Memorandum

To: Commissioners Christmann, Fedorchak and Kroshus

From: Victor Schock Public Utility Analyst VS

Date: November 30, 2021

Re: Northern States Power Company June 4-6, 2021 Mayville, ND Outages

On July 20, 2021, the Commission received a letter from the City of Mayville, ND requesting an investigation of the management of Northern States Power Companies (NSP) utility systems in the City of Mayville. The letter stemmed from a series of outages that impacted Mayville between June 4th and 6th, 2021.

Staff investigation found the following information relative to Mayville, and the outages. Mayville, ND is served by NSP via a single substation that is separated into two areas. The first being approximately 456 customers served by a 4kV system and transformer #1 (TR1), the second an additional 1145 customers served by a 12.5kV system and transformer #2 (TR2).

On June 4, 2021 at 3:30pm an outage caused all 1,601 customers in Mayville, ND to loose power for approximately 4 minutes. Shortly after, at 4:30pm an outage caused the same 1,601 customers to loose power for approximately 6 minutes. Following the second outage, it was suspected that there was a problem with the 69kV transmission line feeding the substation. At 5:10pm an intentional outage was initiated for the same 1,601 customers in order to inspect and test the transmission line. Having found no issues with the line, service was restored at 6:30pm. At 7:38pm there was a fourth outage. Following this outage, technicians focused on the substation itself for the potential fault in the system. After conducting an inspection of all components and finding no obvious problems, service was restored at 10:37pm. At 11:21pm there was a fifth outage. At 12:56am (Sat June 5th) service was restored to the customer connected to TR2. This portion was then monitored from inside the substation by technicians to ascertain which of the two transformers were the issue. Seeing no issues from the TR2 system, the focus turned to TR1. Based on the electrical signature of the outage from recording equipment, technicians believed the arrestor for TR1 to be the issue. The arrestors were removed from the transformer, and service to TR1 was restored at 2:33am. All customers on both TR1&2 remained online until 5:00pm (June 5th) when all 1,601 customers again lost service. At 7:00pm NSP determined it needs a mobile substation sent to Mayville to resolve the outage and called their Maple Grove, MN service center requesting them to send the proper mobile sub configuration. At 7:44pm service was restored to TR2 with the belief that TR1 was the issue causing the repeated outages, which was confirmed by testing of the oil in TR1. At 3:00am(Sun June 6th) the mobile substation equipment arrived on site at the Mayville sub and crews began working to connect it. TR2 was intentionally put out of service at 3:33pm in order to connect the mobile substation equipment. At

4:42pm service was restored to all customers on TR1&2 from the mobile substation. Typical mobile sub connection time is 12-16hours, and this falls within that at 13.5hours. The mobile substation will serve the customers until step down transformers can be installed and all customers on TR1 can be served by TR2.

Staff's investigation continued into the area of standard testing procedures, ages and retirements of transformers. This found that the typical lifespan of a transformer is 50 years. TR1 was 54 years old at the time of the outages. While this does not mean it should have been retired, it is an indicator that it was at the end of its life. Staff's next focus is testing procedures for the transformers. On an annual basis NSP performs thermography and oil sample tests on transformers of this type. The most recent April 22, 2020 thermography test did not reveal any issues. However, an oil sample taken September 28, 2020 and tested by the lab in December, 2020 showed higher levels of gases that would indicate likely if not certain arcing and hotspots in the transformer. The lab forwarded these results to NSP's transmission engineering group, which had not taken any action.

The final part of staff's investigation was of communication throughout the events. Staff found that on both Saturday and Sunday NSP had FB postings and outage map updates on their website with the details they were aware of at the time in addition to telephone and text notifications for customers who had signed up to receive such notifications. I can appreciate the lack of a specific restoration time in the notices, but given the unique circumstances of the outages, it may not have been appropriate to provide a restoration time.

In summary, Staff believes that NSP's communication was adequate for this event, but would suggest making better attempts to contact key city and county officials during future incidents. In regards to transformer testing procedures and ages, Staff recommends the commission review this incident with NSP during a public information exchange meeting in the near future.

c. Dave Sederquist