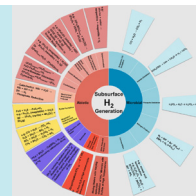


Geological Hydrogen Generation Network

1st Annual Meeting and Workshop 5th and 6th December 2024

Edinburgh Climate Change Institute (ECCEI), Edinburgh, Scotland, UK



Background

Our network has reached an exciting milestone, bringing together over 250 members from around the world! Following two successful online meetings, we're thrilled to host our first in-person annual meeting and workshop, in Edinburgh on December 5-6th. This gathering marks the official launch of our network, offering a unique opportunity to connect, collaborate, and advance the field of subsurface hydrogen generation. We look forward to welcoming you as we embark on this next chapter together!

Aim

Here the aim is to connect experts, enthusiasts, and professionals interested in natural hydrogen, hydrogen farming in subsurface, and in situ hydrogen generation from fossil fuels in subsurface. This network and workshop is aimed to facilitate collaboration, knowledge exchange, and innovation in this field.

Agenda Day 1

9:00-9:30	Registration/ Coffee Breakfast/ Networking
9:30-9:35	Welcome: Dr Ali Hassanpouryouzband
9:35-9:55	Professor Stuart Haszeldine, University of Edinburgh
09:55-10:15	Building Confidence in Modeling and Simulation of Hydrogen-Driven Processes in Subsurface Reservoirs Professor Hadi Hajibeygi, Delft University of Technology
10:15-10:35	Initiating Low-Temperature Hydrogen Generation Testing from Granites, an Australian Example Dr Ema Frery, CSIRO
10:35-10:55	Hydrogen Formation from Alteration of Ultramafics Professor Helge Hellevang, University of Oslo
10:55-11:30	Coffee Break
11:30-11:50	The Rise of Publicly Traded Natural Hydrogen Companies: What it Means for Investors and the Industry Morten Stahl, Natural Hydrogen Ventures
11:50-12:10	The HyAfrica Project, Accessing Natural Hydrogen Resources and Socioeconomic Impacts in African Countries Paulo Mesquita, Universidade de Évora
12:10-12:30	Subsurface Monitoring of Hydrogen-Saturated Rock: Limits and Opportunities. Professor David Iacopini, Università di Napoli, Federico II
12:30-13:30	Lunch Time
13:30-13:50	Phase Behaviour and Thermophysical Properties of Hydrogen Mixtures Professor Antonin Chapoy, Heriot-Watt University
13:50-14:10	Microbial Hydrogen Metabolism and Hydrogen Fluid Flow in Subsurface Porous Media Dr Eike Marie Thaysen, IDAEA-CSIC
14:10-14:30	Hydrogen Generation from Radiolysis Dr Sean McMahon, University of Edinburgh
14:30-14:50	Making Natural Hydrogen a Technically and Economically Viable Energy Source Stefano Bagala, BatiGea Ltd
14:50-15:05	Questions and discussion session
15:00-15:30	Tea break
15:30-16:30	Panel discussion on Natural Hydrogen Commercialisation: Tom Sandison (Shell), Morten Stahl (Natural Hydrogen), Dennis Donald (ES Hydrogen), Romain Viguier (SCCS)
16:30-17:00	Mentimeter Discussion on Future of Network Everyone involved
17:00-18:30	Drink Reception, Edinburgh Climate Change Institute
19:00	Dinner

Day 2

9:00-9:30	Welcome Coffee Breakfast/ Networking
9:30-9:35	Hydrogen Farming Professor Mark Wilkinson, University of Edinburgh
9:35-9:55	Understanding the Reactivity of natural Hydrogen in Sandstone Formations using Molecular Dynamics Simulations Dr Anh Phan, University of Surrey
09:55-10:15	Hydrogen Flow in Subsurface Dr Saeid Ataei, University of Edinburgh
10:15-10:35	Beneath the Surface: Exploring the Role of Microbes in Hydrogen Generation Dr Verena Nikeleit, NORCE
10:35-10:55	From Hydrogen Generation to Storage: Assessing Geomechanical Alteration Challenges Dr Milad Naderloo, Delft University of Technology
10:55-11:30	Coffee Break
11:30-11:50	Chemical Aspects of Geological Hydrogen Formation and its Synergy with Geothermal Systems. Dr Vinicius Kartnaller, UFRJ
11:50-12:10	Thermal Maturity of Source Rocks - Laboratory Experiments for Hydrocarbons and Hydrogen Generation Dr Vinicius Ottonio Oliveira Gonçalves, UFRJ
12:10-12:30	Environmental Impacts of Anthropogenic Hydrogen Leakage to the Atmosphere Professor David Stevenson, University of Edinburgh
12:30-13:30	Lunch Time
13:30-13:50	Ongoing Research to Extend the Risk-Based Well Leakage Modelling Framework for Well Integrity Assessment in Geological Hydrogen Production Dr Morteza Haghghat Sefat, Heriot-Watt University
13:50- 14:10	Exploration for Natural Hydrogen in the UK: Prospective Basins and the Challenge of Monitoring for Gas Dr Tim Armitage, British Geological Survey
14:10-14:30	Hydrogen Adsorption in Clay Minerals and Shales Dr Mohammad Masoudi, Sintef /Oslo University
14:30-14:50	Native Hydrogen Emissions Dr Olivier Sissman, IFPEN
14:50-15:05	Questions and discussion
15:00-15:30	Tea break
15:30-16:30	Panel discussion on worldwide hydrogen generation potential: Mostafa Tavan (James Hutton Institute), Dr Ema Frey (CSIRO), Dr Tim Armitage (BGS)
16:30-16:50	Closing remark: Dr Ali Hassanpouryouzband University of Edinburgh
17:00	Workshop Ends

Speaker Bios



Dr Aliakbar Hassanpouryouzband GeHyGeNet Founder and Workshop Chair

Aliakbar Hassanpouryouzband is Chancellor's Fellow in Net Zero Technologies (since 2023) at the School of Geosciences, University of Edinburgh. He started his journey there in 2019 as a postdoctoral research associate. His research focuses on CCUS and large-scale sustainable energy generation, transport, and storage with particular focus on hydrogen. He completed his PhD at Heriot-Watt University in 2019, specializing in low-carbon energy production and CO₂ capture and storage, a part of which was conducted at MIT's Molecular Engineering Laboratory. Aliakbar received his BSc (2013) and MSc (2015) in Petroleum Engineering from Sharif University of Technology.



Dr Romain Viguiet Business Development manager

Romain Viguiet specialises in industry engagement, commercialisation, innovation management, and project management. He has developed long-term strategic relationships with key stakeholders across major industrial sectors, including bioenergy, hydrogen, food & drink, oil & gas, petrochemicals, steel & cement, and numerous SMEs. Romain has organised industry events, facilitated technical meetings, and has initiated and supported the development of successful international research collaborations and large-scale research projects involving industrial partners and diverse stakeholders.



Professor R. Stuart Haszeldine Professor of Carbon Capture and Storage at the University of Edinburgh

Director of SCCS. He has 45 years experience working with subsurface information from hydrocarbon extraction to waste disposal. His University group focusses on CO₂ storage geology, with a particular emphasis on natural analogues, containment processes and subsurface pressures. Stuart was awarded the Scottish Science Prize in 1999, elected Fellow of the Royal Society of Edinburgh in 2003, appointed OBE for services to climate change technologies in 2012, and in 2021 he was awarded the Energy Medal by the Geological Society of London.



Professor Hadi Hajibeygi,
Delft University of Technology

Professor of geo-energy solid and fluid mechanics at TU Delft Hadi Hajibeygi is also the Theme Lead of Subsurface Storage. He serves as the Science Lead of the IEA TCP 42 on Underground Hydrogen Storage. Hadi holds PhD (with medal) from ETH Zurich in Fluid Dynamics and did a postdoc at Stanford Energy Resources Engineering until 2013 when he joined TU Delft.



Dr Ema Frery,
CSIRO

Dr Emanuelle Frery, Senior research scientist leading a research team at the CSIRO, the Australian Science institute. Her team focus on natural hydrogen systems and CCS with a multidisciplinary approach, from the lab to the field. She acquired a worldwide academic expertise in structural geology with a PhD thesis on the fluid and gas circulation along natural faults recorded in the well-known red sandstone of the Colorado Plateau and her implication in the IODP research on active serpentinite mud volcanoes. She is an expert of risk assessment of energy production impact on the environment and socio-economical assets and acted as deputy lead in the \$34.5 million GBA programme.



Professor Helge Hellevang,
University of Oslo

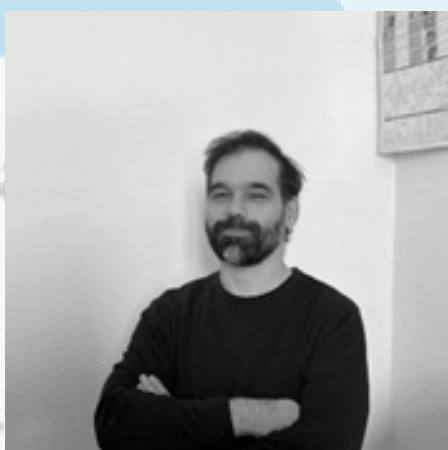
A prominent geoscientist and Head of the Environmental Geoscience Section at the University of Oslo. Specializing in subsurface CO₂ storage, natural hydrogen systems, and geochemical processes, he leads research on geological aspects of carbon capture and storage (CCS) and hydrogen storage, focusing on mineral-fluid interactions and sustainable energy solutions. With a PhD in geosciences, Professor Hellevang's work advances understanding of subsurface environments and reactions crucial for climate mitigation. Widely published and a frequent collaborator, he contributes significantly to sustainable energy research and policy development worldwide.



Morten Stahl,
Natural Hydrogen Ventures

“Morten is an entrepreneur, seasoned climate tech investor, and the founder of Natural Hydrogen Ventures (NHV)—the world’s first investment fund specializing in the emerging natural hydrogen industry. The fund invests globally in both exploration and related technologies and recently completed its second investment in the sector. He is a recognized expert with a comprehensive view of the natural hydrogen industry, with a focus on commercialization, market access, certification, technology, project financing, and of course investment. Leveraging years of experience tracking private natural hydrogen companies, Morten and his team recently launched the NHV NatH2Index—the world’s first index tracking the 10 most relevant publicly traded natural hydrogen companies.

Investing like a good ancestor, Morten’s goal of achieving “profitable impact” is driven by his desire to “be a good ancestor,” investing to ensure that his kids will be financially secure on a livable planet.”



Dr Paulo Mesquita,
Universidade de Évora

Graduated with a degree in Environmental Biophysics Engineering and a master’s degree in Geographic Information Systems and Science, over ten years of experience as geospatial analyst specializing in Environmental and Earth Sciences research. Current research interests are CCUS and natural Hydrogen in the HyAfrica project



Professor David Iacopini,
Università di Napoli, Federico II

Associate professor of subsurface and marine geology at the University of Naples Federico II (Italy), David graduated and received a PhD on structural geology working on metamorphic basement (Variscan basement and Himalayan tectonics) and then shifted his career into marine geology, interpretation of seismic data and subsurface exploration including oil and gas and storage geology. His current research activities partly re focused on hydrogen storage including coordinating the EU project on Hydrogen storage across porous media (SHINE, Marie Curie ETN), a national project on Salt storage (PNRR MIUR with the support of ENI). He is part of an experiment using Muon physics to image salt cavern (PNRR MIUR) and of the PNRR -NEST research network (storage). His group includes several PhD students working on various aspects of subsurface storage and rock physics.



Professor Antonin Chapoy,
Heriot-Watt University

Prof Antonin Chapoy (AC) is a Professorial Fellow at Heriot-Watt University. Following completion of his PhD in Chemical Engineering (Paris School of Mines, France, 2004), he joined the Hydrates, Flow Assurance & Phase Equilibria Research Group-HFAPE at Heriot-Watt. He has over 20 years research experience of gas hydrate, hydrocarbon/acid gas phase behaviour and thermodynamics, and has managed a wide range of projects, predominately sponsored by industry. His research interests include thermodynamics, equation of state, gas hydrates, flow assurance, phase behaviour and properties of reservoir fluids, refrigerant fluids and acid gas systems. He is first or co-author on over 200 refereed journals and conference publications, primarily concerning gas hydrates, flow assurance, transport properties and water-hydrocarbon phase behaviour. He has supervised as first or second supervisors over 25 PhD students some jointly with international partners.



Dr Eike Marie Thaysen,
IDAEA-CSIC

Eike graduated as a PhD from the Danish Technical University in strategies to enhance passive CO₂ storage in aquifers. Subsequently, Eike has worked as a post-doctoral researcher in Denmark, Spain and the UK. Her research areas include biogeochemical cycling of carbon and hydrogen, the effect of climate change on global ecosystems, global climate change mitigation technologies as well as energy storage technologies that can secure a low carbon energy future, in particular H₂ storage. Eike currently lives in Barcelona where she manages and researches on a European Project on groundwater quality but she is keeping a finger on the pulse of hydrogen related research. She has recently been successful in attracting funding for the EU project Hydra- Diagnostic Tools and Risk Protocols To Accelerate Underground Hydrogen Storage- which will start in January 2025.



Dr Sean McMahon,
University of Edinburgh

Sean McMahon has diverse research interests at the interface of palaeontology, microbiology, planetary science, and astrobiology. He is a Reader in the School of GeoSciences and the School of Physics & Astronomy at the University of Edinburgh, where he co-directs the UK Centre for Astrobiology and leads the Planetary Palaeobiology Group. He received his PhD (in Geology) from the University of Aberdeen in 2014 and came back to Scotland as a Marie Skłodowska-Curie Fellow in 2017 after three years of postdoctoral work at Yale University in the US. Sean's interest in natural hydrogen production relates to the potential for H₂ to support subsurface microbial life on Earth, Mars and other planetary bodies.



Dr Stefano Bagala,
BatiGea Ltd

Holds a PhD in Applied Geology from the University of Padova, and a Master of Business Administration from the Robert Gordon University. He has 23 years of experience working in the oil and gas industry for Service Companies and Operators. He is managing director and founder of BatiGea Ltd, a consultancy company for Renewables, Oil and Gas and Mining. Since 2019, he has been actively involved in energy storage and carbon storage projects. Finally, he acts as Vice President of Subsurface Technologies for Energy Internet Corporation, an American technology company that is developing the next generation of Isothermal Compressed Air Energy Storage.



Tom Sandison
(Shell)

Tom Sandison is a geologist by background, joining Shell in 2009 where he has worked in both production and exploration roles globally. Tom began his hydrogen career in 2022 as a business development manager in Shell's hydrogen line of business, initially focussed on green and blue hydrogen project origination. Tom now leads projects for Shell's Upstream Energy Transition Ventures team that focusses on subsurface related energy transition themes.



Professor Mark Wilkinson,
University of Edinburgh

Mark Wilkinson studied geology at the University of Oxford, UK, followed by a PhD at the University of Leicester, UK, about geochemistry of sedimentary rocks. He is Senior Lecturer in Geological CO₂ Storage at the University of Edinburgh, UK. Recent papers focus on geological carbon storage and underground hydrogen storage, to decarbonise energy and industrial activity. Mark co-created the Masters in GeoEnergy degree at the University of Edinburgh, a World-first at the time. He teaches field geology and energy-related applied geology, and has co-created a Massive Open Online Course (MOOC) about CCS and climate change.



Dr Anh Phan,
University of Surrey

Dr Anh Phan is Lecturer in Chemical Engineering at University of Surrey. Her research builds on thermodynamics and transport knowledge, acquired in the Chemical Engineering curriculum, using synergistical combination of analytical theory and advanced simulation techniques (ranging in scale from the atomic, molecular, to the coarse-grained levels) to quantify how interfaces affect the properties of fluids. Before joining Surrey, she was a post-doctoral research associate in the Chemical Engineering Department at University College London (UCL) from July 2018 to December 2021, where she contributed to the Horizon 2020 project Science4CleanEnergy (S4CE) and the hydrate management project in collaboration with Colorado School of Mines. Before UCL, she was a Research Scientist in Institute of High-Performance Computing, A*STAR, Singapore, from June 2017 to June 2018. She was awarded her Ph.D. in Chemical Engineering from UCL in 2016 after transferring her study at the University of Oklahoma in 2013.



Dr Saeid Ataei,
University of Edinburgh

Saeid has 10+ years of experience in CCS, environmental science, and energy. He has collaborated with industry stakeholders such as ADNOC, BP, BRGM, ConocoPhillips, Repsol, Shell, Total, and Woodside Energy through regular meetings, discussions, and technical reports, delivering multi million pound projects.



Dr Verena Nikeleit,
NORCE

Verena Nikeleit perused studies in environmental science and geocology, completing her PhD in 2024 in geomicrobiology at the University in Tübingen, Germany. Her PhD research focused on the influence of organic and inorganic substrates on the Fe(II) oxidation by metabolic flexible phototrophs.

Since 2024 she joined NORCE as a Post Doc in the Subsurface Energy Solution group. She is part of the MOCHyS project focusing on the enrichment and characterisation of hydrogen consuming bacteria.



Dr Milad Naderloo,
Delft University of Technology

Milad Naderloo is a researcher in the field of Geomechanics and Applied Geophysics, currently embarking on a postdoctoral journey at TU Delft. With a foundation in rock mechanics from the University of Tehran and a Ph.D. focused on geomechanics and petrophysics from TU Delft, Milad has honed his expertise in induced seismicity, fault mechanics, passive acoustics, and rock deformation experiments. His primary research focuses on understanding the deformation of reservoirs and the reactivation of faults associated with energy storage projects, such as underground hydrogen and CO₂ storage, as well as geothermal energy. Milad's current postdoctoral research delves into the interactions between hydrogen and rock formations, exploring its implications on reservoir geomechanics, a critical aspect of sustainable energy solutions.



Dr Vinicius Kartnaller,
UFRJ

Vinicius Kartnaller earned his bachelor's degree in Chemistry with Technological Attributes from the Federal University of Rio de Janeiro (2013), followed by a master's degree in Science (Chemistry) in 2014 and a PhD in Science (Chemistry) in 2018, all from the Federal University of Rio de Janeiro. He is currently an Associate Professor at the Federal University of Rio de Janeiro (UFRJ) and a member of the Real-Time Chemical Process and Analysis Development Center (NQTR). His research focuses on advancing analytical methodologies, chemometrics, and artificial intelligence for data analysis and mathematical modeling, with applications in: (i) monitoring and understanding the kinetics of organic and inorganic reactions; (ii) predicting physicochemical parameters of petroleum using instrumental analysis; (iii) preventing scale formation in oil and gas production; (iv) evaluating artificial maturation methods for organic matter in source rocks; and (v) developing strategies for improving CCUS. He works closely with both academic institutions and industry partners to apply research findings to practical challenges in chemistry and related sectors.



Dr Vinicius Ottonio Oliveira Gonçalves,
UFRJ

Associate Professor in the Department of Physical Chemistry at the Federal University of Rio de Janeiro.

His academic background includes a degree in Chemical Engineering with a Ph.D. in Organic, Mineral, and Industrial Chemistry.

He is part of the coordination board of the laboratory Núcleo de Desenvolvimento de Processos e Análises Químicas em Tempo Real (NQTR), engaging activities involving high pressure (up to 30.000 psi) and high temperature (up to 700 °C). His contributions provide high-quality industrial support in areas such as Petroleum Flow Assurance and Petroleum Organic Geochemistry.

His research interests in Petroleum Organic Geochemistry encompass a broad range of topics, including hydrous pyrolysis, thermal maturity, source rock and oil reservoir thermal alteration, cracking, micro-scale sealed vessel, pyrolysis, carbon capture and storage (CCS), porous media, and core flooding.

In the field of Flow Assurance, his areas of focus include scale formation, inhibitors evaluation, wax, asphaltenes, squeeze, natural gas hydrates, polymorphism, physico-chemical equilibrium, and image analysis for solid formation.



Professor David Stevenson,
University of Edinburgh

David Stevenson is Chair in Atmospheric Chemistry Modelling at The University of Edinburgh. He initially worked at the Met Office, building and applying some of the first global coupled climate-chemistry models, before moving to The University of Edinburgh about 25 years ago. He has been a contributing author to several IPCC reports, in the areas of tropospheric ozone radiative forcing and changes in atmospheric oxidants and methane. He currently works on three projects that are developing and using the latest generation Earth System models to assess the climate impacts of hydrogen emissions, funded by the Norwegian Research Council, the UK's Natural Environment Research Council, and the European Commission.



Dr Morteza Haghghat Sefat,
Heriot-Watt University

Dr. Morteza Sefat is an Associate Professor at Heriot-Watt University, where he leads research in well decommissioning and well integrity assessment. He also directs and co-directs various other teaching, research, and consultancy activities in the area of drilling engineering, well design and advanced well completions. Morteza holds bachelor's, master's, and PhD degrees in petroleum engineering and had previously worked in the petroleum industry



Dr Tim Armitage,
British Geological Survey

Dr Tim Armitage is a Geoscientist at the British Geological Survey (BGS) Energy Storage research group where he investigates the geological storage for energy, such as through underground hydrogen storage in salt caverns and depleted gas fields, and investigates the natural occurrence of hydrogen. Tim has a strong technical background founded by a PhD and postdoc in geoscience and geoenergy. During his postdoc, Tim produced the UK Integrated Hydrogen Storage Database, an open-access GIS tool that helps pre-feasibility studies to co-locate hydrogen storage with production, transport, and demand. His technical skillset is coupled with experience of the wider energy system and hydrogen policy landscape gained through consultancy for energy producers, gas distribution networks, market regulators and government on hydrogen storage in the UK. Of note, he has helped shape the UK Government's Hydrogen Storage Business Model, a seminal piece of government support enhancing UK hydrogen storage capacity, and has presented evidence on hydrogen storage to the House of Lords as part of an inquiry into Long Duration Energy Storage. Tim promotes the need for a clean decarbonised power grid, enabled through energy storage and natural hydrogen balancing intermittent renewable energy.



Dr Mohammad Masoudi,
Sintef /Oslo University

Mohammad masoudi is a research scientist at SINTEF Industry. He hold a PhD on Environmental Geosciences from the University of Oslo. He has done a postdoc on Hydrogen storage at the university of Oslo. He has been doing research on water/gas/rock interactions during CO₂ and H₂ storage for the last 6 years



Dr Olivier Sissman,
IFPEN

Olivier Sissmann is a geochemist who obtained a BSc in Geology from the University of Queensland, Australia, before travelling back to France to obtain a PhD on CO₂ mineral storage from Institut de Physique du Globe de Paris and Ecole Normale Supérieure. He then joined IFP Energies Nouvelles as a research scientist, where he has been working on native H₂ emissions ever since, collecting associated rock and gas samples around the globe whenever the opportunity arose. He remains an associate lecturer at Institut de Physique du Globe de Paris, where he teaches about subsurface energy resources, and is co-leader of the IEA Task 49 on Native Hydrogen. He specializes in stable isotope analysis, HP/HT experiments, and fluid rock interactions modeling. He's on a quest to discover which processes control the formation of abiotic organic compounds and the appearance of the building blocks of life, in H₂-rich subsurface environments. When he's not doing any of that, he loves to play a good game of Go or delve into sci-fi.



Mostafa Tavan ,
(James Hutton Institute)

Mostafa Tavana is a Geographic Information System (GIS) Developer at the James Hutton Institute, contributing to the Information and Computational Sciences department. His work involves analyzing spatial data to support environmental and agricultural research.

