

# THE GLOBAL PLATFORM WHERE HYDROGEN BUSINESS GETS DONE

PRODUCED BY:



IN PARTNERSHIP WITH:



## 2<sup>ND</sup> WORLD HYDROGEN SUMMIT

9 - 11 MARCH 2021 | VIRTUAL SUMMIT

# EXECUTIVE SUMMARY



PRODUCED BY:



IN PARTNERSHIP WITH:



## With Thanks to Our Partners & Sponsors

PRINCIPAL PARTNERS

LEAD SPONSOR

HOST SPONSOR



DIAMOND SPONSOR

GOLD SPONSORS



SILVER SPONSORS

EVENT PARTNER



BRONZE SPONSORS



PRODUCED BY:



IN PARTNERSHIP WITH:



## Editor's note

Hype or Hope? Hydrogen has been hailed as the element that cried “viable!” for the last few decades. Today the consensual support behind Hydrogen is unprecedented and the discussions to integrate the energy vector have moved from “if” to “how”. Our delegates will remember the lively debates in Amsterdam at our inaugural World Hydrogen Summit just 12 months ago which now seem obsolete given the speed of progress since then.

The year 2020 will be remembered by many as a year of chaos and precarity, and yet this was the year many governments decided to bet on Hydrogen for the security, the prosperity and the environmental health of its citizens, with over 30 national hydrogen strategies released as part of official energy plans and decarbonisation projects with the global private sector.

Perhaps circumstances helped these changes to pass under the radar for many, but today the global commitment to carbon neutrality and the undeniable severity of climate change is compounded by our economies' needs to recover and grow sustainability into our post-COVID futures. To the Sustainable Energy Council, the time to debate the viability of Hydrogen has now passed and we are honoured to bring the leaders of our global energy future together to catalyse new Hydrogen achievements.

At the World Hydrogen Summit, we discuss the politics, the economics, the chemistry, the physics and – most apprehensively for many, the financial mathematics behind all of it as we gear up for 2030, 2050 and beyond.

Next year, we will return to Rotterdam on the 9th and 10th of March 2022 to once again strengthen cross sector ties, take over Hydrogen missing links and expand global strategies towards a sustainable energy future.

I look forward to seeing you there, and I encourage you to get in touch with the team to discover how you can get involved in the summit and exhibition.

**Soizic Le Lesle Fauvelle**

Producer

**Sustainable Energy Council**

## Summit Day 1 - Tuesday 9th March 2021

**Ahmed Aboutaleb**, Mayor of our digital co-host the **City of Rotterdam** kicks off the opening addresses. The city of Rotterdam's sustainable efforts are well underway and the city budget has been taking advantage of energy cost savings from low carbon energy solutions for years now. It has kicked into a new gear with the embrace of Hydrogen, the next major step for the city according to the Mayor who affirms – Green Hydrogen IS the future.

The city of Rotterdam and Port Authority are working closely together in their shared conviction that Hydrogen will help us meet our climate goals IF we succeed to switch from fossil sources to hydrogen. A circular economy and growing green energy potential are the current priorities, and the vision is clear: the local reduction will meet the required national target as described in the Paris Agreement.



**Ahmed Aboutaleb**, Mayor, **City of Rotterdam**

**Bart Biebuyck**, Executive Director, **Fuel Cells & Hydrogen Joint Undertaking (FCHJU)** shares existing achievements from the FCHJU. The Public Private Partnership is partnered by Hydrogen Europe, and the European Commission who fund the R&I projects, resulting in 285 projects supported by about 1.07 billion euros of public money. 1.08 billion euros have been spent by the private sector since 2008, therefore over 2 billion has been spent to date on energy, as well as transport and the cross curing of standardisation, safety and so on.

Ports are a huge opportunity for sectoral integration through hydrogen as commercial hubs and Executive Director Biebuyck makes a call for ports that are keen to get involved and be part of the worldwide Hydrogen Ports coalition, a current project in the work in partnership with CEM (Clean Energy Ministerial) that will be more commonly known in the summer.

To realise the sectoral integration, we need to scale up electrolysis of course and this has been a mission for years and have already decreased cost and increased capacity. The European Green deal call received 16 proposals last year demonstrating huge appetite to reach the multi gigawatt scale.

Their new project CertifHy enables guarantees of origins for hydrogen on a platform across Europe in order to roll out this scheme across all member states in Europe, with the involvement of various regulators.



Finally, the fuel Cells and Hydrogen Observatory was made as a go-to resource for user friendly content covering the global FCH sector.

**Bart Biebuyck**, Executive Director, **Fuel Cells & Hydrogen Joint Undertaking (FCHJU)**

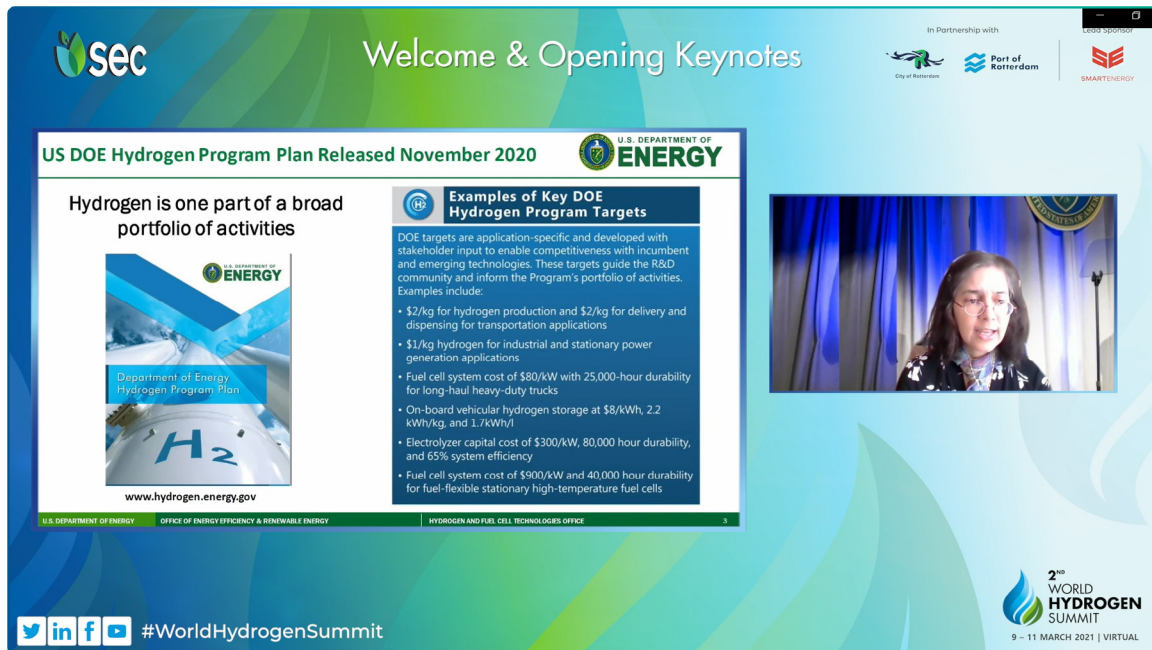
The next speaker provides an Overview of Hydrogen and Fuel Cell Activities by **Dr. Sunita Satyapal**, Director, Hydrogen and Fuel Cell Technologies Office, Office of Energy Efficiency and Renewable Energy, **U.S. Department of Energy**.

Today the US has thousands of fuel cell systems and the capacity for about 14 Megawatts of PEM electrolyzers, and there are clear growing interests to reach Gigawatt scale.

Dr Satyapal highlights it is important to note we have a huge challenge in driving costs down and not overhype hydrogen. In the new administration, there are budgets and strategies specifically targeted at addressing very strong concrete goals – net zero emissions by 2050.

The USA has a long-term strategic plan to cover all stages beyond production - delivery and storage: the USA already has over 16000 miles of pipelines and the worlds’ largest hydrogen cavern, and now conversion at larger scale - storage and chemical carriers and conversion technologies focusing on turbines and fuel cells over to application.

Dr Satyapal is also part of the IPHE which has launched an early career network to champion education, inclusion and outreach on the platform and nurture early careers in policy, energy and leadership and encourages prospective members to get involved and read up on the global center for hydrogen safety which provides training and resources around key safety questions.



The screenshot shows a presentation slide with the following content:

- sec** logo in the top left.
- Welcome & Opening Keynotes** title in the top center.
- Partnership logos for City of Rotterdam, Port of Rotterdam, and SMARTENERGY in the top right.
- US DOE Hydrogen Program Plan Released November 2020** header with the U.S. DEPARTMENT OF ENERGY logo.
- Hydrogen is one part of a broad portfolio of activities** sub-header.
- A thumbnail image of the 'Department of Energy Hydrogen Program Plan' document.
- Examples of Key DOE Hydrogen Program Targets** section with a list of targets:
  - \$2/kg for hydrogen production and \$2/kg for delivery and dispensing for transportation applications
  - \$1/kg hydrogen for industrial and stationary power generation applications
  - Fuel cell system cost of \$80/kW with 25,000-hour durability for long-haul heavy-duty trucks
  - On-board vehicular hydrogen storage at \$8/kWh, 2.2 kWh/kg, and 1.7kWh/l
  - Electrolyzer capital cost of \$300/kW, 80,000 hour durability, and 65% system efficiency
  - Fuel cell system cost of \$900/kW and 40,000 hour durability for fuel-flexible stationary high-temperature fuel cells
- A video feed of a speaker on the right side.
- Footer with social media icons, **#WorldHydrogenSummit**, and the **2nd World Hydrogen Summit** logo with dates **9 - 11 MARCH 2021 | VIRTUAL**.

**Dr. Sunita Satyapal**, Director, Hydrogen and Fuel Cell Technologies Office, Office of Energy Efficiency and Renewable Energy, **U.S. Department of Energy**

**Prof. Ad Van Wijk**, Professor Future Energy Systems, **TU Delft** highlights an important update, over 30 countries have released hydrogen strategies and now so has the European Union. Prof. Van Wijk affirms “Hydrogen is necessary to decarbonise hard to abate sectors but over time even more importantly to store and transport cheap solar and wind electricity all over the world.”

Like electricity, Hydrogen is an energy carrier, so it is necessarily produced from an energy resource. Electrolysis is important, as are production methods like thermal pyrolysis which entails producing hydrogen from natural gas and fixed carbon without carbon emissions. You can also produce Syngas from biogenic waste and convert it to Hydrogen and CO<sub>2</sub>, then use the green CO<sub>2</sub> as a feedstock for chemicals production and thereby negate the CO<sub>2</sub> emissions by replacing the use of other fossil fuel emissions.

Europe has good resources to produce green hydrogen, but neighbouring countries (e.g., in the North Africa region) have even better renewable resources, so it is in both interests to explore green hydrogen potential on either side of these borders and look at opportunities in the realisation of a Gas Infrastructure between Europe and from North Africa.

Prof. Van Wijk ends by addressing Governments appealing to regulators to include not only a central approach in their energy policy planning, but also spatial planning and trade to unleash large scale energy and hydrogen production potential.

Acting as spokesperson for our co-host, **Allard Castelein**, President & CEO, **Port of Rotterdam Authority** shares the port is gearing up for substantial hydrogen imports as the North Sea is not enough to meet domestic demands, and entertaining conversations with countless governments and companies. Rotterdam is the energy hub of North Western Europe, and only a third of energy arriving here is consumed domestically.

With the leadership from national and regional governments, Port of Rotterdam is working with Uniper, Nouryon, Gasunie, Shell, Air Liquide and many more, setting up simultaneous projects in partnership with companies and governments that will together realise all stages of the hydrogen value chain, from the production of green and blue hydrogen to the development of a hydrogen trading platform.

Shipping costs are not a showstopper when the shipping industry will shift to more sustainable fuels, in fact shipping will be the solution according to Castelein. Using existing gas networks for the first years of new energy flows between Germany and the Netherlands will be a viable short-term solution. Looking at the longer term, public authorities will need to coordinate partnerships for the setting up of new infrastructure for longer term use, which will in turn stimulate new activities in the economy to encourage commercial partners. This entails demanding cooperation from key players and the Port of Rotterdam is committed to playing their part.



Allard Castelein, President & CEO, **Port of Rotterdam Authority**

**Tudor Constantinescu**, Principal Adviser to the Director General for Energy, **European Commission** opens our finance and policy session by sharing the European Green Deal's Road map to 2050 and the European Commissions' focus on creating the new markets that will arise from new fuels and new infrastructure.

By 2024, the scaling up of electrolysis is set to 6 GW, with regulation for liquid hydrogen markets, replacement of existing hydrogen production and the planning of critical hydrogen infrastructure.

By 2030, 40 GW should be reached as well as new applications in steel and transport, hydrogen for electricity balancing purposes, the realisation of Hydrogen Valleys and cross-border logistic infrastructure.

By 2050, it is expected that hard to abate sectors will be scaled up and hydrogen-derived synthetic fuels will be expanded through an EU-wide network with an open international market with the euro as a pricing benchmark.

The Hydrogen Investment agenda is based around Next Generation EU, Invest EU, Cohesion Policy, CEF-E, CEF-T, ETS Innovation Fund and Horizon Europe to reach these very concrete goals, but Constantinescu notes that for these, the expenditure requirement is in the hundreds of billions of euros.



**The Hydrogen Strategy – a roadmap to 2050**

- 2024**
  - 6 GW of renewable hydrogen electrolyzers
  - Replace existing hydrogen production
  - Regulation for liquid hydrogen markets
  - Planning of hydrogen infrastructure
- 2030**
  - 40 GW of renewable hydrogen electrolyzers
  - New applications in steel and transport
  - Hydrogen for electricity balancing purposes
  - Creation of "Hydrogen Valleys"
  - Cross-border logistical infrastructure
- 2050**
  - Scale-up to all hard-to-decarbonise sectors
  - Expansion of hydrogen-derived synthetic fuels
  - EU-wide infrastructure network
  - An open international market with € as benchmark

#WorldHydrogenSummit

9 – 11 MARCH 2021 | VIRTUAL

**Tudor Constantinescu**, Principal Adviser to the Director General for Energy, **European Commission**

Some of the funds will come from the European Commission but it is of course also needed from private. Our next speaker, **Dr Joaquin Narro**, Managing Director, **Alcazar** has a very clear stance on the topic - low carbon hydrogen uniformity is required to draw investment, and therefore hydrogen needs to be, as it is beginning to be, commoditised. The path to commoditisation is full of opportunities, but also riddled with risk, and Dr Narro wants to share how you can take advantage of current hydrogen opportunities while avoiding the pitfalls, armed with Alcazar's quantitative knowledge of the full stakeholder ecosystem.

It is crucial for players to evaluate risk appetites against the potential outcomes in the multiple possible scenarios. According to Dr Narro, some of those scenarios are still riddled with deterring regulatory uncertainty. Dr Narro is looking at quantifying multiple scenarios, identifying and contractualising factors relating to risk and gain in order to protect investor interests looking to take advantage of the moment in time to "be first".

Thanks to these Green Hydrogen investment opportunities, we know how these big targets translate in terms of renewable energy projections, and we have the concrete electrolysis capacity figures in gigawatts stating the resulting timelines. **Christian Pho Duc**, Managing Director H2 Projects, **Smartenergy** shares that from their perspective adding H2 to their RES portfolio is both an investment opportunity and a hedging mechanism to reduce risk on pure photovoltaic and wind investments. We know we have the electrolysis capacities in the pipeline (no pun intended), and Christian says the investment opportunity lies in the off taking side. Smartenergy is partnered with 8 partners for Project Setup ORANGE.BAT in Spain, which is dedicated to creating a compelling business case across the value chain to attract investment appetite.

The price for CO2 emissions is expected to increase sharply in the next period and several industries will be under financial pressure to decarbonise. These will be the markets who will need to move first, and one example that is engaging with Smart Energy is the Ceramics and Cement industry. 95% of the industry is constrained in Valencia, responsible for 33% of carbon emissions for the entire region and therefore facing with a pressing need to invest innovation and change.

Christian Pho Duc moderates the following panel joined by panellists **Astrid Behaghel**, Energy Transition Expert – Hydrogen Coordinator, **BNP Paribas**, **Oliver Bishop**, General Manager – Hydrogen, **Shell**, **Shiva Dustdar**, Head of Innovation Finance Advisory, **European Investment Bank (EIB)** and **Dr Joaquin Narro**, Managing Director, **Alcazar**.





### Panel Discussion: A Global Overview of Policy & Investment Opportunities

Oliver Bishop expresses the importance of the regulator and the need for synchronised demand and supply by means of policy and subsidies report to drive down CAPEX and OPEX. What BNP Paribas perceives is that years ago at the emergence of renewable markets there distinctly high CAPEX and low OPEX, however what we see today with hydrogen is mid-high CAPEX and high OPEX, so financing will have to adapt, and what we are missing now is long term commitments from private and public off takers for bankability. The Hydrogen council has evaluated that 300 billion dollars will be spent on hydrogen in coming years, and BNP Paribas offers financing support across the whole chain from electrolysis to heavy duty trucking.

Shiva Dustdar joining us from the “EU Climate Bank” has aligned their activities to the Paris agreement, and are planning to mobilise a trillion euros of capital by 2030. The EIB’s financial advisors’ role on technological risk in innovation is guide projects to bankability with the aid of financial instruments, be it from European Commission funding, and help create commercial scale. WID is working with Mackenzie to map investor risk appetite to quantify what it will take in terms of public support (financing) to power the private capital.

While last year called for more collaboration and funding on the policy side, it seems the emergence of quantifying risk appetite is indicative of a step in the right direction in attracting private funding.

And speaking of steps in the right direction, over a transformative 2020 **Paul Bogers**, Vice President-Hydrogen, **Shell** shares Shell has in fact doubled down their climate commitments and has pledged to be a net-zero emission energy business by 2050 or sooner, a significant heightening in ambition since Shell intervened at our inaugural summit in Amsterdam just 12 months ago.

**Dr Hans Dieter Hermes**, Renewable Energies - Project Governance Officer, **Vattenfall Europe Windkraft GmbH** underscores what has been said by our financial panel, the high support for hydrogen projects currently is public money, but this public money needs to serve as confidence to multiply investments and a strong increase in Co2 costs is crucial to support green hydrogen investment. The cost of green electricity needs to be brought down by removing taxes and levies to lower the input costs for the electrolysis. The outlook for 2050? Local production at industry offtakes are important for technology leadership and risk mitigation though these come at a high cost, and in the long term, imports from low LEC regions will form the major part of hydrogen and synthetic fuels supply.

The presentation by **Dr Lars Röntzsch**, Head of department, Hydrogen Technology, Head of business unit, Energy Technology, **Fraunhofer IFAM** raises the question is the battle of electrolysis technologies an accurate description of the dynamic between electrolysis technologies.

The challenges for electrolysis manufacturers remain improving long-term efficiency, heightening power density, implementing a modular system design, automating mass production GW p.a. and the realisation of supply chains



### Panel Discussion: **The Battle of the Electrolysis Technologies**

**Nils Aldag**, CEO & Co-Founder, **Sunfire** thinks in the first 5-10 years it will be most challenging to match demand with supply (a resounding opinion the reader will note), and so at first Aldag believes the only bankable technology is pressured alkaline or in general alkaline electrolysis technology.

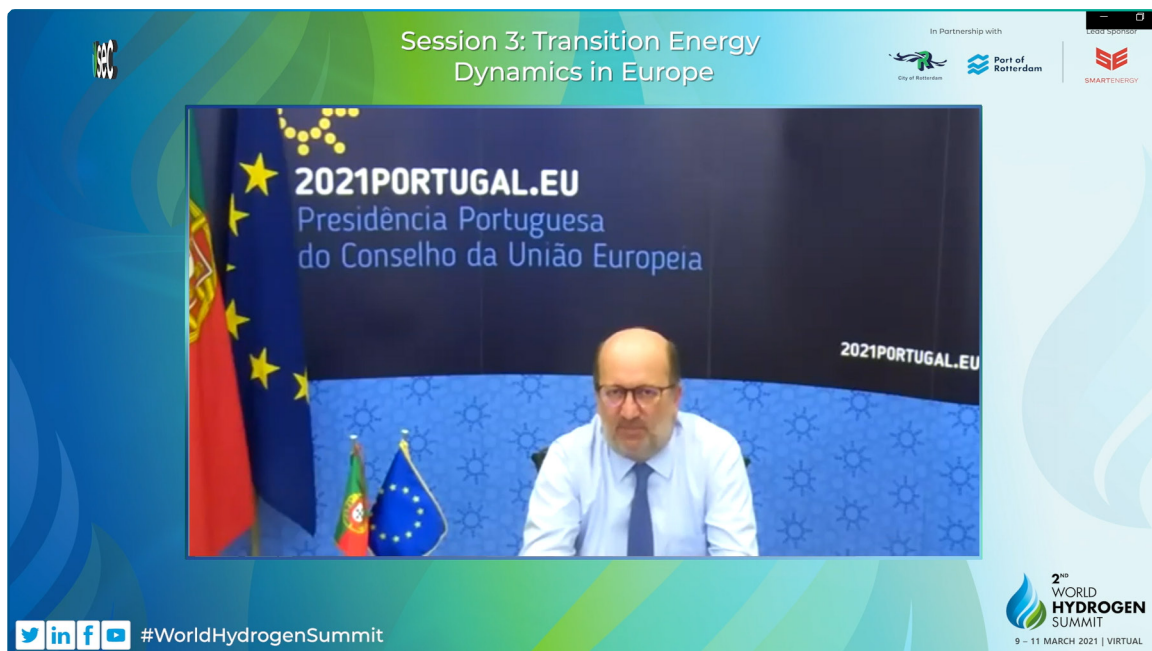
**Florent Baudu**, Sales Director, Industry Market, **McPhy** notes that a real strength in technology would be combining the high flexibility of the electrolyser with extended lifetime as we see that robustness with the grid will be key, and alkaline electrolysis technology has the highest robustness.

**Anna Murray**, Platform Manager, Fuel Cell & Hydrogen Technologies, **Cummins** responds to concerns in availability of precious material for PEM electrolysis technology, conceding that one factor is that precious metal loading is decreasingly rapidly over time. The loading has already decreased by a factor of 10 and on the fuel cell side and this is not perceived to be a limiting factor in the future.

**René Schoof**, Vice President Asset Development, Operation & Logistics Hydrogen, **Uniper Hydrogen GmbH** feels technology is ready for market on paper, yet we need a lot of running hours to have a positive business case and we know that alkaline system is known, trusted and available, however, when it comes to dynamic purposes we need more flexibility when we aim to offer grid services. This drove Uniper to look closer at PEM technology along with Hydrogenics, Fraunhofer and other development partners and a second plant in Hamburg, at that time the first PEM electrolyser in its kind, and it was learned that PEM does have efficiency (10% higher than alkaline) and also space usage efficiency per output yet costs are higher.

A series of keynotes from government officials follows to expand national strategies in the energy transition. **H.E. Joao Pedro Matos Fernandes**, Minister of Environment & Climate Action, **Portugal** speaks first. The minister shares that designing public policies that can ensure a successful energy transition has become a core activity at the Ministry and this entwined with the recovery strategy. The Portuguese Presidency has made it a priority to promote the EU as a leader in climate action, and 5 global priorities have been defined: resilience, social, green, digital and global.

Minister Matos Fernandes suggests that Portugal could even go beyond its initial hydrogen production goals and exceed European Targets. Portugal intends to implement cross border support mechanism applied to green hydrogen projects and other renewable energy sources, based on the REDII Directive within the framework of joint projects between member states.



**H.E. Joao Pedro Matos Fernandes**, Minister of Environment & Climate Action, **Portugal**

**H.E. Dan Jørgensen**, Minister for Climate, Energy & Utilities, **Denmark** begins his speech by echoing former Secretary General of the United Nations who stated there can be no 'Plan B' as there is not 'planet B', just weeks after NASA's Mars 2020 mission success. If we fail to act on climate change, the costs will be tremendous to all, but mostly to the world's most vulnerable population, and so let there be no ambiguity – failing is not an option.

With that sobering truth in mind, Denmark has pledged to reduce its green hydrogen emissions by 70% by 2030 and achieve climate neutrality by 2050. Denmark is already well on the way to phase out coal and wind energy currently makes up almost 50% of electricity supply.

Denmark is the biggest oil and gas producer to establish a cut-off date for the industry by 2050 at this point in history, and is currently building an artificial wind island, with the capacity of 10 GW connected to several wind farm serving as a hub to other countries. 10 GW is enough to supply to the demand of about 10 million European households.

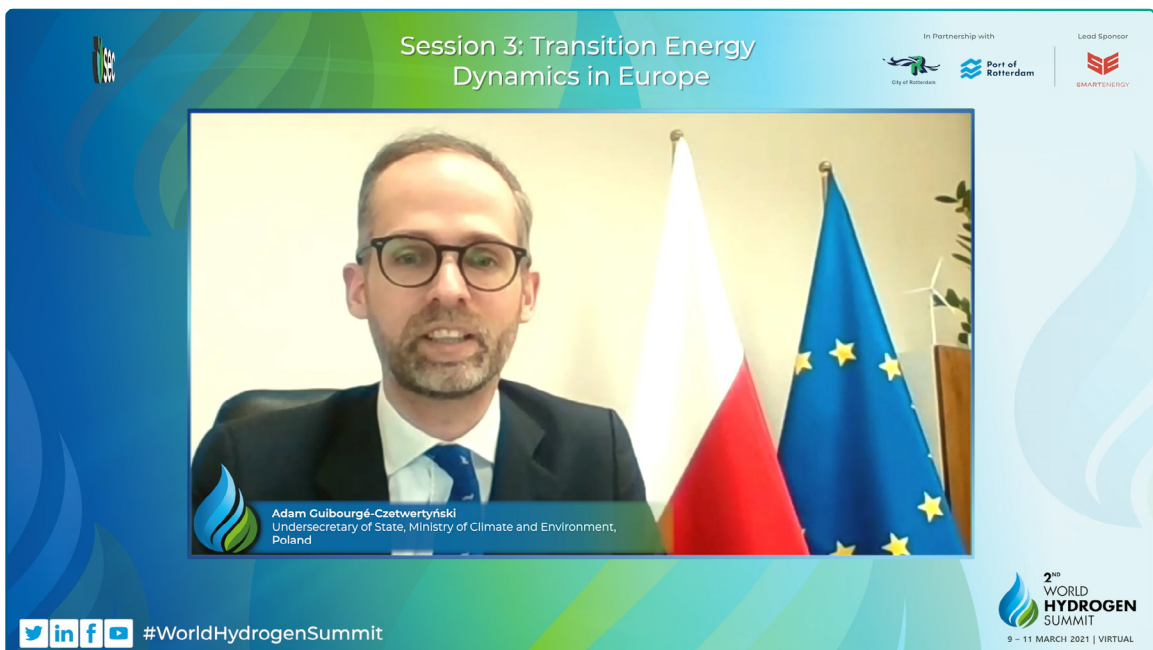
Denmark has taken energy action a step above many of its European peers and urges others to raise our actions to meet our ambitions by means of political and financial instruments.





H.E. Dan Jørgensen, Minister for Climate, Energy & Utilities, **Denmark**

H.E. Adam Guibourgé-Czetwertyński, Undersecretary of State, Ministry of Climate and Environment, **Poland** who joins consensus that hydrogen technologies can support the transformation of our energy market and enable sector coupling. In February, the council of minister approved Poland’s energy strategy which focuses on three main pillars, ensuring a just transition with no one left behind, build a zero-emission energy system and ensuring good air quality.



H.E. Adam Guibourgé-Czetwertyński, Undersecretary of State, Ministry of Climate and Environment, **Poland**



PRODUCED BY:



IN PARTNERSHIP WITH:



Our final speaker **The Rt Hon. Anne-Marie Trevelyan MP**, Minister of State (Minister for Business, Energy and Clean Growth), Department of Business, Energy and Industrial Strategy, **United Kingdom** affirms that the UK intends to be at the forefront of establishing hydrogen as a key route to decarbonisation and the provision of clean growth.

Minister Trevelyan shares two major events taking place this year, firstly a plan on the revenue mechanism to stimulate private investment in new low carbon hydrogen facilities and secondly, publish the UK's first ever hydrogen strategy.

The UK's advantages for hydrogen, natural assets, expertise and innovation position give the nation the potential leader able to create strong supply chains with jobs and growth expected across industrial heart lands to ensure that the transition is just and inclusive.



**The Rt Hon Anne-Marie Trevelyan MP**, Minister of State (Minister for Business, Energy and Clean Growth), Department of Business, Energy and Industrial Strategy, **United Kingdom**

The inaugural **World Hydrogen Awards** took place today as a virtual ceremony during the 2nd World Hydrogen Summit, with 6 winners recognised in different categories for their contribution to the hydrogen industry.

In the **Hydrogen Transport** category, **H2Haul** was named the winner for 2021 for their hydrogen fuel cell trucks for heavy duty zero emissions logistics. The **Green Hydrogen Project** award went to **NEOM, ACWA Power and Air Products**, for their Neom city power-to-hydrogen-to-ammonia facility. The **Port of Rotterdam** won the **Port of the Future** award for their strides in establishing a large-scale hydrogen network across the port complex including production, import, application and transport.

The **Hydrogen Industrial Application** award went to **Star Scientific** for their **Hydrogen Energy Release Optimiser HERO®** technology which can be used in power generation, heating, off-grid, industrial heat and desalination.

**Heidi Genoni**, Programme & Project Manager at **Arup** won the **Woman in Hydrogen** award for her key role in a wide range of projects supporting the progression towards a hydrogen economy, including the recognised Hydrogen for Heating (Hy4Heat) programme.

PRODUCED BY:



IN PARTNERSHIP WITH:



The **Hydrogen Person of the Year** award went to **Noe van Hulst**, Chair of IPHE and Hydrogen Advisor to International Energy Agency and Gasunie, for his significant contribution to Hydrogen in various roles in government, at the IEA and in industry for raising awareness and advocating for the need for hydrogen in decarbonisation



The Winners of the World Hydrogen Awards 2021

End of Summit Day 1



# Summit Day 2 - Wednesday 10th March 2021

**Sushil Purohit**, President, **Wärtsilä Energy** opens day two underscoring how Wärtsilä anticipates hydrogen to present opportunities for the technology company primarily present in energy and maritime markets.

Long term power system balance cannot take place without future fuels for their storage capabilities to counter existential challenges like seasonal variations.

Wärtsilä has several years of experience in power to x technology and has formed the Wärtsilä Future Fuels Collaboration with 6 partners, one of whom is Soletair power solutions seed funded by Wartsila.

Renewable fuels' availability in large quantities begins with hydrogen as a raw material, and the biggest factor in application allocation will be economics.

**Vasilis Gregoriou Ph.D.**, Chief Executive Officer, **Advent Technologies** presents on their next generation of fuel cell technology that has the potential to significantly improve the economics of Hydrogen Power.

Since 2003, Advent Technologies have commercialised over half a billion dollars of R&D into fuel-flexible, lightweight and resilient high temperature PEM membranes and Membrane & Electrode Assembly (MEA) for the transport sector.

Dr Gregoriou claims that their next generation technology accelerates the clean energy transition by solving issues that cannot be solved by batteries pertaining to range and recharge, providing consumers with the same convenience as a conventional vehicle without the pollution thanks to the MEA technology.

**Session 4: Welcome Panel on the Future of Hydrogen Fuel Cells in Heavy Duty Transport**

**Next Generation Technology Accelerates Clean Energy Transition**

Fuel cells solve for issues that cannot be solved by batteries alone

**Need for Power** (max 1000Wh/kg)

**Need for Range** (max 1000 km)

**5000-10000Wh/kg**

**500-1000Wh/kg**

**100-2000Wh/kg**

**2hrs autonomy** | **4hrs** | **8hrs** | **12hrs+**

**BATTERY EV** | **BATTERY + FUEL CELL HYBRID** | **FUEL CELL**

**Advantages of Fuel Cells:**

- Operates many hours continuously; impossible to have large battery, weight and volume limitations
- True net-zero (not grid-dependent) with green fuel
- Possible to do EV only, but fuel cell hybrid is more practical and still electric

**Disadvantages of Batteries:**

- Take most of the time; Easy to refill; Small battery

**Advent Technologies**

**2nd WORLD HYDROGEN SUMMIT**  
9 - 11 MARCH 2021 | VIRTUAL

#WorldHydrogenSummit

**Vasilis Gregoriou Ph.D.**, Chief Executive Officer, **Advent Technologies**



**Noe van Hulst**, Chair, IPHE & Hydrogen Advisor to **IEA & Gasunie** moderates our next panel joined by **Monica Swanson**, Business Manager International Hydrogen Projects, **Port of Rotterdam**, **Dr Graham Cooley**, CEO, **ITM Power**, **Mattijs Slee**, Commercial Head Europe – Hydrogen, **Shell** and **Andy Marsh**, President & CEO, **Plug Power Inc.**



### Panel Discussion: **The Future of Hydrogen Fuel Cells in Heavy Duty Transport**

Dr Cooley is CEO of the well-known British PEM electrolyser manufacturer, who recently moved into the largest electrolysis factory in Sheffield with the capacity of 1 GW per annum.

The most promising applications for Hydrogen Fuel Cells according to Dr Cooley are buses and trucks. Sustainable aviation fuel delivered from captured CO<sub>2</sub> seems the solution for air travel and Dr Cooley notes that shipping seems to be going in the direction of ammonia and methanol.

Monica Swanson wants to be clear that when it comes to trucks, it is important to note the quantity of vehicles and scale of trucking infrastructure and the difficulties to overcome in changing the infrastructure due to the diversity of stakeholders, despite huge efforts from OEMs and gas refuelling in scaling up. The aim as a port is to have at 500 hydrogen fuel cell trucks by 2025 from a program Port of Rotterdam are supporting and being a support with so much traffic the intention is to continue to support market development wherever possible.

Mattijs looks at how Shell sees Hydrogen, a key component in the future of Fuel cells in heavy duty transport. Over time this could reach diesel parity and take off on its own economic merits. Hydrogen is clearly an advantaged fuel for the long-haul heavy-duty sector not only because of range but also on a system basis.

Andy Marsh raises the issue of charging infrastructure, where he points out that with a fleet of over 20, fuel cells make a lot of sense because of the simplification of infrastructure and cost reduction. In fact, some of his largest customers are not only looking at fuel cells for heavy duty vehicles but also some light duty commercial fleets, as demonstrated by a recent joint venture with Renault.

**Martin Lambert**, Senior Research Fellow, **The Oxford Institute for Energy Studies** moderates the next panel alongside **Antony Green**, Head of Hydrogen, **National Grid**; **Philip Severin, Sr.**, Director Business Development, Clean Hydrogen, **Linde**; **Troy Michaud**, Vice President, Global Market Strategy and Business Development, **FuelCell Energy**; and **Steinar Eikaas**, Vice President Low Carbon Solutions, **Equinor**.





### Panel Discussion: **Hydrogen Opportunities in Existing Gas Infrastructure**

Hydrogen is obviously currently more expensive than natural gas, that may change, but for the time being how do we evolve as a gas market? Antony Green shares the National Grid has a few things underway to this end, one is the Future Grid project to decommission assets around the UK working in the natural gas world and bring them into a test facility and create a loop of decommission assets and combine various in one new capability to be studied with 2%, 20% and 100% hydrogen running through.

Steinar informs the audience that Equinor has committed to be carbon neutral by 2050, not only the production but also the consumption. Equinor is growing exponentially into Renewables, with a various offshore wind farms and expect huge amounts of green hydrogen. Equinor have recently joined the northern lights project, which is a CCS joint project with Equinor, shell and total in Norway. CO2 will be collected in one location and shipped to the west coast of Norway where it will be injected permanently. It will not only enable industry in Europe to manage emissions but also a solution to manage CO2 from blue hydrogen projects. Equinor is clear in its stance that blue hydrogen is necessary to build scale early, which will be crucial to embrace green hydrogen at a later stage.

Philip Severin explains Linde has been in the hydrogen business for over a century and are a global leader in the production, processing, storage and distribution of hydrogen. Today Linde generates 2.2 billion USD in revenue with hydrogen and have invested already over 6.5 billion USD in hydrogen.

Linde is teaming up with partners to develop infrastructure and technology needed to establish the widespread and cost-effective use of hydrogen, for instance their power to gas plant in Germany which has been running for over five years. It produces power using PEM electrolysis connected to national gas grid.

At the end of last year an agreement was also signed with SNAM (who own and operate the largest natural gas transmission network in Europe) to jointly develop clean hydrogen projects. Furthermore, there is a membrane technology in the works to extract CO2 from natural gas, and to apply the same principle to extract hydrogen from natural gas. This would allow the use of existing gas infrastructure to transport hydrogen over long distances for industrial applications and a source of clean energy for mobility by injecting the hydrogen in the pipeline delivered via wide range to import applications, then the separate technologies to extract the hydrogen are already available.

PRODUCED BY:



IN PARTNERSHIP WITH:



FuelCell Energy recognises that the different colours bring different price points, and so the technology that has been sitting on the shelf for a long time is ideal for blue hydrogen, a carbonate-based fuel cell – the electrochemical reaction that occurs inherent to that design take a methane-based fuel (i.e. natural gas or biogas) and separates the carbon and the hydrogen from the natural gas supply. This platform is scalable and can be located at a point of use or along a gas pipeline to take a small stream of natural gas as a feedstock and make the separate to supply CO2 on one value stream and Hydrogen on the other.

Having options when it comes to Hydrogen price points and different carbon indices is going to be key in successfully balancing a successful energy transition.

**Ulrich Schmitz**, Marketing Manager, **Atlas Copco Gas and Process** continues the CCUS discussion joined by **Ruben Beens**, CEO, **BP**, **Stijn van Els**, Commercial Director, **Port of Rotterdam** and **Alice Krekt**, Program Director, **Deltalinqs**.



### Panel Discussion: From CCUS to Hydrogen Pathways in 2021

The panel recommends that the global energy community renews its international collaboration and knowledge sharing, and that ahead is an energy revolution rather than a transition. The history of the port of Rotterdam shows this is not the first time that Rotterdam faces up to decarbonisation challenges, and it's important to remain confident and persevere as united front in join efforts to reduce CO2 footprints.

**Iain Elder**, Projects Partner, **Shearman & Sterling LLP** moderates our next discussion focused on transitioning to Green Hydrogen alongside **Ville Rimali**, Director, Growth & Development, **Wärtsilä Energy**, **Emmanouil Kakaras**, Senior Vice President, Head of New Products and Energy Solutions, Mitsubishi Power Europe, **MHI Group** and **Roland Kaepfner**, Executive Director Hydrogen & Green Fuels, **NEOM**.



**Panel Discussion: New Opportunities in Transitioning to Green Hydrogen**

Wärtsilä and Vantaan energia are collaborating on a carbon neutral synthetic gas production in Finland. Rimali shares the organisation’s enthusiasm for hydrogen yet stresses that hydrogen is not the only solution for the transition and emphasizes that we need to look inclusively at what energy sources can be combined realistically.

Prof. Kakaras believes that CO2 pricing alone will not be in a position for a while to breach the funding gap between renewable fuels and conventional ones. REDII is a piece of lock-off legislation that was missing in the past which will enable so called “blue fuels” for instance feature decarbonisation by means of CCS. Australia has excellent renewable conditions as we have a combination of wind and solar that as outstanding, extremely promising in terms of price levels however Europe will unlikely match this, so here in Europe we will likely see imported green fuels but first the sector should embrace blue fuels.

NEOM is pushing ahead with industrial scale green hydrogen, and when it comes to timing NEOM is working air products and ACWA power for the biggest ever green hydrogen and ammonia plant which wants to go live in 2025, noted internationally for its remarkable speed. On a larger global economy scale, NEOM believes that scale and supply are going to be paramount priorities for market activation.

**Edgare Kerkwijk**, Board Member, **Asia-Pacific Hydrogen Association** hosts the Asia-Pacific Regional Outlook session and introduces **The Hon. Mick de Brenni Minister for Energy, Renewables and Hydrogen and Minister for Public Works and Procurement, Queensland Government.**

In just under a decade, Queensland developed a 70-billion-dollar onshore gas industry that is exporting more than 20 million tons of LNG per year, and in 2020 Australia overtook Qatar as the world’s largest LNG exporter. Queensland’s new ambition is to become a new leading hydrogen producer and exporter, leveraging its LNG and Renewable energy experiences and unique to attributes, namely a wealth of renewable resources and strategic port location to reach key Asian markets. But Beyond Oceania, Queensland intends to be part of supply chains with a global reach, including Europe’s busiest ports, specifically the Port of Rotterdam.





**The Hon. Mick de Brenni**, Minister for Energy, Renewables and Hydrogen and Minister for Public Works and Procurement, **Queensland Government**

**The Hon. Minister Stephen Patterson**, Minister for Trade and Investment, **Government of South Australia** in turn affirms that “reduced costs of solar and wind energy generation, combined with technology advancements have created a tipping point where renewable produced hydrogen is now a viable and much needed carbon free energy carrier”. The launch of South Australia’s hydrogen action plan outlines 20 actions across five themes with the objective of scaling up production for export and domestic consumption in order to achieve South Australia’s vision to become a world class renewable hydrogen supplier.

Significant land mass and world class solar and wind resources combined with over seven billion dollars invested in projects (and another 20 billion in the pipelines), South Australia can become a clean hydrogen supplier of choice for partners all over the world while reaching its own target of net 100% Renewable energy generation by 2030. Six gigawatts of capacity already installed/under construction and 13 GW under development.



**The Hon. Minister Stephen Patterson**, Minister for Trade and Investment, **Government of South Australia**





**Ohira Eiji**, Director General, Fuel Cell and Hydrogen Office Advanced Battery and Hydrogen Technology Dept., **NEDO (The New Energy and Industrial Technology Development Organization)** joins to deliver Japan's activities and vision to realise a hydrogen society. Japan is set to achieve climate neutrality by 2050, and METI has formulated the pathway to this goal.

Japan's progress in adoption of Hydrogen applications is impressive, with 380,000 residential fuel cells are already installed in Japanese households and 4,100 passenger vehicles, circa 100 buses and just under 150 refuelling stations as of December 2020. The Japan Hydrogen Association (J2HA) co-ordinates Japan's private sector with various stakeholder to ensure Japan continue to lead global hydrogen activities with a focus on social implementation projects, creation of funds, policy, international activities and data collection to inform future projects.

The Japanese Government is focused on promoting Hydrogen with strong clarity and direction, and activities are currently focused on using initial market penetration projects to feedback to R&D and enhance applications and technologies, with a view to scaling up and integrity more elements on the energy system towards Japan's carbon neutrality goals.

**Hirofumi Taba**, Partner, **Linklaters** speaks on the wider South East Asian market, stating that in APAC while there is apparent international competition there is also a high degree of dependency and required collaboration. Demand side is driven by North East Asian countries where the mobility sector is showing the earliest sides in driving demand, in contrast with Europe where industrial use is expected to lead demand. The policies are technology agnostic as to blue and green hydrogen as well, and so the utilisation of existing LNG infrastructure with a catalyst can further the establishment of international supply chains.

**Andrew Horvath**, Global Group Chairman, **Star Scientific** presented at Asia Pacific Hydrogen Summit in 2020 showcasing their revolutionary HERO technology which has seen the company win awards from S&P Global Platts and the Sustainable Energy Council. Star Scientific has signed an MoU with the Government of Philippines with a view to advance the Philippines towards one of the most robust zero net energy economies, with boundless socioeconomic opportunities to raise standards of living and employment with a vertical integration project that will implement HERO technology. The chairman notes that the ability to build large cities and develop them around a hydrogen economy is infinitely easier when that country is not a major established economy, for instance Germany or the US. Chairman Horvath believes that the best way to engage the hydrogen economy globally is to look at growing markets that are looking to become manufacturing hubs and raise the living standards of their people, this is where the opportunity lies.

**Andrew Horvath**, Global Group Chairman, **Star Scientific**



**Sergey Ulyakhin, PhD, APMP, CLP, RTPP**, Chief Innovation Officer, **FTXT Energy Technology Co., Ltd.** speaks next on their heavy involvement in FCEV deployment tens of thousands of vehicles in China's five pilot cities and agglomerations of Beijing, Hebei, Shanghai, Guangdong and Henan by 2024. As of 2021, 128 Hydrogen refuelling stations have been built in China and 2025 this figure is expected to reach 300. Dr Sergey says Hydrogen can be used as an important medium to alleviate the uneven distribution of energy production and consumption in China, with north western china accounting for most of supply thanks to an abundance of resources and eastern china exceeding 60% of national consumption if renewable energies are integrated.

**Session 8: APAC International Collaboration & Investment Opportunities**

In Partnership with

**Industry Development and Competition Pattern** **FTXT**  
未势能源

Seven industrial clusters are the main driving force for the development of hydrogen energy industry


**Northwest Industrial Cluster**  
Key cities: Datong, Changzhi, Ningdong  
Supply chain: parts, stack / system, vehicle, hydrogen production, hydrogen storage and refueling

**Beijing-Tianjin-Hebei Cluster**  
Key cities: Beijing, Tianjin, Zhangjiakou, Baoding  
Supply chain: parts, stack / system, auxiliary system, vehicle, hydrogen production, hydrogen storage, refueling, testing and certification

**Jiaodong Peninsula Cluster**  
Key cities: Weifang, Qingdao, Jiaman, Jining  
Supply chain: parts, stack / system, vehicle, hydrogen production, refueling

**Yangtze Delta River Cluster**  
Key cities: Shanghai, Suzhou, Nantong, Yangcheng, Wuxi, Changzhou, Jiaxing, Ningbo  
Supply chain: parts, stack / system, auxiliary system, vehicle, hydrogen production, hydrogen storage, refueling, testing and certification

**Pearl River Delta Cluster**  
Representative cities: Foshan, Shenzhen, Guangzhou, Dongguan  
Supply chain: parts, stack / system, auxiliary system, vehicle, hydrogen production, refueling



CONFIDENTIAL

#WorldHydrogenSummit

9 - 11 MARCH 2021 | VIRTUAL

**Sergey Ulyakhin, PhD, APMP, CLP, RTPP**, Chief Innovation Officer, **FTXT Energy Technology Co., Ltd.**

End of Summit Day 2



## Summit Day 3 - Wednesday 11th March 2021

**Florent Baudu**, Sales Director, Industry Market, **McPhy** joined last year in Amsterdam where he was able to share his expertise on electrolysis economics and capacity in 2020. In 2021, the implications of the limitations at play have changed, and Mr Baudu shares that in one year the unlocking of decarbonated hydrogen has been beyond encouraging. Mr Baudu reminds us of EU & Member states official ambitions for 40 GW by 2030 and 6 GW by 2024, as well as the new initiatives (IPCEI, Green Deal) which has provoked a “craze of major off-takers to join the pioneering journey”. As an electrolyser supplier, scaling up manufacturing capacity is not the only issue to be addressed, and there is a need to also facilitate a readiness for scaling up and synchronise supply demand. On their side, McPhy has responded with a 180-million-euro capital increase, the establishment of new partners and investors and steady organic growth.

**sec** Opening Keynotes

In Partnership with: City of Rotterdam, Port of Rotterdam, SMARTENERGY

**Green H2 ecosystem :**  
| a “living body”, fully interdependent

Public Authorities, Techno providers, Public, Suppliers, Off takers, Financers

→ Decarbonated H2 ecosystem is a living body, still at its early days  
→ Each stakeholder as one cell (or organ) of the “growing body”

Successful scale up

- No silo working
- Cross cooperation between stakeholders
- Break the line (cooperation between techno providers / possible complementarity of technologies)
- A synchronized growth (progress and develop in a consolidated manner)
- Taking the most of EU impulsed momentum

#WorldHydrogenSummit 9 - 11 MARCH 2021 | VIRTUAL

**Florent Baudu**, Sales Director, Industry Market, **McPhy**

**Robin Mills**, CEO, **Qamar Energy** on behalf of Regional Business Development at the **Embassy of the Kingdom of the Netherlands in the Gulf Cooperation Council (GCC)** and **Martijn Coopman**, Program Manager & Energy Transition, **Port of Rotterdam** share the potential for Hydrogen growth in GCC, who are very interested in developing value chains in both green and blue hydrogen and a number of production and distribution options are being explored, driven by a belief that green hydrogen has the potential to be cheaper than blue by 2040 in the GCC. The Port of Rotterdam projects blue hydrogen as transition fuel to be phased out by 2050 and working hard with partners in the GCC to move intensely towards green hydrogen by 2030 to reach its projection of 20 Mt in Hydrogen flow by 2050.



## Embassy of the Kingdom of the Netherlands in GCC

In Partnership with

### Strategic opportunities exist for EU-GCC Hydrogen Partnerships

Sources: PwC, Qamar Energy Research

Opportunity	Benefit to EU-GCC Partnership
H <sub>2</sub> supply diversification	<ul style="list-style-type: none"> <li>EU plans to import the hydrogen equivalent of 40 GW of electrolyzers by 2030, mostly from North Africa / Russia (?)</li> <li>But faster + cheaper (in ammonia) from GCC, plus reduces Russian reliance</li> </ul>
Trade Boost	<ul style="list-style-type: none"> <li>GCC represents the EU's fourth-largest export market while the EU is the largest trading partner of the GCC</li> <li>Energy trade remains most significant, &amp; H<sub>2</sub> can support a free trade agreement?</li> </ul>
Decarbonising	<ul style="list-style-type: none"> <li>Hydrogen can be a decarbonised export, and/or GCC states could export decarbonised materials made with blue or green hydrogen, such as ammonia, steel, glass, and fertilisers</li> </ul>
Employment	<ul style="list-style-type: none"> <li>Green hydrogen export market can create up to 800,000 operations and maintenance jobs, 300,000 in renewable power generation and 500,000 at electrolysis facilities</li> <li>Can assist in EU-GCC recovery from the Covid-19 pandemic</li> </ul>
Paris Goals	<ul style="list-style-type: none"> <li>GCC H<sub>2</sub> could enable Europe to become climate-neutral by 2050 in a cheaper and faster way</li> <li>EU-GCC partnerships could help meet Paris Goals → reducing emissions by 20% between now and 2050</li> </ul>

Stakeholder	Policy Mechanisms	Financing	R&D	Technology Development
Saudi Aramco		✓	✓✓	
Abraxa	✓	✓	✓✓	✓
Masdar		✓	✓✓✓	✓✓✓
Mubadala	✓	✓✓✓	✓✓	
DEWA			✓✓	✓✓
UAE Ministry of Energy & Industry	✓✓	✓		
Saudi Ministry of Energy	✓	✓		
Qatar National Research Fund			✓✓	✓

Qamar Energy 2021 16

9 - 11 MARCH 2021 | VIRTUAL

**Robin Mills, CEO, Qamar Energy on behalf of Regional Business Development at the Embassy of the Kingdom of the Netherlands in the Gulf Cooperation Council (GCC)**

Dr Gokce Mete, Head of Secretariat, Leadership Group for Industry Transition, **Stockholm Environment Institute** moderates a discussion with **Shibu K. John**, Vice President – Strategy & Business Development (Upstream), **Primetals Technologies**, **MHI Group**, **Peter Adam**, Head of Sustainable & Hydrogen Business Development, **Siemens and Afkenel Schipstra**, Senior Vice President Business Development, Hydrogen - Project Manager HyNetherlands, **ENGIE** on the topic of hydrogen in industrial applications.

In order to achieve a commercial use for hydrogen hard to abate industry, the infrastructure is today one of the key levers beside the cost of production. One solution is to, of course, repurpose the natural gas pipeline, and the cost to do this is only roughly 10-15% in building a new pipeline and there is also capacity to utilise gas storage facilities available today. For Siemens, the focus is to help in countries and support the building up infrastructure and decarbonising the power industry while meeting the large power demand required by power plants.

## Session 9: Hydrogen Opportunities arising from Industrial applications

In Partnership with

9 - 11 MARCH 2021 | VIRTUAL

**Panel Discussion: Hydrogen Opportunities Arising from Industrial Applications**



PRODUCED BY:



IN PARTNERSHIP WITH:



Dr Mardit Matian, Founder & Director, **EH Group** is joined by **Randy MacEwen**, President & CEO, **Ballard Power Systems**, **Dr Daniel Teichmann**, Founder & Managing Director, **Hydrogenious LOHC Technologies GmbH**, Jo Bamford, Executive Chairman, **Ryse** discuss Hydrogen opportunities for heavy duty mobility.



**Panel Discussion: Timescales, Economics & Opportunities for Heavy Duty Mobility**

Over the last few years there has been much speculation over which fuel will be the one to revolutionise mobility. It is clear certain applications and regions lend themselves to different solutions, and while these seem to be competing, they are in fact all facilitating each other. For instance, LOHC can utilise existing infrastructure and reduce implementation costs thereby help to make hydrogen a commodity in existing infrastructure. Many projects over the next years involve different carriers helping drive down hydrogen costs, and what is needed is for cross-sector regular knowledge sharing to avoid wasted resources, assets and research duplication.

**Rachel Crouch**, Project Finance Attorney, **Norton Rose Fulbright US LLP** sets the scene for the Americas (North and South) Regional overview sharing that a teal-coloured transition in the United States is most likely. There are opportunities available from methane derived hydrogen today, while areas where there is an abundance of renewables scale up production to respond to domestic demand.



**Rachel Crouch**, Project Finance Attorney, **Norton Rose Fulbright US LLP**



**Mark Kirby**, President & CEO, **Canadian Hydrogen & Fuel Cell Association (CHFCA)** joins us from the voice of the sector in Canada who strongly believe that combination of supply points are needed for a low cost track to get to where we need to be and collaboration is key.

**Max Correa**, Head of the Hydrocarbons & New Energy Division, **Ministry of Energy, Government of Chile** has some of the most remarkable ambitions large-scale green hydrogen exports in the world to develop an industry to rival its mining sector, a huge stake in Chile's national economy. Since launching its hydrogen strategy, the number of companies seeking to deploy projects has doubled, namely a noted project joint with Enel, Siemens, Magallanes and Porsche, totaling over 18 projects with a sum of 12 billion USD of identified investment.

**Session 11: Hydrogen Progress in the Americas**

**Our ambition**

Year	Goal	Context / Achievement
2025	5 B USD	Top destination for green hydrogen investment in LATAM
	5 GW	Electrolysis capacity operating and under development
	200 Mt/year	Production in at least 2 hydrogen valleys in Chile
2030	2.5 B USD/year	Leaders in export of green hydrogen and derivatives
	<1.5 USD/kg	The cheapest green hydrogen on the planet
	25 GW	Leaders in production of green hydrogen via electrolysis

MINISTERIO DE ENERGÍA | #WorldHydrogenSummit | 9 - 11 MARCH 2021 | VIRTUAL

**Max Correa**, Head of the Hydrocarbons & New Energy Division, Ministry of Energy, **Chile**

**Dale Nally**, Associate Minister of Natural Gas & Electricity, **Government of Alberta, Canada**, the final speaker of the session, shares that Alberta is focused on developing a roadmap to leverage existing strengths in tandem with the newly released Canadian Hydrogen strategy, with the close advice of stakeholder groups and representatives, including environmental organizations and indigenous representatives. The roadmap will in turn inform specific policy and regulatory decisions to support long term growth towards a low carbon energy future.

**Arno Bonte**, Vice Mayor for Sustainability, Clean and Air Energy Transition from the **City of Rotterdam** gives the closing remarks and shares some most exciting news – the World's Hydrogen Community is invited to Rotterdam next year March 9th and 10th where we will experience a greater summit than ever before – mark your calendars, bring your colleagues and we look forward to seeing you all!

**Closing Remarks**

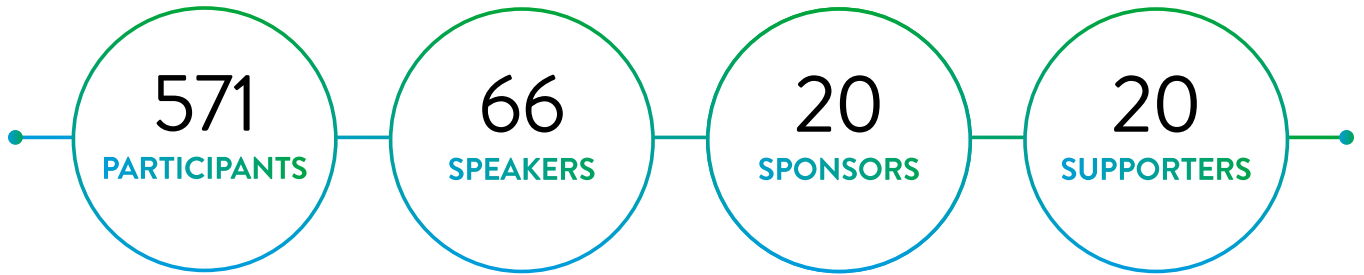
It has been a fantastic event with a lot of inspiring presentations.

**ARNO BONTE**  
CITY OF ROTTERDAM,  
VICE MAYOR FOR SUSTAINABILITY, CLEAN AIR & ENERGY TRANSITION

#WorldHydrogenSummit | 9 - 11 MARCH 2021 | VIRTUAL

**Arno Bonte**, Vice Mayor for Sustainability, Clean and Air Energy Transition from the **City of Rotterdam**

## The Summit's Participants



Director / CEO / COO / MD / Chairman / President / VP / Head



Advisor / Consultant / Analyst



Business Development / Commercial / Sales / Marketing



Government Representative



General Manager / Senior Manager / Country Manager



Legal

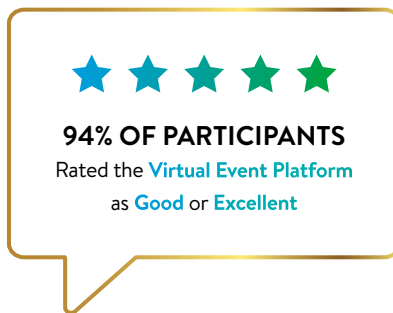


Engineer / Procurement

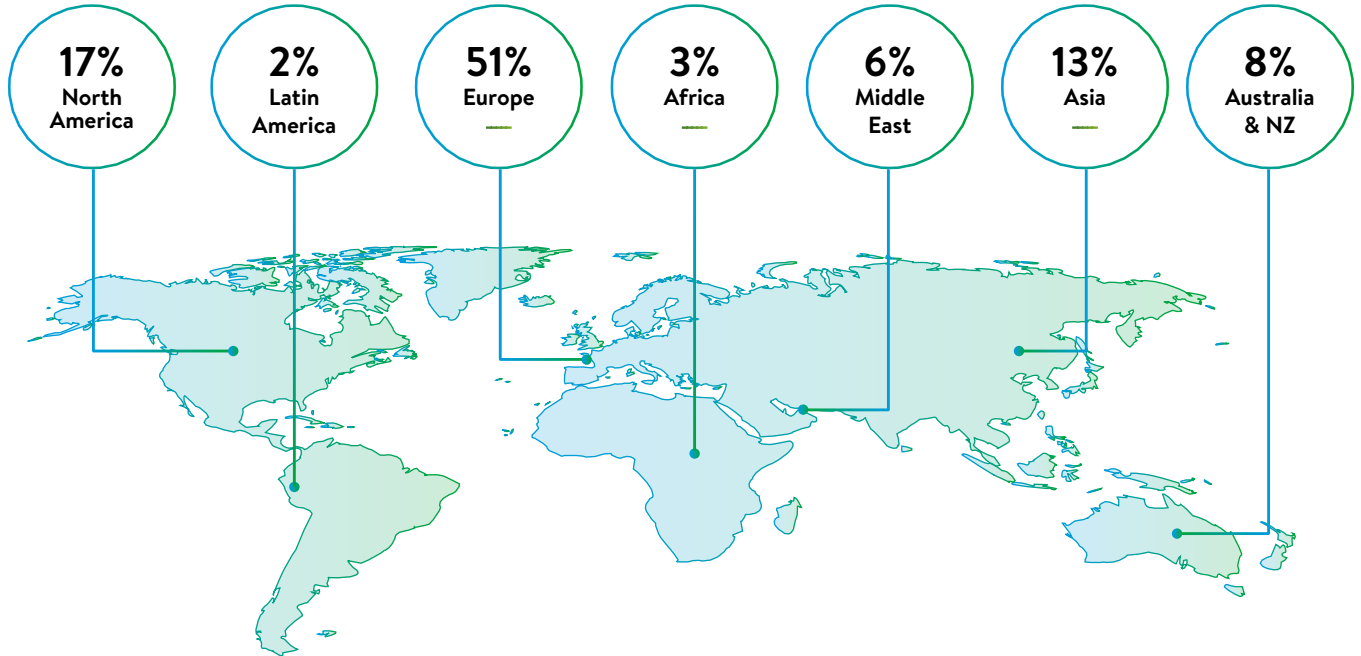


Press/Academia

## Participants' Satisfaction Rates



## Participants' Geographic Location



## Participants' Testimonials

“Fantastic conference, I really enjoyed my time at the conference and looking forward to the next conference.”

“ ” **KATIE MILLE**  
Head of Strategy & Corporate Development,  
Strategy & Corporate Development  
**Ureenco**

“Very well done and comprehensive.”

“ ” **NORDINE AIT-LAOUSSINE**  
Director  
**Nalcosa**

“This virtual event was an interesting experience for me, it was done very professionally and effective with great speakers and nicely design booths and technical materials.”

“ ” **BEHROOZ ERSHAGHI**  
Manager Marketing and Technology  
**Atlas Copco Mafi-Trench**

“It was an excellent event, specially taking in consideration the current pandemic situation.”

“ ” **MIGUEL VIEIRA DE CASTRO**  
Maritime operations  
**Port of Sines**

“It was a state of the art virtual event.”

“ ” **RAFAEL AUGUSTO GALEANO**  
Director  
**GRUPO GM SA DE CV**

“Many congratulations to SEC for organizing the Second Hydrogen Summit on 9-11 March 2021. This was an excellent conference on the production, uses and applications of green hydrogen as a clean source of energy to mitigate climate change in the world. It was very well organized and progressed smoothly. Scientific contents was up to date and of high quality, and was attended by large number of experts in the field, private, academics and official representations of a senior level!”

“ ” **DR. JEHAN BABAN**  
President and Founder,  
**The Iraqi Environment and Health Society-UK**



PRODUCED BY:



IN PARTNERSHIP WITH:



## With Thanks to Our Supporting Associations



International Partnership  
for Hydrogen and Fuel Cells  
in the Economy





# sec

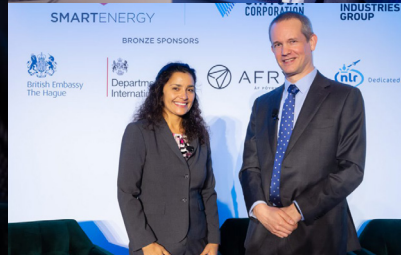
## Sustainable Energy Council

The World's Leading Hydrogen Event Series



The Sustainable Energy Council World Hydrogen series bring together governments and companies across the hydrogen value chain to drive forward the industry and ensure hydrogen plays a pivotal part in the energy transition.

Visit [SustainableEnergyCouncil.com](https://SustainableEnergyCouncil.com)



SEC  
WORLD  
HYDROGEN  
SERIES



# WORLD HYDROGEN 2022

SUMMIT & EXHIBITION

9-10 MARCH 2022 | ROTTERDAM, NETHERLANDS

## THE WORLD'S LEADING HYDROGEN SUMMIT IS COMING TO ROTTERDAM IN 2022

- Meet & Connect with the **World's Hydrogen Leaders all in One Place**
- Ground-breaking Announcements at **Leading Strategic Summit**
- Innovative Technologies & Solutions at **World-Class Exhibition**
- Celebrating Excellence at the **2nd World Hydrogen Awards**
- Targeted Networking for the **Entire Hydrogen Value Chain**
- Enabling the Energy Transition Co-Located with the **International CCUS Summit**

## THE GLOBAL PLATFORM WHERE HYDROGEN BUSINESS GETS DONE



### EXCHANGE INSIGHTS

Access Expert Insights & Connect Directly with Global Hydrogen Leaders



### SECURE DEALS

Showcase Your Hydrogen Solutions & Secure New Deals on the Exhibition Floor



### MAKE CONNECTIONS

Join the Entire Hydrogen Value Chain at the Industry's Leading Networking Event

For Sponsorship, please contact:

**Rob Arthur** on **+44 20 7978 0095** or email: **Hydrogen@SustainableEnergyCouncil.com**

For Exhibition, please contact:

**Chris Hugall** on **+44 20 7978 0080** or email **Hydrogen@SustainableEnergyCouncil.com**

For Speaking & Programme, please contact:

**Soizic Le Lesle Fauvelle** on **+44 (0) 20 7978 0034** or **+44 (0) 7417 44 0038**  
or email: **Hydrogen@sustainableenergycouncil.com**