Got Desalination

In Your Water Portfolio?

Mark Lambert, CEO IDE Americas

Texas Desalination Association, 2016

IDE Technologies | Your Water Partners

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Delivering Excellence Through Partnership

50 YEARS

Industrial Water Treatment

Seawater Desalination

Wastewater Reuse

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A Full Range of Water Project Types

EPC / EPS / Turnkey

Water Sales

Operation & Maintenance Services

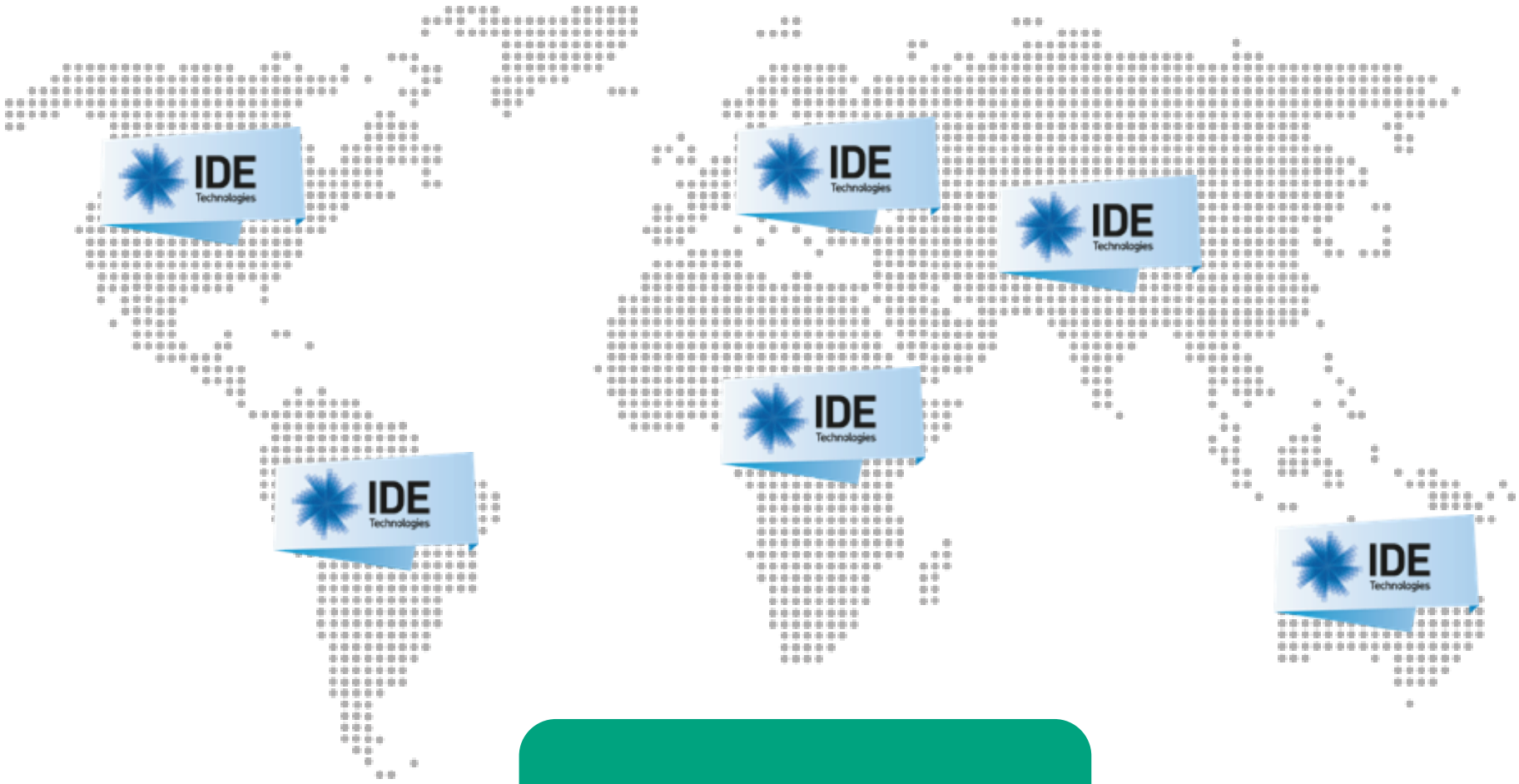
Municipalities

Mines

Energy

Oil &Gas

Successful Global Leadership



3M **m³/day of high quality water**

IDE's Value Proposition

EPC Global Market Leader

- **Reduced Costs:**
  - Unparalleled optimization of Capex vs. Opex expenses
- **Expertise:**
  - Successful implementation of world's largest, most complex thermal & SWRO facilities
  - Successful global BOT projects
  - Creative Financing
- **Sustainable Solutions**
  - Reduced energy consumption
  - Renewable energy
  - Low chemical footprint

Reliance, India 160,000 m^3/day
MED desalination facility

Ashkelon, Israel 118M m^3/year
Second largest operating desalination facility worldwide

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Leadership in Seawater Desalination

Sorek, Israel

The largest SWRO plant worldwide: 624,000 m³/day – BOT

Tianjin, China

The largest desalination plant in China: 200,000 m³/day – EPC

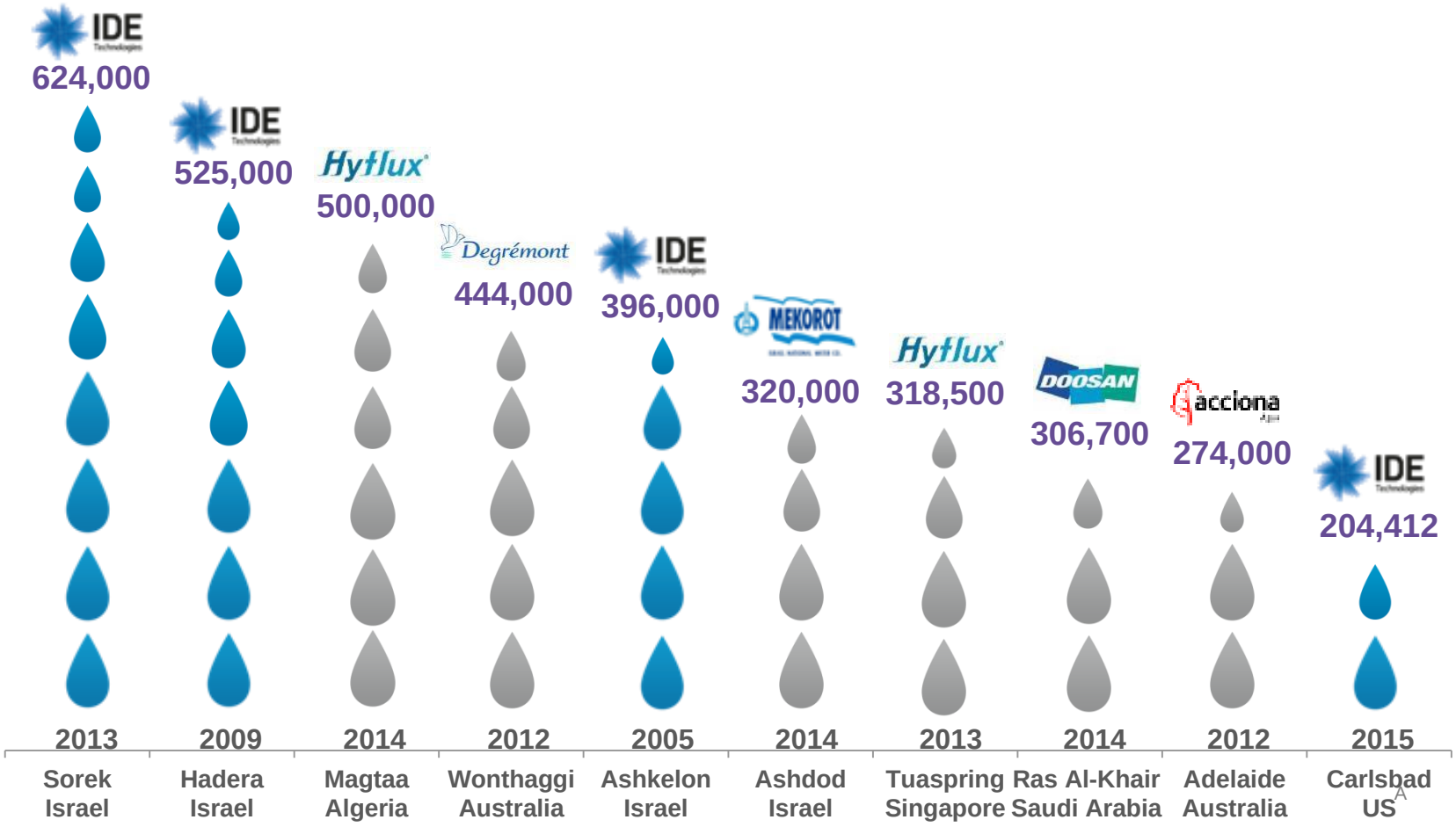
Reliance, India

The largest desalination plants in India: 400,000 m³/day – EPC

Carlsbad, USA

The largest desalination plant in the western hemisphere: 204,000 m³/day – EPS + O&M

Leadership in Large Scale SWRO Projects

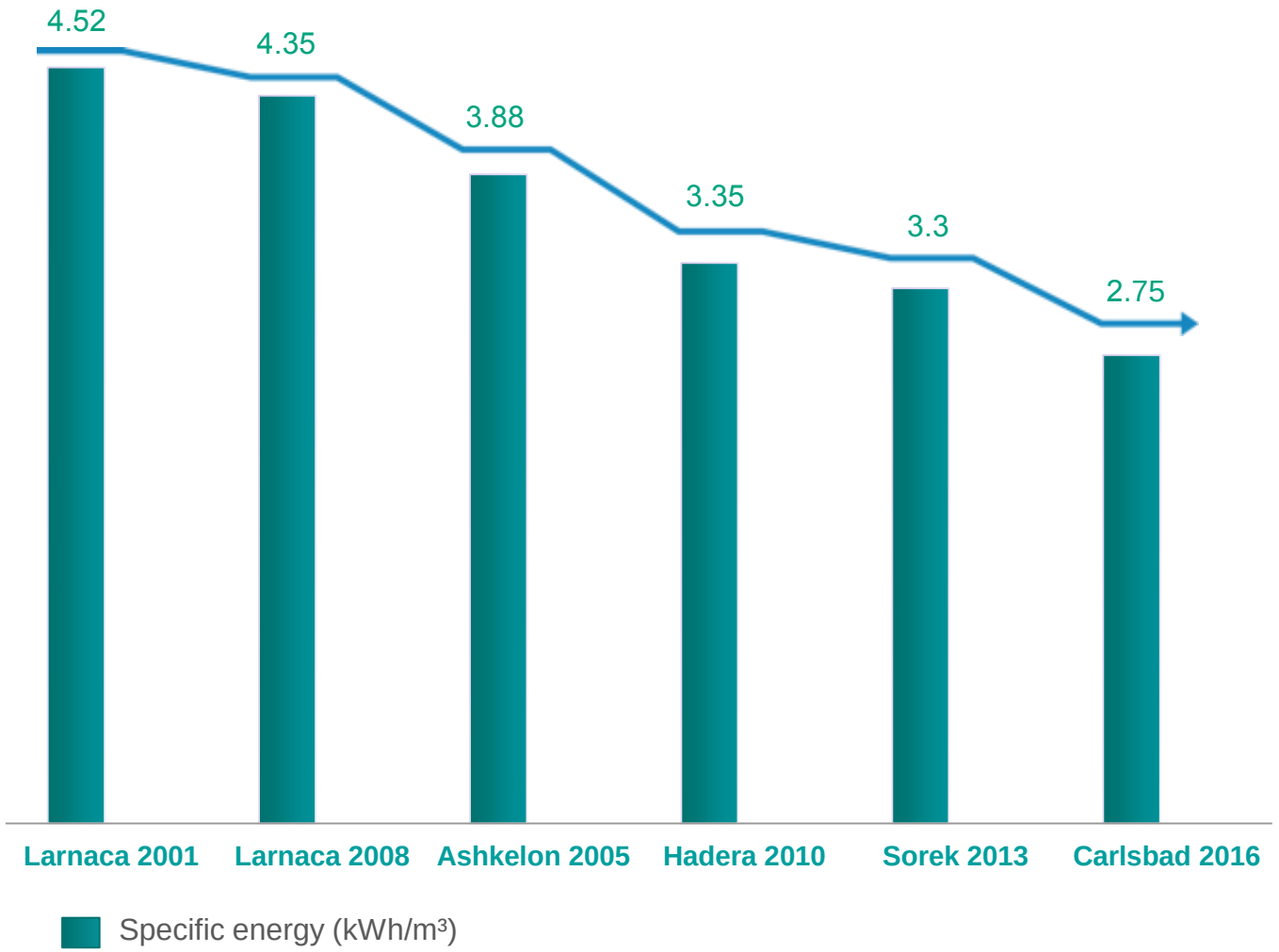


Source: *Global Water Intelligence (2014), company information*

****In accessible markets***

Leadership in Energy Consumption

Total Specific Energy Consumed per m³ of Product Water



Culture of Continual Innovation

Proven innovations:

- Pressure Center Design
- Boron Removal System
- Chemical-Free Desalination
- Direct Osmosis Cleaning (DOC)
- 16” Membranes in a Vertical Array

- Increased efficiency and reliability
- Reduced CAPEX and OPEX costs
- Minimize environmental impact

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Carlsbad Desalination Plant

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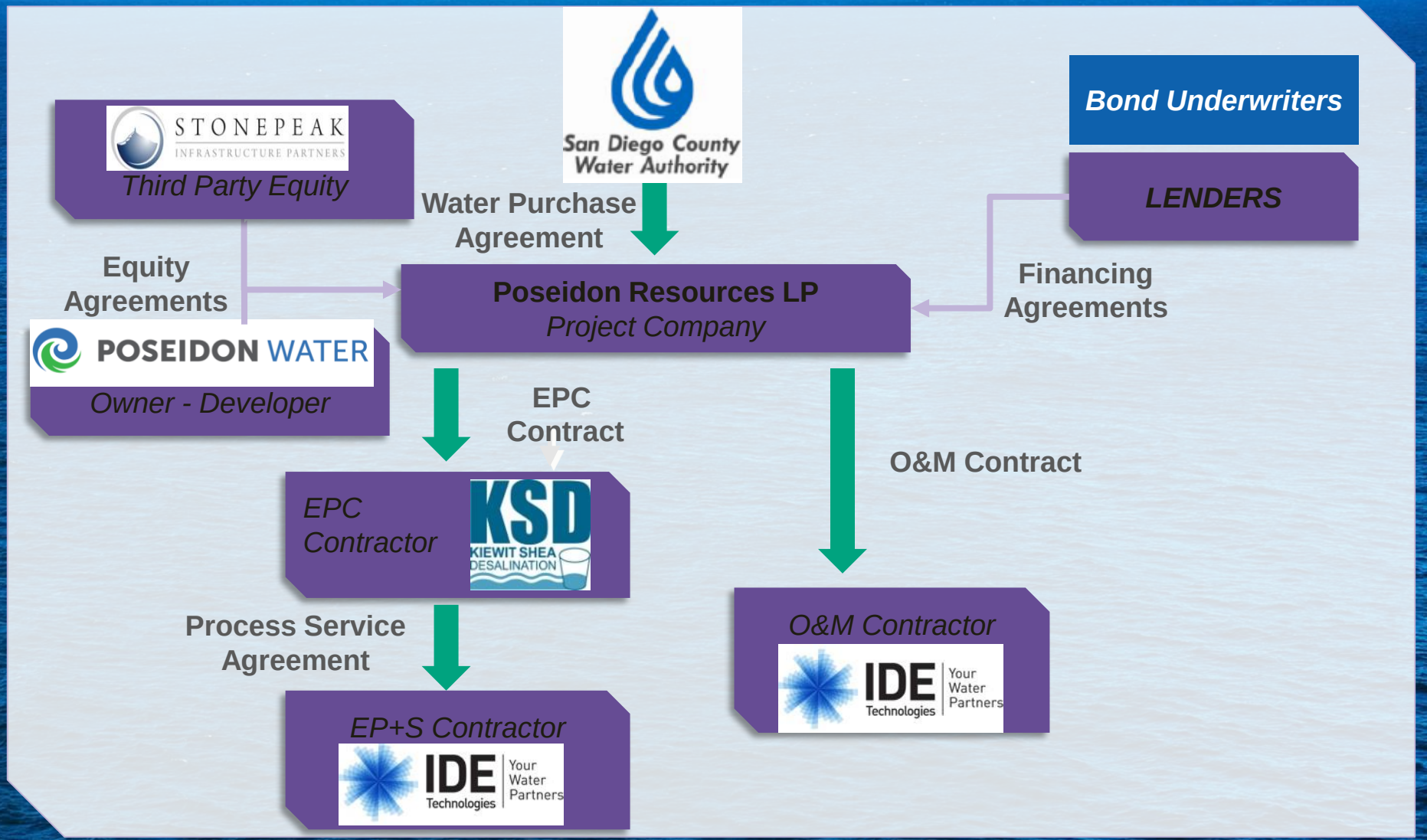
Carlsbad, California, USA

An award-winning, milestone plant for the desalination industry and a critical piece of a balanced water portfolio for San Diego

Overview

- **Capacity:** 54 MGD (60670 AFY)
- **Technology:** SWRO
- **Project Type:** PPP (IDE as EPS and O&M – 30 years)
- **Footprint:** 6 acres (24,000 m²)
- **Off-Taker:** San Diego County Water Authority (SDCWA)
- **Commission Date:** December, 2015
- **Project Delivery:** Design Build Operate (36 months)

Shareholders and Contractual Structure



Project Milestones

January 2003: BOT MOU for 54 MGD/year

May 2012: Financial close (execution of the Financial Agreements)

December 2012: Issuance of the Notice to Proceed

June 2015: Start of Plant Commissioning

December 2015: Completion Date (54 MGD)

December 2045: End of of Agreement

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Ground Breaking: May 2013

Agua Hedionda Lagoon Aerial View

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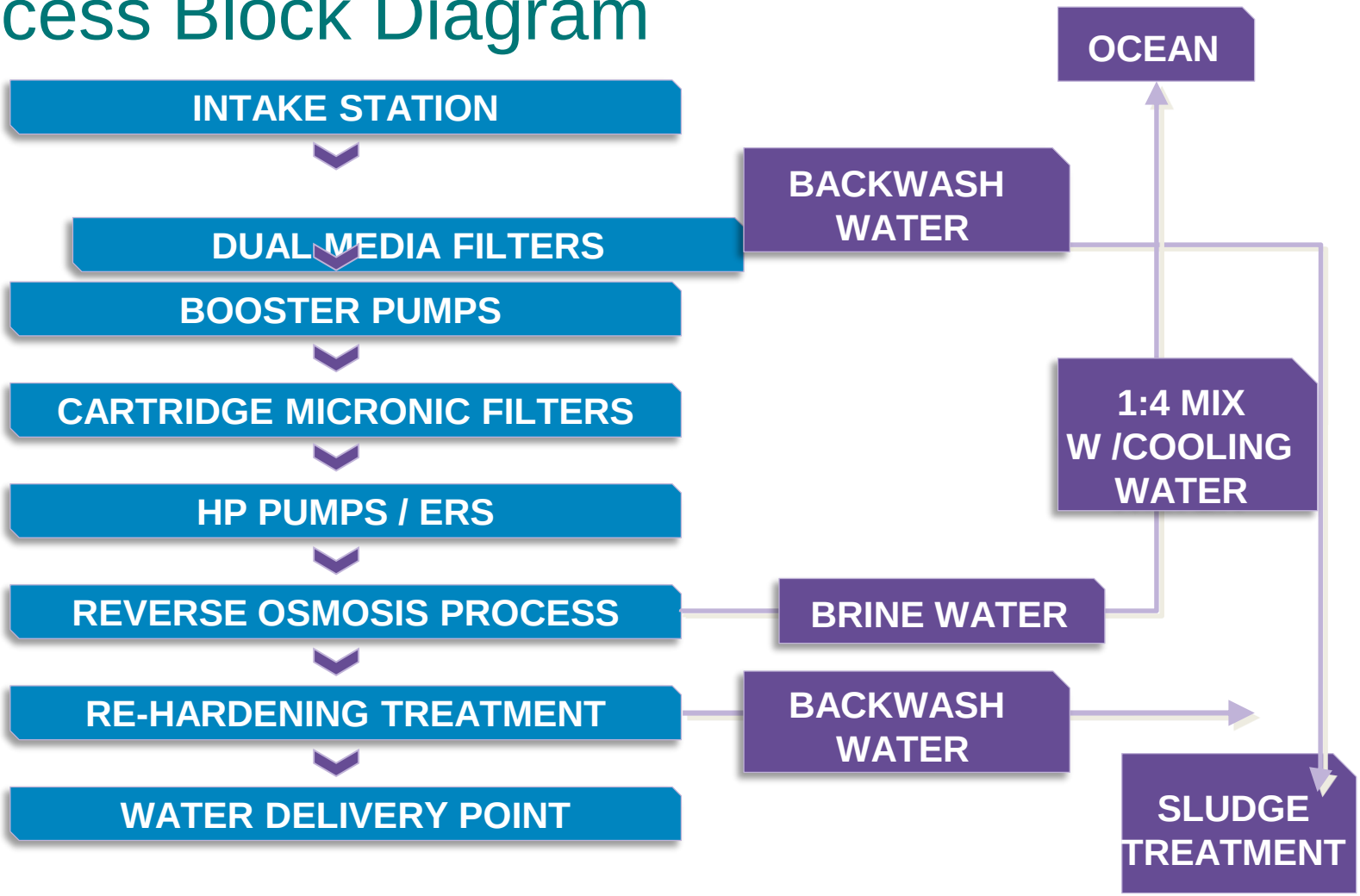
Process Block Diagram



Bid Water Price*: $1,849 - $2,064 per acre-foot
$ 5.70-6.40/1000 gallons ($1.50-1.67/m^3)

Plant Aerial View

Seawater Feed Line

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RO Section

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Key Technical Parameters

- Recovery ratio ~52% - intake capacity 104 MGD
- Plant footprint - 6 acres
- 14,000 RO membranes →6.2 million ft^2 of membrane area
- 4 high-pressure pumps 970-1060psi → 14.4 kWh per 1000 gallons
- 8 ERI trains – 168 PX300Q in total → 98% efficiency
- DAF-Lamella sludge treatment system → 20% dryness of sludge
- 2.5 million gallon product water tank → 8 – 420psi Product Pumps

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San Diego Water Supply Benefits

- 56,000 acre-feet per year of new water
- Locally-controlled, drought-proof supply
- 8% of regional demand
- Key element of SDCWA water supply diversification strategy
- Reduces demand on groundwater and other sensitive water bodies

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Economic Benefits

- Private investment in regional infrastructure
- supported 2,400 skilled jobs in construction period
- Approx. $560 million in local spending
- Approx. $5.3 million/year in incremental property and business tax revenues

Environmental Responsibility

MINIMIZED ENVIRONMENTAL IMPACT

- Minimized marine impacts by using Encina Power Station intake
- Minimized marine impacts by mixing of Brine 4:1 with seawater prior to ocean discharge
- Zero CO2 footprint, 66 acres of wetlands built in San-Diego Bay
- Reduced electrical and chemical consumption
- Dredging responsibility for the Agua Hedionda Lagoon
- Use of environmentally harmless chemicals and treatable cleaning solutions
- Treatment of media filters and limestone reactor backwashing

Commissioning and Operation

- Mechanical completion: November 7th
- Acceptance Test: November 7th to December 12th, 2015
- Started producing water on December 14th, 2015
- 10 billion gallons of water produced thus far (through August, 2016)
- 24/7 operation staffed by 34 operations and maintenance team

Conforming to Federal and State Regulations

- American Society of Mechanical Engineers (ASME)
- American Water Works Association (AWWA)
- The Clean Water Act (CWA)
- California Water Resources Control Board (DDW)
- California Cryptosporidium Action Plan (CAP)
- California Environmental Quality Act (CEQA), including an Environmental Impact Report (EIR)
- California Code of Regulations (CCR)
- Code of Federal Regulations (CFR), related to drinking water
- National Science Foundation (NSF) Standard 61
- US Environmental Protection Agency (EPA), in particular:
  - Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)
  - Membrane Filtration Guidance Manual
  - National Pollutant Discharge Elimination System (NPDES) Permit Program
  - Surface Water Treatment Rule (SWTR)

Public Health Requirements >>Design Basis

Requirements

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  - Membrane Filtration Guidance Manual

Design

- All products with drinking water contact from source to tap are either NSF-certified or NSF-compliant
- Construction materials either
  - NSF approved materials list

  Or
  - Leach tested
- Design prevents cross-contaminations with CIP solutions, waste, brine, untreated water

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Public Health Requirements >>Design Basis

Requirements

- Log removal inactivation credits

Based on these treatment processes the plant will be credited with the following log removal/inactivations provided that the plant is operated per regulation and a CDPH approved Operations Plan:

Pathogen	Log Removal/Inactivation Credits			
	Direct Filtration	Reverse Osmosis	Disinfection	Total
Cryptosporidium	2	2	-	4
Giardia	2	2	0.5 – 1 required	4.5 – 5
Viruses	1	2	1 – 2 required	4 - 6

Design

- Media filter filtration velocity < 6 gpm/ft2
- Filter to waste piping
- Filtration effluent turbidity (IFE and CFE) < 0.3 NTU
- RO system salt removal - 99% TDS
- Online RO Integrity testing (Indirect)
- Daily RO Integrity (Direct Testing)

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IDE – Your Water Partners

Santa Barbara Desalination Project

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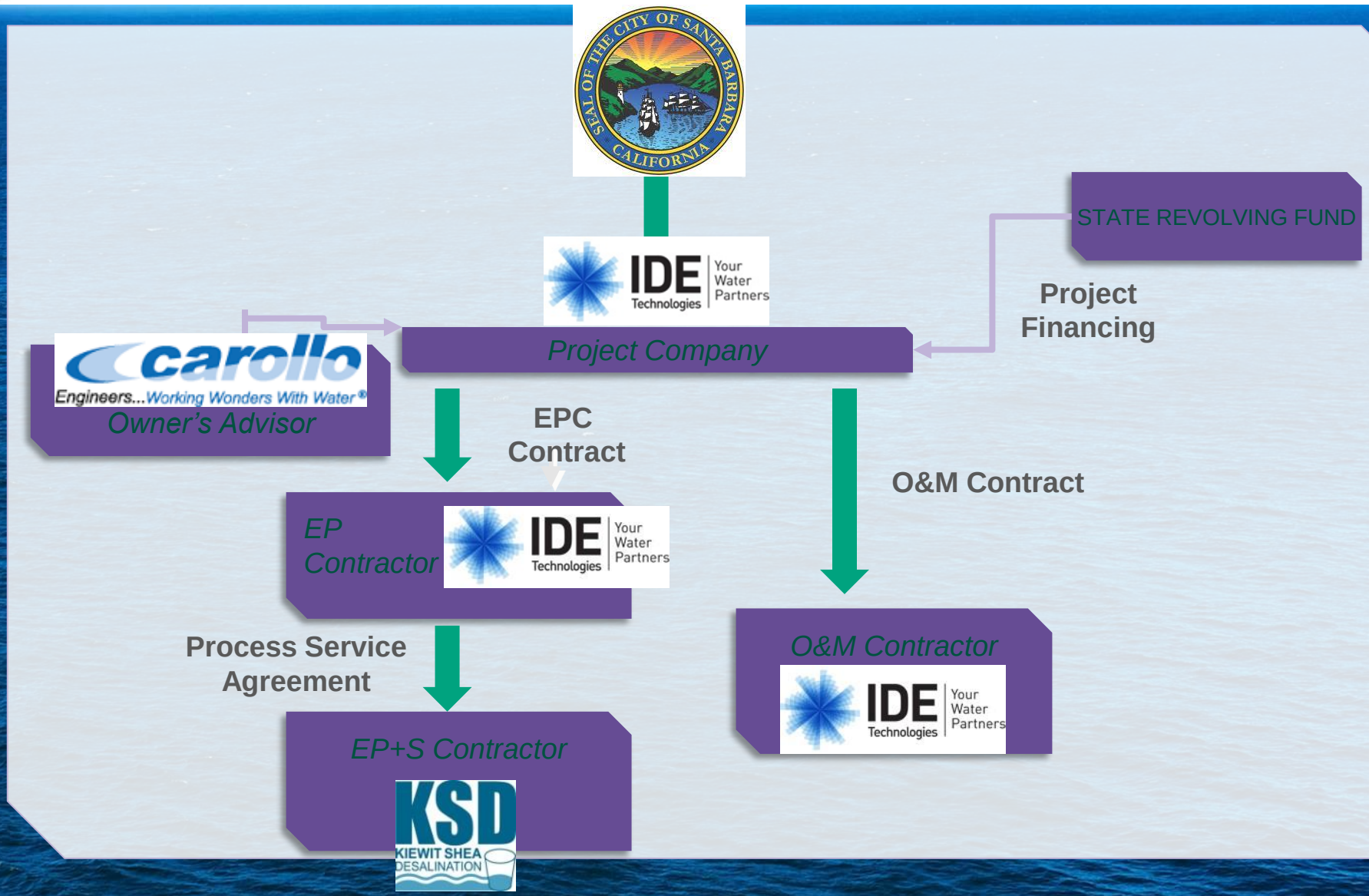
Project Overview

- Retrofit of Existing Plant (1990's vintage)
- Customer wanted a scalable facility = IDE's Modular Concept
- Capacity: 2.8 MGD (3125 AFY)
  - Potential of expansion to 6.7 MGD (7500 AFY)
- Technology: SWRO
- Project Type: DBO (EPC and O&M – 5 years)
- Off-Taker: City of Santa Barbara
- Commission Date: December 2016
- Accelerated Project Delivery
  - Site preparation and module construction simultaneous

Stakeholders and Contractual Structure



Project Milestones

July 2015:
Contract Signed

August 2015:
Financial close (execution of the Financial Agreements)

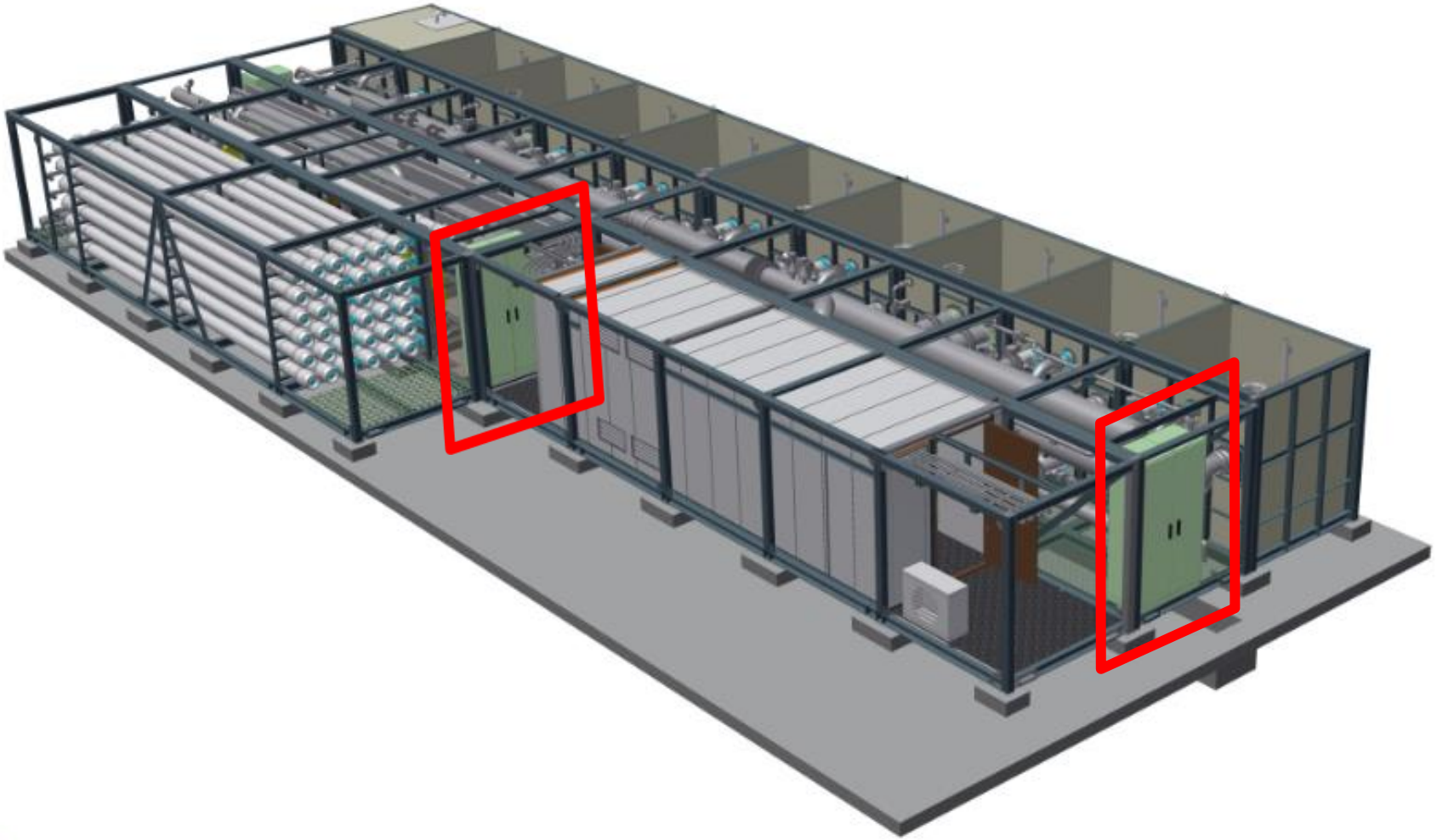
August 2015:
Issuance of the Notice to Proceed

September 2015:
On Site

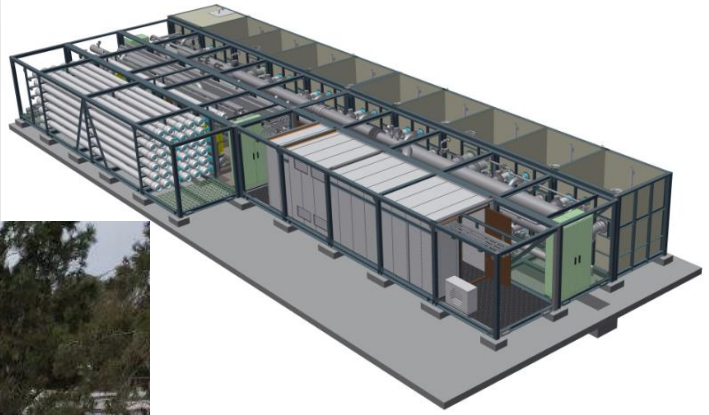
January 2017
Projected Completion

December 2021:
End of O&M agreement

SWRO 5,000 Module (1 MPD unit)



Santa Barbara 08-2016



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Industrial Application Case Studies

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IDE's Horizontal Evaporator: MED-50 MGD Capacity SDIC, Tianjin, China

POWER - CHINA'S LARGEST DESALINATION PLANT

- SDIC Electric Generation Plant: Tianjin, China
- No fresh water source available
- EPC project delivery
- In operation since 2010
- Powered by waste heat from SDIC
- 25% BFW, 75% sold to external industrial
- Brine recycled to produce table salt

8 X MED-25,000 m^3/day

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IDE's Horizontal Evaporator: MED-60 MGD Capacity Reliance - Gujarat , India

DOWN STREAM O&G - INDIA'S LARGEST DESALINATION PLANT

- Largest Refinery in the world
- Government terminated source of fresh water supply after 20 years.
- In operation since 1998
- Expandable source of water with 45 MGD SWRO currently under construction
- 20% to BFW; 80% to process/utility supply

4 X MED-50,000 m^3/day(feed)
24,000 m^3/day(distillate)

5 X MED-25,000 m^3/day(feed)
12,000 m^3/day(distillate)

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To Get Fish (a balanced portfolio)

Must Manage the Risks