

**«Il futuro della dissalazione, nuovi progetti, integrazione dei territori, isole minori, utenze industriali, valorizzazione della salamoia»**

## **SUEZ NELLA DISSALAZIONE**

**Eng. Daniela Grassi**

**28-11-2024**

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**Nuova Fiera del Levante, 27-28 novembre 2024**

IN COLLABORAZIONE CON





## SUEZ references overview of iconic Desalination projects

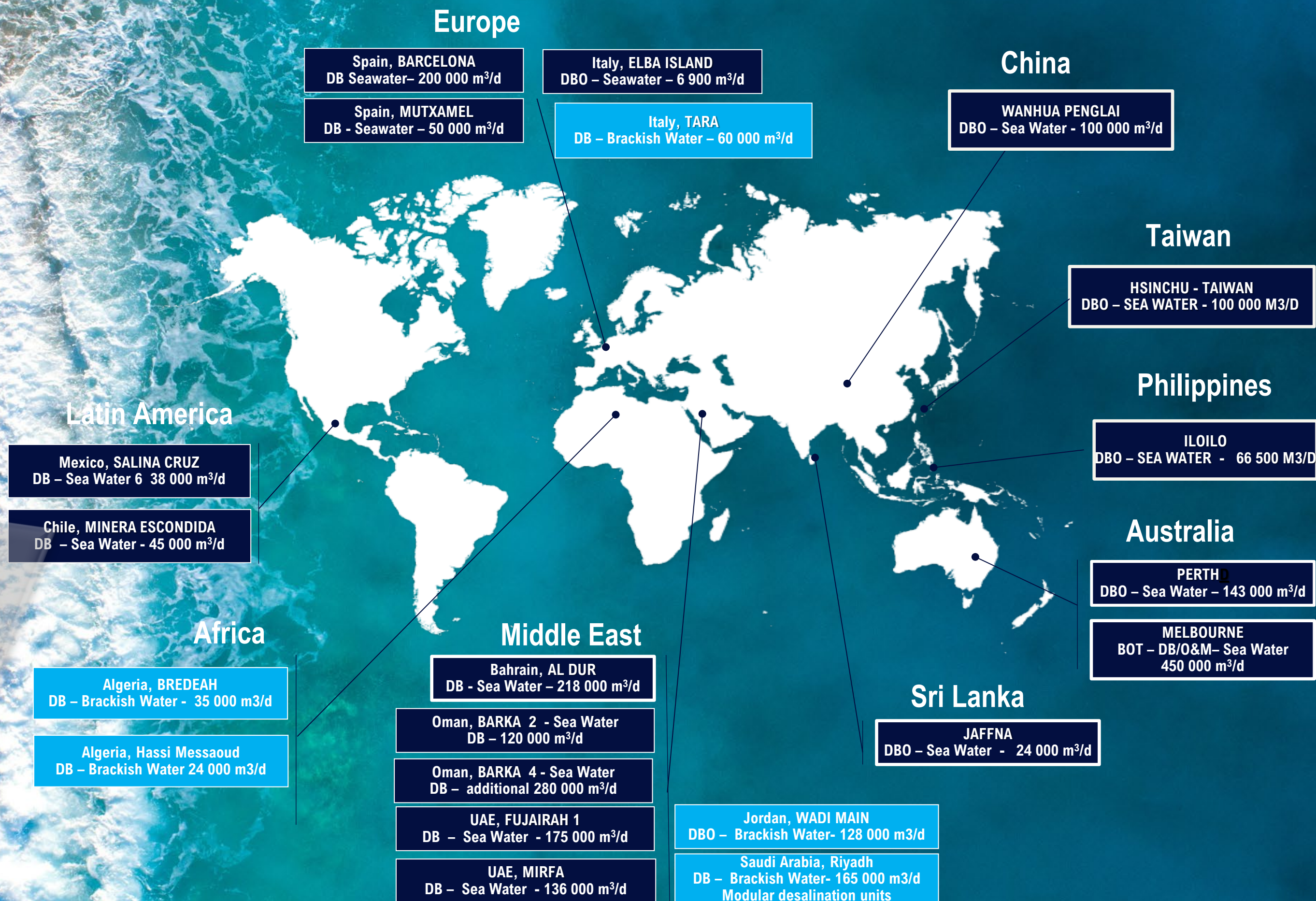
SUEZ retains all its technical expertise, **know-how** (design, construction, long-term operation and financing) and the resources that carried out these projects

DB = Design & Build  
DBO = Design, Build & Operate  
BOT = Build, Operate & Transfer

# + 260

**DESALINATION** plants  
designed and built by SUEZ

**+ 50 years**  
experience in  
**sustainable**  
**desalination**





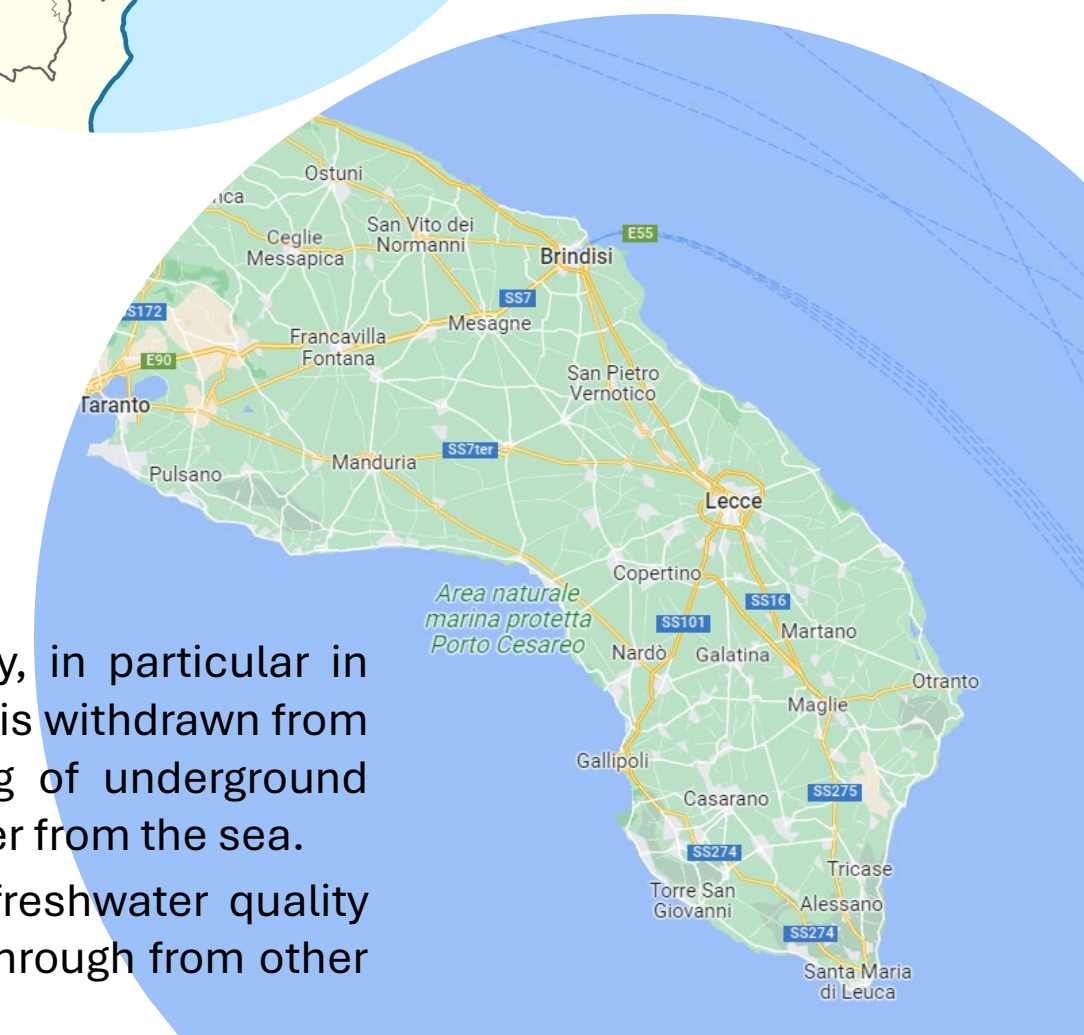
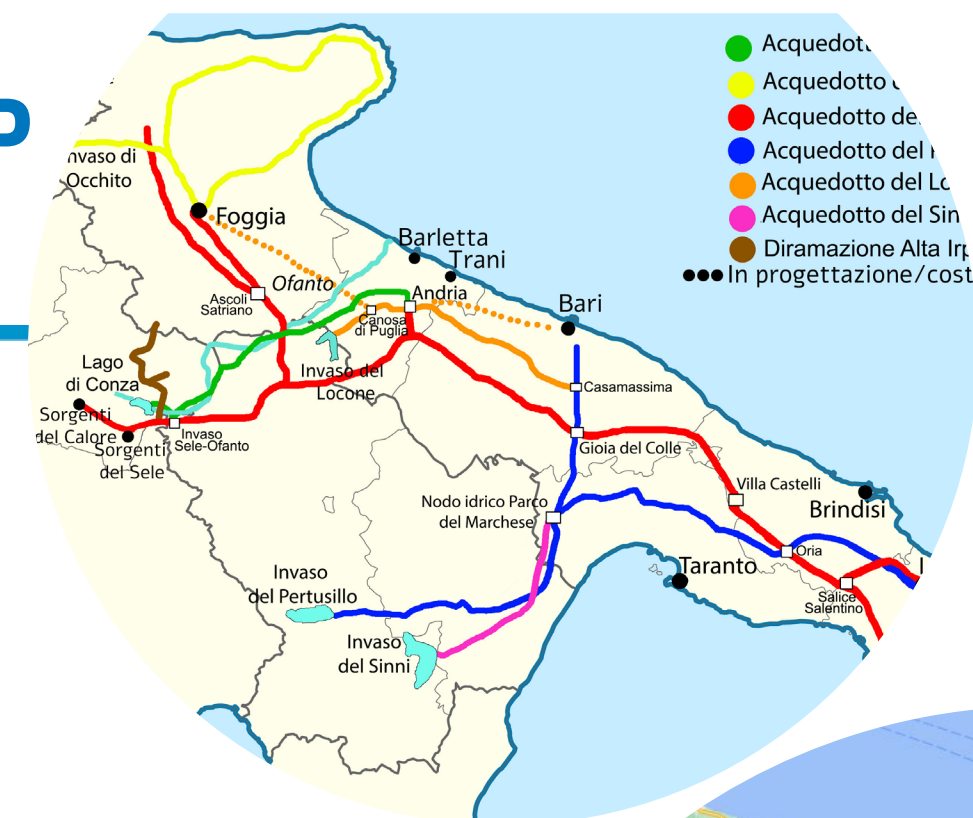
### Project Overview

- Tara BWTP is a new drinking water treatment plant and its distribution network. The desalination plant will include **reverse osmosis** technology, to treat brackish water from Tara river.
- **60 000m<sup>3</sup>/day** (630 l/s), serving 385,000 equivalent population. With its capacity it is 5 times bigger than industrial Sarlux Refinery Plant, nowadays the biggest desalination plant in Italy.
- The produced potable water by mean of an underground pipe (14km long) will feed a reservoir of 200thousands cubic meters located in Taranto.

### Sustainability:

Salento area is facing a problem of water scarcity, in particular in summer periods. To cope with peak demand, water is withdrawn from underground wells. As consequence, the lowering of underground freshwater level allows the entrance of brackish water from the sea.

Tara treatment plant will preserving underground freshwater quality from sea intrusion and reduce the water imported through from other Regions and

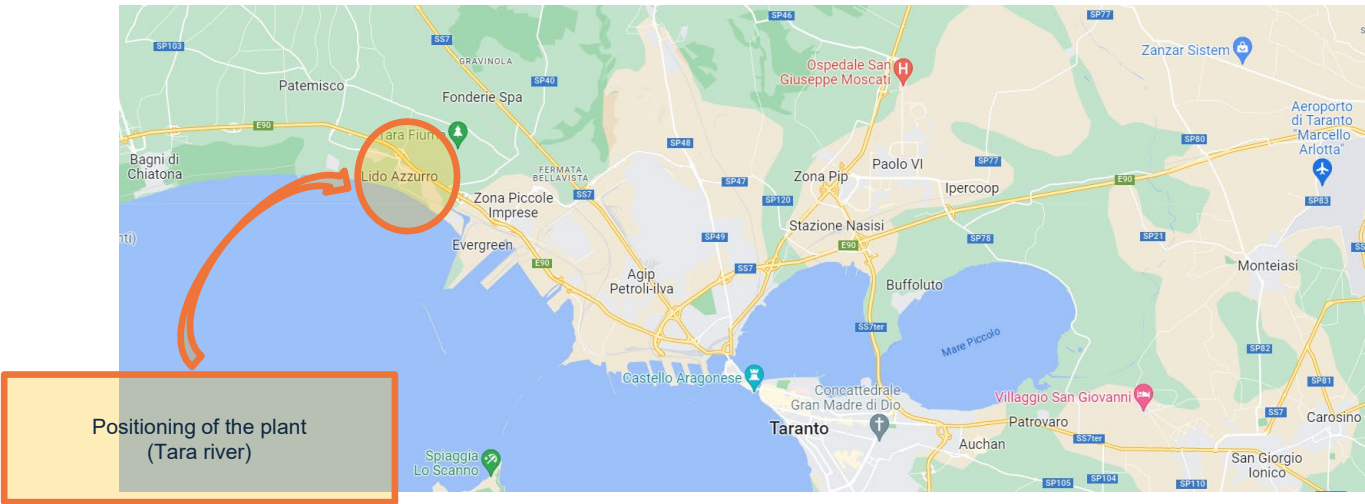






Analita	UM	Valore	Analita	UM	Valore	Analita	UM	Valore
Bicarbonati	mg/l	378	Solfati	mg/l	179	Nichel	µg/l	<1
BOD <sub>5</sub>	mgO <sub>2</sub> /l	< 2	SST	mg/l	8,8	Piombo	µg/l	<1
Cloruri	mg/l	784	Alluminio	µg/l	< 5	Rame	µg/l	<1
COD	mgO <sub>2</sub> /l	< 5	Arsenico	µg/l	< 1	Tallio	µg/l	< 0,2
Conducibilità	mS/cm	3360	Berillio	µg/l	<0,1	Zinco	µg/l	< 5
Temperatura	°C	19,2	Boro	µg/l	616	Calcio	mg/l	161
Durezza totale	°F	70	Cadmio	µg/l	<0,25	Magnesio	mg/l	85
Floruri	mg/l	0,47	Cobalto	µg/l	<0,3	Potassio	mg/l	18
Fosfati	mg/l	< 0,1	Cromo tot	µg/l	<1	Sodio	mg/l	451
Ione ammonio	mg/l	< 0,4	Ferro	µg/l	14	Vanadio	µg/l	4,92
Nitrati	mg/l	31,1	Litio	µg/l	45,5	Cromo IV	µg/l	0,17
Ossigeno disciolto	mgO <sub>2</sub> /l	8,8	Manganese	µg/l	1,87	Stronzio	µg/l	2756
pH	-	7,26	Mercurio	µg/l	<0,02			

- Potable Water: according to Decreto Legislativo 18/2023.
- Reject water: in compliance with Decreto legislativo 3 aprile 2006, n. 152 e ss.mm.ii.



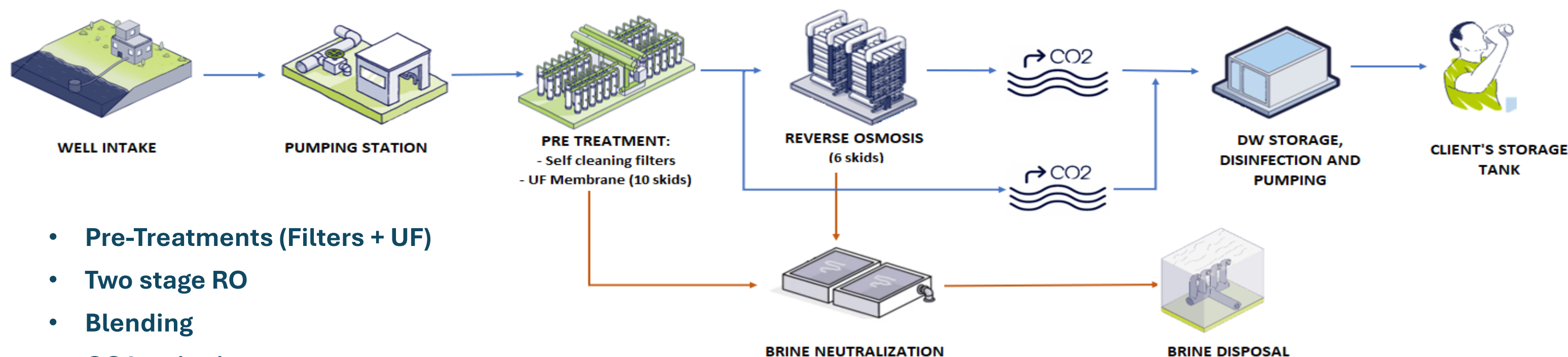
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- Pre-Treatments (Filters + UF)
- Two stage RO
- Blending
- CO2 stripping
- Langelier index Alkali adjustment

- ✓ 3 intake pumps (2+1R) 500lt/sec each
- ✓ 3 Self-cleaning filters 200micron (2+1R) 500lt/sec each
- ✓ 10 UF (8+2R)
- ✓ 6 RO batteries (5+1R) with 6 HP pumps and 1 common cold spare
- ✓ Emergency generator to guaranty min flow during black out
- ✓ Control system by one PLC with 2 CPU in hot back up configuration. RIO panel distributed along the plant with a closed ring communication network
- ✓ Space and some facility already available for 30% future expansion

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- To **optimize Design and secure potable** water quality
  - ✓ UF pretreatment 0,02 µm
  - ✓ BWRO membranes selection in order to maximize the Recovery till 65% consequentially reducing water flow rate intake from TARA
- Remineralization including cascade degassing **to reduce chemical dosage** and plant carbon footprint (up to 97% chemical reduction compared to tender requirement)
- **Customized energy-saving measures** reaching less then 1,5kWh per cubic meter of produced water (use of a pressurization system with low specific energy consumption: isobar recuperator with booster pump, discharge to sea by gravity, 2000mq of solar panels)
- A flexible and reliable plant through equipment redundancy to minimize plant stops and emergency generator to guaranty minimum flow during black out





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Nowadays Elba Island is fed by potable water from the mainland by mean of a sub marine pipeline 10km long  
On the top of it the mainland wells source due to water scarcity are becoming more and more salty.  
Mission of the project is to make the Island self sustained from potable water perspective, producing inland water from sea.

- ✓ **Biggest seawater RO** desalination plant in Italy to produce potable water
- ✓ Production up to **6900 m<sup>3</sup>** of drinking water per day
- ✓ Estimated population served: 30 000 in Wintertime till to **300 000 in Summertime**
- ✓ DBO contract (under construction), Including 1-years O&M period
- ✓ Intake line and brine outfall to the sea 1,2km from the coast made out from SUEZ scope.



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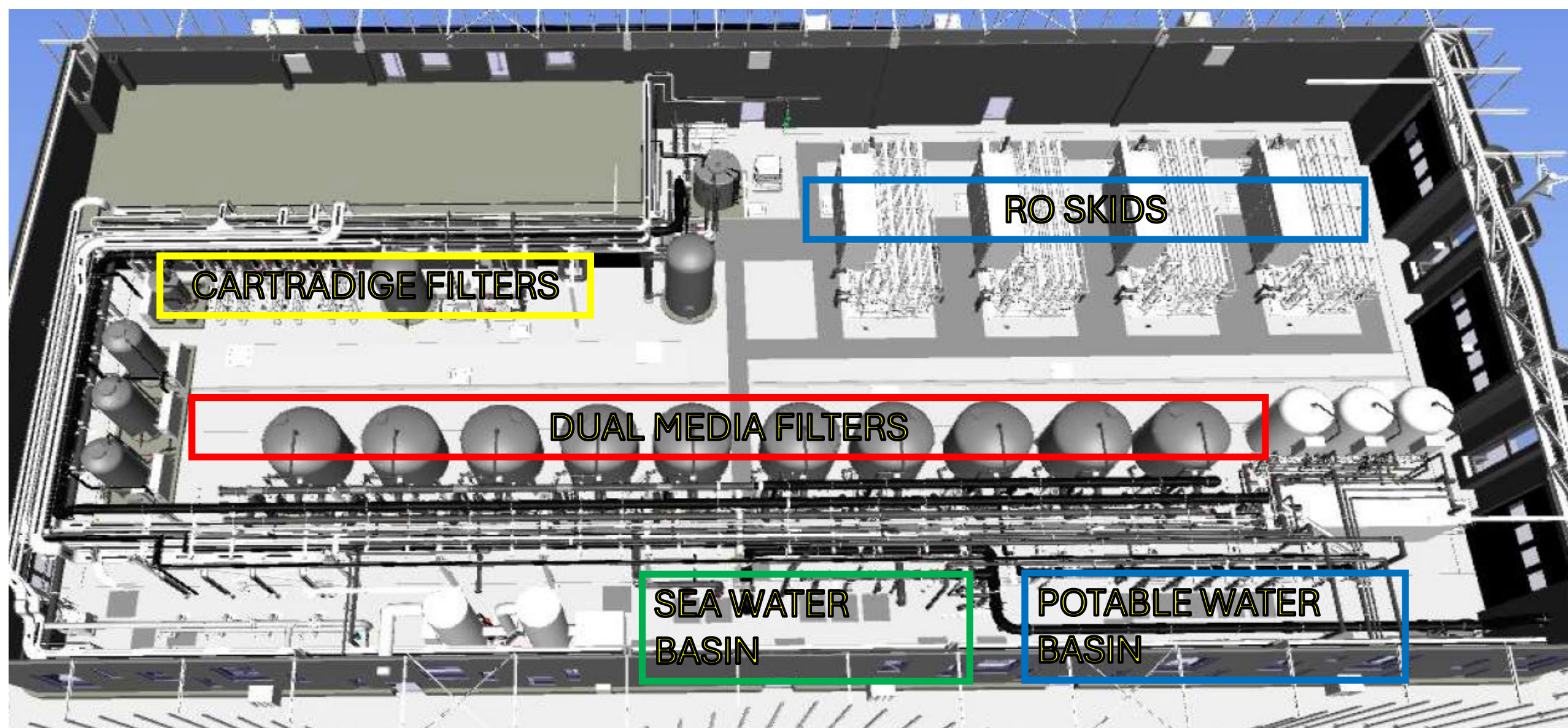
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### Key design data

- SWRO 7 MLD
- 10 press. DMFs + 4 RO lines
- Remineralization by blending with existing wells



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- Design suitable to TDS, Temperature variations during all the plant lifetime
- To minimise the skid dimensions in order to allow lifting and transportation in a small island like Elba
- The use of a pressurization system with low specific energy consumption: the coupling with piston pump (with higher efficiency than centrifugal pumps) and isobar recuperator with booster pump, allow lower specific consumption than other applicable systems (in Elba project specific consumption is about 3,89kWh/m<sup>3</sup>)
- Very carefull membrane selection in order to guarantee potable water quality (i.e. when job started Boron max content <1mg/lt now 2.5mg/lt)



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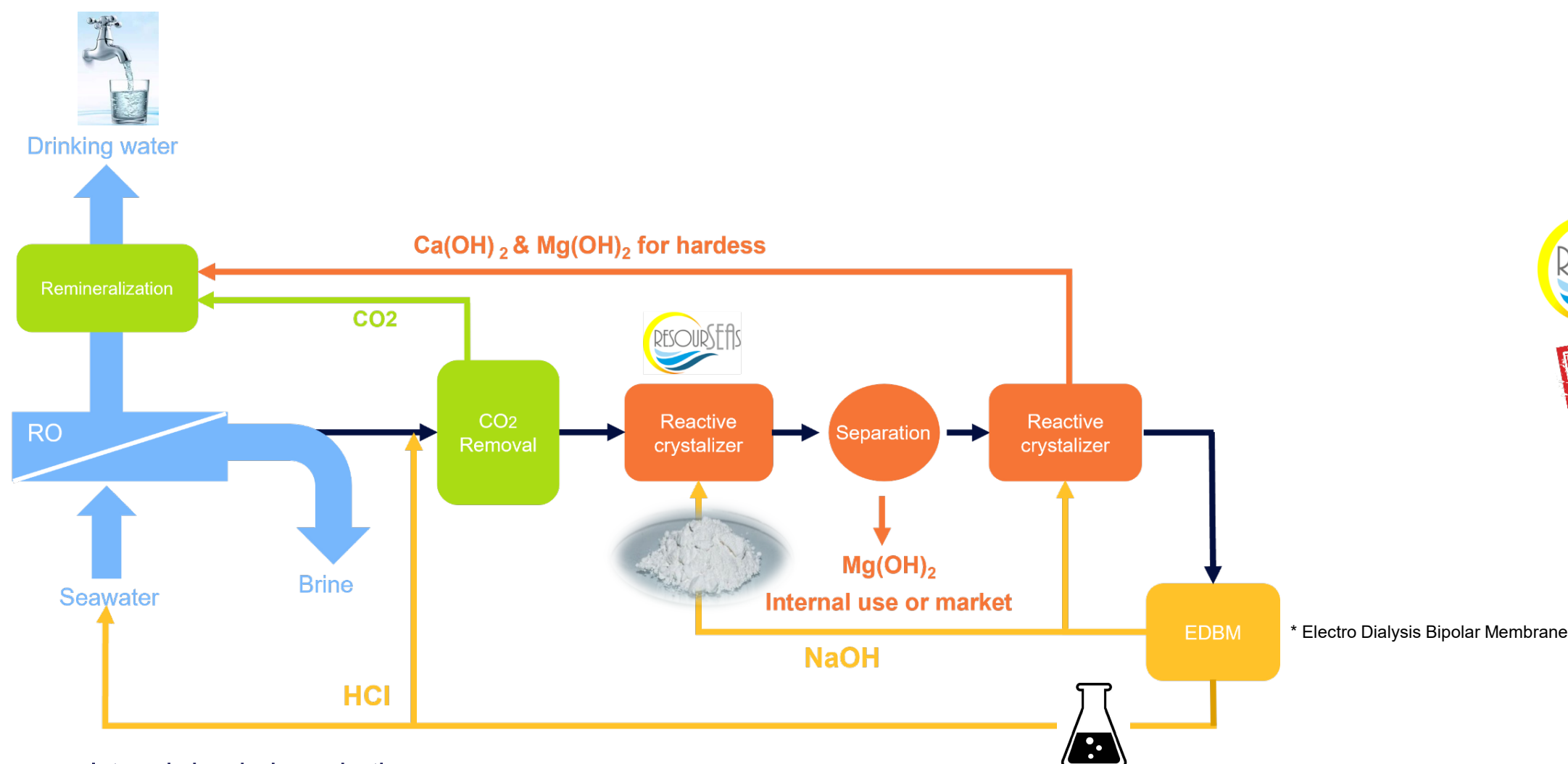


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- Internal chemicals production
  - 100% circular economy approach, avoid price fluctuations
- Addition of Mg in drinking water – Answer to a Health concern
- By-product Mg(OH)<sub>2</sub> valorization – Additional revenue
- Reduction of CO<sub>2</sub> emission – Sustainability increase

Island as one of the best scenarios for circularity and internal chemicals production  
 Adopting these approaches worldwide could save significant CO<sub>2</sub> emissions  
 Academic/ Innovation partnerships are key in SUEZ innovation strategy



CO<sub>2</sub> extraction column + CO<sub>2</sub> injection skid



Reactive crystalizer



ElectroDialysis  
with Bipolar  
Membranes  
EDBM



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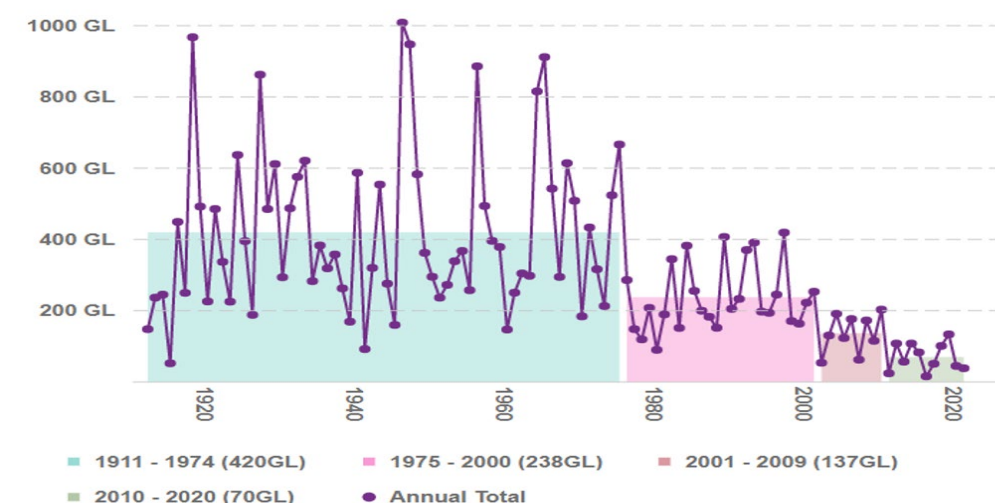
Water Corporation is the principal supplier of water, wastewater, drainage and bulk irrigation services in Western Australia: a 10 years plan to protect groundwater environment and ensure quality drinking water

- Transferring groundwater abstraction to deeper aquifers
- Replenishing deep aquifers with recycled water
- Expand seawater desalination capacity
- Continue focus on water use efficiency
- Use wastewater recycling for industry, public open spaces and agriculture

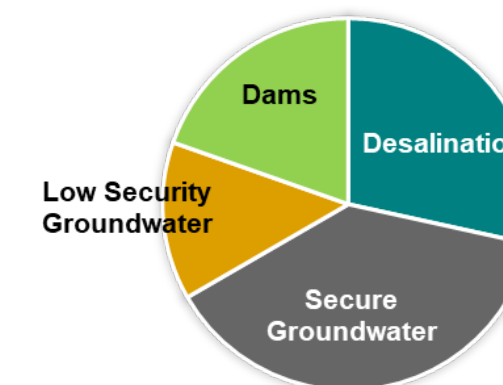
### Suez - Beenyup Advanced Water Recycling Plant (AWRP)

first utility in Australia to replenish our groundwater through an innovative concept where treated wastewater is purified to drinking water standards at an advanced water recycling plant (AWRP) and then pumped (recharged) underground. This purified recycled water is stored in deep groundwater aquifers, which provide additional natural filtration of the water until we need it. The first stage started recharging purified recycled water to Perth's deep aquifers in 2017. By 2022, the second stage of the groundwater replenishment scheme was completed. This expansion doubled the treatment capacity of AWRP from 14 billion litres to 28 billion litres of water per year.

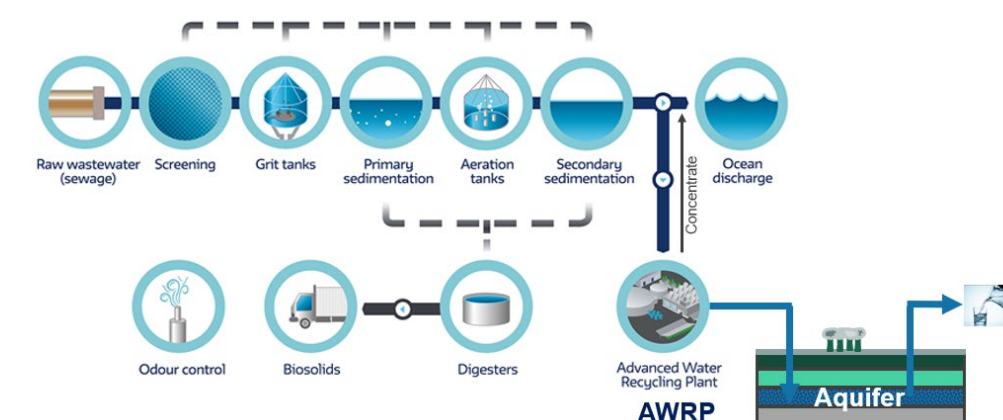
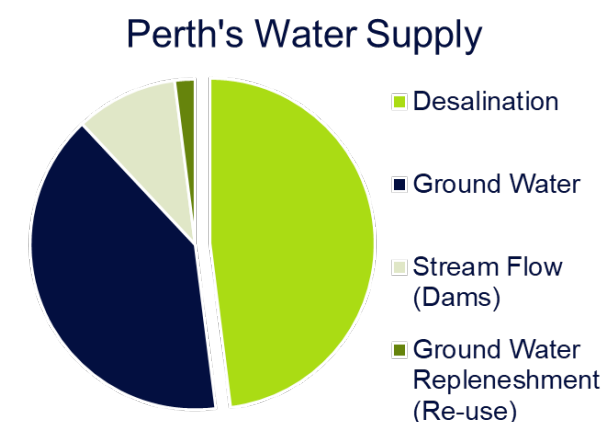
Currently, groundwater replenishment makes up 5% of our Integrated Water Supply Scheme.



### STARTING POINT



### CURRENT SOURCES



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The Perth seawater desalination plant to safeguard the future of Perth Metropolitan drinking water

### KEY FIGURES

- Joint Venture between SUEZ & Multiplex construction was awarded a **25-year contract** until 2032 (commissioned in 2016)
- Capacity: **143,700 m<sup>3</sup>/d**
- Estimated population served: **2 million**
- **Reverse Osmosis**: 12 trains (first pass), 6 trains (second pass)

### CHALLENGE

In 2005, stream flows had dropped by nearly 30% over the preceding eight years. As a result, urgent medium-term including water restrictions and additional groundwater allocations were implemented. To safeguard the future in the longer term, Perth needed to diversify its water strategy. The aim of this desalination plant was to increase the drinking water production in Perth region.

### SOLUTION

- **Innovative Reverse Osmosis design with a pre-treatment system**: [Seaclean™] Dual Media filters.
- Reverse Osmosis with double-pass membranes to achieve a salinity below 200mg/L and a bromide content below 0.1mg/L. **Remineralisation** to meet stringent drinking water quality standards.
- Advanced **brine dispersion** technology
- Innovative **energy-saving** measures

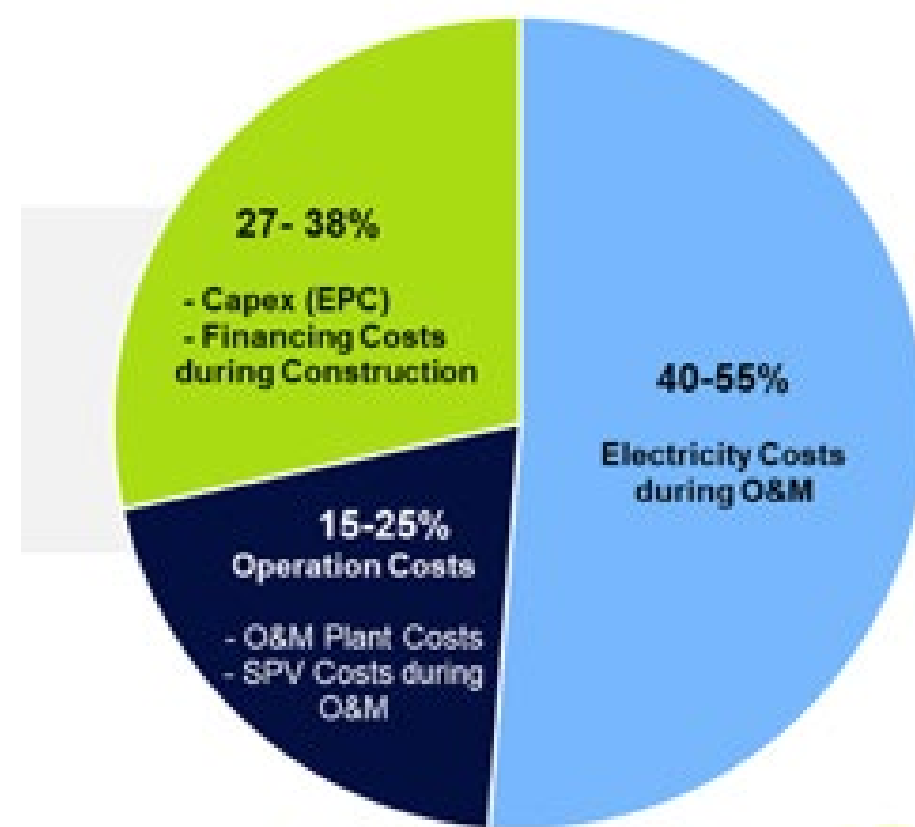
### BENEFITS

- **Operational efficiency** and novel design, helping mitigate the effects of drought with minimal environmental impact.
- **Reducing total reliance on rainfall** is a critical step in ensuring clean and safe drinking water for Perth's population well into the future.



Desalination is a reliable solution to water scarcity

### WATER TARIFF breakdown



Renewable energy supply to comply with the European taxonomy, the GHG emissions must not exceed 1080 gCO<sub>2</sub>e/m<sup>3</sup> of water produced



SEC < 3 kWh/m<sup>3</sup> for large projects (>100 MLD)



Less CHEMICALS



Promote **circular economy** solutions in desalination plants : Brine valorization

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**THANK YOU**

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