



ISO/TC 197  
Hydrogen technologies

Email of secretary: [jonathan.lafontaine@bnq.qc.ca](mailto:jonathan.lafontaine@bnq.qc.ca)  
Secretariat: SCC (Canada)

**Korea Marketplace presentation Plenary M Choi 20191104**

Document type: Other committee document

Date of document: 2019-12-18

Expected action: INFO

Background: Please find attached the presentation made by Dr. Choi for the Korea Marketplace, presentation made during item 12.2 of the plenary meeting.

Committee URL: <https://isotc.iso.org/livelink/livelink/open/tc197>

**ISO TC 197 28<sup>th</sup> Plenary Meeting**  
**December 12-13, 2019, Grenoble, France**

# **Members Updates on H2 Programs**

## **- Korea -**

**Jae-Ou Choi , Kyung Hee Lee**

## ◆ To talk about:

- 1) **Korean Participation in ISO TC 197**
- 2) **Institutional strategies for H2 Economy**
- 3) **Long term Plan (Roadmap)**
- 4) **Buildup of Value Chain in Industry**
- 5) **RCS Activities and Pre-normative Research**

## ◆ ISO TC 197 and Korean Participation

- Korea is P-Member of TC 197 since its beginning.
- Hosted 18<sup>th</sup> Plenary Meeting in October 2009
- Attended the most of all Plenary and WG meetings since 2004
  - Involved 3-4 experts per WG in average
- 99% of all international standards has been adopted into Korean Industrial Standards, KS
- Well structured supporting organizations and activities:
  - KATS (Korean Agency for Technology and Standardization)
  - KRISS (Korean Research Institute for Science and Standards)
  - 2 COSDs (Cooperative Organization for Standards Development)
  - Support projects for experts dispatching
- “Standardization Forum” has been established to go along with hydrogen economy roadmap.
  - ca. 20 experts meet 2-3 times in a year
- Normative research projects are preferentially funded by the government.

## ◆ Political strategies and Governmental tools

- Hydrogen Economy is adopted as one of the 3 key innovative growth engines of Korea
- Roadmap for boosting hydrogen economy (Jan 2019)
- Roadmap for technology R&D for hydrogen economy (Nov 2019)
- Strategic roadmap for standardization (RCS) of hydrogen technology (April 2019)
- Allocated total 477 mill US\$ of the government's budget to hydrogen industry for 2020 (52.4% increase over this year)

## ◆ Activities of local governments

- 7 metropolitan councils have been initiated their own long-term plans.

## ◆ Legislative activities in bill proposal

- Supreme law for boosting hydrogen economy and safety management of hydrogen fuel  
>>> Established Exclusive Corporation for Promotion Agency and Safety Management

## ◆ Status quo of Hydrogen Industry in Korea

- Solid political vision on sustainable energy and people's awareness of environmentally sound energy use esp. carbon-free based on hydrogen
- Top-down roadmap is set up for boost hydrogen economy >> Hydrogen industry and technology are ranked as one of the 3 major governmental strategic investment sector.  
>>> Total government's budget for fiscal year 2020: ca. 400 mill. USD (493 bill. Won)
- World-leader in HFCEV related industries and FC-based distributed power systems  
>>> 31 stations, 727 FCEVs (cumulative until end of 2018), World sales share in 2019: 52.4%  
fuel cell power generation: 446 MW (Nov 2019)
- Rich supply chain of high-graded hydrogen from chemical and petro-chemical industries
- Well developed gas industry and infrastructure for both fuel and feedstock gas
  - Market penetration of new energy technologies is still lagging and needs a lot governmental subvention. >>> institutional market
  - Some key parts of facilities and system technology are still to be developed.
  - Green hydrogen related technologies and industrial projects are still insufficient.
  - Safety management skills are not enough yet to get stabilized public acceptance.

# ◆ Promoting Organizations and Projects

## ● Academia and Research Institutes

1. Korea Institute for Science and Technology (KIST)
2. Korea Institute for Energy Research (KIER)
3. Korea Research Institute for Science and Standards (KRISS)
4. Nationwide 5 collage faculties specialized in hydrogen technology and engineering

## ● Supporting Bodies and Associations

1. H2KOREA since July 2017 with 70 members from Local governments and industries
2. Korea Hydrogen Industry Association (KHIA) since Jan. 2014, ca. 130 industrial members
3. Special Purpose Corporation (SPC) for Facilitating and Operation of Refueling Stations, HyNet with 13 Ind. Members
4. Hydrogen Industry Promotion Agency (in plan)

## ● Big-scale R&D Projects

1. Frontier Research Consortium for Hydrogen Technology (KIER 2003)
2. Frontier Research Consortium for Hydrogen and Fuel Cell Technology (KIST, 2004)
3. Life Cycle Evaluation Center for Hydrogen Technology (2019)
4. Research Consortium for Electrolysis Technology (2019)
5. Business Unit for Development of Hydrogen City (in plan)
6. Test lab for large scale fire and explosion (2016)
7. Demonstration plant for marine bio-hydrogen production (2019) <sup>6</sup>
8. Hydrogen industry clusters (2019)

## ● Test, Inspection and Certification Bodies

1. Korea Gas Safety Corporation (KGS)
2. Korea Electricity Safety Corporation (KES)
3. Korea Institute for Energy Research (KIER)





















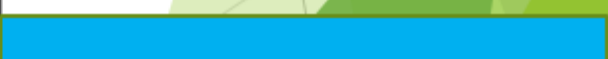



## ● Special zone for regulatory freedom for Hydrogen Green Mobility - Ulsan

## ◆ International Cooperation

1. Korea-Australia: LOI for Hydrogen Cooperation (2019)
2. Korea-US Renewable Energy and Hydrogen Industry Cooperation (2019)
3. Bilateral Hydrogen Cooperation: Norway, Saudi Arabia, Israel
4. KETEP (Korean Energy Technology Evaluation and Planning) –RCN (Research Council of Norway)  
Money Follows Cooperation Agreement – Renewable energy incl. energy storage system
5. International Hydrogen Energy Conference, Seoul, 2019
6. International Green Energy Conference, Daegu, 2018
7. International Hydrogen Forum, Pyeongchang, 2019
8. International Conferences on Hydrogen-H2WORLD, Changwon 2019



# ◆ Evaluation of Hydrogen Value Chain in Korea

Fields		Sub-fields	Governmental Instruments	R&D Infrastructure	Industries and Markets
Production		Blue hydrogen <sup>1)</sup>	Fully developed and no needs for additional action		
		Green hydrogen <sup>2)</sup>	 <sup>3)</sup>		Nearly null
Distribution		Gas	Doesn't need	Only for safety equipment	
		Liquid and Solid	Included in roadmap		 Only few industries
Application	Mobility	HRS			
		HCEV (light duty)			 (domestic)
		Heavy duty veh.			 (domestic)
		Industrial trucks			
	Energy	Power Generation (distributed)			
		Heat & power (resident./comm.)			

1) By-product gas from chemical industry and NG reforming


2) Electrolysis and Power-to-gas

3) The size of the bar indicates a quantity relative to 100% of imaginary goals

<sup>8</sup> Data source: H2 industry value chain in Korea (see slide 8,9)

# ◆ Roadmap for RCS development incl. Normative Research


## ● International standards (ISO & IEC)



2022 → 2030

Mobility	① Portable HRS Performance · Safety	2	⑥ HRS Safety monitoring	6
	② Fuel cell requirements or drones or construction machinery		④ Safety of construction machinery, Ship ⑤ ⑥ ⑦ ⑧ Safety/Performance of Drone,	
ENERGY	① Tri-gen Fuel cell system ② Micro Fuel cell for notebook	2	③ ④ Safety of Tri-gen Fuel cell system	2
	H <sub>2</sub> Supply		① RFC with electrolyser Large capacity(400m <sup>3</sup> /h) reformer Hydrogen flow meter performance (OIML standard proposal)	

## ● Korean standards (KS)



2022 → 2030

Mobility	Valves Hose, Dispenser DMFC for forklift	8	HRS compressor Fuel cell for Drones Fuel cell for Construction machinery (Excavator, Agriculture)	12
	DMFC,SOFC(10kW)		DMFC,SOFC(50kW) □ ~□	
H <sub>2</sub> Energy	PEMFC(50kW)	5	PEMFC(100kW)	5

Source: Strategic roadmap for hydrogen economy standardization, April 2019  
H. Lee, Standardization forum, June 2019

# ◆ Normative Research Projects and Related Standards

- RES power coupling electrolyzer for Power-to-Gas system
  - ISO 22734-2:2011: ISO/FDIS 22734
  - Large scale electrolyzers, Fully coupled with RES power output, High conversion efficiency
- Real-time responding (RTC) fueling protocol
  - ISO/FDIS 19880-1; SAE J 2601, SAE J 2799, JPEC S 0003, EU Project “HyTransfer”
  - IoT based full communication fueling (No look-up table, No formula)
  - Simple, safe, fast, and complete fill and applied to all vehicle types
- Performance evaluation of metering systems for HRS
  - ISO/FDIS 19880-1
  - Test methods for safety and performance of metering system of refueling stations
- Standardization for mobile hydrogen refueling station
  - ISO/FDIS 19880-1 and Fueling family
  - Safety considerations for mobile HRS additionally to those of stationary HRS
  - Safety control for moving and vibrating parts / impact analysis
- Liquid hydrogen – Air vehicle tank
  - ISO 13984:1999 : ISO 13985:2006
  - Structural integrity and thermal Insulation Test, Requirements for Materials Connections
  - GH2 supplying system

**Thank You !!!!!**