

ODEMAR

OPTIMIZING THE OPERATION OF SEAWATER DESALINATION PLANTS POWERED BY RENEWABLE ENERGY

Seawater desalination using renewable energy sources helps ensure that the water produced is **carbon-free and reduces the risks associated with fluctuations in grid electricity costs**, by enabling energy storage in the form of desalinated water or through battery systems.

On the other hand, the growing need to guarantee **water supply in coastal, island and isolated areas** has driven the development of **modular and autonomous desalination systems**, capable of operating **without a connection to the electrical grid and without requiring large energy storage systems** (batteries). These **technologically accessible and proven solutions** can be designed for different production scales — *from a few m³/day to several thousand* — and **allow for progressive expansion of their capacity** by incorporating new racks as demand grows.

The **ODEMAR tool**, jointly developed by the **Instituto Tecnológico de Canarias (ITC)** and **Ingeniería Calero Luna (ICL)** within the framework of the **IDIWATER Project**, allows for the analysis of multiple design options for a desalinated water production facility powered by renewable energy before its physical implementation, providing all possible electrical connection configurations, from grid connection to 100% off-grid systems.

Applying **the results obtained with ODEMAR** under different scenarios offers clear **economic advantages** — *competitive costs, less dependence on the variability of conventional electricity prices, a boost to the industrial sector and job creation, including in the primary sector* — and **environmental advantages**, by guaranteeing the water supply for the population and agriculture regardless of rainfall, preventing the overexploitation of aquifers, and reducing emissions when integrated with renewable energies.



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The **ODEMAR tool** has been developed within the framework of the **IDIWATER Project**, co-financed at 85% with ERDF funds through the **Interreg MAC 2021-2027 Programme** and integrated into the **DESAL+ Living Lab Platform**.

WHAT IS IT AND WHAT DOES IT PROVIDE?

ODEMAR is a design and optimization tool that determines the **optimal configuration, from a technical and economic standpoint**, of a seawater reverse osmosis desalination plant powered totally or partially by renewable energy, in order to meet a specific water demand.

The simulation results obtained by **ODEMAR** optimize the use of renewable energies by adapting the plant consumption to energy availability at all times (figures 1 and 2).

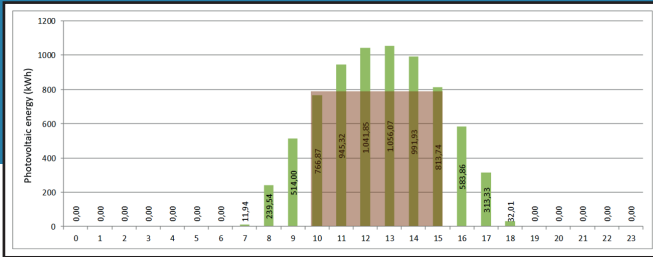


figure 1

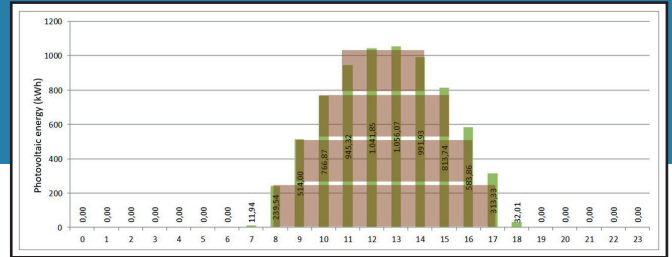


figure 2

ODEMAR customizes a tailor-made design using wind and/or solar photovoltaic energy, considering all variables involved in each specific case in order to fully optimize a real scenario.

ODEMAR enables optimization of existing desalination plants, modifying the electrical, hydraulic, product water storage, and plant control system variables as necessary in order to maximize water production at minimum cost.

The following figures show examples of **ODEMAR** results under **different scenarios**, making them **easily comparable** and allowing rapid identification of the most optimal scenario.

ODEMAR provides simulations of desalination plants with different installed capacity options to be optimized under several operating regimes:



Off-grid operation.



Self-consumption with management, adapting the plant's production to the demand at any given time, with the option to sell or not the surplus renewable energy within the limits of current legislation.



Self-consumption without management, with constant plant production and the option to sell or not the surplus of renewable energy.



Grid-connected operation, with or without management.

