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Timeline

WP	Activities	Year 1			Year 2			Year 3					
1	SMGT Conceptual Development and Experimental Validation	●	●	●									
2	SWRO Conceptual Development and Experimetal Validation	●	●	●	●								
3	Full Conceptual Design				●	●	●	●	●	●	●	●	●
4	Technology Implementation				●	●	●	●	●	●	●	●	●
5	Project Management and Dissemination	●	●	●	●	●	●	●	●	●	●	●	●

Project Information

National Programme of R+D+i focused on societal challenges

Acronym: SOLMIDEFF
Grant Agreement ID: RTI2018-102196-B-I00
Duration: 3 years (1 January 2019 - 31 December 2021)
Budget: 166,000.00 €

GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES
AGENCIA ESTATAL DE INVESTIGACIÓN

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SOLMIDEFF

SOLar Micro gas turbine-driven Desalination for Environmental oFF-grid applications

Project RTI2018-102196-B-I00, funded by: ERDF/Ministry of Science and Innovation – Spanish State Research Agency.

Proyecto RTI2018-102196-B-I00, financiado por: FEDER/Ministerio de Ciencia e Innovación – Agencia Estatal de Investigación.

Leaflet V. 1

SOLMIDEFF

Objectives

The SOLMIDEFF project aims to accomplish the following main objectives:

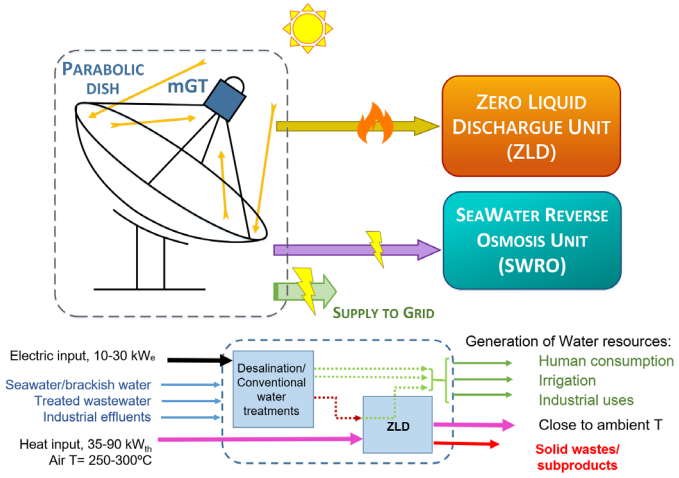
- Conceptual development of a Solar Micro Gas Turbine (SMGT) with optimised-design, tailored to the needs of the bottoming desalination process and potentially to other water treatment processes.
- Experimental development of a bottoming desalination and water treatment system operating on electric and thermal energy produced by the micro gas turbine and enabling Zero Liquid Discharge (ZLD).

Concept

The concept set forth in the SOLMIDEFF project is presented in the accompanying figure. A parabolic dish collector is used to collect and concentrate solar energy into a focal plane where the Power Conversion Unit is installed. The PCU is comprised of a micro gas turbine engine and solar receiver. The compressor of the MGT drags atmospheric air which is compressed and fed into the solar receiver through the recuperative exchanger. The receiver is also a heat exchanger which transfers the concentrated solar energy received from the collector to the incoming stream of pressurised air, delivering air at high pressure and temperature. This air, typically at around 800°C, is then expanded across the turbine where power is produced to drive both the compressor and the electric generator. The gases exhausting from the turbine are discharged to the atmosphere but, before this, they flow across a counter-current heat exchanger where they are used to preheat compressor delivery air before flowing into the solar receiver. This layout was previously developed and demonstrated by the OMSoP project in Europe.

The bottoming system of the SOLMIDEFF concept is comprised of two elements. An advanced desalination unit based on Reverse Osmosis technology is driven by the electric power produced by the micro gas turbine.

This RO unit produces fresh water and a brine with high concentration of salts which is treated further in the second element of the bottoming system. This is a Zero Liquid Discharge unit driven by the waste heat available in the exhaust of the micro turbine (air at some 250-300°C). Both technologies, the advanced RO and ZLD units, will be demonstrated experimentally in SOLMIDEFF.



Project

The technical challenges addressed by the SOLMIDEFF project are divided into four main Work Packages (WP 1-4) with WP5 focused on project management, dissemination and communication:

Conceptual development of the SMGT concept (WP1)

The main task of this WP is to optimise the SMGT system based on the experience gained with de OMSoP project. A performance modelling of an SMGT will be developed and used in order to achieve close coupling with the bottoming system.

Conceptual development of advanced RO desalination (WP2)

There are two main tasks in WP2. The first task is aimed at designing a RO lab-scale prototype in order to prove the concept and to experimentally assess the largely different transient characteristics of solar power generator (SMGT) and the desalination unit. The second task is to design a lab-scale ZLD prototype and to demonstrate the concept experimentally.

Full conceptual design of the SOLMIDEFF technology (WP3)

WP3 is focused on system integration. A detailed transient performance model of each component in SOLMIDEFF and of the integrated system will be developed to enable deep analysis of the technology. Then, the model so developed will be used to explore system operation under typical operating conditions and also during strongly transient maneuvers. The simulation tool will eventually be embedded in an optimiser to enable system optimisation in WP4.

Technology Implementation Plan (WP4)

This WP is comprised of two main tasks. The first task is to implement a roadmap for the industrialization of the technology, including the exploitation of the project results, and a techno-economic evaluation of the technology in potential markets. The second task will identify and contact the Spanish industry and also potential international end-users. Within this WP, actions will be taken towards developing a pathway for further research of the SOLMIDEFF technology in the frame of R&D programmes in either Spain or Europe.