European Twinning for research in Solar energy to (2) water (H2O) production and treatment technologies
GA Number: 101079305
European Research Executive Agency REA.C3

Sol2H2O

Funded by
the European Union

Fast-Track School #2

Pilot plant installed within the JRA of Sol2H2O project

POZO IZQUIERDO, 24.-27.09.2024

AGENDA

PROJECT SOL2H2O

SOLAR DESALINATION AT CER

SOLAR DESALINATION - INFRASTRUCTURE

SOLAR DESALINATION - PILOT

PROJECT OBJECTIVES AND IMPACTS

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PROJECT Sol2H2O

- Objective is to strengthen networking between the partners and the coordinator
- Improving its research profile through the valorisation of human resources and infrastructural synergies
- Developing a European reference facility for the development and testing of circular solar technologies for water production and treatment

Project in collaboration with:

- Plataforma Solar de Almería
- Universidade de Palermo
- Instituto Tecnológico de Canarias

SOLAR DESALINATION AT CER

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PROJECT Sol2H2O

Part of the research programme of the European project:

- Sol2H2O - Grant agreement ID: 101079305

Developed in the installations of Renewable Energies Chair by the **Water Production and Water Treatment** unit (WPWT)

Solar-powered water production and "Zero-Liquid Discharge" solutions

With a technological focus on

- Desalination by reverse osmosis powered by photovoltaic systems (PV-RO)
- Vacuum-enhanced air-gap membrane distillation for the production of fresh water via brines, interconnected with solar thermal energy
- Brine treatment processes for salt recovery ('Multiple Feed Plug Flow Reactor' - MF-PFR)

SOLAR DESALINATION - INFRASTRUCTURE

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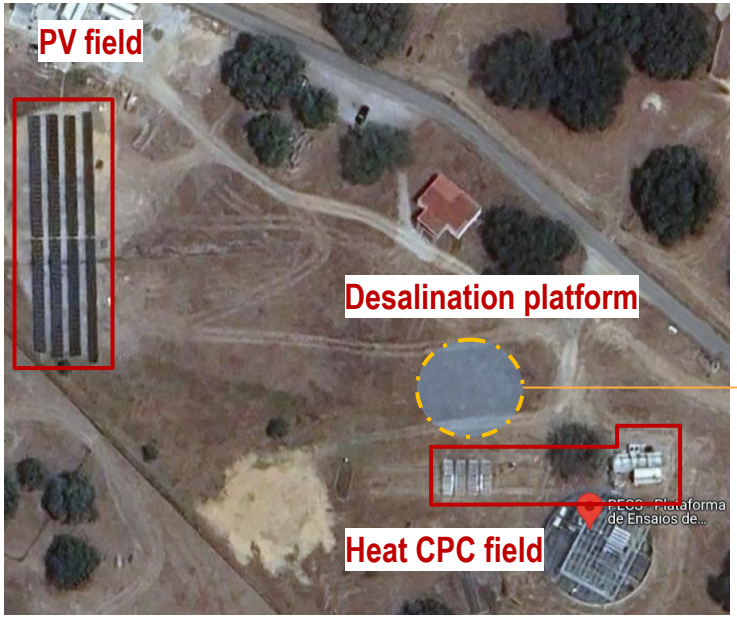
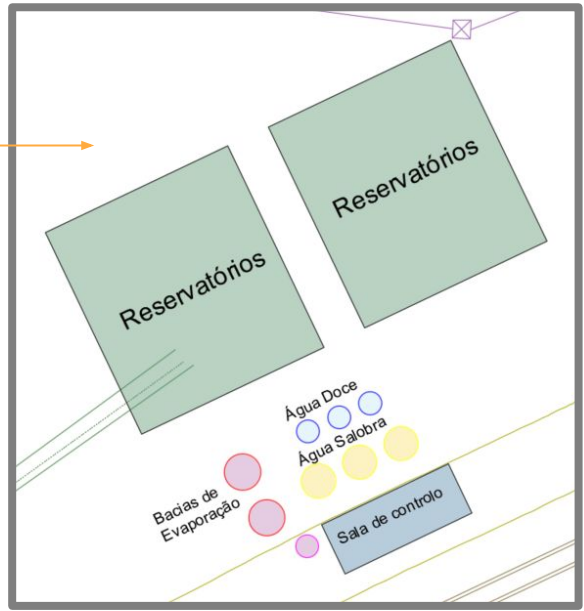
- **Conception**
- **Design**
- **Construction**

Of a pilot solar desalination plant with a high recovery rate, based on the "Zero Liquid Discharge" concept





SOLAR DESALINATION - INFRASTRUCTURE

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PV power supply:

- Two (2) monofacial rows and two (2) bifacial rows
- Row 1 and 2 - monocrystalline type n, full cell
- Row 3 and 4 - monocrystalline type p, half-cell
  - **N** type shows **>** efficiency to **P** type
- Total power of: ~90 kWp

SOLAR DESALINATION - INFRASTRUCTURE

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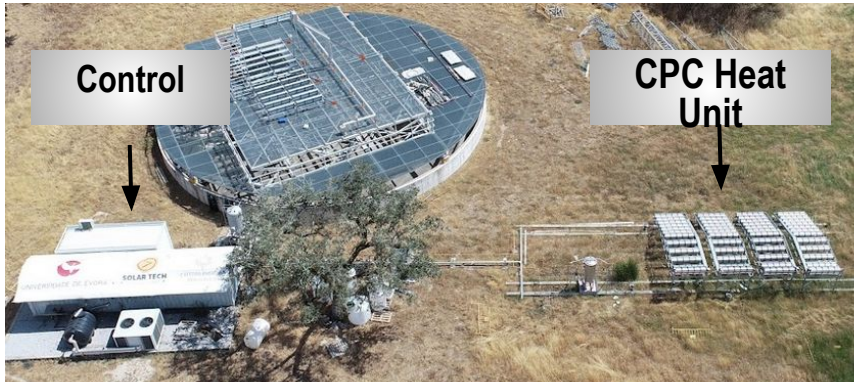
Heat supply:

Almost stationary **CPC** (compound parabolic collector) type collectors field:

- Thermal oil loop
- Nominal operation temperature of **180 ºC - 200 ºC**
- Operation pressure up to 5 bar
- Power of **16 kWp_{th}**



SOLAR DESALINATION - INFRASTRUCTURE

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PROJECT Sol2H2O

SOLAR DESALINATION - INFRASTRUCTURE

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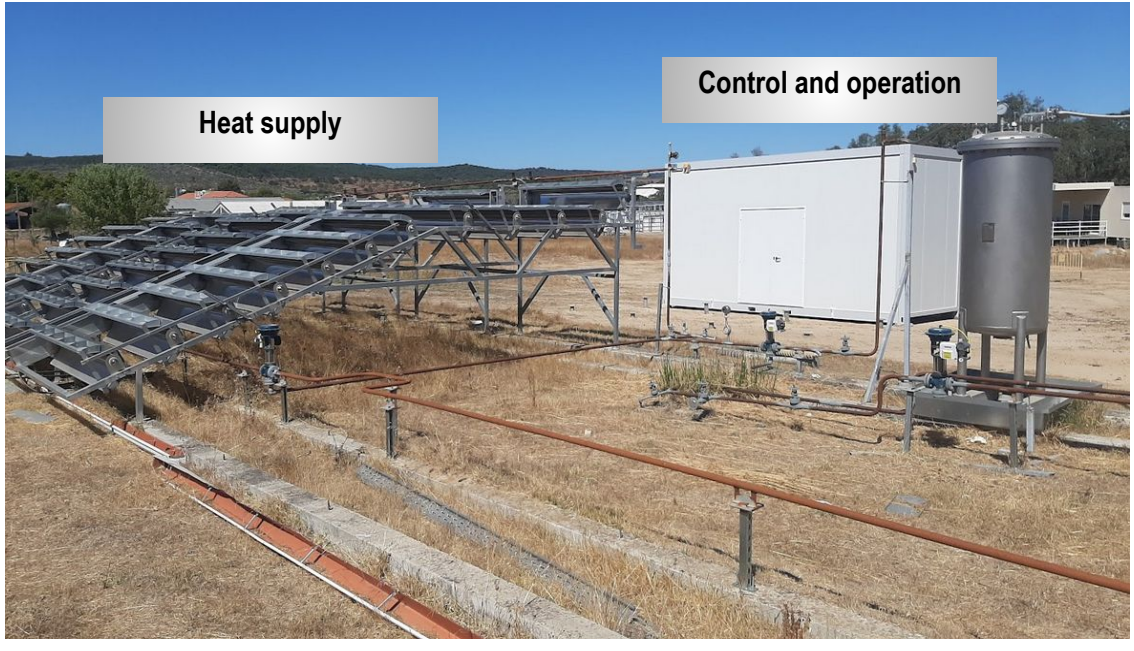
Hydraulic connections accordingly with the specific product (brine ou permeate)



SOLAR DESALINATION - PILOT

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PROJECT SoI2H2O

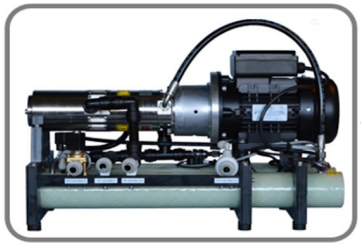
Brine treatment capacity

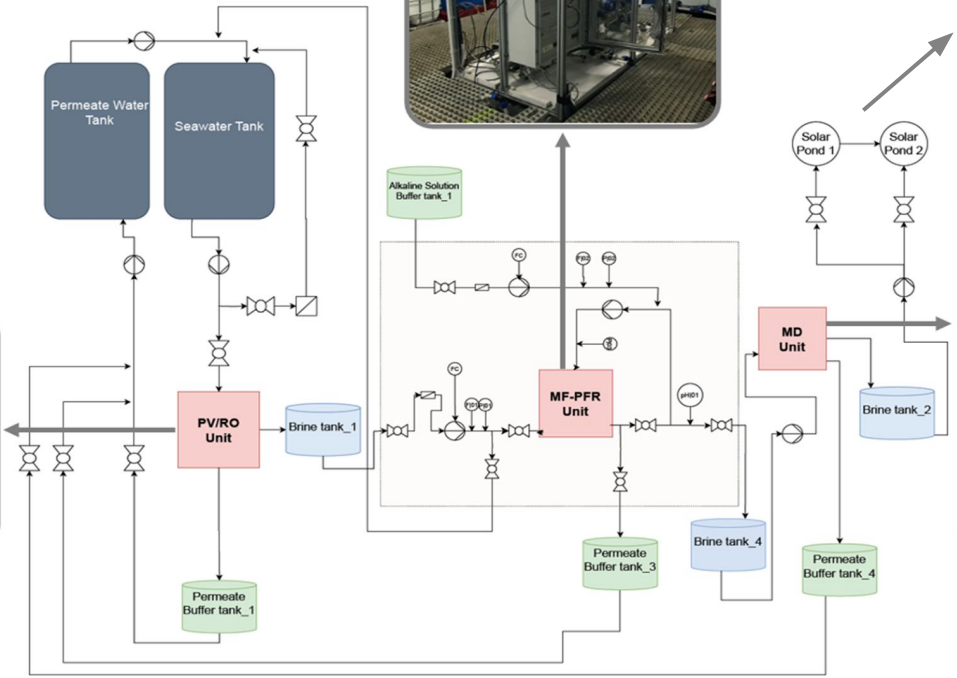
1 m^3/day

MF-PFR Unit

Evaporation Ponds

PV/RO Unit





MD unit

SOLAR DESALINATION - PILOT

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REVERSE OSMOSIS SYSTEM

Model - WM11000E-340

- **Capacity** - 11000 L/day
- Completely automatic operation
- Power consumption of 2.2 kWh/m^3
- **Membrane** - FilmTec™
  - Polyamide Thin-Film Composite
  - Configuration Spiral Wound
  - 3” Size
  - Max. Operating Temperature - 45 °C
  - Max. Operating Pressure - 69 bar

SOLAR DESALINATION - PILOT

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MULTIPLE FEED PLUG FLOW REACTOR SYSTEM

- **Raw Water source** - SW Reverse Osmosis Brine
- Recuperação Selective recovery of Hidroxium **Magnesium** and **Calcium**
- **Reactive crystallisation** by chemical precipitation
- Raw Water flow-rate - 60 - 180 L/h
- Max. Operating Temperature - 20 - 40 ºC
- System duty cycle - 8 h/d
- Power consumption - 2.2 kWh

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MEMBRANE DISTILLATION SYSTEM

Model - Aquastill PURA-1 system

- Vacuum assisted AGMD module
- **Module type**
  - Spiral-wound
  - Plica serie AS26
- **Capacity** - 50-2500 L/day
- Max. Operation temperature - 83 °C
- Maximal pressure - 0.6 bar
- HX exchangers - titanium
- Heating demand **16 kW**

SOLAR DESALINATION - PILOT

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EVAPORATION PONDS

Final stage

- The highly concentrated brine is sent to the 1st 'evaporation pond' to produce **high purity NaCl**
- The remainder is sent to evaporation pond 2 for complete evaporation and precipitation

TEAM CER

UNIVERSITY OF ÉVORA

RENEWABLE ENERGIES CHAIR_10 YEARS

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WPWT UNIT







SOLAR DESALINATION

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