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مركز التكامل المتوسطي

World Bank – CMI Joint Webinar Series
Knowledge Exchange on Green Hydrogen for the Mediterranean Region

Green Hydrogen Industrial Strategies around the Mediterranean

15 June 2021 | 10:00 EDT/16:00CEST

Summary of Presentations and Key Points from Speakers

Silvia Pariente-David (introductory remarks)

- Today's event is the fourth in a series of webinars jointly hosted by the Center for Mediterranean Integration (CMI) and the World Bank on Green Hydrogen for the Mediterranean Region. Given I am chairing today on behalf of the CMI, let me say a few words on the CMI, given everybody is familiar with the World Bank, but may be less so with the CMI. The Center for Mediterranean Integration (CMI) is a multi-partner knowledge exchange platform where development agencies, governments, local authorities, and civil society from around the Mediterranean convene to exchange ideas, discuss public policies, and identify regional solutions to address regional challenges in the Mediterranean. It aims at promoting regional development through Mediterranean integration. One of its programs is the Mediterranean Forum on Energy and Climate Change, which is a discussion platform among countries, international organizations, regulators and energy companies, with the objective of supporting the transition to a low-carbon economy in the Mediterranean by (i) disseminating knowledge on how to successfully achieve low carbon growth in the Mediterranean and (ii) raising awareness on the benefits of Mediterranean energy market integration.
- Previous webinars have shown that the Mediterranean region could become a major trading hub for green hydrogen, as it encompasses both countries with excellent renewable energy resources and those with demand likely to boom as they seek carbon neutrality. The pipeline of hydrogen projects in the region is impressive and growing fast as countries express their intentions to participate in the future hydrogen economy.
- However, today we want to talk about the private sector because we won't have a Mediterranean hydrogen market without a substantial involvement of the private sector, and we also need private financing, besides the large government programs. Today we will discuss what various companies are doing to develop this market but also what they need for that market to develop from a policy and regulatory point of view.

Ramabhadran (RB) Balaji, Principal Industry Advisor, International Finance Corporation

- The presentation covers several applications of green hydrogen, including its application in industry (green ammonia, green methanol, refining, steel manufacturing), in transportation (marine fuel, fuel for vehicles and passenger cars, aviation, rail), and energy and power generation (heat and energy needs). It also provides some cost estimates for green hydrogen and its derivatives and current challenges for its deployment. You can find the full presentation [here](#).

- To a question from the audience on what IFC is telling its clients in developing countries about the forthcoming EU Carbon Border Adjustment Mechanisms (BCAM), IFC responded that this will affect all the products that they are exporting to Europe. The production of base materials like chemicals, steel and cement is very energy intensive industry. IFC has a climate change objective as well as a climate finance component. IFC looks at development status of the country and project need, sustainability footprint, carbon emitted and materials used in manufacturing and assess what is the best way for that project/company to meet climate and sustainability goals and remain competitive for long time, otherwise it will become stranded assets.. It's also important to work with other development banks and funds, especially concessional funds such as the Clean Technology Fund, to leverage those funding to deliver the climate objectives and lower the cost of capital.

Franck Le Baron, Senior Vice President – ENGIE Hydrogen

- Engie's vision is to make green hydrogen happen. The company has recently adopted high ambition targets of 4GW of installed capacity by 2030, 700 km of dedicated hydrogen network, 1 TWh of storage capacity and more than 100 fueling stations.
- Engie is one of the main sponsors of the ENERGY OBSERVER, the world's first autonomous hydrogen-powered zero emission boat. It is a floating laboratory, autonomous in energy and works thanks to a combination of renewable energies, from solar panel to wind energy, feeding a system for producing hydrogen from seawater. It is a great ambassador to deliver the message.
- The Mediterranean region means to many great weather, great food, great holidays, great quality of life, so we need to find solutions to protect this beautiful region. This region is also rich in renewable energy sources and an ideal place to develop green hydrogen.
- Hydrogen is not new, but what is new is that it will soon be competitive, maybe even before 2030, and there is a momentum to develop green hydrogen with several countries in Europe and in the world announcing hydrogen strategies.
- Engie created a dedicated business unit three years ago, as the company believed it had a role to play and thus needed to be organized for that. Engie is uniquely positioned, from being a utility company, to an experienced player on gas entire value chain, to developer of zero carbon solutions for their customers. Hydrogen is not only the link between all these activities, but also the solution.
- Engie's approach is to develop massive production of green hydrogen in key geographic areas, where RE is abundant and competitive, and where there is political push and support for things to happen, and where Engie has already a strong presence, connected to key stakeholders, like for instance in Australia, Chile, Morocco, South Africa, France. Most of the time partners want to decarbonize their production.
- Engie is ready to cooperate with Mediterranean countries to develop green hydrogen. But support is needed from a regulatory, political, financial perspective, like subsidies to help the launching of the projects in the early years where green hydrogen is not yet competitive with grey hydrogen. Long term financial incentives, public tenders for green procurement, and implementation of traceability and guarantee of origin systems, storage obligations and others, will be important to create demand and scale up the industry.
- Green hydrogen projects involve significant amount of CAPEX, needing both investors, developers, clients, partners, off takers, and each of them can take its part on the risks. Hydrogen will be a success with the right consortiums, at the right time, at the right place.

- Business models: It is more a matter of logistic than “trade”, one day there will be a logistic framework for hydrogen like it happened for gas and LNG. We need to create this. It will take time. One key place are the harbors, where you have trade, industries, logistics. Create hubs in harbors could be ideal for the development of new business models.
- Engie has developed desalination of water knowledge and experience in the Middle East over the past 15 years, and believe is important to bring this as solution to water scarcity issues

Daniele Agostini, Head of Energy and Climate Policies, ENEL Group

- Enel is headquartered in Italy but is a global player in the energy value chain in more than 30 countries. The company strongly believes in green hydrogen expecting to produce 90 ton of it by 2030. Enel is very skeptical regarding blue hydrogen because of its reliance on the CCS technology. We have explored in the past CCS technology and found its many technical challenges hard to overcome. Furthermore, extended planning and construction and operational life timeframes expose CCS projects to a significant risk of stranded assets.
- There are three critical issues regarding green hydrogen, as it is:
 - a) Critically necessary - Based on the findings of the energy transition roadmaps projects we implemented in the countries in which we operate, hydrogen will definitely play a key role in hard to abate sector and as seasonal storage in the power sector.
 - b) Scarce - Hydrogen will have to be green and thus compete for electricity from renewable energy. Thus, it should be focused on hard to abate sectors, industrial, aviation, shipping, as those sectors do not have an alternative. We will need to accelerate hydrogen generation rapidly in the next 20 years.
 - c) Technologically behind - There are lots of discussions, but we are far away to implementing and deploying this technology. Today’s for instance, direct electrification is much more mature, we can see it in the transport sector, in the building sector, and also in the industrial sector. For hydrogen the company sees a longer curve with a research phase up to 2030, a pilot phase up to 2040 and full deployment after 2040. That is why we believe it needs support.
- In light of the above the production of hydrogen should be close to consumption, for instance close to industrial plants in the energy intensive sector such as steel, cement, glass, refineries, etc. Transport is a huge issue with many challenges and less effective, and it should be reserved where it is needed.
- Policy is needed to support a full supply value chain on generation, incentives to deploy electrolyzer, and accelerate the deployment of renewable energy sources (RES). The lack of regulation and permitting is holding up the scaling up of RES. On the infrastructure side we need electricity grids to bring renewable energy to the electrolyzers. We also need traceability to make sure hydrogen is totally green. On the consumption side some sectors are moving fast, like the paper industry, some others are lagging behind. Policy should encourage them to leave the fossil fuels and move to green alternatives.
- Regarding the long distance transport of hydrogen, we believe the current debate on the topic is struggling in understanding that the world is drastically changing. We are still very much attached to the old top down views of the energy sector, where energy is produced in one site and then transported and consumed in another. We are too used to have energy coming from the Middle East, Central America, Russia and then be moved to wherever is needed. We need instead to completely change our mindset. The world of energy is not going to be top down anymore, not

center to periphery, but bottom up, periphery to periphery, possibly going through regional hubs. It will be a world where hydrogen will not be transported across long distance, but it will be consumed closer to points of production. Transport and trading will be minimized with production and consumption points concentrated within the so-called hydrogen valleys. The sooner we understand that, the sooner we can drive the change wave we need to accelerate the energy transition.

- In the past industrial activities used to be located close to rivers in order to have easy access to the hydro energy. Similarly in the future energy intensive companies will need to think in that same way and relocate close to the hydrogen energy production sites within hydrogen valleys where RES energy will be abundant. Maybe in the beginning a little of trading and long-haul transport will go on, but it will eventually disappear as the proximity model gains momentum and the new green industry will be relocating itself closer to where green hydrogen can be produced.

Laurent Antoni, Public Affairs Manager for Hydrogen Technologies, CEA Liten

- Hydrogen is ready for massive deployment; the time of hydrogen has arrived! But it remains a young technology with challenges to overcome. Research is still needed and needs even to be intensified in order to scale up the technology to achieve the 2030 targets on renewable and low carbon hydrogen and carbon neutrality overall.
- CEA Liten is a research institute, focusing on renewable energy, solar, storage batteries, EE heating and H₂, and develops advanced materials used in all different energy sectors. CEA Liten's mission is to transfer technology and new ideas originated in the labs to industry. The institute has been working with several industries already, for example it developed solar technology and transferred to ENEL which is now produced in south of Italy, fuel cell stacks for transportation which are now used by Symbio, and is working on electrolyzers, in particular on high temperature electrolysis. Recently CEA Liten's technology has led to the creation of a new joint venture GENVIA French company with Schlumberger, CEA, Vicat, Vinci construction and AREC Occitanie to develop high temperature electrolyzers. CEA Liten is also working on developing CCU for the production of hydrogen or e-fuels.
- Research institutes can contribute to develop new, low carbon technologies for the industries and form new industry players. Technology has to be economically viable, and will have to adapt to the new currency, the carbon. Thus, technology has to have low carbon content. It is indeed important to first agree on how to measure that, so developing standards for carbon footprint, and safety standards, at national level and international level, is important to ensure that regulation is not an additional barrier to the development of green hydrogen.
- Business models: local vs export is a key question and it will depend on the business models and case by case. In some regions and some industries, it will be better to have production onsite and close to consumption, but in other cases it will be better to have hydrogen provided via pipelines. This will much depend on the existing assets, either electric or gas grid and on the consumption quantity of the hydrogen. It is important to study the specific cases and the synergy with the region, exporting hydrogen or the final product like ammonia. All the carbon emission have to be taken into account, including H₂ conditioning and transport to the consumption gate.
- Water has to be considered, but it doesn't appear as a key problem as it only represents a small part of the industrial water consumption.

Silvia Pariente-David (concluding remarks)

- To summarize, we have heard today that there is a consensus that green hydrogen is needed to reach carbon neutrality, especially for the sectors where electrification is difficult. I think we had

less of a consensus on whether production of green hydrogen should take place close to consumption centers or where RES are plentiful and then transport the hydrogen.

- Hydrogen will however become a global market, and the Mediterranean could become a major hub for green hydrogen. The Mediterranean is surrounded by countries with a large potential for hydrogen production given their plentiful resources in carbon-free energy (mostly in the South) and countries that need vast amounts of hydrogen that will increasingly be green (mostly in the North).
- There will be a variety of business models, from niche players to integrated value chain actors. Research institutions need to work closely with the various players to accelerate technological development and create a well-functioning and liquid hydrogen market.
- Succeeding in making hydrogen a powerful vector of decarbonization requires cooperation, between countries, between the various players. North African countries are likely to be major players, and they are more likely to take that role rapidly if they manage to do it together (mimicking what was at the birth of the EU in the 1950s when the ESCC was created)
- We were not able to address all your questions, and even those we tackled will need more time, research and analysis to get answers. A question that kept popping up was regarding the carbon footprint, depending in what form hydrogen is transported and where it is produced. Other questions were around government support and regulations needed to create the green hydrogen market. Finally, the question of water availability remains a debatable point.
- Luckily, we have planned more seminars in the series that will address those questions and more. The EU Gas Package is due in the next couple of months, and this will deserve our attention as well. The next webinar will probably be on regulatory issues, but we'll have more on national policies and company strategies as well, as the two we had on those questions were very successful, but we were able to cover only a few countries.