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# **Direct seawater electrolysis technology for distributed hydrogen production**



**SWEETHY - Deliverable report**

**D8.1 – Basic stack engineering**



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#### Document History

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V1.0	04.05.2026	Jeffrey Roth	Initial Version
V1.1	06.05.2026	Jeffrey Roth	Major revisions in all chapters
V1.2	19.05.2026	Jeffrey Roth	Major revisions in all chapters
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<b>V2.0</b>			
<b>FINAL</b>	29.05.2026	Jeffrey Roth	Final corrections



## Project Summary

SWEETHY will develop an advanced technology for direct seawater electrolysis that will be able to produce H<sub>2</sub> and O<sub>2</sub> under intermittent conditions accounting for the coupling to renewable power sources (especially wind, PV). The electrolyser will be based on an anion exchange membrane (AEM) operating in natural or alkaline seawater, and the SWEETHY technology will be developed along three dimensions:

- a) Materials optimisation. To meet the specific requirement of seawater environment the project will focus on corrosion resistance and selective PGM-free electrocatalysts for hydrogen and oxygen evolution reactions, on AEM with high selectivity for transporting hydroxide anions and anti-fouling properties as well as on novel anti-corrosion coatings for bipolar plates and porous transport layers prepared by plasma spraying and electrodeposition.
- b) Electrolyser stack prototyping. The project will exploit a novel stack architecture, which uses hydraulic cell compression to host the advanced materials to produce H<sub>2</sub> at high pressure. Beneficial functions of the targeted unique stack are related to scalability and maintainability that will be tremendously improved in comparison to conventional AEMWE stacks.
- c) Sustainability analysis. The project will conduct studies (life-cycle assessment (LCA), techno-economic analysis (TEA)) to evaluate circularity of the electrolyser system and its integration into renewable-power systems and to explore an efficient by-product utilisation way through industrial symbioses. These studies will feed back to materials optimisation and stack development. Complementing LCA, social LCA and techno-economic analyses/optimisation by qualitative work ensures both environmental, economic, and social sustainability.

Combining these three dimensions, SWEETHY will utilise Mediterranean seawater from the coast of Messina, Italy, to test its electrolyser with the goal to withstand more than 2000 h of operation to produce 20 g<sub>H<sub>2</sub></sub>/h with a degradation rate lower than 1%/100h. In addition, SWEETHY will demonstrate how the operation of the electrolyser can ensure an optimised revenue concerning by-products and grid services.



## Public summary

The report D5.1 "Basic stack engineering" includes description of the direct seawater electrolysis stack developed in SWEETHY-project: system interfaces (electrical, media, hydraulic circuit), estimated size, weight, and shape of the stack, number of cells, active cell area, etc. (to mention just few). All material developers will have to consider the fundamental geometries specified in this report for their respective work packages. As a living document, it can later be updated if respective experimental findings require changes to realize the final prototype design.



## 5 Acknowledgement

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### Project partners:

#	Partner short name	Partner Full Name
1	RISE	RISE RESEARCH INSTITUTES OF SWEDEN AB
2	CNR	CONSIGLIO NAZIONALE DELLE RICERCHE
3	CIDETEC	FUNDACION CIDETEC
4	DLR	DEUTSCHES ZENTRUM FUR LUFT- UND RAUMFAHRT EV
5	IC	INSTITUT DE LA CORROSION SASU
6	SINTEF	SINTEF AS
7	PROPULS	PROPULS GMBH
8	CENMAT	CUTTING-EDGE NANOMATERIALS CENMAT UG HAFTUNGSBESCHRANKT
9	UNR	UNIRESEARCH BV

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