To: Minnesota Public Utilities Commission,
From: Tim Wulling
Date: Oct 14, 2021
RE: Docket number E002-RP-19-368

In the matter of Xcel Energy's Upper Midwest 2020-2034 Integrated Resource Plan

There's much to like in Xcel Energy's Alternate Plan in its Integrated Resource Plan, including:

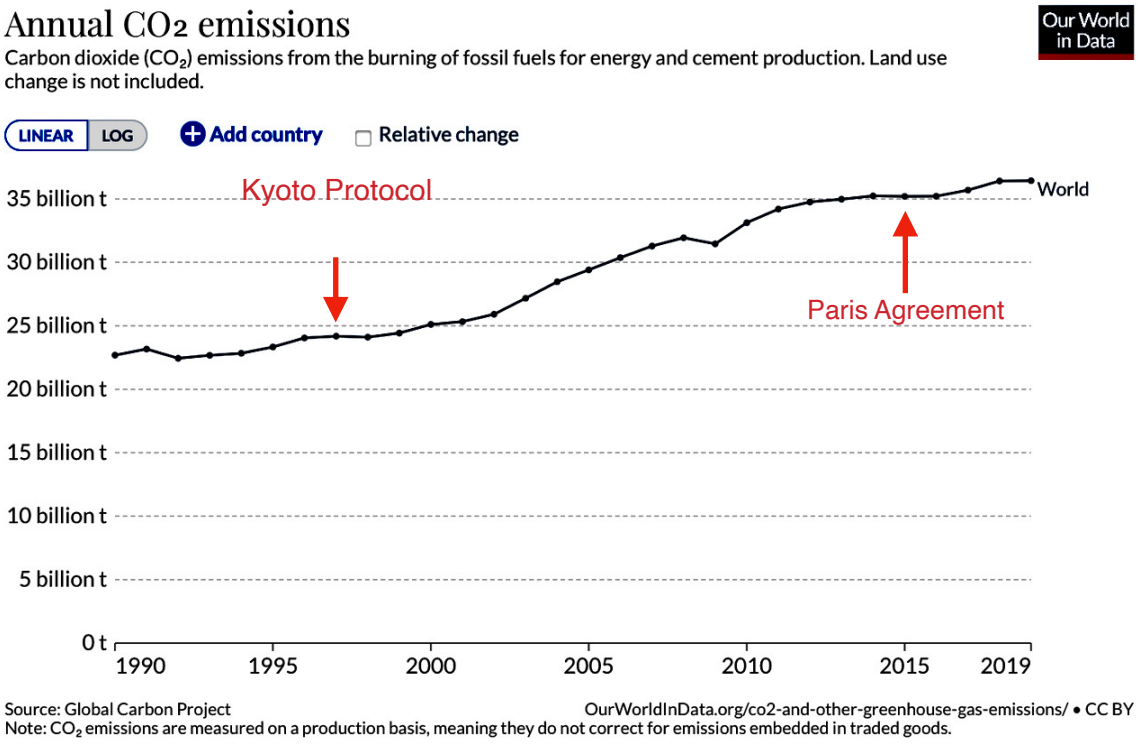
- Commitment to reducing greenhouse gas emissions
- Early retirement of coal plants
- Sizable additions of wind and solar
- Zonal black start.

Yet, regardless of whether Xcel is an industry leader, the Alternate Plan is not enough. Climate change continues unabated.

As the country eliminates fossil fuels in response to climate change, electric utilities carry an extra burden: first, of supporting increased load from electrification of end-uses that will be switching from coal, gas, and oil; and, second, do so with more intermittent renewable resources. The new model will be require more partnership between the utility and customers – the utility continuing to attempt to accommodate customers' demand, and customers becoming aware of the changing availability energy on the grid.

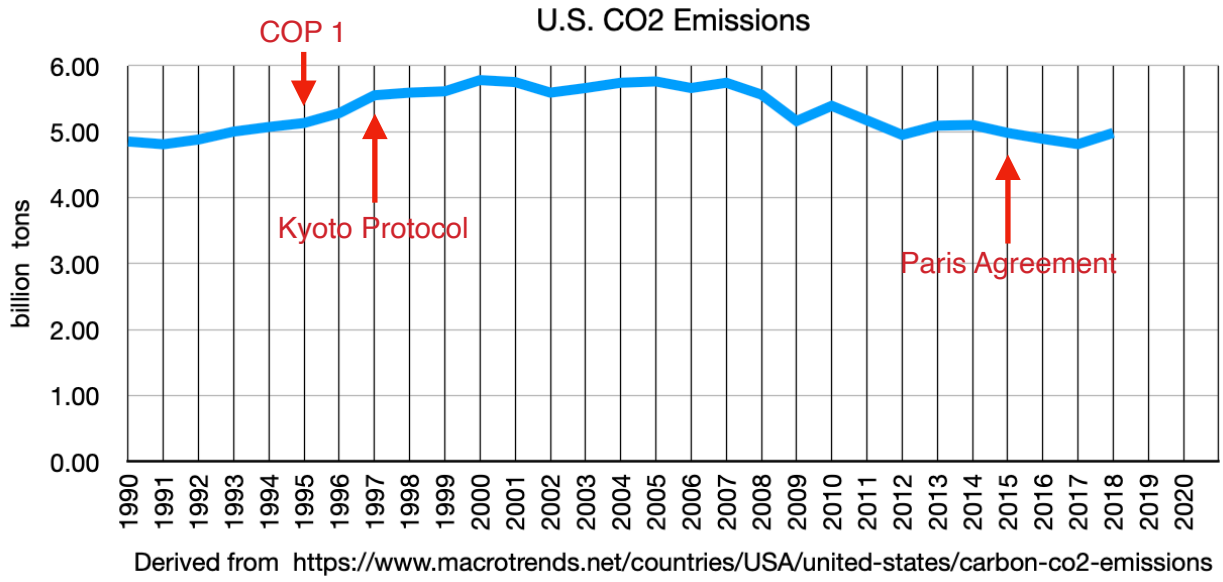
1. Because overall greenhouse gas emissions haven't gone down in the last 25 years, the U.S. now has less time to act; our carbon-free deadlines must be advanced to 2040, not 2050 any more.

In spite of agreements at climate conferences, world CO2 emissions have continued to increase.



https://ourworldindata.org/co2-emission

In the U.S., CO2 emissions are about the same as they were when climate conferences began in 1995. They are down only 14% from the peak in 2000.

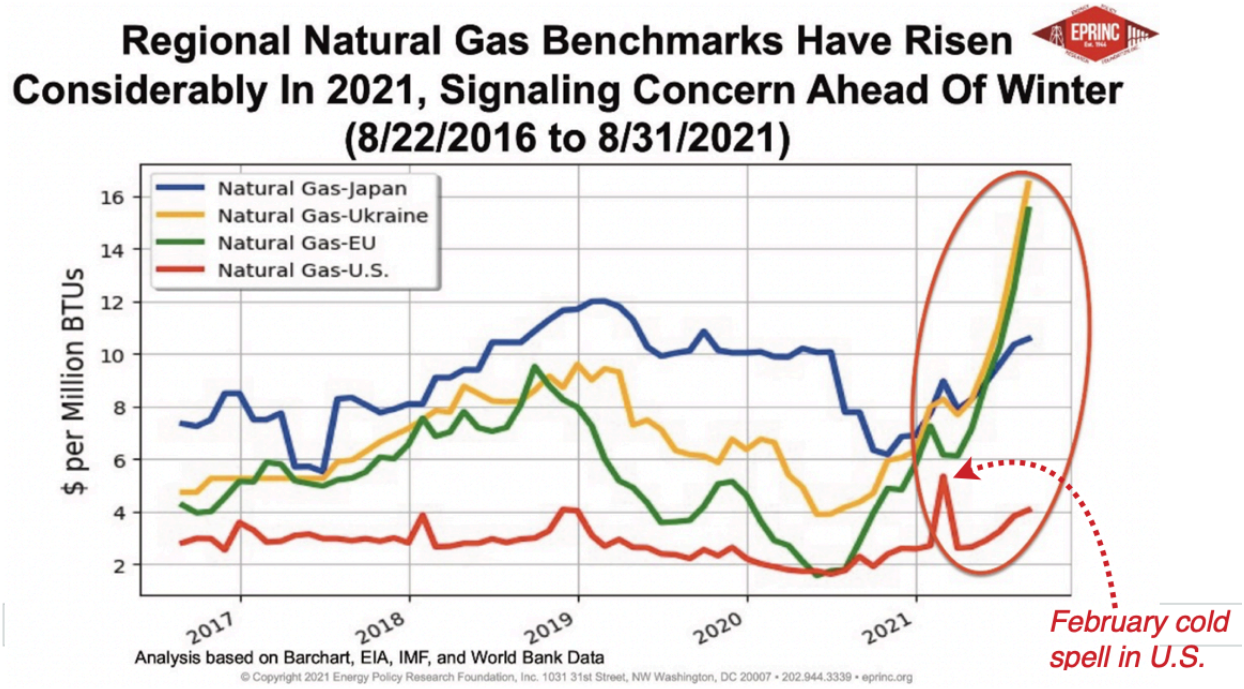


2. The PUC must deny fossil-fueled peaker plants; fossil gas can no longer be considered a bridge fuel.

Neither lower emissions nor lower cost of fuel are the advantages they were once thought to be.

Methane leaking during the extraction and delivery of fossil gas adds to the greenhouse gas emissions of gas power plants.

The fuel cost of fossil gas has increased recently as a result of, first, supply challenges during last February's cold spell, and second, increased exports that are responding to higher prices in Europe and Japan. The following graph shows this.[1]



3. Before approving new or re-powered gas peaker plants, the PUC should direct Xcel to explain in the next IRP its plans for using hydrogen with the peaker plants.

It's not enough for Xcel to say the four peaker plants will eventually run on hydrogen. In the next IRP, Xcel should have a proposal encompassing how and where hydrogen will be produced, the availability of renewable resources for supplying the energy for hydrogen production, how hydrogen will be stored and delivered, and what equipment will combust hydrogen to generate electricity.

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[1] The Energy Bulletin Weekly – Sept 21, 2021
https://energybulletin.org/the-energy-bulletin-weekly-27-september-2021

4. The PUC should direct Xcel to evaluate alternatives to combustion peaker plants.

Combustion generation is not the only way to provide extra energy during times when demand exceeds renewable generation. Battery storage and electric thermal energy storage are other possibilities at utility scale.

Battery storage helps meet shorter-term load variations.

Electric thermal energy storage can be used for short term storage to seasonal storage. This system converts excess renewable energy to heat that is stored to be drawn later to produce steam to run a generator. The renewable energy becomes dispatchable, and the fossil-fueled power plant is not a totally stranded asset. Such systems are becoming available.[2] [3]

5. Demand-Side Management (DSM) must become a major component of the coming renewable grid, not just desirable where convenient.

The transition from fossil-fueled electric generation to renewable generation is a fundamental change in how the grid operates and depends on customer adoption of Demand Side Management. As the grid adds some dispatchability to intermittent renewable resources (described in #4 above), customers can add flexibility to their demand.

Many residential customers have storage with which they can shift their load on the grid to a different time from when they benefit from the energy.

- Electric tank water heaters use electricity at one time while making hot water available at later times. What is needed is a signal from the grid telling the water heater when to heat and when to refrain. With the right size tank and with higher storage temperatures tempered with a mixing valve, a water heater could ride through a cold, calm night easily and perhaps even a few days of an extreme cold spell, thereby relieving the grid at such a peak time.

- Electrified space heating has long had the option of a storage system to make use of lower night-time electric rates.[4] With an appropriate signal from the grid, the system could be timed to actual grid conditions, instead of to the hour of day.

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[2] Siemans Gamesa's electric thermal energy storage systems can be used at grid-scale or at the scale of an industrial customer. https://www.siemensgamesa.com/-/media/siemensgamesa/downloads/en/products-and-services/hybrid-power-and-storage/etes/siemens-gamesa-etes-general-introduction-3d.pdf

[3] Stiesdahl Storage Technologies systems provide storage ranging from short term to seasonal. https://www.stiesdal.com/storage

[4] Steffes electric thermal storage systems for residential, commercial, and utility https://www.steffes.com/electric-thermal-storage

- Batteries have become an option for residences to store electricity.

Each of these storage methods could provide additional value to the grid if communication with the grid is added. Then the storage system could be responsive to grid variations without curtailing the availability of the customer's end use.

Each of these storage systems also provides resilience for times of power outages.

In addition to being able to shift loads, a residence could have a load center able to shed loads. A load center is available[5] that allows the customer to rank each circuit as *essential* to life or to damage avoidance (refrigerator, freezer, space heating, a few lights, internet connection), *important* but could do without (air conditioning, ...), or *non-essential*. If this concept could be extended to have grid interaction, it could provide "dispatchable load" for emergency situations.

6. Xcel's 5-year plan does not show how Advanced Metering Infrastructure (AMI) will be used for advancing Demand-Side Management.

Xcel indicated that existing meter technology is nearing end of life and that Advanced Metering Infrastructure will be installed by the end of 2024 – within the span of the 5-year plan. However, there's scant information about what AMI will offer.

- Will equipment aid customer awareness of energy use?
- Will the communication with the premise be a marketing signal (price) or a technical signal (such as Automatic Generation Control)?
- Will the signal reach into the building to the load itself?
- How will customers be made aware of DSM opportunities and what incentive will they have?

7. I submit these comments as a long-time shareholder – first of Northern States Power Company and now of Xcel Energy beneficially with my spouse – for nearly two-thirds of the life of NSP.

The urgency of the times calls for Xcel and the PUC to prioritize the renewable transition over shareholders' continued high return.

Sincerely,

Tim Wulling, volunteer with St. Paul 350
t.wulling@earthlink.net
1495 Raymond Ave., St. Paul, MN 55108

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[5] Although the Span "smart panel" seems intended for energy awareness and smart use of battery backup for resilience, could the concept be developed for grid interaction? https://www.span.io/smart-panel-product