



## **IMPROVED LIFETIME STACKS FOR HEAVY DUTY TRUCKS THROUGH ULTRA-DURABLE COMPONENTS**

**Grant agreement no.: 101006641**

**Start date: 01.01.2021 – Duration: 42 months**

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### **DELIVERABLE REPORT**

<b>D1.4: TRUST REPORTING 2024</b>		
Due Date	31/03/2024	
Author (s)	D. Jones (CNRS)	
Workpackage	WP1	
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<b>DISSEMINATION LEVEL</b>		
<b>PU</b>	Public	
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	<b>X</b>
<b>NATURE OF THE DELIVERABLE</b>		
<b>R</b>	Report	
<b>P</b>	Prototype	
<b>D</b>	Demonstrator	
<b>O</b>	Other	<b>X</b>

<b>SUMMARY</b>	
<b>Keywords</b>	Annual data reporting, TRUST
<b>Abstract</b>	<p>Annual data reporting in SuiteCRM and in TRUST for the calendar year 2023 has been completed for IMMORTAL. All sections were completed in SuiteCRM and in TRUST for the templates</p> <ul style="list-style-type: none"> <li>• Fuel cell research at stack level or lower</li> <li>• Results</li> <li>• Dissemination and Exploitation</li> <li>• Safety</li> </ul>
<b>Public abstract for confidential deliverables</b>	<i>Same as above</i>

<b>REVISIONS</b>			
<b>Version</b>	<b>Date</b>	<b>Changed by</b>	<b>Comments</b>
<b>1.0</b>	01/03/2024	D. Jones	Drafted

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# TRUST AND SUITECRM REPORTING 2024

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## 1 INTRODUCTION

Single cell and stack data, as well as notable results, statistics on hydrogen safety and on dissemination and exploitation are collected annually using the on-line tool TRUST. IMMORTAL was required to complete the on-line data template to reflect the 2023 status of IMMORTAL technology. In addition this year, IMMORTAL was invited to complete the new tool SuiteCRM and provide the project status in terms of the achievement of targets, an overview of the activities and the progress beyond the state of the art, as well as information on publications and synergies with other projects or initiatives. This tool replaces the previous project “fiche”.

## 2 SCOPE

Data were submitted to the TRUST and SuiteCRM portals and submitted on 29/02/2024. Data from the IMMORTAL stack test results with Gen2 MEAs were provided by partner Bosch.

## 3 DISCUSSION

Of the 29 entries in TRUST for the stack test date, 18 are public. The public entries are given in the annex. A link to the TRUST portal is provided below:

<https://trust.clean-hydrogen.europa.eu/ui/>

A screenshot is also provided of the page of SuiteCRM regarding “progress” and that showing “submission”.

## 4 CONCLUSIONS AND FUTURE WORK

IMMORTAL finishes in March 2024 and the remaining activities are to

- finish the currently running stack test,
- complete post mortem analytics of MEAs from last stack load profile test,
- provide HD fuel cell powertrain validation and system recommendations,
- complete the techno-economic evaluation,
- hold the project dissemination workshop,
- complete the project reporting.

Future plans also include carrying forward the learning and most prospective materials from IMMORTAL to future heavy duty MEA development projects, in particular HIGHLANDER.

## 5 ANNEX – PUBLIC ENTRIES IN SUBMISSION TO TRUST

Year	Project Display Name	Research Object Display Name	Template Display Name	Template Version	Classification	Order	Parameter Display Name	Input type	Measurement Type	Value	Corrected value	Confidentiality level
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	1	Start date for reportin date			01/01/2023	01/01/2023	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	2	End date for reporting date			31/12/2023	31/12/2023	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	3	Stack manufacturer	freeText		Bosch	Bosch	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	4	Fuel cell technology	list		PEMFC - Proton excha	PEMFC - Proton excha	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	5	Fuel	list		Hydrogen	Hydrogen	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	7	Stack weight	quantity	kg			Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	7	Stack volume	quantity	l			Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	8	Number of cells per st	quantity		10	10	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	9	Active cell area	quantity	cm <sup>2</sup>	300	300	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	10	At start level: Capacity	quantity	kW	3.6	3.6	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	11	Catalyst at the cathod	freeText		0.3 mg(Pt)/cm <sup>2</sup>	0.3 mg(Pt)/cm <sup>2</sup>	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	12	Catalyst at the anode	freeText		0.05 mg(PGM)/cm <sup>2</sup>	0.05 mg(PGM)/cm <sup>2</sup>	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	14	KPI - At start level: st	quantity	%	54	54	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	15	KPI - Est. stack CAPEX	quantity	EUR/kW	50	50	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		DESCRIPTIVE	16	KPI - PGM loading	quantity	g/kW	0.32	0.32	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		OPERATIONAL	10	Operating pressure	quantity	bar	2	2	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		OPERATIONAL	11	Operating temperatur	quantity	°C	68	68	Public
2023	IMMORTAL	IMMORTAL_FC stack	Fuel cell research at st v18		OPERATIONAL	9	Hours of operation	quantity	h	11000	11000	Public

## 6 ANNEX – EXEMPLARY ENTRIES INTO SUITECRM

The screenshot shows the 'Progress' tab in SuiteCRM. The left sidebar contains 'View Projects' and 'Recently Viewed'. The main content area has tabs for 'Project Overview', 'Project Management', 'Project Classification', 'Progress', 'Information for Posters', and 'Submission'. The 'Progress' tab is active, displaying two sections:

- PROJECT CONTEXT AND GENERAL OBJECTIVES:** IMMORTAL aims to develop high-performance and high-durability membrane electrode assemblies (MEAs), and their components, specifically designed for heavy-duty truck application. The project intends to develop load profile tests specific to HD truck application, and apply these tests, and accelerated stress tests, to MEAs at both sub-scale and short stack levels. The results of load profile testing will also be used to validate a novel lifetime prediction method, and the method used to predict the lifetime of project MEAs. The project will assess the results through a techno-economic analysis.
- PROGRESS BEYOND STATE OF THE ART, EXPECTED RESULTS UNTIL END OF THE PROJECT AND POTENTIAL IMPACTS:**
  - Developed a nanofibre reinforced membrane with exceptional durability in an MEA in accelerated stress testing at 90 °C, comprising 120,000 wet/dry cycles at

The right sidebar shows the 'WORK PERFORMED AND MAIN ACHIEVEMENTS AND RESULTS:' section, which states: simulated to produce load profiles that were used to develop a modal load profile test protocol that was applied to baseline, Gen1 and Gen2 MEAs. By month 18, new materials (support, catalyst, membrane) were developed and upscaled, and were integrated into a Gen1 heavy-duty MEA. The performance of these MEAs came within 93% of the final power density target at 0.875 V in short-stack testing. Information derived from post-test analysis of Gen1 MEAs was used to develop a bill of materials for Gen2 MEAs that were available at M30. Gen2 MEAs achieved 0.642 V at 1.77 A/cm².

The screenshot shows the 'Submission' tab in SuiteCRM. The left sidebar contains 'View Projects' and 'Recently Viewed'. The main content area has tabs for 'Project Overview', 'Project Management', 'Project Classification', 'Progress', 'Information for Posters', and 'Submission'. The 'Submission' tab is active, displaying several sections:

- DISCLAIMER:** By clicking this button, you are confirming that all the data of your projects, including its targets, synergies, publications and patents, have been updated.
- VALIDATION PROCESS:** When this box is ticked, the Project Officer has been informed of your update and he has started the data validation process. For any needs required, you will be informed by email.
- PROJECT OFFICER DISCLAIMER:** By clicking this button, I confirm that I've checked and validated all project data.
- UPDATED BY PC DONE:** A checkbox that is currently checked.
- DATA VALIDATION IN PROCESS:** A checkbox that is currently unchecked.
- THE DATA HAS BEEN VALIDATED:** A checkbox that is currently unchecked.