Substation Asset Management Engineering

Grand Rapids 115 kV Substation Battery Replacement Scoping Document, Cost Estimate, and Estimated Schedule

Jeremy Goodell, Project Engineer

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1) Project Location

Grand Rapids 115 kV Substation
709 Walter Avenue
Grand Rapids, MN 55744

2) Project Summary

The Grand Rapids 115 kV Substation was constructed in 2005 to provide power for all electrical loads within the Grand Rapids Public Utilities service territory at a stepped down voltage of 22,860 volts. Three 115 kV transmission lines power the substation and equipment within the substation allow for switching of these transmission lines.

The substation battery system installed in the electrical equipment enclosure is designed to power all DC electrical loads within the substation for an extended period of time. The battery charger maintains the battery system and the DC distribution panel distributes power to the required loads. The battery system powers all DC loads including the control systems for high and medium voltage breakers and switches, protective relays for the high and medium voltage system, data acquisition, and communication equipment.

Since the battery system is reaching it's end of life at 20 years, it requires replacement. After a period of 20 years battery systems tend to degrade quickly and to eventually fail. Minnesota Power procedures direct substation batteries to be replaced after 20 years of use. Additionally, NERC or the North American Electric Reliability Corporation requires this system to be maintained properly and to be replaced when necessary to maintain a reliable electric grid.

Minnesota Power is proposing a replacement battery system in 2024. This system will be designed and sized per IEEE 485-2020. This standard requires the battery system to effectively power all required components within the substation for a duration of eight hours in the event of loss of AC power. This will allow continued operation of breakers and switches along other DC powered electronic devices. The proposal as outlined below is for Minnesota Power personnel to remove, dispose of, and replace the battery, charging system, battery mounting rack, and battery acid containment system along with other required equipment.

3) Project Contact List

Name	Company	Role	Email	Phone
Jeremy Goodell	MP	Project Engineer	jgoodell@mnpower.com	218-355-2408
Ben Bittner	MP	Project Manager	eortman@mnpower.com	218-313-4352

Table 1: Project Contact List

4) Project Detailed Description

a) Removals

i) Remove and dispose of 60 lead acid battery cells

ii) Remove and dispose of battery charger

iii) Remove and dispose of battery cell mounting rack and battery acid containment system

iv) Remove and dispose of power cables, control cables, and other equipment

b) Physical Electrical

i) Install new battery cell rack with integrated containment system

ii) Install new 58 cell 125 VDC battery with required intercell connections and copper connection cables to existing DC distribution panel

iii) Install new maintaining battery charger along with control, monitoring, and power cables

c) Perform required tests on new battery system to include test discharge and charge, integrity test of all connections

5) Project Cost Estimate

a) Material and parts

i)	58 cell, utility grade storage battery	$12,000
ii)	Battery charger/maintainer 125 VDC, 25 amp	$7,900
iii)	Battery rack, two step, seismic zone 0	$1,800
iv)	Spill containment tray with neutralizing pillows	$3,400
v)	Flip top flame arresters, each battery cell	$1,500
vi)	Fuse box, power fuse, power cables, intercell connectors, control cable	$3000
vii)	Sub-total	$29,600

b) Construction Scope

i)	Temporary battery trailer, labor, equipment	$9600
ii)	Minnesota Power engineering, planning, drafting, project management	$4800
iii)	Subtotal	$14,400
c)	**Total**	**$44,000**

Project cost shown are estimated only, actual costs may vary

6) Estimated Schedule

Task Name	Duration		Start	Finish
Engineering Design	30	days	4/29/24	5/29/24
Equipment Specifications	15	days	4/29/24	5/14/24
Purchasing Documents	5	days	5/15/24	5/20/24
Material lead time	60	days	5/20/24	7/19/24
Pre-Construction	1	days	-	8/19/24
Construction: removal and installation	4	days	8/26/24	8/29/24
Dates are preliminary and do not represent an approved milestone schedule.				

7) Version History

Version	Change Description	Review Date	Author(s)
0	Initial Draft	4/03/24	Jeremy Goodell