



Ministry of Energy & Infrastructure

Policy Planning and Strategy Division

MED-GEM Country Consultation Workshop Summary

Agenda

10:00 (GMT+2) Opening Statements

- Address of representative from Ministry of Energy and Infrastructure (MoE) from Israel **Ms. Sharon Hatzor**, Deputy Director General, MEI
- Welcome Note by EU Delegation in Israel, **Andrea Carignani di Novoli**, Head of Section Research & Innovation and EU other policies
- Welcome Note/Setting the Scene by **Frank Wouters**, Director of the MED GEM Network
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10:30 (GMT+2) Session 1: Energy Transition in the EU and Israel and the role of Green Hydrogen

Presentations:

- “The EU’s energy transition: Challenges and opportunities” European Commission – **Matteo Fumerio**
- “The Current Situation of Clean Energy in Israel: challenges and opportunities” – **Noam Degani**
- “The green hydrogen in Israel and future development” – **Lior Elbaz**

Q&A session

12:00 (GMT+2) Lunch Break

13:00 (GMT+2) Session 2: Policy options for Developing green Hydrogen in Israel

Presentations:

- “Hydrogen Valleys : Experiences and Best Practices” – **Patrick Cnubben**, Hydrogen Architect

Open Discussion:

1. **Policy and Regulations** – **Noam Degani**, Senior coordinator Long Term Strategic Policy Planning, Strategy and Policy Planning, MoE
2. **Finance and Investment (Business models including Public-Private- Partnerships)** – **Dr. Yael Harman**, Director of R&D, Chief Scientist office, MoE
3. **Development of Hydrogen Valleys in Israel** – **Meshi Laks**, Director of Policy and Innovation, Policy Planning and Strategy Division, MoE

14:45 (GMT+2) Takeaways and identification of Priority actions: MEI, EU Delegation and MED-GEM

15:00 (GMT+2) End of the online workshop



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Discussions Summary

Session 1: Energy Transition in the EU and Israel and the role of Green Hydrogen – Q&A

Q1: What is the ability to promote blue hydrogen?

A1(1): Capturing CO₂ is in an immature development stages, including storage and use. Currently, some technologies seem very promising, and if they prove to work, blue hydrogen can be very relevant in Israel. (Lior Elbaz)

A1(2): One of the steps presenting in the roadmap at the *Israel Hydrogen Strategy* for the immediate term, is performing a large analysis of carbon storage underground. It is also important to take into consideration how many reserves of natural gas will be available 20 years from now in Israel when considering blue hydrogen. (MoE, Strategy Division)

Q2: What about turquoise hydrogen, sea-mining, gypsum-magnesium and as such?

A2(1): Airovation-tech is aiming to perform a field pilot of clean hydrogen out of phosphogypsum. Currently, the Hebrew University is conducting tests for the capture of greenhouse gases and the conversion of them into calcium carbonate and sulfuric acid. Initially, we used sodium and potassium bicarbonate, but since we are seeking to permanently lock the carbon, calcium proved to be a better solution. (Airovation-tech representative)

A2(2): A project in TA University- *Pyrolysis of Natural Gas into Hydrogen and Solid Carbon in a Multi-phase Reactor*, supported by MoE Chief Scientist is about to be completed, using a multi-metal reactor. The project is at a laboratory scale and needs to be scaled up before it can be commercialized. In regard to byproducts of desalination, there are projects concerning magnesium and other rare metals. (MoE, Chief Scientist)



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Q3: What is the EU perspective for electricity production from hydrogen?

A3(1): Considering the energy losses from converting renewable electricity into hydrogen and then again into electricity, the process isn't as efficient as direct use of electricity generated from renewables. So using hydrogen production/import for end uses mainly in the hard-to-abate sectors will rather be the best option, and maybe also as a utility for energy storage. (Matteo Fumerio)

Q4: In the case of producing renewables at sea and transferring it inland – maybe hydrogen can be a solution for the grid challenges?

A4(1): Ideally, the EU would prefer to invest in grid debottlenecking as the main route in that matter rather than using hydrogen, both in improving interconnection and in delivering electricity to the demand areas, which will make more sense from an energy perspective as well as economically. (Matteo Fumerio)

A4(2): In the short-medium term, hydrogen has the potential to be used as a low carbon fuel across hard-to-abate sectors such as heavy industry and heavy transportation, and it might be possible to use it for long-term energy storage. The *Israel Hydrogen Strategy* considers the use of hydrogen for electricity only in the maximum scenario, depending on worldwide trends, price and efficiency. (MoE, Strategy Division)

Q5: Does the EU plan to have enough capacity of “green” energy for electricity production without using hydrogen?

A5(1): Yes, from the EU perspective, we aim to maximize the capacity factor without the need to invest in reconversion, but still to examine project by project. We are not saying "one size fits all" – but we are ensuring the integration of renewables as deep as possible, and maybe using hydrogen as storage solution, where it makes sense. (Matteo Fumerio)

A5(2): There is also a large energy storage capacity in Europe – 25%, most of it molecules, and so we will probably have the same need for storage in the future and we need to take that in consideration. I do think we will have these clean molecules for energy storage. (Frank Wouters)



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Q6: What is the situation regarding importing hydrogen into Israel and how MEDGEM would support that?

A6(1): As described at the *Israel Hydrogen Strategy*, Israel will not be able to produce all of the future hydrogen demand locally, and will need hydrogen import. Promoting international cooperation is one of the main key steps in the strategy's roadmap. Israel's geostrategic location enables it to serve as a bridge between hydrogen-exporting and importing countries, from neighboring countries to Europe. (MoE, Strategy Division)

A6(2): Blue hydrogen is needed alongside the green hydrogen, because the industry still needs carbon and eventually we will find solutions from CCUS. Hence, Israel might be able to produce the local demand. But in order to import we have to also export, to be a part of a chain which will eventually go to Europe. We can't be only importers or exporters. (Israel Natural Gas Lines representative)

A6(3): Israel could import hydrogen through various means, primarily through shipments or pipelines connected to neighboring countries with abundant green hydrogen production capacity. MED-GEM can bring technical expertise on the topics of transport and infrastructure of hydrogen. For example, it can also look at the possibilities related to building interconnecting pipelines or establishing trade routes for green hydrogen shipments. Or, it could as well support in developing regulations and standards related to green hydrogen production, transportation, and usage. MED-GEM is a technical partner able to co-create a conducive environment for green hydrogen trade and investment, enhancing Israel's ability to import green hydrogen efficiently. Besides, being funded by the EU, MED-GEM can also coordinate with other EU initiatives such as Horizon Europe to stimulate R&D and as such, explore innovative solutions responding to the issue of energy import. (MED-GEM representative)



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Session 2 – Hydrogen Regulation and Policy discussion room:

Host: Noam Degani, Senior coordinator Long Term Policy Planning, Strategy and Policy Planning Department, MoE

No. of participants: 27

Introduction: The *Israel hydrogen Strategy* studied hydrogen policies in selected countries, and concluded that most countries have not formulated a dedicated regulation for hydrogen. Instead, they use existing regulation in the areas of hazardous materials, environment and transport, usually with several different regulating bodies, as is the case also in Israel. Government-supported projects are dedicated both for scale up, but also for teaching regulators to be better prepared for hydrogen use. In Israel, hydrogen receives a residual reference within the existing regulation (Hazardous Materials Law), it's considered a field in its infancy, and is not yet addressed in the relevant regulation. The questions to be asked when formulating a flexible and enabling regulation, are whether it's beneficial to establish regulations now, in the early stages of the hydrogen economy, and if so, how much of the regulation is necessary? Recommendations for the Short- Medium Term:

Ad-hoc and specific Legislative Amendments	Amendments in the regulation regarding Testing and Piloting	Policy
Promoting legislative amendments required for the construction of hydrogen facilities (amendments required in the natural gas and fuel economy legislation)	Defining physical testing areas	Establishing a multi-sectoral hydrogen forum
Formulating a tailored definition for hydrogen in the Hazardous Substances Law		Accompanying and advising entrepreneurs and projects
Defining hydrogen as an energy source	Creating enabling pathways within existing regulations	Training dedicated manpower
Promoting and adopting safety standards for facilities and infrastructure		Issuing a Request for Information (RFI) for hydrogen valleys



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Dorit Bannet, Expert of clean energy:

The expert presented the main challenges and obstacles of the current regulation surrounding the value chain of hydrogen, and emphasized several crucial needs of the market:

1. The policy needs to take into consideration the whole value chain, as some areas within the value chain might be "under the radar" for part of the regulators.
2. The policy needs to emphasize budgeting, and create goals and priorities within the value chain for the short-term, medium-term and long-term, as well as make yearly assessments of implementation.
3. Establishing a statutory inter-ministerial committee that will accompany the formulated goals: Ministry of Energy & Infrastructure, Land Authority, Planning Administration, Ministry of Environmental Protection, the Innovation Authority, the Ministry of Economy and Industry, the Electricity Authority and the Standards Institution.
4. There is a need to set clear definitions for characterizing planning zones of hydrogen production, storage transportation. The main question: does the production can be built on engineering facility, or on industrial zone or any other type, or regarding the size of production. This has implications on many aspects (especially in Israeli land regulation). In rural settlements, when installing a renewable energy facility, it is considered using only 10% of the rights. Hoe ever if you are building the same facility in an industrial zone, it will be considered as though you used 100% of the rights.
5. Standardization for production and use of hydrogen: production, compression, storage, transportation (hydrogen piping) and conversion of engines, boilers, burners, transportation, parking lots, etc.
6. Numerous permits/business licenses required: environment, firefighting, homeland security, and others, given from different regulators (local, areal or governmental) according to project size and quantities, and necessitating different adjustments.



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Discussion:

- In regard to considering the whole value chain of hydrogen in the regulation, exporting hydrogen to Europe will need to fall under the European certification and CBAM, and will be inspected through all parts of the value chain.
- Dividing the land into areas might incentivize investors. Also, setting common infrastructure for several projects in the same area might help with funding and efficiency.
- Promoting Public-Private-Partnerships, where within the same area there are both governmental support, testing labs and other facilities.
- Adopting European/American standardization – The industry needs to know upon which standards to work. Setting European standards will also help with synchronizing and helping the industry to collaborate with Europe.



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Session 2 – Financing and Investments discussion room

Host: Dr. Yael Harman, Director of R&D, Chief Scientist office, MoE

No. of participants: 27

Introduction: The Chief Scientist office at the MoE is promoting innovative technologies and granting clean energy investment for sustainable projects annually, for project in pilot and demonstrations, academia, R&D and startups. Since 2018 until today, there are various projects in the field of hydrogen in Israel that are supported by the MoE; Over 40 academic research in the fuel cell and hydrogen, startups and pilot and demonstration projects. Additionally two feasible projects today, are the hydrogen fuel station and the hydrogen tracks in Yagur, and the Green Hydrogen Yotveta project at the Arava.

The MoE representative presented the international comparative investments at hydrogen valleys, as elaborated at the *Israel Hydrogen Strategy*: hydrogen valleys are critical to the development of the hydrogen economy and the rate of public support of the total cost of the project in Europe at the PPP model is about 34% of the scope of the initial cost.

Yotam Ben Shitrit, Economist, Long-Term Policy and Strategic Projects Division, MoE :

The expert presented the main economic issues to be address when supporting a hydrogen project:

1. Hydrogen is widely regarded as a pivotal technology that could help the world achieve zero emissions. It has diverse applications, including its use in industry, energy storage, and transportation, among others. However, the technology also presents certain challenges, particularly in the production process and the associated costs.
2. Like many countries around the world, Israel recognizes the potential of investing in 'hydrogen valleys'. One of the main reason is that Hydrogen valleys serve as centralized hubs where various infrastructures integrate. They provide a platform for the dual use of technology, thereby there is an innovation environment.
3. This concentration of resources and expertise in one location creates a technological incubator, which could potentially catalyze future developments in the field of hydrogen technology.



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4. We examine investment of hydrogen technology, we see that governments are investing 34% in hydrogen valleys, as evidenced in countries like Germany, the Netherlands, and France.
5. However, in Israel, the infrastructure is still in its early stages. Therefore, investing in the short term for the establishment of projects is the most appropriate approach at this time.

Discussion:

- It's very hard for the private sector to invest when there are no government decision about hydrogen as part of the fuel structure, even though hydrogen is predicted to be part of the fuels within the Government's plan for 2050.
- In the current planning and permitting procedures planning of infrastructure such as ports and pipelines there is no reference to hydrogen, and it might affect the long term strategy.



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Session 2 – Development of Hydrogen Valleys in Israel discussion room

Host: Meshi Laks, Director of Policy and Innovation, Policy Planning and Strategy Division, MoE

No. of participants: 32

Introduction: The MoE representative presented the policy of hydrogen valley, as described in the Israel Hydrogen Strategy; the main reasons for establishing a hydrogen valley in Israel is for helping reducing GHG. Hydrogen valleys allow developing a knowledge and experimental hub for research, development demonstration and growth in various aspects. These include: using innovative technology for producing hydrogen, supplying the minimum national hydrogen demand, examining and adapting wide segments of regulation, legislation and standardization, especially regarding safety provisions (hydrogen is flammable substance 2.1), building a training programs of dedicated personnel and enabling a hydrogen market from a grassroots level to international economy.

The characteristics of the hydrogen valley are based upon six segments: the hydrogen valley is located in a defined geographic area, and is close by to end-users; It covers a significant portion of the hydrogen value chain, from production and storage, throughout transportation of hydrogen into the end-users, which are multiple and include various sectors such as transportation, industry, and electricity generation and storage. The technologies that are used in the hydrogen valley must be innovative with Technology Readiness Level of over 6 (demonstration of the technology in a real environment), and classified as beta-type. The hydrogen valley will also enable lower TRLs for research, development and demonstration, as well as for implementation of mature technologies. The partnerships in the hydrogen valley are across many sectors: industry, startups, academy, government, and the hydrogen valley will allow to establish the primary groundwork for regional collaboration and international connectivity.



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Dubi Gerber, MDI consulting company and David Greniman expert advisor:

The experts presented the main characteristics and features of the Green Hydrogen Yotveta project, including partnerships, location, production and end users with the possibility of regional connectivity with neighboring countries and EU. There are five main stages to follow in order to be able to make a project applicable (regulatory and feasibility aspects):

1. Locating experts in each section in the hydrogen value chain and regulation
2. Forming a consortium of partnerships, including international companies and countries for future collaboration and regional economy development
3. Funding alongside involving connections and network with international stakeholders such as *Hydrogen Europe* and EU partners
4. Getting supporting from the municipality in which the projects takes place
5. Getting guidance from Patrick Cnubben, an expert who established the first Hydrogen Valley in the Netherland, for more deliberation

Discussion:

- The readiness level of the local industry to accept hydrogen is immature. There is a need to formulate diverse hydrogen valleys in different sizes before scaling up: starting small with fuel stations (as exists today in Yagur), advancing in the local hydrogen production for one factory (as the Yotveta project)¹ – and when government-funding is more firm – establishing a mature and comprehensive hydrogen valley. However, all participants in the room agreed with the statement "*establishing a hydrogen valley in Israel is urgent*" (please see appendix Polls).
- Israel is not going to be a main hydrogen producer and exporter. Should the hydrogen valley support startups and technology accelerators as an experimental field for producing hydrogen or as a technology innovative exporter?
- The importance of consortiums and the role of developers and off-takers in the process of choosing the location for the hydrogen valley. The establishment of the valley should be

¹ Both projects are funded and supported by the MoE



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initiated through a reverse-engineering method, starting from the off takers to the developers.

- Number of hydrogen valleys in Israel – one or more, with emphasis on the connectivity between different geographical areas, in order to turn Israel into a green-hydrogen hub.
- Hydrogen valley can also serve as an engine for economic growth and the promotion of Israel as a bridge between hydrogen-importing and hydrogen-exporting countries, through regional collaborations with neighboring countries and through using shared infrastructure.
- Incentives and subsidies are needed for the growth of a hydrogen economy. The forecasts for hydrogen prices (by 2030 should be around 4 \$ per kg) verify the viability of hydrogen use in the future.



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Polls results²

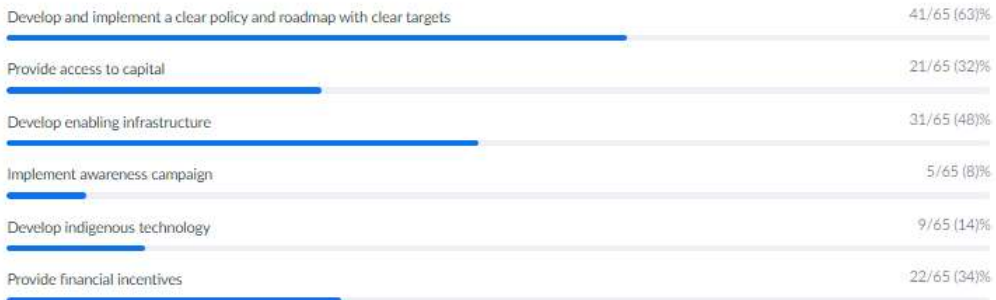
1. How optimistic are you about Israel's potential to become a leader in the green hydrogen market by 2050? (Rating scale)

76/79 (96)% answered



2. What are the most immediate actions required to kickstart a green hydrogen economy in Israel? (Multiple choice)

65/79 (82)% answered



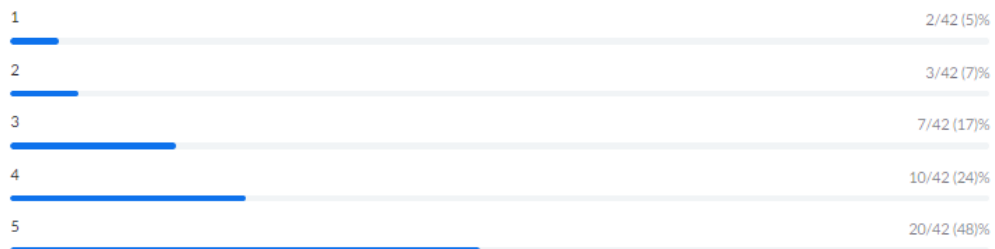
1. Which policy measure do you think is most critical for developing green hydrogen in Israel? (Multiple choice)

43/43 (100)% answered



1. How urgent is it for Israel to develop Hydrogen Valleys? (Rating scale)

42/42 (100)% answered



² Displaying answers from more than 10 responders. Poll Num 2 was not presented during the session. All polls were shared in the big conference room