



Project title	MEMBRANE SCALE UP FOR CHEMICAL INDUSTRIES		
Project acronym	MEASURED		
Project number	101091887		
Project start date	01/01/2023	Duration	48 months

D7.9 - MEASURED DISSEMINATION ACTIVITIES (INCLUDING TRAINING, VISIT DEMO, ETC) 1

Due date	30/06/2024	Delivery date	30/06/2024
Work package	WP7		
Responsible Author(s)	TUE, PNO		
Contributor(s)	Pierre Olivier (Engie), Manuela Guiducci (PNO), Alessandra Criscuoli (CNR-ITM), Michele Ongis (Modelta), Martina Vitiello (GVS), Serge Tretjak (Arkema), Efrem Curcio (Unical), Fausto Gallucci (TUE), Luca Di Felice (TUE)		
Reviewer(s)	Luca Di Felice (TUE)		
Version	0.3 (final)		
Dissemination level	PU		

VERSION AND AMENDMENTS HISTORY

Version	Date (MM/DD/YYYY)	Created/Amended by	Changes
0.1	09/05/2024	Manuela Guiducci (PNO)	Document and content set up
0.2	26/06/2024	All contributors	Content upgrade
0.3 (final)	30/06/2024	Luca Di Felice (TUE)	Reviewed and in final form

TABLE OF CONTENTS

1	INTRODUCTION	4
2	STRATEGIC DISSEMINATION AND STAKEHOLDER ENGAGEMENT IN MEASURED	5
2.1	DISSEMINATION STRATEGY	5
2.1.1	Scientific/technical publications and oral/poster presentations at conferences, symposia, seminars, workshops, etc.	6
2.1.2	Education sessions	6
2.1.3	Liaison with EU communities	6
2.1.4	Liaison / collaboration with relevant projects	6
2.1.4.1	Connection with related EU projects already established	6
3	PLAN FOR DISSEMINATION ACTIVITIES	9
3.1	THE SECOND WINTER SCHOOL ON MEMBRANES AND MEMBRANE REACTORS IN EINDHOVEN....	9
3.2	JOINT WORKSHOP MELODIZER & MEASURED	9
3.3	JOINT EU PROJECT SESSION: MELODIZER, CUMERI & MEASURED	9
3.4	FINAL WORKSHOP AT ENGIE FOR PRESENTING THE MEASURED RESULTS	9
3.5	GUIDED VISITS FOR STAKEHOLDERS TO THE DEMONSTRATION SITES	10
3.6	TRAINING SESSIONS ON SOFTWARE TOOLS DEVELOPED IN WP6	10
3.7	OPEN DAYS/LECTURES AT SCHOOLS/TRAININGS	11
3.8	MEASURED PARTICIPATION IN EUROMEMBRANE 2024	12
4	MEASURED: EARLY PROGRESS IN DISSEMINATION AND AWARENESS INITIATIVES .	13
5	CONCLUSION	15

LIST OF FIGURES

FIGURE 1: INNOMEM PROJECT	7
FIGURE 2: MACBETH PROJECT	7
FIGURE 3: MELODIZER PROJECT	8
FIGURE 4: CUMERI PROJECT	8
FIGURE 5: APOLO PROJECT	8
FIGURE 6 INTERACTIVE SESSIONS ON POLYMERIC MEMBRANE PREPARATION AT PRIMARY/SECONDARY SCHOOL STUDENTS (UNIVERSITY OF CALABRIA-UNICAL, 29 SEPTEMBER 2024)	11
FIGURE 7: MEASURED SHOWCASED AT MD SORRENTO 2023	13
FIGURE 8: : FROM LEFT TO RIGHT, LUCA DI FELICE (TU/E), MARGOT ANABELL LLOSA TANCO (TECNALIA), MATHILDE JÉGOUX, (ENGIE) AT ICCMR 2023	14

LIST OF ABBREVIATIONS

Abbreviation	Definition
EU	European Union
EC	European Commission
HEU	Horizon Europe
D&C	Dissemination and Communication
PNO	CiaoTech – PNO Group
TUE	Eindhoven University of Technology
UNICAL	Università della Calabria
CNR	Consiglio Nazionale delle Ricerche

1 INTRODUCTION

Deliverable D7.9 focuses on the dissemination activities planned for the MEASURED project, which will be carried out in the upcoming months of implementation. This document highlights the initiatives already planned by the consortium for publicly disclosing the results achieved within MEASURED.

A significant aspect of this deliverable is the emphasis on training, guided visits for stakeholders to the demonstration sites, the MEASURED public workshop, and joint activities that MEASURED plans to organize in collaboration with its sister projects.

This deliverable is to be considered a living document and will be regularly updated throughout the entire project course, aligning with its progress. Specifically, updates will be made in M36 (D7.10 - MEASURED dissemination activities (including training, visit demo, etc) and M48 (D7.11 - D&C MEASURED dissemination activities (including training, visit demo, etc).

2 STRATEGIC DISSEMINATION AND STAKEHOLDER ENGAGEMENT IN MEASURED

The success of MEASURED relies heavily on well-coordinated dissemination efforts. Creating a detailed plan for dissemination activities ensures broad knowledge dissemination while safeguarding exploitation interests. Priority will be given to sharing project findings with the industry sector, which stands to benefit most from the innovative technologies, data, and knowledge.

The dissemination strategy is aimed:

- To promote MEASURED technologies as reliable to the market, disclosing the portfolio of systems & their potential in terms of cost-effective and efficient membrane separation processes.
- To engage chemical companies, membrane users community to use MEASURED products.
- To disseminate the results from the project test sites and coordinate that research infrastructures will be open and accessible for knowledge transfer.
- To interact with a wide audience through the internet, promotional material and events.

The role of stakeholders in MEASURED will be very relevant: leveraging the wide network of consortium partners, industrial, and scientific partners will be involved throughout the entire project to support the definition of MEASURED's unique value proposition at the technological and business levels (M1-12) and to foster the definition of a TRL9 roadmap and replication starting from pilot campaign outcomes (M24-48).

To ensure smoother replication and to broaden EU knowledge among RTOs and industries, MEASURED will promote a specific web-based training strategy (consisting of webinars, downloadable materials, video tutorials, and e-learning tools) aimed at training the next generation of operators and engineers.

The target audience for this training strategy includes industrial energy managers and owners interested in implementing the project's solutions, as well as industrial operators who will handle these solutions, along with undergraduate, graduate, and PhD students aspiring to pursue careers in this field.

2.1 DISSEMINATION STRATEGY

Measures to maximize impact will result in activities aimed at raising interest among stakeholders and the exploitation-oriented dissemination of the benefits provided by the innovative technology proposed in the project toward potential target end-users/adopters.

Having reputable and business-focused RTOs like TEC and TNO, along with innovative companies such as ENGIE, ARKEMA, OE, RKV, GVS, CWT, and CTI, covering the entire EU membrane market, ensures the creation of new markets and business opportunities, including for SMEs. This also fosters the development of exceptional and unique knowledge at the European level, to be widely promoted in EU R&D, technology, and policy circles. Coordination by TUE and synergies with other ongoing EU-funded projects like INNOMEM and MACBETH further enhance these efforts.

To ensure the broader dissemination of the project findings and promote knowledge exchange within the industry sector, the MEASURED consortium has defined a detailed dissemination strategy, as reported in the following chapters.

Whenever possible, the dissemination activities planned by the MEASURED consortium will be recorded and made available to the project target groups on the [project website](#). In addition, the partners will also consider taking advantage of the [WAMS education portal](#) to collect the lectures that will be held within MEASURED.

2.1.1 Scientific/technical publications and oral/poster presentations at conferences, symposia, seminars, workshops, etc.

The project's results will be published in international scientific and technical literature, including journals such as Energy, Applied Thermal Engineering, Applied Energy, Journal of Power Engineering, ASME, and other ELSEVIER journals, as well as in relevant scientific and technical literature at the national level, primarily in the member states where the partners are established.

Results will also be presented at relevant conferences, symposia, seminars, workshops, and other events, such as Euromembranes, ICOM, ICCMR, DHC+ Annual Congress, Sustainable Places, and SSPCR conferences, through oral or poster presentations.

Furthermore, the project will promote its results at the national level in various Member States where partners are located.

2.1.2 Education sessions

Education sessions, integrating the knowledge developed within the project, will be offered at both local and international levels to undergraduate and postgraduate students, as well as researchers, in high-level MSc and postgraduate courses at TUE, UNICAL, and CNR. These sessions are made possible by the presence of researchers and professors from these institutions within the consortium, along with established collaboration.

2.1.3 Liaison with EU communities

The consortium will aim to establish connections with the most pertinent EU communities regarding MEASURED topics, including relevant EU Technology Platforms (ETPs) like Hydrogen Europe.

2.1.4 Liaison / collaboration with relevant projects

The consortium will seek liaison and collaboration with other hydrogen HEU projects that could complement project activities and provide synergies, also to effectively disseminate project results.

2.1.4.1 Connection with related EU projects already established

The relevant partners within the MEASURED consortium are active in the field of membrane materials and process development, modelling and simulation, membranes production, LCA and techno-economic assessment. They have carried out numerous research and innovation activities in these fields. Multiple collaboration efforts between partners within the consortium have already

been established at the national and international level. The output from those activities and collaborations will be fed to the MEASURED project, providing not only technical support but also new commercial opportunities. Some key examples of this cooperation are listed below:



Figure 1: INNOMEM Project

INNOMEM: Is the testbed on membranes developing pilot scale membrane manufacturing lines. From INNOMEM we selected the most interesting applications to be scaled at TRL7. Access to production lines, virtual modelling lab and virtual characterization lab will be secured by INNOMEM partners working in MEASURED.



Figure 2: MACBETH Project

MACBETH: MACBETH develops at TRL7, 4 lines using membrane reactors. Design practices for TRL7 design of membrane based systems will be shared with MEASURED by key partners of MACBETH. Additionally, a SME created in MACBETH (LCMR) to exploit the models of membrane processes will participate in MEASURED to ensure continuity in modelling efforts.

SOLIDARITY: In the Dutch nationally funded Solidarity project, the focus is on Process efficient Solid and Liquid Dewatering and Drying. TNO and partners are working together to demonstrate cost-effective drying & dewatering in the process industry. TNO is testing hybrid Silica membranes for the glycol dehydration for natural gas dewatering applications experimentally and determining if (and how much) the replacement of TEG dehydration column with a pervaporation unit can lead to economic and environmental benefits.



Figure 3: MELODIZER Project

MELODIZER: MELODIZER implements high-performance membranes and modules in strategic applications of membrane distillation (MD), hence providing the decisive step for the success of MD. MELODIZER will address these design issues carefully, via both modelling and experimental work, to provide new knowledge about the best combination and maximisation of module parameters suitable for high-end applications, as well as improved module structures. Our modules will simultaneously increase thermal efficiency and productivity through smart geometry, arrangements, spacers, and energy recovery strategies.



Figure 4: CUMERI Project

CUMERI: Industrial processes use a tremendous amount of valuable resources including raw materials, water and energy. Enhancing the efficient use of resources in environmentally friendly ways will contribute to a more sustainable and resilient economy. The EU-funded CUMERI project will develop and demonstrate advanced membrane separation systems customised for the steel and oil and gas (O&G) sectors. In the steel sector, one comprehensive system will both recover H₂ and capture CO₂. The O&G industry will benefit from a two-step liquid filtration system to recover base oil and additives recovery from used lubricant oil. The technologies will decrease emissions, enhance the valorisation of valuable chemicals, and increase energy efficiency while promoting a circular economy.



Figure 5: Apolo Project

APOLO: APOLO's main objective is to provide a quantum leap in the development of advanced power conversion technologies based on the smart combination of an innovative onboard ammonia cracking technology based on a Catalytic Membrane Reactor (CMR) coupled with either 1) an advanced Fuel cell running on pure hydrogen or, 2) a novel ammonia engine running on an ammonia/hydrogen blend targeting in all cases the full decarbonization of the maritime sector at the TRL5 scale (125 kW output power).

3 PLAN FOR DISSEMINATION ACTIVITIES

MEASURED partners will implement several public actions, offering them to interested stakeholders and users across academia, industry, and public sectors. These activities, aimed at disseminating results and engaging project stakeholders, include workshops, webinars, trainings, and guided visits to demo sites.

Below is an overview of the preliminary dissemination activities. It's important to note that these actions may vary as they will be implemented according to the project's progress, results, and future connections established with MEASURED sister projects.

3.1 THE SECOND WINTER SCHOOL ON MEMBRANES AND MEMBRANE REACTORS IN EINDHOVEN

The event will take place on 27-28 January 2025 at TU/e in Eindhoven (Netherlands), and it is coorganized by the APOLO and MEASURED projects. The event will provide exciting presentations from experts in the field of membrane reactors, in particular membrane preparation, scale-up, catalyst development for membrane reactors, laboratory and large-scale demonstrations. The school will feature a presentation of the Hybsi membrane development (TNO/CTI), a modelling presentation (AMU/TNO), and a presentation about the pilot & the application (Alsys/Arkema).

3.2 JOINT WORKSHOP MELODIZER & MEASURED

The event, organised by CNR-ITM, will be held on June 5, 2025 at the Hotel San Michele, Cetraro (CS) Italy. It will focus on the development of innovative membranes for enhancing the performance of the three lines identified in the MEASURED project (membrane distillation, pervaporation and gas separation). The innovative membranes and modules for membrane distillation developed in the MELODIZER project, will also be presented. The Workshop will be an interesting opportunity to exchange ideas among Colleagues in the field of membrane development and optimization for industrial applications. In order to attract participants, also not involved in the two projects, the Workshop will be included in an International MD Conference (Membrane Distillation and Innovating Membrane Operations in Desalination and Water Reuse) which will be organised on June 4-6, 2025. The expected number of participants is around 70.

3.3 JOINT EU PROJECT SESSION: MELODIZER, CUMERI & MEASURED

MEASURED will join forces with CUMERI and MELODIZER sister projects and will have a dedicated session at the Acchener Membran Kolloquim 2024, 03-05 / 12 /2024. The event aims at bridging the gap between industry and research, focusing on innovation in membrane materials development as well as new large scale manufacturing technologies and robust membrane module design for efficient and stable operation. The special session for the projects is already in the event agenda with title "EU projects: membrane development & demonstration". Two presentations per project will be given. In MEASURED, the two presentations will be given by WP3 leader (TNO – focused on materials) and by WP6 leader (Modelta – focused on modelling).

3.4 FINAL WORKSHOP AT ENGIE FOR PRESENTING THE MEASURED RESULTS

The event will take place at ENGIE demo plant and is scheduled to be held in M48. The event will be organized to present the MEASURED project results to the industrial stakeholders and a broad audience. The event will take place over a whole day and will be decomposed in two parts. A plenary session to share main results obtained within MEASURED project over the 3 demonstration lines. And a visit of the GAYA platform, a unique semi-industrial platform dedicated to the production of renewable methane from dry solid residues thanks to pyrogasification and methanation. This visit will also be the opportunity to see the gas separation pilot operated within the project and to share how the whole platform is used to demonstrate innovative technologies dedicated to green gases production.

3.5 GUIDED VISITS FOR STAKEHOLDERS TO THE DEMONSTRATION SITES

Guided visits to demo sites: TUE will host and organise the guided visits for stakeholders to the demonstration sites.

Concerning Pervaporation Arkema propose as a preliminary suggestion two visits for stakeholders. A first visit on Orelis site (M30-M32) to visit membrane and skid pilot with prior acceptance testing before shipping the pilot to Arkema. A second visit to Arkema at M44 after pilot tests so that we can share visit and some results. Total number of persons 10 –15 and visit by group of 5 persons on a Seveso Site in production.

On the topic of the Membrane Distillation demonstration, a similar approach is suggested, consisting firstly in the organization of a visit to Circular Water Technologies (CWT) in Stockholm in the months before the pilot shipping (M29-30, corresponding to May-June 2025). This first visit would be focused on the presentation of the module assembly and pilot characteristics and how the membranes developed in the project have been employed.

A second visit will be planned at GVS in Bologna around March-April 2026 (M39-40), after about 10 months of pilot operations within the membrane manufacturing facility. It is expected that this time frame would be enough to gather enough data to be shared. The visit would go through the presentation of the main manufacturing line and how the wastewater is generated. It would then focus on the integration of the MD pilot in the facility and the results obtained. The site itself is not considered high risk, so a single day visit by all the participants would be feasible.

Finally, regarding gas separation demonstration, a single visit will be organized on the demonstration site i.e. Gaya platform in the South of Lyon, France. This visit will be organized once the gas separation pilot will be installed on site around March-April 2026 (M39-40) and it will be the opportunity to both share insights regarding pyro gasification and methanation demonstration plant as well as the gas separation pilot to upgrade methane quality at the outlet of methanation reactor. The visit will be organized over a half-day and will be limited to 10-15 people due to limited hosting capacity of the site.

3.6 TRAINING SESSIONS ON SOFTWARE TOOLS DEVELOPED IN WP6

Training sessions on software tools developed in WP6 will be done remotely, via webinars. The webinar will be held in the frame of MEASURED second reporting period. The webinar agenda will

potentially contain presentations about the different modelling techniques and scales investigated in the project. In details:

- Computational Fluid Dynamics (CFD) modelling, with focus on applications in membrane modules for the study of relevant phenomena (e.g. temperature and concentration polarization) by NIC.
- Phenomenological modelling of membrane separators/reactors, where simplified tools are developed in order to be later applied to process modelling. By TNO/MOD.
- Modelling of membrane-based processes: process design, optimization and sensitivity. By MOD/AMU.
- Life Cycle Assessment (LCA), social-LCA and circularity analyses in membrane processes: environmental impact of innovative solutions. By EUT.

3.7 OPEN DAYS/LECTURES AT SCHOOLS/TRAININGS

As part of MEASURED dissemination actions, partners are dedicated to fostering community engagement and educational outreach through a series of dynamic activities.

Lectures are organized to inspire and educate school students about cutting-edge scientific and technological advancements achieved by the project, presenting innovation with a simple and accessible language. Initiatives include interactive sessions and hands-on demonstrations, tailored to different age groups, to ignite curiosity and enthusiasm. These initiatives will also offer the opportunity for some specialized training for educators to enhance their expertise in membrane technology (making them able to effectively teach and apply new scientific concepts in a simple way), emphasizing its pivotal role in addressing significant societal challenges.

These efforts aim to build a more informed, skilled, and motivated next generation, driving forward MEASURED vision of innovation and sustainability.



Figure 6 Interactive sessions on polymeric membrane preparation at primary/secondary school students (University of Calabria-UNICAL, 29 September 2024)

Open days, which provide an opportunity for the community (especially young people) to visit laboratorial facilities and interact with researchers, will be regularly organized by academic partners to reach a broader audience, ensuring widespread dissemination of research findings and fostering a collaborative environment. Ultimately, these activities aim to bridge the gap between science and society, encouraging active participation and fostering a culture of innovation and learning.

Concerning training activities aimed at providing advanced scientific and technical knowledge on the field, a dedicated event “The second winter school on Membranes and Membrane reactors” will be organized. The event will take place on 27-28 January 2025 at TU/e in Eindhoven (Netherlands), and it is co-organized by the APOLO and MEASURED projects. The event will provide exciting presentations from experts in the field of membrane reactors, in particular membrane preparation, scale-up, catalyst development for membrane reactors, laboratory and large-scale demonstrations. The school will feature a presentation of the Hybsi membrane development (TNO/CTI), a modelling presentation (AMU/TNO), and a presentation about the pilot & the application (Alsysis/Arkema).

In addition, open days/lectures at schools/trainings will be organised to create awareness. Lectures on pervaporation will be considered, as well as 2 PhD specific programmes at TUE and UNICAL

3.8 MEASURED PARTICIPATION IN EUROMEMBRANE 2024

EUROMEMBRANE, scheduled to be held in Prague from September 8-12, 2024, aims to bring together European “membranologists” and key players from all over Europe to discuss all aspects of research and applications of membrane and membrane processes. The event is one of the flagships of the European Membrane Society (EMS), which is keen on supporting scientific or technical events related to membranes and membrane processes.

In this year's call for abstracts, many MEASURED partners have participated to present the advancements related to the project. Below is the list of submitted abstracts:

- [*Study of the performance in Membrane Distillation of PVDF membranes prepared with green solvents and specific coatings*](#), M. C. Carnevale, F. Russo, A. Corozzi, M. Raimondo, R. Conti, M. Aquino, S. Santoro, E. Curcio, A. Figoli, A. Criscuoli.
- [*Sustainable PVDF membranes preparation using \$\gamma\$ -Valerolactone \(GVL\) as a green solvent*](#), F. Russo, F. Galiano, A. Gordano, M. Aquino, S. Santoro, E. Curcio, A. Criscuoli, F. Figoli.
- [*Ceramic Biomimetic Coatings to Boost PVDF Membrane Performance in Treating Low Surface Tension Wastewater Streams*](#), A. Corozzi, M. Caruso, F. Russo, F. Galiano, M.C. Carnevale, A. Gordano, R. Conti, F. Gallucci, E. Curcio, A. Criscuoli, A. Figoli, M. Raimondo.
- [*Acid Resistant Hybrid Silica \(HybSi\) Membrane for Enhanced Esterification Reaction by Pervaporative Dehydration of Acrylic Ester Reaction Mixture*](#); M. Nikbakht Fini, M. van Tuel, Y. van Delft, D. Dhaler, D. Tournigant, S. Tretjak.
- [*Integration of pervaporation in organic compounds dehydration processes*](#), F-T. Lo, S. Clercq, E. Gout, P. Moulin, E. Carretier.

4 MEASURED: EARLY PROGRESS IN DISSEMINATION AND AWARENESS INITIATIVES

Awareness raising and early dissemination of the MEASURED progress already started in the frame of the first reporting period of the project. The project partners joined major relevant conferences and other events to present the project and disseminate its results, taking advantage of the MEASURED D&C Toolkit (described in deliverable D7.4). MEASURED has been already presented in the framework of:

- **Kallelse till Circular Water Technologies årsstämma 2023**, April 2023.
- **3rd International Workshop on Membrane Distillation and Innovating Membrane Operations in Desalination and Water Reuse - md-sorrento2023**, April 2023.
- **13th International Congress on Membranes and Membrane Processes (ICOM2023)**, July 2023.
- **Night of Researchers 2023**, September 2023.
- **16th edition of the International Conference on Catalysis in Membrane Reactors**, October 2023.
- **“Le Giornate del Dipartimento DSCTM”, Sestri Levante (GE) Italy**, October 2023.

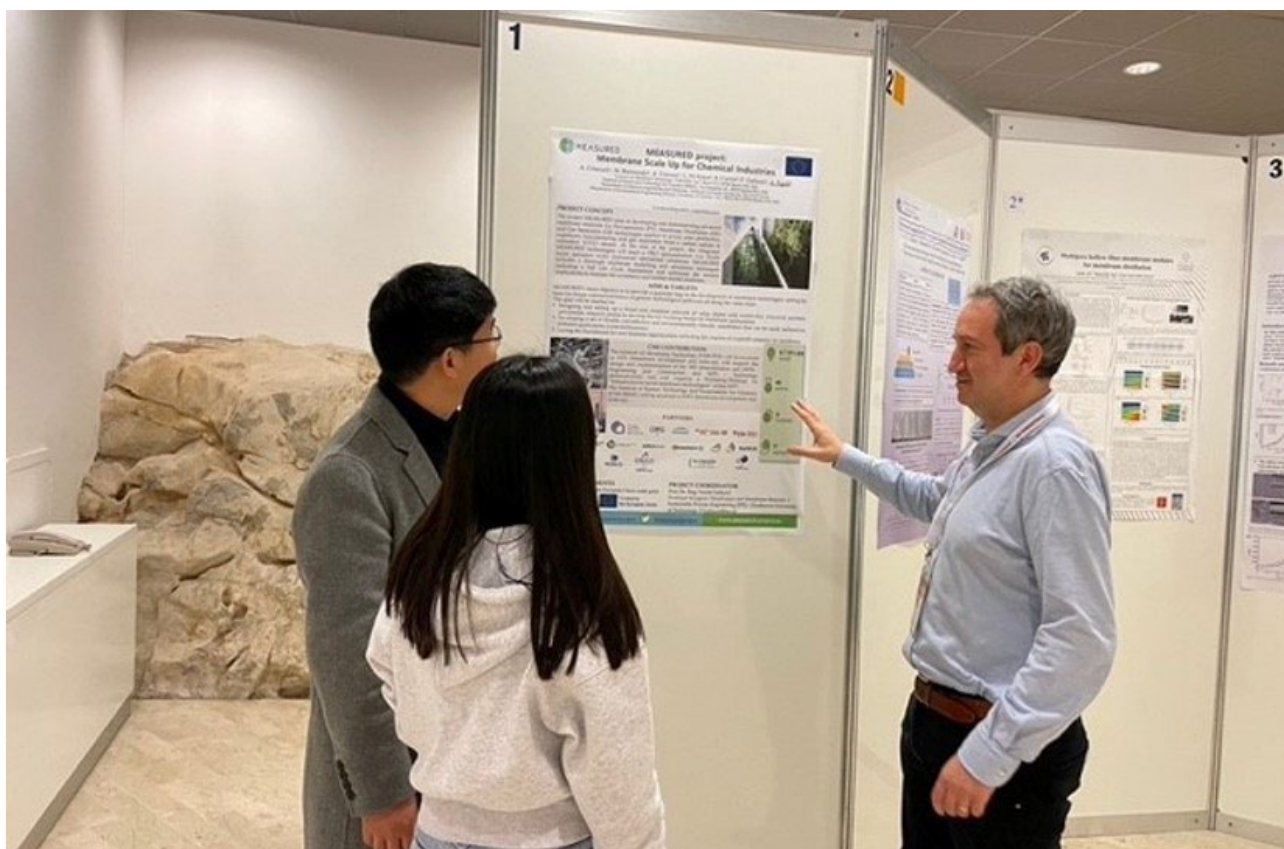


Figure 7: MEASURED showcased at MD Sorrento 2023

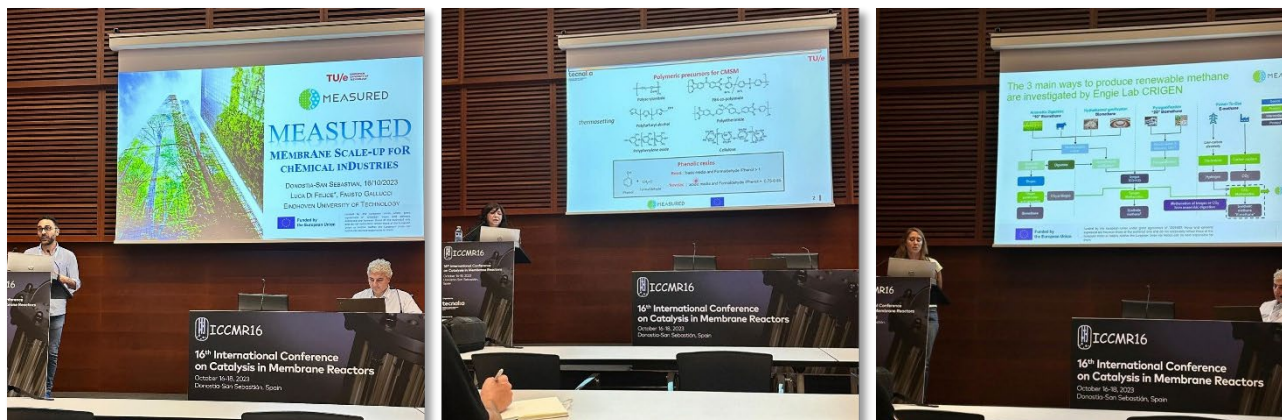


Figure 8 : : from left to right, Luca Di Felice (TU/e), Margot Anabell Llosa Tanco (TECNALIA), Mathilde Jégoux, (ENGIE) at ICCMR 2023

5 CONCLUSION

Deliverable D7.9 focuses on the dissemination activities planned by the MEASURED consortium to ensure broad knowledge dissemination and stakeholder engagement. The document emphasizes training, guided visits for stakeholders to the demonstration sites, MEASURED public workshops, and joint activities that MEASURED plans to organize in collaboration with its sister projects, to be carried out in the upcoming months of implementation.

Additionally, the deliverable provides information on the early progress in dissemination and stakeholder engagement thus far.

This deliverable is to be considered a living document and will be regularly updated throughout the entire project course, aligning with its progress. Specifically, revisions will occur in M36 (D7.10 - MEASURED dissemination activities (including training, visit demo, etc) 2) and M48 (D7.11 - D&C MEASURED dissemination activities (including training, visit demo, etc) 3).