

# AD ASTRA

## HARNESSING DEGRADATION MECHANISMS TO PRESCRIBE ACCELERATED STRESS TESTS FOR THE REALIZATION OF SOC LIFETIME PREDICTION ALGORITHMS



<b>Project ID:</b>	825027
<b>PRD 2023:</b>	Panel 5 – cross-cutting
<b>Call topic:</b>	FCH-04-3-2018: Accelerated stress testing (AST) protocols for solid oxide fuel cells (SOFC)
<b>Project total costs:</b>	EUR 3 008 426
<b>Clean H<sub>2</sub> JU max. contribution:</b>	EUR 3 008 426
<b>Project period:</b>	1.1.2019–31.8.2022
<b>Coordinator:</b>	Agenzia Nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile, Italy
<b>Beneficiaries:</b>	Commissariat à l'énergie atomique et aux énergies alternatives, Danmarks Tekniske Universitet, École Polytechnique Fédérale de Lausanne, Europäisches Institut für Energieforschung EDF KIT EWIV, Institute of Electrochemistry and Energy Systems, SolydEra SpA, Sunfire GmbH, Università degli Studi di Genova, Università degli Studi di Salerno

<https://www.ad-astra.eu/>

### PROJECT AND OBJECTIVES

Accelerated stress tests deliberately stress a test material, component or product for a short period to assess the stability of new materials without having to use them in an operational system over a long period. The EU-funded AD ASTRA project aims to define accelerated stress testing protocols deduced from a systematic understanding of degradation mechanisms in aged components of solid oxide cell stacks operating in both fuel cell and electrolysis modes. Benchmarking has been completed, as have the first two campaigns of possible accelerated tests. Validation of the test protocols is the next step.

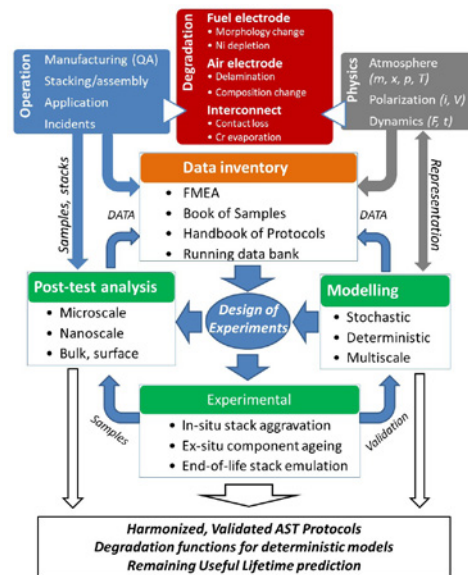
- AST protocols have been verified qualitatively, by comparison with analyses of field-tested samples, and quantitatively, using dedicated experiments to estimate degradation rates and accelerating factors.
- AD ASTRA completed the model for transfer functions developed from accelerated stress testing for real-life operation.
- It designed a multiple-model prognosis algorithm for estimating remaining useful life.

### PROGRESS AND MAIN ACHIEVEMENTS

- Twelve accelerated stress testing (AST) protocols have been developed through three cycles of testing campaign.

### FUTURE STEPS AND PLANS

- AD ASTRA will support the development of an international standard for AST protocols and its implementation at the industry level.
- Accelerated stress testing protocols will be validated on solid oxide cell stacks.



### QUANTITATIVE TARGETS AND STATUS

Target source	Parameter	Target	Achieved to date by the project	Target achieved?
Project's own objectives	Degradation acceleration	10 x	More than 10 x	✓
	Published articles	2 for each of work packages (WPs) 3, 4 and 5	8 for WP3, 4 for WP4, 7 for WP5	✓