

BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

Katie J. Sieben  
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Joseph K. Sullivan  
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Chair  
Commissioner  
Commissioner  
Commissioner  
Commissioner

In the Matter of Xcel Energy's Petition for a  
Long-Duration Energy Storage System Pilot  
Project at Sherco

ISSUE DATE: August 1, 2023

DOCKET NO. E-002/M-23-119

ORDER APPROVING PILOT PROJECT

**PROCEDURAL HISTORY**

On March 6, 2023, Northern States Power Company d/b/a Xcel Energy (Xcel) filed a petition for approval of a long-duration energy-storage pilot project.

By May 5, 2023, the following parties and participants filed comments:

- The Department of Natural Resources (DNR)
- The Union of Concerned Scientists (UCS)
- Fresh Energy
- The Minnesota Solar Energy Industries Association (MnSEIA) and Clean Energy Economy Minnesota (CEEM), jointly
- Sierra Club
- The Department of Commerce, Division of Energy Resources (the Department)
- The Office of the Attorney General—Residential Utilities Division (the OAG)

On May 19, 2023, Xcel filed reply comments.

On July 6, 2023, the matter came before the Commission.

**FINDINGS AND CONCLUSIONS**

**I. Long-Duration Energy-Storage Pilot and Battery Acquisition**

**A. Xcel's Proposal**

Xcel requests approval of a 10 megawatt (MW)/1,000 megawatt-hour (MWh) long-duration energy-storage pilot project consisting of a 100-hour, multi-day energy-storage system to be located at the site of the retiring coal-fired Sherburne County Generating Station (Sherco) in

Becker, Minnesota. The petition included a draft agreement with developer Form Energy to supply the iron-air battery equipment for the pilot project (the Battery Supply Agreement).

The petition asserts that iron-air batteries offer greater duration of output than lithium batteries, which could help Xcel maintain reliable service in case of extended periods in which renewable energy sources are insufficient to meet demand. Additionally, the iron used in this technology is more prevalent than lithium and other elements used in other types of batteries.

Xcel contended that long-duration battery technology will play a critical role in the elimination of carbon emissions from its system while maintaining safe, affordable, and reliable electric service by helping the utility integrate more renewables with greater efficiency and reliability, manage peak demand, and smooth out the production curves of renewables on the system. There are times when solar and wind resources generate energy in excess of immediate demand or transmission capacity, leading to congestion or curtailment of such resources, and there are other times when demand outpaces renewable energy generation. Through the proposed pilot, Xcel intends to test the potential of long-duration batteries to absorb excess renewable energy and store it for dispatch when it is needed.

The petition also identifies other potential system benefits—such as controlling frequency or voltage, mitigating transmission congestion, providing emergency power supplies during outages, and reducing peak power costs—to be studied in the pilot.

Xcel asserted that the energy-storage system would be an important investment in the Becker community, providing construction jobs and local tax revenue to support the community’s energy transition plan as the Sherco coal facility is retired.

According to Xcel, locating the project in Becker—which qualifies as an “energy community” due to the retirement of coal plants—will entitle the project to a 10% bonus credit on top of the standard 30% investment tax credit under the federal Inflation Reduction Act.

Xcel was awarded a \$10 million grant from Breakthrough Energy Catalyst to help offset project costs and is pursuing additional grant funding from the U.S. Department of Energy that would further reduce the amount of pilot costs passed on to ratepayers if awarded.

Xcel accounted for offsets from the known grant and expected tax credits in its pilot project cost estimate, which was filed as not-public, trade-secret data. In addition to battery-system purchase and installation costs, Xcel’s cost estimate incorporates estimated decommissioning costs, less estimated salvage value, to be included in depreciation over the 10-year life of the asset.

If approved, Xcel plans to begin construction in 2024 and place the battery system into service by the end of 2025. This timing is expected to coincide with the completion of two new solar arrays that are under construction at the Sherco site, which will allow Xcel to begin collecting data about the coordination of this type of energy storage with solar generation as soon as the battery system is operational.

## **B. Legal Standard**

Minn. Stat. § 216B.16, subd. 7e, allows a utility to petition to recover costs associated with an energy-storage-system pilot program. The Commission may approve a rate schedule that

provides for the automatic adjustment of charges to recover prudently incurred costs associated with an energy-storage pilot if the Commission has found the pilot to be in the public interest and has approved the pilot under subdivision 7e.<sup>1</sup>

Additionally, under Minn. Stat. § 216B.50, the Commission must approve a utility's acquisition of plant in Minnesota for consideration in excess of \$1,000,000 if the transaction is consistent with the public interest.<sup>2</sup> The estimated cost of the proposed iron-air battery system exceeds the statutory threshold, requiring Commission approval.

## **C. Comments**

### **1. The DNR**

The DNR recommended certain site-management practices to avoid or mitigate impacts to wildlife, including loggerhead shrike and Blanding's turtles, during construction and operation of the energy-storage system.

Xcel committed to complying with the DNR's recommendations for natural-resource protection.

### **2. Clean Energy and Environmental Organizations**

Fresh Energy, Sierra Club, MnSEIA, and CEEM recommended that the Commission approve the proposed pilot. They argued that long-duration energy storage will serve an important role in achieving Minnesota's 100% carbon-free electricity standard by providing a reliable source of carbon-free power during extended periods of low solar and wind output or extreme weather. They asserted that the pilot would yield valuable insights into managing an innovative long-duration battery system to advance renewable-energy integration and optimization.

These organizations specifically supported the use of iron-air technology because iron can be supplied domestically—potentially within Minnesota—and is more widely available than elements used in other types of batteries. Sierra Club added that mining iron is generally less environmentally damaging than mining lithium.

These organizations also supported locating the project at the Sherco site, stating that it will allow Xcel to leverage existing infrastructure and planned new solar generation while mitigating the adverse financial impact to the Becker community resulting from the impending retirement of the Sherco coal generators.

MnSEIA and CEEM further contended that this type of innovative energy pilot will help ensure that Minnesota remains at the forefront of building and deploying clean energy technologies, which are critical to attracting and securing investment and jobs in Minnesota communities.

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<sup>1</sup> See Minn. Stat. § 216B.16, subd. 7e(b)–(d).

<sup>2</sup> During the 2023 legislative session, the Legislature amended Minn. Stat. § 216B.50 to increase the threshold amount from \$100,000 to \$1,000,000. Minn. Laws ch. 60, art. 12, § 23.

### **3. The Department**

The Department recommended that the Commission approve the long-duration energy-storage pilot project and approve the proposed battery acquisition under Minn. Stat. § 216B.50 as reasonable and in the public interest.

The Department stated that an extended period of low renewable generation throughout the Midcontinent Independent System Operator, Inc. (MISO) system could lead to insufficient capacity to meet demand, which could expose ratepayers to high energy prices and service interruptions. As utilities reduce their reliance on carbon-emitting fuels, they will increasingly rely on renewable energy sources such as wind and solar that generate electricity intermittently. The Department argued that long-duration energy storage may be the only feasible way to store and dispatch renewable energy to manage potential extended renewable-energy droughts.

Because the iron-air battery technology has not yet been tested, the Department contended that a pilot is warranted to test and evaluate the technology before adopting it on a larger scale. The Department asserted that the pilot would provide a better understanding of the value of energy-storage systems and that the spectrum of expected learnings outlined in the petition is reasonable.

The Department therefore contended that Xcel's proposed battery acquisition and pilot are in the public interest because they present reasonable steps for exploring how to effectively manage reliability and economic risks as decarbonization efforts advance.

#### **D. Commission Action**

The Commission finds that the proposed long-duration energy-storage pilot is in the public interest and will therefore approve it under Minn. Stat. § 216B.16, subd. 7e. Accordingly, the Commission will allow Xcel to pursue recovery of all prudently incurred costs of the pilot, less the Breakthrough Energy Catalyst grant funding, any potential future grant funding, and applicable tax credits and bonus credits, subject to the cost cap approved below.

The Commission will also approve the proposed battery acquisition as set forth in the Battery Supply Agreement with Form Energy filed as Attachment A to Xcel's petition, finding that it is consistent with the public interest under Minn. Stat. § 216B.50.

The pilot is reasonably designed to test the capability of emerging long-duration energy-storage technology to help Xcel eliminate carbon emissions from its system consistent with Minnesota's 100% carbon-free standard while maintaining safe, affordable, and reliable electric service at times when demand for power exceeds Xcel's current generating capacity. As the Department noted, the long-duration iron-air battery technology appears to offer a uniquely promising solution to the problem of maintaining the provision of carbon-free electricity during extended periods of low wind- and solar-powered generation, in addition to potentially providing other system benefits.

The Commission concurs with the Department that the pilot will help Xcel to explore managing reliability and economic risks related to potential extended periods of low wind and sunlight as Xcel and other utilities in the MISO system achieve greater decarbonization. With the learning objectives outlined by Xcel and the reporting requirements adopted below, the pilot is reasonably designed to cultivate valuable insights into the use and effectiveness of this new technology.

The Commission recognizes additional value in locating the battery system at the Sherco site, which will help mitigate the financial effects on the Becker community resulting from retiring the Sherco coal generators and will unlock additional savings for all ratepayers through the energy-community tax-credit bonus under the Inflation Reduction Act. The Commission also appreciates Xcel's efforts to pursue all available credits and grant funds to offset the project's costs and will require Xcel to apply all such credits and funds to reduce the level of costs to be recovered from ratepayers.

## **II. Cost-Recovery Procedure and Revised Tariff**

### **A. Introduction**

Minn. Stat. § 216B.16, subd. 7e, allows a utility to petition for a rate schedule that provides for the automatic adjustment of charges (also known as a rider) to recover prudently incurred costs associated with energy-storage pilot projects approved by the Commission.

Asserting that creating a new rider specific to this pilot would be inefficient and could confuse customers, however, Xcel initially requested to recover the costs of this pilot program through the rider it currently uses to recover costs of complying with the state's renewable energy standard (RES).<sup>3</sup> Xcel argued that it would be reasonable to incorporate these costs into its RES rider because this pilot will help Xcel learn more about integration and optimization of higher levels of power from renewable sources onto Xcel's distribution system, which is consistent with the goals of the RES statute.

### **B. The Department's Cost-Recovery Proposal**

The Department argued that Xcel should establish a rate schedule for the energy-storage pilot under Minn. Stat. § 216B.16, subd. 7e, rather than treating those costs as RES costs directly, because the RES rate schedule is for costs incurred specifically to satisfy the RES.

However, the Department shared Xcel's concerns that establishing a separate rider with separate cost-recovery filings for this single pilot would be inefficient and could make customer bills more confusing. To avoid these issues, the Department proposed an alternative approach: for regulatory-review purposes, Xcel would include the costs of the storage pilot in its RES rider petitions and add these costs into the RES adjustment factor, creating a successor adjustment factor that would work the same except that it would also include approved storage-pilot costs. Xcel would have a rate schedule for storage-pilot costs under Minn. Stat. § 216B.16, subd. 7e; however, that storage-pilot rate schedule would run with the RES-rider process, eliminating the need for additional regulatory filings or line items on customer bills.

Xcel agreed with the Department's proposed cost-recovery procedure and filed proposed revised tariff sheets reflecting that approach.

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<sup>3</sup> Xcel maintains an RES rider under Minn. Stat. § 216B.1645, subd. 2a, which allows a utility to petition for a rate schedule that provides for the automatic adjustment of charges to recover certain prudent costs incurred by a utility to satisfy the RES. The RES is set by the Legislature and requires electric utilities to generate or procure designated percentages of the electricity they provide to retail customers in Minnesota from wind, solar, or other eligible technology by certain dates, as set forth in Minn. Stat. § 216B.1691.

### **C. Commission Action**

The cost-recovery approach proposed by the Department and agreed to by Xcel is reasonable, captures regulatory efficiencies, and avoids potential confusion. Accordingly, the Commission will approve a rate schedule for the recovery of prudently incurred storage-pilot costs as contemplated in Minn. Stat. § 216B.16, subd. 7e, but will allow Xcel to include those costs in its RES rider petitions and add them to its RES adjustment factor with no additional filings or line items on customer bills, as described in the Department's May 5, 2023, comments.

To effectuate this cost-recovery procedure for the energy-storage pilot, the Commission will approve Xcel's proposed modifications to its RES rider tariff, Section 5, Sheet No. 147, filed as Attachment 1 to its May 19, 2023, reply comments in this docket.

### **III. Cost-Recovery Cap**

#### **A. The OAG's Cost-Cap Proposal**

The OAG recommended that the Commission limit Xcel's recovery of costs associated with the energy-storage pilot to the amount estimated in Xcel's May 1, 2023, filing, citing three reasons why a cost cap is necessary to protect customers from potential cost increases.

First, the OAG argued that Xcel's decision not to undergo the typical competitive-bidding process in the selection of this battery system raises questions about whether the utility secured the best price for ratepayers.

Second, the OAG asserted that the proposed project would impose high costs on ratepayers.

Third, the OAG contended that the experimental nature of iron-air battery technology makes it difficult to predict and evaluate costs and risks, such that actual costs may exceed Xcel's current estimate. Although Xcel suggested that the levelized cost of this technology should decrease as the utility optimizes battery operation and as Form Energy scales up its manufacturing capabilities and develops its supply chain, the OAG argued that it is not clear when such cost reductions will be realized and whether they will affect this project or only future projects.

For these reasons, the OAG argued that capping Xcel's cost recovery at the current estimated level of costs is necessary to protect ratepayers from potentially imprudent cost increases that may arise as the pilot progresses.

#### **B. Comments**

##### **1. Xcel**

Xcel disagreed with the claim that its battery acquisition process was inadequate to protect customers. Xcel contended that competitive bidding would have been futile because there were no known alternatives to the selected technology for long-duration energy storage; to Xcel's knowledge, Form Energy was the sole source of batteries capable of 100-hour dispatch durations until about 2022.

Further, Xcel asserted that it vetted the technology based on standardized criteria including carbon and environmental factors, ability to serve load, technology readiness, efficiency, siting flexibility, and public acceptance. Xcel stated that it had also analyzed the viability of using advanced compressed-air storage that leverages subterranean development, but that Form Energy's technology had scored higher in the assessment criteria due to limits on dispatchable duration, siting flexibility, and risk with subterranean technology.

While defending its selection process, Xcel conceded that it would be reasonable to place a cap on cost recovery to provide some certainty that the current cost estimates are accurate—so long as Xcel would retain the right to request recovery of any incremental costs above the cap in the future if it shows by clear and convincing evidence that the incremental costs were reasonable, prudent, and beyond the utility's control. Xcel argued that it would be reasonable to allow an opportunity to justify future incremental costs because the novelty of the technology makes cost prediction difficult.

## **2. The Department**

The Department did not take a position on the proposed cost cap but contended that Xcel's selection process was reasonable under the circumstances because there were no identifiable alternatives to the selected technology in the emerging market for long-duration energy storage.

### **C. Commission Action**

Based on the record, the Commission finds it reasonable to cap recovery at the level of Xcel's current cost estimate to protect customers from unexpected cost increases. However, the Commission also recognizes that costs of this pilot may change given the new and untested nature of the technology. Having found that the pilot is reasonable, in the public interest, and beneficial to customers, and considering the novelty of the technology, the Commission is not persuaded at this time to preempt all possibility that Xcel may ultimately incur storage-pilot costs that exceed the current estimate but nevertheless should be recoverable.

Accordingly, if Xcel incurs costs for the long-duration energy-storage pilot above the amount identified in its May 1, 2023, filing, the Commission will allow the utility to request recovery of the incremental costs by showing through clear and convincing evidence that such costs were reasonable, prudent, and beyond the utility's control.

## **IV. Rule Variance**

Xcel requested a variance to Minn. R. 7825.1800, subp. B, which requires that petitions for approval of a transfer of utility property be accompanied by certain information listed in Minn. R. 7825.1400, items A to J. Items A to J establish filing requirements for capital structure approval that Xcel contends do not apply to the proposed battery acquisition.

The Commission grants a variance to its rules when the enforcement of the rule would impose excessive burden on the applicant or others, granting the variance would not adversely affect the public interest, and granting the variance would not conflict with standards imposed by law.<sup>4</sup>

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<sup>4</sup> Minn. R. 7829.3200.

Xcel argued that enforcing the rule would impose an excessive burden because the proposed transaction does not implicate the information sought by Minn. R. 7825.1400, items A to J. Because the transaction does not involve the issuance of securities, Xcel contended that the transaction does not conflict with the public interest. Finally, Xcel stated that the requested variance will not violate any standards imposed by law. The Department agreed with Xcel's analysis and recommendation.

The Commission concurs with Xcel and the Department and will therefore grant the requested variance to Minn. R. 7825.1800, subp. B.

## **V. Reporting Requirements**

Xcel and the Department agreed on certain reporting requirements relating to the long-duration energy-storage pilot project. No one opposed these reporting requirements. The Commission agrees that the reporting requirements are reasonable and will provide valuable information, and will therefore adopt them as set forth below.

### **ORDER**

1. The Commission approves Northern States Power Company d/b/a Xcel Energy's proposed 10 MW/1,000 MWh long-duration energy-storage pilot project, to be located at the Sherco facility site.
2. The Commission approves Xcel's acquisition of the batteries pursuant to the Battery Supply Agreement with Form Energy provided as Attachment A to Xcel's March 6, 2023, petition, and determines that the proposed transaction is consistent with the public interest under Minn. Stat. § 216B.50.
3. The Commission grants Xcel's request for a variance to the requirements of Minn. R. 7825.1800, subp. B, to allow Xcel to not provide the information set forth in Minn. R. 7825.1400, items A to J.
4. The Commission finds that this energy storage pilot project is in the public interest and, as such, allows Xcel to pursue cost recovery of all prudently incurred project costs, less the Breakthrough Energy Catalyst grant funding, any potential future grant funding, and applicable tax credits and bonus credits, through the Renewable Energy Standard rider, as proposed by the Department.
5. The Commission approves Xcel's proposed modifications to the RES rider tariff sheet, Section 5, Sheet No. 147, provided as Attachment 1 to its May 19, 2023 reply comments.
6. The Commission limits cost recovery for the pilot to a cost cap of the amount identified in Xcel's May 1, 2023 letter, unless Xcel shows by clear and convincing evidence that any incremental costs above that amount were reasonable, prudent, and beyond Xcel's control.
7. Xcel shall report information regarding the pilot as shown in the table below:



Information	Frequency	Timing Notes
Construction and schedule updates	Quarterly	Beginning upon Commission approval until the pilot project is in service
Operational performance data, including: <ul style="list-style-type: none"> <li>• Round-Trip Efficiency</li> <li>• Average Leakage Rate</li> <li>• Maximum Ramp Rate (Charge &amp; Discharge Rates)</li> <li>• Derated Capacity at 5%</li> <li>• Highest and Lowest Temperatures</li> </ul>	Annually	Beginning one year after the pilot project is in service and continuing for 10 years (through the pilot duration)
Update on grant funding pursuits	Ad hoc	As noted in the petition and response to IR # 1, Xcel is pursuing both governmental and non-governmental grant funding; Xcel expects to be able to provide confirmation of either/both in the summer of 2023 and April 2023, respectively.
Update on Workforce Benefits	Annually	Beginning one year after the pilot project is in service and continuing for 10 years (through the pilot duration); the report will include information on jobs created, apprenticeship opportunities, etc.
Update on Form Energy Project in Colorado	Annually	Beginning one year after the pilot project is in service and continuing for 10 years (through the pilot duration); the report will include updates on the project, lessons learned, and how Xcel is incorporating the lessons learned
Updates on decommissioning plans and/or costs	Annually	Beginning one year after the pilot project is in service and continuing for 10 years (through the pilot duration)
Investment Tax Credit information and calculations		Provided with future cost recovery filings

8. This order shall become effective immediately.

BY ORDER OF THE COMMISSION



Will Seuffert  
Executive Secretary



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## **CERTIFICATE OF SERVICE**

I, Mai Choua Xiong, hereby certify that I have this day, served a true and correct copy of the following document to all persons at the addresses indicated below or on the attached list by electronic filing, electronic mail, courier, interoffice mail or by depositing the same enveloped with postage paid in the United States mail at St. Paul, Minnesota.

**Minnesota Public Utilities Commission**  
**ORDER APPROVING PILOT PROJECT**

Docket Number **E-002/M-23-119**

Dated this 1<sup>st</sup> day of August, 2023

/s/ MAI CHOUA XIONG

[illegible]

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Joseph	Meyer	joseph.meyer@ag.state.mn.us	Office of the Attorney General-RUD	Bremer Tower, Suite 1400 445 Minnesota Street St Paul, MN 55101-2131	Electronic Service	No	OFF_SL_23-119_M-23-119
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Generic Notice	Residential Utilities Division	residential.utilities@ag.state.mn.us	Office of the Attorney General-RUD	1400 BRM Tower 445 Minnesota St St. Paul, MN 551012131	Electronic Service	Yes	OFF_SL_23-119_M-23-119

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