Desal Research Needs Project
(WRF#4834)

Julie Minton
Water Research Foundation

Jeff Mosher
Carollo Engineers
MISSION
Advancing the science of water to improve the quality of life.

VISION
To create the definitive research organization to advance the science of all things water to better meet the evolving needs of subscribers and the water sector.
WRF Partners and Subscribers

- **Partners**
  - United States: 58
  - Australia: 4
  - Canada: 6
  - United Kingdom: 4
  - China: 1
  - Colombia: 1
  - Germany: 1
  - Italy: 1
  - Japan: 1
  - Korea: 1
  - Netherlands: 1
  - Singapore: 1
  - South Africa: 1
  - Switzerland: 1

- **Subscribers**
  - United States: 1098
  - Australia: 39
  - Canada: 77
  - United Kingdom: 2
  - Denmark: 2
  - Italy: 2
  - France: 1
  - New Zealand: 1
  - Spain: 1
  - Uruguay: 1
  - Czech Republic: 1
Five Research Programs

- Research Priority Program
- Tailored Collaboration Program
- Unsolicited Research Program
- Emerging Opportunities Program
- Facilitated Research Program
2020 Research Areas

- CECs/Trace Organics
- Cyanobacteria & Cyanotoxins
- Energy Production & Efficiency
- Emerging DBPs
- Intelligent Water Systems
- Lead & Copper Management
- Linkages in Receiving Water Quality
- Microplastics
- Nutrients Treatment
- PFAS
- Optimizing Reuse w/o Brine
- Resilient Water Infrastructure
- Reuse Monitoring
- Stormwater & Flood Management
- Waterborne Pathogens in Premise Plumbing
Desalination Research Needs (WRF Project #4834)

• Purpose of project:
  – Develop a 2-3 year research plan for WRF
  – Consisting of vetted and prioritized “project descriptions”
  – Ocean desal, brackish desal, and concentrate
  – Technical and policy (planning, permitting, acceptance, etc.)

• Information Workshop at MSSC Summit
  – “Information Workshop” to solicit input
  – 45+ attendees at February 26, 2020 Workshop
  – Opportunity to solicit input on research gaps and needs
Desal Research Needs Project Organization

• **Julie Minton** – WRF Project Manager

• WRF Project Advisory Committee
  – **Amy Childress** (University of Southern California)
  – **Angel Bustamante** (El Paso Water)
  – **Christine Owen** (Hazen and Sawyer)
  – **Yuliana Porras-Mendoza** (Bureau of Reclamation Desalination and Water Purification Research Program)
  – **Nikolay Voutchkov** (Water Globe Consulting)

• Facilitator and PI
  – **Jeff Mosher, Carollo**
Project Partners

- **MSSC**
  - Host of information workshop

- **Southern California Salinity Coalition (SCSC)**
  - Funding Partner

- **American Membrane Technology Association (AMTA)**
  - Promote survey to members
History of Desalination Research at the Foundation(s)

- ~30 projects (2001-2015)
- CA DWR Desal Grant
- Joint Water Reuse and Desalination Task Force (WRF, WateReuse, WERF, USBR, Sandia) (2001 to ~2006)
- 3 projects (through 2018)
- 22 projects (through 2013)
Examples of Previous Research

Development of Habitat Restoration Programs for the Mitigation of Impingement and Entrainment Effects from Intakes for Seawater Desalination Facilities

Final Report
Emerging Energy Reducing Technologies for Desalination Applications

Desalination Concentrate Management Policy Analysis for the Arid West
Project Objectives

- Evaluate brackish groundwater, seawater, and concentrate management
- Identify timely, compelling research needs.
- Identify opportunities to improve current technologies.
- Identify emerging and novel technologies.
- Outline the key focus areas and research scope of potential future projects
- Support a WRF desalination research program for the next 2-3 years
Overview of Approach/Tasks

- Support the development of the **WRF desalination research program** by completing the following:

  - **Task 1:** Literature review
  - **Task 2:** Survey of Research Needs
  - **Task 3:** Research Needs Workshop
  - **Task 4:** Final Report
    - List of project descriptions of potential desalination research projects
Task 2: Survey

- **Format:** Use of an online survey
- **Audience:** Promote to academia, consulting firms, utilities, equipment manufacturers, and others in the desalination field
- **Scope:**
  - Inquire about relevant and critical research needs in various regions and countries
  - Request suggested research concepts
  - Address technical topics and nontechnical topics (regulatory, permitting, policy, and public perception)
Task 3: Expert Workshop

- **Date and venue**
  - TBD

- **Workshop participants**
  - WRF staff, the PAC, project team, and in-kind partners
  - Others could include:
    - Academics
    - Utility representatives
    - State and federal agency representatives
    - Consultants
    - Researchers
### Workshop Agenda

- Overview of WRF and desalination
- Overview of National Alliance for Water Innovation (NAWI)
- WRF project background
- Research needs identification
  - “Round Robin Suggestions”
  - Range of topics:
    - Regulatory topics
    - Intakes and outfalls
    - Pretreatment
    - Water quality
    - Technologies
    - Concentrate management
    - Permitting challenges
    - Energy and carbon footprint
    - Implementation topics
Research Needs Identification

• Potential Topics:
  – Regulatory topics
  – Intakes and outfalls
  – Pretreatment
  – Water quality
  – Technologies
  – Concentrate management
  – Permitting challenges
  – Energy and carbon footprint
  – Implementation topics
What did we hear? Some familiar topics.....

- Seawater intakes and outfalls
  - Look at facilities across the world
  - Define metrics

- Concentrate management
  - Guidance on technology selection

- Improved energy recovery systems

- Pilot demonstrations of innovative technologies

- Control membrane fouling and scaling

- Decentralized treatment systems
Topics that have keep coming up...

- Sequester marketable constituents from brine
- Reduce energy consumption and/or use of renewable energy
- Selective removal of specific contaminants - Selective membranes and absorbents
- Fate of constituents in brine
- Communications and public acceptance
A few new twists...

- Characterize economic and environment benefits of desal
- Integrate energy recovery systems into smaller systems
- Integrate “induction sensors” that support high recovery options
- Approaches for inland brackish softening that is salt neutral (all scales)
- PFAS (1,4-dioxane)
- Rethink “water grid”. Best practices for demand risk, blending, optimization
More ideas...

Evaluate urban watershed/sewershed salinity impacts

As we approach high recoveries (>85%), missing models to predict behavior of saturated and supersaturated brines

How do we include future impacts in the design of systems today? How to include that in LCAs?

Evaluation of the operations and maintenance costs for brine lines
Next Steps

• Survey will released in Spring
• Develop draft state of the science report by Summer.
• Hold “Expert Workshop” in August/September
• Final Report in late 2020