H2 Innovation KOREA 2022
- Open Innovation With Korean Partners -

- April 25th, 2022, KOTRA -

□ Overview

○ Name of the Event: H2 Innovation KOREA

○ Purpose: Fostering H2 industry value chains through matchmaking Korean partners and overseas companies

○ Korean Partners: 4 global leaders in the hydrogen economy

- (H2 Infrastructure) SK Gas, Hyosung Heavy Industries, Lotte Chemical
- (H2 Mobility) Hyundai Motor Company

○ Organizer: KOTRA Invest KOREA, Ulsan Free Economic Zone(UFEZ), Ulsan Center for Creative Economy & Innovation(UCCEI)

○ Program

No.	Process	Date	Venue
❶	[Presentation by Korean Partners] **Technologies for Open Innovation** * This event will be held concurrently with the inauguration ceremony of Global Hydrogen Industrial Association Alliance (GHIAA)	May 25 (Wed) - KST: 15:40~17:10 - CEST: 08:40~10:10	Four Seasons Hotel Seoul (broadcasted on YouTube) - (KOR) https://youtu.be/xSGSZa2ma7k - (ENG) https://youtu.be/khbWTQfk3E0
❷	[Application by Overseas companies] **Application for meetings with Korean Partners**	May 26 (Thur) ~ June 13 (Mon)	Online (Application form in excel)
❸	[Shortlisting of Overseas companies] **Shortlisting overseas companies based on technology and business feasibility**	June 14 (Tues) ~ June 22 (Wed)	Online
❹	[Meetings with Korean Partners] **1:1 Business meetings with shortlisted overseas companies**	June 23 (Thur) ~ July 15 (Fri)	Online (Zoom)

□ Application Procedure

○ (Step ❶) Please watch the presentation of Korean partners on May 25th, and check if your company has those presented technologies

○ (Step ❷) Apply for meetings with Korean Partners.

○ (Step ❸) Shortlisting process by Korean Partners

○ (Step ❹) Participate in online meetings with Korean Partners*

*** Only for shortlisted overseas companies**

1 List of Technologies for open innovation

Industry	No.	Company	Technologies for open innovation
H2	1	SK Gas	① **Technologies for cracking ammonia into hydrogen** - Technologies related to ammonia-cracking catalysts
			② **Technologies for Direct Ammonia Fuel Cells (DAFC)** - Technologies related to the production & use of DAFCs without converting ammonia into hydrogen
			③ **Technologies for Hydrogen Heating System** - Technologies related to the development of heating systems powered by hydrogen which enable chemical companies to reach net-zero emmissions
			④ **Technogies for CCU (Carbon Capture Utilization)** - Technologies related to converting CO2 or Syngas into chemical feedstocks
	2	Hyosung Heavy Industries	① **Technologies for Liquefaction of Hydrogen, and Fast-refueling Hydrogen** - Technologies related to liquid hydrogen production facilities, storage tanks, trailers and refueling stations
			② **Technologies for water electrolysis with Renewable Energy**
	3	Lotte Chemical	① **Technologies for Direct CO2 to Methanol Synthesis**
			② **Technologies for ultra-large area electrodes for Electrolysis**
	4	Hyundai Motor Company	① **Fuel Cell Technologies for Green Mobility** - Technologies related to the production & use of Fuel cell electric vehicles(FCEVs), Marine Vessels, Trains, Drones etc.
			② **Fuel Cell Technologies for other advanced applications** - Technologies related to the production & use of Electric Generators and Agricultural Machines etc.

1. SK Gas

https://eng.skgas.co.kr

SK gas	Incorporated : 1985 Employees : 580 (2021) Revenue: KRW 6.49 trillion (USD 5.4 billion) * 1USD=1200KRW	Since its foundation in 1985, SK Gas has been fulfilling pivotal role and responsibility in the domestic energy industry as the No.1 LPG player in Korea. Now, the company strives to become a leading company in the eco-friendly energy field by overcoming challenges of the domestic market and LPG products to realize the vision of "Global Top Tier Eco Energy Total Solution Provider" in the global market..

Technologies for Open Innovation

Description	① **Technologies for cracking ammonia into hydrogen** - Technologies related to ammonia-cracking catalysts ② **Technologies for Direct Ammonia Fuel Cells (DAFC)** - Production & use of DAFCs without converting ammonia into hydrogen ③ **Technologies for Hydrogen Heating System** - Technologies related to the development of heating systems powered by hydrogen ④ **Technogies for CCU (Carbon Capture Utilization)** - Technologies related to converting CO2 or Syngas into chemical feedstocks
Background	① **Technologies for cracking ammonia into hydrogen** - Ammonia, which has a high level of energy density, can easily be transported via existing infrastructure. - Ammonia can serve as a hydrogen storage and transport medium if technologies for cracking it into hydrogen could be commercialized in the near future. Ammonia-cracking catalysts will play a key role in this process. ② **Technologies for Direct Ammonia Fuel Cells (DAFC)** - If ammonia can be directly used for generating power, without converting it into hydrogen, it will be more energy-efficient and eco-friendly - Direct ammonia fuel cells will be an important emerging technology which enables ammonia to be an efficient energy source. ③ **Technologies for Hydrogen Heating System** - Heating systems powered by hydrogen enable chemical companies to reach net-zero emissions and are expected to be commercialized in the near future. ④ **Technogies for CCU (Carbon Capture Utilization)** - For petrochemical companies, converting CO2 or Syngas on petrochemical sites into feedstocks for chemical products is the key to reach net-zero emissions.
Type of Partnership	We would be open to different types of partnership format depending on the final outcome of this open innovation project. We will review factors such as the level of technology involves, potential market size, the level of collaboration before making the final decision.

2. Hyosung Heavy Industries

www.hyosungheavyindustries.com/en/main.do

HYOSUNG HEAVY INDUSTRIES	Incorporated : 1962 Employees : 3,125 (2021) Revenue: KRW 2.36 trillion (USD 1.97 billion) * 1USD=1200KRW	Hyosung Heavy Industries creates environmentally friendly infrastructure where humanity and nature can be sustained together. The company is engaged in various areas of construction, including the areas of housing, redevelopment and reconstruction, business and commercial facilities, civil engineering and environment, and SOC. It possess core technologies necessary for building the future electricity grid, including ESS, STATCOM, and Smart Grid.

Technologies for Open Innovation

Description	**① Technologies for Liquefaction of Hydrogen, and Fast-refueling Hydrogen** - Technologies related to liquid hydrogen production facilities, storage tanks, trailers and refueling stations **② Technologies for water electrolysis with Renewable Energy** - Technologies related to using electricity generated by renewable energy to split water into hydrogen and oxygen
Background	**① Technologies for Liquefaction of Hydrogen, and Fast-refueling Hydrogen** - Hydrogen in its gaseous state needs to be liquefied to save on transportation costs. - Technologies for transporting liquid hydrogen under its liquefaction point, -252.9℃, are essential to commercialize liquid hydrogen value chains. - Technologies and Materials·Equipment·Machines for liquid hydrogen production facilities, storage tanks, trailers and refueling stations are to be further developed to meet the increasing demand for hydrogen. **② Technologies for water electrolysis with Renewable Energy** - (Worldwide) Numerous countries have announced decarbonization strategies based on producing green hydrogen from renewable energy sources. European and North American countries have launched water electrolysis demonstration projects (10MW). - (Domestic) Korea started its first water electrolysis demonstration project in 2017 on Jeju Island (250KW), which has been gradually followed by larger projects*. Korea will launch large-scale water electrolysis demonstration projects from 2022 to 2025. * Ulsan(1MW), Donghae(2MW), Jeju(3MW).
Type of Partnership	We would be open to different types of partnership format depending on the final outcome of this open innovation project. We will review factors such as the level of technology involves, potential market size, the level of collaboration before making the final decision.

3. Lotte Chemical

www.lottechem.com/en/index.do

LOTTE CHEMICAL	Incorporated : 1976 Employees : 10,093 (2021) Revenue: KRW 18.12 trillion (USD 1.51 billion) * 1USD=1200KRW	Lotte Chemical, which was founded in 1976 and developed into a global general chemical company through international scales and stable profit structures, is Korea`s representative chemical company and has been growing into a `global top 7 chemical company` by procuring product competitiveness based on its superior R&D capacities and expertise.
Technologies for Open Innovation		
Description	**① Technologies for Direct CO2 to Methanol Synthesis** **② Technologies for ultra-large area electrode for Electrolysis**	
Background	**① Technologies for Direct CO2 to Methanol Synthesis** - Technologies for direct CO2 to methanol synthesis have still to be commercialized in Korea. - (Worldwide) Carbon Recycling International (CRI), founded in 2006 in Icleland, sells 4000 tonnes of methanol produced from waste CO2 per year. - (Domestic) Korea Institute of Science and Technology (KIST) developed CO2 hydrogenation to form methanol via a reverse-water-gas-shift reaction. - To develop technologies for direct CO2 to methanol Synthesis, 1) high-efficiency catalysts, 2) optimization of the process design for direct CO2 hydrogenation, 3) economic evaluation research and Life Cycle Assesment (LCA) are considered essential. **② Technologies for ultra-large area electrodes for Electrolysis** - (Necessity) Ultra-large area electrodes for electrolysis are needed to commercialize green hydrogen production. These will be used to enlarge existing alkaline water electrolysis cells. - (Qualifications) 1) Single electrodes larger than 100 x 100 ㎠ * Small-scale electrodes (5 x 5 ㎠) with an efficiency of above 95% 2) Electrode coating with precious metals and transition metals by electrochemical deposition * Technologies for controlling the density of precursor solutions are necessary. 3) Porous electrodes of zero-gap alkaline water electrolysis cells to minimize ionic resistance between an electrode and a separator. * Gases on the electrode surface are to be emitted easily. * If necessary, patterning electrodes is required for gas desorption.	
Type of Partnership	We would be open to different types of partnership format depending on the final outcome of this open innovation project. We will review factors such as the level of technology involves, potential market size, the level of collaboration before making the final decision.	

4. Hyundai Motor Company

www.hyundai.com/worldwide/en

HYUNDAI	Incorporated : 1967 Employees : 72,000 (2021) Revenue: KRW 117.6 trillion (USD 98 billion) * 1USD=1200KRW	Since its establishment in 1967, Hyundai has been making continuous efforts to provide customers with the best products and services possible. Hyundai has also achieved outstanding results in evaluations of its sustainability as a company. Based on its `Strategy 2025`, the company will fully establish itself as "Smart mobility solution provider".
Technologies for Open Innovation		
Description	① **Fuel Cell Technologies for Green Mobility** - Technologies related to the production & use of Fuel cell electric vehicles(FCEVs), Marine Vessels, Trains, Drones etc. ② **Fuel Cell Technologies for other advanced applications** - Technologies related to the production & use of Electric Generators and Agricultural Machines etc.	
Background	∘ **(Domestic)** In 2020, the Korean Government announced `the 9th Basic Plan for Electricity Supply and Demand` for the years 2020-2034. According to this plan, renewable energy will take up nearly 42% of South Korea`s power generation capacity by 2034. Korea`s electricity generation capacity is projected to reach 185 GW by 2034. In Korea, the Hydrogen Energy Portfolio Standard(HPS), which makes it mandatory for electric utility companies to generate certain amount of electricity from hydrogen fuel cells. ∘ **(Worldwide)** According to Precedence Research, a Canadian market research firm, the global market for fuel cells is expected to surpass around USD 42.3 billion by 2030 and is expanding growth at a CAGR of 25.1% from 2021 to 2030.	
Type of Partnership	We would be open to different types of partnership format depending on the final outcome of this open innovation project. We will review factors such as the level of technology involves, potential market size, the level of collaboration before making the final decision.	