



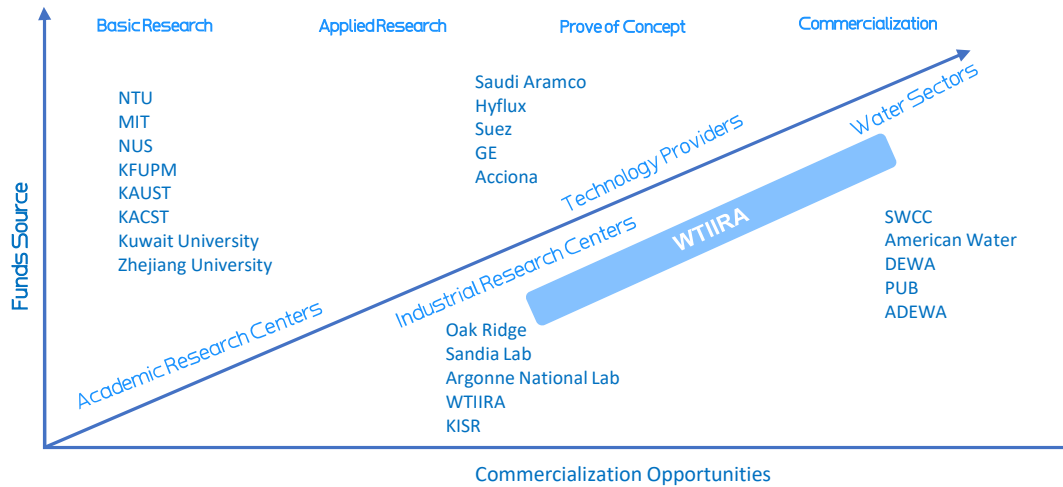
Innovation & Research WTIIRA-SWCC

WTIIRA in Numbers

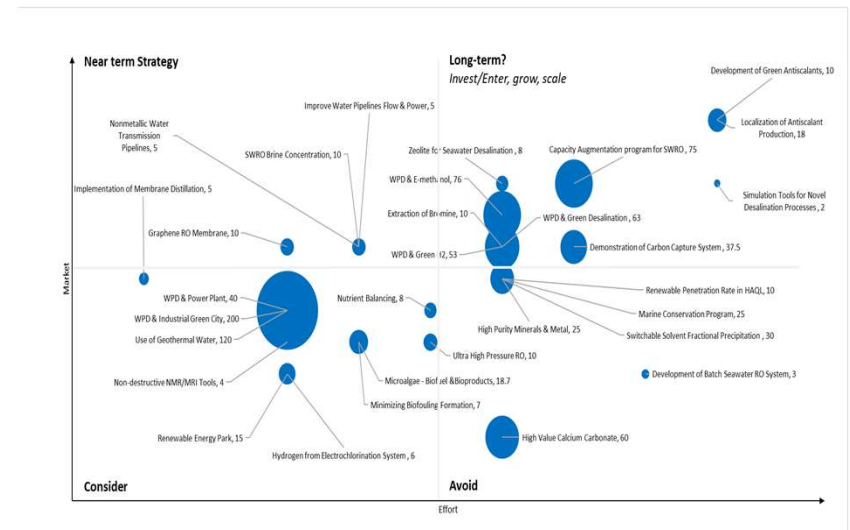


WTIIRA Research Groups

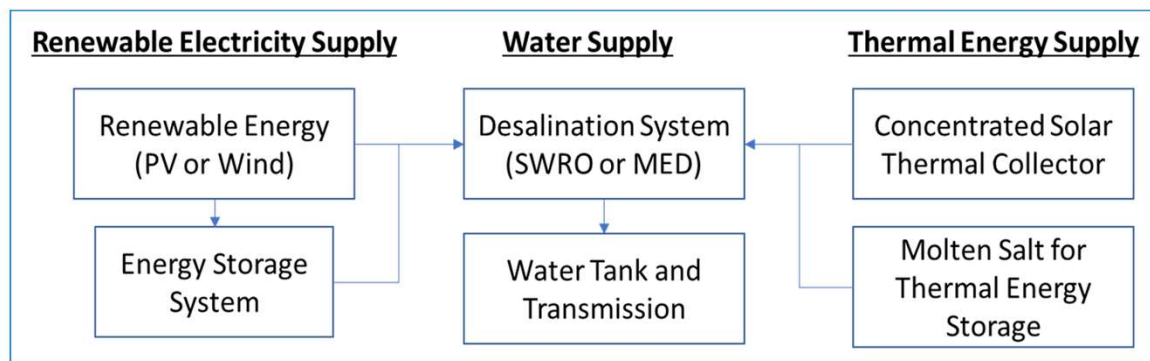
- | | |
|---|---|
| Brine Mining <ul style="list-style-type: none"> Extraction of valuable minerals from waste stream. Feasible conversion of waste into valuable products. | Renewable & Green Energy Group <ul style="list-style-type: none"> Penetration of RE in sustainable manner. Clean energy associated with desalination plants. |
| Sustainability & Advanced Materials <ul style="list-style-type: none"> Develop new technologies for tangible economic impact. Support the plants achieve operation stability & growth. | Processes & Products Innovation <ul style="list-style-type: none"> Improve SWRO efficiency Investigate the efficiency of various Pretreatment technologies Innovative solutions and equipment |



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GREEN DESALINATION – Configuration

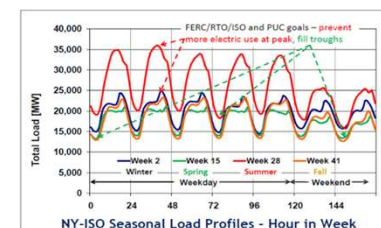
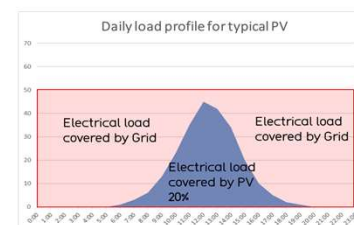


No new technologies for Green desalination system
 Question is how to make this configuration financially feasible

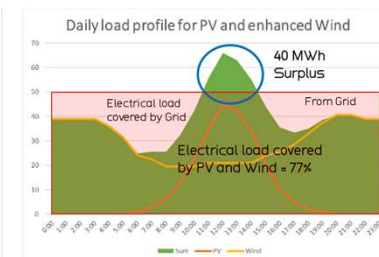
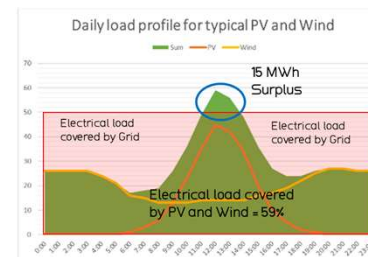
	SWRO	Electricity by Renewable [A]	Electricity by ESS [B]	Renewable Capacity [C=(A+B/0.8)/24/CF]
Renewable with CF=0.5 (Wind Case)	400,000 M3/day (288 mil.USD)	600 MWh	600 MWh (247.2 mil.USD)	112.5 MW (147.5 mil.USD)
Renewable with CF=0.2 (PV Case)	400,000 M3/day (288 mil.USD)	240 MWh	960 MWh (395.5 mil.USD)	300 MW (264.8 mil.USD)

Renewable Penetration

For typical SWRO (400,000 m3/day, 3.0 kWh/m3)
 Average daily electrical energy consumption is 1200 MWh



This concept could make sense because tariff of grid power usually expensive during daytime and cheap during nighttime.

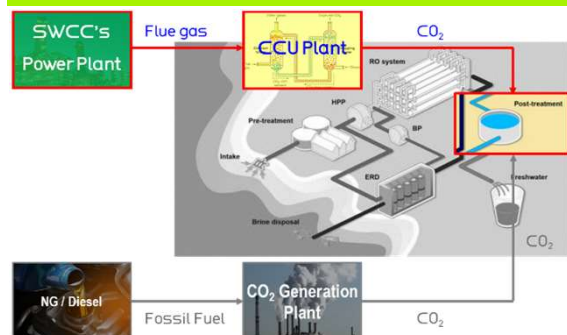


- With 50 MW PV (CF=0.2) and 50 MW Wind (CF=0.4-0.6), renewable penetration rate can be increased to 59 - 77% (Later stage after accumulating operation data of area specific Wind turbine from demo. Plant)
- Surplus electricity can be used in hydrogen production and sell it to industry to subsidize water production cost

SWCC – WTIRA technologies developments for CO2

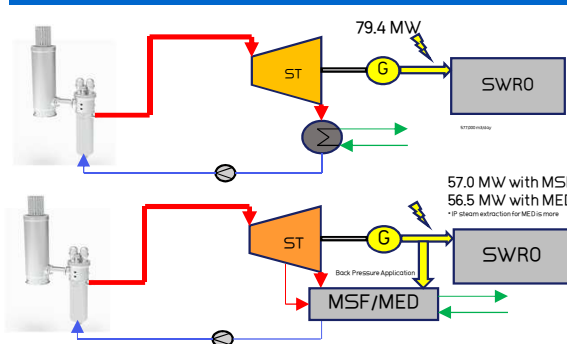
Technologies insights

CCUS in Desalination



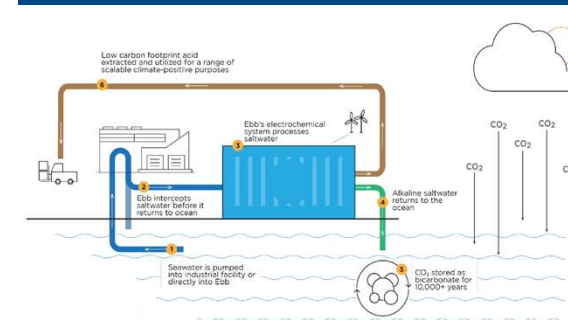
- 200 t/day of liquid CO2 is required to recarbonate desalinated water in post-treatment system
- utilizing captured CO2 in the post-treatment system, daily **87,000 liters of diesel can be saved**
- Annual savings more than **23 mil.SAR**

SMR baseload application



- Can eliminate electrical interface
- Contain electrical facility inside the boundary
- Power to Application
- Carbon Neutral

Direct Ocean Capture

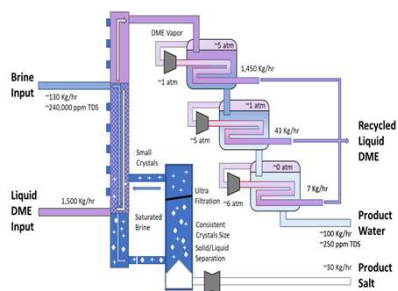


- Making seawater basic by adding base chemical or removing dissolved CO2

SWCC – WTIRA technologies developments for CO2

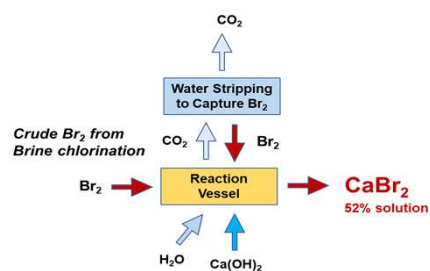
Technologies insights

Switchable Solvent



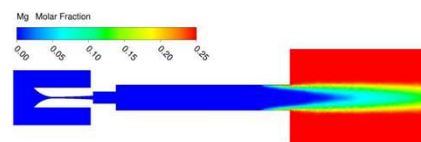
- ◀ Rather than evaporate water to precipitate salts, add DME under pressure
- ◀ Less energy than thermal evaporation or membrane brine concentration
- ◀ Smaller footprint than evaporation ponds
- ◀ Process design for NaCl and KCl (from brine concentrate) and MgSO4 and MgCl2 (from NF reject)
- ◀ Awaiting finalization of contract with Circular H2O

Bromide Salts Desalination Brine



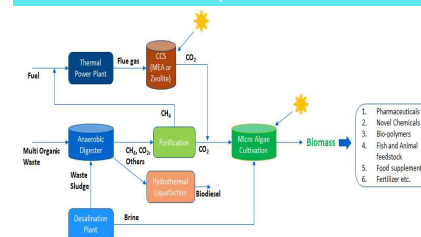
- ◀ Process for producing bromide salts for oil and gas industry, without going through highly purified bromine (reduced cost).
- ◀ Will enable techno-economic analysis of sodium bromide, calcium bromide, and zinc bromide production, allowing a business plan for provision of these chemicals to Aramco
- ◀ Project budget: 600,000 SAR.
- ◀ Expected completion Date April 2025.

Carbothermic Production of Magnesium



- ◀ Proof of concept for commercial production of metallic magnesium from seawater
- ◀ Unit will be the foundation for future projects investigating process conditions for magnesium oxide of varying purity/composition derived from different treatments of brine streams

Microalgae Cultivation for Biomass production



- ◀ Proof of concept for commercial production of microalgae cultivation plant by using SWRO brine and captured CO2 in order to produce biomass which can be used for animal feed stock
- ◀ Increase food security in the kingdom

Research & Innovation Reinforce

Global Prize Innovation Desalination (GPID)

1st of its kind in:

- Environmental Aspects of Water Industry
- Energy Consumption
- CAPEX & OPEX Reduction
- Innovative Desalinated Water Approach.

GPID Funds:

- Largest World Water Prize
- Piloting Winners Ideas.

Targeted Aud.:

- Research Centers
- Universities
- Entrepreneurs
- Companies
- Water Related Partners

Water Research Community (WRC)

1st WRC January, 2023

- 160** Researchers Attendees
- 60** Research Projects Ideas
- 6** Approved Research Agreements

2nd WRC November, 2023

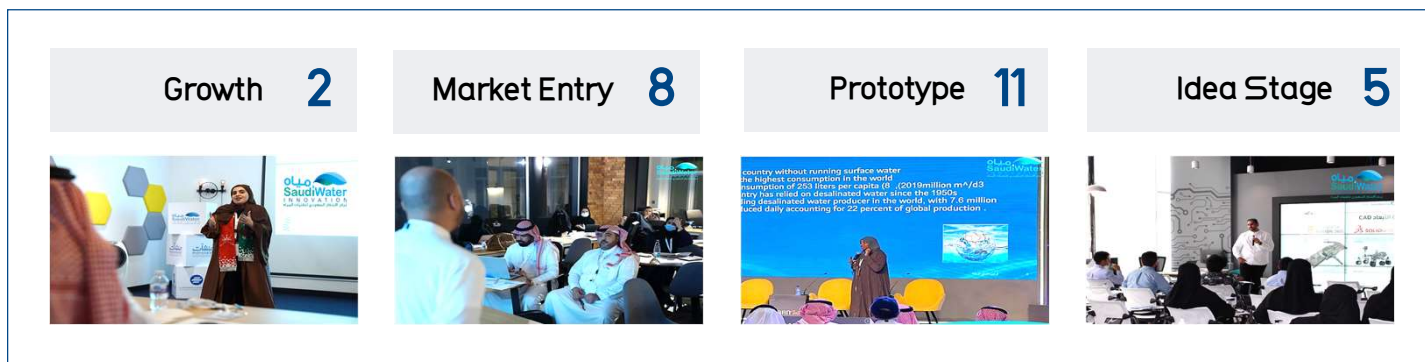
- 250** Researchers Attendees
- 80** Research Projects Ideas
- 11** Approved Research Agreements



Saudi Innovation Centre for Water Technologies

Key targets for 2024

- Enabling innovative and entrepreneurial ideas in water technologies to support local content and technology localization.
- Expanding quality services to foster an innovation culture in the water sector.
- Increasing the number of training camps in technical fields to support entrepreneurship in the water sector.
- Annual event to attract innovative ideas for challenges in the water sector.



Key achievements of 2023





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