

RORE POWER

ROBUST AND REMOTE POWER SUPPLY



Project ID	824953
PRR 2024	Pillar 4 – H ₂ end uses: stationary application
Call topic	FCH-02-3-2018: Robust, efficient long term remote power supply
Project total cost	EUR 4 220 093.75
Clean H₂ JU max. contribution	EUR 2 999 190.26
Project period	1.1.2019–31.12.2023
Coordinator	Teknologian tutkimuskeskus VTT Oy, Finland
Beneficiaries	3E Energy Oy, European Fuel Cell Forum AG, SolydEra SpA, Sunfire Fuel Cells GmbH, Sunfire GmbH

<https://rorepower.com/>

PROJECT AND GENERAL OBJECTIVES

Fuel cells can play a major role in the energy market as a clean, highly efficient way to produce energy in decentralised power generation. Reliable fuel cell systems for continuous, off-grid energy supply provide very promising export markets for the European fuel cell industry. The applications of this kind of fuel cell technology are characterised by key requirements such as low maintenance, the long service life of components, the possibility of remote monitoring, and reliable operation in critical applications such as oil, gas or safety infrastructure. In addition, they are able to cope with harsh climate conditions in both cold and hot regions. The overall objective of this project is to further develop and demonstrate solid oxide fuel cell systems for off-grid power generation in markets, such as the gas and oil infrastructure in remote regions with harsh climate conditions (from – 40 to + 50 °C), and the supply of power to telecommunication towers, especially in emerging countries (e.g. telecommunication base stations or microwave transceivers). In addition, one objective was to demonstrate the functioning of 47 solid oxide fuel cell (SOFC) units in remote sites.

The project developed and demonstrated the reliable operation of two off-grid, remote power systems from three manufacturers. The requirements of the generators were:

- start-up and operation at – 40°C to + 50 °C ambient temperature for natural gas;
- high electrical efficiency (> 35 %);
- long-term validation and demonstration in a relevant environment to gain reliable data from the field (> 24 months);
- high availability (98.5 %);
- defined service and maintenance concept (maintenance frequency of 15 months);
- fulfilment of the regionally different normative requirements with a modular design;
- increase in the reproducibility of production stages of fuel cell systems in large quantities (> 90 %);
- training course for less-educated personnel (two courses from each manufacturer);

- service contract concept for the end customer (one concept per manufacturer).

NON-QUANTITATIVE OBJECTIVES

The other objectives were:

- application of a standard remote communication/monitoring solution;
- meeting of the regionally different normative requirements with a modular design.

PROGRESS AND MAIN ACHIEVEMENTS

Fifty SOFC remote units have been installed and demonstrated in end user sites, and those units have achieved almost all project targets. This indicates that progress in the project has been good. In comparison with the state-of-the-art achievements, a significant reduction in the total cost of ownership has been achieved by reducing the cost of the balance-of-plant component, and the stack and its periphery. In addition, the common supply chain and joint procurement for the system manufacturer in the case of the generic component and spare parts have reduced the total cost of ownership by a remarkable amount. Furthermore, harmful emissions (CO₂, SO_x, NO_x, particulate matter), noise, vibrations and the risk of soil contamination by liquid fuels have been reduced and higher power supply security has been reached. Moreover, systems have operated in harsh conditions: Sunfire fuel cells have operated at – 40 °C with natural gas and at – 40 °C with propane; SolydEra has operated at 15 °C with natural gas. All systems have good electrical efficiency, high availability and reasonable maintenance frequency.

FUTURE STEPS AND PLANS

The project has finished.

Original equipment manufacturers are continuing to commercialise their remote SOFC systems: they sell and service fuel cell devices for off-grid energy supply. The most interesting market is the telecommunication sector. However, other markets and applications are also being considered.

PROJECT TARGETS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?
AWP 2018	Temperature of operation in harsh conditions	°C	– 40	– 40 can be achieved with project solutions	
	Temperature of system start-up in harsh conditions	°C	– 40 with natural gas and – 15 with LPG	Sunfire has achieved – 40 for start-up with natural gas and LPG. SolydEra has achieved – 15 with natural gas but has not verified a temperature with LPG because there are no units in cold areas	✓
	Long-term desulphurisation	months	15	15	
	Electrical efficiency	%	> 35	> 35	
	Maintenance frequency	months	15	12	