BUREAU OF RECLAMATION

FY 2024 Science and Technology Facilitated Adoption Projects

Development and Refinement of Rotor Turning Device for Safer and More Efficient Maintenance and Diagnostic Tasks, Year 1 Funding: $215,000

This project demonstrates the commercial grade device for turning rotors developed through an internal Reclamation research projects for use within Reclamation facilities. This project will expand the number of Rotor Turning Test Suites (RTTS) devices to additional facilities or regions, train facility personnel, and include an internal Operations & Maintenance workshop. Implementation of this device will improve bearing alignment and signal mapping and reduce the need for human intervention to manually turn rotors.

Evaporation Monitoring at Lemon Reservoir and Lake Nighthorse, Year 1 Funding: $195,767

The purpose of this project is to establish local evaporation monitoring stations to inform operational planning and decision making. Buoy based weather stations are deployed on Lake Nighthorse and Lemon Reservoir located in the Upper San Juan Mountains of Colorado to estimate reservoir evaporation rates using instrumentation and technology demonstrated in previous research. Observations collected at the buoys, including air temperature, relative humidity, water surface temperature, wind speed, and surface pressure used to estimate daily reservoir evaporation rates. These evaporation rates will be used by water managers in the Western Colorado Area Office to inform reservoir operations and by the Colorado River Basin Forecast Center to refine the inflow forecasts they provide to Reclamation going forward.

Demonstration and Use of Advanced 3D Measuring Techniques Using Portable Laser and Arm Technology, Year 1 Funding: $104,000

Laser metrology has untapped potential across Reclamation in applications of reverse engineering, component alignment, verification of contractor work, and in quality control for laboratory tests. The goal of this project is to implement the use of laser metrology at hydropower facilities and demonstrate the diverse benefits this technology has to offer in accomplishing Reclamation's Hydropower objectives. Over the course of this facilitated adoption, pre- and post-teardown metrology measurements will be collected to ensure correct unit placement, reverse engineering of components for FEA analysis, and pre- and post- weld repair scanning for distortion estimation.

Evaporation Monitoring on Lake Powell for Water Management: $167,591

Evaporation is a highly uncertain component of water budgeting and modeling efforts at Lake Powell. To improve estimates from the reservoir, a targeted in-situ evaporation study from 2017 to 2024 was completed. The intent of this Facilitated Adoption project is to continue over water data collection at Lake Powell, leveraging tools, team, and equipment already in-place, to support in-situ evaporation monitoring on the reservoir over the next three years. This project supports on-going modeling and reporting requirements, including consumptive use and loss estimates, and provide critical information on evaporation and water quality dynamics at Lake Powell.

Turbine Air Injection Testing and Implementation, Year 1 Funding: $175,000

Turbine air injection has proven successful in reducing rough zone range and vibration magnitude on units in Grand Coulee's Washington Powerhouse under prior Reclamation research projects. This facilitated adoption proposal aims to expand turbine air injection to additional Reclamation facilities through testing and data analysis to assess turbine air injection benefits at up to three Reclamation facilities in separate regions. Once testing is completed, one air injection system will go through design, control system supply, and commissioning for one facility.

Evaluation and Validation of Fatigue on Aging Hydro Mechanical Components using Finite Element Analysis, Year 1 Funding: $156,979

The objective of this project is to better predict equipment failures, identify high stress concentrations, and extend equipment fatigue life by expanding Finite Element Analysis capability for assessing hydropower mechanical components. Prior Reclamation internal research resulted in the creation and analyses of models spanning trust brackets, shafts, and mechanical seals. This project continues to develop Reclamation core technical capability in modeling, analyzing, and predicting fatigue life in hydropower mechanical components across Reclamation assets.

Demonstration of Robotic Vehicles for Inaccessible Metallic Pipe, Year 1 Funding: $195,752

Traditionally, inspection of penstocks and outlet works at Reclamation has been completed by humans using rope access techniques where necessary. Robotic crawlers and submersibles offer the ability to physically collect information in these structures remotely without putting humans at risk. This project demonstrates robotic inspection vehicle solutions for visual and quantitative condition assessment of the lining of steel structures. A secondary objective is to develop the capability for Reclamation to perform these inspections in-house at other facilities.

Utilizing satellite imagery to document increasing sedimentation at Reclamation reservoirs, Year 1 Funding: $203,942

All rivers transport sediment. Over time, the volume of sediment increases and the available water storage decreases. Projecting the rate of reservoir capacity loss is critical to understanding Reclamation's current and future ability to deliver water and produce hydropower. This facilitated adoption project implements indirect and inexpensive measurements of sedimentation at Reclamation Reservoirs using satellite imagery to measure above-water sedimentation.

Refurbishment of Small Diameter Embedded Pipes in Powerplants and Dams, Year 1
Funding: $135,990

As Reclamation infrastructure ages, options for refurbishment of embedded small diameter piping are being explored. The Pipe Packer is a viable option to structurally repair a variety of damage in hard to access small diameter pipe. For this facilitated adoption, an 8-to-12-inch diameter Pipe Packer repair tool will be purchased and used to demonstrate the repair procedure in a discharge tube drain line, and concurrently train facility staff in this technique and troubleshoot any problems that arise. Successful demonstration and implementation will reduce facility downtime.