NL-IL Mini-Symposium on Hydrogen and Renewable Energy

Date: 2 February 2021 11:00-13:00 IL time 10:00-12:00 NL time

Location: Online, via Zoom

Link to zoom: https://zoom.us/meeting/register/tJYvcO2opj4qHdymsFiqV3e-NywutMsm9KY-

Registration: https://www.eventbrite.com/e/dutch-israeli-mini-symposium-on-hydrogen-and-renewable-energy-tickets-132811642197

Background:

Hydrogen is a key enabling technology for the energy integration challenge as it provides valuable solutions for several independent appliances, from in-land and offshore large transportation to heating as well as for energy storage. Hydrogen also has a key role to play in decarbonisation. Cooperation is an essential element to boost the hydrogen economy worldwide. Both the Netherlands and Israel have unique selling points in where they can contribute to decarbonisation and in where both countries can benefit from the given opportunities and from each other's expertise. This mini symposium aims at presenting the outstanding impact already delivered by individual hydrogen projects and discuss how the technology can now enable cooperation between Israel and the Netherlands under the new Green Deal proposal/plan and post-COVID Recovery Plan.

Funding opportunities:

- **LC-GD-2-2-2020:** Develop and demonstrate a 100 MW electrolyser upscaling the link between renewables and commercial/industrial applications

Target audience:

This symposium is meant for professionals in and outside the energy sector who want to get an in-depth overview of the entire hydrogen value chain and want to learn more about the possibilities hydrogen has to offer, such as strategic analysts and business developers,

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business analysts, legal advisors and consultants, (renewable) energy producers, regulators and policymakers, academic researchers.

Program

IL time (10:00 NL time)

11:00-11:05 ***Welcome notes***

- HE Hans Docter, Netherlands Ambassador to Israel
- Dr. Racheli Kreisberg, Innovation Attaché, Netherlands Embassy in Israel and Israeli Dutch Innovation Center (IDIC)
- Jochem Durenkamp, Energy Analyst, New Energy Coalition

11:05-11:20 ***How to create a hydrogen valley? Hydrogen Energy Applications in Valley Environments for Northern Netherlands (HEAVENN)***
Dr.-Ing. Patrick Cnubben, Program Manager Hydrogen, New Energy Coalition Groningen

11:20-11:35 ***Recent Advances in Fuel Cells Research by the Israeli Fuel Cells consortium (IFCC)***
Prof. Lior Elbaz, Bar Ilan University

11:40-11:55 ***BrigH2 initiative at the Brightlands Chemelot Campus, an alternative route to renewable hydrogen using torrefied biomass***
Marc van Doorn, Business Development – Sustainable Processes, Brightlands Chemelot Campus

11:55-12:10 ***Alkaline Fuel Cells Regulate Voltage and Contribute Grid Stability to the Energy Cloud***
Gil Shavit, VP Business Development, **GenCell Ltd.**

12:15-12:30 ***New Electrochemical Hydrogen Fuels, The New Way Out from The Old CO_2 Crisis***
Dr. Marnix ten Kortenaar, CEO Dr. Ten

12:30-12:45 ***Increasing the usability of renewable energy to 24/7***
Sonya Davidson, Founder and CEO H_2 Energy Now

12:45-13:00 ***Hydrogen Act for Europe***
Frank Wouters, VP Clean Hydrogen at Worley, Director of the EU GCC Clean Energy Technology Network, director of Gorestreet Capital, London

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Background on companies and research

Bar-Ilan University, founded in 1955, is one of Israel's leading institutions of higher education, uniquely combining cutting-edge scientific research with education steeped in Jewish values and social responsibility. From 70 students to close to 19,000, its milestone achievements in the sciences and humanities and all fields of human endeavor have made an indelible imprint on the landscape of the State of Israel. The university has 8 faculties: Jewish Studies, Medicine, Engineering, Law, Life Science, Exact Sciences, Social Sciences, and Humanities. The Faculty of Exact Sciences includes the Institute of Nanotechnology and Advanced Materials (BINA), Department of Chemistry, Department of Physics, Department of Mathematics, Department of Computer Science, Department of Optometry. At BINA, a renowned research staff – including a large number of young faculty members recruited from abroad – educate Israel's next generation of nanoscience professionals, while collaborating with academic and industrial experts on nano-based approaches to energy, magnetism, optics, clean tech, materials, robotics and biomedicine.

Brightlands Chemelot Campus is a breeding ground for materials science and innovation, which is the first European Circular Hub, and boosts innovation and business growth by giving tenants access to talent, knowledge, infrastructure, and entrepreneurship. BrigH2 plans to start a 50 MW gasification unit to produce 6300 mtpa renewable hydrogen, pure bioCO_2 and Biochar. This Demonstration plant will be situated on the Brightlands Chemelot Campus and will serve the industrial users on the Chemelot site, where the technology is suitable to produce Fuel Cell grade Hydrogen for the mobility sector. The project is in the feasibility phase. The location of the plant on the Chemelot campus fits exactly with the circularity target of the campus and the site. The feedstock will be torrefied biomass, where torrefaction does create a significant extension of the area where the biomass is gathered. Torrefaction also creates an uniform feedstock for the delicate process, reducing the investment costs per ton of renewable hydrogen to the max, but has proven itself in the quality of the syngas produced and the potential for uninterrupted continues production. Next to the hydrogen production, BrigH2 also provides a long-term sustainable route for CCU processes due to the biogenic origin of the CO_2 produced, as well as negative CO_2 emissions by connecting to the CCS infrastructure under development on the Chemelot site. Alternatively, the CO_2 prevents an additional fossil CO_2 emission once applied in greenhouses. The Biochar is of exceptional quality and suitable for many applications now dependent on petrochemical coke of low sulfur. The technology is developed by Torrgas in Groningen on a 1 MW scale.

Dr Ten: operates since 2008 in the Netherlands and since 2016 in Jerusalem. It ran different applied R&D projects in physical chemistry. The company works mainly for customers and consortium R&D projects. In the past years the company has developed a new metal air fuel cell, new solar water desalination system, new bio-lipids for infant and sports nutrition, new plastic composites and bio-lubricants. Besides, it has studied and developed

new electrochemical fuel reaction processes for the synthesis of green fuels like hydrogen, oxygen, hydrogen peroxide, ammonia, XCO2 related fuels and halogen related fuels. Biggest hit so far was the sea salt battery, a green, low-cost new battery for solar, wind and grid energy. Both half fabricates and battery cells have gone in pilot production in Jerusalem with assembling to full pilot battery-ICT-electronic systems in the Netherlands. First successful demonstration testing has been performed in Europe, USA and Israel.

Energy Delta Institute (EDI) is the world's leading energy business school: outstanding education combining solid theoretical grounding with high practical use. They offer a wide range of programmes that cover all parts of the energy value chain and all aspects of the great energy transition, such as Hydrogen. EDI is part of New Energy Coalition since 2018.

GenCell: Alkaline fuel cells enhance regional microgrids that can be operated alternately as connected components of the "energy cloud" within a national grid or can be run independently whenever necessary and with zero CO_2 emissions. The fuel cells deliver ultra-reliable and long-duration backup power that complements intermittent renewables and recharges batteries, enabling extremely reliable, continuous and smooth power systems for facilities incorporating mission-critical applications that need uninterrupted power such as hospitals or other medical facilities, university campuses or various industrial or commercial complexes. The fuel cells contribute to microgrids an internally redundant source of backup power that kicks in during outages as well as serving to stabilize system voltage. Furthermore, these microgrids can then run independently of the grid for as long as clean hydrogen fuel is made available, either during peak power times of use or to avoid load shedding.

H2 Energy Now: The biggest problem facing all of us having the use of available renewable energy whenever we need it is storage. With storage renewable energy will be available 66% more of the time. Hydrogen is an amazing molecule and can play an enormous role in the next generation power delivery. Because it can be compressed, liquefied, and combusted it is a highly advantage element. Our company seeks to improve the next generation by expanding the use of hydrogen. Our process uniquely uses electromagnetic waves to create green hydrogen so that it is available to smooth out renewable energy generation cycles. We are currently expanding our test systems to support the creation of 100 kg of hydrogen a day. Our testing has shown that our system is 88% efficient compared to the 60% efficiency of electrolysis. We have presented all over the world. We are presently working with two MBA students from Ben Gurion University Bengis Center as we move forward. Scale up requirements are power input 430.2KWh an equivalent AE electrolysis system will cost between $350,000 to $500,000. Our scale-up goal is to scale up our product, so our capital cost is half of an equivalent Electrolysis system and with lower operating costs.

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New Energy Coalition is a network and knowledge coalition that is committed to a smart and successful transition to the sustainable energy system of the future, in the Netherlands and the rest of the world.

Worley is an Australian-American engineering company which provides project delivery and consulting services to the resources and energy sectors, and complex process industries. With more than 52,000 employees working from more than 200 locations in over 50 countries, Worley is the world's largest engineering company in the energy and chemicals industry, and a leading player in the resources field.

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Biosketches

Dr.-Ing. Patrick Cnubben, New Energy Coalition Groningen

Drs. Ing. Patrick Cnubben (1965) studied Chemical Engineering at the Hogere Technische School Heerlen (1989) and Chemistry at the University of Amsterdam (1993) and has been employed successively by Pré Consultants, Philips, Energy Research Centre of the Netherlands, PricewaterhouseCoopers, and Technology Center North Netherlands before his involvement within the Energy Valley Foundation. Within the Energy Valley Foundation, which is now merged into the New Energy Coalition, he has been active for over 18 years now and responsible for the realization of large-scale investments in the field of Bio Energy & Gas enhancing amongst else the production and use of (biogenic) energy carriers such as Green Gas, (Bio)LNG and Hydrogen. Patrick is the architect of Heavenn, the Northern-Netherlands Hydrogen Valley project and involved in many green Hydrogen related development projects. Recently Patrick has been appointed the coordinator of the green molecules program (green hydrogen and green gas) with New Energy Coalition where further development of these novel value chains is key - from idea generation, knowledge development to realization and operation.

Sonya Davidson

Sonya Davidson, CEO H2 Energy Now, bio. Female founder of a start-up involved in creating hydrogen using electromagnetic waves. Born in USA, made Aliyah in 2017, have five academic degrees. Fascinated by science. Use thought experiments to solve problems. 2018 NASA iTech presenter. Winner of a challenge grant. Worked with 9 interns presently two MBA students from Ben Gurion University, both female and previous IDF officers. Next team is from Vanderbilt University. Presented all over the world. Made finals in numerous competitions.

Marc van Doorn, Business Development Manager at Brightlands Chemelot

Marc van Doorn has a chemical engineering background (TU Eindhoven), followed by 30+ years of experience at DSM and later OCI Nitrogen with jobs ranging between plant manager for DSM on the technical side to commercial director for OCI Nitrogen on the commercial side. Recently he made the switch to use his experience to reach a sustainable world, working in a self-employed manner to develop sustainable processes on the Brightlands Chemelot Campus, provide his knowledge to world scale green hydrogen projects and founding BrigH2 as an alternative to renewable hydrogen starting from torrefied biomass.

Prof. Lior Elbaz, Bar Ilan University

Prof. Lior Elbaz has a BSc, MSc and PhD in Chemical Engineering. During his graduate studies, he became an expert in electrochemistry and electrocatalysis. After finishing his PhD, he joined the Los Alamos National Laboratory, NM, USA, a world leader in the development of fuel cell technology, where he developed new catalysts and advanced materials for fuel cells, to reduce fuel cell prices and to increase their durability. After almost four years at Los Alamos, Lior came back to Israel to take a position at the Department of Chemistry, Bar-Ilan University. After his return to Israel, Lior decided to establish and head the Israeli Fuel Cells Consortium (IFCC), composed of 12 leading Israeli labs, generously funded by the Israeli prime minister's office. Lior is also the official representative of the Israeli Ministry of Energy to the International Energy Agency's Executive Committee for Advanced Fuel Cells. In the capacity of the head of the IFCC, Lior is in direct contact and collaboration with parallel consortia in the US, Germany and Japan. He is also a co-founder of an Israeli start-up company in the field, developing light fuel cell for airborne applications. Lior is currently promoting the hydrogen energy economy in Israel, working together with all relevant ministries to prepare Israel to the Hydrogen revolution.

Marnix ten Kortenaar CEO of Dr Ten BV and Dr Ten Ltd.

Marnix studied chemistry in Leiden with an MSc degree in new electrodes for metal air batteries. Next, he gained his PhD in Physical Chemistry from TU Delft with R&D in electrocatalysis / nanoparticles for Hydrogen/C1 conversion (applied in fuel cells). He worked for 3 years for RWE-Essent in renewable energy projects after which he joined FrieslandCampina for 5 years. There he worked on bio-catalytic milk conversion and new CO2 assisted spray drying processes. Then he joined DSM for a year to work on new powder coatings after which he started his company Dr Ten BV in 2008. Besides, he was a lecturer at TU Delft in entrepreneurship and valorization (related to Yes!Delft).

Gil Shavit, VP Business Development, GenCell Ltd.

Over 30 years of engineering and entrepreneurship experience in high tech and clean energy fields. Enrollment based leadership that led into several bootstrapped ventures, including management buyouts. The composition of veteran engineering, business skills, and personal approach results in good atmosphere and overall calm business surrounding in companies I am involved in.

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Frank Wouters, Global Lead Green Hydrogen, Worley

Mr. Frank Wouters has been leading sustainable energy projects, transactions, and technology development for over 28 years. He has played a lead role in development of renewable generation projects valued at over $4.5 billion. These range from small scale PV solar electrification in Uganda to the 100MW Shams I Concentrated Solar Power (CSP) Plant in the UAE, and strategic equity investment in the London Array, the world's largest offshore wind project. His transactions have received multiple project finance "Deal of the Year" awards. As Deputy Director-General of the International Renewable Energy Agency (IRENA), the first global intergovernmental organisation dedicated to all renewables, he managed a US$350 million IRENA/Abu Dhabi Fund for Development project facility for RE. He appraised over 80 projects a year and recommended projects for funding, including solar PV projects in Africa. Mr. Wouters has served on the board of several energy companies, including Torresol Energy SA, where he developed three solar plants with an overall budget of US$1.4 billion. Mr. Wouters has a proven track record of advice to public power sector agencies. As Director of the Masdar Clean Energy Unit, a clean energy company owned by the Abu Dhabi Government, he managed more than US$3 billion of power projects, including solar and wind power projects. He coordinated with government ministers and other stakeholders to promote private sector investment for RE projects as part of the Africa Clean Energy Corridor Initiative. He currently serves as Global Lead Green Hydrogen at Worley, he is Director of the EU GCC Clean Energy Technology Network, he is a director of Gorestreet Capital, London, he is advising the World Bank on solar energy around the world and he is a fellow of the Payne Institute, Colorado School of Mines. Qualified with a Master of Science in Mechanical Engineering from Delft University, he is fluent in English, German and Dutch.