

Staff Briefing Papers

Meeting Date August 6, 2026

Agenda Item 1**

Company Northern States Power Company, d/b/a Xcel Energy

Docket No. **E-002/RP-24-67**
In the Matter of Xcel Energy's 2024-2040 Upper Midwest Integrated Resource Plan

E-002/CN-23-212
In the Matter of Xcel Energy's Competitive Resource Acquisition Process for up to 800 Megawatts of Firm Dispatchable Generation

Issues Should the Commission require Xcel Energy to work with interested parties to develop a tariff to support customer-owned thermal batteries and file a tariff proposal within 90 days?

If the Commission requires a new tariff, should the tariff be filed in a new docket?

If the Commission requires a new tariff, what information should the initial filing include?

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✓ Relevant Documents	Date
Xcel Energy, Rondo Energy Thermal Battery Pilot Proposal Update (Public and Non-Public)	December 30, 2025
Department of Commerce, Letter	March 2, 2026
Clean Energy Organizations, Letter	March 4, 2026
Department of Commerce, Comments	April 15, 2026
Minnesota Large Industrial Group, Comments	April 15, 2026

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The attached materials are work papers of the Commission Staff. They are intended for use by the Public Utilities Commission and are based upon information already in the record unless noted otherwise.

✓ **Relevant Documents**

Public Comment – Renewable Thermal Collaborative

Public Comment – Thermal Battery Alliance

Clean Energy Organizations, Reply Comments

Xcel Energy, Reply Comments

Date

April 16, 2026

April 16, 2026

April 29, 2026

April 29, 2026

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I. Background

A. Procedural Background

In Xcel Energy's (Xcel or the Company) Competitive Resource Acquisition Process for up to 800 Megawatts (MW) of Firm Dispatchable Generation (Firm Dispatchable Docket), Rondo Energy, Inc. (Rondo) submitted a bid for a thermal heat battery combined heat and power (CHP) project to be located at the Sherburne County Generating Station (Sherco) in Becker, Minnesota. The project was designed to supply steam for industrial customers at the Sherco site while providing electricity to the grid.

Rondo submitted its bid on January 24, 2024, but withdrew its bid from consideration on August 13, 2024.

On October 3, 2024, Xcel entered into a Settlement Agreement with various parties intended to resolve issues in both the Firm Dispatchable Docket and the Company's 2024-2040 Integrated Resource Plan (2024 IRP), which was also pending before the Commission at the time. The Settlement Agreement contained terms specific to each docket:

- For the Firm Dispatchable Docket, the settling parties agreed to (1) a selection of project bids, (2) a power purchase agreement (PPA) process, and (3) updated modeling from Xcel on the selected bids to support the Settlement Agreement.
- For the 2024 IRP, the settling parties agreed to (1) a Five-Year Action Plan, (2) provisions for resource procurement, (3) provisions for Xcel's next IRP, (4) equity and labor commitments, and (5) additional program and pilot findings.

On April 21, 2025, the Commission issued an *Order Approving Settlement Agreement with Modifications*. Ordering Paragraph 23 directed Xcel to continue exploring options for a thermal battery pilot with Rondo. The Commission required Xcel to file a pilot proposal by December 31, 2025, or provide an explanation as to why a pilot would not be reasonable.

On December 30, 2025, Xcel filed a letter notifying the Commission that, upon further evaluation and collaboration with Rondo, Xcel would not proceed with the Rondo thermal battery pilot project, stating that such a pilot project is not reasonable under current market and technology conditions.

On March 2, 2026, in response to Xcel's decision, the Department of Commerce (Department) filed a letter stating that, while it does not dispute Xcel's decision, thermal battery technology may still hold future value; therefore, the Department recommended the Commission order Xcel to work with stakeholders to develop a customer tariff supporting customer-owned thermal batteries and file a proposal within 90 days.

On March 4, 2026, the Clean Energy Organizations (CEOs)¹ filed a letter supporting the Department's recommendation and expressing their disappointment that Xcel was not moving forward with the pilot.

On March 11, 2026, the Commission issued a *Notice of Comment*, asking interested stakeholders whether the Commission should order Xcel to develop and file a customer-owned thermal battery tariff proposal within 90 days, and if so, what information Xcel's initial filing should contain.

By April 16, 2026, the following parties filed comments:

- CEOs
- Department
- Minnesota Large Industrial Group (MLIG)²
- Renewable Thermal Collaborative (RTC)³
- Thermal Battery Alliance (TBA)⁴

Table 1 below provides a summary of parties' support or opposition to the Department's request. Xcel was the only party who opposed the Department's request.

¹ The Clean Energy Organizations are: Clean Grid Alliance, Minnesota Center for Environmental Advocacy, Fresh Energy, and Sierra Club.

² The Minnesota Large Industrial Group is an ad hoc consortium of large industrial end-users of energy in Minnesota spanning multiple utilities and functioning to represent large industrial interests before regulatory and legislative bodies.

³ RTC is a nonprofit organization representing over 100 major industrial heat users and clean heat solution providers. RTC's members operate more than 60 facilities in Minnesota.

⁴ TBA is a coalition of leading U.S. thermal energy storage system manufacturers dedicated to transforming the industrial and power sectors, strengthening U.S. manufacturing, and enhancing grid reliability while lowering energy costs for all.

Table 1. Summary of Party Positions

Party	Position
Department	Recommends the Commission order Xcel to work with stakeholders to develop and file a customer-owned thermal battery tariff proposal within 90 days. The Department also suggests the Commission open a new docket for this tariff and require that Xcel's initial filing address rate design principles, MISO cost protections, and peaking resource cost comparisons.
CEOs	Supports the Department's proposal, arguing that a customer-driven deployment pathway is more efficient than Xcel's utility-partnered pilot approach.
MLIG	Supports exploring a thermal battery tariff but argues that the effort should not be limited solely to Xcel. Recommends opening a new docket applicable to all electric utilities and requiring initial filings to outline technology costs, benefits, and implementation barriers.
RTC	Supports a 90-day, collaborative tariff-development process to create a transparent, scalable mechanism for customer investment in electrified thermal storage.
TBA	Supports the creation of a customer tariff, emphasizing that thermal batteries store off-peak power as heat to lower energy costs, enhance grid reliability, and support U.S. manufacturing.
Xcel	Opposes developing a customer-owned thermal battery tariff at this time, arguing there is no demonstrated unmet customer need, and existing programmatic approaches are better-suited for this highly site-specific technology. If the Commission mandates further exploration, Xcel agrees with MLIG that it should occur in a new, statewide docket applicable to all utilities.

B. Background on Rondo Proposal

According to its January 24, 2024 bid, Rondo's technology is a long-duration, thermal energy storage system capable of discharging both electricity and steam heat (heat battery CHP), which Rondo argued offers advantages such as rapid charging, operational flexibility, and efficient storage of renewable energy that may otherwise be curtailed. Rondo claimed that, when combined with steam turbine technology, its batteries provide CHP by servicing industrial loads and providing utilities with flexible energy storage to deliver firm capacity and certain ancillary services.⁵ Rondo heat batteries charge from renewable resources, requiring approximately 4-6 hours of charge time within a 24-hour period, can deliver energy exclusively

⁵ Rondo's technology uses refractory bricks to store heat, by heating them up using electrical resistance heating, enabling the use of thermal energy at a later point in time, for both heating needs and electricity generation.

from storage over multiple days, and keep the turbine operating continuously.

Although Rondo withdrew its bid, the subsequent Settlement Agreement ensured the project concept remained active. The Settlement Agreement required Xcel to continue exploring options for a thermal battery with Rondo through a potential pilot project proposal by December 31, 2025, or an explanation as to why such a pilot would be unreasonable.

C. Background on Otter Tail Power's Thermal Market Energy Pricing Rider

Several parties to this proceeding, including the Department, referenced Otter Tail Power Company's (OTP) Thermal Market Energy Pricing (TMEP) Rider – which the Commission approved on November 13, 2025 in Docket No. 25-253 – as a relevant precedent and helpful reference point for designing a new tariff for customer-owned thermal batteries in Minnesota.

As background, OTP's TMEP Rider is a voluntary tariff OTP developed to provide a rate option specifically designed for large, new customers that utilize thermal energy storage technologies. The purpose of the TMEP Rider is to allow qualifying thermal energy storage customers to receive and react to real-time MISO market price signals. To qualify for the rider, a customer's thermal storage load must be tied to a specifically-identified, nearby wind and/or solar generation resource.

Xcel argued that OTP's TMEP Rider is not an applicable precedent or a workable template for its system, as it was designed for a narrow, distinct use case; further, it requires highly-specific operational constraints and does not match Xcel's customer base.

II. Xcel December 30, 2025 Letter

On December 30, 2025, Xcel filed a letter, as required by the Settlement Agreement, informing the Commission that the Company will not proceed with the Rondo thermal battery pilot project.

Xcel explained that, after extensive evaluation, a pilot under current market and technology conditions is unfeasible. Specifically, Xcel has been evaluating a CHP solution from Rondo since Fall 2024, which could be designed to supply steam for industrial or building heating applications while providing electricity back to the grid. Xcel evaluated multiple configurations and searched for appropriate steam customers whose demand profiles could support a pilot project of sufficient scale. However, Xcel identified two primary barriers that prevented the development of a viable pilot:

1. **Affordability:** Xcel was unable to find a steam customer with the necessary large, consistent, year-round demand, which forced them to downsize the project. The largest configuration (51 MWe / 40 MWt) was unfeasible, and smaller designs failed to offer meaningful learning opportunities for scalability. Furthermore, electrified steam produced by the Rondo battery would be more expensive than natural gas generation.

Steam revenues were insufficient to offset high capital costs, and steam sales do not directly benefit electric customers. Compared to other emerging battery energy storage systems (BESS) like the Sherco Form and Capacity Connect projects, the cost of capacity for the Rondo project was substantially higher.

2. **Scalability and Technical Limitations:** Rondo's technology is tailored for specific industrial steam customers rather than utility-scale grid storage, which means operational profiles are dictated by individual user needs rather than grid reliability or Xcel's system. From a technical standpoint, the system cannot currently optimize renewable resources for storage at scale. Further, local renewable energy is inadequate to fully charge the battery, and there is no mechanism to ensure charging comes exclusively from renewables. Finally, integrating the system into existing utility infrastructure is complex, involving substantial balance of plant costs and complicated grid management due to high charge loads.

III. Department Request

On March 2, 2026, the Department filed a letter responding to Xcel's decision not to move forward with a Rondo pilot project. The Department did not dispute Xcel's decision, but they emphasized that thermal battery technology holds future value. To foster this technology, the Department recommended that the Commission order Xcel to collaborate with interested parties to develop a customer tariff supporting customer-owned thermal batteries. The Department requested that this tariff proposal be filed within 90 days. The Department noted that such a tariff could resemble the OTP TMEP Rider approved in November 2025.

The Department highlighted several key benefits and goals of implementing a tariff for customer-owned thermal batteries:

1. **Economic Growth:** The tariff would help attract industrial load, thereby supporting local economic growth.
2. **Renewable Energy Storage:** Thermal batteries provide a mechanism to absorb and store excess renewable energy generated on the grid.
3. **Reducing Curtailment:** By discharging stored energy when renewable sources are unavailable, thermal battery technology has the potential to reduce the curtailment of renewable energy.

IV. Party Comments

A. *Clean Energy Organizations*

On March 4, 2026, the CEOs filed a letter supporting the Department's request. The CEOs argued a specialized tariff is a superior alternative to the previously-anticipated, Xcel-led pilot program. The CEOs also emphasized that thermal batteries are an essential and innovative

technology for modernizing the region's energy infrastructure and argued that advancing thermal energy systems will provide the following system benefits:

- Enhancing overall grid flexibility;
- Mitigating the negative impacts of renewable energy curtailments;
- Reducing industrial-source emissions; and
- Making progress toward meeting the Carbon-Free Standard (CFS).

In reply comments, the CEOs reiterated their support for requiring Xcel to develop a customer-owned thermal battery tariff. While the CEOs applauded Xcel for its continued exploration of thermal battery technologies through programs like the Commercial Thermal Storage Pilot and Commercial Air-Source Heat Pump and Thermal Energy Storage Pilot, they pointed out that Xcel has faced significant challenges in implementing these utility-led pilots. Given these challenges, the CEOs argued that it would make sense to facilitate customer-driven deployment of this technology in addition to deployment through Xcel's existing pilot programs. The CEOs argued:

Developing a tariff to support customer-owned thermal batteries will enable industries that are motivated to decarbonize to work with thermal battery companies to find the right company and the right project to suit their needs. This could create a much more efficient pathway than the utility partnering with a thermal battery company and then looking for the right industrial customer, as with the Rondo pilot.⁶

The CEOs also noted the broad consortium of stakeholders already involved in this proceeding as a positive sign for the creation of the tariff through a stakeholder process. According to the CEOs, creating a stakeholder-supported tariff for customer-owned thermal batteries provides an efficient pathway for industries to directly partner with battery companies and achieve their decarbonization goals. The CEOs argued:

[G]iven the parties who have expressed support for the creation of the tariff, including the Minnesota Large Industrial Group, the Renewable Thermal Collaborative, and the Thermal Battery Alliance, we believe there is a strong group of stakeholders that could provide meaningful input on how best to design a tariff.⁷

B. Department

For reasons discussed above, the Department recommends the Commission:

- Require Xcel to work with interested parties to develop a tariff to support customer-owned thermal batteries and file such a tariff proposal within 90 days.

⁶ CEOs reply comments, p. 1.

⁷ CEOs reply comments, pp. 1-2.

- Require that the proposed tariff be filed in a new docket.
- Require Xcel's petition to include the following information:
 - how the proposed rate addresses statutory rate design principles;
 - how the proposed rate reasonably protects non-participating customers from incurring marginal MISO costs;
 - the size and timing of Xcel's need for peaking resources and a demonstration of how the cost of the capacity to be acquired compares to the cost of other peaking resources; and
 - lessons learned from any of Xcel's prior thermal storage programs.

One of the Department's justifications for the development of this tariff is tied to Xcel's future capacity needs. The Department pointed to its comments filed on Xcel's MISO Expedited Resource Addition Study (ERAS) portfolio, in which the Department highlighted that Xcel will experience a substantial need for peaking resources in the post-2030 timeframe. According to the Department, a dedicated customer-owned thermal battery tariff may help satisfy this upcoming resource deficit.

Procedurally, the Department advised the Commission to open a new docket for the proposed tariff. To ensure the thermal battery tariff is evaluated thoroughly and contains sufficient ratepayer protections, the Department recommended that the initial filing include the four specific categories of information listed above—that is, standard rate design principles; protections for non-participating customers from marginal MISO costs; need demonstration and cost comparisons; and lessons learned from prior thermal storage programs.

C. Minnesota Large Industrial Group (MLIG)

MLIG supports the exploration of thermal battery technology and advocates for testing its feasibility across Minnesota through the development of a tariff or other avenues. While MLIG generally supports the Department's request, MLIG differs in its preferred scope, recommending that this initiative should not be restricted to just one utility. Instead, MLIG recommends broadening this investigation by opening a new docket to develop a proposed tariff applicable to all electric utilities. This will ensure that the potential benefits of this emerging technology can be realized statewide.

Furthermore, MLIG outlined specific requirements for initial filings to ensure a clear understanding of the landscape, which include three main components:

- the current state of the technology and where and how it has been deployed;
- the current costs and benefits of the technology; and
- known or possible barriers to the successful implementation of this technology in Minnesota.



D. Renewable Thermal Collaborative (RTC)

RTC supports the Department's request and provides three main recommendations:

- Xcel should work with stakeholders to file a thermal battery tariff proposal within 90 days of the Commission's order.
- Xcel's initial filing must include key tariff design details such as eligibility, rate structures, and a development timeline.
- The Commission should use lessons from this tariff to support a broader suite of flexible industrial electrification technologies.

To support its recommendations, RTC argued that customer-owned thermal batteries can provide system value when coupled with appropriate rate design:

Because these resources can shift when electricity is consumed to produce and store heat, they may help align industrial energy demand with periods of higher renewable output and reduce the likelihood that new electrified thermal load contributes to system peaks.⁸

By providing a structured regulatory pathway and clear price signals, RTC believes Minnesota will be better-equipped to attract and retain industrial investments that support grid reliability, affordability, and economic development. Also, establishing a dedicated tariff through a collaborative stakeholder process would create a transparent, scalable mechanism to evaluate and encourage future industrial investments in electrified thermal storage.

Upon requiring a new tariff, RTC recommends the Commission also require that Xcel's initial filing include certain tariff design information:

Xcel's initial filing should clearly describe the proposed purpose and scope of the tariff, eligibility criteria and intended use cases for customer-owned thermal batteries, a proposed rate structure and key price signals, an explanation of how the tariff would recognize the flexibility value of thermal batteries, and a proposed stakeholder engagement process and timeline for further development.⁹

RTC highlighted the South Dakota Public Utilities Commission's approval of OTP's TMEP Rider as a relevant precedent for approving the Department's proposal in this case.

RTC also recommends using lessons learned from this tariff to support a broader suite of flexible industrial electrification technologies. While the current proceeding focuses specifically

⁸ RTC comments, p. 1.

⁹ RTC comments, p. 2.

on customer-owned thermal batteries, RTC noted that this technology is just one of a wider range of flexible industrial electrification tools, such as electric boilers, industrial heat pumps, and hybrid systems. The successful deployment of all these technologies relies heavily on rate designs that adequately recognize the value of their grid flexibility benefits.

E. Thermal Battery Alliance (TBA)

TBA recommends that the Commission “encourage Xcel to work with interested parties to develop a customer tariff to support customer-owned thermal batteries.” According to TBA, a customer-owned thermal battery tariff “can build on momentum from the Otter Tail Power tariff rider for thermal energy storage to support Minnesota’s leadership in low cost, long duration storage options for industrial process heat.”¹⁰

TBA continued that thermal batteries provide benefits such as industrial decarbonization, increased competitiveness of the U.S. industrial manufacturing base, better-utilization of existing grid assets, lower energy costs for all consumers, and provision of an affordable, reliable alternative for process heat.

F. Xcel Energy

Xcel opposes the Department’s request. The Company argued that developing a new thermal battery tariff at this time is premature and risks duplicating existing, Commission-approved programs. Xcel noted that it already addresses the goals of peak demand management and load shifting through programs such as its Commercial Thermal Storage Pilot, which is being transitioned into a Custom Load Management program expected to launch in 2027 under its Energy Conservation and Optimization (ECO) Triennial Plan. Additionally, thermal storage is a part of Xcel’s electrification strategy under its Natural Gas Innovation Act (NGIA) plan; moreover, existing Time-of-Use (TOU) rates already provide economic incentives for customers to capture benefits by shifting their demand to off-peak periods. Consequently, Xcel maintains that there is no demonstrated market failure or barrier that necessitates a new, technology-specific tariff.

Furthermore, Xcel contended that OTP’s TMEP Rider is not a reasonable precedent for this tariff, as OTP’s tariff was designed for a single specific customer and relies on strict physical coupling to a specifically-identified renewable generator. Because thermal energy storage remains an emerging, capital-intensive, and highly site-specific technology, Xcel argued that flexible, programmatic approaches are much more effective than a generic, standardized tariff that could lock in untested rate assumptions. However, if the Commission determines further investigation into thermal batteries is necessary, Xcel believes it should be conducted as a broader, statewide inquiry applicable to all Minnesota electric utilities rather than Xcel alone.

The remainder of this section will expound upon Xcel’s main reasons for opposing the

¹⁰ TBA comments, p. 1.

Department's request, which Staff categorized as follows:

1. No demonstrated market failure or barrier has been identified.
2. Existing programs and rates already address the claimed objectives.
3. Tariff development would duplicate existing efforts and impose unjustified costs.
4. Programmatic and customer-specific approaches are more appropriate than a generic tariff.
5. OTP's TMEP Rider is not an applicable precedent.
6. If the Commission determines further review is warranted, the scope should be broader than Xcel.

First, Xcel characterized the Department's request as a proposed solution without the identification of a specific problem. The Department and others who support the development of a new tariff refer to broad policy goals, but they fail to demonstrate either that (1) customer adoption of thermal batteries requires this specific tariff, or (2) Xcel would fail to achieve these policy goals without it. Xcel noted that no party has identified a specific customer class that is currently blocked from pursuing thermal energy storage due to existing rate design limitations.

Second, Xcel argued that existing programs and rates already address the claimed objectives. Xcel referred to three existing avenues for thermal storage:

- Commercial Thermal Storage Program;
- Xcel's electrification strategy; and
- Existing electric rate structures.

Xcel previously operated a Commercial Thermal Storage Pilot as part of its Load Flexibility portfolio, which suffered from low participation and was closed. Xcel is applying the lessons learned from that pilot to propose a new Custom Load Management program in its June 1, 2026, ECO Triennial Plan. This program will offer upfront incentives and bill credits for load shifting, allowing Xcel to evaluate site-specific thermal storage opportunities.

Thermal storage is also an element of Xcel's electrification efforts under its approved NGIA plan. Specifically, the Company is operating the Commercial Air-Source Heat Pump and Thermal Energy Storage Pilot, which integrates thermal storage with building electrification to help manage new electric loads and mitigate peak impacts. Some aspects of the NGIA pilot related to thermal energy storage include:

- Pairing electrified heating systems with thermal storage to assess whether load shifting can reduce coincident peak demand, improve overall system efficiency, and enable

greater electrification.

- Measuring the incremental value of storage by structuring the pilot to include projects both with and without thermal storage.
- Generating operational data regarding customer response to paired electrification and storage, operational behavior under load-shifting requirements, and dispatch effectiveness.

Ultimately, Xcel argued that establishing a new thermal battery tariff or program before the NGIA pilot concludes would preempt the empirical learning and evaluation that the Commission specifically directed the Company to undertake.

Xcel has also proposed new TOU rates for Commercial and Industrial (C&I) customers that feature differentiated on-peak, mid-peak, and off-peak pricing, alongside peak-tied demand charges. Customers capable of managing their electric load via thermal batteries can capture economic benefits under these existing and proposed rate structures without needing a specialized tariff.

Third, Xcel argued that forcing the development of a tariff within 90 days would duplicate existing efforts and impose unjustified costs. In part, this is because developing a new tariff requires complex rate design, cost-allocation frameworks, billing system modifications, and ongoing regulatory oversight. Diverting staff and resources to create a tariff for a technology that lacks demonstrated market demand is inefficient and risks wasting ratepayer funds.

Fourth, because customer-owned thermal batteries are an emerging and highly capital-intensive technology, Xcel argued that their feasibility relies heavily on site-specific customer processes, operating schedules, and physical constraints. A generic tariff requires standardizing assumptions about customer behavior, system performance, and grid value. Xcel warned that forcing a tariff now would embed untested assumptions into rate design before the utility has gathered sufficient empirical data on how the technology performs in the real world. Programmatic approaches, which allow for negotiated parameters, custom incentives, and iterative adjustments, are better suited for this stage of market development.

Fifth, Xcel refuted the parties' suggestion that a new tariff could use OTP's TMEP Rider as a template for Xcel, arguing the OTP rider is a highly-specialized construct that does not translate to Xcel's broader system. Xcel noted that OTP designed its tariff specifically for a single facility – POET Biorefining in South Dakota – which relies on steam from a nearby coal plant that faces frequent intermittent dispatch. Additionally, the OTP tariff requires customers to have a minimum demand of 25 MW, register as a MISO Load Modifying Resource, manage daily price-sensitive bids, and accept full exposure to wholesale day-ahead and real-time market pricing with mandatory curtailment penalties. Xcel explained that its diverse C&I customer base does not generally operate at this scale, nor do they desire direct, continual engagement with wholesale energy markets. Therefore, Xcel believes that creating a tariff based on the

parameters of the OTP TMEP rider would likely fail to address any actual needs in Xcel's service territory.

For these reasons, Xcel concluded:

the Company respectfully requests that the Commission take no further action toward development of a customer-owned thermal battery tariff at this time. If the Commission determines that additional exploration of tariff-based approaches may be appropriate in the future, such consideration would be better informed if it occurred after additional program experience is available and in a forum including all utilities that allows for fuller development of the record before committing resources to permanent rate design.¹¹

V. Staff Discussion

To weigh the merits of the arguments for and against the need for a new tariff specific to customer-owned thermal batteries, Staff believes it is appropriate to consider the context from which the Department's recommendation arose. As discussed throughout these briefing papers, the origins of this issue lie in a Settlement Agreement stemming from Xcel's 2024 IRP and Firm Dispatchable acquisition proceedings, which included a provision requiring Xcel to explore a thermal battery pilot with Rondo. Ultimately, Xcel concluded that pursuing a thermal battery pilot with Rondo is not feasible due to high capital costs, scaling limitations, and the difficulty of finding an industrial customer with sufficient, consistent steam demand.

No party opposed Xcel's December 30, 2025, letter informing the Commission of its decision, including Rondo, who has not filed comments since the Company's letter. However, despite agreeing with Xcel that moving forward with the Rondo project would not be prudent, the Department recommended a generalized customer tariff to support thermal batteries across Xcel's service territory.

In Staff's view, there are reasonable arguments on both sides of this debate, and in the following sections, Staff will address the major arguments in support of, and against, a new customer-owned thermal battery tariff.

Overall, proponents of a new tariff argued that a dedicated rate structure would provide regulatory certainty, encourage grid flexibility, and create a transparent, scalable pathway for industrial decarbonization, among other benefits. Conversely, Xcel raised concerns that mandating a technology-specific tariff without a clearly-defined customer need is premature, particularly when existing initiatives are already designed to gather empirical data on thermal storage.

¹¹ Xcel reply comments, p. 11.



A. *Arguments Supporting a New Tariff*

In this section, Staff will present the following arguments supporting a new customer-owned thermal battery tariff, based on the facts provided by parties in this record:

1. **Grid Flexibility and Resource Adequacy:** A thermal battery tariff may encourage load-shifting behaviors that align with utility system needs and renewable energy output, as well as contribute to Xcel's post-2030 peaking generation needs.
2. **Reducing Renewable Energy Curtailment:** Thermal batteries can store off-peak renewable energy as heat for around-the-clock industrial use. Price signals could encourage charging during excess generation periods, thereby minimizing wasted renewable energy and improving the overall efficiency of the renewable fleet.
3. **Fostering Customer-Driven Deployment:** A customer-focused tariff empowers industrial facility operators to independently evaluate site-specific economics and select battery technologies that fit their unique operational profiles.
4. **Promoting Economic Development and Decarbonization:** A new tariff could make electrified heat economically viable, reduce industrial carbon emissions, increase manufacturing competitiveness, and attract industrial investments within the state.
5. **Providing Regulatory Certainty:** A new tariff could provide industrial facilities with the long-term price transparency necessary to justify capital-intensive investments in thermal battery technology.

1. **Reliability – Grid Flexibility and Resource Adequacy**

Several parties argued that thermal batteries have unique load-shifting capabilities that may align well with utility system needs, and a dedicated tariff could encourage consumption behaviors that might benefit the broader electric grid. For example, RTC discussed how thermal energy storage can shift electricity consumption to align industrial demand with renewable energy output, and, if paired with an appropriate rate design, can provide value to Xcel's system. The Department noted that Xcel has a substantial need for peaking resources in the post-2030 timeframe, and a thermal battery tariff could potentially help address this need to improve resource adequacy.

These arguments suggest that a thoughtfully-designed tariff with input from several interested stakeholders could enable large industrial thermal loads to be a more flexible grid asset. In addition, if thermal batteries can reliably shift demand away from peak hours, it is possible that such a tariff could defer the need for Xcel to procure traditional peaking generation resources.

2. **Reductions in Renewable Energy Curtailment**

Parties also described thermal batteries as a "sink" for excess renewable energy that might

otherwise be wasted. For example, the Department and the CEOs discussed thermal batteries' potential role in reducing renewable energy curtailment, and TBA explained that thermal batteries can charge using low-cost, off-peak intermittent power, storing it as heat that can be delivered around-the-clock for industrial operations.

If a tariff could be structured to provide a price signal that encourages industrial customers to charge their thermal batteries during these periods of excess generation, it might improve the overall efficiency of Xcel's renewable energy fleet. This could theoretically aid the state in making more cost-effective progress toward the CFS.

3. Fostering Customer-Driven Deployment and Scalability

The CEOs noted that utility-driven pilots have struggled to match utility assets with specific industrial needs, and a customer-focused tariff would create a more efficient pathway for thermal battery deployment; a specialized tariff also empowers industries already motivated to decarbonize to independently select thermal battery technologies that fit their specific operational profiles. MLIG suggested that industrial customers would be more incentivized to explore thermal battery options if a standardized framework were available.

These arguments suggest that establishing a generic rate structure could foster a more market-driven adoption curve, allowing thermal batteries to scale at a pace dictated by actual customer demand rather than the parameters of a utility-designed pilot.

4. Potential Economic Development and Industrial Decarbonization Benefits

Several parties linked the deployment of thermal batteries to broader economic and environmental goals. TBA noted that existing thermal batteries can store energy at temperatures high enough to address up to 80% of U.S. industrial heat demand, and they increase the competitiveness of the U.S. manufacturing base by lowering energy costs for companies. The CEOs similarly viewed thermal batteries as a vital technology to reduce industrial-source emissions. The Department argued that a tariff could support economic growth by helping to attract industrial load to the state. RTC argued that offering modern rate structures reflecting evolving grid conditions could provide the regulatory certainty needed to position Minnesota to attract and retain industrial investment.

If a tariff can offer sufficiently-low electricity rates during off-peak hours in exchange for interruptible or load-shifting requirements, it could make electrified heat economically viable while potentially advancing both emission reduction and economic objectives.

5. Providing Regulatory Certainty and Clear Price Signals

Parties argued that the regulatory certainty of a permanent tariff might be a necessary prerequisite for capital-intensive industrial investments. RTC argued that a collaborative tariff development process could establish clear participation rules and price signals that



appropriately value the flexibility attributes these systems provide to the grid. Several pointed to OTP's TMEP Rider as a precedent that could inform Xcel's tariff design.

If the only available option for industrial facilities is existing pilot programs, those facilities may be hesitant to invest in emerging thermal battery technology without knowing exactly how their electricity consumption will be billed over the entire lifespan of the equipment. A formal tariff could provide the long-term price transparency required for business to make these investments.

B. Arguments Against a New Tariff

In this section, Staff will discuss the following arguments against requiring a new tariff:

1. A tariff is premature without a defined customer or technology. The Rondo pilot was canceled due to prohibitive costs and the inability to identify a viable customer base. Ordering a generic tariff now would effectively force Xcel to design a permanent rate structure for an unknown customer utilizing unproven technology.
2. Existing programs, such as Xcel's NGIA pilots and the proposed Custom Load Management program, might already be capable of addressing Xcel's load flexibility goals and achieving the outcomes desired by proponents of a new tariff.
3. The OTP TMEPT Rider was designed specifically for a single South Dakota facility facing unique operational and geographic constraints. Attempting to adapt this highly-specialized tariff to Xcel's much larger and diverse C&I customer base would be a misapplication of the Commission's decision in the OTP case.
4. If the Commission wishes to explore a thermal battery tariff, it could choose to do so in a new, separate docket that includes all Minnesota electric utilities, as recommended by the MLIG and supported by Xcel.

1. Development of a new tariff might be premature.

As discussed previously, Xcel determined a pilot with Rondo would not be prudent because the technology is too expensive and lacks a viable customer base. The response to this determination was a request for a generic tariff that would effectively require Xcel to design a solution for an unproven market. In Xcel's words, thermal batteries are "an emerging and highly site-specific technology,"¹² so designing a generic tariff without a clear use-case risks embedding untested assumptions about customer behavior, system performance, and grid value into permanent rate structures. Moreover, Staff agrees with Xcel that no party has demonstrated a defined market failure or identified a specific customer class that is currently prevented from adopting this technology due to rate design limitations.

¹² Xcel reply comments, p. 2.

If the Commission agrees with Xcel that the Company's existing NGIA pilots and upcoming Custom Load Management programs already provide the necessary vehicles to test this technology, the Commission may decline the Department's recommendation to mandate a 90-day tariff filing. This would allow time for empirical data from existing pilots to guide any future rate design.

2. Existing programs might already be capable of achieving the outcomes desired by proponents of a new tariff.

Proponents for a new tariff, in particular the CEOs and RTC, argued that a dedicated tariff is a more transparent and scalable mechanism than individual pilot programs. They suggest that a tariff would enable motivated industrial customers to work directly with thermal battery companies, bypassing the challenges and delays Xcel faced in partnering with Rondo.

Xcel countered that existing and future programs can achieve the same objectives, but with lower administrative risk and complexity, and the Company is already evaluating thermal storage and load flexibility through multiple Commission-approved pathways. For example, the Commercial Air-Source Heat Pump and Thermal Energy Storage Pilot, approved under Xcel's NGIA plan, is specifically designed to generate operational data on how thermal storage can shift load, mitigate peak demand, and improve system efficiency.

Staff believes Xcel provides reasonable arguments supporting its programmatic approach because it allows for negotiated participation parameters, flexible incentives, and iterative adjustments based on actual empirical data. Directing the Company to duplicate these efforts by establishing a new tariff may require resource-intensive rate design and billing modifications before the Commission has received empirical data from ongoing pilots. Relying on existing programs could also satisfy the Department's concerns regarding impacts on non-participating ratepayers while still enabling interested industrial customers to test thermal battery technology.

3. OTP's TMEP Rider might not be a reasonable precedent for ordering a new tariff.

Several argued that OTP's TMEP Rider serves as a successful regional precedent and a template for Xcel. For example, RTC stated that OTP's TMEP Rider "is a helpful example of how a thermal battery rate can promote better utilization of grid assets and conform to generally agreed upon cost allocation principles."¹³

However, Xcel refuted this comparison, stating that OTP's rider "is a narrowly tailored, case-specific rate construct developed to accommodate a unique customer configuration under particular local grid and market conditions, rather than a generally applicable or transferable

¹³ RTC, comments, p. 2.

tariff framework suitable for broad adoption across utilities or customer classes.”¹⁴

Staff agrees that the OTP rider is not a translatable proxy for Xcel, as it appears to have been designed for a single specific customer—a thermal storage facility supplying steam to a POET biorefinery in South Dakota. The tariff further requires strict physical constraints, mandating that the thermal load operate concurrently with a specifically identified, nearby renewable energy resource, including other specific parameters that may not be relevant or appealing to Xcel’s broader C&I customer base.

C. Scope of the Tariff

If the Commission wishes to move forward with a thermal battery tariff, it could adopt MLIG’s procedural recommendation – which Xcel supports if a new tariff is required – to expand the scope to a new, separate docket that includes all Minnesota electric utilities. MLIG argued that a statewide docket would avoid a fragmented framework and allow the Commission to establish common principles for cost allocation and system integration. Staff does not support this approach for reasons explained below.

Staff recognizes that MLIG’s recommendation aims to establish a cohesive statewide framework, but one must also consider both the possibility that such a proceeding could be a massive undertaking on which not all affected parties have had an opportunity to comment.

First, requiring an all-utility docket would likely require significant time and resources for intervening parties and Staff, since it would involve standardizing assumptions about an emerging, site-specific technology, unknown customer behavior, and specific customer adoption forecasts that would need to fit the unique characteristics of each individual utility and their service territories. The Commission may instead find that existing TOU rates and load management programs already provide the necessary price signals to incentivize load-shifting, and therefore a statewide docket may be duplicative.

Second, expanding this proceeding to all Minnesota electric utilities may be inappropriate without comment from those who would need to be involved, as no other electric utility has weighed in on the Department’s request or MLIG’s recommendation.

Third, creating a new tariff is not a simple administrative task. As Xcel pointed out:

Developing, implementing, and administering a new customer tariff is resource-intensive. It requires detailed rate design, billing system modifications, cost-allocation frameworks, ongoing reporting, and continued regulatory oversight. Those costs ultimately must be justified by demonstrated benefits.¹⁵

¹⁴ Xcel reply comments, p. 2.

¹⁵ Xcel reply comments, p. 8.

The Commission may also consider that if these administrative burdens are difficult to justify for a single utility, multiplying them across every utility in a statewide docket would require an unjustifiable amount of time and resources from the utilities, parties, and Staff.

D. Filing Requirements

If the Commission requires Xcel to develop a customer tariff for thermal batteries within 90 days, it might be helpful to outline what the initial filing should contain. Without any guidance from the Commission, Xcel's proposal may fail to address the barriers to thermal battery adoption in Minnesota and/or ensure that non-participating ratepayers are not subsidizing industrial process heat. Xcel noted that electrified steam remains more expensive to produce than natural gas, even assuming competitive electricity pricing of \$20/MWh, and the primary revenue stream for these systems (steam sales) benefits the specific industrial user, not electric ratepayers or the broader grid. Staff believes any proposed rate design should address these concerns.

Stakeholders appear to agree that a 90-day filing should at least (1) evaluate the economics of the tariff and technology and (2) address how thermal batteries will be deployed. This includes detailing the current state of technology, cost-benefit analyses, eligibility criteria, grid flexibility valuation, and an outline of potential barriers to implementation.

Table 2 shows parties' specific recommendations for filing requirements:

Table 2. Recommended Initial Filing Contents

Party	Issue
Department	• An explanation of how the rate addresses statutory rate design principles. • Details on how the proposed rate will protect non-participating customers from marginal MISO costs. • Information regarding the size and timing of Xcel's need for peaking resources, including cost comparisons to other peaking resources. • Lessons learned from previous thermal storage programs.
MLIG	• The current state of thermal battery technology and examples of where and how it has already been deployed. • An assessment of the current costs and benefits of the technology. • Any barriers to implementing the technology in Minnesota.
RTC	• The purpose, scope, and eligibility criteria of the tariff, along with the intended use cases for customer-owned thermal batteries. • A proposed rate structure and key price signals. • An explanation of how the tariff will recognize thermal batteries' flexibility value. • A proposed stakeholder process and timeline for the tariff's development.

VI. Decision Options

1. Order Xcel to work with interested parties to develop a tariff to support customer-owned thermal batteries and file such a tariff proposal within 90 days. (*Department, CEOs, RTC, TBA, MLIG*)

And

2. Require that the proposed tariff be filed in a new docket. (*Department*)

And

3. Require Xcel's initial filing to address:
 - a. how the proposed rate addresses statutory rate design principles;
 - b. how the proposed rate reasonably protects non-participating customers from incurring marginal MISO costs;
 - c. the size and timing of Xcel's need for peaking resources and a demonstration of how the cost of the capacity to be acquired compares to the cost of other peaking resources; and
 - d. lessons learned from any of Xcel's prior thermal storage programs. (*Department*)

And

- e. a description of the proposed purpose and scope of the tariff, eligibility criteria and intended use cases for customer-owned thermal batteries,
- f. a proposed rate structure and key price signals, an explanation of how the tariff would recognize the flexibility value of thermal batteries, and
- g. a proposed stakeholder engagement process and timeline for further development. (*RTC*)

And

- h. the current state of thermal battery technology and examples of where and how it has already been deployed.
- i. an assessment of the current costs and benefits of the technology.
- j. any barriers to implementing the technology in Minnesota. (*MLIG*)

Or

4. Expand the efforts to develop a proposed customer-owned thermal battery tariff in a new docket that includes all rate-regulated electric utilities. (*MLIG, supported by Xcel only if the Commission requires a new tariff.*)

Or

5. Deny the Department's request. (*Xcel*)