BIL 40101(d) Application

Project Title: Phase 1 Electrical Upgrades

Applicant: City of Hillsboro

Date of Application: 06/02/2025

Date of Application Revision:

Amount of Grant Request: $2,800,000

Total Amount of Proposed Project: $5,635,000

Duration of Project: 3 Years (2026-2028)

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North Dakota Transmission Authority

North Dakota Industrial Commission

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Applicant Description

Located in Traill County, North Dakota, the City of Hillsboro has an estimated population of 1,649, based on the 2020 decennial census. The city was founded in 1880, incorporated in April of 1883, and lies between two of North Dakota's largest cities. Fargo, North Dakota, is 42 miles southwest of the City of Hillsboro, and Grand Forks, North Dakota, is located 40 miles north. Hillsboro is served by major transportation networks including Interstate 29, State Highway 200, the BNSF Rail line, and the Hillsboro Regional Airport.

The City of Hillsboro is led by a city commission, which includes a president and four commissioners:

- Levi Reese, President
- Paul Geray, Commissioner – Vice President
- Jon Myers, Commissioner
- Jason Pohlkamp, Commissioner
- Nicole Evans, Commissioner

The city provides municipal power, water, sewer, garbage and recycling services to its residents. The power transmission supply to the city consists of looped 69 kV transmission lines owned by Xcel Energy. Hillsboro Utilities distributes power through a system composed of both overhead and underground sections and is supported by two 69 kV to 4.16 kV load-serving substations. Approximately 56% of the distribution system is underground. In 2024 the City of Hillsboro provided power to 1,069 customers, with annual sales of approximately 32,000 MWh.

Project Description

Capital Improvement Plan – Phase 1

The scope of this project is the first of a four-phase capital improvement plan. These phase 1 improvements aim to eliminate or minimize system deficiencies and improve capacity to meet future demand. The improvements included within Phase 1 are discussed below:

Water Treatment Plant Mainline Project

The City partners with East Central Regional Water District to provide water service to the region. We are expanding our regional water treatment plant to increase treatment capacity, which will require additional power from our electrical system. We will install new underground circuitry and convert to a 12.5 kV system voltage on the west feeders. This will eliminate potential voltage and distribution system capacity violations once the treatment plant expansion is complete.

Northeast and Southeast Voltage Conversions

These improvements include the installation of new underground circuitry and conversion from a 4.16 kV to 12.5 kV system voltage via step-up transformers at the Traill substation. This will help eliminate voltage and capacity violations under system normal and contingency. Additionally, it eliminates old unjacketed 4.16 kV underground circuitry and provides more reliable service to the essential services within our community including our schools and medical facilities.

Need for Improvements

Back-feed capabilities under peak loading conditions are limited due to the use of 200 Amp load-break elbows on some 4/0 aluminum circuit mainlines – significantly reducing the overall capacity of the 4.16 kV system west of the interstate. Additionally, there are radial portions of the system with no back-feed capability whatsoever. The existing 4.16 kV system is limited in the amount of voltage it can provide while within the conductor's thermal limitations. Within each substation, critical equipment in the yard is on average over 40 years of age, with the transformer at Traill Substation operating on a rebuilt unit.

The physical condition of the existing 4.16 kV overhead distribution system is average in general, with the most concerning areas located on the downtown feeder. No obvious problems with recent construction methods were observed, however, areas of town with unjacketed concentric neutral type underground cable pose a risk of corroding away causing costly cable failures.

The City plans to convert older overhead segments of the system to new underground lines, which serves to increase the level of safety and reliability of service, especially during storms and other weather-related events. Improvements in construction methods of underground

lines have been made in recent years allowing for the sectionalizing of line. This process provides quicker fault detection and helps protect equipment.

As the primary utility providing power to the East Central Regional Water District treatment facility, maintaining a continuous power supply at water treatment plants is crucial for ensuring the delivery of safe and clean drinking water to our region. Any interruption in power can lead to significant public health risks, operational challenges, and environmental concerns. Alongside power interruptions, voltage concerns can damage treatment facility equipment leading to unpredictable down time and expenses.

The primary role of water treatment plants is to purify and deliver potable water to the public. A power outage can halt treatment processes, allowing contaminants to enter the water supply. This can lead to waterborne diseases, posing serious health risks, especially to vulnerable populations such as children, the elderly, and those with compromised immune systems. Ensuring stable power supply is essential for protecting public health.

Water treatment plants must operate continuously to meet the demands of the community and regions they serve. Power outages can disrupt the pumping, filtration, and disinfection processes necessary for treating water. Interruptions can result in inadequate water pressure, leading to supply shortages and potentially impacting firefighting capabilities and other critical services that depend on a reliable water supply.

Load Growth and Energy Projections

The maximum overall system peak of 8,322 kW was established in the winter of 2021. Over the past four (4) years, the City's system has experienced an average increase of approximately 4.8% for the summer peak demand loading levels while the winter peak has remained fairly flat.

To ensure the city retains the ability to provide power to the growing demands of its residents and businesses, replacing aged conductor is an important first step in the capital improvement process. Alongside reducing line loss, the improvement of the 4.16 kV system to a 12.5 kV system will remedy voltage violations experienced during heavy loading levels. Based on load growth projections conducted by DGR Engineering, by 2033 the City of Hillsboro will reach a peak system demand of nearly 12,764 kW.

Design and Engineering

The improvements outlined within the capital improvement plan are designed to increase system reliability, provide flexibility and expandability to meet the needs of projected growth, and ensure voltage levels are maintained at all times within ANSI limits for Class A service.

The City intends to adopt a formal policy to maintain "N-1" or "single contingency" design on all transmission, substation, and distribution facilities when feasible. "Single contingency" design is defined as the ability to operate the system peak load with the loss of any single major system

component. Electric consumers have undoubtedly come to expect that electric service be available at all times, except for minor weather-related outages.

Improving the system will help maintain voltage levels at the consumer's premises within ANSI limits for class A service. Voltage limits are defined as a maximum voltage of 126 volts, a minimum voltage of 110 volts, and a maximum daily voltage swing of eight (8) volts.

System improvements will be conducted in a manner that considers flexibility and adaptability allowing for a number of combinations of circuit configurations for serving existing loads as well as future system development. This will be accomplished by designing multiple tie and switching points between distribution circuits, as well as providing sufficient distribution circuits themselves. Alongside the improvement of cable, 600 Amp deadbreak elbows will replace the existing 200 Amp load-break elbows on the mainline system. This will create a more robust system and allow the ability to safely transfer critical loads from circuit to circuit.

The system will be designed such that new loads can be added without major upheaval to the existing system. This does not mean the system should be overbuilt, rather sufficient capacity must be available in substations and lines to handle the addition of a reasonably large load without scrambling to provide facilities for it and affecting consumer's rates.

Anticipated Results

The anticipated result of this capital improvement project is increased system capacity, improved reliability, and a hardening of systems that affect public health and safety. By improving the current distribution system to a 12.5 kV circuit, the new system will be well on its way to support the projected peak demand of 12,764 kW by 2033. Converting a portion of the current overhead spans to underground further insulates the system from weather-related damage typically caused by wind, ice, and lightning. Improvements will also reduce voltage violations and line losses further protecting consumer electronics within homes and businesses.

Proactively replacing aging overhead lines and unjacketed underground cables with modern underground systems will reduce the frequency and duration of outages. Sectionalizing allows for quicker fault isolation and restoration to the affected area, therefore increasing the availability of power while also providing the ability to reroute power around the problem area.

Technological and Economic Impacts

Modernizing the electrical infrastructure positions the City of Hillsboro for long-term economic growth by attracting new businesses and supporting the current and future population of the city. A reliable utility system is a key factor in economic development and community resilience. Technological improvements to the distribution system like voltage conversion and enhanced underground cabling increase operational efficiency and help reduce energy losses. In doing so, less maintenance costs translates to better financial stewardship for the city and may potentially fewer utility rate increases for residents.

Standards of Success

Objective 1: Eliminate system deficiencies

The City of Hillsboro plans to address critical system deficiencies in its aging electrical infrastructure throughout the first phase of the capital improvement plan. Currently, the use of 200 Amp load-break elbows on 4/0 aluminum circuit mainlines limits back-feed capabilities, especially under peak loading conditions. Additionally, restructuring the system to address radial portions of the system will provide additional back-feeding options during outage situations, decreasing the system's vulnerability. The existing 4.16 kV system also struggles to maintain voltage within thermal limits, and areas with unjacketed concentric neutral underground cables are at an increased risk of failure due to their age and state of corrosion. Upgrading to 600 Amp deadbreak elbows and replacing deteriorating cables will significantly enhance the system's robustness and operational flexibility during outage situations.

Objective 2: Increase capacity to meet future demand

A major procedure identified in the attached capital improvement plan is the voltage conversion from a 4.16 kV to 12.5 kV system, which will support the projected peak demand of 12,764 kW by 2033. This upgrade will reduce voltage violations and line losses, while also ensuring the system can handle growing residential and commercial loads. Improving the system to 12.5 kV introduces a system that's built for scalability and flexibility. Incorporating multiple tie and switching points alongside sufficient distribution circuits will help accommodate the introduction of new loads without major disruptions throughout the system. Adopting an "N-1" contingency design will allow the system to continue operating even if a major component fails, ensuring uninterrupted service during peak demand periods.

Objective 3: Improve reliability and safety of power distribution

The City aims to convert older overhead lines to modern underground systems, which are less susceptible to weather-related damage such as wind, ice, and lightning. The attached outage summary from 2021-2024 provides a breakdown of when outages typically occur within the city. Outages frequently appear throughout the system during the months of May through August. These outages correlate with the seasonality of electrical storms paired with high winds indicating the system's overhead lines are particularly vulnerable to weather-related events. Converting these lines to underground systems will improve overall system reliability and public safety.

Modern underground construction methods allow for sectionalizing, which enables quicker fault detection and isolation, reducing outage duration. Ensuring a stable power supply is especially critical for facilities like water treatment plants and medical facilities, where interruptions in electrical service can pose serious public health risks.

Maintaining voltage within ANSI Class A limits will protect sensitive equipment in homes and businesses, while proactive infrastructure upgrades will enhance overall system resilience and

reduce maintenance costs tied to unplanned major construction events. These improvements will also support economic development and future expansion by providing a reliable utility system that attracts new businesses and supports community growth.

Project Timeline

Activity	Start	Finish
NDIC Application Selection	July 2025	July 2025
DOE Approval	August 2025	October 2025
Engineering Design	September 2025	February 2026
Bid Opening	March 2026	March 2026
Bid Award	April 2026	April 2026
Construction	May 2026	August 2028

Project Budget

The City of Hillsboro is requesting a 49.7% grant through the North Dakota Transmission Authority for $2,800,000. The City will fund the remaining 50.3% local match through a loan from the Bank of North Dakota's Infrastructure Revolving Loan Fund.

Project Associated Expense	NDIC Grant	Applicant's Share (Cash)	Total
12.5 kV WTP Mainline			
Construction Contract	$147,750	$49,250	$197,000
Owner-Furnished Materials	$342,000	$114,000	$456,000
Engineering & Contingencies	$123,000	$41,000	$164,000
SE Voltage Conversion			
Construction Contract	$660,000	$220,000	$880,000
Owner-Furnished Materials	$0	$1,256,000	$1,256,000
Engineering & Contingencies	$400,500	$133,500	$534,000
NE Voltage Conversion			
Construction Contract	$737,250	$245,750	$983,000
Owner-Furnished Materials	$67,000	$668,000	$735,000
Engineering & Contingencies	$322,500	$107,500	$430,000
Total	**$2,800,000**	**$2,835,000**	**$5,635,000**