



## **Concentrating solar power (CSP) system integrated with MED-RO hybrid desalination**

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Renewable energy technologies, in particular Concentrating Solar Power (CSP), are becoming more and more interesting for powering water desalination system. Moving from an European Community funded project called MATS, Multipurpose Applications by Thermodynamics Solar, the authors have further developed an alternative scheme by a proper integration of CSP system with multi-effect distillation (MED) and reverse osmoses (RO) desalination processes. According to the proposed scheme thermal desalination process is powered by the low temperature exhaust steam delivered from the back pressure steam turbine while the RO is powered by the electricity produced by the same steam turbine in addition to that generated by a conventional gas turbine. The latter is used as a thermal back-up system allowing for a higher power production as well as for an extended operation time. The effective match of the alternative solar thermal and electricity into such hybrid power-desalination scheme is discussed in details. An economical analysis together with a developed comprehensive model is provided where power availability, water production rates and environmental benefits have been implemented.

The double hybridization proposed in this scheme based on a suitable integration of solar energy and the chemical energy of a fuel, led to a water production cost less than 1 €/m<sup>3</sup>. The latter is a very competitive value if compared to a traditional solar assisted scheme. This result is encouraging taking into account that a solar system benefits for a reduction of associated greenhouse gas emissions. Moreover the expected cost reduction of future CSP system will allow to increase the thermal storage capacity with a consequent further reduction of water production cost.

The developed configuration allows to work under continuous operation mode increasing plant reliability and becoming a valid scheme in reducing water production cost respect to traditional solar assisted schemes not only for large-scale plants.

**Keywords:** Hybrid Desalination, MED, RO, Renewable Energy, CSP