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AFRICA HYDROGEN FORUM



CO-HOSTED WITH



9 MAY 2023

ROTTERDAM AHOY, NETHERLANDS

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EXECUTIVE SUMMARY

WRITTEN BY



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OPENING KEYNOTE ADDRESS 1

Dr. Miloud Medjelled

Director General of Economic Studies and Foresight, [Ministry of Energy and Mines, Government of Algeria](#)

The Africa Hydrogen Forum was opened by Algeria’s Miloud Medjelled who outlined Algeria’s ambitious renewable and low-carbon hydrogen targets and presented the cornerstones of the country’s recently-published hydrogen roadmap. Algeria has ample wind and solar power generation potential and also hopes to benefit from its existing natural gas pipeline infrastructure which includes connections to southern Europe, specifically Spain and Italy, Medjelled said. Algeria’s hydrogen roadmap, released earlier this year, envisages a diversification of the country’s energy mix, a reduction of local fossil-fuel consumption and the development of a hub for hydrogen exports, he said. Algeria currently uses grey hydrogen for instance in oil refineries and ammonia production, but the roadmap sets a target of first green and blue hydrogen pilot projects being developed until 2030. A transition to larger-scale green hydrogen projects is then envisaged for the following decade, while in the 2040s green hydrogen is to be used even more extensively, including in power generation. The country’s green hydrogen production and transport sector could require investments of around \$25bn until 2040, Medjelled noted.



The renewable energies programme aims to reach a total capacity of 50,000 megawatts by 2030.”

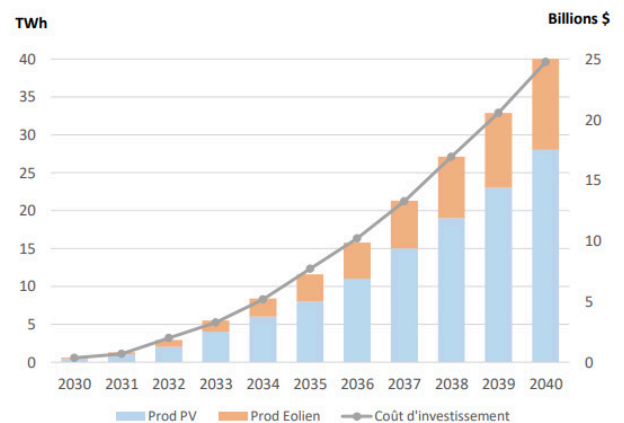
Dr. Miloud Medjelled

Director General of Economic Studies and Foresight, [Ministry of Energy and Mines, Government of Algeria](#)

HYDROGEN DEVELOPMENT PERSPECTIVE IN ALGERIA: INVESTMENT

Horizon 2030 and 2040:

A study was carried out covering the second phase of the hydrogen sector development roadmap, horizon 2030 - 2040, with the implementation of industrial-scale projects. The projects cover the entire Green Hydrogen value chain (production & transport, excluding storage).



OPENING KEYNOTE ADDRESS 2

Hon. Sihle Zikalala

Minister of Public Works and Infrastructure, [Government of South Africa](#)

In a second keynote address, South Africa’s Sihle Zikalala made clear that his country is also betting big on hydrogen. “Green hydrogen provides the best long-term opportunities for decarbonisation, especially in our case,” Zikalala said. South Africa may be able to attract investment to build 3-5GW of electrolyser capacity by 2030, supported by 6-10GW of renewable power, he said. By 2050, the country could produce 6mn-13mn t/yr of hydrogen of which it may export 4mn-8mn t/yr and consume 2mn-5mn t/yr domestically, for instance in heavy industry and the mining sector. Hydrogen could represent a \$15bn-30bn/yr market opportunity for South Africa by 2050, and the country hopes to gain a 4-8pc share of the ammonia export market, Zikalala said, adding that Japan and South Korea could be key targets for this. Most of the country’s planned projects are located in Northern Cape province, Zikalala said, including the flagship Boegoebaai hydrogen and ammonia export hub which is planned by chemical company Sasol. The project is set within a special economic zone where incentives will be used to attract developers. The government is also eyeing other initiatives to support projects developers and help them reach financial close, such as the creation of a clear regulatory framework. Based on Argus calculations, it would currently cost around \$5.90/kg to produce renewable hydrogen in South Africa — including capital expenditure — but technological advances could help cut the costs considerably over the coming years.



Green hydrogen provides the best long-term opportunities for decarbonisation, especially in our case.”

Hon. Sihle Zikalala

Minister of Public Works and Infrastructure, [Government of South Africa](#)

GREEN H2 POTENTIAL EXPORT AND DOMESTIC DEMAND

INTERNATIONAL

- 64 countries covering 89% of global emissions have announced net zero targets
- Global H2 demand to increase by 7x by 2050 (660 MT)
- For world to limit global warming to <1.5 degrees, H2 to make up 10-20% of the global energy mix

DOMESTIC

- Green H2 has the potential to remove 10-15% of domestic emissions
- Potential to localize productions of electrolyser and fuel cell components (65% opportunity for FDI)
- 70% of the total investment is in renewable energy and electrolyser capacity building

EXPORTS

- SA could target to export 4-8 MT of H2 and derivatives by 2050
- Strong potential to capture 4-8% of the ammonia export market with strong possibility in Japan and South Korea
- Strong potential to export value added products like green steel and fertilizers (have a potential to be competitive against conventional technologies with a relatively log carbon price)

SA DOMESTIC DEMAND

- SA domestic demand could reach 2-5 MT by 2050

UNDERLYING HYPOTHESIS

- Ability to attract investors to build 3-5 GW of electrolyser capacity and 6-10 GW of dedicated renewable energy by 2030
- Securing early off-take agreements
- Strong bilateral ties with Japan, South Korea, Europe, China and India
- Deep pool of technical skills and funding



SESSION 1: REALISING CLEAN HYDROGEN PROJECTS IN AFRICA

The day's first panel discussion focused on project plans in various African countries and their progress to realisation. Siemens Energy's Nadja Haakansson opened the session by pointing to the many African countries that have ambitious plans in the hydrogen space. Haakansson stressed the need to "create real value chains" within Africa, utilising some of the continent's natural resources, such as South Africa's platinum reserves which are used in proton exchange membrane (PEM) electrolyzers. Building value chains means to not just extract minerals and "to ship them to another continent for refinement," but to actually create the end products in Africa, Haakansson said. This will stimulate growth and create jobs, she noted.

bp's Carolina Mesa Ivern shed some light on the company's plans in Mauritania which it had first announced in November last year. bp has determined where it intends to set up its project and has carried out initial environmental, social and logistics studies, Mesa Ivern said. "Mauritania has world-class renewable resources" with wind conditions among the best in the world, she noted, adding that wind speeds reach 10m/s in many parts of the country while solar resources are also strong. Mesa Ivern further touted bp's long-established relationships with the Mauritanian government while the land availability and access to water — enabled by Mauritania's 700km coastline — are also crucial. But bp also faces a variety of challenges in the country, many of which also apply to other countries in Africa and elsewhere. This includes a lack of port infrastructure that is able to receive equipment for renewable power generation, such as large wind turbines, while there also questions around sufficient road and rail transport infrastructure, Mesa Ivern said. A lot of skilled labour will also be needed to realise the project, she added.

While large-scale, primarily export-focused projects in Mauritania and other countries are getting a lot of attention, there is also ample potential for smaller scale production geared at consumption in Africa itself. Hydrogen Egypt's Khaled Nageib pointed out that this was a key focus area at the Cop 27 climate summit last year, with many discussions centred around how hydrogen can be used in distributed power microgrids. Tarik Hamane of Masen meanwhile touted Morocco's potential for renewable power and its role as a frontrunner for the energy transition in Africa. Morocco is aiming for 52pc of its installed electrical capacity to be from renewables by 2030 and is on course to even exceed this target, he said. The country has more than 4.4GW of renewable power capacity in operation and the same amount is due to come on line again "within the next 3-4 years". Morocco is among the top three countries globally for cost-competitive renewable hydrogen production, according to the International Renewable Energy Agency (Irena), while its proximity to Europe could help facilitate exports, Hamane said. The country could capture a 4-8pc market share of power-to-X products eventually, he added.



We are always waiting for the narrative to come from the EU. Why don't we have our own narrative?"

Khaled Nageib
CEO, Hydrogen Egypt

Marcel Raats

Manager Global Public Goods, Energy and Climate Team, Department for International Development, Netherlands Enterprise and Development Agency (RVO.nl) (Moderator)

Carolina Ivern Mesa

VP Hydrogen, Spain and New Markets, bp

Nadja Haakansson

Managing Director of Africa, Siemens Energy

Khaled Nageib

CEO, Hydrogen Egypt

Tarik Hamane

Acting CEO, Masen

The panellists agreed that international organisations and governments have a crucial role to play to get initial projects in Africa off the ground. International financial institutions and development banks have to show that initial projects "can fly", similar to what they did in the renewable power generation space 20 years ago, Hamane said.



SESSION 2: CREATING HYDROGEN SUPPLY CHAINS FOR AFRICA

The second session was opened by Algeria’s Nouredine Yaassaa who outlined the country’s ambitions in the hydrogen space, building on some of the points mentioned in the day’s first keynote session. Algeria currently produces around 4mn-5mn t/yr of grey ammonia through steam methane reforming, according to Yassaa. It hopes to “green” this production through renewable hydrogen projects, with a few initial pilot sites under development, Yassaa said. Renewable hydrogen could also be used for power generation in Algeria by blending it into gas turbines, he added.

Decarbonising domestic hydrogen production is also a key focus for South Africa. The country currently produces 2.5mn t/yr of hydrogen from coal and natural gas, Sasol’s Dumisani Nkala said, adding that transitioning to greener production pathways presents a huge opportunity. But Nkala cautioned that any transition will have to happen in a “just way that doesn’t result in job losses or ghost mining towns”. Sasol alone currently uses around 40mn t/yr of coal for its hydrogen production, demonstrating the sector’s economic and social importance. Making all of Sasol’s existing hydrogen “green” would require some 22GW electrolyser capacity and around 50GW of renewable power, Nkala estimated. In terms of export products and transport vectors, Nkala expects a mix of different approaches, with Sasol looking at renewable hydrogen and ammonia as well as sustainable aviation fuels. Sustainable aviation fuels in particular could be a good route to go down for African producers given the expected strong demand from the sector to decarbonise, Germany’s Till Mansmann said.

The Port of Rotterdam’s Monica Swanson stressed the need for Europe to ensure that it can facilitate large-scale renewable and low-carbon hydrogen imports, including from Africa, to meet demand. Rotterdam is open to receive blue hydrogen as a first step, but “green is the real future,” Swanson said. Mansmann concurred with Swanson regarding the massive import needs. Germany may need around 100TWh/yr of renewable hydrogen by 2030, of which around 50-70pc would have to be imported, he said. The energy transition will constitute “a change in every part of the industry for my country,” he added, before stressing the need for education in Europe and abroad, including in Africa, to drive ahead innovation and technology.



Hydrogen is not a new economy for us.”

Dumisani Nkala

Senior Vice President for Low-Carbon Solutions, [Sasol](#)

Stefan Krümpelmann

Editor, Hydrogen and Future Fuels, [Argus Media](#) (Moderator)

Dr. Yassaa Nouredine

Algerian Commissioner for Renewable Energy and Energy Efficiency, [CEREF](#)

Till Mansmann MP

Innovation Commissioner for Green Hydrogen, [German Federal Ministry of Education and Research \(BMBWF\)](#)

Monica Swanson

Program Manager International Hydrogen, [Port of Rotterdam](#)

Dumisani Nkala

Senior Vice President: Low Carbon Energy Solutions, [Sasol](#)



SESSION 3: CROSS-CONTINENTAL COLLABORATION TO COMMERCIALITY

The session started with a spotlight on Namibia.

Honourable Obeth Mbuipaha Kandjoze

Director General, National Planning Commission, Chairperson, Green Hydrogen Council, Government of the Republic of Namibia (Keynote Address)

The country aims to produce 10mn-12mn t/yr of renewable hydrogen by 2050, utilising nearly 130GW of electrolyser capacity, with a view to exporting hydrogen and derived products, such as ammonia, methanol and synthetic kerosene, Obeth Mbuipaha Kandjoze said. Namibia has identified three “green valleys”, with the one in the country’s southern region the most advanced, Kandjoze said.

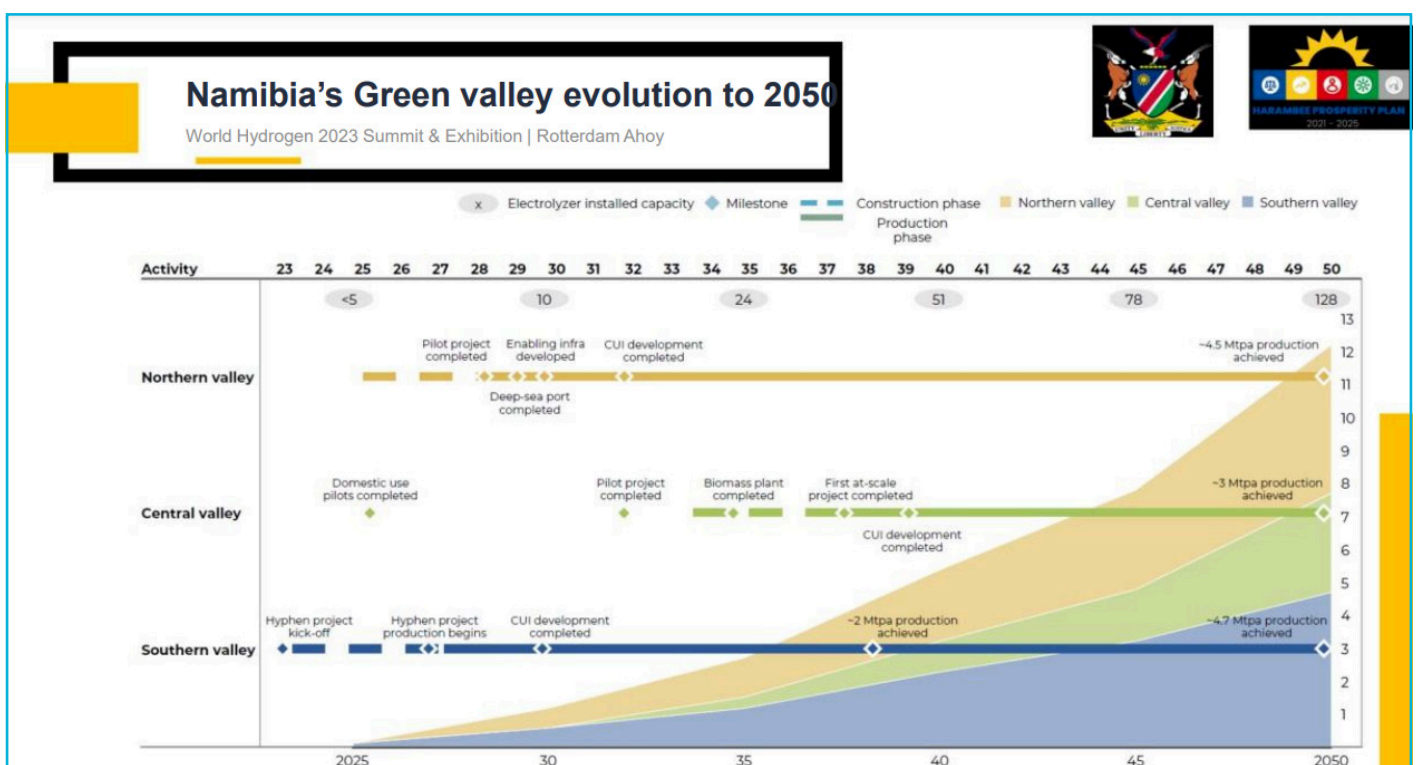
The southern valley, where the Hyphen flagship project is located, could provide 4.7mn t/yr of hydrogen by 2050, while the central valley could supply 3mnt/yr and the northern valley could produce 4.5mn t/yr. But Kandjoze pointed out that there is no legal framework for the development of projects in place yet, saying that the country is “looking for all sorts of support” in that area. The government is aiming to develop a “synthetic fuels act as a comprehensive regulatory framework” for the sector, while it is also looking to set up an “invest support office” as a single point of contact for developers and is seeking to establish “common use infrastructure”, Kandjoze said.

An initial agreement over the use of land with the Hyphen project developer – a joint venture between German renewables firm Enertrag and UK investment firm Nicholas Holdings – was to be reached by the end of May, he added. This has since been concluded, marking a major milestone for the Hyphen project and giving the Namibian government initially a 24pc stake as well as 5pc royalties in the operating stage. Hyphen is one of the few production projects planned in Africa for which preliminary offtake agreements with international buyers have been reached. Its developers have inked agreements for a total of more than 1mn t/yr of renewable ammonia, Argus data show. Offtakers include Germany’s RWE and South Korea’s Apptorium.



“We are going to try and focus on export of hydrogen derivatives.”

Honourable Obeth Mbuipaha Kandjoze,
Director General, National Planning
Commission, Chairperson, Green Hydrogen
Council, Government of the Republic of Namibia



SESSION 3: CROSS-CONTINENTAL COLLABORATION TO COMMERCIALITY

Bart Biebuyck of the Clean Hydrogen Joint Undertaking opened the subsequent panel discussion, saying that the body plans to launch and finance a “Just Green Africa” project with partners, such as the African Hydrogen Partnership, “in order to see how we can collaborate”. The body is hoping to launch a complete roadmap for collaboration by mid-2024, Biebuyck said.

Hydrogen Europe’s Jorgo Chatzimarkakis pointed to the various mandates for renewable hydrogen use that the EU is planning, such as in industry, aviation and the maritime sector, saying that these could provide a combined demand of about 5mn t/yr by 2030. But the mandates could trigger more private investment to encourage additional demand on top, as the EU aims for 10mn t/yr domestic production and another 10mn t/yr of imports. Chatzimarkakis criticised the EU’s definition of renewable hydrogen as too complex, with Hydroma’s Asma Diallo adding that aligning standards globally will be crucial, not least to enable exports from Africa to key demand centres such as Europe.

But Diallo also stressed the importance of developing domestic offtake opportunities on the African continent. Hydroma itself is pursuing several renewable hydrogen projects, such as in Senegal and Nigeria for domestic mobility applications. But it is also hoping to develop naturally-occurring hydrogen reserves in Mali. For the African Hydrogen Partnership’s Bamidele Adebisi, a key message is that “Africa wants industrialisation” and this will be about “regeneration” rather than just “taking from the ground”. Hydrogen can have a crucial role to play in this and become an enabler, including for electricity generation, but also by stimulating fresh water production that can then also be used in other sectors, such as agriculture, Adebisi said.



“Africa wants industrialisation.”

Bamidele Adebisi

Professor, [African Hydrogen Partnership/](#)
[Manchester Met University](#)

Bart Biebuyck

Executive Director, [Clean Hydrogen](#)
[Joint Undertaking \(JU\)](#) (Moderator)

Franz Lehner

Head Of Division International
Cooperation, [National Organisation](#)
[Hydrogen & Fuel Cell Technology](#)

Jorgo Chatzimarkakis

CEO, [Hydrogen Europe](#) and [SEC](#)
[Hydrogen Advisory Board Member](#)

Asma Diallo

Strategy and Development Director,
[Hydroma](#)

Prof Bamidele Adebisi

Director/ Board Member, [African](#)
[Hydrogen Partnership](#), Head of Smart
Infrastructure and Industry Research
(SIIR) Group, [Manchester Metropolitan](#)
[University](#)



SESSION 4: FINANCING, REGULATIONS & POLICIES SUBSIDISING HYDROGEN PROJECTS & DEVELOPMENTS

H.E. Abdessalam Mohamed Saleh

Minister of Petroleum, Mines and Energy, [Government of Mauritania](#)
(Keynote Address)

Mauritania's Abdessalam Mohamed Saleh opened the session with a keynote address on the country's ambitions in the renewable hydrogen space. Mauritania will have 80GW of electrolyser capacity if all of its planned hydrogen projects come to fruition, Saleh said. CWP Global, Chariot, TotalEnergies, bp, Conjuncta, Infinity and Masdar are among the companies planning projects in Mauritania, he said. But all projects are still in early planning phases, and with no final investment decisions taken so far, considerable hurdles remain.

Finding administrative and logistical support from the right international organisations and unlocking finances are the key challenges, according to Saleh. As much as \$80bn could be needed to reach the proposed 80GW of capacity, which would be equivalent to \$4bn/yr even when assuming a 20-year timeframe – a huge investment compared with the size of Mauritania's economy, Saleh said. This underlines the need for financial support to get projects off the ground, he noted. "The ball is in the court of the World Bank, IMF [and the] African Development Bank to help unlock the potential of Africa."



The ball is in the court of the World Bank, IMF [and the] African Development Bank to help unlock the potential of Africa."

H.E. Abdessalam Mohamed Saleh
Minister of Petroleum, Mines and Energy,
[Government of Mauritania](#)



SESSION 4: FINANCING, REGULATIONS & POLICIES SUBSIDISING HYDROGEN PROJECTS & DEVELOPMENTS

Starting the panel discussion, CWP Global’s Alex Hewitt picked up Saleh’s point to underline the scale of the required investments. CWP Global’s planned project in Mauritania – which could eventually produce around 2mn t/yr of hydrogen – “has a price tag of \$35bn,” he said, adding that the company has previously focused on renewable power, where investments – even for a very large wind farm – do not exceed \$1bn. The 10mn t/yr which the EU wants to produce domestically by 2030 could require investments of around \$300bn for power generation and electrolyser capacity as well as related infrastructure, Hewitt estimated. And this investment would have to come by 2025-26 to reach the targets given construction times, he said.

The panellists largely agreed that derisking projects will be key to attract financing in Africa and elsewhere. Blended finance and offtake contracts will be key to meeting the challenges around investment, according to Invest International’s Joost Oorthuizen. Setting up separate funds for different risk profiles, for instance related to development, construction and maintenance, could be a suitable approach, Oorthuizen said.

But it will be difficult to find investors without offtakers, and governments from potential demand centres may need to provide volume or minimum price guarantees to send the right signals to project developers and investors, he added. For Africa specifically, regional cooperation between countries will be crucial, RRS Trade and Investment’s Ipeleng Selele added. RRS Trade and Investment itself already works on a hydrogen mobility project that spans South Africa and Namibia, she said.

Mark-Simon Benjamins

Business Manager, [Port of Rotterdam](#)
(Moderator)

Joost Oorthuizen

Chief Executive Officer, Invest
International, [The Netherlands](#)

Axel Dombrowski

Director of Innovation and Digitalisation,
DNV

Alex Hewitt

CEO, [CWP Global](#)

Ipeleng Selele

Group CEO, [RRS Trade and Investment](#)



I also believe that the financiers themselves do need to be upskilled and trained in fully understanding and grasping the importance of the project that we are working on.”

Ipeleng Selele

Group CEO, [RRS Trade and Investment](#)



SPOTLIGHT: BANKABILITY OF GREEN HYDROGEN PROJECTS IN AFRICA

The following spotlight session focused on the bankability of projects, a topic which – according to the panellists – is of particular relevance for Africa. The question of bankability has to be “at the very forefront” from the inception of a project, partly because Africa “does not have the luxury of grants or subsidies,” Nigerian Teknologi’s Akin Ande said. “We have to be creative in the way we approach this,” he said. While financing challenges exist for project developers in many regions, “Africa is at a disadvantage when it comes to green hydrogen projects, full stop”, according to Mizuho’s Junaid Belo-Osagie. He sees difficulties arising for Africa on multiple levels. Projects will struggle to find offtakers because of a lack of sovereign underwriting, while the continent is struggling to attract project developers of the same skill as other regions and there is a big infrastructure gap. Moreover, the cost of capital in Africa is multiple times as high as in some other regions, Belo-Osagie said. Projects such as Saudi-Arabia’s flagship Neom site, which recently reached financial close, have benefitted from “quite a lot of sovereign underwriting”, Belo-Osagie said. “But the challenge for Africa is that we don’t have the money of the Middle East,” he said. And while competitive auction schemes, such as Germany’s H2Global initiative, are “innovative”, they sideline projects on a continent that has a “huge capital cost burden”, Belo-Osagie added. It would help if such mechanisms introduced specific Africa-focused clusters, he said. Blended finance mechanisms and equity funds as well as offtake mechanisms for local consumption in Africa could help overcome some of the challenges, according to Belo-Osagie. Other panellists agreed that the potential for local offtake in Africa should not be neglected, despite many projects focusing on large-scale exports. “Africa needs hydrogen for Africa as well,” Ande said. The African Hydrogen Partnership’s Siggie Huegemann said that local offtake will be the first phase for renewable hydrogen developments in Africa. The first step is use of hydrogen for baseload power supply replacing diesel generators, Huegemann said. A lot of African economies are heavily based on industrial hard-to-abate sectors, providing ample scope for renewable hydrogen use to decarbonise, he added. Namibia’s James Mnyupe then shed some further light on the agreement between his government and the Hyphen project developer which was finalised later in the month. The agreement gives certain rights to the developer as well as specific rights to the government, he said. Mnyupe stressed that it will be important for the entire community to “buy into” the project, including from a non-financial perspective. He added that African countries should seek to not just sell the hydrogen or ammonia but aim to use it to manufacture “more robust goods” that are “a lot less susceptible to the commodity price,” such as hot briquetted iron.

Marie Badiane-Mbuyu

Independent Legal Advisor, Ivoire
Hydrogène (Moderator)

James Mnyupe

Presidential Economic Advisor, Namibia

Siggie Huegemann

Secretary General, African Hydrogen
Partnership

Junaid Belo-Osagie

Executive Director for Investment
Banking, Mizuho

Akin Ande

Founder, Teknologi



Use electrons in the molecules
to make more robust goods
in Africa.”

James Mnyupe

Presidential Economic Advisor, Government of
The Republic of Namibia



The large scale
commercialisation of green
hydrogen in Africa has already
started.”

Siggie Huegemann

Secretary General, African Hydrogen
Partnership



SESSION 5: DEVELOPING HEAVY INDUSTRY IN AFRICA TO POSITION AFRICA AS A GLOBAL LEADER IN RENEWABLE PRODUCTS

The day's final discussion revolved around the use of renewable hydrogen and derived products on the African continent, specifically to decarbonise heavy industry. From a perspective of ammonia use, decarbonising existing production in northern Africa, such as in Morocco and Algeria, will be the "low-hanging fruits," the Ammonia Energy Association's Hans Vrijenhoef said.

This supply could then be transported to sub-Saharan Africa. But there is also the possibility of building decentralised, small-scale renewable ammonia plants in the more southerly part of the continent, thereby reducing the required logistics, Vrijenhoef said. This would open the door to producing low-cost fertiliser in the middle of Africa, making it "a no-brainer to start thinking about it," he added. FFI is among the companies pursuing this approach, with a 300MW geothermal energy plant for renewable ammonia production in Kenya a possible starting point, the company's Bruh Ayele Terfie said.

Decarbonising mining operations could be another application for renewable hydrogen and Africa may even be able to attract industry from elsewhere thanks to its renewable potential, Terfie said. For ammonia, power generation may be a key application area besides fertiliser production, Vrijenhoef added.

Arup's Sally Prickett pointed out that opportunities for industry also arise much earlier in the value chain. Manufacturing electrolyzers, or even wind turbines, domestically could add value to local economies in Africa, she said. If equipment cannot be manufactured locally this will also pose questions around the logistics of bringing it in, given the scale of the challenge surrounding the construction of large-scale projects, she added. Selling oxygen as a by-product from the hydrogen production process could also open up additional opportunities for project developers, Vrijenhoef said.



We are seeing now, a chance to link the energy value chain with the industrial value chain."

Bruh Ayele Terfie
President - Sub Saharan Africa, Fortescue Future Industries

Eugene McKenna
Commercial & Strategy Director,
Johnson Matthey (Moderator)

Sally Prickett
Director, Hydrogen Advisory, Arup

Bruh Ayele Terfie
President - Sub Saharan Africa,
Fortescue Future Industries

Hans Vrijenhoef
EVP President Elect, Ammonia Energy Association

Farhanja Wahabzada
Head of the Business Alliance on Green Hydrogen, GIZ



FINAL KEYNOTE ADDRESS

H.E. Liesje Schreinemacher

Minister for Foreign Trade and Development Cooperation, [Government of the Kingdom of the Netherlands](#) (Keynote Address)

The Africa Hydrogen Forum concluded with a keynote address from Liesje Schreinemacher who stressed the “central role” that Africa will have to play in a transition to a more sustainable future, including through renewable hydrogen. Cooperation and knowledge-sharing will be key to unlocking the continent’s potential, she said.

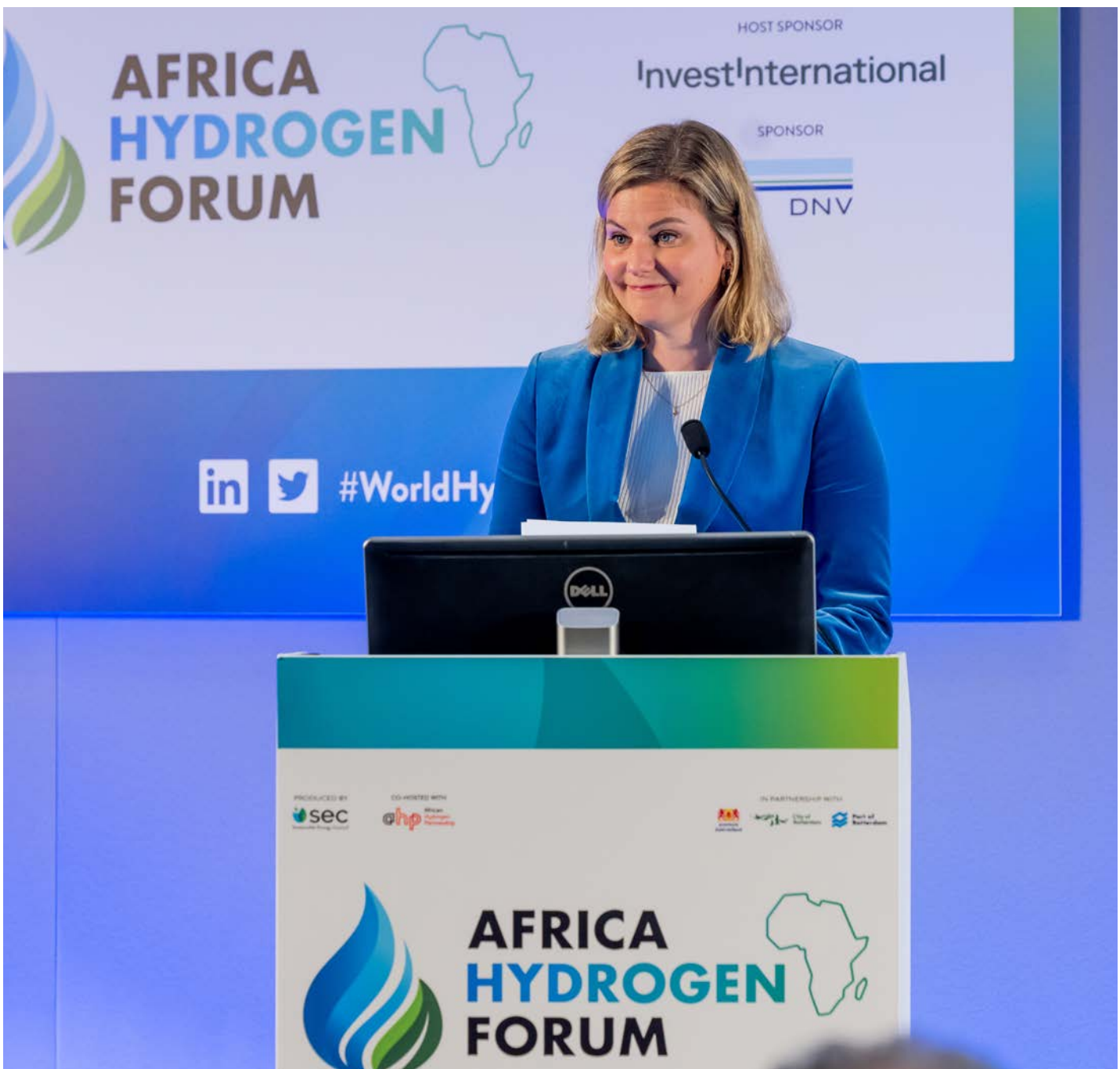
In line with what previous speakers had said, Schreinemacher pointed to the importance of ensuring that the “financial, social and economic benefits of the global energy transition are fairly distributed”. The Netherlands is also already engaging extensively with African partners around renewable hydrogen production projects and in setting up supply chains, Schreinemacher said.



Africa has the best possible conditions for the production of green hydrogen.”

H.E. Liesje Schreinemacher

Minister for Foreign Trade and Development Cooperation, [Government of the Kingdom of the Netherlands](#)





WORLD HYDROGEN 2024

SUMMIT & EXHIBITION



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