



*INTEGRATED PUMPED HYDRO REVERSE OSMOSIS SYSTEM (IPHROS)*

## PROPOSED PROJECT FOR PITIQUITOS IN SONORA, MEXICO

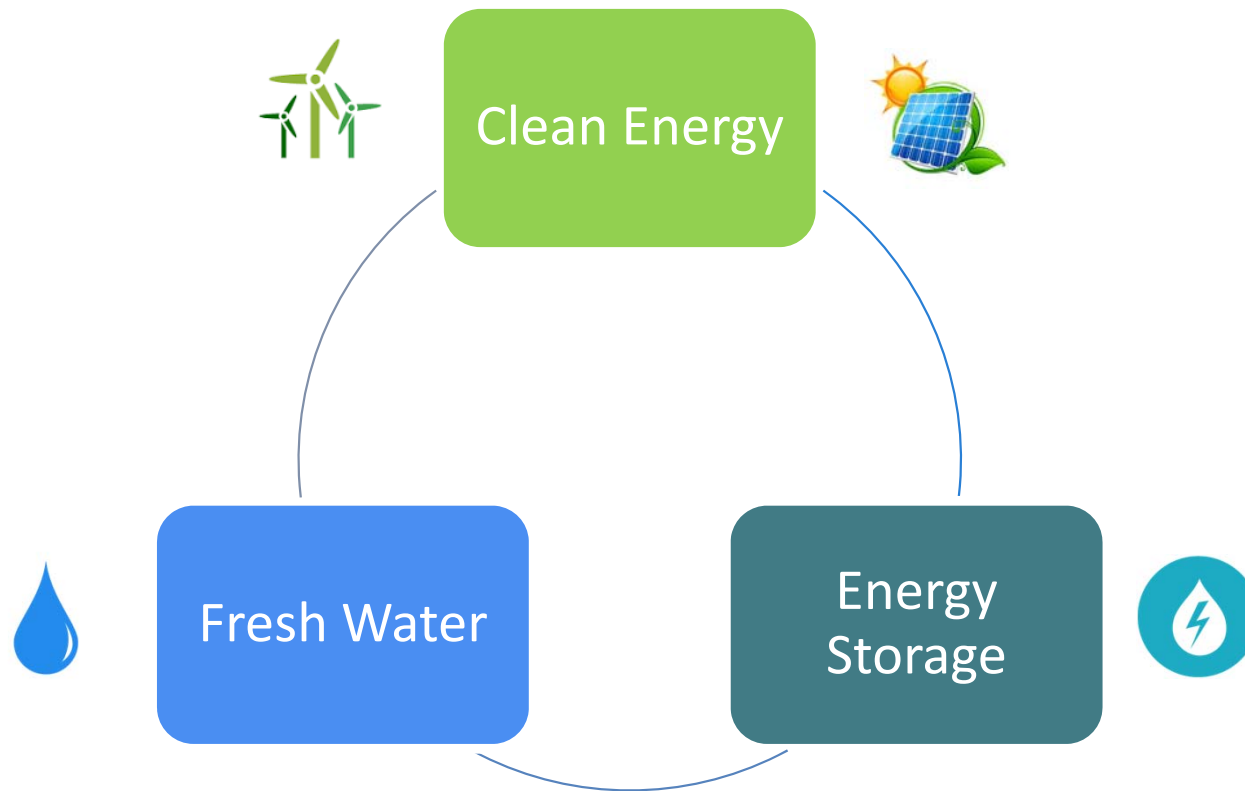


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**Transformative Impacts** when affordable and reliable **water and energy** become available in a **water scarce region**



*Integrated Pumped Hydro Reverse Osmosis System*

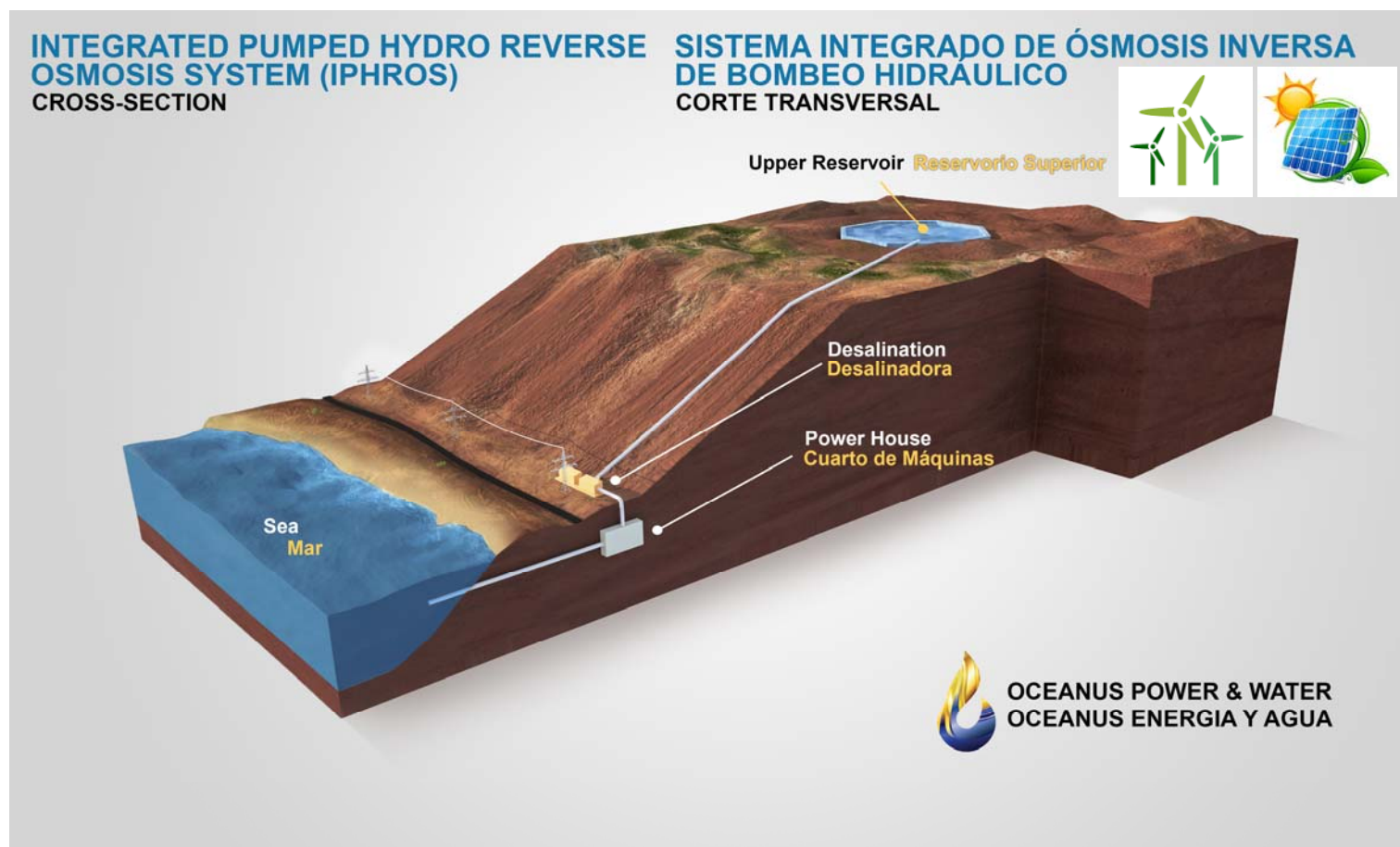
**IPHROS**



# THE OCEANUS SOLUTION

INTEGRATED PUMPED HYDRO REVERSE  
OSMOSIS SYSTEM (IPHROS)  
CROSS-SECTION

SISTEMA INTEGRADO DE ÓSMOSIS INVERSA  
DE BOMBEO HIDRAULICO  
CORTE TRANSVERSAL



- Seawater is pumped up to upper reservoir during periods of excess, low-cost energy, and released back to the ocean generating power during peak demand periods
- 10% of stored water is routed to desalination plant to continuously produce fresh water **without requiring further energy input**
- Photovoltaic and Wind Generation Facility from adjacent or nearby



# COMPETITIVE ENVIRONMENTAL ADVANTAGES

*Integration and Co-location provides unique solutions to environmental challenges typically facing SWRO.*



- **SPSH outflow dilutes SWRO waste brine, Brine Discharge blended** with discharge flows from SPSH designed to be within 5-10% of ambient salinity levels
- Hydraulic head drives to reduce **Energy Footprint:** ~ 40-60% reduction from conventional SWRO
- Reduced **Air Emissions:**
  - IPHROCES ~ **50% of energy required is zero emissions** (from PV & Wind); the other 50% is “off-peak” from base load generators





# COMPETITIVE COST ADVANTAGES

*Integration and Co-location provide unique solutions to drive down CAPEX and OPEX.*

## CAPEX Savings

- **Common Infrastructure:**  
Intake/outlet and pipelines, grid interconnection
- **Exposed** penstocks vs boring/tunneling
- **Reduction** in Pump HP

## OPEX Savings

- Joint operations and maintenance team
- SWRO Less Energy Required
- **Optimization of**  
Integration of SPSH, PV and SWRO

## Savings Impacts

- Low cost of SPSH Energy
- Low cost of SWRO
- Low cost of PV





# COMPETITIVE TECHNICAL ADVANTAGES

*Integration and Co-location provides unique solutions to environmental challenges typically associated PSH.*



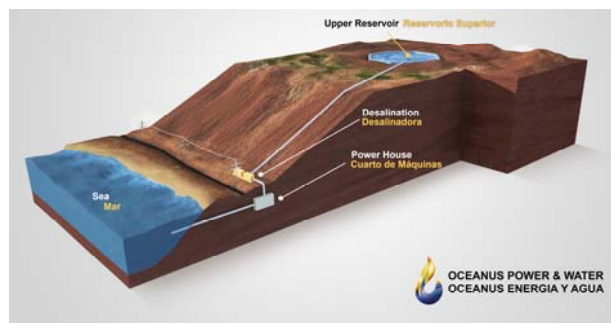
- PSH Operation **35% capacity factor** - ~3,000 hours/year of dispatchable energy to grid with rotating equipment providing grid stability features
- **Fast Response Times:** < 5 minutes
- **Can capture "Duck Curve" over-generation of PV & Wind**
  - Enables increased penetration of PV & Wind with fast response matching storage
  - Eliminate curtailment/dumping of PV & Wind





# OCEANUS SOLUTION FOR SONORA, MEXICO

- Integration of **proven technologies** drives down the costs of water and energy, securing long-term lower prices
- Benefits for Sonora include:
  - Benign brine discharge reduces environmental impact
  - Fresh sources of water for water scarce region
  - Fast response, dispatchable energy storage for very high penetration of PV
  - Driving towards zero emissions energy for utility scale water supply
  - Very long term, low cost water and energy infrastructure
  - Resilient systems for regions susceptible to hurricane or tsunami





# PROJECT - LOCATION

- The project is located in Sonora, the second largest state in Mexico, is sparsely populated
- Mountainous and arid, the region is sunny almost year-round and has little rainfall
- Agriculture is an important economic activity in the state, mostly the production of grains
- Sonora is rich in mineral resources. Nearly all of Mexico's copper is produced here





# MANAGEMENT TEAM AND CONTACT



## Neal Aronson, President and CEO

neal@oceanus.pw, +1-650-380-3323

- 25 years experience in master plan development throughout western US and Mexico; 5 years of renewables development. Flagship project is 150+ MW of solar PV on 1,200 acres of US Bureau of Reclamation land; interconnection with WAPA; complex permitting process

## Sandra Walker, COO

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- 30+ years experience in renewable energy development including hydro, solar, and biomass.
- Low-head Hydro for largest irrigation district in U.S.; VP of CA Turbine-in-a-Pipe energy recovery systems; managed for solar-powered circulation systems for water and wastewater treatment; development team for biomass plant

## Jose Garcia, Presidente of Oceanus de Mexico

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- 25+ years experience in project and program development with extensive ties to agriculture, water and energy sectors in Mexicali Valley. Experienced in negotiating with Ejidos, owners of large undeveloped land.
- Former Deputy Mayor of Mexicali, managing real estate assets, labor contracts, for a city with 1 million population, and capitol of Baja California, Mexico.

## Joan Leal, VP Engineering

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- 15+ years experience in civil engineering, project management and business development
- Head of Business Development – Engagement Manager for consulting firm focusing on power and mining projects, and coastal engineering, including desalination. Built global teams that have for new products and services to market. International Business Development in LATAM and Africa for infrastructure projects.

## Orestes Beltrones, VP Government Affairs

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- 20+ years experience in project and economic development in Mexico. Expertise in managing government relations for private and public sectors.