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Irrigation Modernization



Department of Energy National Laboratory System



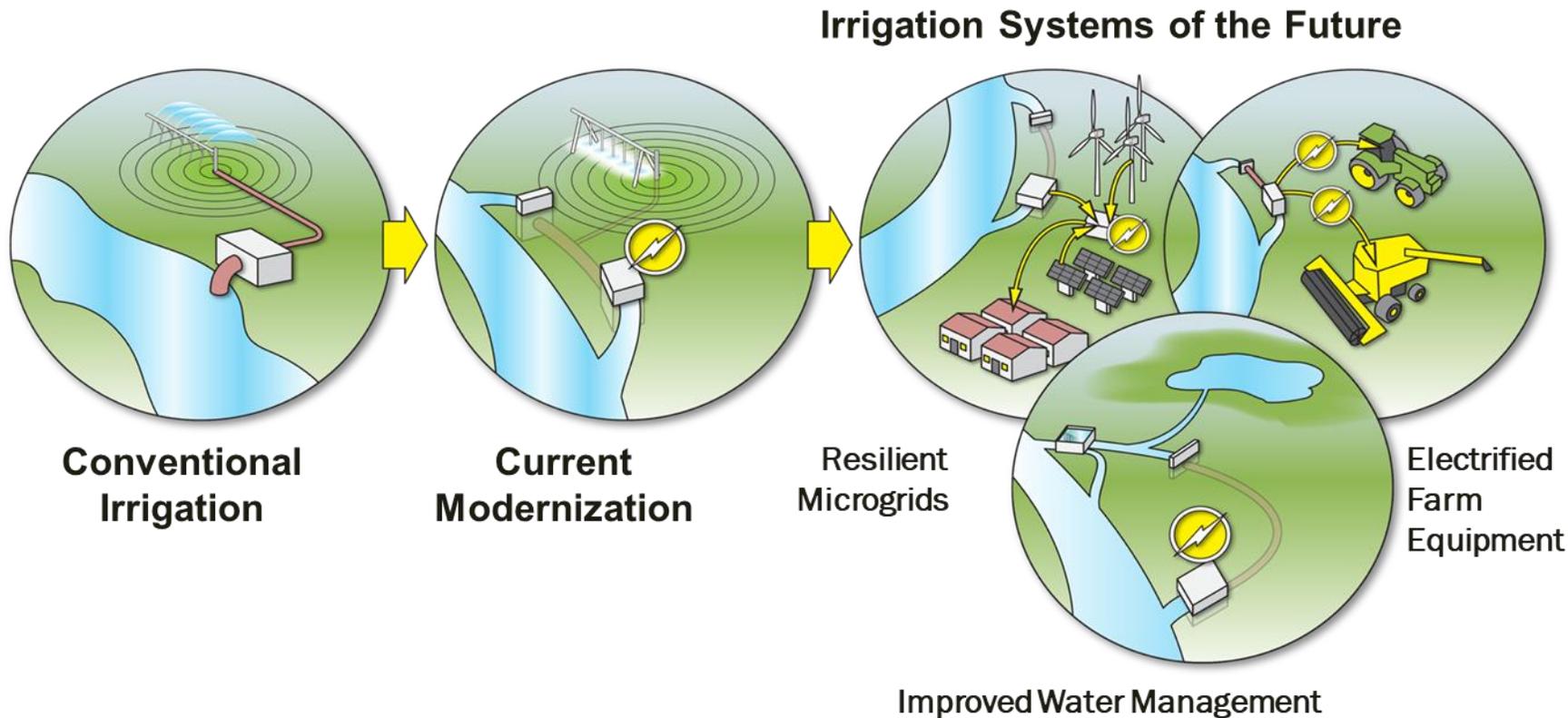
Idaho National Laboratory

“Our vision is to change the world’s energy future and secure our nation’s critical infrastructure.”

- Integrated Energy Systems
- Nuclear Energy
- Homeland Security

Leveraging scientific investment of WWII, 17 national laboratories have been leading innovation for 60 years.

DOE Recognizes Opportunities for Energy Projects In Irrigated Agriculture and Irrigation Modernization Projects



Energy Potential: Generation

- Hydropower
- Solar
- Distributed Wind
- Microgrids
- Battery Integration

Efficiency

- Piping and Lining Canals
- Pump Upgrades

Others?

While systems are modernizing perhaps there are opportunities for energy projects?

DOE Acknowledges Significant Hurdles to Incorporating Energy Projects into Irrigated Agriculture Systems



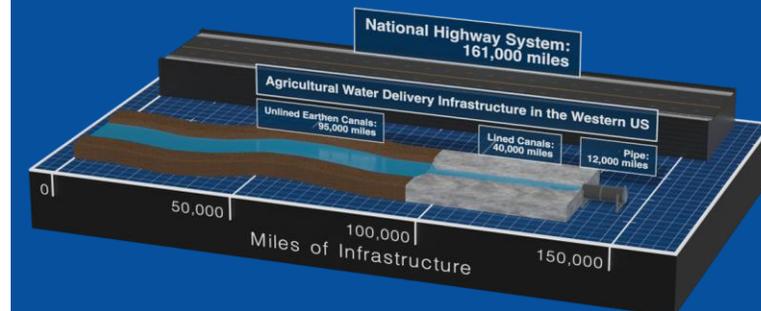
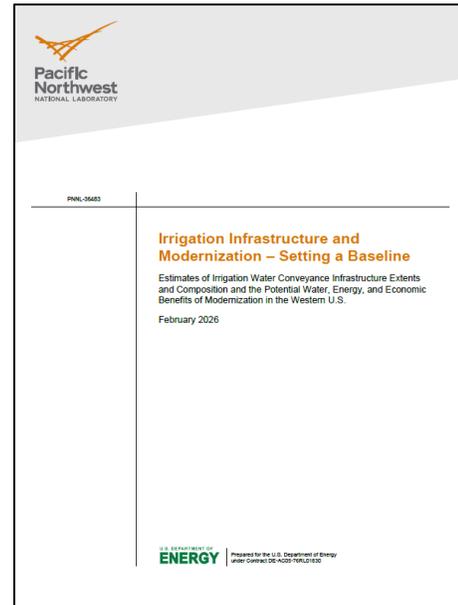
Hurdles

- Resource awareness
- Pre-planning
- Funding
- Permitting
- Interconnection
- Distance to transmission is cost prohibitive

Most irrigation infrastructure lacks power generation capability. Why?

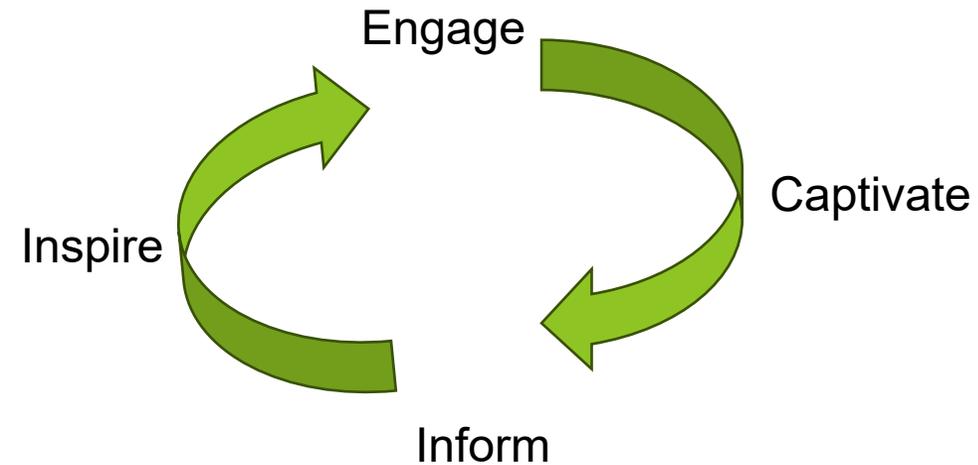
Developing Innovative Solutions

- **Tool Development**
 - IrrigationViz
 - High-Level Energy Estimates
 - AI Canal Mapping Capability
- **Reporting/Data Analysis**
 - National Resource Assessments
- **Engagement**
 - Stakeholders
 - Direct/Indirect Technical Assistance
 - Awareness



Mini Hydropower in Irrigation Canal Display

Demonstrates hydropower generation in an open canal system



Interactive gate shows influence of flow on power generation



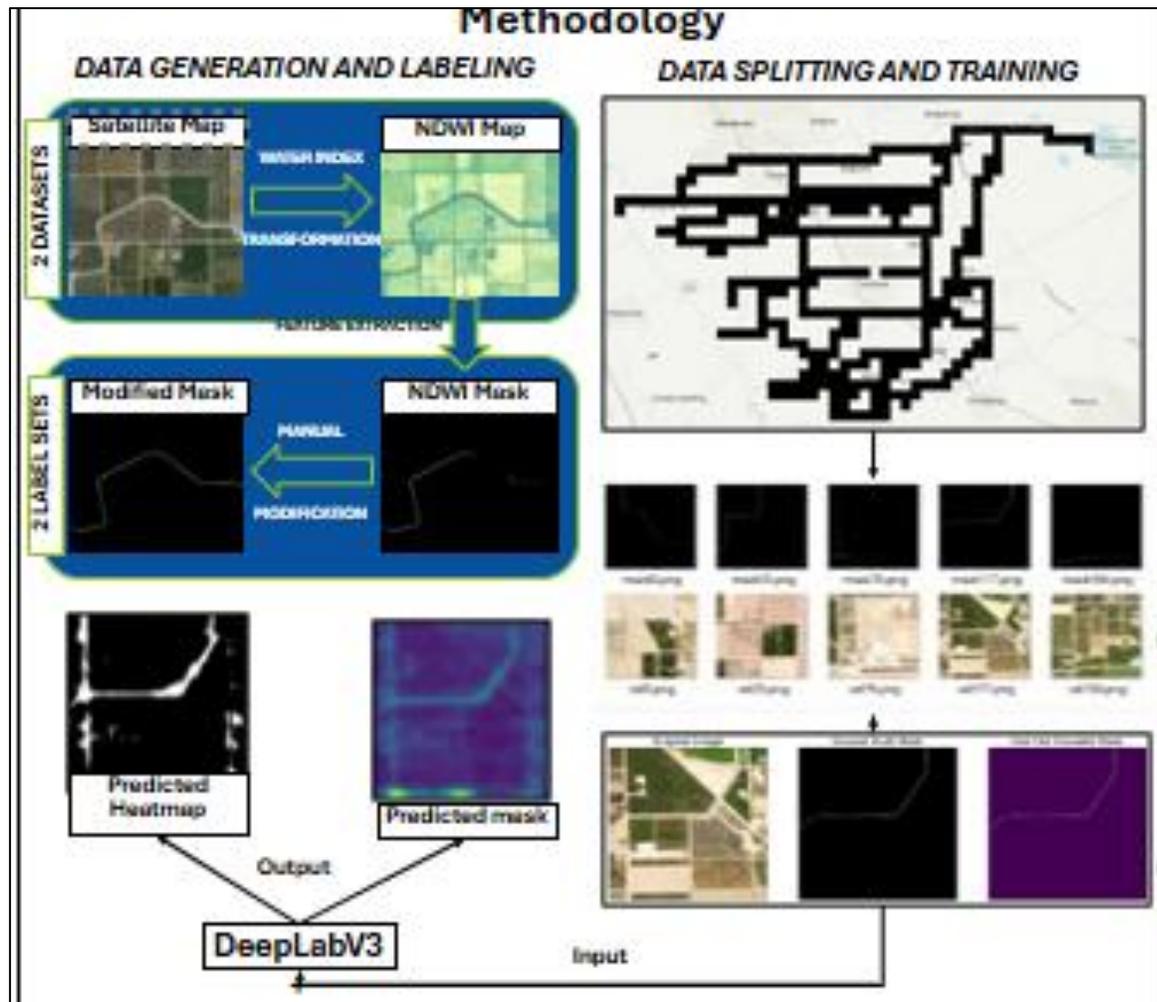
STEM Nights

ASME Turbine Design Contest

Inspiration to Irrigators?



AI Mapping of Irrigation Canals to Automate Canal Mapping



Automated Mapping

- Uses high-resolution satellite imagery and computational tools to speed up modernization projects.
- Traditional methods are costly and time consuming.
- We need MORE DATA!

Reach Out!

Case Studies/Technical Assistance (TA)



Follow projects to show successes and wins to enable other projects and break down barriers.

TA Scope

INL and PNNL can provide TA through lab staff to support irrigation modernization projects with connections to energy.

Reach Out!

Currently looking for systems interested in battery/distributed energy projects

Medford
Irrigation District
Floating Solar Project

 Project Area
 Existing pipe


0 125 250 Feet
Source: FCA, NHD, ODOT
MID Floating Solar.mxd 6/8/2023

This map compiled by FCA as a visualization tool and not intended for legal purposes. FCA is not liable for damages caused by omissions or errors in data displayed herein.

IrrigationViz: Pre-planning Tool



IrrigationViz: Project Scoping & Visualization tool

- Quickly estimate:
 - Conduit hydropower
 - Other renewable energy opportunities
- Visualize:
 - Canal / pipe systems
 - Piping and other projects

IrrigationViz

Plan, model, and compare projects to your irrigation system with decision support visualization software developed by US DOE

- ⚡ Estimate conduit hydropower generation
- ☀️ Estimate ground-mount or floating solar generation
- 🔧 Visualize piping and lining projects
- 📍 Map existing or planned water conveyance infrastructure

[Try IrrigationViz Now](#)

↑ Piping Project - Canal Subsection

WATER SAVINGS	ANNUAL SAVINGS	PROJECT COST	BREAK EVEN
800 acft/yr	\$110k/yr	\$2.1M	19.1 yrs

[Compare](#)

<https://irrigationviz.pnnl.gov/>

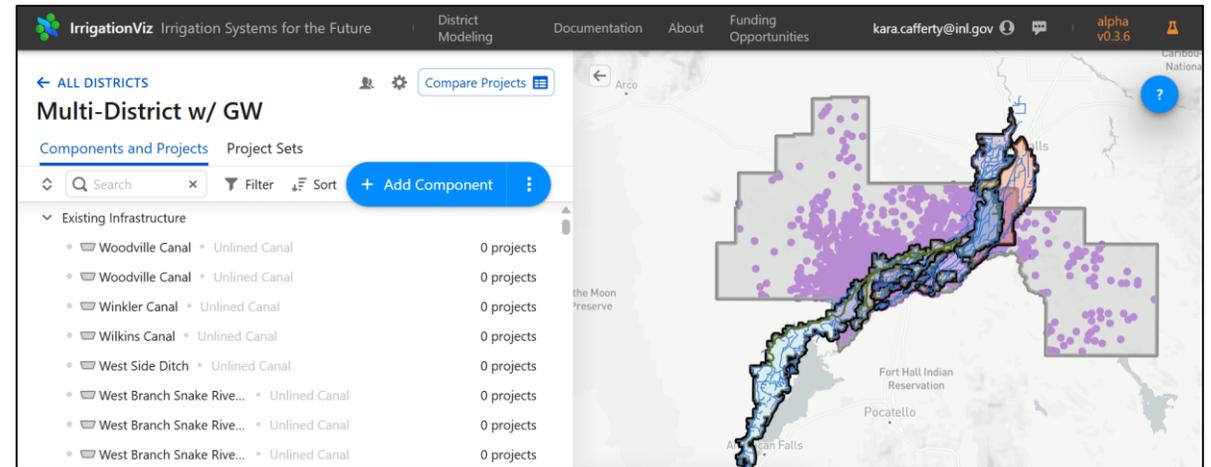
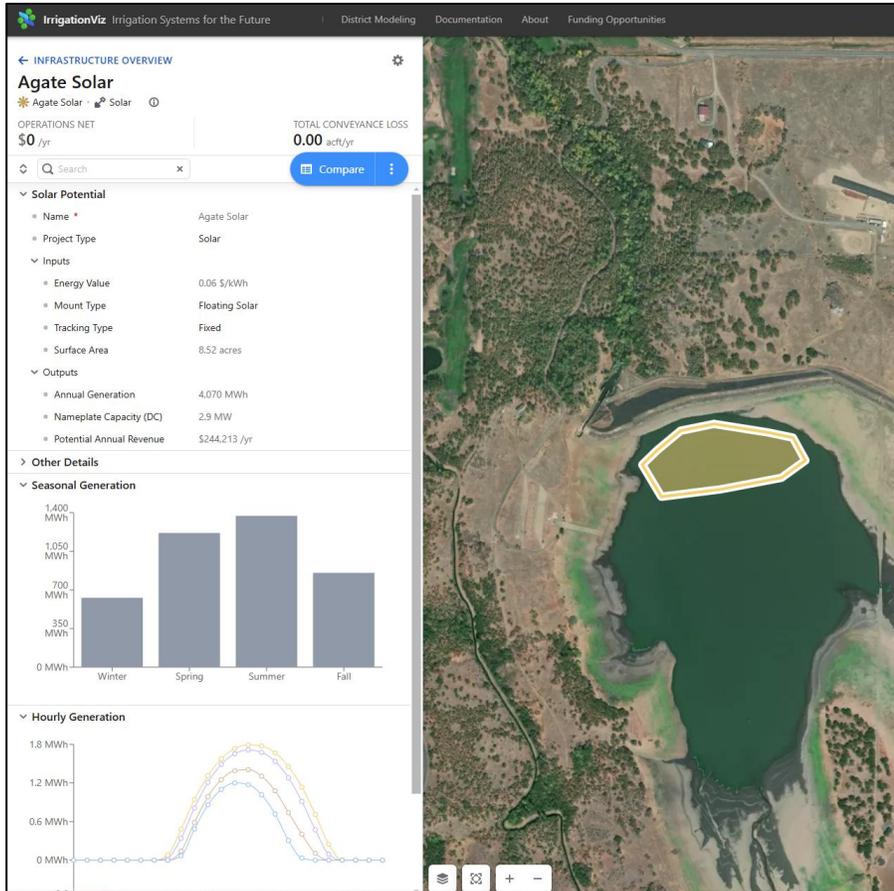
Features

- Free
- Web-based
- Real World Tested
- User “Friendly”
- No GIS experience or files required
- “Kick the tires analysis”
- Does not replace engineering design

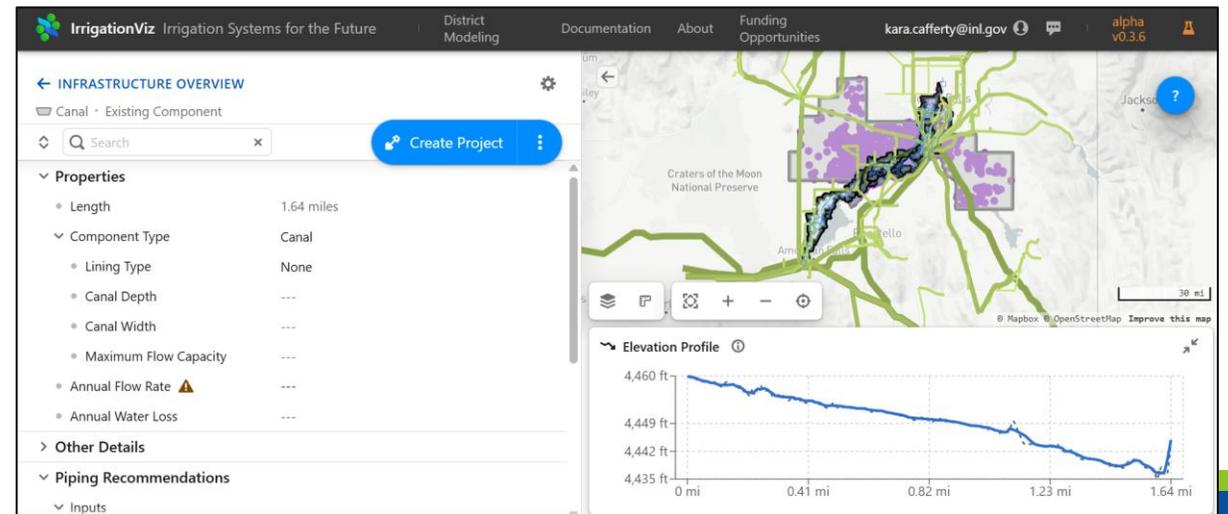
Ready for Users!!!

New Features!

Boundary and point capability to allow multiple districts and point files.



Transmission lines greater than 75KV.



Includes other distributed energy power generation calculations



LIVE DEMO