Strategic Roadmap for Korea’s hydrogen Economy & Role of H2KOREA

2021.06.29

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In response to global warming and climate change, Global Leaders agreed to:

1. Keep a global temperature rise in the 21st century well below 2°C above pre-industrial levels
2. Pursue efforts to limit the temperature increase even further to 1.5°C

* U.S. withdrew from the Agreement in 2019. But officially rejoined the Paris Climate Agreement in 2021

With global trend of transition into renewable energy, Eco-friendly energy source Hydrogen will replace the fossil fuels.
Types of Hydrogen & their importance

Types of Hydrogen

- Grey Hydrogen: 5~10kg CO₂ per 1kg Hydrogen
- Blue Hydrogen: Small Amount of CO₂
- Green Hydrogen: No CO₂ Emission

CO₂ Emission Free during the entire producing value chain

Play a crucial role in Carbon neutrality in 2050

Hydrogen is Versatile eco-friendly energy

- Fuel
- Heat
- Feedstocks

Transport
- Industry
- Chemicals

Power
- Buildings
- Products

- Electric power, power generation (for peak-time), etc.
- Household & industrial use, etc.
- Metallurgy, Steel, Glass, etc.

Renewable Electricity

LNG

Carbon Capture Storage

H₂O
Korea’s Efforts to realize hydrogen economy

- 2019:
  - Hydrogen economy roadmap
  - Hydrogen economy standards roadmap
  - The 3rd energy master plan (H2 included)
  - Development Strategy of future vehicle industry

- 2020:
  - Hydrogen economy roadmap
  - Regulatory improvement plan for Hydrogen infrastructure
  - Establishment strategy for Hydrogen infrastructure
  - Hydrogen technology development roadmap
  - Hydrogen Safety Roadmap
  - Hydrogen Economy Act Enacted

- 2021:
  - Strategy for future vehicle expansion & Market pre-occupation
  - 2050 Net Zero declared
  - The 3rd Hydrogen Economy Committee
  - Hydrogen Economy Act enforced

- 2022:
  - The 4th Hydrogen Economy Committee

- 2023:
  - The 5th Hydrogen Economy Committee

- 2024:
  - The 6th Hydrogen Economy Committee

- 2025:
  - The 7th Hydrogen Economy Committee

- 2026:
  - The 8th Hydrogen Economy Committee

- 2027:
  - The 9th Hydrogen Economy Committee

- 2028:
  - The 10th Hydrogen Economy Committee

- 2029:
  - The 11th Hydrogen Economy Committee

- 2030:
  - The 12th Hydrogen Economy Committee
Korea’s Hydrogen Economy Roadmap and its progress (17 Jan. 2019)

**Vision**

*To Become the World’s Top-Class Country in Hydrogen Economy*

1. Achieving the No.1 share of global market for FCEV and fuel cells
2. Becoming Green Hydrogen Producer from Energy Importer

**Target**

<table>
<thead>
<tr>
<th>Year</th>
<th>2018</th>
<th>2022</th>
<th>2030</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCEV</td>
<td>1,800 units</td>
<td>81,000 units</td>
<td>850,000 units</td>
<td>6.2 million units</td>
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<tr>
<td>H₂</td>
<td>14</td>
<td>310</td>
<td>660</td>
<td>1,200</td>
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<tr>
<td>H₂ power</td>
<td>307MW</td>
<td>1.5 GW</td>
<td>2.0 GW</td>
<td>15 GW</td>
</tr>
<tr>
<td>H₂ production</td>
<td>130,000 tons/year</td>
<td>470,000 tons/year</td>
<td>1,940,000 tons/year</td>
<td>5,260,000 tons/year</td>
</tr>
<tr>
<td>Price</td>
<td>8,000 won/kg</td>
<td>6,000 won/kg</td>
<td>4,000 won/kg</td>
<td>3,000 won/kg</td>
</tr>
<tr>
<td>Source</td>
<td>By-product hydrogen, Hydrogen extraction (LNG reforming)</td>
<td>By-product hydrogen, Hydrogen extraction</td>
<td>By-product hydrogen, Hydrogen extraction, Overseas production</td>
<td></td>
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</tbody>
</table>
Korea’s Hydrogen Economy Roadmap and its progress (as of May)

Hydrogen Vehicle and HRS

- Hydrogen cars: 14,426 units
  ※ Gyeonggi 2,372, Ulsan 2,040, Seoul 2,005 etc.
- Bus: 106 units, Taxi: 20 units
  ※ Hydrogen-powered public transport (~2040)
    Taxi: 80,000 units, Bus: 40,000 units, Truck: 30,000 units

- Hydrogen Refueling Station (HRS): 88 units

The 1st Regulatory sandbox:
HRS at the National Assembly (2019.9)

Fuel cell power plants

- Plants: 53 units, 659MW
- Buildings: 7.1MW (as of Dec 2020)
Institutionalization the Promotion of Hydrogen Economy
- Hydrogen Act : Main contents & the meaning of enactment

Promulgation of <The Promotion of hydrogen economy and the hydrogen Safety Management Act>:
Enactment (‘20. 2. 4.), Enforcement(21.2.5, Safety Sector : 22.2.5)

Main Points

1. Preparation of a promotion system for the hydrogen economy
   - Hydrogen Economy Committee (led by Prime Minister)
   - Designation of a dedicated institution for promotion/distribution/safety of hydrogen industry
   - Preparation of a hydrogen economy implementation system

2. Support policy to foster the hydrogen economy
   - Promoting the creation of a foundation such as fostering/supporting hydrogen-specialized companies
   - Human resources management, technical development, standardization, commercialization, and designation of hydrogen-specialized complexes

3. Safety management of related plants and low-pressure balance of plant such as electrolyser
   - Establishment of safety management regulations for hydrogen-related products (fuel cell, electrolyser, hydrogen extractor, etc.) and facilities

Meaning of enactment

- World’s First Hydrogen Act to promote safety-based hydrogen economy
- Eliminate uncertainty and Secure sustainability in government policy → Encourage private investment

* SK, Hyundai Motor Co, Posco agreed to invest 43 trillion won (‘21.3.2, The 3rd Hydrogen Economy Committee)
Institutionalization the Promotion of Hydrogen Economy
- Hydrogen Economy Committee

Status
“Hydrogen Economy Control Tower”
chaired by prime minister and related ministers

Role
“Leap forward as a pioneer in Hydrogen Economy
through policy review and resolution”

Launch
Leap forward as a global leader in hydrogen economy by converging the capabilities of ministries

1. Compare to developed countries (USA, JPN, DEU), momentum is needed to become a leader in the global hydrogen economy

2. Building at-scale ecosystem to achieve the goal of supplying 67,000 FCEV, 310 HRS by 2021
   * Designation of institutions dedicated to industrial promotion, distribution, and safety to support balanced development of the ecosystem such as fostering specialized companies

3. Need to start mid-to-long term future projects in advance
   * Full-scale international cooperation projects needed to build and expand global green hydrogen supply chain

1st (’20.07)  →  2nd (’20.12)  →  3rd (’21.03)
Institutionalization the Promotion of Hydrogen Economy
- Designation of hydrogen economy dedicated agencies

**Promotion of Hydrogen Industry (H2KOREA)**

- **Main role**
  - Establishing the foundation of the Hydrogen Industrial Promotion
  - Fostering Hydrogen Economy Eco-system

- **Main Business Plan**
  - Promoting and Supporting Hydrogen Specialized Enterprises
  - Improving Public Relations & International cooperation

**Hydrogen Distribution (KOGAS)**

- **Main role**
  - Stabilizing Hydrogen cost
  - Establishment of Hydrogen Distribution Order

- **Main Business Plan**
  - Opening and Operating a Hydrogen trade market
  - Monitoring illegal activities & H2 quantitative Inspection

**Hydrogen Safety (KGS)**

- **Main role**
  - Hydrogen Safety Standards, R&D, International Cooperation
  - Promotion of Hydrogen Safety Education

- **Main Business Plan**
  - Establishment of life cycle assessment on Hydrogen Safety Management System
  - Securing Safety of Hydrogen Infrastructure & Establishing Hydrogen Safety Eco-system

**Public H₂ Production Hub**

- Product

**Hydrogen Market**

- By-product
  - HRS

- By-product
  - HRS

- By-product
  - HRS
H2KOREA is an organization dedicated to promoting the hydrogen industry in Korea. It was designated by the Korean government on July 1st, 2020.

**Background**
- Various value-chain including FCEV, H2 production & transportation, deployment & operation of HRS, etc.
- Need an organization for participation and cooperation of public and private sector

**Purpose**
- To develop H2-based industry and to take its leading role between public and private

**Policy Planning**
- Policy support for promoting the supply of FCEVs and hydrogen refueling stations and fostering sustainable hydrogen energy-related industries

**Infrastructure Build-up**
- Support smooth supply of FCEVs, hydrogen refueling stations

**Technology Development**
- Support for commercialization of FCEVs, hydrogen refueling stations & hydrogen technology

**Business Coordination**
- Support for public safety promotion, technical standards, international cooperation and export of hydrogen energy-related industries
Main roles of H2KOREA

Offer customized support activities for improvement in public acceptance, policy making, Industry·Academic·Research cooperation

National policy & Legislative assistance
- Improving consistency and transparency of domestic hydrogen policies
- Activities for establishing relevant policies, laws and regulations

Increasing public awareness
- Increase in the public’s understanding of hydrogen safety
- Establishing a Public-Private joint hydrogen energy promotion system (government, related agencies, enterprises, experts & public participation)

Support for Industry·Academic·Research cooperation
- Establishment of industry-academic-research cooperation network for advancing hydrogen industry technology
- Exploring new business areas, R&D designing, technology commercialization
Challenges to Overcome

**Laws and Institutions**

**Challenge**
Absence of regulations and institutions

**Overcome**
- Analyze existing laws
- Create special-case clause
- Improve regulations (e.g., regulatory sandbox)
- Propose

[Best Practice] 1st regulatory sandbox (HRS in National Assembly)

**Infrastructure Build-ups**

**Challenge**
Avoid operating HRS due to deficits

**Overcome**
- Improving profitability by expanding subsidy support and improving regulations
- Propose

[Best Practice] Allow commercial facilities

**Public Acceptance**

**Challenge**
Civil appeals of residents in installation sites

**Overcome**
- Promote positive aspects preemptively
- Collecting opinions in advance and promoting communication

[Best Practice] Resolution of conflicts in Incheon FC plant

**Conflicting interests of stakeholders**

**Challenge**
Conflicts due to industry transformation

**Overcome**
- Provide incentives for the co-existing industry transition

[Best Practice] Support industry transition (Gas station → HRS)

**Competences of Domestic Companies**

**Challenge**
Avoid using domestic products due to their reliability

**Overcome**
- Encourage collaboration between large enterprises, SMEs, public organizations, and research institutes

[Best Practice] Hydrogen technology transfer

**Global Issues**

**Challenge**
Immediate respond to global issues

**Overcome**
- Strengthening international network through active information exchange and regular support

[Best Practice] Cooperation with major countries
Importance of International Cooperation

H2KOREA, Establishment of nationwide network

- Expansion of nationwide network for hydrogen economy
- Establishment of cooperation network between hydrogen importers and exporters
Thank you for your attention.