



— BUREAU OF —
RECLAMATION

Research and Development Office

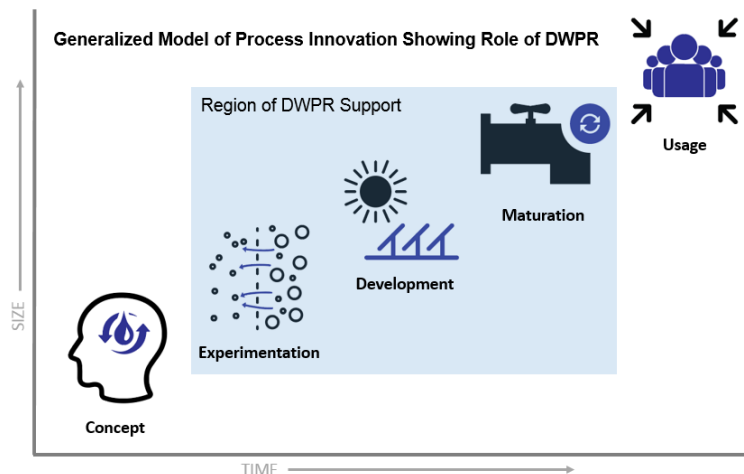
FY 2019 Highlights



Reclamation's Research and Development Office

The Research and Development Office (R&D) applies technology and science to advance the agency's mission to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. R&D's two programs, Desalination and Water Purification Research and Science and Technology address the technical obstacles related to our mission. Learn more at: <https://www.usbr.gov/research>.

Desalination and Water Purification Research (DWPR)



Reclamation's DWPR Program seeks to reduce the cost, energy consumption, and environmental impacts of using desalination and other water purification technologies to develop water supplies from otherwise unusable sources (e.g., brackish groundwater, sea water, produced water from oil and gas extraction, municipal wastewater).

These are some of the challenges and solutions proposed by FY 2019 funded projects:

Challenges being addressed:

- Harmful algal blooms
- Silica pretreatment
- Energy and cost reduction of desal
- Concentrate management

Solutions proposed:

- Innovative nanotechnology treatment systems
- Enhanced evaporation innovative approaches
- Solar desalination
- Forensic investigations of membranes in potable reuse applications to reduce cost

DWPR Projects FY 2019 By the Numbers

- 140 Applications
- 37 Awarded Grants
- \$6M Federal Funding
- \$6M non-Federal Match

Brackish Groundwater National Desalination Research Facility

The DWPR program funds the operation and maintenance of the Brackish Groundwater National Desalination Research Facility (BGNDRF), located in Alamogordo, New Mexico, a focal point for developing technologies for the desalination of brackish and impaired groundwater found in the inland states.

BGNDRF brings together researchers from Federal government agencies, universities, the private sector, research organizations, and state and local agencies to work collaboratively and in partnership.

Since 2017, the facility has operated at full client capacity. In FY 2019 it hosted four major events and over 1,000 visitors toured the facility.



Science and Technology Program (S&T)

The S&T program funds innovative development, applied and demonstration research addressing the full range of technical issues confronting Reclamation water and power managers, customers, and stakeholders. Program research is funded in five areas:

- Water Infrastructure (WI)
- Power and Energy (PE)
- Developing New Water Supplies (WS)
- Environmental Issues in Water Delivery and Management (EN)
- Water Operations and Planning (WP)

For the projects highlighted below, “ROI” is estimated as the return on investment reflecting non-federal cost share to-date and estimated benefits during conservative level of adoption.

**S&T Projects
FY 2019 By the Numbers**

- 184 Active Projects
- 47 Completed Projects
- \$12.5M Federal Funding
- \$11.8M non-Federal Match

WI: Unmanned Aerial Systems (UAS) Data Collection

Problem
Data collection quality and safety

Solution
UAS for condition assessments and inspections

Impact
High quality data collected more safely

Cost: \$487,736
ROI: 6.2



Reclamation's UAS fleet supports condition assessments and inspections.

PE: Machine Condition Monitoring (MCM)

Problem
Generator maintenance and outage costs

Solution
Online MCM to improve maintenance scheduling

Impact
Reduced outages and increase reliability

Cost: \$997,000
ROI: 12.8



MCM helps Reclamation reduce outages and increase reliability.

WP: Invasive Mussel Open Access Data

Problem
Data availability to inform models

Solution
Open access database

Impact
Improved mussel establishment prediction

Cost: \$249,496
ROI: 2.0



Zebra mussel cluster.

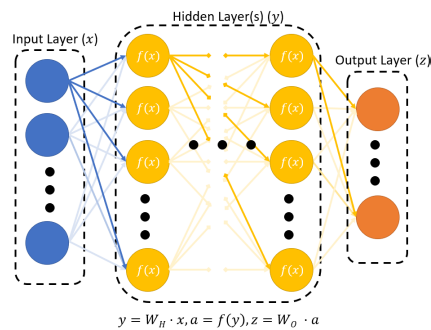
EN: Artificial Neural Network (ANN) for Temperature in Operations Planning Models

Problem
Model limitations for temperature when allocating water

Solution
Use ANN to improve model

Impact
Optimized water allocations

Cost: \$135,000
ROI: 4.0



ANN schematic.

WS: Concentrate Management Toolbox

Problem
Concentrate waste disposal from water treatment facilities

Solution
Compare methods to improve decision making

Impact
Increased water supplies by removing concentrate disposal barriers

Cost: \$324,003
ROI: 13.7



Water treatment membranes.

S&T Technology Transfer

The S&T Program pursues a variety of joint venture research partnership agreements by leveraging Technology Transfer (TT) with the private sector.

This includes Cooperative Research and Development Agreements (CRADA), Materials Transfer Agreements (MTA), and Facility Use Service Agreements (FUSA), among others, where industry plays a role in maturing and transforming research results into usable, manufactured products that can be supplied to Reclamation and the broader water management community.

TT Activity Summary FY 2019 By the Numbers

- 2 CRADAS
- 7 MTAs
- 12 Active Patents with
- 4 License Agreements

TT: New Detection Technology in using Patch Antennas in Corona Mapping and Other Partial Discharge in Hydropower Rotating Machines

Problem

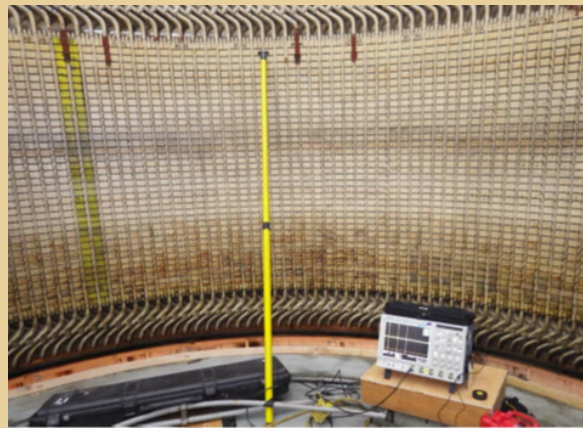
Current existing detection technologies to measure partial discharge in rotating machines are cost prohibitive and have high voltage safety risks.

Solution

New detection device, patch antennas will allow diagnostic tests to be performed routinely, and data could be trended that can result in a drastic reduction in unplanned machine failures and associated outages could potentially be prevented.

Impact

Reclamation has filed a provisional patent for this new partial discharge detection device and is currently seeking research partners to mature and commercialize. This new technology can have significant cost savings and improve safety throughout the power generation industry.



S&T Prize Competitions

Reclamation continues to use prize competitions to harness the innovative capacity of the public and private sector to solve problems related to Reclamation's mission and stakeholder interests.

In FY 2019, Reclamation launched its first two competitions through its newly established relationship with NASA Center of Excellence for Collaborative Innovation (see image below).

Reclamation is now reaching the international community of solvers for more complex challenges.



Prize Activity FY 2019 By the Numbers

- 4 Launched
- 5 Completed
- 200 Solutions Received
- 33 Solutions Paid
- \$327,500 Awarded

Prize competitions complement traditional research by providing another tool to help find breakthroughs or overcome technical obstacles and complexities. Reclamation is working internally and with prize winners to further develop solutions received from completed competitions including eradication of mussels in open water and preventing or deterring burrowing animals for earthen canal embankments.