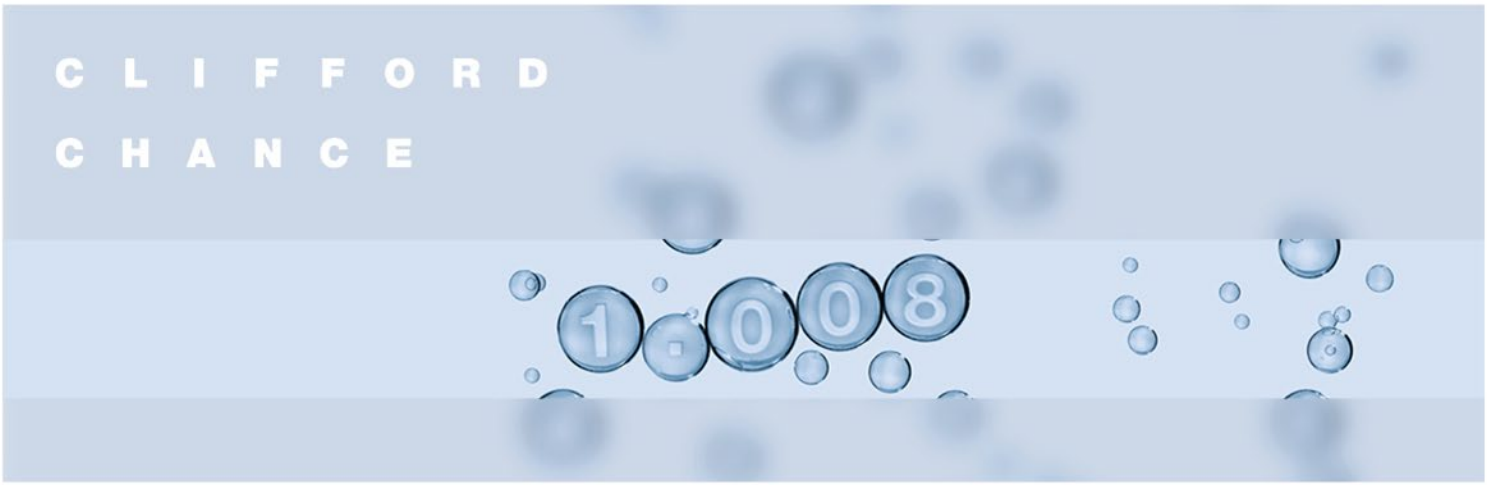

FOCUS ON HYDROGEN: KOREA'S NEW ENERGY ROADMAP

Korea's Hydrogen Economy Roadmap is a plan to create a comprehensive hydrogen ecosystem in Korea by 2040. This briefing highlights the key aspects of the roadmap and recent developments in pushing forward the hydrogen agenda in Korea.

Key issues

- Hydrogen Economy Roadmap was announced on 17 January 2019
- Hydrogen Economy Promotion and Safety Management Act was enacted on 4 February 2020 and will come into force on 5 February 2021
- Both private and public sectors actively investing in hydrogen using technology and infrastructure
- Korea's Roadmap is more focused on economic growth and industrial competitiveness than climate change objectives

HYDROGEN ECONOMY ROADMAP

The Korean Ministry of Trade, Industry and Economy (**MOTIE**) published its Hydrogen Economy Roadmap on 17 January 2019. Korea's vision in the roadmap is to become a leading country in the new global hydrogen economy with the support of two pillars: fuel cell electric vehicles (**FCEVs**) and fuel cells. This is not surprising given that Korean companies are equipped with world-class technologies in FCEVs and fuel cells.

Targets

The roadmap sets out the following specific targets:

Mobility – Production/installation on a cumulative basis

Note: Figures in brackets indicate amounts for domestic consumption

	2018	2022	2040
FCEVs	1,800	81,000 (67,000)	> 6,200,000 (2,900,000)
- Passenger Vehicles	1,800 (900)	79,000 (65,000)	5,900,000 (2,750,000)
- Taxis	-	-	120,000 (80,000)
- Buses	2 (all)	2,000 (all)	60,000 (40,000)
- Trucks	-	-	120,000 (30,000)
Hydrogen Refuelling Stations (HRSs)	14	310	> 1,200
Trains/Ships/ Drones	Commercially operational and available for export by 2030 through research and development		

Energy – Installation on a cumulative basis

		2018	2022	2040
Fuel Cells	Power Generation	307.6MW	1.5GW	> 15GW (8GW)
	Housing / Buildings	7MW	50MW	> 2.1GW
Hydrogen Gas Turbines		Research and development of hydrogen gas turbine technology to be commercially operational by 2035		

Hydrogen Supply and Price

	2018	2022	2030	2040
Supply quantity	130,000 tonnes p.a.	470,000 tonnes p.a.	1,940,000 tonnes p.a.	> 5,260,000 tonnes p.a.
Supply means	(1) By-product (2) SMR	(1) By-product (2) SMR (3) Electrolysis	(1) By-product (2) SMR (3) Electrolysis (4) Import (1)+(3)+(4): 50% (2): 50%	(1) By-product (2) SMR (3) Electrolysis (4) Import (1)+(3)+(4): 70% (2): 30%
Price	-	KRW6,000/kg (US$5.18/kg)	KRW4,000/kg (c. US$3.46/kg)	KRW3,000/kg (c. US$2.59/kg)

Other plans

In addition to the specific targets mentioned above, the roadmap also includes plans relating to:

Safe and economic transportation and storage of hydrogen

- Relaxation of existing regulations relating to the storage of highly pressurised gases (e.g. raising the refuelling pressure from 35 MPa to above 45 MPa)
- Research and development of liquefied hydrogen storage technology
- Reduction of transportation costs through weight reduction of tube trailers and in the long term, construction of specialised hydrogen pipelines across the country

Establishment of a hydrogen industry ecosystem and safety management system

- Enactment of hydrogen specific safety and management legislation
- Revise and amend regulations on safety standards for HRS parts and systems in accordance with international standards
- Establish and operate a safety evaluation centre
- Enactment of a hydrogen economy legislation setting up the legal foundations for the promotion of the hydrogen economy including the

establishment of basic plans for implementing the hydrogen economy, support for specialist companies and improvement of regulations

KOREA'S HYDROGEN ACT

As contemplated in the Hydrogen Economy Roadmap, the Hydrogen Economy Promotion and Safety Management Act (**Hydrogen Act**) was enacted on 4 February 2020 by the Korean National Assembly. However, the Hydrogen Act will only come into force on 5 February 2021 so that the relevant government ministries can put in place the subsidiary legislation (or Presidential Decree) relating to the Hydrogen Act.

The Hydrogen Act broadly covers:

- the creation of a 'Hydrogen Economy Council' with the aim of devising relevant strategies, policies and regulations at a national level. It also serves to tackle the financing of hydrogen projects through sustainable means.
- support for hydrogen-focused companies via R&D subsidies, commercialisation processes, loans and tax exemptions. Investment companies dedicated to investing in hydrogen-focused companies can also be registered and designated as a hydrogen investment company as outlined in the Hydrogen Act.
- procedures in respect of HRS and fuel cell installations. It further specifies the designation process of, and subsequent funding towards, 'Hydrogen Complexes" that seek to specialise in hydrogen infrastructure development.
- means to propel the transition towards a hydrogen economy via training of personnel, standardisation of hydrogen products, industry research, international cooperation and the building of a social consensus at the governmental level. Institutions will also be selected, each exclusively dedicated to the promotion, distribution, and safety of hydrogen.
- establishment of safety standards in areas such as hydrogen-related business permits, manufacturing facilities, product inspections and completion/ maintenance inspections of hydrogen-powered facilities. Such measures are augmented by appropriate penalties as well as mandatory insurance coverage.

RECENT MARKET DEVELOPMENTS

Private sector activity

Korean companies had been actively investing in hydrogen related technologies well before the announcement of the roadmap. However, the announcement of the roadmap and the Hydrogen Act reinforce government's support to such Korean companies. Recent notable developments include:

Hyundai Motors: Being the first company in the world to commercially produce a FCEV, Hyundai Motors has announced, in its FCEV Vision 2030, that it plans to produce 500,000 hydrogen vehicles and 200,000 other fuel cell systems for power plants, ships and trains by 2030. In July 2020, it exported its FCEV trucks to Switzerland. Hyundai Motors formed Hyundai Hydrogen Mobility, a joint venture with H2 Energy (a Swiss Company), back in 2019. The joint venture will lease the trucks to commercial truck operators.

Hanwha Energy: Completed in July 2020 a 50MW hydrogen-based fuel cell power plant in the Daesan petrochemical complex. This power plant uses by-product hydrogen sourced from the nearby Hanwha Total Petrochemical Co's petrochemical plant.

Doosan Fuel Cell: Doosan FC produces fuel cells and has almost 80% of the domestic market share. It has invested in the 50MW hydrogen-based fuel cell power plant completed by Hanwha Energy. With the rise in orders, Doosan FC is targeting US$1 billion in revenues by 2023.

Hyosung: Announced in July 2020 a joint venture deal with the Linde Group to build the world's largest liquid hydrogen production facility in Ulsan. The two companies will invest around US$245m in the facility which is expected to be completed in 2022.

SK E&C: In a joint venture with Bloom Energy, completed 2 fuel cell power plants in September 2020 in Hwasung (19.8MW) and Paju (8.1MW).

Public sector activity

The Korean government has also announced projects for testing the application of hydrogen in transportation and housing.

Ansan, Ulsan and Wanju-Jeonju were named as Hydrogen Pilot Cities in December 2019 by the Ministry of Land, Infrastructure and Transport. Various pilot projects will be implemented in these cities including the production of green hydrogen using electricity from a tidal power plant (Ansan), installation of pipelines for supply of hydrogen (Ulsan), installation of numerous HRSs, deployment of FCEV buses and forklifts and construction/supply of hydrogen fuel cell powered housing (all three cities).

MOTIE also selected five cities (Busan, Daejon, Chuncheon, Gwangju and Changwon) in May 2020 for the installation of mid-to-large size hydrogen reforming stations. These hydrogen reforming stations will reform hydrogen from natural gas and are expected to produce (in aggregate) around 7,380 tonnes of hydrogen per year. These investments are being made to facilitate the use (and therefore, the increase in numbers) of FCEVs on Korean roads.

CONCLUSION

Korea has ambitious plans to become a leader in the new global hydrogen economy. Korea's targets on hydrogen are primarily focused on the transportation and electricity sectors in line with the country's competitiveness in FCEVs and stationary fuel cells. The strategy appears to be driven more by the perceived opportunities for economic growth and industrial competitiveness than by climate change objectives. It remains to be seen what concrete steps or plans will be devised for the shift from grey to green hydrogen on the production/supply side.

ABOUT

Focus on Hydrogen is a Clifford Chance briefing series covering hydrogen-related developments globally. 1.008 is the standard atomic mass of hydrogen.

For other hydrogen publications, please see our climate, sustainability, green finance and renewables page here.

For hydrogen queries in other jurisdictions, please contact Anthony Giustini and Andreas Formosa (listed under Global contacts below).

CLIFFORD CHANCE

CONTACTS

ASIA PACIFIC

AUSTRALIA

Nadia Kalic
Partner

T +612 8922 8095
E nadia.kalic
@cliffordchance.com

Philip Sealey
Director

T +618 9262 5542
E philip.sealey
@cliffordchance.com

JAPAN

Hans Menski
Partner

T +81 3 6632 6669
E hans.menski
@cliffordchance.com

KOREA

Bong-Sang Cho
Local Partner

T +82 2 6902 8003
E bong-sang.cho
@cliffordchance.com

SINGAPORE

Matthew Buchanan
Partner

T +65 6410 2206
E matthew.buchanan
@cliffordchance.com

Mel Chan
Senior Associate

T +65 6506 2771
E mel.chan
@cliffordchance.com

GLOBAL

Anthony Giustini
Partner

T +33 (0)1 44 05 59 26
E anthony.giustini
@cliffordchance.com

Andreas Formosa
Senior Associate

T +44 20 7006 4421
E andreas.formosa
@cliffordchance.com