



NanoH₂O

**Next Generation Reverse Osmosis Membranes
for Desalination and Water Reuse**

*GreenTech 2008 / Pasadena, CA
June 6, 2008*

Company History / Status

- Founded late 2005 based on UCLA research (Dr. Eric Hoek)
- \$5M Series A from Khosla Ventures March 2007
- World-class R&D team operating since September 2007
- Commercial prototype stage
- Market introduction targeted for end of 2009

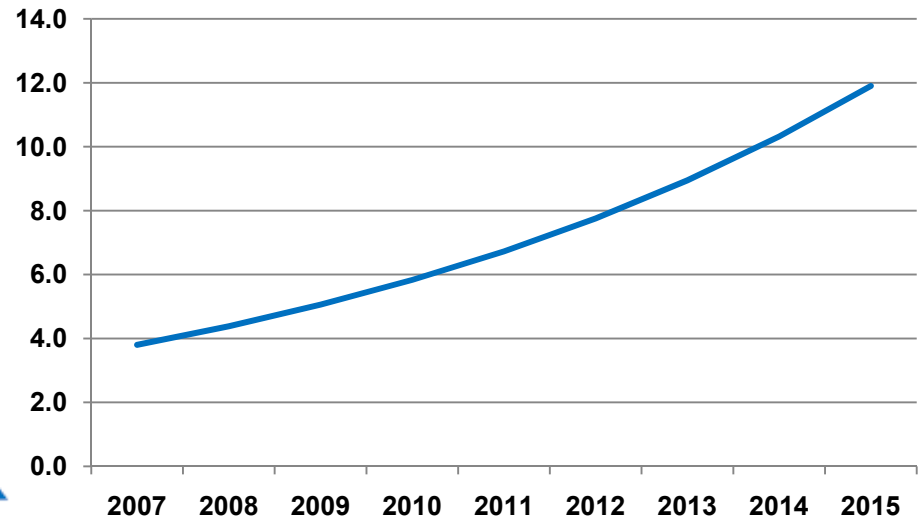
Growing SWRO Installed Base

- **SWRO Growth: 3.8B → 11.9B GPD in capacity / 15.3% CAGR / \$25.4B in capex**
- **NanoH₂O Opportunity: ~\$2B membrane sales, ~\$10B engineering services**



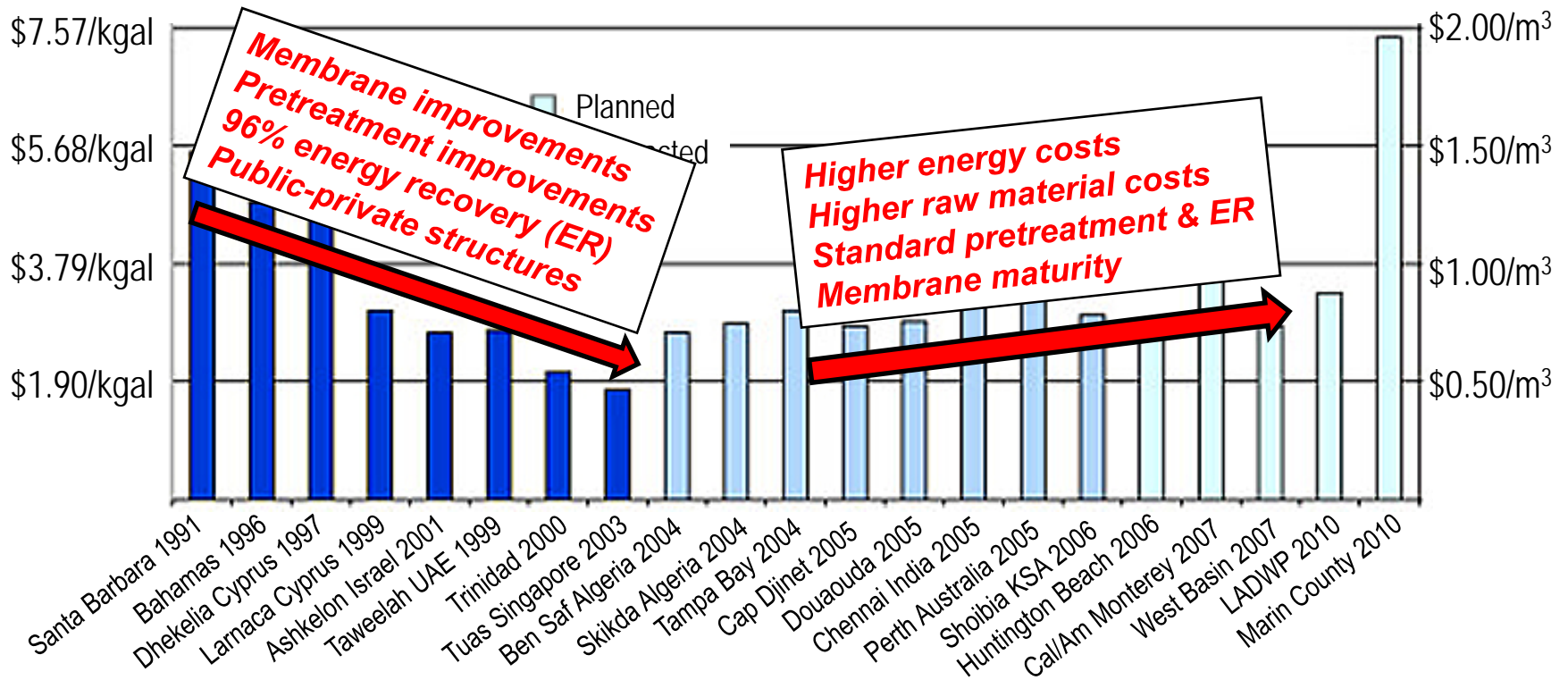
Current SWRO Installed Base

Worldwide SWRO Capacity



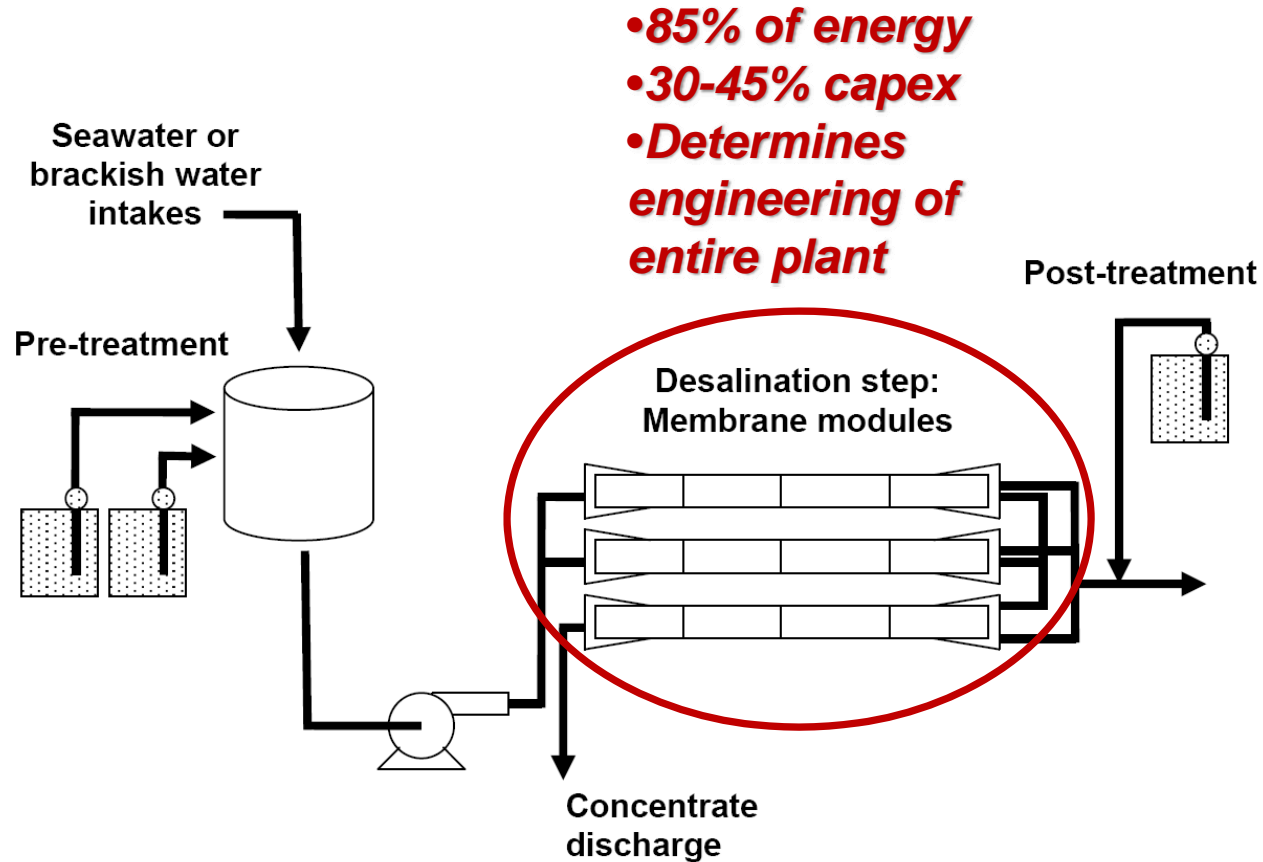
Sources: Tom Pankratz, *Global Water Market 2008*
Global Water Intelligence

Standard & Mature Technology has led to a Flat SWRO Cost Curve



Source: Tom Pankratz, Global Water Intelligence

SWRO Process Flow Diagram



Membrane Performance: Cost-effective Driver of SWRO Economics

50 MGD SWRO Plant Example

Capital Costs	\$M	%
Intake & discharge	17.91	7%
Pretreatment	35.24	14%
SWRO system	71.66	29%
RO Membranes	9.40	4%
Support Facilities & Equipment	32.56	13%
Project development	35.49	14%
Project engineering	21.62	9%
Contingency	22.39	9%
Total	246.26	

Better Membrane Performance Leads To:

Smaller SWRO System

Lower Energy Consumption

Less Membranes to Replace

Better Labor / Maintenance Economy

$\$ \text{ capex / GPD} = \4.93

Membrane Impacts SWRO OPEX drivers

Lower Energy Consumption →

Less Membranes to Replace →

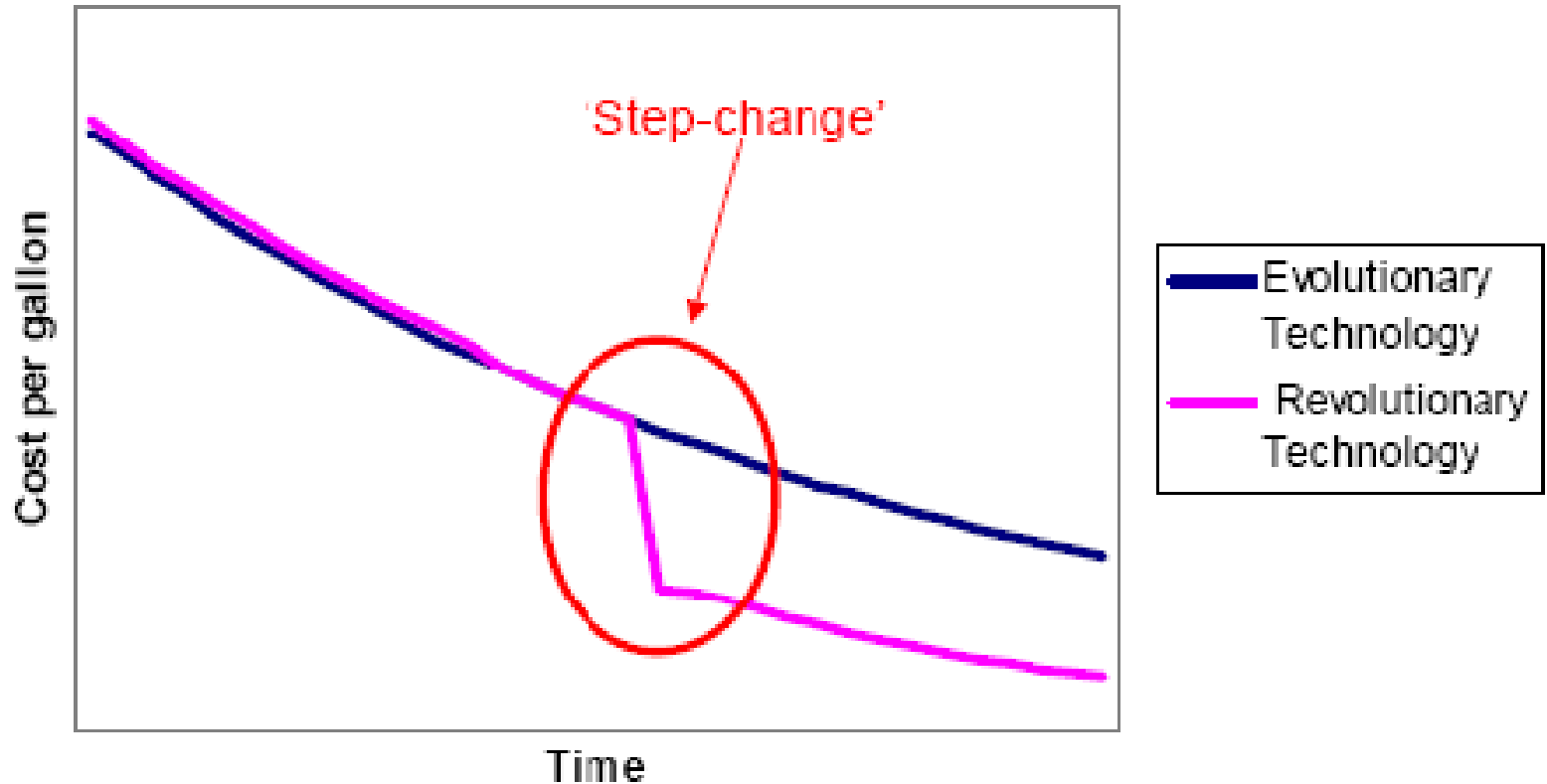
Better Labor / Maintenance Economy →

O&M Costs	% of Total O&M Costs
Power	35.0 – 58.0 %
Chemicals	5.5 – 9.0 %
Membranes	6.5 – 11.0 %
Waste stream	3.5 – 7.0 %
Labor / Maint.	17.0 – 24.0 %
Environmental	1.0 – 5.0 %
Indirect O&M	7.0 – 20.5 %

Source: Nikolay Voutchkov, Poseidon Resources



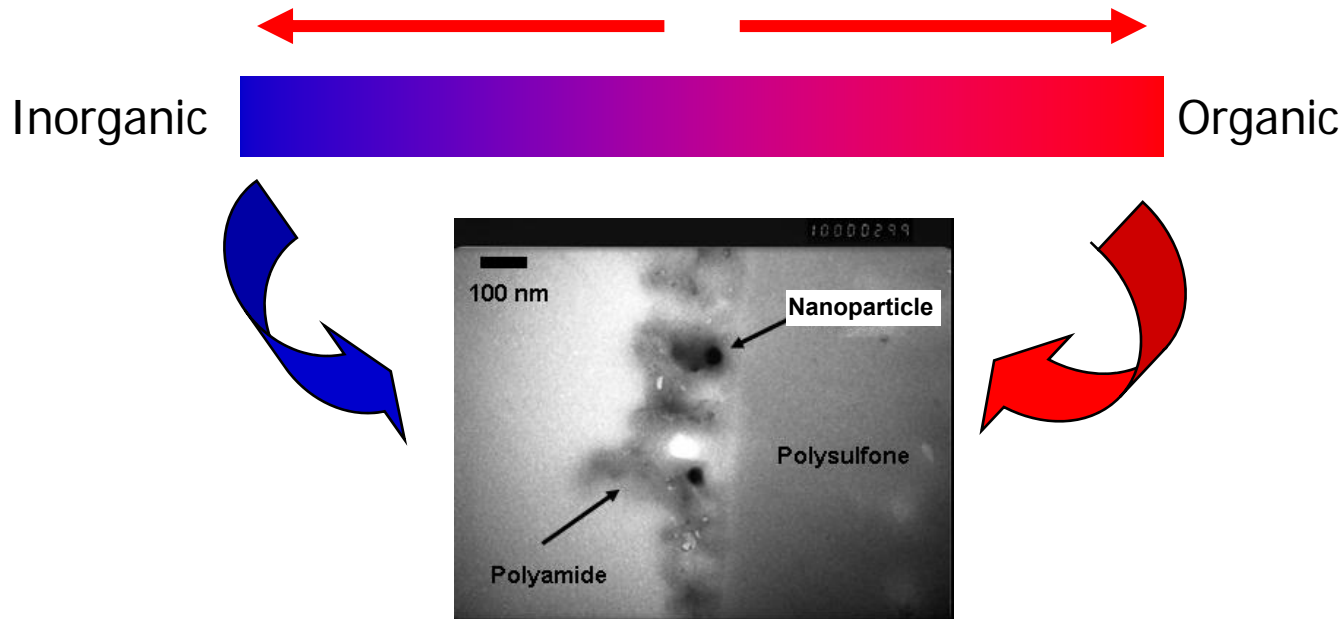
Needed: A Step-change



Can we get there with 100% pure polymer membranes?

Source: Desalination and Water Purification Roadmap, 2003

Advanced Membrane Materials for Desalination



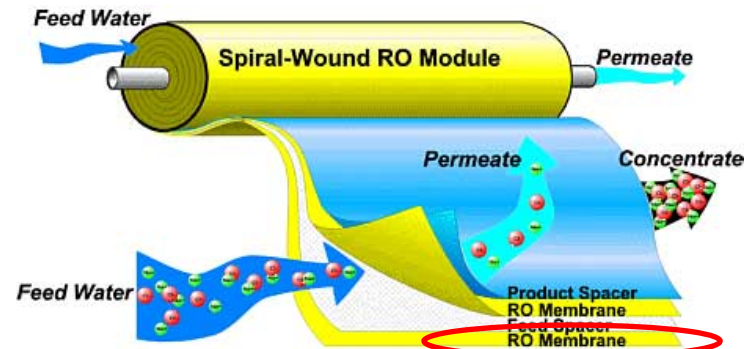
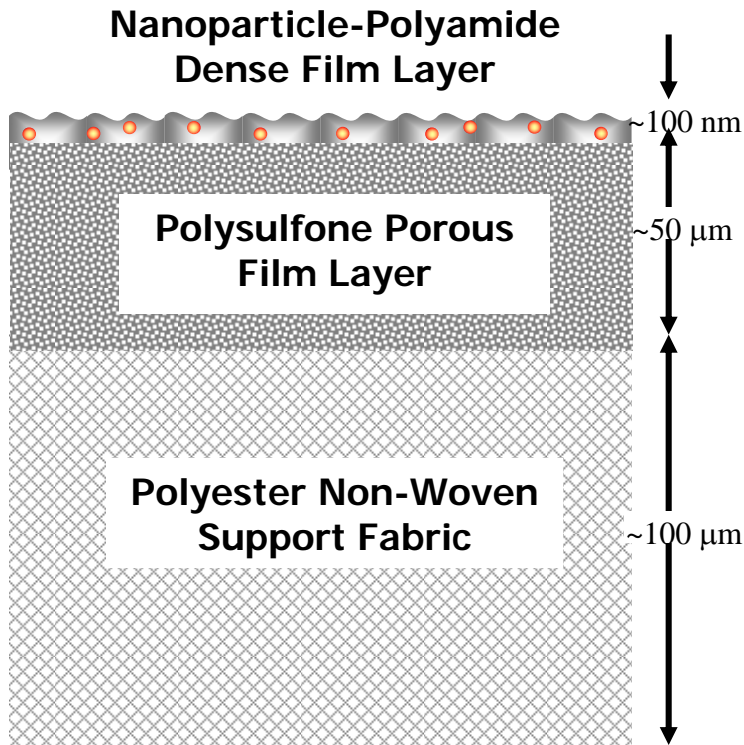
TEM image of NanoH₂O Nanocomposite Membrane

Nanoparticles incorporated in conventional polymer membranes lead to:

- ✓ **2X Productivity**
- ✓ **Fouling Resistance**
- ✓ **Same Form Factor**

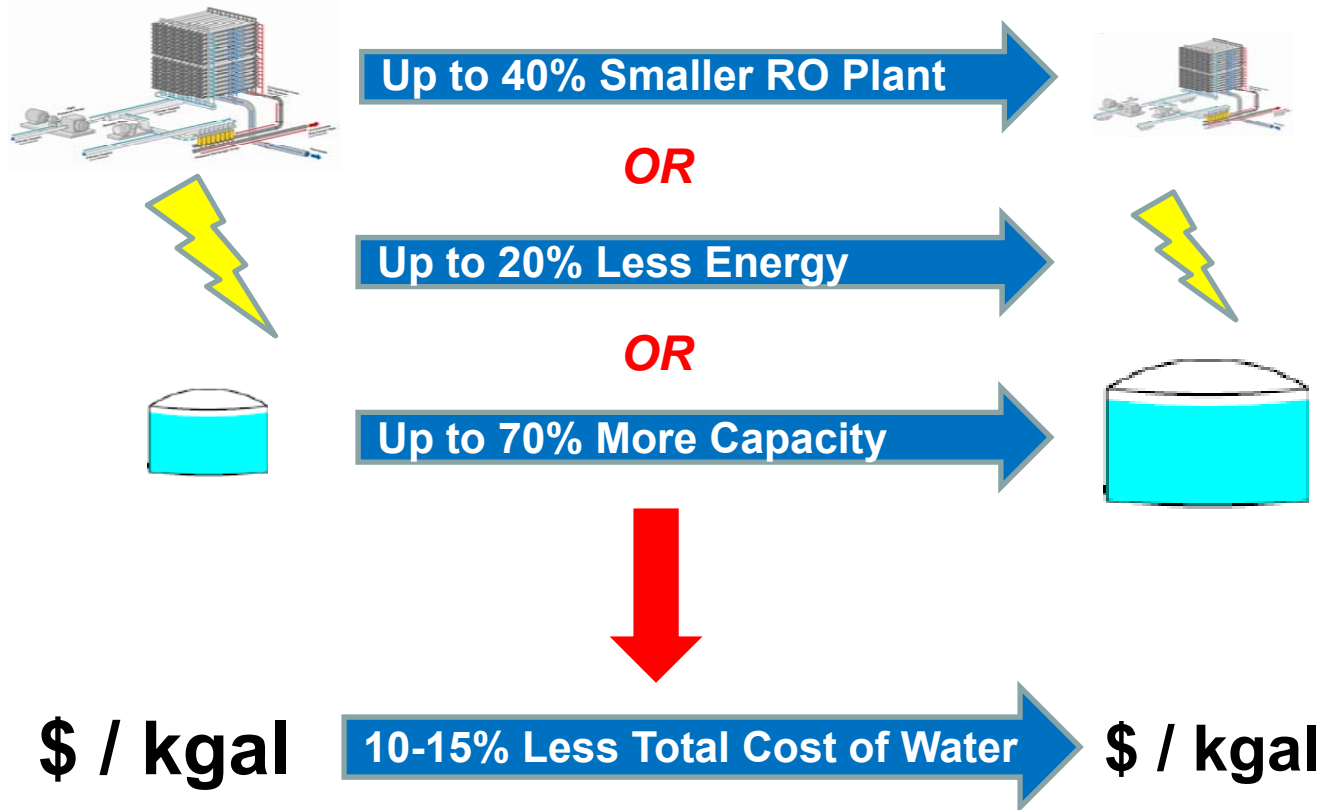
Technology Leverages Industry Infrastructure

- ✓ Same manufacturing process
- ✓ Same spiral wound element
- ✓ Nanoparticles add ~5% in cost
- ✓ Nanoparticles are benign material



Nanocomposite RO Membrane

Impact of 2X Membrane Productivity Increase



Summary

- Fast-growing and immense demand for freshwater
- Membranes are the key factor to cost-competitive desalination
- Next-generation membrane technology leveraging industry infrastructure
- Desalination becomes an economically viable alternative water source

