



# OUTFOX

OPTIMISED UP-SCALED TECHNOLOGY FOR NEXT-GENERATION SOLID OXIDE ELECTROLYSIS

## PROJECT OVERVIEW

### MAIN OBJECTIVE

The main aim of OUTFOX is to remove scale as limiting factor in the deployment of solid oxide electrolysis (SOEL) technologies while proving their potential to become the preferred option for green hydrogen production. By combining experimental results up to 80 kW scales with identification of optimal cell and system designs, OUTFOX will prepare SOEL for industrial scale systems of 100 MW with a Levelized Cost of Hydrogen (LCOH) as low as €2.7/kg H<sub>2</sub> and applicability to mass manufacturing lines. Advancing towards two full-scale demonstrators by 2027.

### CURRENT PROBLEMS

- Inefficiency in Large-Scale Hydrogen Production:** Current green hydrogen production methods are not capable of efficiently producing hydrogen at the scale required for decarbonizing industrial sectors and energy generation.
- Scale Limitations of SOEL Systems:** While SOEL has the potential for efficient hydrogen production, current SOEL systems face limitations in scalability, hindering their ability to produce hydrogen at the necessary rate and cost.
- High Production Costs:** The cost of producing green hydrogen using existing methods is prohibitively high, hindering its widespread adoption.
- Manufacturing Challenges:** Economical manufacturing processes for electrochemical cells at the required scale are lacking, which is a barrier to achieving full decarbonization in relevant sectors.

## PROJECT OBJECTIVES

### Scaled up cells for SOEL:

Manufacture scaled-up cells with areas up to 900 cm<sup>2</sup>, representing a 2-6 times boost in cell area, with performance validated in short stacks with > 0.85 A/cm<sup>2</sup> current density and over 6000 hours operating time.

### Design and Validation:

Use techno-economic analysis and simulations to design and validate a stack architecture that is compatible with low-cost manufacturing techniques and increases power capacity 8-fold per stack interface.

### Manufacturing Technology:

Develop an industrial scale, high throughput manufacturing process to produce ≥300 cm<sup>2</sup> cells with a reduced thickness of 300 microns and minimal total thickness variation < 25 microns.

### Demonstration at 80 kW scale:

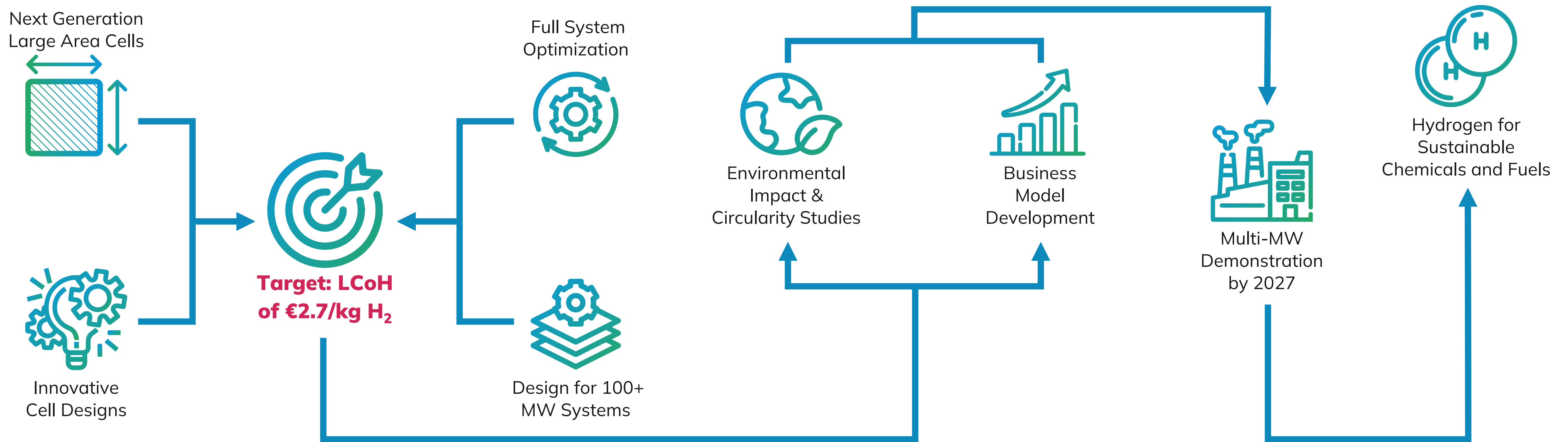
Build and operate two 80 kW pilot modules for 4000+ total hours to show achievement of performance targets at larger scales and with operation under intermittent and other industrial operating regimes.

### Reduction in Levelized Cost of H<sub>2</sub>:

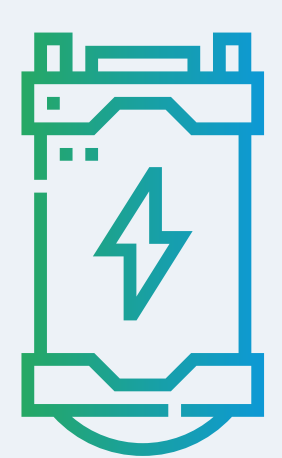
Demonstrate the impact of the SOEL technology scalability and potential to achieve an LCOH of €2.7/kg with comprehensive process evaluation and set up of follow-up projects for multi-MW SOEL demonstration.

### Improved environmental impact:

Demonstrate the circularity, safety and sustainability of the stacks and components via a comprehensive life cycle analysis of relevant materials and processes, with designs focused on improved industrial usability.



## PROJECT IMPACTS



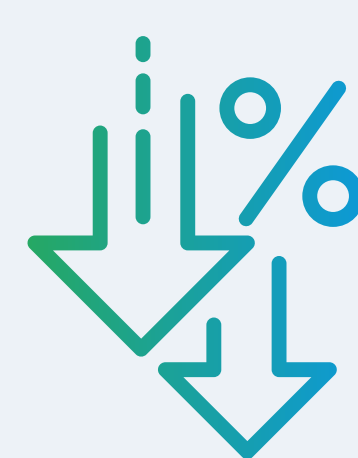
**6-FOLD**

Increase in maximum feasible SOEL cell enhancement.



**20%**

Less critical raw materials needed for the same H<sub>2</sub> production output.



**80%**

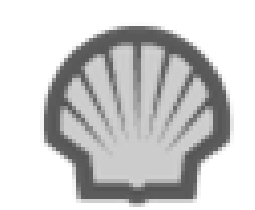
Reduction in required capital investment for solid-oxide electrolyzers.



**€350M**

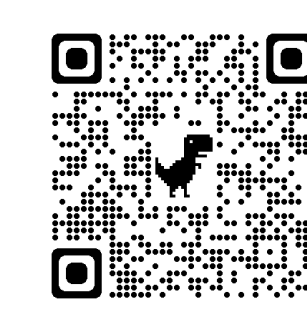
Market value for European companies and creation 1000s of new jobs.

## THE OUTFOX PARTNERS

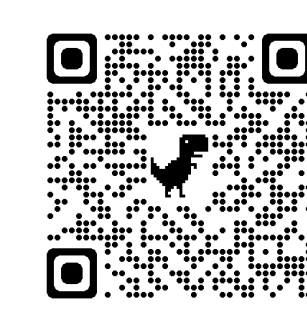


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