

Project Title: Direct Current System and Low Voltage Switchgear Upgrade

Dam and Reservoir Project: Lower Granite

Estimated Total Cost: \$7-12 million

Estimated Schedule for Completion of the Project: Phase 1a: None for this Project

Phase 1: FY2016-2019

Phase 2: FY2019-2022

Expected Physical Completion: FY2022

Current Status as of 7/31/18: Phase 1 (design)

This project will upgrade the Direct Current (DC) System, Governor Oil Pump System, and Low Voltage Station Service Switchgear System at Lower Granite Dam and Reservoir Project (Project). The DC System is comprised of batteries and inverters that supply the 125-voltage direct current system power for multiple pieces of equipment. The Governor Oil Pump System is comprised of pumps, motors, and piping to deliver oil to the turbine. The Low Voltage Switchgear System is a lineup of breakers, which allow distribution of the power to desired loads. All three of these systems are used to control the hydropower generating units in the powerhouse. A failure of the current systems would impact power generation and emergency systems at the Project. These impacts would vary depending on which equipment failed. The upgrade will improve reliability and reduce the likelihood of a failure within the electrical systems. If a failure occurred on the DC System, the ability of station service to meet the needs of the Project would be compromised and the Project would likely not be able to operate safely and reliably. The station service provides power to multiple critical loads including: generator control, spillway control, fish passage systems, drainage systems, unwatering pumps, and other critical control systems.

The batteries, breakers, and cabling of the DC System are near the end of their design life and are in need of replacement to avoid future unnecessary forced outages. As part of the DC System configuration, two new battery chargers will be acquired. Other than one existing charger (which will be reused), the current chargers are being replaced because they are undersized for the new batteries. The current DC System equipment, including the chargers, breakers, and cabling, does not reliably meet the current DC System load requirement at the project, and therefore justifies replacement. This project will also replace the 480-Volt Low Voltage Station Service Switchgear Breakers for SQO and SQ1, and SH, CQ, and SU Switchgear. These breakers and switchgear provide reliable redundant power to the electrical distribution systems. The switchgear and breakers that are to be installed as part of this project will provide adequate Arc Flash/blast (a type of electrical explosion) protection to operators and maintenance personnel in accordance with National Fire Protection Association 70E (Standard for Electrical Safety in the Workplace) to avoid electrocution hazard and allow equipment testing in accordance with Institute of Electrical and Electronics Engineers (IEEE). This project will also improve monitoring, testing, and reporting data about the functionality of the switchgear and breakers and ensure continued

compliance with current North American Electric Reliability Corporation and Western Electricity Coordinating Council reliability and safety requirements.

Certain components of the Governor Oil Pump System will be upgraded, including the motors, starters, cabling, and the addition of a transformer. Additionally, the voltage of the Governor Oil Pump System is being converted from 4160-Volt to 480-Volt. This conversion and the upgrades will improve safety conditions for Corps staff by reducing the voltage of equipment they are tasked with maintaining, improving system reliability by replacing equipment, and increasing operational flexibility by providing the capability to isolate each pump from the electrical system to perform maintenance work. The current configuration requires removing two to four hydropower generating units from service to perform maintenance or repairs, which limits operational capacity.

The Capital Workgroup approved the Corps' request for additional funds in order to complete design and to award and execute a construction contract to complete the recommended alternative. Prior approval by the Capital Workgroup was for funding estimated to be sufficient to complete the design efforts for this project and not the total project cost.