



### ARENHA

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# WP7 – Dissemination and communication

# D7.23 ARENHA Dissemination activities M60

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### 1. Executive summary

### **1.1. Description of the deliverable content and purpose**

Among the tasks outlined in the ARENHA project, dissemination and communication activities play a crucial role in sharing scientific knowledge and technological advancements with the widest possible audience. This work package enhances the project's visibility, ensures optimal recognition, and facilitates future exploitation by engaging with major European and global forums and platforms relevant to the project's focus.

The purpose of this deliverable is to detail the actions undertaken during this period (M60) to achieve the objectives and results set forth in the ARENHA project. This document provides an in-depth account of the activities carried out, highlighting progress in the project's main communication strategy and measurable objectives.

### **1.2. Deviation from objectives**

Overall, social media engagement was far stronger than anticipated, scientific publications, newsletters and attended conferences and events overperformed, and most dissemination tools (flyers, website visits, downloads) were effective, although visit duration could be improved.

No relevant deviation of the deliverables completed and KPIs of the WP7 were experienced during this period.



### 2. Dissemination and communication plan

The dissemination and communication plans are divided in four stages (Figure 1).

The first one was mainly focused on the basic internal dissemination, initial external communication, the implementation of the dissemination strategy, and the creation of communication tools (i.e. public and private website, communication material...).

The second and third stage had a special focus on communicating with the external audience: participating in congresses, publishing scientific papers and preparing press articles.

During the final stage the final workshop took place, a PhD thesis was submitted, and papers and press articles were published to allow sharing the results of the whole projects with public.



Figure 1. Stage of exploitation and dissemination activities.

The dissemination and communication plan has been successfully implemented.



### 3. Dissemination and communication activities

### 3.1. Progress of the dissemination and communication activities

Table 1 summarizes the dissemination activities of the project, comparing expected impact (KPIs) against achieved impact on Month 36 and Month 60.

Diss	Expected impact	Achieved Impact M36	Achieved Impact M60	
	Monthly visits	300	708	288
	Duration of visits	3 min	1´35"	1´30"
Project Website	Downloads per month	20	34	34
·	Total subscription of stakeholders	100	107	118
	References from other webpages	5	5	6
Partners website	References from partners websites	11	3	23
	Post/messages/tweets	200	165	581
LinkedIn, Twitter,	Visits to posts	>50	>15.784	138,452
YouTube	Videos	2	1	3
Nie was le ff e ne	Total videos visualisations	>1000	661	897
Newsletters	Publications	6	5	9
News/Press releases	Publications	10	7	17
Journal articles	Scientific papers	6	5	13
Leaflet	Copies	1200	150	1600
	Attended conferences with presentations/posters	20	23	42
Attendance to events: Exhibitions,	Oral communication at congresses & events	6	2	28
conferences & networking events	Attended industrial events / fairs	10	4	11
	Events for the general public	3	2	2
	Flyers distributed	1200	150	1450
Organized workshops, webinars	Workshops	2	0	3
& training	Registrations	>30	>43	170
<u> </u>	Webinars / training	1	0	2

Table 1.	<b>Dissemination and</b>	communication	progress	bv M60
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The visitor numbers to the project website were slightly below the expected impact but improved over time (288 instead of 300). Anyhow, we should point out that the number recorded does not include the last dissemination activities (e.g., final newsletter, video of the final workshop, final video of the ARENHA project...). Downloads exceeded the KPI, showing strong interest in the content, even though the webpage visits duration was shorter than expected. Stakeholder subscriptions grew steadily and references from other webpages slightly surpassed the target. Finally, mentions and references from partner websites were higher than expected, demonstrating active collaboration.

The number of posts/tweets in social media doubled the target in M60, with a total of **408 posts** (155 in LinkedIn and 253 in Twitter/X). Despite the higher effort posting in Twitter, the number of followers was ten times higher in LinkedIn.



Overall, three **videos** were produced in the frame of ARENHA reaching 897 views (before including the video of the final workshop and the final video of the ARENHA project).

The number of **scientific papers (13)** in peer-reviewed journals (excluding conference proceedings) doubled the KPI of 6 and they were all **Gold Open Access**. The number of periodic newsletters and press articles exceeded the expected number. A PhD Thesis was published by TU/e as a result of the project.

The KPI for the total number of **attended conferences**, industrial events and events for the general public was set at 39. By the end of the project this number reached a total of 44, with 37 of the events being conferences involving an oral communication and presentation, and five of them leading to open access publications in the conference proceedings.

Number leaflets printed and distributed in the events mentioned above exceeded the KPI.

The number of organized workshops and webinars met expectations.

### 3.1.1. Branding elements

The project logo, two different leaflets, two posters, and a card were created and taken to congresses, fairs and other events. The two sides of the open leaflet are shown in Figure 2 and Figure 3.



Figure 2. New ARENHA leaflet. Page showing the front (right column) and back (central column) of the close leaflet.



#### Objectives

ARENHA aims to demonstrate the full power-to-ammonia-to-usage value chain at TRL5 and the outstanding potential of green ammonia to address the large-scale energy storage through life cycle analysis, sociological surveys and techno-economic analysis connected with multiscale modelling. Our main technical objectives are:

- To develop and integrate innovative solid oxide cell materials into a high temperature electrolysis unit to produce 1.5 Nm<sup>3</sup>/h of hydrogen from solar power.
- To develop and integrate innovative materials into an ammonia synthesis loop to produce 10 kg/day at 80 bar.
- To develop and integrate innovative materials into a decomposition reactor that generates pure hydrogen from green ammonia
- To develop and test innovative materials and solutions for the alternative direct synthesis and utilization of green ammonia.
- To demonstrate ammonia as a flexible energy carrier through the development of a fully integrated prototype for green ammonia synthesis and decomposition.
- To assess the social acceptance, techno-economic-environmental feasibility, and replication potential of the developed value chains.



Figure 3. New ARENHA leaflet. Internal side of the open leaflet.

#### 3.1.2. Public website and social media networks

The website (<u>https://arenha.eu/</u>) was continuously updated with all the publishable information from the project partners. This web site is provided by TECNALIA and managed by TECNALIA and CNH2, and contains all public information about the project, organised in the following main sections: *Home, About, Partners, Technology, Public Documents, News & Events, Links, Contact Us,* and *Newsletters.* 

The *Public Documents* section includes the public presentations, materials of the project workshops, all the scientific publications (most of them Open Access), conferences, press articles, videos, patents and thesis.

A new section called *Footprinter* (Figure 4) has been added in the last period. It is a user-friendly webbased tool that allows users to compare the use of ammonia for the different applications, based on different scenarios.

Finally, a social media campaign was actively carried out in order to ensure adequate coverage of project activities on the social networks. The project uses LinkedIn (*"ARENHA Project"*, 155 posts and 1989 followers) (Figure 5), Twitter (@ARENHA\_H2020, 253 posts and 146 followers), and YouTube (project videos) to disseminate activities and results. The number of followers in LinkedIn was ten times higher (Figure 6), and the total increased gradually to make a total of 1990. The total number of posts (Linkedin and Twitter) was 408.





Figure 4. ARENHA website last update with Footprinter.



Figure 5. Some post in LinkedIn.



Figure 6. Evolution of the number of followers in social media.

## 3.1.3. Publications and newsletters

Thirteen scientific papers (with gold open access) were published in peer reviewed journals. They are listed below, together with press articles in non-scientific media (17), and nine newsletters. Moreover, a PhD Thesis has been completed as part of the project.

There were also five publications in conference proceedings, although they are not listed in this section but in section 3.1.4 Conference and other events.

### Peer Reviewed Articles

- 1. Jaysree Pan, Heine Anton Hansen and Tejs Vegge, Vanadium oxynitrides as stable catalysts for electrochemical reduction of nitrogen to ammonia: the role of oxygen., *Journal of Material Chemistry A*, **2020**, *8*, 24098- 24107. <u>https://doi.org/10.1039/D0TA08313E</u>.
- Valentina Cechetto, Luca Di Felice, Jose A. Medrano, Camel Makhloufi, Jon Zuniga and Fausto Gallucci. H2 production via ammonia decomposition in a catalytic membrane reactor. *Fuel Processing Technology*, **2021**, *216*, 106772. <u>https://doi.org/10.1016/j.fuproc.2021.106772</u>.
- 3. Christine Mounaïm-Rousselle, Pierre Brequigny, Clément Dumand and Sébastien Houille, Operating Limits for Ammonia Fuel Spark-Ignition Engine, *Energies*, **2021**, *14*(14), 4141. <u>https://doi.org/10.3390/en14144141</u>.
- 4. Freddy Kukk, Sergii Pylypko, Enn Lust and Gunnar Nurk, Influence of Active Layer Thickness of Reversible Solid Oxide Cells on the Electrochemical Performance of Water Electrolysis, *ECS Transactions*, **2021**, *103*(1), 511. <u>https://doi.org/10.1149/10301.0511ecst</u>.
- Valentina Cechetto, Luca Di Felice, Rocio Gutierrez Martinez, Alba Arratibel Plazaola and Fausto Gallucci. Ultra-pure hydrogen production via ammonia decomposition in a catalytic membrane reactor, *International Journal of Hydrogen Energy*, **2022**, *47*(49), 21220-21230. <u>https://doi.org/10.1016/j.ijhydene.2022.04.240</u>



- 6. Adrien Mercier, Christine Mounaïm-Rousselle, Pierre Brequigny, Jean Bouriot, and Clément Dumand, Improvement of SI engine combustion with ammonia as fuel: Effect of ammonia dissociation prior to combustion, *Fuel Communications*, **2022**, *11*, 100058. https://doi.org/10.1016/j.jfueco.2022.100058.
- 7. Valentina Cechetto, Cynthia Lan Struijk, Luca Di Felice, Anouk W.N. de Leeuw den Bouter, and Fausto Gallucci, Adsorbents development for hydrogen cleanup from ammonia decomposition in a catalytic membrane reactor., Chemical Engineering Journal, **2023**, 455, 140762. <u>https://doi.org/10.1016/j.cej.2022.140762</u>.
- 8. Christine Mounaïm-Rousselle, Adrien Mercier, Pierre Brequigny, Clément Dumand, Jean Bouriot and Sébastien Houillé, Performance of ammonia fuel in a spark assisted compression Ignition engine, International Journal of Engine Research, **2023**, 23 (5), 781, <u>https://doi.org/10.1177/14680874211038726</u>.
- Valentina Cechetto, Serena Agnolin, Luca di Felice, A. Pacheco Tanaka, M. Llosa Tanco and Fausto Gallucci, "Metallic Supported Pd-Ag Membranes for Simultaneous Ammonia Decomposition and H2 Separation in a Membrane Reactor: Experimental Proof of Concept. Catalysts 2023, 13(6), 920; <u>https://doi.org/10.3390/catal13060920</u>.
- Valentina Cechetto, Luca Di Felice and Fasuto Gallucci, Advances and Perspectives of H2 Production from NH3 Decomposition in Membrane Reactors. Energy Fuels 2023, 37, 15, 10775– 10798; <u>https://doi.org/10.1021/acs.energyfuels.3c00760</u>.
- F. Kukk, S. Pylypko, E. Lust, and G. Nurk. Influence of Hydrogen Electrode Active Layer Thickness on Electrochemical Performance of Solid Oxide Cell Operating in Electrolysis Mode. 2023 Journal of the Electrochemical Society, 170(9); <u>http://dx.doi.org/10.1149/1945-7111/acf20b</u>.
- Brooker-Davis C.A., Makepeace J.W., Wood T.J. Enhancement of the catalytic activity of Lithium Amide towards ammonia decomposition by addition of transition metals. The Journal of Ammonia. 2023, 1(1), 46-58; <u>https://doi.org/10.18573/jae.11</u>
- Richard, A. Ramirez Santos, P. Olivier, F. Gallucci. Techno-economic analysis of ammonia cracking for large scale power generation. International Journal of Hydrogen Energy, 2024, 71. <u>https://doi.org/10.1016/j.ijhydene.2024.05.308</u>.

### Press articles

1. K. Schwarz, EU-Projekt ARENHA: Grünes Ammoniak für die Energiewende, on Fraunhofer IKTS website.

https://www.ikts.fraunhofer.de/de/presse/news/2020\_10\_13\_eu\_projekt\_arenha.html.

- 2. C. Eckart, Ammonia as a tamer for green hydrogen. Public media article on the German newspaper "Background Tagesspiegel"
- 3. E. Monge, V. Sendarrubias, J. Martín, El proyecto ARENHA demostrará el potencial del amoniaco como forma de almacenamiento energético, Public media article on the Spanish newspaper "Energética". <u>https://www.energetica21.com/revistas-digitales/septiembre-2021</u>
- 4. M. Hernández Solana, E. Monge Ruiz, Un proyecto con dinero europeo impulsa el uso del amoniaco verde para almacenar energía. The objective. <u>https://theobjective.com/sociedad/medioambiente/2021-11-15/proyecto-europeo-amoniaco-verde-energia/</u>
- 5. V. Sendarrubias, E. Monge, J. Martin, Nueva reunión del consorcio del proyecto ARENHA en el que participa el CNH2 de Puertollano, La comarca de Puertollano. https://www.lacomarcadepuertollano.com/articulo/puertollano/nueva-reunion-del-consorcio-del-proyecto-arenha-en-el-que-participa-el-cnh2-de-puertollano/20221019112124376297.html
- 6. J.L. Viviente. Advance materials and reactors for energy storage through ammonia. Issue 13 of The Innovation Platform. Energy Storage section, Pages 176-179. https://www.innovationnewsnetwork.com/publication/the-innovation-platform-issue-13/
- 7. E. Monge. Ciudad Real High Tech | Amoníaco para mover los barcos. Cadena SER: <u>cadenaser.com/audio/1698236388013/</u> (radio interview)
- 8. El Proyecto 'ARENHA', en el que participa el CNH2 de Puertollano, avanza en la utilización de amoníaco como vector energético renovable. La Comarca de Puertollano.



https://www.lacomarcadepuertollano.com/articulo/puertollano/proyecto-arenha-avanzadesarrollo-prototipos-utilizacion-amoniaco-como-vector-energeticorenovable/20240319134632538297.html

- E. De Aragón. El proyecto ARENHA da pasos para desarrollar prototipos para el uso del amoníaco como vector energético. H2 Hidrógeno verde. <u>https://hidrogeno-verde.es/proyecto-arenha-uso-amoniaco-vector-energetico/</u>
- 10. E. De Aragón. Los avances del proyecto ARENHA para el uso del amoníaco como vector energético. Energy News. <u>https://www.energynews.es/uso-amoniaco-proyecto-arenha/</u>
- 11. H2SITE entrega su planta de descomposición de amoniaco a Fertiberia para ser operada por el CNH2. Cluster Energía. <u>https://www.clusterenergia.com/noticias-asociados-2/h2site-entrega-su-planta-descomposicion-amoniaco-a-fertiberia-para-ser-operada-por-cnh2</u>
- 12. J.L. Viviente. The ARENHA project is working to overcome the technical challenges of using green ammonia for flexible, safe, and profitable energy storage. Innovation News Network. <u>https://www.innovationnewsnetwork.com/advanced-materials-reactors-energy-storage-through-ammonia/29289/</u>
- 13. Hidrogeno Verde. El proyecto ARENHA da pasos para desarrollar prototipos para el uso del amoníaco como vector energético. <u>https://hidrogeno-verde.es/proyecto-arenha-uso-amoniaco-vector-energetico/</u>
- 14. H2Tech. Elcogen delivers electrolysis stack for green ammonia production. <u>https://h2-tech.com/news/2023/09-2023/elcogen-delivers-electrolysis-stack-for-green-ammonia-production/</u>
- 15. El CNH2 de Puertollano organiza un workshop sobre el proyecto 'ARENHA'. La Comarca de Puertollano. <u>https://www.lacomarcadepuertollano.com/articulo/puertollano/cnh2-puertollano-organiza-workshop-proyecto-arenha/20250307234621583272.html</u>
- 16. Amoniaco verde, la solución al transporte y almacenamiento de hidrógeno renovable. Cryospain. https://cryospain.com/es/amoniaco-verde
- 17. ARENHA Project. UreaKnowHow.com. <u>https://ureaknowhow.com/arenha-project-advanced-materials-and-reactors-for-energy-storage-through-ammonia/</u>

### Newsletters

A total of nine newsletters have been prepared every six months and shared among stakeholders via the webpage and the newsletter's subscription. These include the outputs of the project, main achievements and highlight upcoming events.

### PhD Thesis

Valentina Cechetto (2024). Ultra-pure hydrogen production via ammonia decomposition in packed bed membrane reactors. Technische Universiteit Eindhoven, ISBN: 978-90-386-6030-1

### 3.1.4. Conferences and other events

The consortium has disseminated the progress and results of the project in a total of 42 conferences and events (listed below). The objective of these events is to present ARENHA project to general public including research organisations, potential users, industry and other stakeholders.

- C. Mounaïm-Rousselle, P. Brequigny, S. Houillé, C. Dumand. Potential of Ammonia as future Zero-Carbon fuel for future mobility: Working operating limits for Spark-Ignition engines. SIA Powertrain & Energy 2020, Nov 2020, Online, France. <u>https://hal.archives-ouvertes.fr/hal-03188481</u>.
- V. Cechetto, L. D Felice, A. Arratibel Plazaola and F. Gallucci. Ammonia inhibition on H2 produced via ammonia decomposition in a catalytic membrane reactor. World Online Conference on Sustainable technologies. March 17-19, 2021. Oral presentation. <u>https://wocst.org/index.php</u>.
- 3. C. Makhloufi. Utilising Liquid Ammonia for Cost-effective storage and distribution of large Quantities of Renewable Energy. 14th Energy World Forum. May 19th, 2021. Oral presentation. https://energystorageforum.com/session/utility-utilising-liquid-ammonia.



- 4. F. Kukk, S. Pylypko, E. Lust, and G. Nurk. Influence of active layer thickness of Reversible solid oxide cells on the electrochemical performance of water electrolysis. SOFC XVII conference. July 18th-23th, 2021. Oral presentation. <u>https://www.electrochem.org/sofc-xvii/</u>.
- C. Mounaim-Roussellle. Ammonia as zero-carbon fuel for Internal Combustion Engine: where are we today? 15th International Conference on Engines and Vehicles. September 12th-16th, 2021. Keynote Lecture. <u>https://www.sae-na.it/</u>.
- J. L. Viviente. Advanced materials and Reactors for Energy storage tHrough Ammonia (ARENHA). Online workshop: NON-BATTERY BASED ENERGY STORAGE: Four sustainable European solutions. September 15th, 2021. Oral presentation. <u>https://recycalyse.eu/recycalyse-joint-workshop/</u>.
- Z. Sahin, V. Cechetto, L. Di Felice, F. Gallucci, H2 Production through Ammonia Decomposition in a Catalytic Membrane Reactor: A computational and experimental study, 12th International Conference on Hydrogen Production (ICH2P-2021 – On-line conference). September 19th-23rd, 2021. Oral presentation. <u>https://www.innomem.eu/event/12th-edition-of-the-internationalconference</u>.
- 8. J.L. Viviente. Advanced materials and Reactors for ENergy storage tHrough Ammonia (ARENHA). EMIRi TechTalks. Online. November 5, 2021. <u>https://emiri.eu/wp-content/uploads/2021/11/15-EMIRI-Workshop\_ARENHA\_JLViviente\_5Nov.2021-final.pdf</u>
- 9. E. Monge. Assess stage and opportunities of ammonia as an element for decarbonising the shipping sector, World Hydrogen & Ammonia Shipping. December 15-16, 2021.
- L. Viviente, F. Gallucci, R. Campana, X. Sun, S. Megel, W.I.F. David, G. van Zee, S. Pylypko, J.A. Medrano, C. Dumand, C. Rouselle and A. Ramirez-Santos. Advanced materials and Reactors for ENergy storage tHrough Ammonia (ARENHA). European Hydrogen Energy Conference 2022 (EHEC2022). Madrid (Spain), May 18th-20th, 2022. Oral presentation.
- 11. C. Dumand, C. Mounaïm-Rousselle, P. Gaillard, E. Gérard, J. Dedeurwaerder, J. Op de Beeck. Ammonia powertrain for a carbon free mobility, SIA Powertrain & Energy 2022, June 15th-16th, 2022, Rouen (France). Oral presentation.
- J. L. Viviente. Advanced materials and Reactors for ENergy storage tHrough Ammonia (ARENHA).
   15th International Conference on Catalysis in Membrane Reactors (ICCMR15), Tokyo (Japan).
   July 31st-August 4th, 2022. Keynote Lecture.
- V. Cechetto, L. Di Felice, F. Gallucci. Adsorbent materials for residual ammonia removal from hydrogen produced via ammonia decomposition in a catalytic reactor. 15th International Conference on Catalysis in Membrane Reactors (ICCMR15), Tokyo (Japan). July 31st-August 4th, 2022. Oral presentation. <u>https://research.tue.nl/en/publications/adsorbent-materials-for-residualammonia-removal-from-hydrogen-pr</u>
- Z. Sahin, V. Cechetto, A. Rahimalimamaghani, F. Gallucci, M. Gazzani, L. Di Felice, M. Llosa Tanco, A. Pacheco Tanaka. Ammonia decomposition in Ru-based catalytic membrane reactors. 15th International Conference on Catalysis in Membrane Reactors (ICCMR15), Tokyo (Japan). July 31st-August 4th, 2022. Oral presentation.
- 15. V. Cechetto, L. Di Felice, F. Gallucci, Hydrogen production and purification via ammonia decomposition in a catalytic membrane reactor, 1st Symposium on Ammonia Energy, 1-2 September 2022 Cardiff, UK.
- 16. V. Verde, Á. R. Santos, F. Gallucci, Techno-Economic Analysis of a Small-Scale, 1st Symposium on Ammonia Energy, 1-2 September 2022 Cardiff, UK.
- 17. B. David, M. Cummings, 1st Symposium on Ammonia Energy, 1-2 September 2022 Cardiff, Keynote Speech, UK <u>https://www.ammoniasymposium2022.com/</u>
- 18. G. Nurk, S. Pylypko, E. Lust, Modification of the state-of-the-art solid oxide cells to increase performance and durability in electrolysis operation, Graduate School Of Functional Materials And Technologies Scientific Conference, Tallin 2022.
- 19. S. Pylypko, ELCOGEN. SOFC/SOEC cell and stack technology, 4th International Workshop on Degradation Issues of Fuel Cells and Electrolysers. 3-6 May 2022. Corfu, Greece. https://www.iceht.forth.gr/en/events/4th-international-workshop-on-degradation-issues-of-fuelcells-and-electrolysers-3-6-may-2022-in-corfu-greece/



- 20. E. Monge, ARENHA Advanced materials and Reactors for Energy storage tHrough Ammonia. H2 Revolution International Congress. 29 October 022. Puertollano, Spain.
- 21. X. Sun. Advanced materials and Reactors for ENergy storage tHrough Ammonia (ARENHA), HANNOVER MESSE, 30 May 2 June 2022, Hannover, Germany.
- 22. E. Monge. Present ammonia among other European projects about green energy production, storage and usage. IMPROVEMENT Project Conferences. Online, 29 November 2022.
- 23. C. Merino. Widespread the knowledge of the ammonia as an energy carrier in Japan to establish synergies for future projects between Spain and Japan within this sort of technology. The 11th NEDO CDTI Joint Workshop, Kofu (Yamanashi Prefecture, Japan), 24 January 2023.
- 24. ELCOGEN. Providing a platform for the state-of-the-art presentations and information exchange on the cutting-edge ceramic and composite technologies. 47th International Conference and Exposition on Advanced Ceramics and Composites, Daytona Beach (Florida, USA), 22-27 January 2023.
- 25. A. Karabanova. Development of Sorbents for Novel Ammonia Synthesis Routes, 6th European Power to Ammonia® Conference, Rotterdam (The Netherlands), 8-9 June 2023.
- 26. V. Cechetto, A Comparison Between Pd-Ag and Carbon Molecular Sieve Membranes for Hydrogen Separation During Ammonia Decomposition In A Membrane Reactor, 2nd Symposium On Ammonia Energy, Université d'Orleans (France), 11-13 July 2023.
- 27. M. Hanhoun, R. Briere, E. Monge, A. Saker, P.E Olivier, A. Prieur-Vernat, Preliminary environmental impacts of ARENHA project with life cycle assessment, the 11th International Conference on Life Cycle Management, Lille (France), 6-8 September 2023.
- 28. V. Verde, A. Saker, A. Berrady, A. Ramirez Santos, P. Olivier, F. Gallucci, Integration of Solid Oxide Electrolysis and Enhanced Ammonia Synthesis for Green Ammonia Production: A Technoeconomic Analysis. European PhD Hydrogen Conference (EPHyC 2024), 20-22 March 2024.
- V. Cechetto, A. Arratibel Plazaola, S. Ágnolin, G. Anello, L. Di Felice, F. Gallucci. Techno-economic assessment of a decentralized plant for hydrogen production from ammonia decomposition. 16th International Conference on Catalysis in Membrane Reactors (ICCMR16), Donostia-San Sebastián (Spain), 16-18 October 2023. Oral presentation.
- 30. J.L. Viviente, F. Gallucci, R. Campana, X. Sun, S. Megel, W.I.F. David, C. Liang, S. Pylypko, J.A. Medrano, C. Dumand, C. Rouselle and A. Saker, Advanced materials and Reactors for ENergy storage tHrough Ammonia (ARENHA). 16th International Conference on Catalysis in Membrane Reactors (ICCMR16), Donostia-San Sebastián (Spain), 16-18 October 2023. Oral presentation.
- 31. K. Richi, O. Shankar,; P. Trtik, M. Bybjerg Brock,; J. Okkels Birk, K. Kaiser, Andreas; X. Sun, A. Karabanova. Ammonia Sorbents for Novel Ammonia Synthesis Routes studied using in situ neutron imaging. MLZ User Meeting 2023, Munich (Germany), 4-5 December 2023.
- 32. C. Serrano. ARENHA Project. European Hydrogen Energy Conference 2024. Bilbao (Spain). March 6th-8th, 2024. Oral presentation. <u>https://ehec.info/ehec2024/</u>
- 33. C. Serrano. How CNH2 promotes the application of hydrogen technologies. Hannover Messe. Hannover (Germany). April 22th-26th, 2024. Oral presentation. https://www.hannovermesse.de/de/landingpage/img/
- 34. J. Ruiz de Pascual. Cómo el CNH2 promueve las tecnologías de Hidrógeno. Proyectos relevantes. III Foro Hidrógeno y gases renovables. Cartagena (Spain), 4th June, 2024. Oral presentation.
- 35. V. Verde, E. Gurbuz, P. Olivier, A. Saker, F. Gallucci. Techno-economic analysis of a multi-module high-temperature electrolysis system under intermittent operation. IX Symposium on Hydrogen, Fuel Cells and Advanced Batteries (HYCELTEC 2024). Milazzo (Italy). June 30- July 3, 2024. https://www.hyceltec2024.it/
- S. Megel, J. Peter, S. Hielscher, S. Rothe, N. Trofimenko, S. Mosch et al., NH3-SOFC and SOECoperation with MK35x stacks. Proceedings of the 16th European SOFC & SOE Forum. Lucerne, Switzerland. 2-5 July, 2024. <u>https://www.efcf.com/2024</u>
- V. Verde, E. Gurbuz, P. Olivier, A. Saker, F. Gallucci. Techno economic analysis of a multi-module high temperature electrolysis system under intermittent operation. Poster at the 16th European SOFC & SOE Forum. Lucerne, Switzerland. 2-5 July, 2024. <u>https://www.efcf.com/2024</u>



- 38. J.L. Viviente. 2024 JRC/HaDEA RMIS Workshop (online). 9-10 October 2024. Oral presentation. https://rmis.jrc.ec.europa.eu/RMISworkshops
- 39. C. Alonso. The ARENHA project. 2nd International Conference on Renewable Energy, November 11-13, 2024 Madrid, Spain. Oral presentation. <u>https://ren.unitedscientificgroup.org/home.php</u>
- 40. S. Megel. Hannover Messe. Hannover (Germany). March 31 April 4, 2024. https://www.hannovermesse.de/de/landingpage/img/
- 41. M. Cummings, T. Wood, W. David. A wartime catalyst for ammonia production. 3<sup>rd</sup> Symposium on Ammonia Energy. Shanghai, China. 22-26 September 2024. Oral presentation. <u>https://soae.sjtu.edu.cn/</u>
- 42. E. Nieto. CNH2 y el Proyecto ARENHA. Second LATAM Meeting on Green Ammonia and Powerto-X. Santiago de Chile, Chile. 8-10 January 2025. Oral presentation. https://greenammonialatam.com/es/

### 3.1.5. Patents

One patent has been already granted to Proton Ventures and the other one from TU/e is pending for approval. The list of patents is detailed hereafter:

- 1. Preliminary Patent application by TUE: V. Cechetto, L. Di Felice, F. Gallucci, "System to produce ultrapure hydrogen from ammonia", application number: NL N2027727, application date: March 9th, 2021 (NL).
- 2. Patent application by TUE: V. Cechetto, L. Di Felice, F. Gallucci, "System to produce ultrapure hydrogen from ammonia". Application number: PCT/NL2022/050128., application date: March 9th, 2022 (NL). International Publication Number: WO 2022/191702 A1.
- 3. Patent by PV: Gerard Van Zee "Ammonia separation system for an ammonia synthesis loop", Patent Granted on November 13<sup>th</sup> (2023). Reference number: NL2031757B1.

### 3.1.6. Workshops, courses and guided visits

### Workshops and courses

Three public workshops have been organised in hybrid mode (face-to-face and online attendance), in months M24, M36 and M60:

- 1. Introduction to novel technologies related to ammonia-based energy storage. ENGIE Lab CRIGEN, Paris (France), 2022. Presentations available at the public website.
- 2. NH3 Academy. PROTON VENTURES. Het Nieuwe Instituut, Rotterdam (The Netherlands), 2023.
- 3. ARENHA Project Final Workshop. CENTRO NACIONAL DEL HIDRÓGENO, Puertollano (Spain), 2025. Presentations and video available at the public website.

Moreover, a webinar on "Non-battery-based energy storage" was held on September 15<sup>th</sup>, 2021. It was organised by ARENHA plus three other consortiums under the same topic (RECYCALYSE, Next AEC and PROMETH2).

### **Guided visits**

Three guided tours were organised in the framework of the project:

- Visit to the manufacturing plant of H2SITE in Spain (April 2024)
- Tour to the facilities of the Technical University of Eindhoven (October 2024)
- Site visit to the prototypes at Fertiberia, in Spain (March 2025)





Figure 7. Guided visits: Top: H2SITE (Spain), Middle: Technical University of Eindhoven (The Netherlands) Bottom: Fertiberia (Spain).

### 4. Internal communication tools

Internal communication played a crucial role in the project's progress. Throughout the project, a kick-off meeting was held, along with eight Consortium Meetings (M6, M12, M18, M24, M30, M36, M42, M48, M54, M60) and six Project Technical Committee meetings (M3, M9, M15, M21, M39, M57).

To enhance collaboration, standardized templates, internal protocols and a confidential private data management SharePoint were established to enable direct interaction and continuous information exchange among all project partners. Additionally, dedicated mailing lists were created for the consortium, various governing bodies, and individual work packages, ensuring smooth communication between partners.



#### 5. Annex

## 5.1. Annex 1. LinkedIn publications

Date	Title
27/04/2025	After the final consortium meeting, on March 26th CNH2 - Centro Nacional del Hidrógeno hosted the Final Workshop of the ARENHA Project, where we had the opportunity to share key findings and takeaways.
	This project's success has been made possible thanks to the hard work of our partners and European funding EU 💛
	ARENHA is a European project with a global impact, aiming to develop, integrate, and demonstrate key material solutions that enable the use of
	#ammonia for flexible, safe, and profitable energy storage and utilization 👉 🕰
	A huge thanks to our partners for their active participation to Viviente José Luis and Clara Serrano for organising this event.
26/04/2025	Today we had our Final Consortium Meeting with great input from all the partners.
	We started the day with a visit to Grupo Fertiberia demo-site, to whom we feel greatful for having provided everything we needed to run the pilot.
	We have finished the meeting acknowledging the huge effort of the consortium, with four companies investing efforts together with the research centers. Thank you ENGIE, Proton Ventures, Elcogen, H2SITE. Thank you to TECNALIA Research & Innovation for the great coordination, and the awesome research centres which have made this come to a great end: Eindhoven University of Technology, CNH2 - Centro Nacional del Hidrógeno, DTU - Technical University of Denmark, Fraunhofer IKTS and Université d'Orléans.
	The way is paved for more exciting developments to make #renewable #ammonia a reality.
	https://arenha.eu/ #ARENHA #research #greenammonia #ammonia #hydrogen
22/04/2025	Time to pack up! After successfully completing 1000 hours of operation, the ammonia cracker has been relocated from Grupo Fertiberia site at Puertollano back to H2SITE in Bilbao. We extend our heartfelt thanks to Francisca Galindo Paniagua, Juan García, José Ramón Serrano, Aritz Arrizabalaga Cameno, Xabier Encinas, Cristina Alonso and the rest of the team for their tremendous effort and excellent collaboration.
	We look forward to working together on future projects!
17/04/2025	#GreenAmmonia #Cracking #Horizon2020 Emilio Nieto. Dr. from CNH2 - Centro Nacional del Hidrógeno was in Santiago de Chile presenting the ARENHA Project about ammonia production from renewable hydrogen. in the Second LATAM Meeting on Green Ammonia and Power-to-X, organized by the Instituto Milenio en Amoníaco Verde como Vector Energético - MIGA.
14/04/2025	Join us for the ARENHA Project Final Workshop!
	31 26th March 2025
	Registration: https://arenha.eu/
	Don't miss this opportunity to participate either online or in person at CNH2 - Centro Nacional del Hidrógeno in Puertollano, Spain.
	#Horizon2020
22/03/2025	Join us for the ARENHA Project Final Workshop!
	3 26th March 2025
	Registration: https://arenha.eu/
	Don't miss this opportunity to participate either online, or in person at CNH2 - Centro Nacional del Hidrogeno in Puertollano, Spain.
	#Horizon2020
20/03/2025	Join us for the ARENHA Project Final Workshop at the CNH2 - Centro Nacional del Hidrógeno!
	31 26th March 2025
	Registration: https://arenha.eu/
	Don't miss this opportunity to participate either online, or in person at CNH2 - Centro Nacional del Hidrógeno in Puertollano, Spain.
	#ARENHA
	#Horizon2020





18/03/2025	Join us for the ARENHA Project Final Workshop at the CNH2 - Centro Nacional del Hidrógeno!
	31 26th March 2025
	Registration: https://arenha.eu/
	Don't miss this opportunity to participate either online or in person
	#ARENHA #Horizon2020
15/03/2025	Join us for the ARENHA Project Final Workshop at the CNH2 - Centro Nacional del Hidrógeno!
	31 26th March 2025
	Registration: https://arenha.eu/
	Don't miss this opportunity to participate either online or in person
	#ARENHA #Horizon2020
09/03/2025	The Director of CNH2 - Centro Nacional del Hidrógeno, Emilio Nieto. Dr., is in Chile presenting the ARENHA Project on the
	Energético - MIGA.
	https://arenha.eu/
	#ANENHA #renewableenergy
	#energy
12/02/2025	Check out this paper from TU/e SUSTAINABLE ENERGY and PROCESS TECHNOLOGY within the #ARENHA Project.
	This review on ammonia decomposition/cracking in membrane reactorsrev was selected as ACS Editors' Choice in Energy
	Free athttps://lnkd.in/ejkcrngi
	Fausto Gallucci, Valentina Cechetto, Luca Di Felice
	#ammonia #hydrogen #membranereactors
08/03/2025	ARENHA at HANNOVER MESSE
	Clara Serrano was at HANNOVER MESSE this year, sharing our advancements in the #ARENHA project
	#H2case #EU #H2020 🛒 #chemistry #processing 🏟 #sustainable 🔌 #energyefficiency 🔵 #shapingtuture #demoplant #modular
02/03/2025	CNH2 - Centro Nacional del Hidrógeno has almost completed one of the tasks of the #ARENHA project, with the
	Invaluable input of ENGIE Research & Innovation.
	It is a footprinter to make the project results more accessible to the large public. Through a comparison based on the
	technologies, enabling their evaluation in terms of cost and sustainibility.
	Great job, Cristina Alonso, Raúl Ortega Gallego, Luis Jose Camacho Parrilla, Alicia Megía, Jesús Fernández Ruiz and
	Raphaël Brière.
01/03/2025	Check out this paper from TU/e SUSTAINABLE ENERGY and PROCESS TECHNOLOGY, an experimental study on a reactor that carries out ammonia decomposition and hydrogen separation simultaneously.
27/02/2025	Fausto Gallucci, Valentina Cechetto, Serena Agnolin, Alfredo Pacheco Tanaka, Margot Anabell Llosa Tanco We have been showcased in Innovation News Network!
24/02/2025	Great inh from our project coordinators Viviente, José Luis and Angela Mary Thomas from TECNALIA Research &
271021202J	Innovation!
	Looking forward to our meeting project today!
21/02/2025	The H2SITE ammonia cracking unit has operated continuously for more than 200 hours consistently producing high-
	purity hydrogen—and it's still going strong.
	Operated by CNH2 - Centro Nacional del Hidrógeno at the Grupo Fertiberia site in Puertollano (Spain), this achievement
	helps to demonstrate the potential of ammonia as energy carrier within the ARENHA Project.
	Keep it going, Cristina Alonso, Alba Sánchez Pastor and Javier Bravo Cabello!
	More info on https://arenha.eu/
	https://lnkd.in/dAdTKW5D
21/12/2024	We just had our consortium meeting in The Netherlands, hosted by Eindhoven University of Technology. All the partners
	presented their progress in their work packages, Viviente José Luis made sure we are on track, and at the end Giulia De Felice kindly showed us their facilities at TU/e Sustainable Energy and Process Engineering Group.
	I HARK YOU FAUSTO GAILUCCI, VALENTINA CECHETTO, VIVIENTE JOSE LUIS AND ANGEIA MARY I NOMAS FOR THE GREAT ORGANIZATION.





	https://arenha.eu/
	#ARENHA #research #greenammonia #ammonia #hydrogen
16/12/2024	In the ARENHA project, the goal is to prove that ammonia possesses the essential qualities to serve as an efficient and cost- effective energy storage medium without CO2 emissions
12/12/2024	Today more than ever, States and societies are more aware of the need to look for healthy, sustainable and environmentally friendly alternatives to fossil fuel-based energies. In a context of global push and demand for renewables, its increase in the energy mix requires increased storage capatity to ensure continuity of supply and availability of a wide range of services. ARENHA project is making progress in the development of prototypes for the use of ammonia as a renewable energy carrier. Full article: https://lnkd.in/d4dqTMw5
04/12/2024	<ul> <li>These are some of the expected impacts of the Arenha project:</li> <li>To decrease dependency on energy imports.</li> <li>To promote the integration of offshore renewables.</li> <li>To integrate renewables in power systems with large-scale energy storage.</li> <li>To diversify energy supply from third countries through ammonia.</li> <li>To boost alternative energy imports through renewable electricity storage and long distance transportation.</li> <li>Attemp://arenha.eu/</li> </ul>
01/12/2024	
	The Spanish portals Hidrógeno verde and EnergyNews published ARENHA's progress in developing useful prototypes using ammonia as an energy carrier. CNH2 - Centro Nacional del Hidrógeno spoke to the journalists to provide all the necessary information and disseminate the benefits of the project for renewable energy production.
	Hidrógeno Verde - https://Inkd.in/daMyRr9M     Epergy News, Todo Epergía - https://inkd.in/dZybDyED
10/12/2024	ARENHA is and EU H2020 funded research projects with global impact seeking to develop, integrate and demonstrate key material solutions enabling the use of ammonia for flexible, safe and profitable storage and utilization of energy https://lnkd.in/dNfBW7vq
28/11/2024	Very happy to announce 📢 📢 that the research project that we have been carrying out at ARENHA will remain active until March 2025 🗹.
	On the horizon, many advances in the different fields of work that have been addressed so far and the evaluation of results in that have been achieved since the beginning of the project.
	#ARENHA #research #areenammonia #ammonia #hudrogen
22/11/2024	The 3rd Symposium on Ammonia Energy (SoAE) will be held in Shanghai until September 26. Under the theme "Ammonia: New Energy, New Opportunity", this international event will address the future challenges of ammonia as an energy carrier and its treatment, as well as the projects underway to achieve sustainable solutions.
	One of these projects is ARENHA, which will not miss this major event in the sector that is the focus of our research.
	More info. https://soae.sjtu.edu.cn/
	#ARENHA #Shanghai #symposium #ammonia #greenammonia
19/11/2024	Among our objectives until the end of the project, ARENHA's consortium plans to complete the integration and validation of the ammonia-based energy storage system, laying the groundwork for the end of the project to enable this chemical compound to facilitate the implementation of systems for transporting #greenhydrogen.
	https://arenha.eu/
16/11/2024	#ARENHA #ammonia #greenammonia #storagesystem #energy Consult ARENHA's main bases on our website: project number, identifier, duration, budget, coordination or summary of the
	https://lnkd.in/dp34vdp7





	#ARENHA #overview #ammonia #hydrogen #greenammonia
13/11/2024	Cristina Alonso (CNH2, ARENHA consortium) participated in the 2nd International Conference on Renewable Energy (November 11th-13th, 2024; Barcelona, Spain) by giving a presentation on the ARENHA project.
07/11/2024	ARENHA's impact will be mainly reflected in the renewable energy sector, laying the foundations for more sustainable energy storage and transporting green hydrogen to many countries, thanks to the action of ammonia.
	https://arenha.eu/
	#ARENHA #renewableenergy #energy #energystorage #greenammonia
16/10/2024	The ammonia cracker pilot plant designed and built by H2SITE is now at Grupo Fertiberia site in Puertollano and ready to be run by CNH2 - Centro Nacional del Hidrógeno .
	It is a fully automated prototype that will produce 1 kg/h of hydrogen from ammonia as part of the ARENHA project.
	La planta piloto de descomposición de amoniaco, diseñada y construida por H2SITE está ya en Grupo Fertiberia, en Puertollano, para ser operada por el CNH2 - Centro Nacional del Hidrógeno.
	Es un prototipo totalmente automatizado que produce 1 kg/h de hidrógeno a partir de amoniaco, en el marco del Proyecto ARENHA.
	#ARENHA #ammonia #greenammonia #energy
	■ https://arenha.eu/
18/10/2024	Very happy to announce 📢 📢 that the research project that we have been carrying out at ARENHA will remain active until March 2025 🖌.
	On the horizon, many advances in the different fields 👌 of work that have been addressed so far and the evaluation of results 📈 that have been achieved since the beginning of the project.
	https://arenha.eu/
	#ARENHA #research #greenammonia #ammonia #hydrogen
14/10/2024	Very happy to announce 📢 📢 that the research project that we have been carrying out at ARENHA will remain active until March 2025 🔽.
	On the horizon, many advances in the different fields 👌 of work that have been addressed so far and the evaluation of results 📈 that have been achieved since the beginning of the project.
	https://arenha.eu/
	#ARENHA #research #greenammonia #ammonia #hydrogen
10/10/2024	Very happy to announce C C that the research project that we have been carrying out at ARENHA will remain active until March 2025.
	On the horizon, many advances in the different fields ♣ of work that have been addressed so far and the evaluation of results 🔀 that have been achieved since the beginning of the project.
	https://arenha.eu/
	#ARENHA #research #greenammonia #ammonia #hydrogen
28/09/2024	The ARENHA web directory gathers all the conferences that our team of researchers have presented about the project in different congresses and scientific conferences.
	You can consult the complete list and the documents of some of the papers in the following link https://lnkd.in/d_T7-N_K
	#ARENHA #ammonia #hydrogen #conferences #research
26/09/2024	A packed bed membrane reactor (PBMR) model for ammonia decomposition and pure hydrogen separation has been developed in ACM.
	The model was analyzed by means of a sensitivity analysis, showing that the model responds as expected to parameter changes.
	O The performance of the model was compared with that of a model available in literature and it was concluded that the two models provide similar results.





	A validation with experimental data obtained from lab tests was also performed and proved the model able to predict hydrogen production from ammonia decomposition with good accuracy.
	https://arenha.eu/
	#ARENHA #ammonia #greenammonia #modelling #purehydrogen
25/09/2024	Did you know that we have our own newsletter? 📩 Through our website you can subscribe to be aware of the latest news about the project and see the progress published so far.
	Discover much more about ARENHA A https://arenha.eu/
22/00/2024	#ARENHA #research #greenammonia #ammonia #hydrogen
23/09/2024	
	ARENHA project extends its completion period and continues until March 2025. Likewise, we are preparing a new consortium meeting for next October. An appointment in which the different members of the consortium will present their progress in the work packages addressed within the project.
	https://arenha.eu/
	#ARENHA #research #greenammonia #ammonia #hydrogen
22/09/2024	The #research carried out by our partners for ARENHA has resulted in a number of patents that corroborate the significance of the project for #ammonia synthesis and pure #hydrogen production, as a basis for future projects in this field.
	https://arenha.eu/
	#ARENHA #researches #patent #greenammonia #purehydrogen
21/09/2024	
	The Spanish portals Hidrógeno verde and EnergyNews published ARENHA's progress in developing useful prototypes using ammonia as an energy carrier. 4
	CNH2 - Centro Nacional del Hidrógeno spoke to the journalists to provide all the necessary information and disseminate the benefits of the project for renewable energy production.
	<ul> <li> <i>A</i> Hidrógeno Verde          <ul> <li>Intps://Inkd.in/daMyRr9M</li> <li></li></ul></li></ul>
	#ARENHA #energy #ammonia #greenammonia #renewableenergy
19/09/2024	These are some of the expected impacts of the Arenha project:
	♦ To decrease dependency on energy imports.
	To promote the integration of offshore renewables.
	<ul> <li>To diversify energy supply from third countries through ammonia.</li> </ul>
	To boost alternative energy imports through renewable electricity storage and long distance transportation.
	https://arenha.eu/
	#ARENHA #energy #greenammonia #renewables #electricity
17/09/2024	In the ARENHA project, the goal is to prove that ammonia possesses the essential qualities to serve as an efficient and cost-effective energy storage medium without CO2 emissions ✓ ✓. This is only feasible if the production and decomposition of ammonia are closely linked to renewable energy generation.
	This is how ammonia production is handled in the ARENHA project, aiming for maximum sustainability in the process - https://Inkd.in/dfB3aMgb
	And this is the formula for the ammonia decomposition process with which the ARENHA will demonstrate its potential as a sustainable hydrogen storage source Attps://Inkd.in/d6TUXqTd
	https://lnkd.in/dmQxB6tD
	#ARENHA #ammonia #greenammonia #useofammonia





12/09/2024	ARENHA project is facing its last stage. CNH2 - Centro Nacional del Hidrogeno staff is operating H2SITE ammonia cracker prototype at Grupo Fertiberia (Puertollano, Spain). Let's get on with it!
	https://arenha.eu/
	#ARENHA #CO2 #greenenergy #energy #energyproduction #sustainable #Arenhaproject
10/09/2024	The ARENHA project is about to reach its end and, for this reason, we're preparing a final workshop where we will present the conclusions of the research carried out by our consortium and lay the groundwork for future research related to the use of ammonia for sustainable hydrogen transport.
	We will soon inform about the date of this crucial meeting at ARENHA.
	https://arenha.eu/
	#ARENHA #workshop #event #ammonia #hydrogen
07/09/2024	The Life Cycle Assessment for sustainable ammonia production estimates different beneficial options for hydrogen transport, resulting in the scheme visible in the second picture.
	https://arenha.eu/
	#ARENHA #LCA #lifecycle #ammonia #hydrogen
2/09/2024	
	Very happy to announce () () that the research project that we have been carrying out at ARENHA will remain active until March 2025 .
	On the horizon, many advances in the different fields 👌 of work that have been addressed so far and the evaluation of results 📈 that have been achieved since the beginning of the project.
	<u>https://arenha.eu/</u>
	#ARENHA #research #greenammonia #ammonia #hydrogen
31/08/2024	ARENHA's Life Cycle study provided preliminary results on its sociological and environmental impact, which are available in the second image.
	https://arenha.eu/
	#ARENHA #lifecycle #LCA #analysis #sociology #environment
	TECNALIA Research & Innovation Eindhoven University of Technology CNH2 - Centro Nacional del Hidrógeno DTU - Technical University of Denmark Fraunhofer IKTS
	Proton Ventures
	H2SITE
	Stellantis ENGIE
28/08/2024	Université d'Orléans
20/00/2024	Why we develop ammonia sorbents materials and beds?
	<ul> <li>To increase the Haber-Bosch synthesis efficiency, reducing the operational parameter.</li> <li>Store in a safe and energy efficient manner the ammonia produced</li> </ul>
	The sorbents materials will be a combination of different metal halides ammines, determined from a density functional theory screening study. The bed and reactor design will be developed from COMSOL multiphysics simulation.
	■ https://arenha.eu/
	#ARENHA #ammonia #greenammonia #useofammonia
26/08/2024	





	A few weeks ago, Valentina Cechetto was awarded a doctoral degree at the Eindhoven University of Technology. Her thesis, with title 'Ultra-pure Hydrogen Production via Ammonia Decomposition in Packed Bed Membrane Reactors,' was carried out within the framework of the ARENHA project.
	Congratulations to Valentina! 💍 💍
	#ARENHA #research #hydrogen #hydrogenproduction #ammonia #greenammonia
21/08/2024	The European Commission approved IPCEI Hy2Use to support the construction of hydrogen-related infrastructure. Two of the announced spanish projects are for the production of green ammonia for fertilizers: Puertollano I and Puertollano II (Iberdrola) and the Ver-Amonia project in Teruel, (Fertinagro – IAM CAECIUS SL, EDP-Tervalis).
	https://Inkd.in/dMSQdRtm
	https://Inkd.in/d82CwBNh
	#ammonia #greenammonia #greenenergy #energy
	TECNALIA Research & Innovation Eindhoven University of Technology CNH2 - Centro Nacional del Hidrógeno DTU - Technical University of Denmark Fraunhofer IKTS
	STFC
	Proton Ventures Elcogen
	H2SITE Obstruction
	ENGIE
49/09/2024	Université d'Orléans
10/00/2024	José Luis Viviente, coordinator of the ARENHA project, published an article on "Advance materials and reactors for energy storage through ammonia" in issue 13 of The Innovation Platform, which can be read on pages 176-179.
	#ARENHA #ammonia #energy #energyproduction #energystorage
16/08/2024	
	This interesting research article, named Performance of ammonia fuel in a spark assisted compression Ignition engine, was published in the International Journal of Engine Research.
	A broad and exhaustive work in which Christine Mounaïm-Rousselle, Adrien Mercier, Pierre Brequigny, Clément Dumand, Jean Bouriot and Sébastien Houillé shows some of the main conclusions drawn from the latest case studies on the use of ammonia in spark ignition engines.
	You can read here 👉 https://Inkd.in/dMCHSVpx
	https://arenha.eu/
	#ARENHA #ammonia #greenammonia #useofammonia
12/08/2024	Current energy production depends on the use of fossil fuels which account for more than 80% of global production. This type of energy creates the so-called greenhouse gases, which overheat the planet and cause the dreaded climate change.
	✓ In response to this problem, the European Commission (and the global climate contract) suggest a reduction of >80% in CO2 emissions by 2050, compared to levels at the beginning of the 21st century. To this end, alternatives are proposed to avoid the use of new CO2-free energy systems, through radical technical solutions and investments in infrastructure.
	With that goal in mind, the ARENHA project was born. ${igodoldsymbol{Q}}$
	https://arenha.eu/
	#ARENHA #CO2 #greenenergy #energy production #sustainableT
11/08/2024	#ARENHA #CO2 #greenenergy #energy #energyproduction #sustainableT ARENHA project is facing its last stage. CNH2 - Centro Nacional del Hidrogeno staff is operating H2SITE ammonia cracker prototype at Grupo Fertiberia (Puertollano, Spain). Let's get on with it!
11/08/2024	#ARENHA #CO2 #greenenergy #energy #energyproduction #sustainableT ARENHA project is facing its last stage. CNH2 - Centro Nacional del Hidrogeno staff is operating H2SITE ammonia cracker prototype at Grupo Fertiberia (Puertollano, Spain). Let's get on with it!
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	<ul> <li>GOAL: High H2 permeance and H2/N2 &amp; H2/NH3 selectivity</li> <li>TARGET: Low N2 permeance at RT</li> </ul>
	✓ 1st generation membranes: < 2·10-9 mol m-2 s-1 Pa-1
	L https://arenha.eu/
	#ARENHA #carbon #membranes #carbonisation #research
29/07/2024	ARENHA will be presented at the European SOFC & SOE Forum (EFCF2024), which will be held in Lucerne from 2 to 5 July. This event will deal with the latest international advances in the use of solid oxide fuel cells (SOFC) and solid oxide electrolysis cells (SOEC). These are relevant fields for the ARENHA project's researches.
28/07/2024	The ammonia cracker pilot plant designed and built by H2SITE is now at Grupo Fertiberia site in Puertollano and ready to be run by CNH2 - Centro Nacional del Hidrógeno .
	It is a fully automated prototype that will produce 1 kg/h of hydrogen from ammonia as part of the ARENHA project.
	La planta piloto de descomposición de amoniaco, diseñada y construida por H2SITE está ya en Grupo Fertiberia, en Puertollano, para ser operada por el CNH2 - Centro Nacional del Hidrógeno.
	Es un prototipo totalmente automatizado que produce 1 kg/h de hidrógeno a partir de amoniaco, en el marco del Proyecto ARENHA.
	#ARENHA #ammonia #greenammonia #energy #energytransition
26/07/2024	https://arenha.eu/ From 30 June to 3 July we will be in Sicily, in the town of Milazzo, where the IX Symposium on Hydrogen, Fuel Cells and
	Advanced Batteries (HYCELTEC 2024) will be held. This event will be a forum for debate between experts in these fields, sharing visions and projects to promote collaboration and common development.
	L https://Inkd.in/dA7WuFvi
	#ARENHA #symposium #hydrogen #fuelcells #batteries #energy
24/07/2024	#ARENHA #symposium #hydrogen #fuelcells #batteries #energy The task of designing and building the ammonia cracker aims to support the production of ultrapure H2 that facilitates mobility, by means of H2-selective membranes that are resistant to the NH3 cracking environment.
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	✓ 1st generation membranes: < 2.10.10 mol m-2 s-1 Pa-1
	Zhu generation membranes: < 4-10-11 mol m-2 s-1 Pa-1
	https://arenha.eu/
	#ARENHA #membranes #hydrogen #greenhydrogen #ammonia
17/07/2024	The ammonia cracker pilot plant designed and built by H2SITE is now at Grupo Fertiberia site in Puertollano and ready to be run by CNH2 - Centro Nacional del Hidrógeno .
	It is a fully automated prototype that will produce 1 kg/h of hydrogen from ammonia as part of the ARENHA project.
	La planta piloto de descomposición de amoniaco, diseñada y construida por H2SITE está ya en Grupo Fertiberia, en Puertollano, para ser operada por el CNH2 - Centro Nacional del Hidrógeno.
	Es un prototipo totalmente automatizado que produce 1 kg/h de hidrógeno a partir de amoniaco, en el marco del Proyecto ARENHA.
	#ARENHA #ammonia #greenammonia #energy #energytransition
	https://arenha.eu/
26/06/2024	Clean Hydrogen Partnership At Elcogen they are still working on the development of an improved SOEC to facilitate the production of green hydrogen.
	This is the latest situation in this regard.
	Anttps://arenna.eu/ #ARENHA #SOEC #cells #hydrogen #greenhydrogen #development
20/06/2024	The development of key components for hydrogen production has led to recent important developments in the improvement of SOECs.
	We summarise the main milestones in this carousel.
	For more information, please visit - https://arenha.eu/ #ARENHA #SOEC #H2 #hvdrogen #cells #areenhvdrogen
02/06/2024	On 6 and 7 June we will be in Rotterdam, taking part in the NH3 Event Europe. This event is the largest event dedicated to ammonia at European level and will bring together leading experts in the field to address the energy transition with sustainable proposals such as this product, which is essential in our project.
	#ARENHA #ammonia #greenammonia #energy #energytransition
01/06/2024	ARENHA will demonstrate the outstanding potential of green ammonia to address the issue of large-scale energy storage. Therefore, its main objective is also what we tell you in this video.
01/06/2024	#ARENHA #ammonia #ammoniaenergy #energy #greenammonia
	The work with the SOFC system for power generation was developed through a simulation with 100 % ammonia fuel, recycling the anode gas.
	Soft stacks with ammonia.
	#ARENHA #SOFC #ammonia #greenammonia #gas #fuel #cell
30/05/2024	We launched this survey in which we seek to know the main challenges that green ammonia faces. Participate and let us know your vision - https://lnkd.in/dEz_5nvV #ARENHA #survey #ammonia #greenammonia #development
27/05/2024	The ARENHA team visited the facilities of H2SITE, one of ours partners, to see first-hand the new ammonia decomposition
	prototype. A prototype that will soon be sent to Puertollano to be operated by the CNH2 - Centro Nacional del Hidrógenoat the Fertiberia facilities.
	Thanks to our partner for their enormous collaboration, it has been a pleasure to share the experience with you. #ARENHA #ammonia #greenammonia
26/05/2024	We share the study published in Chemical Engineering Journal, on adsorbents development for hydrogen cleanup from ammonia decomposition in a catalytic membrane reactor.
	This scientific research has been developed by Valentina Cechetto, Cynthia Lan Struijk, Luca Di Felice, Anouk W.N. de Leeuw den Bouter and Fausto Gallucci.
	ttps://Inkd.in/dAkQVp
	#ARENHA #hydrogen #greenhydrogen #ammonia #catalyticconverter
	Stellantis ENGIE





	Université d'Orléans
22/05/2024	The development of key components for hydrogen production has led to recent important developments in the improvement of SOECs. We summarise the main milestones in this carousel. For more information, please visit https://arenha.eu/
24/03/2023	#ARENHA #SOEC #H2 #hydrogen #cells #greenhydrogen Don't miss the opportunity to join this event organized by PV under the scope of ARENHA Project!
24/03/2023	Under the scope of the ARENHA Project, we will celebrate an event about ammonia energy. Hosted by PV, this include the participation of some of our most experienced researches. Join the event on: https://lnkd.in/geMxxF56
23/03/2023	<ul> <li>The 4th step of the work plan focuses on the scale-up of key components already worked on in WP3 as well as those for the pilot plant. The ammonia-based energy system is designed, built and commissioned.</li> <li>These are prototypes to be developed:</li> <li>SOEC stack modules and balance of plant components (BoP) of electrolyser system for hydrogen production.</li> <li>Ammonia synthesis system prototype based on Haber Bosch with an advanced absorber.</li> <li>Ammonia decomposition membrane reactor prototype.</li> </ul>
22/03/2023	Since the start of the ARENHA project in 2020, a series of conferences have been held on the use of ammonia as a resource for the storage and distribution of renewable energy, focusing on hydrogen. As a gesture of transparency, and to facilitate the consultation of professionals in the field and the public, we have included a directory of all these conferences on our website. You can access the complete list here. Https://lnkd.in/dwzpvWy8
20/03/2023	We present CNH2 - Centro Nacional del Hidrógeno (National Hydrogen Center), an entity dedicated to the research and development of hydrogen technologies, related to the production, storage, purification and conversion into energy. Its work at ARENHA is based on the testing of processes, characterisation, standardisation, certification or validation of technological developments achieved by the production sector to improve the competitiveness of companies and promote the implementation of hydrogen and fuel cell technologies.
16/03/2023	<ul> <li>Item 3 of ARENHA's work plan has focused on the development of key components, prior to its final escalation to TRL 5. It includes the following actions:</li> <li>New materials for SOEC stacks, optimised for hydrogen production.</li> <li>Materials for ammonia synthesis</li> <li>Materials for solid state storage of ammonia</li> <li>Membranes and membrane reactors for ammonia decomposition</li> <li>Materials and systems for the generation of energy from green ammonia https://arenha.eu/</li> </ul>
15/03/2023	The latest newsletter, which we launched via email last December, is now available on the website. In it we explain in detail the project, some case studies, the latest events and conferences that have taken place and the calendar with the next meetings. Available on the newsletter page. http://bit.ly/3T8hCKs
13/03/2023	Don't miss the NH3 academy hosted by Proton Ventures that will take place on March 29th this year! https://Inkd.in/dX7TfGKA
13/03/2023	Introducing the Eindhoven University of Technology, ARENHA's partner dedicated to specialised research in engineering science and technology. Their Sustainable Process Engineering research group is being one of the pillars of our project, as their work focuses on the development of integrated reactors, based on improved knowledge and the use of advanced reactor models. This combines state-of-the-art numerical modelling, non-invasive experimental techniques and experimental demonstration of novel reactor concepts.
09/03/2023	Do you want to know more details about the objectives and studies developed in ARENHA? We are at your disposal to answer your questions and inform you about this fruitful project. http://bit.ly/3yeThch
08/03/2023	<ul> <li>The low energy density and difficulties associated with gas handling are the main drawbacks associated with hydrogen, which have so far prevented its related technologies from gaining popularity for commercial application in the field of energy production.</li> <li>✓ One solution to overcome these drawbacks is to store hydrogen in the chemical bonds of hydrogen-bearing compounds, such as ammonia.</li> </ul>
08/03/2023	We are glad to announce that ARENHA project has been published in the Issue 13 of The Innovation Platform that you can see below; https://Inkd.in/dmT9MGe4





06/03/2023	ARENHA is developing advanced SOECs for
	Catalysts for low temperature/pressure ammonia synthesis.
	<ul> <li>Solid sorbents for ammonia synthesis intensification and storage.</li> <li>Catalysts and membrane reactors for ammonia decomposition for the production of pure hydrogen (&gt;99.99%).</li> </ul>
03/03/2023	Stay tunned to the NH3 Academy event organized by Proton Ventures. ARENHA project will be presented as well as other
	ammonia related topics. More info will be made available soon.
02/03/2023	TECNALIA Research & Innovation is one of ARENHA's partners. Its goal: to transform knowledge into new business opportunities for industry. Its team of 72 scientists works in the following areas of our project:
	<ol> <li>Membrane technology and process intensification.</li> <li>Waste valorisation, based on the recovery of critical and high-tech metals.</li> </ol>
01/03/2023	The second point of the ARENHA work plan translates the general framework that has already been established in WP2. A set of specifications for the new value chain for energy storage, in line with the previous business model and end-user inputs. In addition, it will bring together all the modelling related to each technology and the complete system design.
27/02/2023	Energy discharge processes studied in ARENHA tackle various applications from ammonia decomposition into pure H2 for FCEV, direct ammonia utilization on SOFCs for power and ICEs for mobility.
23/03/2023	The first step in ARENHA has been to define the business case, identifying the needs and obstacles provided by the market, as well as the regulatory framework and potential risks. By using appropriate techniques, the project is oriented towards truly profitable techniques and sets the framework for high impact exploitation actions.
22/02/2023	In total, 11 organisations from seven European countries are part of the ARENHA project, so that a complete supply chain has been created:
	TECNALIA Research & Innovation
	Eindhoven University of Technology     CNH2 - Centro Nacional del Hidrógeno
	<ul> <li>DTU - Technical University of Denmark</li> </ul>
	Fraunhofer IKTS     United Kingdom Research and Innovation
	Proton Ventures
	Elcogen     H2SITE
	Stellantis ENGIE
21/02/2023	Ammonia is characterised as a manageable, carbon-free energy carrier for large-scale energy storage. It thus ensures a
	clean supply covering a wide range of services. m Although it has been in use for several decades, its use in this context is reaching great heights as it has become an innovative and environmentally friendly proposition.
17/02/2023	Last January, CNH2 represented by Carlos Merino, participated in the 11th NEDO CDTI Workshop in Japan where ARENHA project was highlighted as a project that assess green ammonia as an energy vector.
	El pasado mes de enero, el CNH2 representado por Carlos Merino participó en la 11 edición del NEDO CDTI Workshop en Japón donde se destacó el proyecto ARENHA como proyecto que promueve el uso del amoniaco verde como vector energético.
16/02/2023	The ARENHA work plan consists of  work packages spread over 48 months of research and development. We list each of the Work Package as follows:
	1 Business case definition 2 System requirements, design and modelling
	3 Development of key components
	Plant integration and validation
	6 Environmental LCA, economic and safety assessment 7 Dissemination and communication
	Project management
15/02/2023	Over the last decades, hydrogen has gained considerable attention as an ideal and clean energy source. Its reaction with oxygen produces in fact only water as by-product and high efficiencies for energy conversion are achieved when hydrogen is employed as feedstock for power production in fuel cells.
13/02/2023	ARENHA stands for Advanced Materials and Reactors for ENergy Storage tHrough Ammonia, a name that perfectly defines the central aim of the project around ammonia as an excellent solution for flexible energy storage and use.





09/02/2023	Ammonia is traditionally produced from hydrogen and nitrogen, using the well-known Haber-Bosch process. The conversion is typically carried out at 150-250 bar and 400-500 °C, while the feed gas mixture is passed through a series of fixed beds containing an Fe-based catalyst.
	As the conversion in the reactor does not usually exceed 15 %, the unreacted components are recovered in the reactor, after separation of the ammonia product by quench condensation.
08/02/2023	Sectors such as transportation, industry, or thermal activities, which require greater energy storage capacity, will benefit the most from the advances we are working on at ARENHA
06/02/2023	Since ARENHA started in 2020, our partners have been organising and participating in different dissemination events about the project. The event calendar will continue to expand throughout 2023, with new activities in which we will continue to publicise the objectives set in ARENHA and the latest advances.
03/02/2023	What is the ARENHA project? Several scientific entities are developing and integrating material solutions that enable the use of ammonia for energy storage and cost-effectiveness. We tell you more details in this video.
03/02/2023	In addition to being easy to liquefy, ammonia has a high hydrogen gravimetric density by weight and, in turn, by volume (108 kg h2/m3 of liquified NH3). This reduces the cost of transporting hydrogen per unit of stored energy, as well as acting as a CO2-free energy storage medium.
02/02/2023	Find out the latest news about ARENHA in our newsletter, where we tell you about the latest developments in the project and how ammonia plays a role in the use of renewable energies.
24/01/2023	Check this last news! The world's first ammonia truck is 5 times more efficient than an electric one, and recharges in 8 minutes https://Inkd.in/dpN72z3k
16/01/2023	Check out last news about green ammonia Projects aiming the de-carbonization of the Spanish industry.
16/01/2022	Do you - have an interest in decarbonization projects including green ammonia? - understand Spanish? Then the following article shared by the EU-funded ARENHA Project is worth a read.
14/12/2022	El pasado 30 de noviembre se presentaron los proyectos ARENHA y GREENHYSLAND, financiados por el H2020, bajo el ciclo de conferencias organizado por el proyecto IMPROVEMENT, del cual el CNH2 - Centro Nacional del Hidrógeno es líder. Los principales objetivos y progreso de ambos proyectos fueron mostrados y discutidos". El Proyecto Arenha fue presentado por Elena Monge Ruiz, y el Proyecto GreenHysland con José María Ruiz Álvarez ARENHA and GREENHYSLAND projects, both H2020 founded programs, were presented on November 30th during the Conferences organized under the scope of the IMPROVEMENT project, lead by #CNH2. Objectives and main progress of both projects were shown and discussed". The Arenha Project was presented by Elena Monge Ruiz and the GreenHysland Project by José María Ruiz Álvarez Arenha project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862482 GREENHYSLAND project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (now Clean Hydrogen Partnership) under Grant Agreement No 101007201. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation programme, Hydrogen Europe and Hydrogen Europe Research. #GreenhyslandProject #ArenhaProject #Improvementproject #Hydrogen #Ammonia #Agreement
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July 2022	Our last paper at the TU/e SUSTAINABLE PROCESS ENGINEERING group on development of metallic supports for membrane production as part of MACBETH project. A nice cooperation with H2SITE On-site H2 recovery & generation. Gold open access at https://Inkd.in/eFuJpjnW Serena Agnolin Jon Meléndez Rey Luca Di Felice #membranes #membranereactors #hydrogen EIRES – Eindhoven Institute for Renewable Energy Systems
July 2022	The Ammonia Energy Association summarizes research ongoing on low pressure ammonia synthesis. AMBHER project is developing new structured #catalysts and #membranes to produce ammonia at milder conditions as hydrogen carrier.





August 2022	Almost ready to kick off the 15th International Conference on Catalysis in Membrane Reactors #ICCMR15 in #Japan with the Plenary lecture of Alfredo Pacheco Tanaka. our group TU/e SUSTAINABLE PROCESS ENGINEERING will deliver 16 talks including Plenary and Keynotes. the work carried out in MACBETH, ARENHA Project, C2FUEL, AMBHER project, #Microsync, #MemCat, Bizeolcat Project will be presented at the conference.
August 2022	The AMBHER project is being presented at the International Conference on Catalysis in Membrane Reactors, #ICCMR15, in #Tokyo (Japan). Our coordinator Viviente José Luis from TECNALIA Membrane Technology is presenting a Poster about the project.
August 2022	The TU/e SUSTAINABLE PROCESS ENGINEERING group (plus a few friends) at the #ICCMR15 in Japan. Nice experience, and next year is Sansebastian in Spain for #ICCMR16
17/10/2022	The European ARENHA Project (Advanced materials and Reactors for Energy storage tHrough Ammonia) project aims to global impact seeking to develop, integrate and demonstrate key material solutions enabling the use of ammonia for flexible, safe and profitable storage and utilization of energy under the form of green ammonia, celebrated its M30 consortium meeting has been held last October 6th, 2022.
	different work packages was discussed addressing: the business case; the systems requirements, design and modelling; the key component developments and the initial steps for the prototypes set-ups and, finally, the environmental LCA, economic and safety assessment. The consortium also discussed specific short-term activities to be carried out in the coming months. Despite few deviation due to the COVID19 impact the project is progressing as planned. Further information will be presented in the ARENHA public website in coming months
	The project coordinated by Tecnalia Research & Innovation and has a European consortium composed of TU/e, ENGIE, CNH2, DTU, FhG-IKTS, STFC, PV, ELCOGEN, H2SITE, PSA. It gathers all the experience to demonstrate the concept called "power-to-ammonia-to-usage", in all its value chain, based on the development of innovative materials and systems.
	This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 862482.
	Further information on the project can be found at the following link: https://arenha.eu/ and social media Twitter: @ARENHA_H2020. If you want to receive the ARENHA Newsletter please register in: https://lnkd.in/dVmV4W9S
18/10/2022	El proyecto europeo ARENHA (Advanced Materials and Reactors for Energy storage tHrough Ammonia), que tiene como objetivo desarrollar, integrar y demostrar soluciones de materiales clave que permitan el uso de amoniaco verde para el almacenamiento y utilización de la energía de forma flexible, segura y rentable, celebró su reunión de seguimiento el pasado 6 de octubre de 2022 en Lyngby (cerca de Copenague, Dinamarca). El estado y el progreso del proyecto en los diferentes paquetes de trabajo fue discutido en la reunión abordando: el caso de negocio; los requisitos de sistemas, diseño y modelado; los desarrollos de componentes clave y los pasos iniciales para la configuración de prototipos y, finalmente, el Análisis de Ciclo de Vida ambiental, evaluación económica y de seguridad. El consorcio también discutió actividades específicas a corto plazo que se llevarán a cabo en los próximos meses. A pesar de las algunas desviaciones debidas al impacto de COVID19, el proyecto avanza según lo previsto. El proyecto coordinado por TECNALIA Research & Innovation y cuenta con un consorcio europeo compuesto por TU/e, ENGIE, CNH2, DTU, FNG-IKTS, STFC, PV, ELCOGEN, H2SITE, PSA. Reúne toda la experiencia para demostrar el concepto denominado "power-to-ammonia-to-usage", en toda su cadena de valor, basado en el desarrollo de materiales y sistemas innovadores. Este Proyecto ha recibido financiación de la Unión Europea a través del programa de investigación e innovación H2020 bajo el acuerdo Nº 862482. Puede encontrarse más información sobre el proyecto en el siguiente enlace: https://arenha.eu y en las redes sociales de LinkedIn: ARENHA Project y Twitter: @ARENHA_H2020. Si desea recibir información de la newsletter, por favor, regístrese en el siguiente enlace: https://larenha.eu y en las: redes sociales de
17/10/2022	El proyecto europeo ARENHA (Advanced Materials and Reactors for Energy storage tHrough Ammonia), que tiene como objetivo desarrollar, integrar y demostrar soluciones de materiales clave que permitan el uso de amoniaco verde para el almacenamiento y utilización de la energía de forma flexible, segura y rentable, celebró su reunión de seguimiento el pasado 6 de octubre de 2022 en Lyngby (cerca de Copenague, Dinamarca). El estado y el progreso del proyecto en los diferentes paquetes de trabajo fue discutido en la reunión abordando: el caso de negocio; los requisitos de sistemas, diseño y modelado; los desarrollos de componentes clave y los pasos iniciales para la configuración de prototipos y, finalmente, el Análisis de Ciclo de Vida ambiental, evaluación económica y de seguridad. El consorcio también discutió actividades específicas a corto plazo que se llevarán a cabo en los próximos meses. A pesar de las algunas desviaciones debidas al impacto de COVID19, el proyecto avanza según lo previsto. El proyecto coordinado por TECNALIA Research & Innovation y cuenta con un consorcio europeo compuesto por TU/e, ENGIE, CNH2, DTU, FhG-IKTS, STFC, PV, ELCOGEN, H2SITE, PSA. Reúne toda la experiencia para demostrar el concepto denominado "power-to-ammonia-to-usage", en toda su cadena de valor, basado en el desarrollo de materiales y sistemas innovadores. Este Proyecto ha recibido financiación de la Unión Europea a través del programa de investigación e innovación H2020 bajo el acuerdo Nº 862482. Puede encontrarse más información sobre el proyecto en el siguiente enlace: https://arenha.eu y en las redes sociales de LinkedIn: ARENHA Project y Twitter: @ARENHA H2020. Si desea recibir información de la newsletter, por favor
	registrese en el siguiente enlace: https://lnkd.in/e5i88QGr





28/10/2022	Presentación del Proyecto Europeo "ARENHA" Elena Monje - CNH2 - Centro Nacional del Hidrógeno
03/10/2022	Hablamos de Hidrógeno y Amoniaco en el Congreso H2 Revolution International Congress, de la ciudad de #Puertollano, con la exposición de nuestra compañera Elena Monge Ruiz, y en el Proyecto en el que estamos inmersos en el CNH2 - Centro Nacional del Hidrógeno, el Proyecto Arenha. Si quieres saber más sobre este gran Proyecto, puedes visitar nuestra página www.cnh2.es
02/10/2022	Hablamos de Hidrógeno y Amoniaco en el Congreso H2 Revolution International Congress, de la ciudad de #Puertollano, con la exposición de nuestra compañera Elena Monge Ruiz, y en el Proyecto en el que estamos inmersos en el CNH2 - Centro Nacional del Hidrógeno, el Proyecto Arenha. Si quieres saber más sobre este gran Proyecto, puedes visitar nuestra página www.cnh2.es
02/10/2022	Presentación de nuestros proyectos en el Congreso H2 Revolution International Congress, celebrado en la ciudad de #Puertollano, en la que el Hidrógeno verde ha tenido un papel protagonista, así como el potencial y compromiso con el Pacto Verde Europeo.
22/07/2022	Arenha newsletter M24 is available in the website of the project. Click on the next link to check the latest news about ARENHA!
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22/07/2022	Arenha newsletter M24 is available in the website of the project. Click on the next link to check the latest news about ARENHA!
05/07/2022	#GreenAmmonia is one of the most important use cases for #greenhydrogen. Ammonia is essential for fertilizers (aka. food for 8bn people), and there is no other solution. Currently, 50 million tons of #hydrogen are produced for ammonia production, and the CO2 emissions are 500 million tons. To learn everything on this vital but completely neglected aspect of the energy transition, join our free webinar with Charley Rattan: "#Green #Ammonia - The other #Hydrogen": https://lnkd.in/e3qfYCXj What do you think? Wouldn't it make sense to start in an industry that emits huge amounts of CO2 and that has no alternative?
18/07/2022	Dear Network, I am happy to share with you our first paper about pre-treatments of metallic filters for Pd-based membranes preparation. In this article we tackle the issue of surface roughness by introducing a ceramic based smoothening layer, which allowed us to deposit Pd on these very unrefined supports. More work will follow for pore size distribution improvement and gas permeance increase, so feel free to stay tuned :) #membranes #hydrogen #MACBETH_2020
20/06/2022	"ARENHA dissemination material was present at HMI by the partner of the project Fraunhofer IKTS"
26/05/2022	News!! #GreenAmmonia #NewFuels #Sustainability #GreenPower #GreenHydrogen
26/05/2022	Another great collaboration with TU/e SUSTAINABLE PROCESS ENGINEERING group released a paper on ammonia decomposition for pure hydrogen production within the ARENHA Project. The paper is open access at: https://lnkd.in/eNeYxgPt
24/05/2022	Participamos en las #EHEC2022 #Madrid 18-20; la conferencia europea de referencia en el campo de la energía del #Hidrógeno. Podrás visitarnos en el stand del Cluster de Energía   Basque Energy Cluster y conocer nuestras COMPETENCIAS TECNOLÓGICAS e industriales en el ámbito del hidrógeno. TECNALIA participará activamente en el congreso realizando varias presentaciones orales. Ekain Fernandez presentará los proyectos Elkartek H2BASQUE y Cervera H24NEWAGE. Viviente José Luis presentará el proyecto europeo ARENHA. Y Diego García López presentará el proyecto Elkartek BIDERATU. Immanuel Vincent y Cuneyt Karakaya moderarán sesiones sobre Electrólisis para producción de hidrógeno, y electrocatalizadores/electrodos, respectivamente.
07/04/2022	Our colleagues Elena Monge Ruiz and Jesús J. Martínús have participated on the Arenha Consortium Meeting Month 24 celebrated on Paris 6st of April. #ArenhaProject, #ProyectoArenha, #parisrr #France, #Ammonia, #Hydrogen, Fertiberia TECH España
06/04/2022	Today the ARENHA Project meeting is ongoing at ENGIE Lab CRIGEN in France. Valentina Cechetto is presenting the work on membrane reactors for ammonia cracking carried out at TU/e SUSTAINABLE PROCESS ENGINEERING, TU/e Chemical Engineering and Chemistry in collaboration with TECNALIA
06/04/2022	Nuestros compañeros Jesús J. Martín, de la Unidad de Gestión de Proyectos y Elena Monge Ruiz, de la Unidad de Ingeniería Aplicada han asistido al primer Workshop de ARENHA Project.
01/04/2023	ARENHA Project First Workshop: Introduction to novel technologies related to ammonia-based energy storage. We are pleased to invite you to the 1st Workshop of the ARENHA Project. This special dissemination workshop will introduce novel materials and technologies related to ammonia-based energy storage covering the whole power-to- ammonia-to-applications. Lectures are given by scientists of both academia and industry. More information and registration: https://lnkd.in/gVn6gHKB
30/03/2022	We are glad to announce that our colleague Viviente José Luis will give a Keynote Lecture at the 15th International Conference on Catalysis in Membrane Reactors to be held from July 31th – August 4th, 2022 in the Waseda University, Tokyo, Japan.
30/03/2022	Avanzando hacia el amoniaco verde y hacia fertilizantes bajos en carbono





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14/03/2022	ARENHA Project First Workshop: Introduction to novel technologies related to ammonia-based energy storage. We are pleased to invite you to the 1st Workshop of the ARENHA Project. This special dissemination workshop will introduce novel materials and technologies related to ammonia-based energy storage covering the whole power-to- ammonia-to-applications. Lectures are given by scientists of both academia and industry.
22/02/2022	"Huelva será el kilómetro cero de Europa en producción de amoniaco verde"
15/02/2022	Project Catalina: GW-scale green ammonia in Spain
02/02/2022	#SPAIN: Large-scale production project of #GreenHydrogen and #GreenAmmonia announced Copenhagen Infrastructure Partners announces partnership with Enagás, Naturgy, Grupo Fertiberia and Vestas (letter of intent signed committing to work together to realize the Project)
01/02/2022	Es#SPAIN: Large-scale production project of #GreenHydrogen and #GreenAmmonia announced Copenhagen Infrastructure Partners announces partnership with Enagás, Naturgy, Grupo Fertiberia and Vestas (letter of intent signed committing to work together to realize the Project)
04/01/2022	El coche volador de Madrid: para 2 personas, amoniaco de combustible y llegará en 2023
15/12/2021	Our colleagues from CNH2 - Centro Nacional del Hidrógeno, Elena Monge Ruiz and David Fernández Rodríguez from #ARENHA and #MACBETH have participated in the World Hydrogen and Ammonia Shipping Conference taking place on December 15th . This conference aims to asses the state and potential on hydrogen and ammonia and which challenges must be overcome to implement these technologies safely and profitably in vessels and ports. #Ammonia, #Hydrogen, #ArenhaProject, #MacbethProject, Emilio Nieto. Dr.



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16/11/2021	CNH2 - Centro Nacional del Hidrógeno, de la mano de Elena Monge Ruiz, de la Unidad de Ingeniería Aplicada, ha comentado el Proyecto ARENHA (ARENHA Project) en un artículo para la revista The Objective. CNH2 - Centro Nacional del Hidrógeno se encuentra involucrado en el proyecto, que tiene como objetivo demostrar el potencial del amoniaco como forma de almacenamiento energético así como su posterior uso para generación de energía.



# 5.2. Annex 2. Twitter publications

Date	Tittle
26/02/2025	Join us for the ARENHA Project Final Workshop! 26th March 2025. Registration: <u>https://lnkd.in/daZ6ReaQ</u> Don't miss this opportunity to participate either online, or in person at @CNH2 in Puertollano, Spain.
13/11/2024	Cristina Alonso (CNH2, ARENHA consortium) participated in the 2nd International Conference on Renewable Energy (November 11th-13th, 2024; Barcelona, Spain) by giving a presentation on the ARENHA project.
05/11/2024	ARENHA is and EU H2020 funded research projects with global impact seeking to develop, integrate and demonstrate key material solutions enabling the use of ammonia for flexible, safe and profitable storage and utilization of energy
28/10/2024	Today more than ever, States and societies are more aware of the need to look for healthy, sustainable and environmentally friendly alternatives to fossil fuel-based energies. In a context of global push and demand for renewables, its increase in the energy mix requires
28/10/2024	increased storage capatity to ensure continuity of supply and availability of a wide range of services. ARENHA project is making progress in the development of prototypes for the use of ammonia as a renewable energy carrier. Full article:
21/10/2024	In the ARENHA project, the goal is to prove that ammonia possesses the essential qualities to serve as and efficient and cost-effective energy storage medium without CO2 emissions.
14/10/2024	These are some of the expected impacts of the Arenha project: To decrease dependency on energy imports. To diversify energy supply from third countries through ammonia. To boost alternative energy imports through renewable electricity storage and long distance transport
10/10/2024	The Spanish portals Hidrógeno verde and EnergyNews published ARENHA's progress in developing useful prototypes using ammonia as an energy carrier. CNH2 spoke to the journalists to provide all the necessary information and disseminate the benefits of the project
24/09/2024	The 3rd Symposium on Ammonia Energy (SoAE) will be held in Shanghai until September 26, under the theme "Ammonia: New Energy, New Opportunity". ARENHA will not miss this major event in the sector that is the focus of our research. https://soae.sjtu.edu.cn
18/09/2024	Consult ARENHA's main bases on our website: project number, identifier, duration, budget, coordination or summary of the project, among other information.
11/09/2024	ARENHA's impact will be mainly reflected in the renewable energy sector, laying the foundations for more sustainable energy storage and transporting green hydrogen to many countries, thanks to the action of ammonia.
04/09/2024	A packed bed membrane reactor (PBMR) model for ammonia decomposition and pure hydrogen separation has been developed in ACM.
04/09/2024	The model was analyzed by means of a sensitivity analysis, showing that the model responds as expected to parameter changes The performance of the model was compared with that of a model available in literature and it was concluded that the two models provide similar results
04/09/2024	A validation with experimental data obtained from lab tests was also performed and proved the model able to predict hydrogen production from ammonia decomposition with good accuracy.
28/08/2024	Very happy to announce that the research project that we have been carrying out at ARENHA will remain active until March 2025.
28/08/2024	On the horizon, many advances in the different fields of work that have been addressed so far and the evaluation of results that have been achieved since the beginning of the project.
21/08/2024	Latest news!! ARENHA project extends its completion period and continues until March 2025. Likewise, we are preparing a new consortium meeting for next October.
21/08/2024	An appointment in which the different members of the consortium will present their progress in the work packages addressed within the project. https://arenha.eu
14/08/2024	Spanish portals informed their readers about ARENHA's recent progress in developing useful prototypes using ammonia as an energy carrier. Hidrógeno Verde https://tinyurl.com/3r56p36b Energy News- Todo Energía https://tinyurl.com/4ms7w9er
09/08/2024	In the ARENHA project, the goal is to prove that ammonia possesses the essential qualities to serve as an efficient and cost-effective energy storage medium without CO2 emissions.
09/08/2024	And this is the formula for the ammonia decomposition process with which the ARENHA will demonstrate its potential as a sustainable hydrogen storage source
01/08/2024	Valentina Cechetto was awarded a doctoral degree at the Eindhoven University of Technology. Her thesis, 'Ultra-pure Hydrogen Production via Ammonia Decomposition in Packed Bed Membrane Reactors,' was carried out within the framework of the ARENHA project. Congratulations!
18/07/2024	Current energy production depends on the use of fossil fuels which account for more than 80% of global production. This type of energy creates the so-called greenhouse gases, which overheat the planet and cause the dreaded climate change.
18/07/2024	In response to this problem, the European Commission (and the global climate contract) suggest a reduction of >80% in CO2 emissions by 2050, compared to levels at the beginning of the 21st century.
18/07/2024	To this end, alternatives are proposed to avoid the use of new CO2-free energy systems, through radical technical solutions and investments in infrastructure. With that goal in mind, the ARENHA project was born. https://arenha.eu
10/07/2024	The Life Cycle Assessment for sustainable ammonia production estimates different beneficial options for hydrogen transport, resulting in the scheme visible in the second picture. https://arenha.eu





03/07/2024	ARENHA's Life Cycle study provided preliminary results on its sociological and environmental impact, which are available in the second image. https://arenha.eu
26/06/2024	The task of designing and building the ammonia cracker aims to support the production of ultrapure H2 that facilitates mobility, by means of H2-selective membranes that are resistant to the NH3 cracking environment.
26/06/2024	So far, progress has been made on this task: Unit fully designed and constructed. HAZOP, LOPA, and ATEX Studies carried out to ensure safe operation. All the H2-selective membranes manufactured. System undergoing commissioning and ready for operation in Q4 2024.
19/06/2024	This part of the ARENHA project focuses on developing carbon molecular sieve membranes by adding boehmite nanoparticles through dry carbonisation in a single immersion under nitrogen at different temperatures.
19/06/2024	GOAL: High H2 permeance and H2/N2 & H2/NH3 selectivity TARGET: Low N2 permeance at RT 1 <sup>st</sup> generation membranes: < 2·10-9 mol m-2 s-1 Pa-1 https://arenha.eu
12/06/2024	Among other initiatives to facilitate hydrogen separation in the ammonia decomposition reaction, Pd-based double skin (DS) membranes are being developed. GOAL: High H2 permeance and H2/N2 & H2/NH3 selectivity TARGET: Low N2 permeance/leakage at RT
12/06/2024	1st generation membranes: < 2·10-10 mol m-2 s-1 Pa-1 2nd generation membranes: < 4·10-11 mol m-2 s-1 Pa-1 https://arenha.eu
07/06/2024	The ammonia cracker pilot plant designed and built by H2SITE is now at Fertiberia site in Puertollano and ready to be run by @cnh2_es. It is a fully automated prototype that will produce 1 kg/h of hydrogen from ammonia as part of the ARENHA project.
07/06/2024	La planta piloto de descomposición de amoniaco, diseñada y construida por H2SITE, está ya en Fertiberia Puertollano para ser operada por @cnh2_es . Es un prototipo totalmente automatizado que produce 1 kg/h de hidrógeno a partir de amoniaco, en el marco del Proyecto ARENHA.
05/06/2024	On 6 and 7 June we will be in Rotterdam, taking part in the NH3 Event Europe. This event is the largest event dedicated to ammonia at European level and will bring together leading experts in the field. https://nh3event.com
30/05/2024	ARENHA will demonstrate the outstanding potential of green ammonia to address the issue of large-scale energy storage. Therefore, its main objective is also what we tell you in this video. https://i.mtr.cool/hroqwzyjdk #ARENHA #ammonia #ammoniaenergy #energy #greenammonia
28/05/2024	The work with the SOFC system for power generation was developed through a simulation with 100 % ammonia fuel, recycling the anode gas. As a result, the system achieved an efficiency of 56 %. The next step will be the testing of SOFC stacks with ammonia.
21/05/2024	The ARENHA team visited the facilities of H2SITE, one of ours partners, to see first-hand the new ammonia decomposition prototype. A prototype that will soon be sent to Puertollano to be operated by the @cnh2_es the Fertiberia facilities.
21/05/2024	The ARENHA team visited the facilities of H2SITE, one of ours partners, to see first-hand the new ammonia decomposition prototype. A prototype that will soon be sent to Puertollano to be operated by the @cnh2_es the Fertiberia facilities.
21/05/2024	Thanks to our partner for their enormous collaboration, it has been a pleasure to share the experience with you. #ammonia #greenammonia #Arenhaproject
15/05/2024	We share the study published in Chemical Engineering Journal, on adsorbents development for hydrogen cleanup from ammonia decomposition in a catalytic membrane reactor.
15/05/2024	This scientific research has been developed by Valentina Cechetto, Cynthia Lan Struijk, Luca Di Felice, Anouk W.N. de Leeuw den Bouter and Fausto Gallucci. https://doi.org/10.1016/j.cej.
06/05/2024	We present the publication by Valentina Cechetto, Luca Di Felice, Rocío Gutiérrez Martínez, Alba Arratibel Plazaola and Fausto Gallucci. They deal with the production of ultrapure hydrogen by ammonia decomposition in a catalytic membrane reactor. https://bit.ly/3KJ37sl
02/05/2024	Within phase 3 of the Work Plan, which focuses on the development of key components, work is being carried out on an electrochemical cell to enable the production of N2.
02/05/2024	So far, it has been proven that high-purity N2 can be produced at a voltage below 500 mV with a Pr-infiltrated LSCF-CGO cell. After 1,500 hours of operation, it was demonstrated that the N2 purity remained at 98.3 %.
24/04/2024	A few months ago we organised a webinar together with the AMBHER project, in which we discussed the objectives of both projects and the progress made so far in the development of membranes and reactors for ammonia energy.
17/04/2024	The first results regarding the influence of green ammonia on electricity production provided a series of results as shown in the picture, resulting from the phase of the Work Plan focused on the environmental LCA, economic and safety assessment.
15/04/2024	Today we are in Bilbao, for our ARENHA Project Consortium Meeting. Thank you Tecnalia and H2SITE for organizing everything so well! #ARENHA #arenhaproject #hydrogen #greenammonia #ammonia #greenhydrogen
04/04/2024	We launched this survey in which we seek to know the main challenges that green ammonia faces. Participate and let us know your vision https://lnkd.in/dEz_5nvV #ARENHA #survey #ammonia #greenammonia #development
28/03/2024	Proton Ventures has completed the design of the advanced ammonia synthesis loop system. ammonia synthesis system and is building the demonstration unit.
28/03/2024	H2SITE is nearing completion of the construction of its ammonia cracking system, which transforms ammonia into hydrogen at a high level of purity.
28/03/2024	Due to modern SOFCs are not optimized to operate by electrolysis, new materials and structural changes in the active air and active fuel layer have been studied. As a result, new SOECs are manufactured and will be assembled into a stack for a 5 kW system. https://i.mtr.cool/rakikpheuj





Improvement on electrode architecture: - Promising electrode powder compositions investigated by printing on full cells and characterizing by arcs specific resistance (ASR) anongs of thes Decrease of ASR of full cells by approx. 25% at 80°C compared to standard cells.           04/03/2021         Decrease of ASR of full cells by approx. 25% at 80°C compared to standard cells.           04/03/2021         Decrease of ASR of full cells by approx. 25% at 80°C compared to standard cells.           04/03/2021         Decrease of ASR of full cells by approx. 25% at 80°C compared to standard cells.           29/02/2021         Decrease of ASR of full cells with 110 µm electrolyse and admetsion layer.           29/02/2021         Decrease of ASR of full cells with 110 µm electrolyse and admetsion layer.           2002/2021         Decrease of ASR of full cells with 110 µm electrolyse and admetsion layer. This action has been carried out to guarantee operation by electrolysis at high current density, incorporating the results to assemble ab battery that will be tested in a 6KW system.           12/02/2021         ARENHA includes environmental LCA methodologies to measure environmental performance during the life cycle of project technologies an processes.           30/01/2021         ARENHA includes environmental LCA methodologies to measure environmental performance during the life cycle of will help to provide fullus electrolysis at anong the most provide will a batcer by information on the process.           30/01/2021         Area KAmirez, from & Engle, participated in the ARENHA workshop with a declad declanation, whelp the oprotenon the specific comologies an process measure and	11/03/2024	The process for the development and characterisation of modified ESCs for SOEC in hydrogen production follows a process based on the improvement of the cell through two actions:
94/03/2024         Utilization of thinner electrolyte - investigation of electrolytes with thickness < 165 µm Investigation of adherent adhesion layer by approx. 29% at 600°C.	04/03/2024	Improvement on electrode architecture: - Promising electrode powder compositions investigated by printing on full cells and characterizing by area specific resistance (ASR) amongst others Decrease of ASR of full cells by approx. 25% at 800°C compared to standard cells.
29/02/2024         The optimal composition of the composite ammonia sorbent depends on the performance of several characterisation techniques, including the neutron radiography experiment.           20/02/2024         Elcogen has developed a SOEC based on the study of an active fuel layer and an air layer. This action has been carried out to guarantee operation by electrolysis at high current density, incorporating the results to assemble a battery that will be tested in a 5WV system.           12/02/2024         ARENNA includes environmental LCA methodologies to measure environmental performance indicators, which in turn will help to provide future interested entities and researchers with backed-up information on the process.           06/02/2024         Alvaro Ramirez, from @Engin_expritipation in the RENNA workshop with a detailed explanation of the impact of using ammonia for hydrogen storage. The presentation is available at the following ink.           30/01/2024         Membrane-based technologies are among the most promising feature storage. The appearing and purifying hydrogen, replacing conventional and less effective systems. These membranes function as barries that allow the flow of some components from a muscle ded stream.           30/01/2024         Christine Rousselle was in charge of representing @Stellaritis during the ARENNA workshop. During her presentation is available to developed and how to directly use ammonia for mobility (ICE). His presentation is available at the following ink.           15/01/2024         Christine Rousselle was in charge of representing @Stellaritis during the ARENNA workshop. The alcotave there he explained how SOFC technology is able to generate energy from hydrogen fluk Loworkshop. In alcotave therey he explained how SOFC tec	04/03/2024	Utilization of thinner electrolyte - Investigation of electrolytes with thickness < 165 µm Investigation of different adhesion layers with a thickness of 165 µm and 110 µm Decrease of ASR of full cells with 110 µm electrolyte and adhesion layer by approx. 29% at 800°C.
2002/2021         Elcogen has developed a SOEC based on the study of an active fuel layer and an air layer. This action has been carried out to guarantee operation by alcortolysis at high current density, incorporating the results to assemble a battery that will be tested in a SWB system.           12/02/2021         ARENHA includes environmental LCA methodologies to measure environmental performance during the life cycle of project technologies on processes.           06/02/2021         Alcvan Raminer, from @Engin_participated in the RENHA workshop with a detailed explanation of the impact of using ammonia for hydrogen storage. The presentation is available at the following ink.           06/02/2021         Membrane-based technologies are among the most promising technologies for producing, separating and purifying hydrogen, replacing conventional and less effective systems. These membranes function as barriers that allow the flow of some components from a mice ded stream.           30/01/2021         Membrane-based technologies are among the most have the following characteristics: High selectivity towards hydrogen fluct use cannonia for mobility (ICE). His presentation is available at the following invito and the following invito and the desiter terms and the desiter terms are the term be replaned hows objectives.           15/01/2021         Presentation, Separating and purifying the ALENHA workshop, an lacture where he explained how softer the electrocatalysts for the electrocaryststs for the electrochemical Mass Sepectrometry (DEMS).           15/01/2021         The selection and optimisation of electrocatalysts for the electrocarysthesis of ammonia was based on Density Functional Theory (DEMS).           15/01/2024         2024 will	29/02/2024	The optimal composition of the composite ammonia sorbent depends on the performance of several characterisation techniques, including the neutron radiography experiment.
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07/12/2023	ARENHA project includes the design and development of an NH3 cracker for the production of ultrapure hydrogen that allows a more efficient use and intelligent application in the field of mobility, for an H2 production capacity of 20 kg/d.
07/12/2023	What has been achieved so far? Completely designed and built unit. HAZOP, LOPA and ATEX studies carried out to guarantee safe operation All H2 selective membranes manufactured System in the process of commissioning and ready to operate in the fourth guarter of 2024
06/12/2023	A dynamic model of the ammonia synthesis unit is required to optimize the reactor-catalyst synergy towards minimal losses due to pressure and temperature.
06/12/2023	ARENHA will use models to optimize the results and take them from the pilot plant to the relevant product scale, based on a simulation of the ammonia synthesis process built in a quasi-steady and dynamic state. More details coming soon.
04/12/2023	We look forward to seeing you tomorrow in our webinar organized together with AMBHER Project and in which we will delve into the different advances in the development of Membranes and Reactors for ammonia energy https://mtr.cool/rjdvmxpmqc
30/11/2023	Within the industrial requirements in ARENHA, the input and output parameters of each block have been defined. To achieve this function, mass and energy balances have been defined for each individual process unit.
28/11/2023	One week to go until our webinar, where José Luis Viviente and Arash Rahimali Mamaghani will talk about membranes and reactors for ammonia energy.
27/11/2023	This week we will be represented in Antwerp, Belgium, where the Argus Clean Ammonia Europe Conference is being held. The event will bring together industry pioneers developing green ammonia solutions in Europe.
23/11/2023	ARENHA and its results will go beyond the European level where it is being developed. Through new applications of ammonia, the transport and storage of this new sustainable energy method will be facilitated in countries around the world.
22/11/2023	On the 5th of December we are waiting for you in the webinar that we are preparing within the ARENHA project, where José Luis Viviente and Arash Rahimali Mamaghani are talking about membranes and reactors for ammonia energy.
18/11/2023	In 2018, the EU Commission's Low Carbon Roadmap indicated that CO2 emissions should be reduced by up to 80% by 2050. Investing in sustainable projects by public administrations was therefore a matter of urgency.
18/11/2023	This led to projects such as ARENHA, where we are researching new methods of storing and transporting green hydrogen, ensuring a more environmentally friendly future.
17/11/2023	The decisions made at ARENHA are guided by the environmental performance ensured, within the life cycle of the technologies used and the processes developed. This information will provide information in the future that will support the work carried out during these years.
16/11/2023	We share the document with all the information provided by Thomas Wood, from STFC-UKRI, during the informative workshop where we presented the ARENHA project. He assess the status of the main catalysts for the synthesis and decomposition of ammonia.
14/11/2023	Ammonia synthesis is possible under mild temperature conditions, by using innovative catalyst materials and separation/storage methods, such as solid state absorption. https://arenha.eu
10/11/2023	Would you like to stay up to date with the news of the ARENHA project? Then our newsletter is for you. Register and receive our regular publications in your email, thanks to which you will be able to learn about the latest progress of the project. https://mtr.cool/acjxmrvmuj
08/11/2023	Ammonia provides a series of advantages that other elements have not been able to provide so far and that make it an ideal candidate as a carrier of large-scale renewable energy.
08/11/2023	It is a carbon-free material for large-scale renewable electricity storage Ammonia liquefies easily at 1 MPa and room temperature Lower cost per unit of stored energy compared to other alternatives CO2 free energy storage medium #ArenhaProject http://arenha.eu
06/11/2023	The study and research of new concepts of integrated reactors based on advanced multiphase models within the ARENHA project is carried out with our partner @TUeindhoven
06/11/2023	A research process based on three fundamental development axes: Combination of latest generation numerical models Advanced experimental techniques (non-invasive) Experimental demonstration of novel reactor concepts (proof of concept) http://arenha.eu
03/11/2023	Current catalysts use the method of absorption of N 2 and H 2 molecules on the surface of the catalyst, with the strength of nitrogen absorption being what determines their effectiveness.
03/11/2023	Best catalyst used for the synthesis and decomposition of ammonia is ruthenium, but it is an expensive and difficult material. FARENHA proposes an alternative based on the UKRI-STFC ammonia decomposition catalyst technology, using abundant elements and not precious metals.
03/11/2023	Furthermore, its effectiveness will be tested in large-scale processes to lay the foundations for future catalytic technologies. #ArenhaProject #ammonia #greenenergy #greenammonia #catalyst http://arenha.eu
01/11/2023	ARENHA consortium provides breakthrough technologies for the power-to-ammonia-to-usage value chain. In this video, you will learn in just 3 minutes everything that ARENHA will mean in the advancement and use of green ammonia.
30/10/2023	Within WP6, we will evaluate the impact on the environment of the different technologies and processes developed within the ARENHA project, with the aim of demonstrating their viability and providing information on the subsequent use of the technologies.
30/10/2023	This is one of the most valued aspects within the project, since the main mission is to find a solution that is more efficient, sustainable and respectful of the environment. https://mtr.cool/byybdqjgzs
27/10/2023	We invite you to participate in the webinar that we have organized with the AMBHER project team, in which we will delve into the objectives of both projects and we will focus on learning about the different advances in the development of Membranes and Reactors for ammonia energy.
27/10/2023	If you want to attend, register now for the event and follow all the news https://mtr.cool/tvetmmkeev





08/09/2023	One of our key patners is The Spanish National Hydrogen Centre (CNH2), located in Puertollano, Ciudad Real.
11/09/2023	Freddy Kukk, from @Elcogen_EU, explained how the development of solid oxide cells at low temperature takes place, during our dissemination workshop. http://tinyurl.com/2twxa5ud
12/09/2023	@Elcogen_EU is specialised in electrode supported cell and stack design for SOC, that allows to operate at lower temperatures. Several generations of cells and stacks have been developed to achieve very high efficiency at competitive cost, with multilayer ceramic cell.
12/09/2023	Fraunhofer IKTS has been developing electrolyte supported cells and stacks for over 15 years. Moreover, they have delivered stacks and integrated stack modules to several applications.
19/09/2023	As the conversion in the reactor does not normally exceed 15%, unreacted components are recycled to the reactor after separation of the ammonia product by cooling condensation.
19/09/2023	The production of ammonia is based on the Haber-Bosch process on an industrial scale, starting with the supply of hydrogen and nitrogen at 150-250 bar and 400-500 °C. In turn, the feed gas mixture passes through a series of fixed beds containing an Fe-based catalyst.
20/09/2023	Cheng Liang, from Proton Ventures, explained how advanced ammonia synthesis technologies are developed, within the dissemination workshop of the ARENHA project. You can consult the full document in the following link. https://tinyurl.com/229v46ps https://arenha.eu
22/09/2023	The ARENHA consortium gathers 11 organisations from 7 countries (Netherlands, Denmark, Germany, Estonia, France, United Kingdom and Spain). The total industrial participation is around 45% of the consortium, while innovative SMEs represent 27% of the participants.
25/09/2023	Among the research carried out at ARENHA, The Science and Technology Facilities Council succeeded in developing new catalysts for the synthesis of ammonia, based on sodium amide as the best of all light metal amides. https://arenha.eu
26/09/2023	By using solid state for the storage of ammonia, we at ARENHA are achieving greater efficiency of this compound and optimum cost-effectiveness, thus improving its flexibility in the face of variations in the feed flow. https://tinvurl.com/4sawdhzb
28/09/2023	On behalf of Technical University of Denmark, Anastasiia Karabanova intervened during our workshop to explain the development of solid-state ammonia absorption and storage. You can access the presentation document here. https://tinyurl.com/mh3r4p5s https://arenha.eu
03/10/2023	The result: increased system efficiency and cost-effectiveness, as well as flexibility in feed flow variations. https://arenha.eu
03/10/2023	Our goal: to develop a solution to synthesise ammonia. The synthesis unit will operate under mild temperature and pressure conditions, thanks to new catalysts and separation/storage methods based on solid-state absorption.
04/10/2023	In addition to the scientific component, at ARENHA we have analysed the current ammonia market and infrastructure in depth, with the idea of adapting and combining it for the current and future challenges of renewable energy within the European Union. https://arenha.eu
06/10/2023	The production of pure hydrogen (>99.99%) is based on SOEC. This enables the synthesis of ammonia, using catalysts and membrane reactors to break down the product. This action allows direct use in SOFC for energy and ICE for mobility. https://arenha.eu
09/10/2023	Based on LCA methodologies, we obtain data and key environmental performance indicators that facilitate better decision making. More details about how we work, here: https://mtr.cool/mqsneuqiog
09/10/2023	As a research project, ARENHA has the necessary mechanisms to evaluate the impact of the environmental activity of the life cycle of the technologies and process chains that will be developed within the project.
11/10/2023	Next week we will be present at the 16th International Conference on Catalysis in Membrane Reactors, in Donostia-San Sebastián. An important event promoted by Tecnalia with the purpose of boost research and progress in the area of catalytic membrane systems.
13/10/2023	A reminder about what is the main objective of ARENHA: The project seeks to demonstrate the #efficiency and effectiveness of the use of #ammonia in the hydrogen transportation and storage process, thanks to its high capacity as an #energy carrier due to its high energy density.
16/10/2023	Is today! The 16th International Conference on Catalysis in Membrane Reactors starts today in Donostia-San Sebastián and we will be there! José Luis Viviente, Project Manager & Senior researcher at TECNALIA, brings the ARENHA project to all those attending the event.
18/10/2023	The progress made within the framework of the project has already allowed us to know some relevant data on the impact of ARENHA and the use of ammonia as an alternative energy source for the storage and transportation of hydrogen. All details at https://mtr.cool/ionkjftmvw
20/10/2023	Since the beginning of ARENHA, a series of objectives were set that revolve around the use of ammonia, the main material under study in the project.
23/10/2023	In our desire to continue investigating the effects and changes that the use of green ammonia entails at a social and territorial level, we have prepared a short survey to collect expert opinions on the challenges related to ammonia. Take part! https://mtr.cool/qolruecvwb
25/10/2023	Ammonia, as a hydrogen carrier, is established as a particularly promising material due to its high energy density, relatively low cost and ease of liquefaction, storage, and transportation. More details at: https://mtr.cool/oziwovewis
25/10/2023	One of the great solutions to address these obstacles is to store hydrogen in the chemical bonds of hydrogen-bearing compounds, materials that have the ideal gualities and behavioral characteristics to facilitate this transport process
25/10/2023	What are hydrogen carriers used for? The challenges that hydrogen must overcome as a clean and ideal energy source are closely related to aspects such as its low energy density and the current difficulties derived from the handling of gas in its transportation.





08/09/2023	With 13 laboratories and 3 auxiliary facilities, the instituion works in multiple areas related with H2, such as production, storage and purification. We need their help to advance in our studies of ammonia. https://arenha.eu #ARENHA #ammonia #cnh2
07/09/2023	Membrane technologies used for the production of separation and purification of H2 are a really promising way for substituting conventional systems.
07/09/2023	It is low cost, it is really stable and it has high selectivity towards hydrogen, among other characteristics. https://arenha.eu #ARENHA #membranes #hydrogen
05/09/2023	Vía UKRI-STFC's ammonia decomposition catalyst technology, in ARENHA we aim to perform ammonia synthesis and ammonia decomposition in a larger scale.
05/09/2023	It is yet to be tested, but with this proyect, one of our goals is to advance this technology and make it reliable for the future. https://arenha.eu #ARENHA #catalytis #ammonia #decomposition
31/08/2023	Meet ARENHA, an ambitious project to achieve energy storage thanks to green ammonia. Together, we will achieve a sustainable and secure future. More info at https://arenha.eu
30/08/2023	Among the different presentations that took place in our dissemination workshop, Stefan Megel, from Fraunhofer IKTS, presented how this ARENHA partner works on Solid Oxide Cells (SOC) technology.
29/08/2023	— Stacking of single cells is essential for hydrogen production. Interconnections and contact elements are critical components of the system to ensure efficient electric contact and gas flow.
24/08/2023	We share the presentation on ARENHA given by José Luis Viviente, from <a>@tecnalia</a> , during the project dissemination workshop held on 7 April 2022. <a href="https://bit.ly/44jiRdn">https://bit.ly/44jiRdn</a>
23/08/2023	Solid oxide electrolyser cells operate at temperatures between 700 and 1000 °C which enable nonprecious metals as catalysts. The general function of the cell in the ARENHA project is to generate pure H2 from steam which will be afterwards used in synthesis to generate ammonia.
21/08/2023	The @ENGIEgroup is an energy company with a strong focus on the transition to renewables. To this end, they see hydrogen as a promising energy carrier.
21/08/2023	Within the ENGIE Lab CRIGEN, where they carry out R&D projects on new gases and energies, they are developing new technologies and pilot projects that facilitate the step towards the long-awaited energy transition. https://engie.fr
18/08/2023	From 20 to 24 August we will be in Munich, where a symposium on safety in ammonia plants will be held. https://bit.ly/4484Dwc
16/08/2023	Based on the electrochemical reaction, it is possible to split carbon dioxide (CO2) to carbon monoxide (CO) or mixtures of water and carbon dioxide (H2O+CO2) to generate specific synthesis gases (mainly CO and H2) for subsequent processes.
16/08/2023	Because of the integration of excess heat to the SOEC process, the efficiency of SOEC systems can be higher than other electrolysis technologies. https://arenha.eu
15/08/2023	From the beginning of ARENHA, a series of objectives were set to raise awareness of the project during its years of activity. To this end, a dissemination plan was established, the approaches and development of which are explained in this document. https://bit.ly/45an9Vw
11/08/2023	Have you just discovered the ARENHA project? Click on the following link to find out more about the basis of our work in favour of renewable energies. https://arenha.eu/content/introd
09/08/2023	Solid oxide fuel cells (SOFC) have been extensively developed as a low-carbon, efficient electrical power production technology but emerge now also in the use as solid oxide electrolysis cells (SOEC).
09/08/2023	Under applied electrical potential a solid oxide electrolyser cell (SOEC) splits water (H2O) into hydrogen (H2) by transferring oxygen ions (O2-) through a solid ionic conductive membrane that after are recombining with electrons to form oxygen molecules (O2).
08/08/2023	ARENHA will demonstrate the full power-to-ammonia-to-usage value chain at TRL 5 and the outstanding potential of green ammonia to address the issue of large-scale energy storage through LCA, sociological survey, techno-economic analysis deeply connected with multiscale modelling.
04/08/2023	The use of new catalyst materials and the application of ammonia separation/storage methods based on solid state absorption will guarantee two fundamental aspects: increased efficiency of the ammonia synthesis process and improved flexibility against variations in the feed flow.
04/08/2023	Find out how we are going to improve the ammonia synthesis process, with innovative methodologies, at the following link: https://mtr.cool/npvlasexpa #ammonia #ARENHAproject #greenenergy #innovation #energy
02/08/2023	ARENHA will demonstrate the full power-to-ammonia-to-usage value chain at TRL 5 and the outstanding potential of green ammonia to address the issue of large-scale energy storage. https://mtr.cool/xwnhqbvnrp #ARENHA #ammonia #greenammonia #energy #research #hydrogen #power
31/07/2023	Did you know that the ARENHA project has its own newsletter? An information space where you can find: scientific publications, technical articles If you want to be part of our community, register here: <a href="https://mtr.cool/bzgvecpjyt">https://mtr.cool/bzgvecpjyt</a>
27/07/2023	The storage and transport of ammonia through the usual methods in pressurized containers or insulated tanks, presents safety problems in case of leaks and, in addition, wastes part of the energy in the refrigeration process.
27/07/2023	ARENHA will work on the research and development of an innovative absorbent material for the storage of solid ammonia, much safer and more energy efficient.
27/07/2023	An alternative that seeks to solve the current obstacles raised in the process and facilitate better temperature and pressure conditions. https://mtr.cool/wpsayusito #ammonia #greenenergy #hydrogen #sorbents #ARENHAproject
25/07/2023	One of the great challenges that ammonia faces as a carrier of hydrogen is related to its decomposition, a process that, at present, is still not carried out efficiently on an industrial scale.





25/07/2023	ARENHA works on the development new and innovative methods for the dehydrogenation of ammonia, developing new efficient systems for its total achievement. More details about our work at: https://mtr.cool/dccpxccglv #ARENHA #ammonia #greenammonia #energy #development
24/07/2023	We continue working to contribute to the dissemination and awareness of the importance of using ammonia as an innovative technology for large-scale energy storage. Soon we will be present at 2023 Safety in Ammonia Plants & Related Facilities Symposium.
24/07/2023	This will be an important event that will take place from August 20 to 24 in Germany. If you want to know more about this event, you can check this link. https://mtr.cool/tnkmmjohzx https://mtr.cool/znzoqnyuij #ARENHA #ammonia #greenammonia #energy #development
20/07/2023	PSA ID is a division of @Stellantisdedicated to Studies, Research, Innovation and Conception in Automotive field as well as Style and Design activities. All this, thanks to the Stellantis OpenLabs network. This network also includes the participation of the @Univ_Orleans
18/07/2023	Solid oxide fuel cells (SOFC) have been extensively developed as a low-carbon, efficient electrical power production technology but emerge now also in the use as solid oxide electrolysis cells (SOEC).
18/07/2023	Under applied electrical potential, a SOEC splits water into hydrogen by transferring oxygen ions through a solid ionic conductive membrane that after are recombining with electrons to form oxygen molecules.
17/07/2023	ARENHA will demonstrate the full power-to-ammonia-to-usage value chain at TRL 5 and the outstanding potential of green ammonia to address the issue of large-scale energy storage through LCA, sociological survey, techno-economic analysis deeply connected with multiscale modelling.
17/07/2023	To demonstrate ammonia as a flexible energy carrier through the development of a fully integrated prototype for green ammonia synthesis and decomposition.
17/07/2023	To assess the social acceptance, techno-economic-environmental feasibility, and replication potential of the developed value chains. https://arenha.eu
14/07/2023	ARENHA is a project funded by the European Union's Horizon 2020 (H2020) programme, the aim of which is to promote R&D&I initiatives of particular relevance to the development of the European area. More info. https://bit.ly/3rbuCov
13/07/2023	With the idea that you can learn more details about the ARENHA project, we share a link to one of the presentations developed by our team. This presentation is available for download from our website. https://bit.ly/3Xz6OqE
10/07/2023	This week we are participating or will be participating in several events related to the research areas of the project. Take note of them!
10/06/2023	13th International Congress on Membranes and Membrane Processes (ICOM 2023), Chiba (Japan) http://icom2023.jp 2nd Symposium on Ammonia Energy, University of Orleans (France) https://ammonia-energy.sciencesconf.org
06/07/2023	As we discussed in a previous publication, step 2 of the work plan focuses on the system requirements for design and modelling. We go deeper into this with a document where the industrial requirements are explained in full detail. https://bit.lv/3pkPIFO
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05/07/2023	The ARENHA project in detail. https://youtu.be/BgZtP3PqOv0
05/07/2023 03/07/2023	The ARENHA project in detail. https://youtu.be/BgZtP3PqOv0 Did you know that Today, there is around 70 million tonnes (Mt) of current demand worldwide for "pure" hydrogen. By "pure", we mean specific applications that require hydrogen with only small levels of additives or tolerated contaminants.
05/07/2023 03/07/2023 29/06/2023	The ARENHA project in detail. https://youtu.be/BgZtP3PqOv0 Did you know that Today, there is around 70 million tonnes (Mt) of current demand worldwide for "pure" hydrogen. By "pure", we mean specific applications that require hydrogen with only small levels of additives or tolerated contaminants. H2SITE is one of the ARENHA partners. His scientific work focuses on in situ H2 generation system based on advanced membrane reactors and membrane purification systems. More about this partner. https://h2site.eu
05/07/2023 03/07/2023 29/06/2023 28/06/2023	The ARENHA project in detail. https://youtu.be/BgZtP3PqOv0 Did you know that Today, there is around 70 million tonnes (Mt) of current demand worldwide for "pure" hydrogen. By "pure", we mean specific applications that require hydrogen with only small levels of additives or tolerated contaminants. H2SITE is one of the ARENHA partners. His scientific work focuses on in situ H2 generation system based on advanced membrane reactors and membrane purification systems. More about this partner. https://h2site.eu ARENHA continues to present the basis of the project and the most recent discoveries, the result of the work of all our partners. The first week of July we will be in Lucerne, on the occasion of the Low Temperature Fuel Cells, Electrolysers & H2 Processing conference series.
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05/07/2023 03/07/2023 29/06/2023 28/06/2023 26/06/2023 622/06/2023 22/06/2023 22/06/2023 22/06/2023 22/06/2023 15/06/2023 15/06/2023	The ARENHA project in detail. https://youtu.be/BgZtP3PqOv0 Did you know that Today, there is around 70 million tonnes (Mt) of current demand worldwide for "pure" hydrogen. By "pure", we mean specific applications that require hydrogen with only small levels of additives or tolerated contaminants. H2SITE is one of the ARENHA partners. His scientific work focuses on in situ H2 generation system based on advanced membrane reactors and membrane purification systems. More about this partner. https://h2site.eu ARENHA continues to present the basis of the project and the most recent discoveries, the result of the work of all our partners. The first week of July we will be in Lucerne, on the occasion of the Low Temperature Fuel Cells, Electrolysers & H2 Processing conference series. As we have already mentioned, green hydrogen is increasing its presence in sustainable projects. One of the most outstanding, without a doubt is the corridor that will carry this energy source between the towns of Algeciras and Rotterdam. https://tve.es/noticais/20230 From the ARENHA project, where we are developing a system to facilitate the transport of green hydrogen, we want to show our public support for this pioneering initiative. Hydrogen can be compressed, liquefied or converted into hydrogen-based fuels that have higher energy such as ammonia, methanol, etc., but the conversion and subsequent reconversion uses some energy. Hydrogen can be compressed, liquefied or converted into hydrogen-based fuels that have higher energy such as ammonia, methanol, etc., but the conversion and subsequent reconversion uses some energy. We recommend you to take a look at the sequence of newsletters available on the website, where the development of the research has been reported. https://bit.ly/3XJgth And if you want to receive the next newsletters https://bit.ly/3WyCASB ARENHA was represented at "The IFRF ToTem 49 on chemical energy carriers for long-term storage and long-distance transport of renewable energies", thanks to @ENGIEgroup. They p





09/06/2023	Ammonia is easily liquefied at 1 MPa and ambient temperature. It also presents a high hydrogen gravimetric density of 17.8 % by weight and simultaneously an impressive volumetric hydrogen density of 108 kg H2/m3 at 20°C and 8.6 bars.
07/06/2023	Phase 8 of the project focuses on project management during the realisation of the entire workplan:: Overall administrative, contractual and financial reporting Organization of project meetings Coordination of internal communication Risk planning
05/06/2023	Ammonia is the great ally for the energy transition in Europe. Proof of this is the 6th edition of the NH3 Event Europe, to be held on 8 and 9 June in the city of Rotterdam. https://nh3event.com
02/06/2023	Life Cycle Assessment (LCA) is a gate-to-gate assessment of the environmental impact associated with a given product. It provides a holistic view of environmental costs to cover all activities related to the product. https://bit.ly/3OsrWML
31/05/2023	Did you know that? Ammonia is the second most produced chemical compound in the world. It has a higher energy density than hydrogen. It is not considered a flammable product. https://tinyurl.com/y8pfbjus
29/05/2023	Until 2 June, we will be at the 18th International Symposium on Solid Oxide Fuel Cells, which is being held in Boston. This event brings scientists, engineers and researchers to present various projects related to electrolysers and solid oxide fuel cells. https://tinyurl.com/j8skzf84
24/05/2023	We echo the study related to the ARENHA Project, in which it has been analysed the development of adsorbents for the cleaning of hydrogen from the decomposition of ammonia in a catalytic membrane reactor. https://bit.ly/3pTqgln #Hydrogen #GreenEnergy #Energy #Ammonia
22/05/2023	In ARENHA the aim is to demonstrate that ammonia has the required assets to behave as an efficient and cost-effective CO2-free energy storage vector. This only holds true if ammonia production and decomposition are tightly integrated with renewable energy generation. #Greenenergy
18/05/2023	Green ammonia is produced with zero greenhouse gas emissions. Did you know that? This, together with its role as an element for storing and transporting energy, makes it a highly relevant ally for decarbonising energy consumption. https://arenha.eu
17/05/2023	The @cnh2_es is leading the seventh step of the ARENHA Work Plan. It aims to build on the previous work packages in order to capitalise on their results, through very specific communication and dissemination actions. https://bit.ly/3HYblwv
16/05/2023	Within a few years, recent studies predict that hydrogen will have the potential to supply 10-15 million cars and 500,000 trucks. In what year will this happen? Leave your comment and we'll reveal the answer in few days. https://arenha.eu
12/05/2023	We share the study published in Chemical Engineering Journal, on adsorbents development for hydrogen cleanup from ammonia decomposition in a catalytic membrane reactor. https://doi.org/10.1016/j.cej.
10/05/2023	The STFC is one of 9 research councils that make up UK Research and Innovation. Its work focuses on developing large research infrastructures, including the generation of ammonia using a wind generator. The ammonia is then used in an internal combustion engine to release energy.
09/05/2023	We have an appointment in Rotterdam. ARENHA will be present at the World Hydrogen Summit 2023, an event where companies and institutions will present and share the different solutions which have hydrogen as their main energy source. More infohttp://bit.ly/3n0ov4D
05/05/2023	These are some of the expected impacts of the Arenha project: Decrease energy import dependency Promote the integration of offshore renewables for energy dependency.
05/05/2023	Integration of renewable in power systems with large scale energy storage. Ammonia to diversify energy supply from third countries. Alternative energy import through renewable electricity storage and long distance transportation. https://arenha.eu #ARENHA
03/05/2023	Next week will take place one of the most important events for the promotion and support of hydrogen as an energy source that is revolutionizing the world. This is the World Hydrogen Summit 2023 and it will take place in Rotterdam. Here more info: https://bit.ly/3n0ov4D
02/05/2023	ARENHA's main objective is to demonstrate the complete value chain from energy to ammonia to use in TRL 5 and the potential of green ammonia to address the problem of pollution. https://arenha.eu #ARENHA #LCA #environmental #technology #technologies
27/04/2023	Publication by Valentina Cechetto, Luca Di Felice, Rocío Gutiérrez Martínez, Alba Arratibel Plazaola and Fausto Gallucci. They deal with the production of ultrapure hydrogen by ammonia decomposition in a catalytic membrane reactor. https://bit.ly/3KJ37sl
26/04/2023	The use of ammonia has burst onto the scene in various sectors as an efficient and sustainable fuel. The interest aroused has also encouraged research, with the aim of optimising its performance and finding new formulas that allow it to be used as an energy vector.
25/04/2023	Sixth step of the ARENHA workplan: the economic and safety assessment of the environmental LCA. Under the leadership of @ENGIEgroup, this will demonstrate the feasibility of the developed materials and technologies, providing information on the future use of the technologies.
20/04/2023	We echo the scientific publication by Valentina Cechetto, Luca Di Felice, José A. Medrano, Camel Makhloufi, Jon Zúñiga and Fausto Gallucci, who have studied H2 production via ammonia decomposition in a catalytic membrane reactor. https://doi.org/10.1016/j.fupr
19/04/2023	Hydrogen is an element with a lot of potential, with predictions that it will be present in up to 15 million cars and 500,000 trucks by 2030, although its use is also moving into industry, feedstock production, heating and powering buildings
17/04/2023	One of ARENHA's partners is @FraunhoferIKTS, a leading institution in the design and production of flat SOC cells and fuel cells, following a highly technological process. SOC technology makes it possible to implement the system for renewable hydrogen production and mobility.
13/04/2023	We share a scientific study developed by Jaysree Pan, Heine Anton Hansen and Tejs Vegge, who have studied vanadium oxynitrides as stable catalysts for the electrochemical reduction of nitrogen to ammonia, through the role of oxygen.
11/04/2023	Plant integration and validation. Proof of the concept will be carried out in relevant industrial environment, where main components will be tested at Puertollano by @cnh2_es for the demostration of the prototypes on ammonia-based energy storage system.





10/04/2023	Energy discharge processes studied in ARENHA tackle various applications: From ammonia decomposition into pure H2 for FCEV. Direct ammonia utilization on SOFCs for power. ICEs for mobility. https://bit.ly/3JU261g
06/04/2023	The @DTUtweet is one of the most important technical universities in Europe and is also one of ARENHA's partners. It has extensive experience in research on solid state ammonia storage and ammonia electrosynthesis, including experiments, simulations and applications.
04/04/2023	Why is it essential that we promote the use of hydrogen as an energy engine? Hydrogen contains more energy per unit mass than natural gas or gasoline, which makes it an important element to consider as a transport fuel. https://arenha.eu
03/04/2023	In order for ammonia to become a carrier of green hydrogen, the ARENHA project is based on three pillars: Green hydrogen production Ammonia synthesis Ammonia storage Ammonia dehydrogenation https://arenha.eu
30/03/2023	We illustrate the information about ARENHA in our presentation directory. In a schematic way and with multimedia resources, we explain the main details of the project, its objectives, deadlines and the development of the different actions by our partners. https://bit.ly/42nFhur
29/03/2023	Solid oxide fuel cells (SOFC) emerge in use as solid oxide electrolysis cells (SOEC). The general function of the SOEC at ARENHA is to generate pure hydrogen from steam, which will then be used in synthesis to generate ammonia. https://bit.ly/3JU261q
27/03/2023	Green corridors will be the big bet for the integration of renewable energy throughout Europe. Among the alternatives to achieve this objective, ammonia is a great ally, due to its high energy density, which makes it an excellent energy carrier. https://arenha.eu
23/03/2023	The 4th step of the work plan focuses on the scale-up of key components already worked on in WP3 as well as those for the pilot plant. The ammonia-based energy system is designed, built and commissioned.
22/03/2023	ARENHA Project @Arenha_H2020 We have included a directory of all these conferences on our website.
20/03/2023	technological developments achieved
20/03/2023	by the production sector to improve the competitiveness of companies and promote the implementation of hydrogen and fuel cell technologies.
16/03/2023	3 tem 3 of ARENHA's work plan has focused on the development of key components, prior to its final escalation to TRL 5. It includes the following actions:  Very New materials for SOEC stacks, optimised for hydrogen production.  Very Materials for ammonia synthesis
16/03/2023	<ul> <li>Materials for solid state storage of ammonia</li> <li>Membranes and membrane reactors for ammonia decomposition</li> <li>Materials and systems for the generation of energy from green ammonia</li> </ul>
15/03/2023	The latest newsletter, which we launched via email last December, is now available on the website. It is available on the newsletter page.
13/03/2023	Introducing the @TUeindhoven , ARENHA's partner dedicated to specialised research in engineering science and technology. Their Sustainable Process Engineering research group is being one of the pillars of our project.
13/03/2023	Their work focuses on the development of integrated reactors, based on improved knowledge and the use of advanced reactor models. This combines state-of-the-art numerical modelling, non-invasive experimental techniques and experimental demonstration of novel reactor concepts.
09/03/2023	Do you want to know more details about the objectives and studies developed in ARENHA?
08/03/2023	We are at your disposal to answer your questions and inform you about this fruitful project.  the http://bit.ly/3yeThch Low density and gas handling difficulties are the drawbacks of hydrogen, which have so far prevented its technologies from being applied in energy production
08/03/2023	One solution would be to store hydrogen in the chemical bonds of hydrogen-bearing compounds, such as ammonia.
06/03/2023	ARENHA has been published in the Issue 13 of The Innovation Platform. Check this info in the link below
06/03/2023	ARENHA is developing advanced SOECs for O Production of renewable hydrogen. Catalysts for low temperature/pressure ammonia synthesis. Solid sorbents for ammonia synthesis intensification and storage. Catalysts and membrane reactors for ammonia decomposition.
02/03/2023	The second point of the ARENHA work plan translates the general framework that has already been established in WP2.
02/03/2023	A set of specifications for the new value chain for energy storage, in line with the previous business model and end-user inputs. In addition, it will bring together all the modelling related to each technology and the complete system design.
27/02/2023	Energy discharge processes studied in AREINHA tackie various applications from ammonia decomposition into pure H2 for FCEV, direct ammonia utilization on SOFCs for power and ICEs for mobility.
23/02/2023	towards truly profitable techniques and sets the framework for high impact exploitation actions. @ENGIEgroup
22/02/2023	In total, 11 organisations from seven European countries are part of the ARENHA project, so that a complete supply chain has been created:  @@@etccnalia@@TUeindhoven@@cnh2_es@@DTUtweet@@FraunhoferIKTS@@UKRI_News@@protonventures@@Elcogen_EU@Hydrogen Onsite@@Stellantis@@ENGIEgroup
21/02/2023	Ammonia is characterised as a manageable, carbon-free energy carrier for large-scale energy storage. It thus ensures a clean supply covering a wide range of services. The Although it has been in use for several decades, its use in this context is reaching great heights.





16/02/2023	Exey components scale up Deltant integration and validation Environmental LCA, economic and safety assessment Dissemination and communication Project management
15/02/2023	Hydrogen reaction with oxygen produces in fact only water as by-product and high efficiencies for energy conversion are achieved when hydrogen is employed as feedstock for power production in fuel cells.
13/0322023	ARENHA stands for Advanced Materials and Reactors for ENergy Storage tHrough Ammonia, a name that perfectly defines the central aim of the project around ammonia as an excellent solution for flexible energy storage and use.
09/03/2023	Ammonia is traditionally produced from hydrogen and nitrogen, using the well-known Haber-Bosch process. The conversion is typically carried out at 150-250 bar and 400-500 °C, while the feed gas mixture is passed through a series of fixed beds containing an Fe-based catalyst.
09/03/2023	As the conversion in the reactor does not usually exceed 15 %, the unreacted components are recovered in the reactor, after separation of the ammonia product by quench condensation.
08/03/2023	Sectors such as transportation, industry, or thermal activities, which require greater energy storage capacity, will benefit the most from the advances we are working on at ARENHA.
06/03/2023	Since ARENHA started, our partners have been organising and participating in different dissemination events.
06/03/2023	The event calendar will continue to expand throughout 2023, with new activities in which we will continue to publicise the objectives set in ARENHA and the latest advances.
03/03/2023	In addition to being easy to liquefy, ammonia has a high hydrogen gravimetric density by weight and, in turn, by volume (108 kg h2/m3 of liquified NH3). This reduces the cost of transporting hydrogen per unit of stored energy, as well as acting as a CO2-free energy storage medium
01/03/2023	Find out the latest news about ARENHA in our newsletter, where we tell you about the latest developments in the project and how ammonia plays a role in the use of renewable energies.