Accelerating Irrigation Systems of the Future

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Improved Water Management

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• Opportunities from irrigation modernization (Thomas)

• IrrigationViz, a master planning tool (James)

• Irrigation and watersheds (Thomas)

• Discussion (what insights are needed?) (Thomas)

Given that this group is broader than just irrigators:

• What insights do you need about irrigation to inform other water use decisions?

 What insights from other watershed decisions should be incorporated into a tool like IrrigationViz?

4 | Water Power Technologies Office

eere.energy.gov

Federal investment in water enabled the West as we know it

- **Example:** Minidoka Dam in SE Idaho enabled agriculture, electricity, commerce, and recreation for the region.
- Reclamation projects provide water to one-third of the population of the American West.
 125.000 irrigated acres





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Benefits of investing in aging infrastructure

- Operations and maintenance is expensive Modernization reduces these costs
- Loses 30 to 80 percent of water Modernization enables more water to be left in rivers
- Requires extensive pumping Modernization reduces costs and diesel consumption
- And the list of benefits goes on...



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Irrigation is 37 percent of all water use in the U.S.

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- Irrigation uses 846 million gallons per day.¹
- Crops from irrigated land are ~50% of crop market value in U.S. (\$106B in 2012)



Irrigation water use by State (size proportionate to use)

Re-investment in irrigation systems can achieve diverse benefits

- Rural economies More revenue for farmers; well-paying, multi-year construction jobs; increased recreation opportunities
- Environment Increased water for fish and other species; pollinator corridors; less chemical use
- Renewable energy Increased opportunity for hydropower and solar PV; local energy ownership and benefits
- Climate Lower carbon agriculture; increased water supply reliability

Annualized average value for two case studies		
	Central Oregon includes hydro	East Fork
Reduced district OMR	\$70,000	\$248,000
Reduced patron OMR (total)	\$810,000	\$347,000
Increased agricultural income (total)	N/A	\$1,516,000
District energy generation	\$2,378,000	N/A
Environmental benefits	\$6,097,000	\$295,00
Per district subtotal	\$9,600,000	\$2,445,000
Per patron subtotal	\$437	\$1,882

The roles and opportunities for energy generation are changing

- Small hydropower used to enable modernization through generation revenue.
- Today, energy solutions involve a mix of generation types and offer diverse values.



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Design stage planning is critical first step to modernization, but also a challenge

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- Expensive

~\$100K to do master planning study

-Requires specialized knowledge

Irrigation district managers know their systems best, but may want help analyzing modernization options

Many, diverse stakeholders No simple, user-friendly tool to communicate across perspectives

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Recap: overcoming barriers to modernization can create diverse benefits

- Our irrigation systems are already creating enormous value to individuals, communities, and our Nation
- They're also past their design life
- Reinvestment can achieve diverse 21st century objectives:

Sustainable water resources

- Secure water resources for agriculture and enhance community and environmental benefit
- Adapt to unavoidable
 impacts of climate change

Community wellbeing

- Increase agricultural revenue
- Create multi-year well-paying jobs
- Reinvest in rural communities
- Promote environmental justice and sustainability

Decarbonization

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Generate community-owned
 renewable energy

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- Enable precision and lowcarbon agricultural practices
- Reduce fuel consumption
- Increase energy efficiency for farmers and ranchers

IrrigationViz Web Interface





IrrigationViz helps solve challenges



- Quantify benefits of irrigation system reinvestment tradeoffs
- Enable robust conversations around multiple modernization pathways
- Identify commonalities and opportunities for scaling-up benefits across Western U.S.

Return on Investment Crop Yield Energy Production

Water Loss Herbicide Use Pumping Loads

IrrigationViz









Pacific Northwest

DEMO

IrrigationViz Benefits



Project Planning: Pre-engineering estimates Reduces cost/time

Standardized estimates for project benefits



Insights for project selection, funding application

Facilitates informed dialog among diverse stakeholders

Continued module development

e.g. Groundwater recharge, recreational benefits

Further customization e.g. additional user inputs and overrides

Comprehensive Planning e.g. Master planning, full district analysis

Recap





Tension between different uses of water continues, and will likely persist

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Tensions escalate in Klamath Falls as southern Oregon water crisis deepens





Hoover dam reservoir and water for US west

Modernization is especially critical in this context

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USDA Invests in Innovative Management of California Water Supply





Investment is also reducing ground water depletion in Arkansas



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Send us a note if you have questions!

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Idaho National Laboratory