Overview of Water Reuse Challenges and Opportunities

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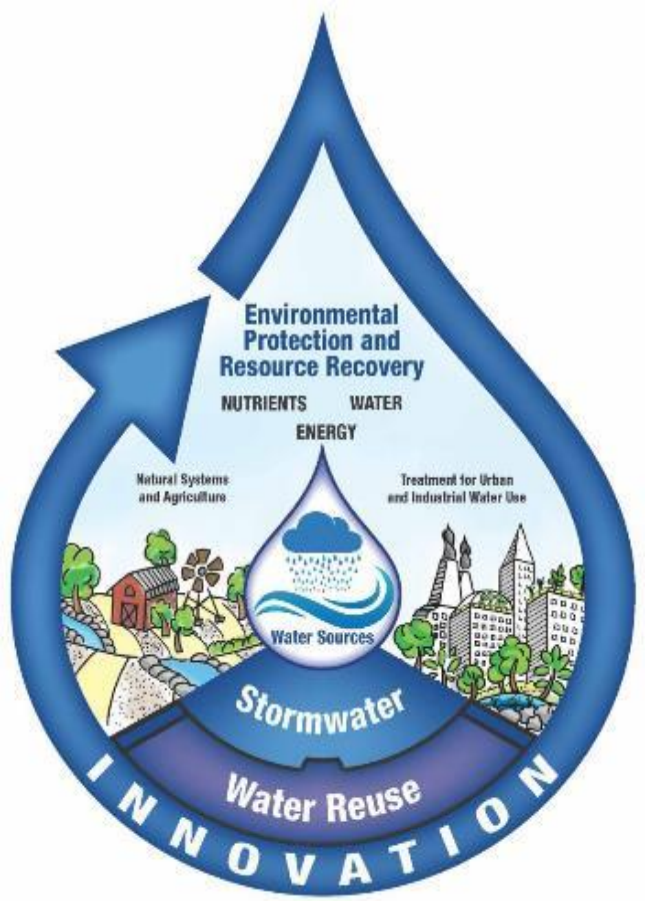
STAR Grant Kickoff Meeting
October 26, 2016

About Water Environment & Research Foundation



WERF and WRRF merged in May 2016

WE&RF: *Dedicated to research on renewable resources from wastewater, recycled water, and stormwater while maintaining the quality and reliability of water for the environment and communities.*

New Focus: One Water.

WateReuse brings recycled water, desalination and related topics.

WERF brings wastewater, resource recovery, stormwater, receiving waters, climate change, and integrated water.

WATEREUSE

WERF
Water Environment Research Foundation
Collaboration. Innovation. Results.

About WE&RF

501(c)(3) nonprofit located in Alexandria, VA

1989-2016: Research portfolio

- >$200 million on water, wastewater, recycled water, and stormwater

Research organization

- >400 subscribers
- Partners: U.S. EPA, DOE, Bureau of Reclamation, CA State Water Board, other states
- 30 staff members (over half manage research)
- Broad focus on integrated water research

Research Programs

- Solicited
- Unsolicited
- Tailored Collaboration and Subscriber Priority Programs
- Partnership Program

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What does WE&RF do?

Deliver Balanced Research

- Manage peer-reviewed research to deliver timely, actionable results

Foster Innovation

- Convene experts and support research to accelerate the adoption of new water technologies

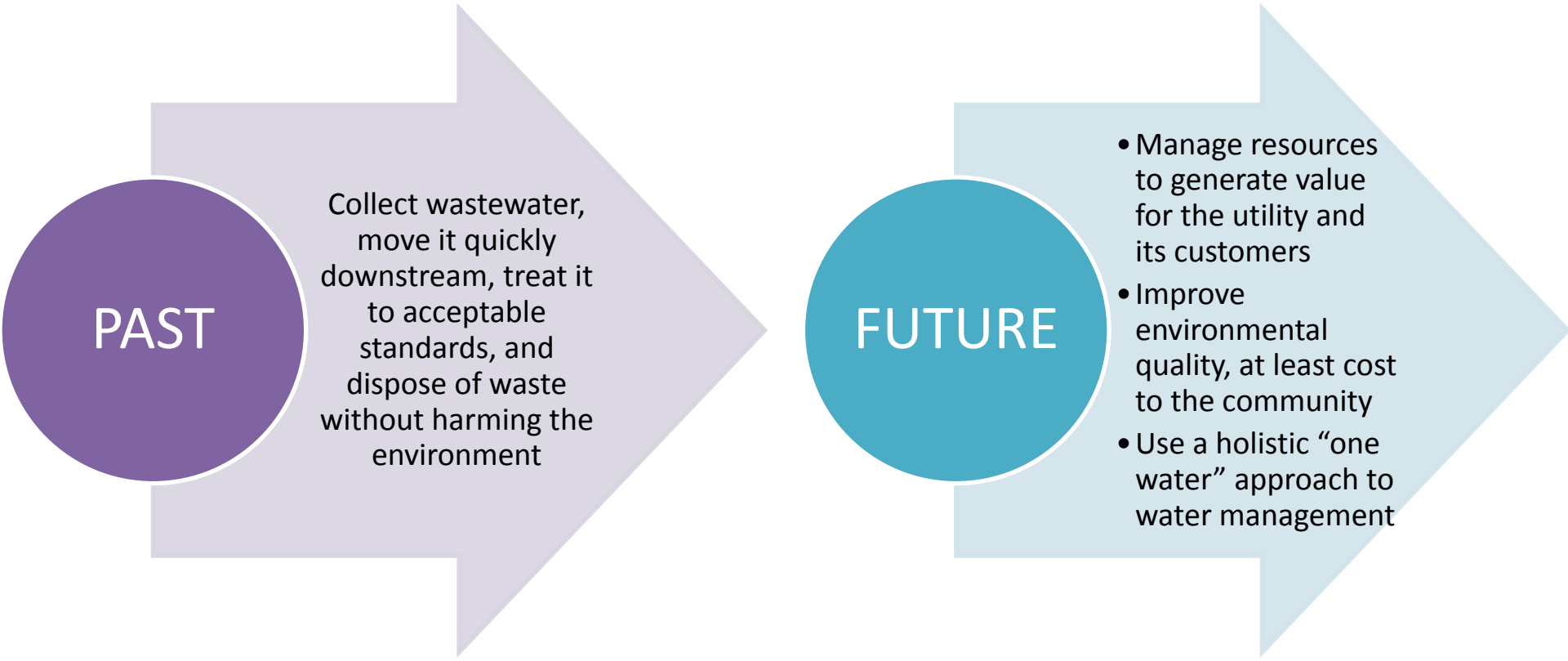
Create Collaborations

- Serve as a research hub for the water quality community (utilities, policy makers, consultants, universities, and industry)

Disseminate Results

- 35-40 reports published annually that are housed in an online, searchable database

Bottom Line: Major Paradigm Shift



Areas of Research

- Asset Management
- Biosolids
- Climate Change
- Compounds of Emerging Concern
- Conveyance Systems
- Decentralized Systems
- Energy
- Integrated Water
- Nutrients
- Operations Optimization
- Pathogens & Human Health
- Receiving Waters
- Resource Recovery
- Security & Emergency Response
- Sensors
- Stormwater
- Water Reuse

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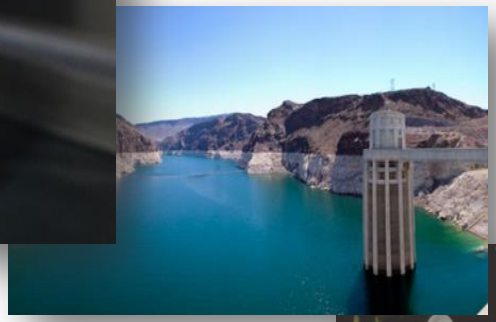
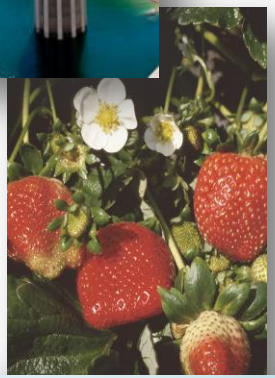
The Full Spectrum





Potable Reuse

Urban Irrigation

Fit for PURPOSE

Food Crop Irrigation

Industrial Reuse

Wetland/ Habitat Restoration

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Fit for Purpose
The right water for the right use

Agricultural Reuse

Great potential for enhanced utilization of recycled water

Ongoing research: WRRF-15-08 - State of Irrigated Agricultural Water Reuse - Impediments and Incentives

Upcoming research to identify existing uses, characterize potential, and develop strategies for overcoming barriers and incentivizing greater use of recycled water

Will evaluate existing governance frameworks and develop recommendations

New research: Evaluating Economic and Environmental Benefits of Water Reuse for Agriculture

Fit for Purpose
The right water for the right use

Industrial Reuse	Private businesses and government have different mandates and priorities	
	Different industrial sectors have different needs for water quality and quantity	
	Completed research seeks to bridge the gap between business and government as well as identify the similarities and differences between sector and end-use	WRRF-13-04 - Drivers, Successes, Challenges, and Opportunities of Onsite Industrial Water Reuse: a Path Forward for Collaboration and Growth
	Ongoing research to develop a framework for onsite reuse and a decision support tool for evaluating the economics of potential projects	WRRF-14-04: A Framework for the Successful Implementation of Onsite Industrial Water Reuse

Potable Reuse

Drivers

- Drought
- Increased Demand
- Lack of or contaminated local supply

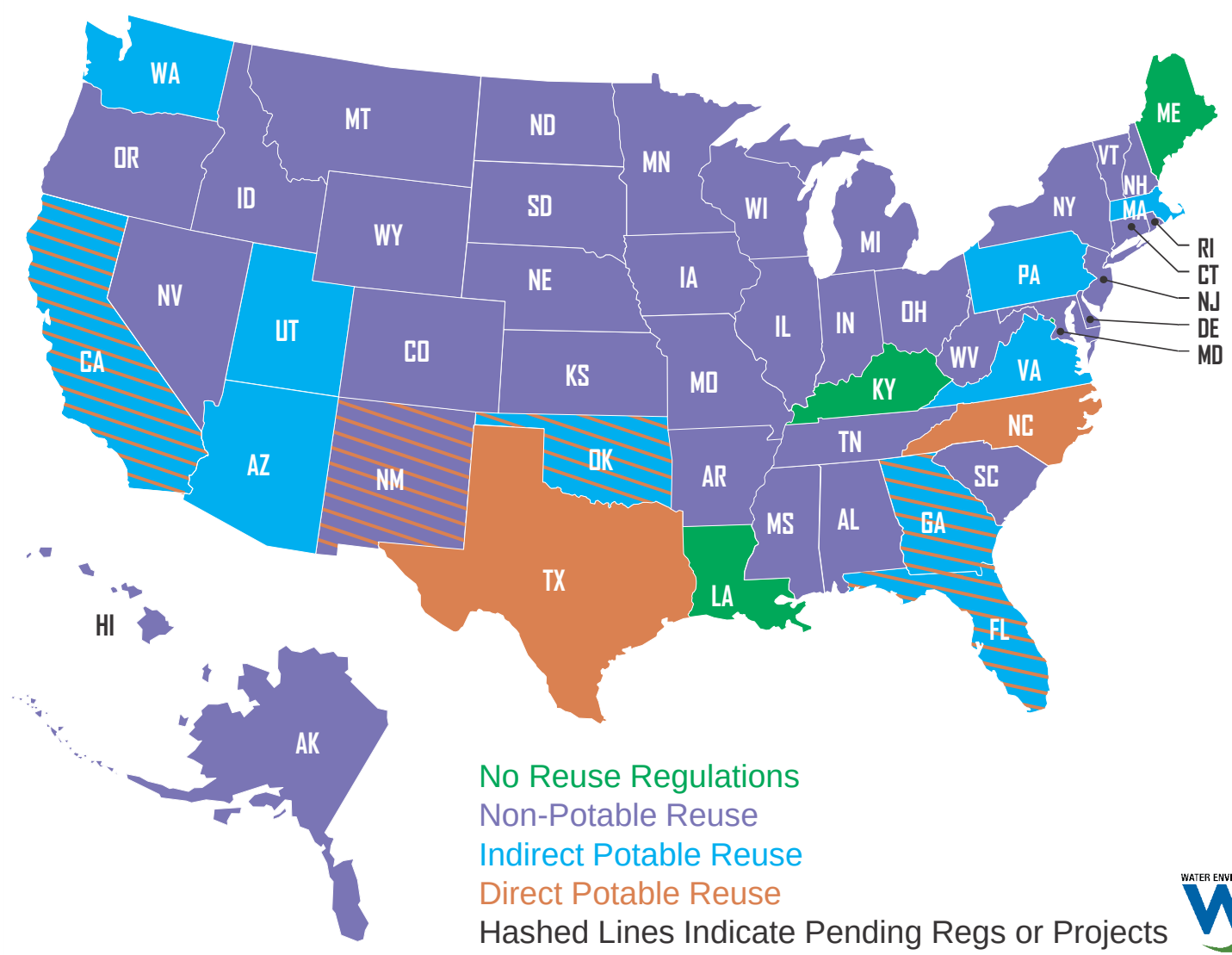
Potable Reuse is

- Safe
- Reliable
- Locally-Controlled
- Environmentally-Friendly

Tools to deliver

- Research
- Technology
- Sound Science
- Innovation

The "State" of Reuse: Developing Consensus on Public Health Protection



No Reuse Regulations
Non-Potable Reuse
Indirect Potable Reuse
Direct Potable Reuse
Hashed Lines Indicate Pending Regs or Projects

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DPR: The Key Questions

- **Treatment requirements**
  - Need for criteria for pathogen and chemical control
- **On-line monitoring**
  - Performance monitoring
- **Treatment technologies**
  - Defining reliability
- **Source control**
  - Managing the collection system
- **Operations and operators**
- **Response time** (respond to off-spec water)
- **Public acceptance**

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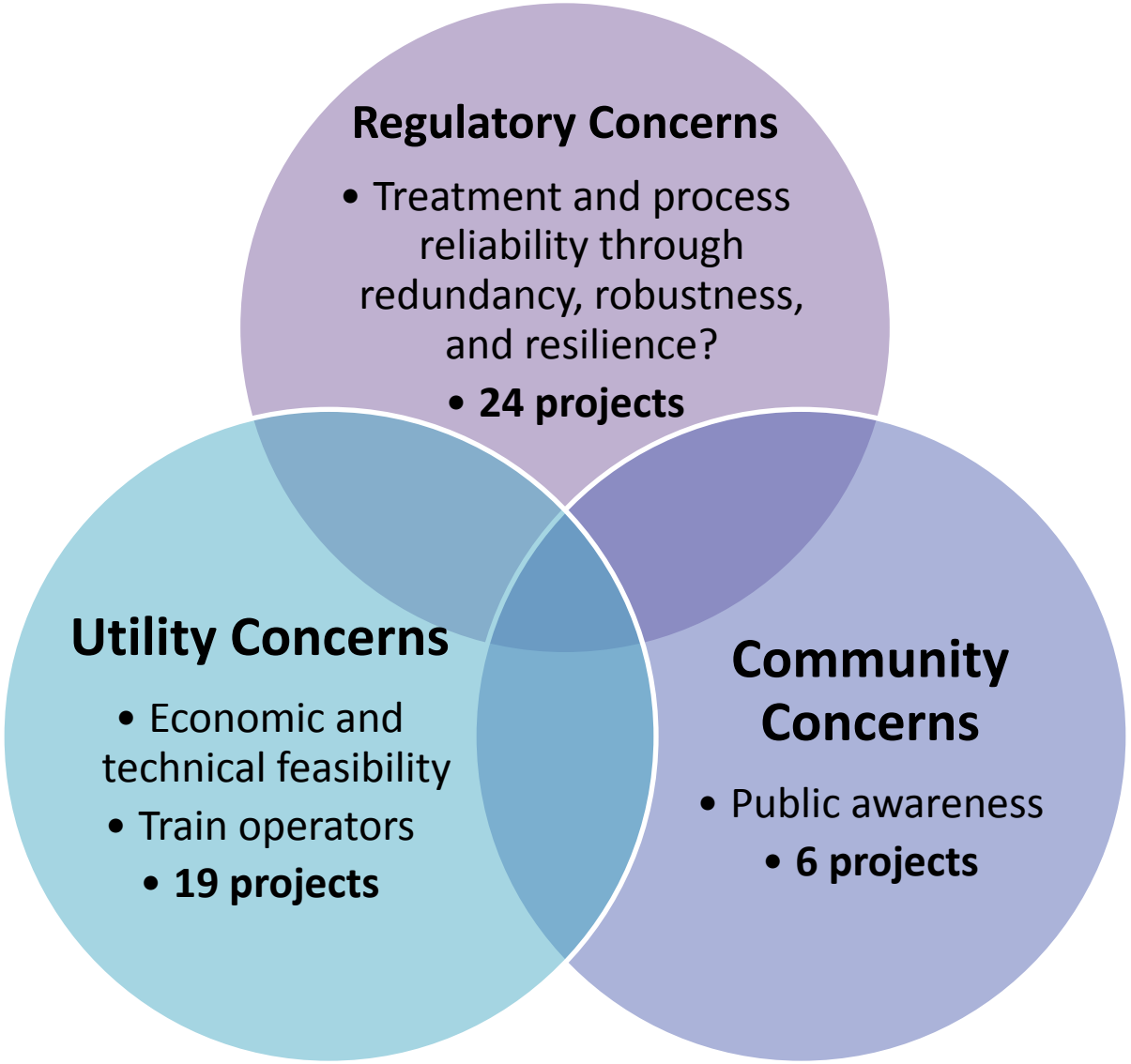
WateReuse DPR Research Initiative

- California: “Feasibility of developing criteria for DPR”
- $6M raised to the need to fill knowledge gaps – leveraged to $24M
- Funded 34 projects on topics
  - Reliability of treatment trains
  - Microbial and chemical water quality
  - Monitoring
  - Operations

“The Expert Panel is impressed by the research that has been funded by the WRRF and supports the continuation of such research.”

- June 30 letter to DDW from Expert Panel Chairs

DPR Initiative Research



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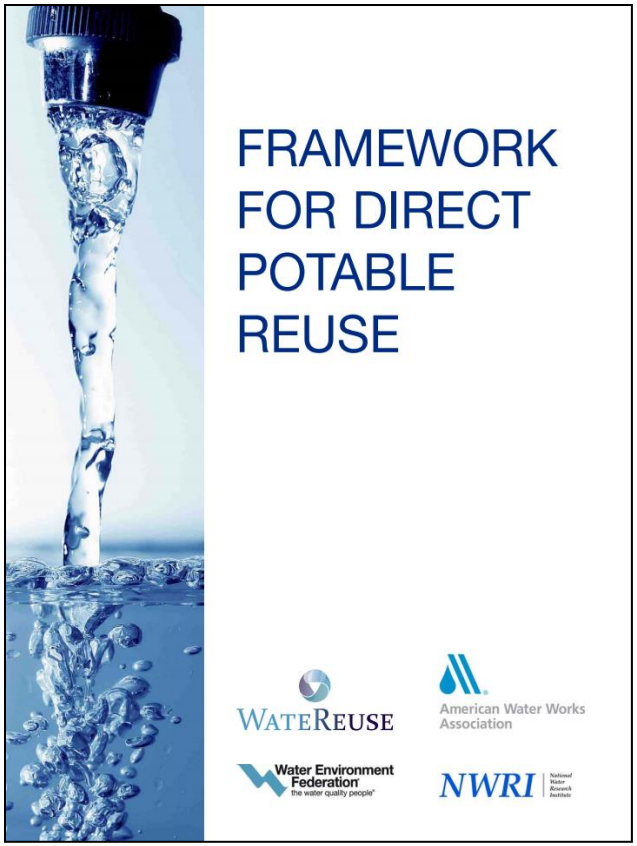
Project: Framework for DPR

WateReuse

Water Environment Federation
the water quality people

American Water Works Association

NWRI National Water Research Institute

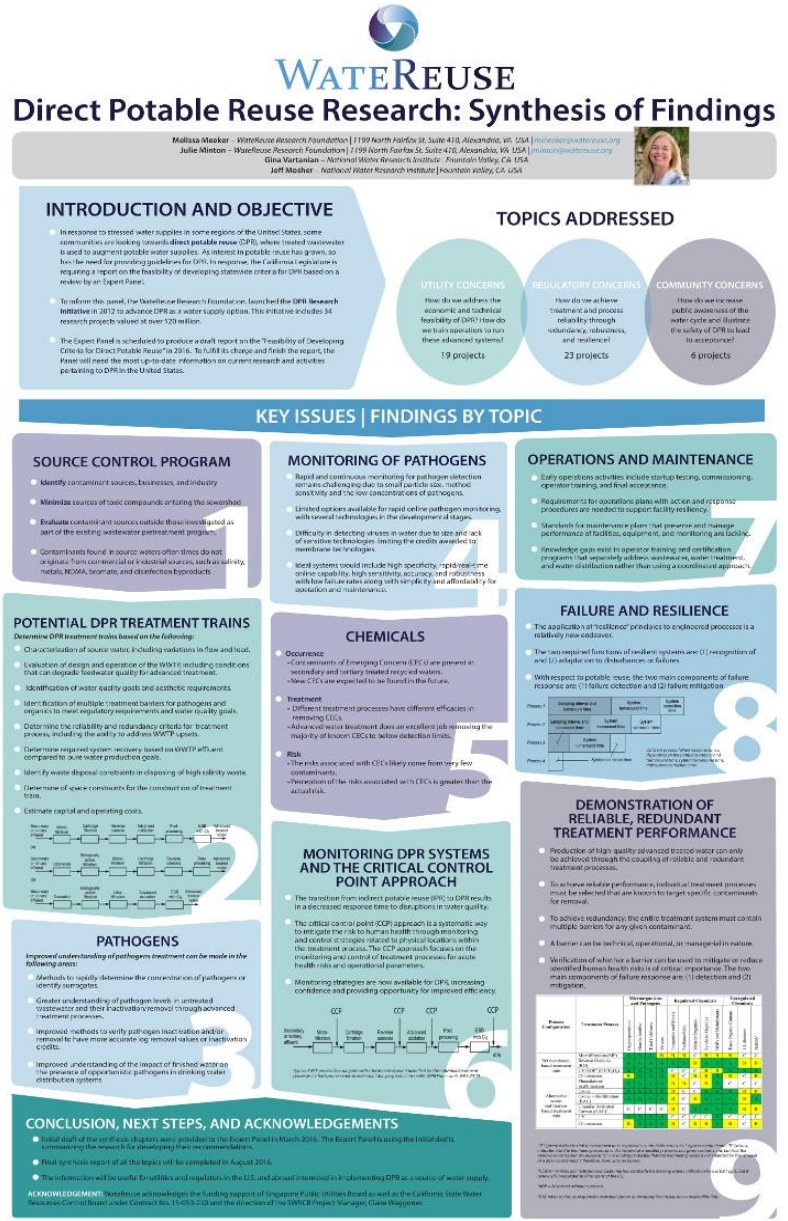


Purpose: To provide an overview of the key elements that make up a DPR program.

Coming Soon!

Potable Reuse Research Compilation: Synthesis of Findings (15-01)

This project summarizes and synthesizes the research results, pulling from outside research where needed, and package this information by topic into a cohesive document.



WRRF 15-01 Topics

Demonstration of reliable, redundant treatment performance	Critical control points	Operations, maintenance, training/certification
Pathogens: surrogates and credits	Pathogens: rapid/continuous monitoring	Failure and resiliency
Removal and risk of constituents of emerging concern	Evaluation of potential DPR trains	Source control

Recent CA Documents

- SWRCB Feasibility Report
- Expert Panel Report
- Advisory Group Report

Released on Sept 8, 2016:

http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/rw_dpr_criteria.shtml

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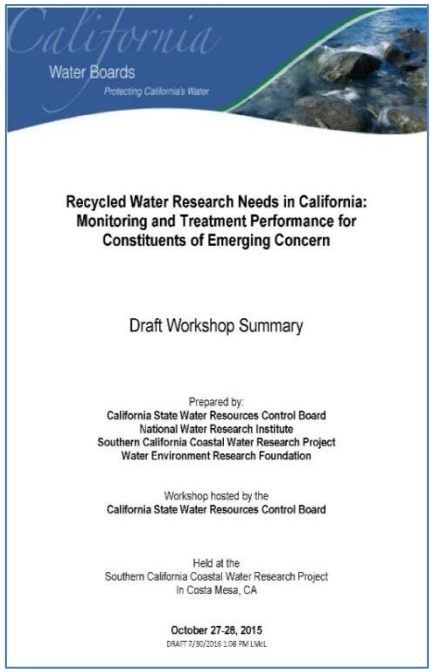
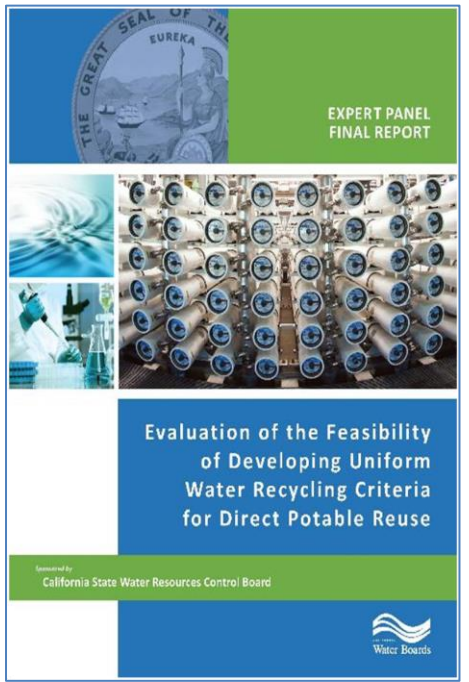
Overall CA Expert Panel Finding

It **is feasible to develop uniform water recycling criteria for DPR** that would incorporate **a level of public health protection as good as or better than** what is currently provided in Calif. by conventional drinking water supplies and IPR systems.

Research Needs: Potable Reuse

- Strong interest by WE&RF and SWB, including DPR
- Significant opportunities to advance recycled water
- Build on ongoing research planning efforts





Research Needs: Potable Reuse

Treatment

- Non-RO treatment trains
- Optimization of treatment
- Technology validation
- Assessment of treatment performance
- Reliability of treatment

Monitoring for pathogens and chemicals

- Surrogates and indictors
- Chemical monitoring
  - Chemicals – CECs, knowns and unknowns
  - Non-targeted analysis; Bioassays
- Pathogen monitoring
  - Emerging pathogens
  - Molecular methods; Next generation sequencing

Operations

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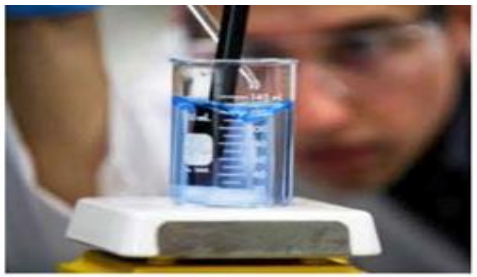
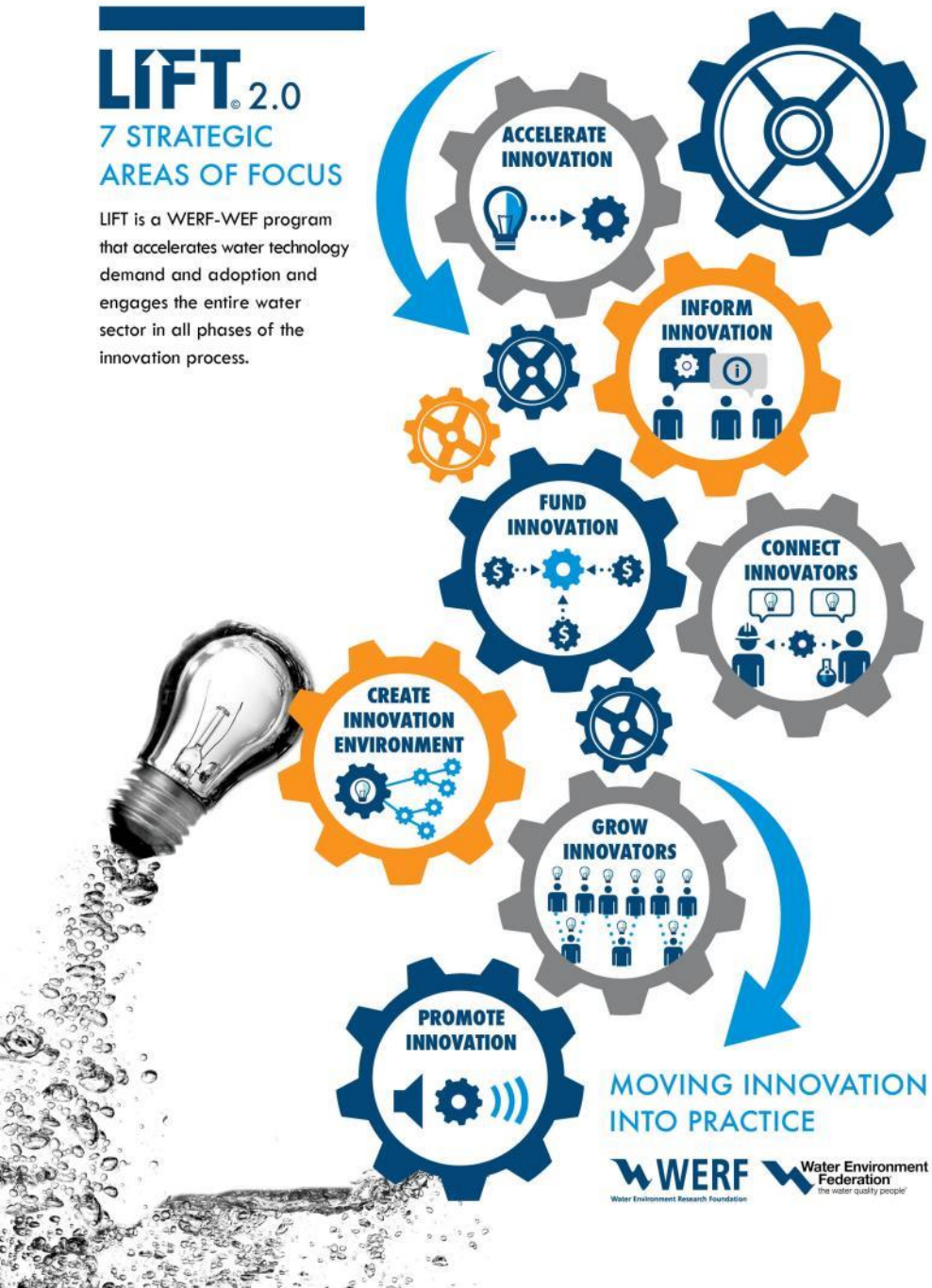
Research

Technology & Innovation

Public Acceptance





LIFT

Leaders Innovation Forum for Technology

www.werf.org/lift

Program Components

1. Technology Evaluation Program
2. People and Policy
3. Communication
4. Informal Forum for R&D Managers

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Public Acceptance

Is “public attitude” the biggest challenge to potable reuse?

WATEREUSE

Public Perception

Water Reuse 101 Advocacy

Model Communication Plans for Increasing Awareness and Fostering Acceptance of Direct Potable Reuse

Project: 13-02

Status: Completed Research

Released: 2015

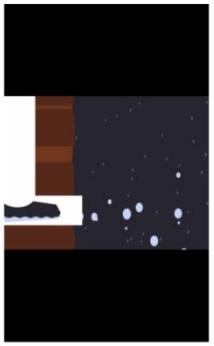
Treatment Technology animations

Ozonation

Reverse Osmosis

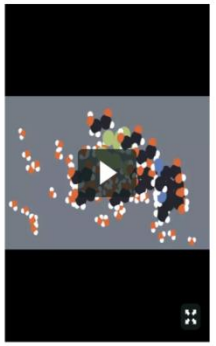
Think & Drink Water

Sustainability



Systems Thinking

Designed for Purpose



Changing minds... One pint at a time

Start a conversation about reuse and the nature of water

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Demystify water purification and the urban water cycle

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Showcase innovative water technology to inform how water can be used

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Thank you for listening!
Questions?

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