February 1, 2022

RE: Summary of Sierra Club’s Reliability Discussions and Citations, Xcel IRP
Docket No. E002/RP-19-368

We file this letter in response to Commissioner Schuerger’s request for citations to our written comments that support our points at last Thursday’s hearing that new combustion turbines are not needed to ensure the reliability of Xcel’s system. Our complete reliability discussions are found on pages 57-93 of our February 11, 2021 Initial Comments; our June 25, 2021 Reply Comments at 17-20; and our October 15, 2021 Surreply Comments at 15-25 (trade secret versions). We summarize these discussions briefly below.

At issue is Xcel’s claimed need for 800 MW of “firm dispatchable” resources in 2027 and 2029. Xcel hardcoded the Encompass model to add two new 374 MW generic gas combustion turbines (“greenfield CTs”) before 2030. As discussed in Sierra Club’s October surreply comments, pages 7-14, we tested Xcel’s plan with and without the forced new greenfield CTs, and EnCompass did not select them, instead adding wind, solar, and storage. EnCompass ensures portfolios are reliable by:

1. During capacity optimization:
   - Enforcing a required reserve margin, which ensures that the utility has some percentage of firm capacity above its forecasted peak demand; and
   - Giving a firm capacity value to intermittent resources that reflects their lower availability (“Effective Load Carrying Capacity,” or ELCC)

2. During the production cost (dispatch) simulation:
   - Dispatching a utility’s resource portfolio on an hourly basis over the course of the year to ensure that there is no unserved energy or loss of load during any hour.

Our preferred plan was developed using EnCompass and thus met all of EnCompass’s reliability criteria.

Xcel points to the fact that some of its CT fleet dispatched for 45 consecutive hours during the 2019 polar vortex as indicating a need for “long duration” resources. [Xcel Reply at 46.] We rebut this claim in our surreply at 24-25. Capacity factors for both Xcel’s combustion turbines and coal fleet were low throughout the event, with most CTs only running for much shorter durations. Solar output was also strong during the event, so in the future, a diverse fleet of wind

1 Synapse made three corrections to Xcel’s modeling assumptions: updated NREL ATB to 2021, decreasing battery size constraint to 20 MW, and increasing the assumed battery operating life from 10 to 15 years. Surreply at 12.
and solar resources on Xcel’s system and across MISO could work together with battery storage resources (as envisioned in our plan) to reliably meet load if a similarly extreme weather event occurs. In our EnCompass-selected preferred plan, we did not force Xcel’s existing gas/oil plants to retire, and so more than 2,400 MW of gas/oil CT capacity remain in Xcel’s portfolio in 2034. Our EnCompass output files show this gas/oil fleet running at capacity factors ranging from less than 1% to roughly 50% in 2034.\(^2\) As part of this modeling exercise, we did not adjust Xcel’s load forecast, which as the Department observed is systematically biased upwards: “By five years out Xcel’s average error is about 625 MW or two large CT units and by eight years out the average error is about 1,100 MW.” [Sierra Club Reply at 3.] Xcel also assumes it will not renew roughly 2,000 MW of PPAs, including around 1,000 MW in existing oil and gas peaking capacity and 1,000 MW of hydropower. [Sierra Club Initial Comments at 28-29.] In other words, even in a world that may overstate Xcel’s load by more than 1,000 MW, and may understate PPAs that Xcel may renew by 2,000 MW, EnCompass still determined that Xcel does not need new CTs.

Xcel tested the future reliability of our preferred plan using three main reliability “analyses.” As we explained on pages 15-37 of our October 15, 2021 surreply comments, some of these metrics are more rigorous than others, but all were flawed. Ultimately, the most robust of Xcel’s analyses showed our preferred plan is reliable.

First, Xcel presents a “firm dispatchable” to peak load comparison. [Xcel Reply at 125-127]. The problems with this overly simplistic metric are discussed on page 15 of our surreply. Second, Xcel presents net load duration curves for various plans [Xcel Reply at 128], which ranked hours from highest to lowest net-load, rather than in hourly sequential order. The issues with this approach are discussed on pages 15 and 16 of our surreply.

Next, Xcel conducted an “initial reliability screen” [Xcel Reply at 131-133, Table 4-12], which purports to show the “annual unserved energy” from Sierra Club and CEO’s plans. As we discuss at page 16-17 of our surreply comments, this table is not a reasonable basis for evaluating reliability because it only looks at years beyond the planning period – 2037-2045. Our EnCompass modeling (appropriately) optimized for the planning period, not for years beyond it. Sierra Club’s plan does not have any hours of unserved energy before 2037.\(^3\) Future resource additions selected in future IRPs can address the needs of future planning periods, but those years should not be used to make an irreversible commitment to new gas plants now. [Sierra Club Surreply at 16].

Finally, Xcel conducted a “base reliability analysis,” using both a typical year and a worst-case analysis under the 2019 polar vortex conditions, with high load and unavailability of many resources. [Xcel Reply at 133-138]. The results of this analysis are summarized in Table 4-14, page 135 of Xcel’s Reply. This approach used hourly sequential modeling, which is the correct approach. However, as discussed in our comments and summarized here, Xcel’s analysis was mostly focused on its ability to meet its load without any interaction with MISO, and also

\(^2\) Sierra Club EnCompass output files provided in response to Xcel IR 43 (Trade Secret)

\(^3\) *Id.*
significantly understated wind’s reliability. Xcel’s table 4-14 also presents the results of its analysis in a highly misleading manner.

First, it bears emphasizing that in Xcel’s polar vortex modeling scenario (labeled “2019 Actual Hourly Load & Generation” in Table 4-14), Xcel assumed that the vast majority of gas CT plants would be unavailable to meet load. It is irrational to justify the need for new gas CTs based on the assumption that other gas CTs are unavailable, as the new CTs would also be vulnerable to the same correlated outages or fuel supply interruptions. [Sierra Club Surreply at 17, esp. footnote 33, which contains trade secret information.]

The second problem is that most of Xcel’s reliability analysis does not account for power exchanges with the rest of MISO; in Table 4-14, only the two farthest right columns, “LOLH” (Loss of Load Hours) and “EUE” (Expected Unserved Energy) included interaction with MISO, while the rest incorrectly evaluate Xcel’s territory as an island (and, unlike LOLH and EUE, are not industry-recognized reliability criteria). By ignoring MISO, Xcel has excluded one of the most important of its system’s reliability attributes. As discussed in our June reply comments, during February 2021 winter storm Uri, MISO was able to maintain reliability despite wide-scale gas plant outages and supply disruptions because it was able to import more than 13 gigawatts from neighboring systems (nearly 9,000 MW from PJM, several thousand MW from TVA, and around an additional 1,000 MW each from Southern Company, Louisville Gas and Electric, and Canada.) [Sierra Club June Reply Comments at 17-18.] Texas, in contrast, is a grid “island” with an import limit of only 800 MW during the event; if it had had regional ties like we have in MISO, it likely could have weathered the storm. [Id.]

When Xcel correctly accounted for the reality of exchanges with the rest of MISO, the claimed reliability concerns with the Sierra Club and CEO plans disappeared. [Sierra Club Surreply at 18-20, 23.] The average loss of load hours for Sierra Club’s plan was 0.7 loss of load hours per year, which is below the NERC reliability criteria of no more than 2.4 hours per year. [Id. at 18.]

Sierra Club’s plan met the NERC standard even though Xcel’s analysis incorrectly extrapolated the output profile for the entire future wind fleet by linearly scaling up the output of a single existing wind project, thereby significantly overstating the variability of wind resources (and therefore understating wind’s reliability). NREL has called out this exact error as a “common error” in utility reliability analyses, as it misses the inherent geographic diversity benefit from adding wind resources at new sites. [Surreply at 18.] Even a 50-mile separation can almost entirely eliminate the short-term correlation between the output of two wind projects. [Id.] Xcel

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4 Xcel repeats this problem in its “additional reliability test” on pages 136-138 of its Reply Comments, in which it modeled what would happen if it “turned off” all of its gas plants in the Twin Cities metro area, but did not turn off its new proposed Lyons and Fargo CTs. Xcel is essentially arguing for geographical diversity of its gas fleet, without explaining how its new CTs would be insulated from correlated outages (in both this imagined scenario and as occurred in reality during winter storm Uri.) In short, Xcel is assuming what it is trying to prove -- i.e., it is assuming the new CTs will be available when others are not, in order to prove a reliability need for them.
repeated this error in its reply comments’ analysis even though Sierra Club’s Initial Comments pointed out this flaw. [Surreply at 17-18.]

Please let us know if you have any follow up questions. We appreciate the Commission’s attention to this important topic.

Respectfully submitted,

/s/Laurie Williams
Senior Attorney
Sierra Club
1536 Wynkoop St. Suite #200
Denver, CO 80202
Tel: (303) 454-3358
Email: laurie.williams@sierraclub.org

February 1, 2022
CERTIFICATE OF SERVICE

I, Laurie Williams, hereby certify that I have this day, served copies of the following document on the attached list of persons by electronic filing.

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Dated this 1st day of February 2022

/s/Laurie Williams