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Fast Track School #2

Beyond State of the Art in Solar-driven Water production & Treatment technologies and brine treatment processes

POZO IZQUIERDO, GRAN CANARIA, 25.26.09.2024

Sol2H2O

INSTITUTO TECNOLÓGICO DE CANARIAS

Gobierno de Canarias

Javier Acerete Navarro

Beyond State of the art solar PV-RO

POZO IZQUIERDO, GRAN CANARIA, 25.26.09.2024

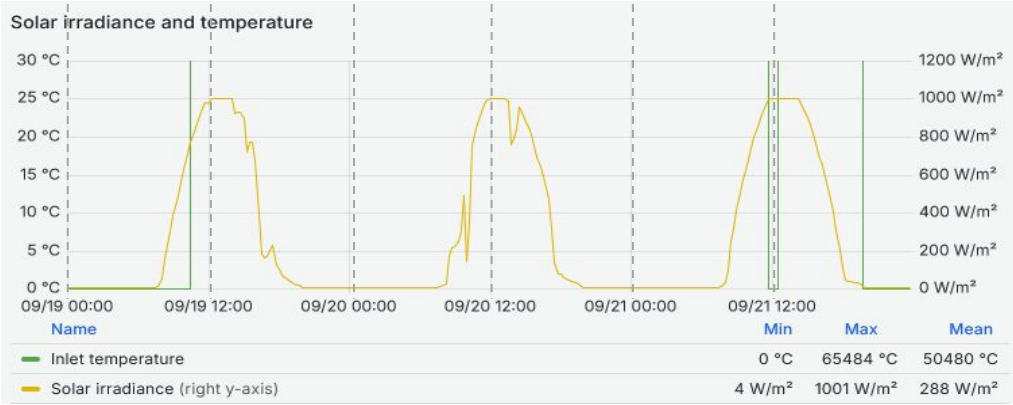
Characteristics of the solar PV-RO installations:

RO desalination plant

- Constant electric charge.
- Damageable equipment with low quality net (tension and frequency): electric damages in pumps, data equipment, control system...
- Damageable equipment with shuts downs: mechanical damages in pumps, pipes, membranes...

Solar PV power supply

- Non-constant supply.
- Unstable supply within the period that is available.

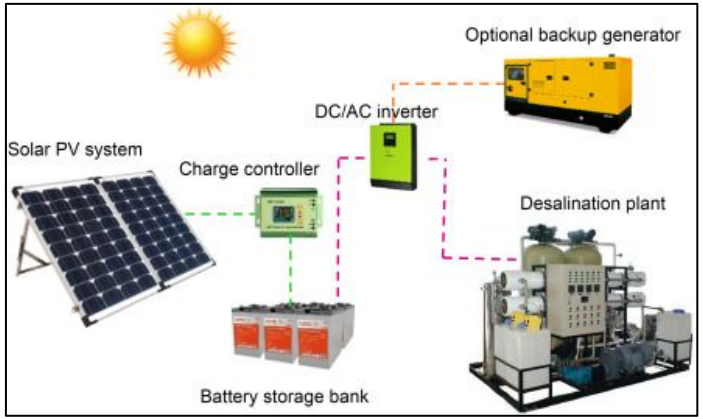


Needs of the solar PV-RO installations:

- Control system to adapt the water production (RO operating point) to the solar PV power available at each moment.
- Grid connexion or micro-grid operation.

PV-RO key equipment, schemes and possible configurations

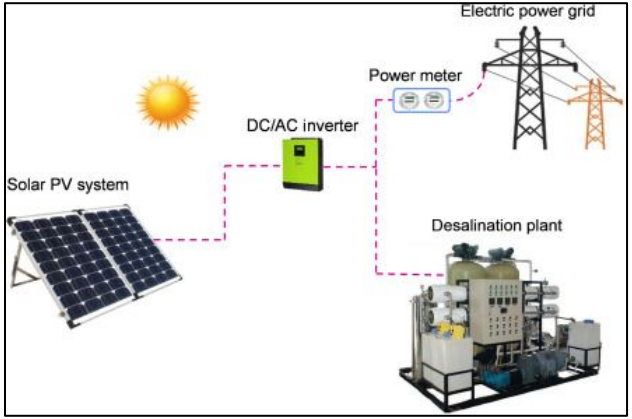
OFF-GRID PV-RO desalination: all the energy required by the desalination plant is supplied by RES.



Use of RES isolated from a power grid (off-grid / micro-grid):

- Small/medium desalination plant capacities.
- Storage of water/energy to overcome the variability of the energy resource.
- High investments depending on the m^3 produced.
- It requires a control system to optimize the use of the energy resource.
- It can be hybridized and/or combined with diesel.

ON-GRID PV-RO desalination: RES supplies a percentage of the energy required per year (30-60% depending on the type of RES). Surplus energy can be sold back to the grid in some cases.



RES connected to a power grid (self-consumption or net balance)

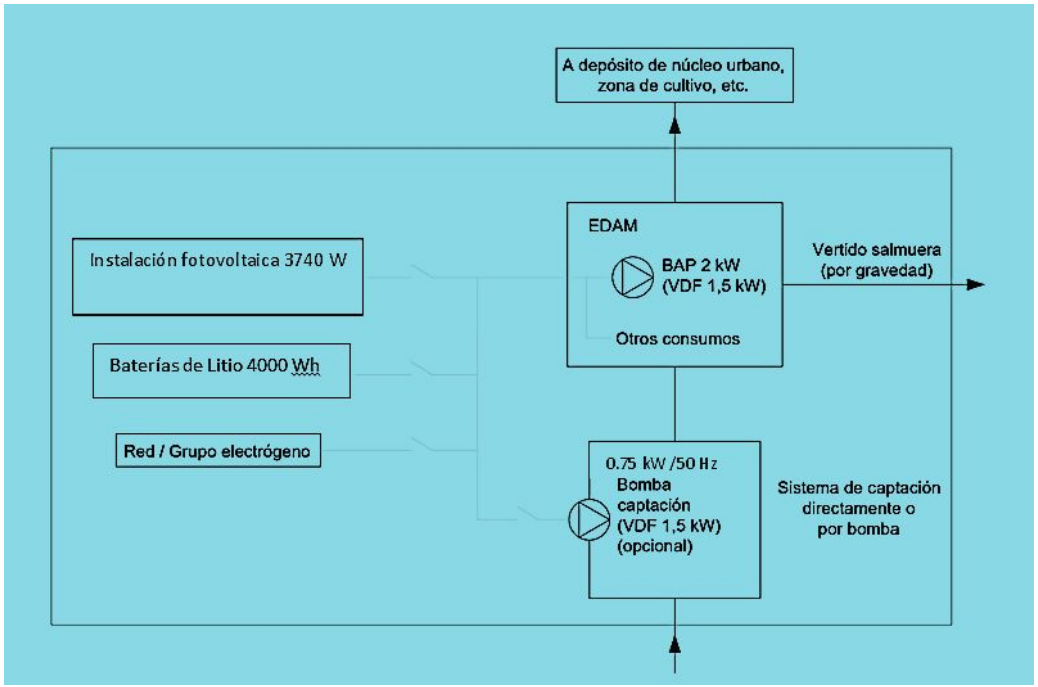
- Medium and large production capacities.
- Water storage to meet demand.
- It requires a control system to manage the load.
- Sale of energy. Economic viability due to the sale of the resource.
- Existing regulatory constraints.

Source: Photovoltaic Solar Energy Conversion. Technologies, Applications and Environmental Impacts. Chapter 8 - Applications of solar PV systems in desalination technologies, S. Gorjian et altres. 2020, Pages 237-274.

OFF-GRID PV-RO desalination:

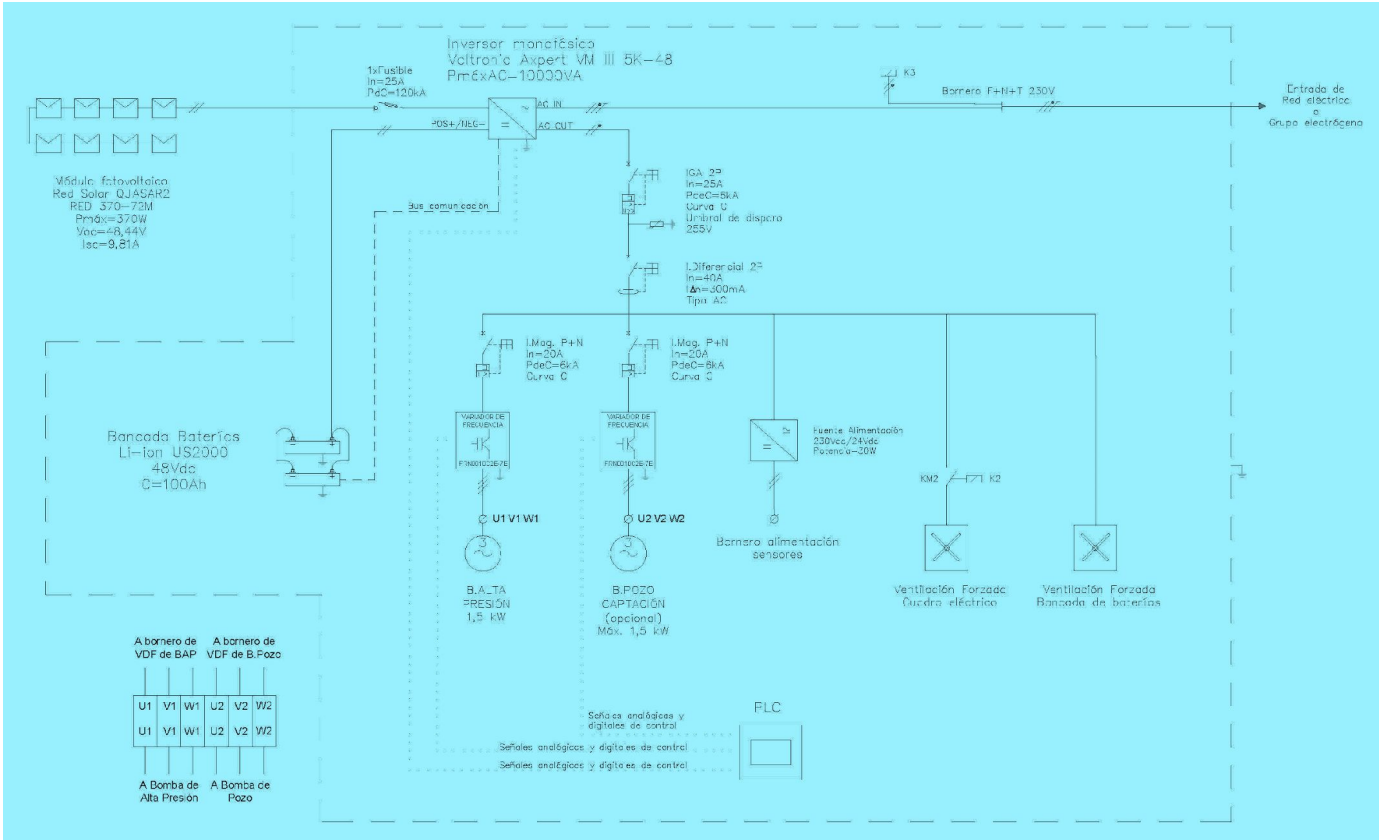
Dessol 2.0 PV-RO – ITC Pozo Izquierdo

RO 550l/h – 2.200 l/4h – 4.400l/8h - 13.200 l/24h (13,2 m3/24h) – **PV** 3,74 kW



OFF-GRID PV-RO desalination:

Dessol 2.0 PV-RO
ITC Pozo Izquierdo



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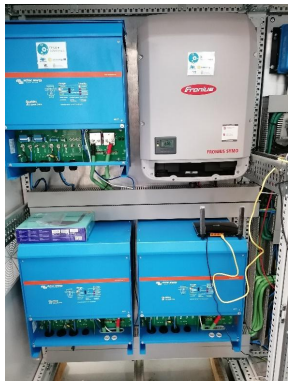
MICRO-GRID PV-RO desalination:

Dessol – Ribera Dom João – Cape Vert

RO 5.000l/h – 20.000 l/4h – 40.000 l/8h - 120.000 l/24h (120m3/24h) – **PV** 34,4 kW



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MICRO-GRID PV-RO desalination:

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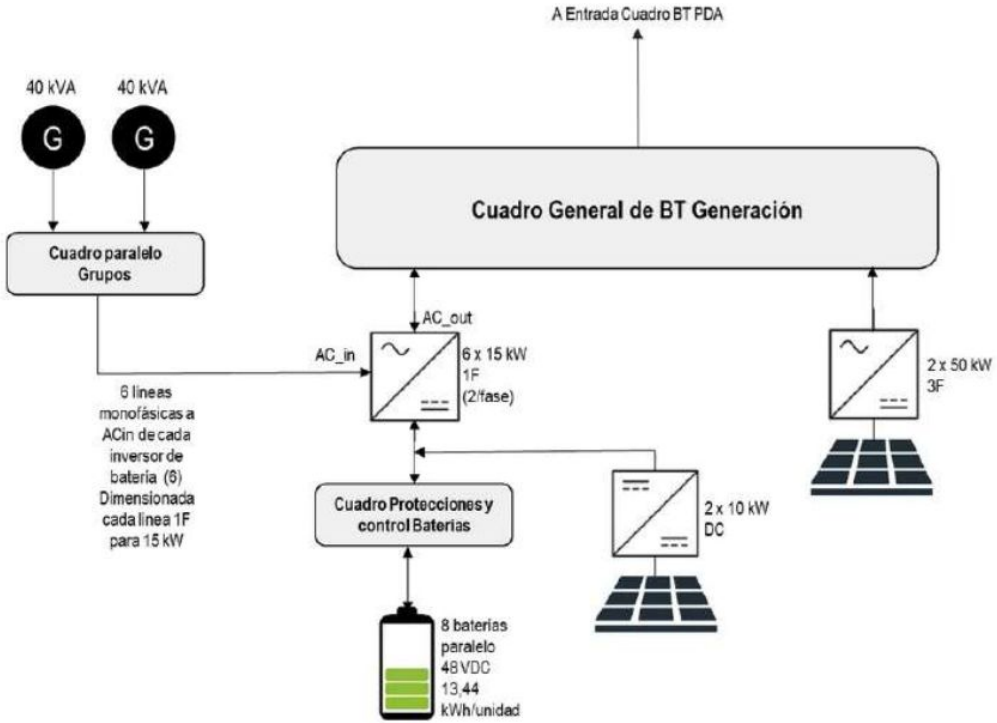
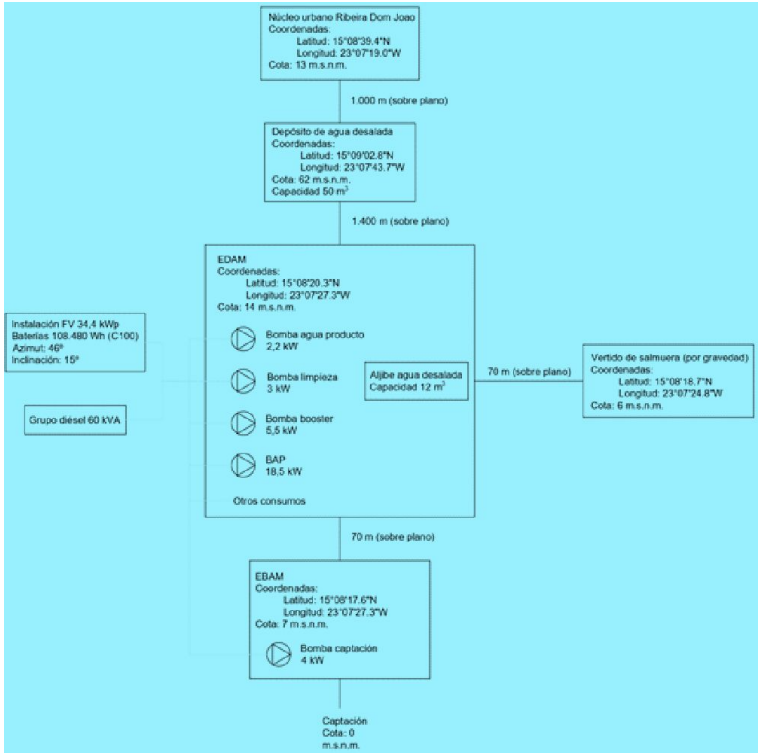
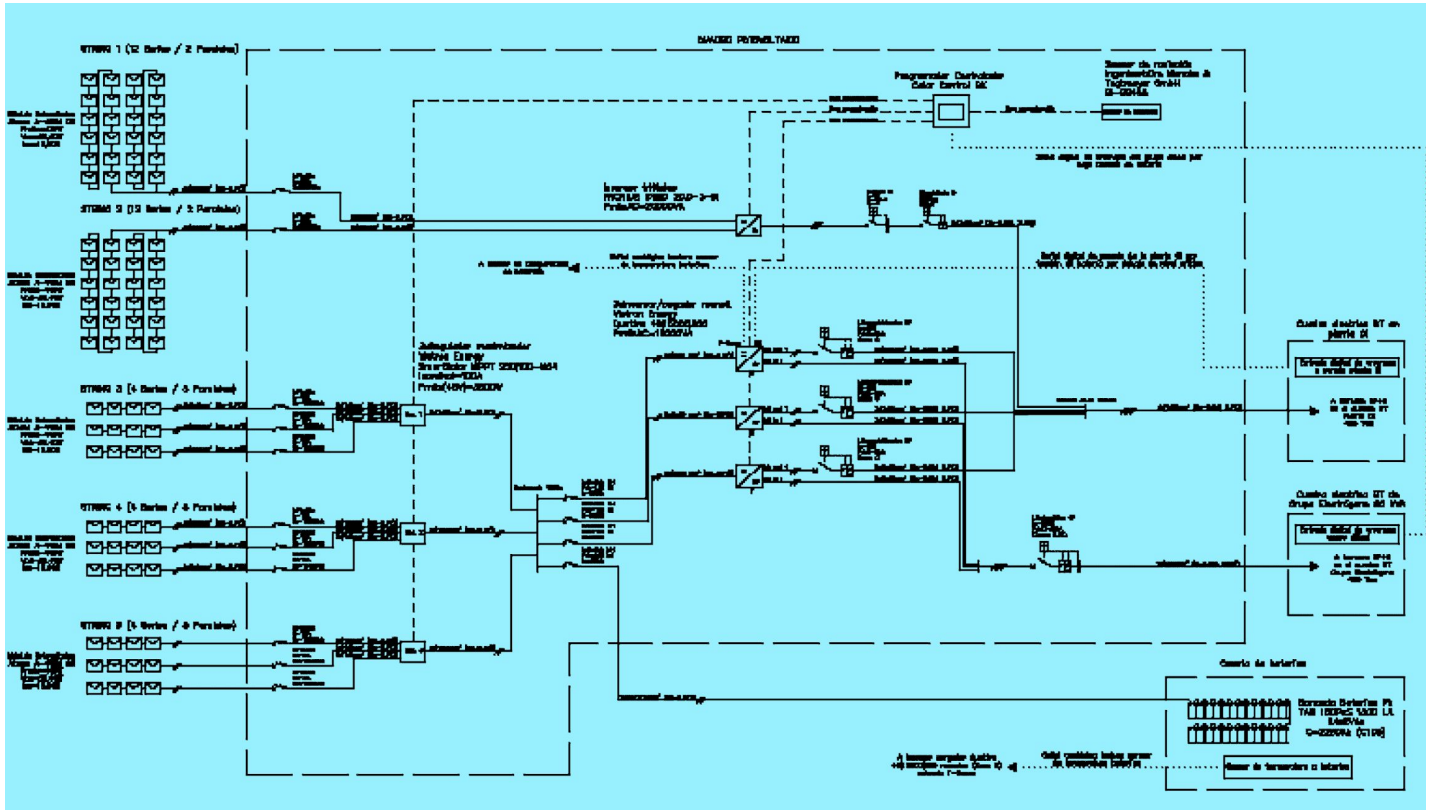




MICRO-GRID PV-RO desalination:

Dessol
Ribera Dom João
Cape Vert



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ON-GRID PV-RO desalination:

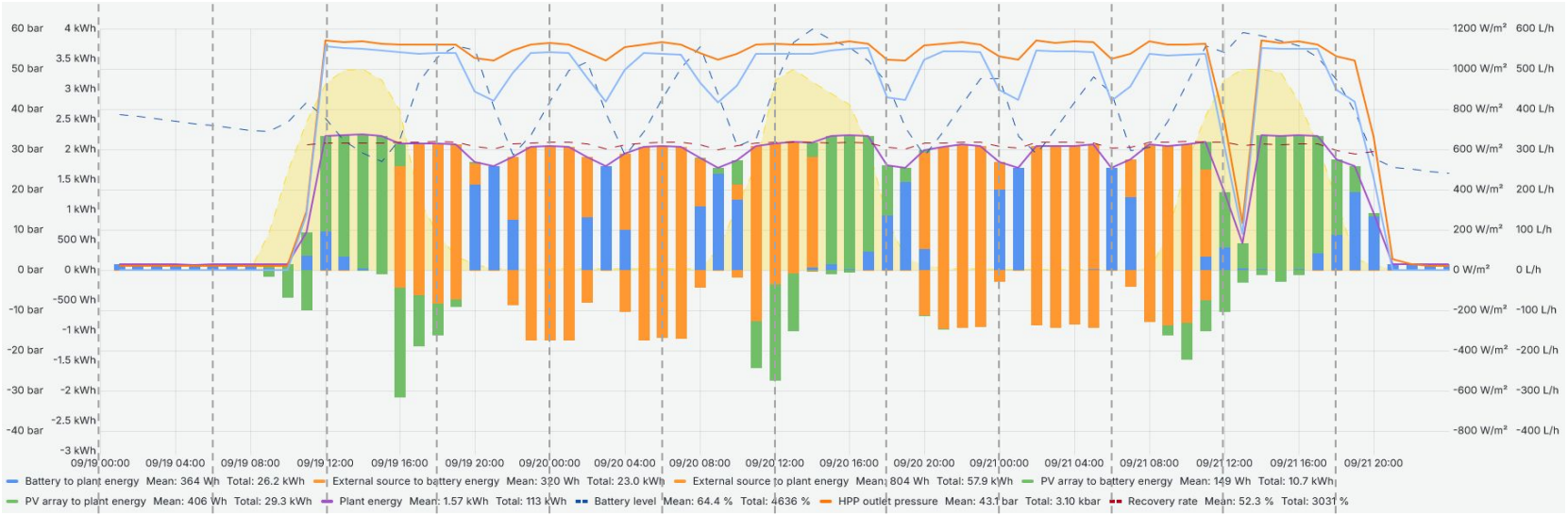
Al Khafji - Saudi Arabia the world's largest PV-RO

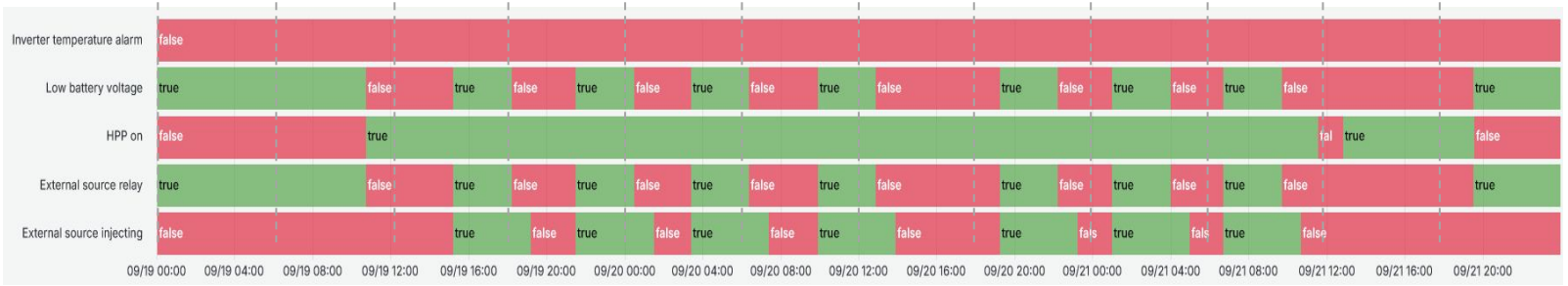
RO 60.000 m3/24h - **PV** 20MW

OFF-GRID PV-RO desalination:

Dessol 2.0 PV-RO – ITC Pozo Izquierdo

Data analysis 1





OFF-GRID PV-RO desalination:

Dessol 2.0 PV-RO – ITC Pozo Izquierdo

Data analysis 2