HIGHLANDER
HIGH performing uLtrA-durable membraNe electroDe assEmblies for tRucks

HIGH PERFORMING uLTRA-DURABLE MEMBRANE ELECTRODE ASSEMBLIES FOR TRUCKS

Grant agreement no.: 101101346
Start date: 01.01.2023 – **Duration**: 36 months.
Project Coordinator: D. J. Jones, CNRS

The HIGHLANDER project is supported by the Clean Hydrogen Partnership and its members Hydrogen Europe and Hydrogen Europe Research.

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DELIVERABLE REPORT

D7.3: PLAN FOR DISSEMINATION AND EXPLOITATION INCLUDING COMMUNICATION ACTIVITIES (PDEC)		
Due Date	30 June 2023	
Author (s)	N. CROS - PXO	
Workpackage	WP7	
Workpackage Leader	PXO	
Lead Beneficiary	PXO	
Date released by WP leader	22 June 2023	
Date released by Coordinator	29 June 2023	
DISSEMINATION LEVEL		
PU	*Public*	***X***
SEN	*Sensitive, limited under the conditions of the Grant Agreement;*	
NATURE OF THE DELIVERABLE		
R	*Document, report*	***X***
DEM	*Prototype demonstrator*	
DEC	*Website*	
DMP	*Data management plan*	
OTHER	*Software, algorithms, models*	

SUMMARY	
Keywords	Plan for Dissemination and Exploitation and Communication activities
Abstract	*This plan for dissemination and exploitation including communication activities, provides a catalogue of planned dissemination, exploitation, and communication measures tailored to the various target audiences.*
Public abstract for confidential deliverables	As above

REVISIONS			
Version	**Date**	**Changed by**	**Comments**
0.1	22 June 2023	N. Cros	
0.2	27 June 2023	D. Jones	
0.3	29 June 2023	N. Cros	

D7.3: PLAN FOR DISSEMINATION AND EXPLOITATION INCLUDING COMMUNICATION ACTIVITIES (PDEC)

CONTENTS

Partners

CNRS	Centre National de la Recherche Scientifique	**ELM**	Elmarco SRO
JM	Johnson Matthey Hydrogen Technologies Ltd	**TUB**	Technische Universitat Berlin
Bosch	Robert Bosch GmbH	**FZJ**	Forschungszentrum Julich GmbH
SOLVAY	Solvay Specialty Polymers SpA	**PXO**	Pretexo

Glossary of Terms

AST	Accelerated Stress Tests	**LPT**	Load Profile Tests
DOI	Digital Object Identifier	**MEA**	Membrane Electrode Assembly
FC	Fuel Cell	**OEM**	Original Equipment Manufacturer
HD, HDV	Heavy-Duty, Heavy-Duty Vehicle	**PEMFC**	Proton Exchange Membrane Fuel Cell
KPI	Key Performance Indicator	**PGM**	Platinum Group Metal
LDV	Light Duty Vehicle	**SRIA**	Strategic Research and Innovation Agenda

1 INTRODUCTION

The HIGHLANDER partners intend to communicate and disseminate the research results to all relevant stakeholders and ensure their exploitation and impact. Communicating to the public is crucial to make society at large aware of the importance of the need to transition to FC electrical power trains. It will also highlight how EU funding contributes to positioning Europe at the forefront towards a FC power train HD transport system.

2 OBJECTIVES

The top-level technical objective of HIGHLANDER is directed towards providing high-performing and ultra-durable MEAs for future implementation in HDV applications and will contribute to the achievement of the SRIA KPIs for HDVs. In this context, the HIGHLANDER dissemination and communication strategy is to reach a large panel of targeted actors such as:

- **Scientific community**: the international research community working on PEMFC materials, modelling, degradation and characterisation;
- **Industry**: industrial developers and manufacturers of MEA materials and components, MEAs, stack developers, stack end-user OEMs, with particular focus on informing European industry to further European competitiveness in the field, but also in Japan, China, Korea, USA, Australia.
- **Clean Hydrogen JU including HER and HE members and JRC, and and other relevant JUs**, including Clean Aviation, 2Zero, Rail, other funded projects from European and National programmes targeting their industrial partners for further exploitation opportunities in related HD fields (train, maritime, aeronautic) and LDV applications;
- **Society at large**: communication to the public about the HIGHLANDER project results to make society aware of the importance of research and innovation to tackle challenges such as climate change and energy security.

3 DISSEMINATION STRATEGY

3.1 Target groups

The HIGHLANDER consortium will specifically target scientists and engineers in industry and academia, Clean Hydrogen JU, science and society education channels as receptors of disseminated results.

3.2 Dissemination channels

Measures for dissemination identified by the consortium are described below:

- **Presentations at international conferences** (at least 4/year): The conferences targeted are the most significant in the field, and they gather the leading fuel cell scientists and engineers from research organisations/universities and industry, funding agency scientists, energy policy makers, e.g. GRC Fuel Cells, ECS PEFC&E, ISE, CARISMA, EFCF.
- **Open Access peer-reviewed scientific publications** (at least 6 peer-reviewed journal articles by the project end). In addition to partners that have previously published jointly, there will be publications from new partner constellations. The academic partners have highly cited publications in the most important peer reviewed journals of the field, and their participation will guarantee high impact scientific dissemination of HIGHLANDER results. Journals targeted include

the Nature, ACS and RSC journals, Journal of the Electrochemistry Society, Electrochimica Acta, Journal of Power Sources. In conformity with Plan S and the EC requirements, HIGHLANDER publications will be Open Access through green open access option (self-archiving) or through gold open access by publishing in OA journals.

- **Contribution to EC/Clean Hydrogen JU Programme Review Days** (annually). All partners have been previously involved in FCH 2 JU Programme Review Days that will continue in the Clean Hydrogen JU. The HIGHLANDER coordinator will present the project's objectives, status, outcome and impact when invited to do so, and will comply with any requests by the Project Officer for additional information to contribute to establishing status at programme level. In addition, HIGHLANDER will present a poster of its results at this annual event.
- **HIGHLANDER Workshop**. At M33, HIGHLANDER will organise a workshop (online if required) for dissemination of its results. The target audience includes researchers and engineers in related Clean Hydrogen JU projects, and national/international projects on HD transport application, in particular in Hydrogen Innovation Challenge member countries. While the Workshop will serve to disseminate project results and increase the visibility of European funded research on materials, components, MEAs and modelling, it will also establish the status (performance, durability, efficiency) and identify gaps and thereby future strategic research directions.
- **Hydrogen Innovation Challenge activities**: the HIGHLANDER consortium intends to pursue the cooperation with the US DOE Million Miles Fuel Cell Truck Consortium initiated under IMMORTAL, for bimonthly discussions on topics of common interest including on LPTs and ASTs and predictive performance degradation modelling. Only non-confidential project results will be shared, all slides to receive the prior approval of HIGHLANDER partners.
- **Social Media**: LinkedIn posts for dissemination towards professional audience and a dedicated YouTube channel to target a wider audience through short video publications. Dissemination activities (publications, conference presentations) will be continued after the project to foster exploitation of HIGHLANDER results.

4 COMMUNICATION STRATEGY

The communication activities will be tailored to ensure that key messages are widespread and that audiences beyond its own community are connected with the project. The project partners will be encouraged to engage in a two-way exchange (outreach activities). The communication strategy will depend on the efforts of the partners in maximising all occasions to promote the project and its results. Efforts will be made to engage the involvement of the earlier-stage HIGHLANDER researchers in the communication activities.

4.1 External Communication

4.1.1 Targeted audiences

Target groups are the public, academic and industrial research communities, energy and hydrogen technologies research funding agencies, energy and hydrogen strategy policy developers.

4.1.2 Communication channels

- **Visual identity package** – The project communication is unified along a common visual entity with a coherent visual chart (colours, fonts, designs) derived from the project logo. This visual identity

will be used throughout the project, creating a distinguishable "branding" that will be recognised by the various communities.

- **HIGHLANDER website**: a project website has been designed and online since M4, It provides non-confidential information on the project, public deliverables, Open Access publications and presentations. Its aim is to reach non-specialised readers, programme managers at funding agencies (e.g., clean transport-focussed JUs, EC, equivalent agencies internationally), the scientific community and stakeholders to further develop the project results.
- **Brochure and Newsletter**: A brochure describing HIGHLANDER will be prepared to present the project's objectives and activities to the public. An annual newsletter will describe and promote the project highlights, progress and outcomes mainly towards a professional audience. These will be available through a direct link on the project website as well as on social media (LinkedIn), with an updates subscription option on the project website.
- **Non-academic forums and industry trade shows**: The industrial partners will use their stands and displays at technology trade shows (three planned) to communicate to other industry professionals, energy and hydrogen technologies energy agencies, representatives of energy policy at local and regional government level.
- **Website Blog**: After its dedicated workshop, HIGHLANDER will implement a blog section on its website to summarise the main outcomes and directly target citizens. This blog will also be relayed on social media.
- **University/industry Open Days or national science festivals** (CNRS: Fête de la Science; TUB: Long Night of Science FZJ: Day of Curiosity) will be used to inform the public of European advances in FCH technologies and their role in achieving EU climate and emissions targets.
- **Press releases**, firstly to promote the project and make it existence known, mainly through the industrial partners' websites and social media and also when important outcomes and milestones are achieved.
- **Interaction with the Programme Office communications services** by establishing contact with the Clean Hydrogen JU communication officer and providing them with information (social media posts, project newsletters) that they can relay through their own channels. This is very effective in broadening communication of project news.
- **Communication with JRC**: Communication channels are already established with JRC scientists. These communication channels will be used to inform JRC of the LPT and AST protocols in use for HDV in HIGHLANDER for collaboration on possible future harmonisation of HD testing protocols.
- **Communication to school children**: JM and FZJ are regularly invited to explain the basics of hydrogen and fuel cells and this will continue, using the opportunity of HIGHLANDER to set European collaborative research in this field in context.

4.2 Internal Communication

A Project Shared Workspace will be implemented by PXO to provide a restricted access platform for project partners, allowing sharing, decentralised and secured archiving of documents.

5 EXPLOITATION

5.1 Exploitation by project partners

CO_2 reduction from heavy-duty trucks is mandatory from 2025, and stringent from 2030. This compressed time-scale to technology implementation is a strong driver to accelerate the technology advances in HIGHLANDER and for rapid application of follow-up steps by the industrial stakeholders, to meet the 2030 target of 100,000 HDT.

- **ELMARCO (ELM)** electrospinning Nanospider™ equipment is world leading technology in industrial nanofibre production. The HIGHLANDER project will support ELM innovation activities towards new market launchable applications. The energy market demand for nanofibres, especially battery separators and fuel cell fields, is showing continuous but relatively slow growth due to complexity of R&D tasks. In HIGHLANDER ELM will continue to optimise advanced polymer electrospun webs at industrial scale and cost-effectively, proving, together with project partners, new applications for functional nanofibre products. These findings are expected to support Nanospider™ equipment customisation to fulfil different requests of material performance. New technological solutions focused on needs from final application create reference products leading to the growth of electrospinning equipment market.
- **SOLVAY** will use the results and technical advancements from this project to produce tailor-made ionomers for both the membrane and catalyst layer (ionomer as electrode binder). Their production cost will be a high priority, within the determined price/performance ratio corridor, such that the cost of the MEA tends to SRIA targets. Advances in processing technology of fluoroionomers to fabricate membranes, with regards to lowering the environmental impact, including CO_2 footprint mitigation and potentially reducing their costs, could also be exploited by the consortium partners in their production over the next five years. In achieving the project objectives, a very positive impact in ionomer sales is foreseen, translating into a very attractive total market opportunity for SOLVAY. HIGHLANDER will provide SOLVAY with the opportunity to explore ionomer properties that extend beyond their incumbent ionomer materials. This endeavour, combined with the excellence that the other partners add and the technical exchange that will occur, will position SOLVAY to be an innovation leader in ionomers for fuel cell applications. HIGHLANDER project offers also the opporunity to pave the way of the new generation of ionomers for Fuel-Cell, fluorine-free ionomer family, with an expected better sustainable profile with reaching, at list, the same level of performances of the incumbent solutions.
- **Bosch** believes the best opportunities for broad adoption of fuel-cell technology are in the commercial-vehicle market. Bosch sees itself as a systems supplier and will manufacture fuel cell stacks starting from 2022. The stack will complement the broad Bosch portfolio of fuel-cell components. Bosch is entering the market for transport fuel cells and is going to take on this task with determination and develop the automotive fuel cell market. HIGHLANDER will give Bosch the ability to capture a significant share of the HD fuel cell stack market and become technology and market leader in this field. The stack with a durable MEA is the core component for technological differentiation and absolutely needed in order to achieve market leadership. For Bosch, an exploitation scenario based on manufacturing 30% of the stacks for 100,000 fuel cell powered commercial vehicles per year in 2025 using the HIGHLANDER MEA will create €0.5 billion additional turnover for Bosch and 500 jobs.

- **Johnson Matthey (JM)**. The market for FC MEAs and electrolyser CCMs is worth £2-4bn and £2-10bn respectively by 2030 (IEA, Hydrogen Council, Morgan Stanley). With >20 years experience and 400 patent applications, JM builds on existing PEMFC manufacturing capacity of 2 GW expanding to 5 GW in 2024. The use of HIGHLANDER best-in-class materials and their direct integration within a Tier 1 automotive supplier stack will allow these improvements to start impacting market growth within a 5-year timeframe. The synergy across multiple applications is also very important and this project, particularly new low permeability membranes, has clear transferability to electrolyser MEAs. JM is extremely well placed to exploit these new developments in the electrolysis business, having recently built links with Plug Power, Hystar and Enapter. JM is the number one global PGM supplier and secondary recycler and will ensure that a design for recycling is used in this project and fully exploited.

5.2 Foreseen actions to boost the exploitation of the HIGHLANDER results

Target groups and channels: To accelerate the technology uptake, the HIGHLANDER consortium will specifically target companies fabricating MEA components and MEAs, and the scientific community working on new materials and components and theory-based methods. The consortium includes four companies that develop fuel cell core materials, manufacture MEA components (ELM, DYN, JM, Bosch) and/or complete MEAs (JM), or are MEA-end-user (Bosch). Consortium members are also involved in HE and HER working groups where the non-confidential results of HIGHLANDER can be made known in the context of the identification of future gaps and needs for future call topics, and this provides an effective channel to boost the exploitation of results, in particular their transfer to other related HD applications (aviation, rail, maritime).

6 FUTURE UPDATES AND MONITORING

The PDEC will be updated at M18 and M36. KPIs, including number of HIGHLANDER website visits, journal articles, invitations to lecture at conferences, press releases, social media posts and their sharing and "likes", will be used to monitor progress 6-monthly, and define contingency measures if necessary. Partners will also contribute to maximising the use of all existing communication and dissemination channels.