot certifications, given that we will continue to protect customer and grid data in whatever manner the Commission and our customer obligations require.

CONCLUSION

We appreciate the opportunity to respond to Parties' comments and parties' general support of certification for our proposed TOU Pilot. FLISR fits squarely within the statutory criteria for certification. It will modernize the system by implementing intelligent devices that automate certain system operations, increase system visibility to aid proactive system operations and planning, and significantly enhance reliability for customers. We respectfully request the Commission to approve our request, as supplemented by our Reply Comments, to certify FLISR, certify the TOU Pilot, and allow us to submit a Grid Modernization Report on November 1, 2018 and annually thereafter through at least 2022.

Dated: February 26, 2018

Northern States Power Company

☐ **Not Public Document – Not For Public Disclosure**
☐ **Public Document – Not Public Data Has Been Excised**
☒ **Public Document**

Xcel Energy
Docket No.: E002/M-17-776
Response To: Department of Commerce Information Request No. 1

Requestor: John Kundert
Date Received: January 5, 2018

Question:
Topic: Integrated Volt-VAr Optimization System
Reference(s): Colorado Public Utilities Commission Docket No. 16A-0588E

Xcel Energy discussed the costs and benefits of Integrated Volt-VAr Optimization (IVVO) technology at length in this proceeding. What are the Company's regarding the installation of an IVVO system in Minnesota.

Response:
We understand the question to be asking whether we have plans to implement IVVO in Minnesota, and have responded accordingly. In summary, yes, we plan to use the IVVO application within our Advanced Distribution Management System (ADMS) in Minnesota – however, running in a different operational mode than in our Public Service of Colorado (PSCo) Operating Company affiliate's service area.

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 including: substation bus voltages; length of feeders; conductor sizing; type, size, and location of different loads (resistive, capacitive, inductive, or a combination of these); and the type, size, and location of distributed energy resources (photovoltaics, distributed wind, various storage technologies, etc.), among others.

The complexity and dynamic nature of these characteristics 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 ANSI standard C84.1-2011 limits, defined as Range A. On a 120V base, this service range is defined as 114–126V and utilization range is 110-126V. During high load conditions, the source voltage at the substation is at the higher end of this range and the service voltages at the end of the feeder 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 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 is capable of running 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 Distributed Energy Resources (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 uses the Load Tap Changer (LTC) or Voltage Regulator inside the substation to lower voltage on the feeder. This lower operating voltage results in small energy savings for most customers on a feeder. In CVR mode, the system is often also run in VAr Control mode – hence the term, "Integrated Volt/VAr Optimization" or IVVO.

In PSCo, we will be using CVR as the primary operational mode, as is discussed in the PSCo docket, with VAr Control as the secondary mode. However, IVVO can be any combination of the four operating modes.

Since 2010, we have been doing VAr Control through our SmartVAR program in Minnesota, which has provided benefits to the grid and our customers.[1] SmartVAR is presently managed through a specific system and will ultimately be transitioned to our ADMS, where we will technically have the ability to implement other IVVO objectives on the Minnesota system. However, there are important considerations involved in determining IVVO application on the system – some of which are technical, and others are about maximizing value for customers.

While the preliminary analysis we have done on the Minnesota system shows that CVR mode may deliver energy savings comparable to the PSCo system, our analysis did not examine the breadth of CVR Factors that vary feeder by feeder; rather, it relied on a representative CVR Factor and a simple extrapolation of the Wilson Substation information to the entire Minnesota system. We know that the different types of voltage control are affected by a variety of factors throughout the distribution network. The following key differences in feeder design between Minnesota and Colorado have factored into our decision thus far to deploy IVVO differently in these two operating areas:

- *The system design in Colorado uses shorter feeders with larger conductor to support a denser load.* Larger conductor size has lower impedance, which means that the voltage drop across the wire is reduced – making the system more capable of CVR; higher load density on each feeder means that the net impact from IVVO on a

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per-feeder basis can be greater. As a result, the PSCo feeder design is more amenable to CVR.

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- *AMI is a beneficial component of IVVO*. AMI meters used as 'bellwether' meters are the least cost method to provide voltage inputs to ADMS at key locations across the grid. For IVVO to be successfully and safely operated, voltage endpoints are necessary at ten end points on each feeder; without AMI, this data would need to be gathered in other ways. The preliminary Minnesota analysis we provide with our response to Department Information Request No. 3 shows the use of Voltage Sensors, which are approximately ten times the cost per unit than an AMI meter. Our PSCo implementation of IVVO relies on AMI as a critical part of the deployment to minimize costs and provide the voltage data.
- *Additional considerations*. Our sample set, using a simple average generated from the Wilson Substation pilot, may not be representative of the potentially wide range of CVR Factors existing on the system.[2] This study also did not take into account higher anticipated levels of DER, as we explained in CEO-55, attached as Attachment E to Department Information Request No. 3 in this docket. And, the analysis did not take into consideration the declining use per customer driven by organic and explicit conservation measures; declining customer use diminishes the potential benefits of IVVO.

For these reasons, we have not proposed IVVO at this time for Minnesota. As we have expressed over time, we are committed to implementing grid modernization at the speed of value for our customers. For the reasons we have discussed, we believe our customers will realize greater value from the Fault Location Isolation and Restoration (FLISR) project and the Time of Use Rate Pilot we have proposed – and continuing to reap the benefits of the present Minnesota IVVO – Voltage Control/SmartVAR functionality.

[2] CVR Factors on NSP-Minnesota feeders vary widely and can range from 0.4 to 1.5, depending on the type of load on the feeder. Commercial and industrial are on the lower end of this range and highly resistive loads such as old lighting are on the higher end. With the transition to LED lighting and other constant power devices, the CVR Factor is expected to decline year-over-year as customers make the transition to more energy efficient equipment.

Preparer: John D. Lee
Title: Senior Director
Department: Distribution Electric Engineering
Telephone: (303) 571-3515
Date: January 19, 2018

CERTIFICATE OF SERVICE

I, Carl Cronin, hereby certify that I have this day served copies of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped with postage paid in the United States mail at Minneapolis, Minnesota

xx electronic filing

Docket Nos. **E002/M-17-776**
E002/M-17-777
E002/M-15-962
Xcel Energy's Miscellaneous Electric Service List

Dated this 26th day of February 2018

/s/

_____

Carl Cronin
Regulatory Administrator

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Generic Notice	Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Office of the Attorney General-DOC	445 Minnesota Street Suite 1800 St. Paul, MN 55101	Electronic Service	Yes	OFF_SL_17-776_M-17-776

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