

# Desalination Status in the Southwestern U.S. & Mexico

GWAC – Desal Subcommittee  
Meeting  
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**Chuck Cullom**  
Colorado River Programs Manager



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CENTRAL ARIZONA PROJECT

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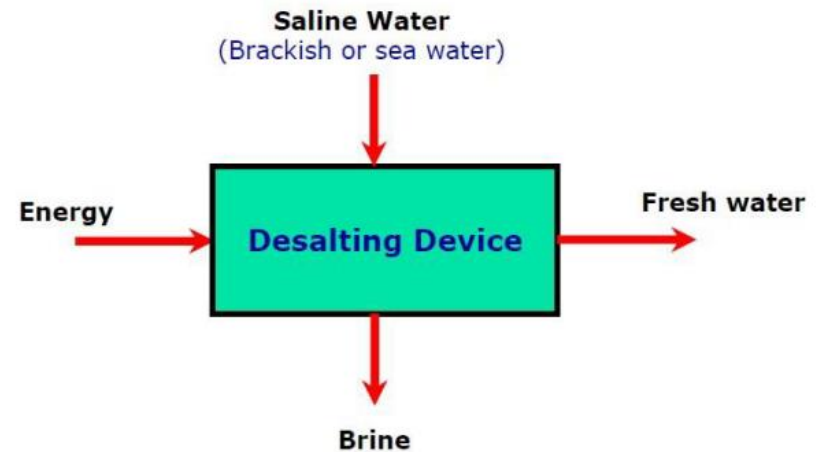
# What will we cover today?

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- Brief primer on desalination issues and costs.
- Cost drivers for desalination.
- Status of desalination plants in the Southwest U.S. and northern Mexico.
- Overview of three key plants:
  - Carlsbad Seawater Desalination Plant
  - El Paso Brackish Desalination Plant
  - Rosarito (MX) Seawater Desalination Plant.

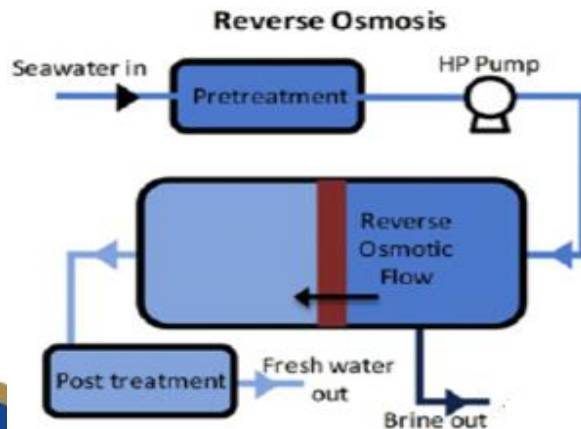
# What is Desalination?

- A process to separate salt from water:

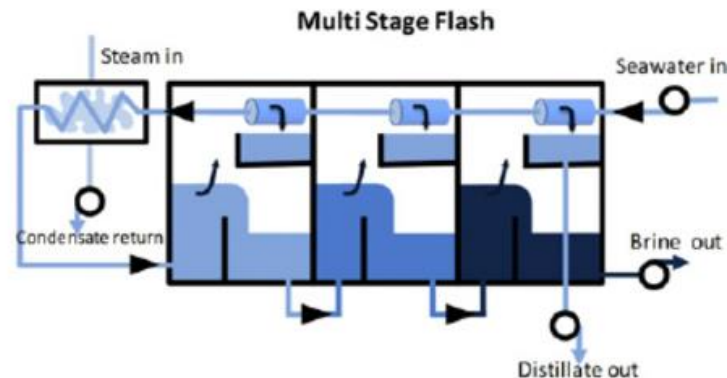


- Two types of technology:

- Membranes



vs. Thermal



# Major Water Sources for Desalination

- 3 Major Sources:
  - Brackish Groundwater (1,000 – 5,000 mg/l salinity), less pretreatment,



- Brackish Surface Water (1,000 – 5,000 mg/l salinity), more pretreatment,



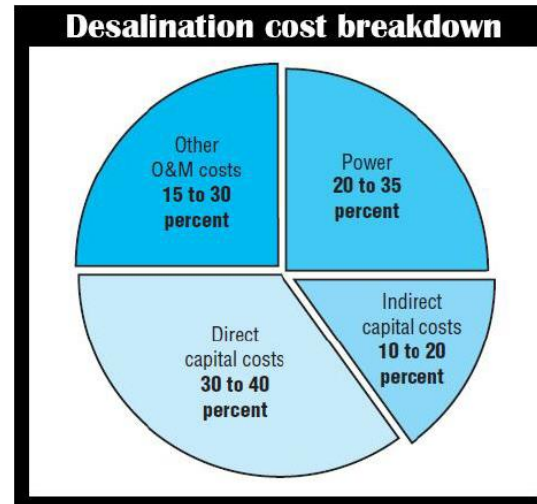
- Seawater (~35,000 mg/l salinity), more energy and capital.



# What are the key issues/cost drivers for Membrane Desalination?

- 3 Cost drivers:

- Capital (30 – 50%)
- Energy (20 – 35%)
- Chemicals/labor (15 – 30%)



- Key Permitting Issue - Brine disposal

- Inland issues – no ocean outfall, requires local disposal
- Seawater discharge issues – diffusion/mixing zone issues

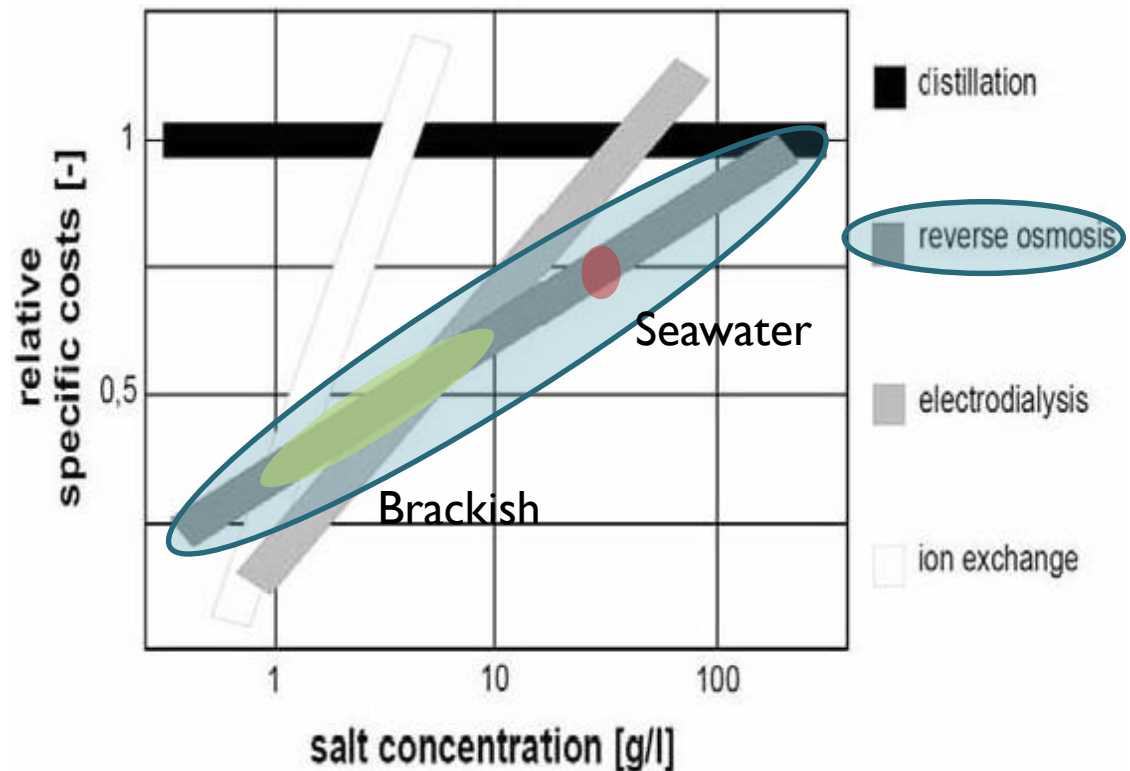
# What effect does scale have on RO Plant Cost?

- Bigger is generally better from a unit cost basis.
- Construction costs show a significant scale benefit.



# How does source water salinity impact RO costs?

- More salt = more energy + more membranes = higher costs (capital + operating).
- Brackish is frequently 1/3<sup>rd</sup> seawater projects, when capital is included.



# Rolled Up Costs (Delivery) Estimates

- There is a wide range of costs data gathered from existing projects due to variations in source water type, salinity, financing, energy, and permitting/mitigation requirements.

Source Water	Delivered Costs, (\$/AF) Retail	Delivered Costs, (\$/1,000 gal) Retail
Brackish Water RO	\$500 - \$1,000/AF	\$1.50 - \$3.00
Seawater RO	\$1,000 – \$2,700/AF	\$3.00 - \$8.00
Local Utility “X”	\$538/AF	\$1.65 (commodity rate)

AMTA 2007 data



# Status of Key Desalination Projects: Southwest US & Northern Mexico

## ▲ Operating Brackish Projects

- Inland Empire (25 MGD - CA)
- Eastern (9 MGD - CA)
- Goodyear (3.2 MGD - AZ)
- El Paso (27.5 MGD - TX)

## ▲ Operating Seawater Projects

- Carlsbad (50 MGD - CA)

## ▲ Constructed Brackish Projects

- Yuma Desalting Plan (73 MGD - AZ)

## ▲ Constructed Seawater Projects

- Santa Barbara (2.8 MGD - CA)

## ▲ Seawater Development

- Rosarito (100 MGD - MX)

## ● Study Areas

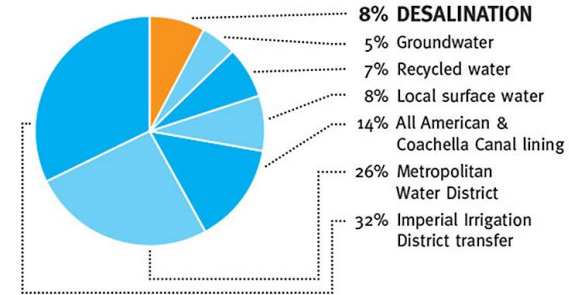
- MWD (CA)
- Yuma Area (AZ)
- CR & Sea of Cortez (MX)



# Summary of the Carlsbad Seawater Desalination Plant

- ~\$1B investment by San Diego County Water Authority as a drought-proof water supply (~8% of SDCWA supply) – 50 MGD,
- Rolled up costs ~\$2,400/af,
- Innovative private (Poseidon) public (SDCWA) partnership and project delivery – 30 year water delivery contract,
- Uses existing Encina Power Station intake and discharge,
- Extremely long (14 year) permitting process: 1998 – 2012,
- Construction began in 12/12 - operations in 09/15,
- Extremely small plant footprint, 2,000 pressure vessels with 16,000 membranes.

Projected San Diego County Water Sources in 2020



# Summary of the El Paso Brackish Desalination Plant

- ~\$91 M investment by City of El Paso as a drought-proof water supply to support the City and Fort Bliss,
- Rolled up costs ~\$600/af,
- Innovative public (U.S. Army \$26M) public (EPWU) partnership,
- Uses brackish groundwater. Protects local potable aquifer and groundwater system from over-pumping and brackish water intrusion,
- Brine discharged in deep saline aquifer, 22 mile pipeline, cost of \$19 M (~20% of project costs), 3 injection wells, from 3,500' to 4,000' total depth, on Ft. Bliss,
- 15 year project development, permitting, and construction process. Operational in 2007.



# Summary of the Rosarito Seawater Desalination Plant

- 100 MGD seawater plant, to be developed in 2x50 MGD phases. Phase 1 to be completed by 2019, and Phase 2 operational in 2024, will be the largest seawater plant in the hemisphere
- Rolled up costs tbd (est. \$1,600/af). Construction costs ~\$490M (USD) w/40 year water purchase agreement by Baja California,
- Innovative public-private partnership between Baja California and private consortium led by NSC Agua,
- Located adjacent to the President Juarez Power Plant at Rosarito Beach. Will use the existing intake and outfall for desalination operations,
- Potential for binational water delivery by direct delivery to Otay and through Colorado River exchange,
- Concept 2005, design + permitting in 2014. Bid awarded in 2016.





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