Western Governors’
Drought Forum Webinar Series
February 11, 2014

Once Marginal, Now Crucial
The Growing Demand for Re-used, Produced, and Brackish Water

Moderator
Michael Teague

Panelists
Dr. Jeri Sullivan Graham
Paul Swaim
Ken Knox
Current Drivers Toward Potable Reuse

- Water reuse is the recycling of treated wastewater for beneficial use
- Drivers for water reuse: population growth, climate change, and drought
- Why is there a trend in some areas to move away from non-potable reuse and towards potable reuse?
  - Winter demands for non-potable reuse are often low, resulting in low reuse seasonally
  - Non-potable demands often are geographically separated by large distances which results in very high pumping and piping costs
Additional Drivers for Potable Reuse

• California
  Legislative Action:
  – Senate Bill 918
  – State Water Resources Control Board Recycled Water Policy

• California discharges 3.5 MAF/yr of treated wastewater to ocean
  – Potable reuse required to reuse most of this water
  – non-potable reuse infeasible and too costly at this scale

• Potable reuse uses less energy than importing water and ocean desalination (Taffler et al., 2008)
  – Ocean desalination = 3,700 kWh/acre-ft
  – State Project water = 3,500 kWh/acre-ft
  – Colorado River water = 2,500 kWh/acre-ft
  – Purified water = 800 - 1,500 kWh/acre-ft
Potable Reuse Plants
RO-Based (West U.S. and International) vs. GAC-Based (East and Central U.S)

Western U.S. uses RO based approach (and SAT)
East and Central U.S. uses GAC based approach
Singapore uses RO based approach
Queensland uses RO based approach

• Fit for Purpose Water: The Cost of Overtreating Reclaimed Water (WRRF-10-01)
Potable Reuse Scenarios Examined

**SCENARIO 2A – COAG+OZONE+BAC+GAC+UV**

- WWTP Effluent
- Discharge
- Options: Coagulant, Flocc/Sedimentation, Ozone, BAC, GAC, UV

**SCENARIO 2B – MF/RO/UVAOP**

- WWTP Effluent
- BW Waste to WWTP Influent
- Options: Microfiltration, Reverse Osmosis, UVAOP, Antiscalant, RO Concentrate, H2O2, Lime and CO2, Salt Disposal to Landfill or Ocean/Sewer Disposal or Mechanical Evaporation (Brine Concentrator + Brine Crystallizer)
Figure is WateReuse Research Foundation’s Intellectual Property
Once Marginal, Now Crucial: The Growing Demand for Re-used, Produced, and Brackish Water

Implementing Brackish Water Use

Western Governor’s Association Webinar
February 11, 2015

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New Mexico Recoverable Water Initiative

NM Drought Task Force
Chair, State Engineer Tom Blaine

Recoverable Water Initiative
Chair, Secretary EMNRD, David Martin

Brackish Water Subcommittee
Work Group

Produced Water Subcommittee
Work Group

Dr. Jeri Sullivan Graham, Work Group Coordinator
Key Aspects to Implementing BW Use

- **Availability** - right place, right time, right volume, and “peaking plants”
- **Treatment** - Metals, TSS, scale-forming minerals
- **Costs**
  - Access (pumping from subsurface)
  - Transport
  - Treatment and waste disposal (solids, liquid concentrate)
- **Market Analysis** - which customer will buy the water? At what price? ...and Scarcity perceptions
- **Infrastructure Investment**
- **Risk perception** and use acceptance
  - Industrial Uses - e.g., mining, oil and gas production
  - Other Human Uses - irrigation, industry, drinking
- **Safe Use and the Environment**
  - Handling salty water and waste from treatment (concentrate)
  - Non-impingement on fresh water resources
  - Operations - spills, corrosion in wells and pipelines, storage
  - Long-term sustainability of the resource - planned obsolescence vs recharge scenarios
  - Hydrologic Studies and regional/basin data
- **Policies** - water rights or rights of capture, inter-basin transfers
- **Regulations**
- **Financing** - Public or Private?
- **Partnerships** with Industry and Localities
  - Build-Own-Operate-Transfer (BOOT), Design-Build-Finance-Transfer (DBFT) and other structures
Energy-Water Nexus at DOE

DOE Water Energy Tech Team
Over 20 participants from all major DOE offices have worked for over a year and a half to develop a Water Energy Program Plan

Water Energy Program Plan
- Seven sections, 250 pages, June, 2014
- Very detailed and comprehensive report that includes:
  - Landscape for regional and national decision making
  - Sections on RD&D needs
  - Water for energy: generation, exploration
  - Energy for water: transport, treatment
  - Policy issues and considerations
  - Stakeholder engagement

“Dramatic Progress in the Water-Energy Nexus Is Required and Attainable”-DOE WETT

Noble Energy Full-Cycle Water Management
Flowback and Produced Water Management

Management Alternatives Include:

Disposal

- Discharge
- Underground injection for disposal
- Underground injection for oil recovery
- Evaporation
- Offsite commercial disposal

Treatment, Recycling and Reuse

- Chemical, physical, mechanical processes
- Integration within water supply system
Beneficial Use - Treatment, Recycling and Reuse

Industrial Applications

- Logistics – capture, storage and conveyance
- Treatment Options – physical, chemical, mechanical
- Use – drilling, dust control, fire protection, hydraulic fracturing
- Integration with Operational demands – cost, quality, amount, location
Beneficial Use - Treatment, Recycling and Reuse

Agricultural and Other Applications

- Use – irrigation, stock watering, construction and dust control, etc.
- Logistics – storage and conveyance infrastructure from producing wells to point of use

Regulatory Considerations

- Water right/permits
- Water quality and environmental compliance
- Multiple government agencies and levels
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Thank You
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Michael Teague
Oklahoma Secretary of Energy & Environment

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New Mexico Energy, Minerals and Natural Resources Department’s Brackish Water work Group/Los Alamos National Laboratory

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Senior Principal Technologist and Deputy Global Service Leader for Drinking Water & Reuse, CH2M HILL

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Senior Advisor & Water Resources Manager, Noble Energy

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Greenhouse Gas Costs (CO$_2$, CH$_4$, N$_2$O)

- MF/RO/UVAOP (mech evap)
- MF/RO/UVAOP (evap ponds)
- MF/RO/UVAOP (Ocean Disposal)
- Floc/Sed/O3/BAC/GAC/UV
- 8-year GAC Replacement
- 2-year GAC Replacement

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