29th IPHE Steering Committee Meeting

KOREA

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Energy Policy Transition by New Government

Sustainable KOREA!

Vision: Energy transition 「RE3020」

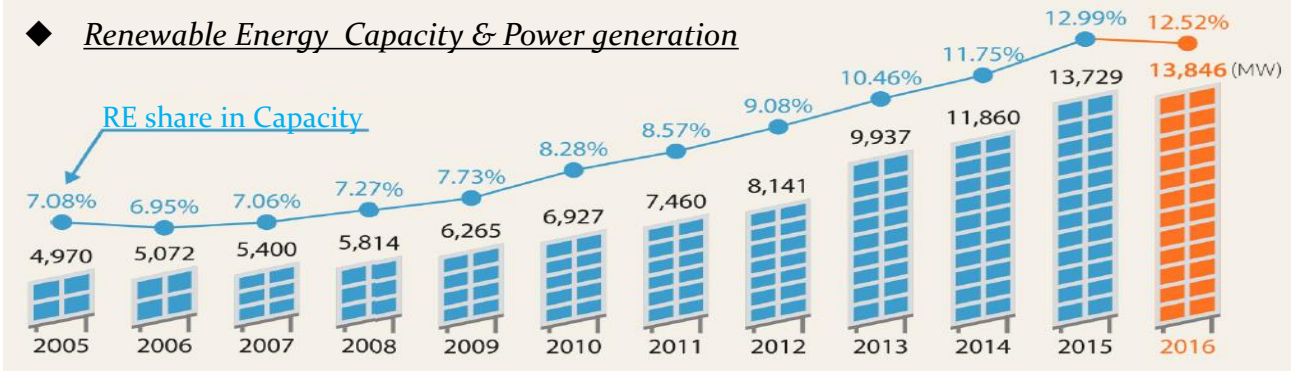
- Everyone's participation & improving the quality of life -

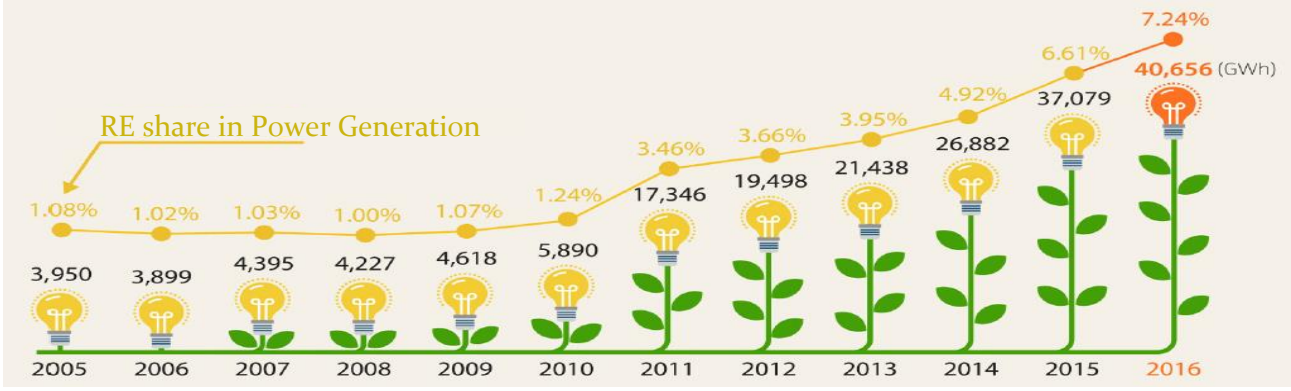
- **Energy Transition** from new nuclear power & fossil fuel power generation
- To Increase **20% of renewable energy by 2030** and relevant job creation
- Deploy eco-friendly and low-carbon energy **cultivating new businesses and markets**
- Govern energy system **adapting to the new climate regime**

Korea`Renewable Energy – Current

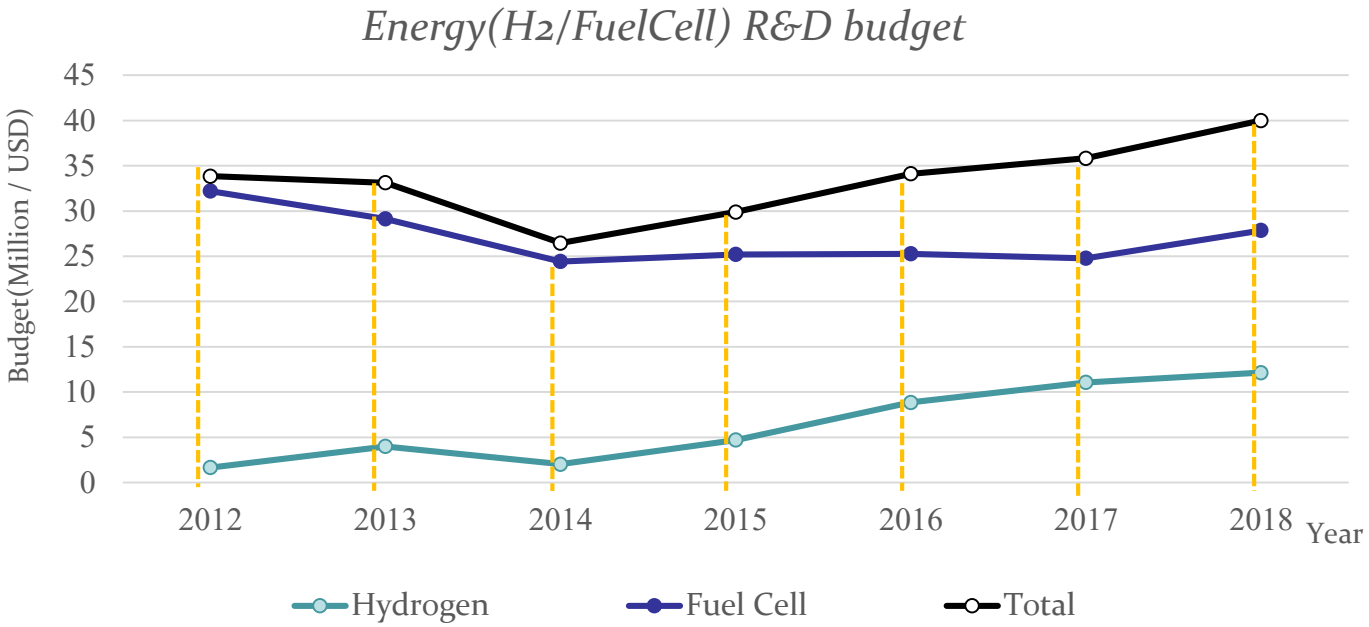
◆ *Renewable Energy Supply (TPES)*

◆ *Renewable Energy Capacity & Power generation*





2018 Energy R&D budget

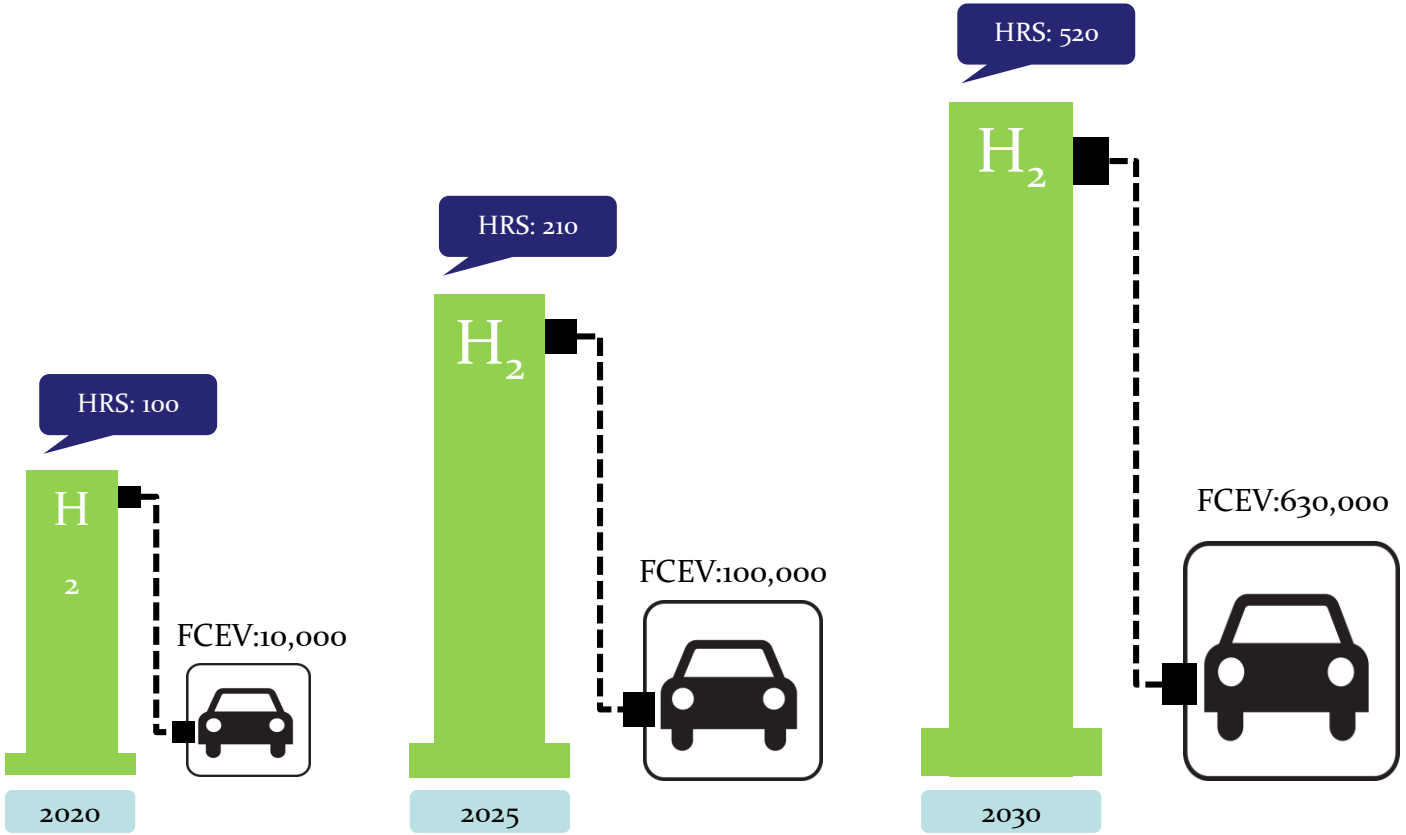


H2 · Fuelcell R&D budget	2012 Budget (Million / USD)	2013 Budget (Million / USD)	2014 Budget (Million / USD)	2015 Budget (Million / USD)	2016 Budget (Million / USD)	2017 Budget (Million / USD)	2018 Budget (Million / USD)
Hydrogen	1.65	3.99	2.02	4.69	8.85	11.06	12.14
Fuel Cell	32.20	29.13	24.43	25.20	25.27	24.77	27.86
Total	33.85	33.12	26.45	29.89	34.12	35.83	40.00

Policy : 2030 Fuel Cell Vehicle Plan

◆ 「2030, Fuel Cell Vehicle 10% Era」 (10% of new car sales, 0.18M/1.67M)

Vision (Strategy)	- Realization of Hydrogen-based economy - FCV is expected to become viable without financial support



Government's Policy to Promote FCEV Supply

FCEV - Strategy

(1) Reducing price of FCEVs by government subsidy and mass production from R&D

- Price reduction by R&D and demand creation (2015 price : $ 85,000 → 2018 price : $ 70,000)
- Price of FCEVs will be on par with EV by 2020, and on par with HEV by 2025

(2) Tax breaks for FCEV purchase and registration

- Tax cut for individual consumption tax($ 5,200) and acquisition tax($2,000) → implemented from 2017
- FCEV and EV are Zero Emission Vehicles(ZEV) and designated as low emission vehicle type 1

(3) Tax breaks for fuel (H_2)

- Tax exemption for hydrogen fuel in order to facilitate initial FCEV market growth

FCEV - Target

Technology development Roadmap

Item	2018	2020	2025	2030
Vehicle price ($10, Sedan)	8,500	~ 5,000	~ 4,000	~ 3,000
Durability (10,000 km)	16	20	25	30
Type of vehicle	Sedan	Bus	truck	Special Vehicles
Stack output (kW/L)	2	3.5	4	Above 4
Hydrogen Price ($!/kg)	4			3.5

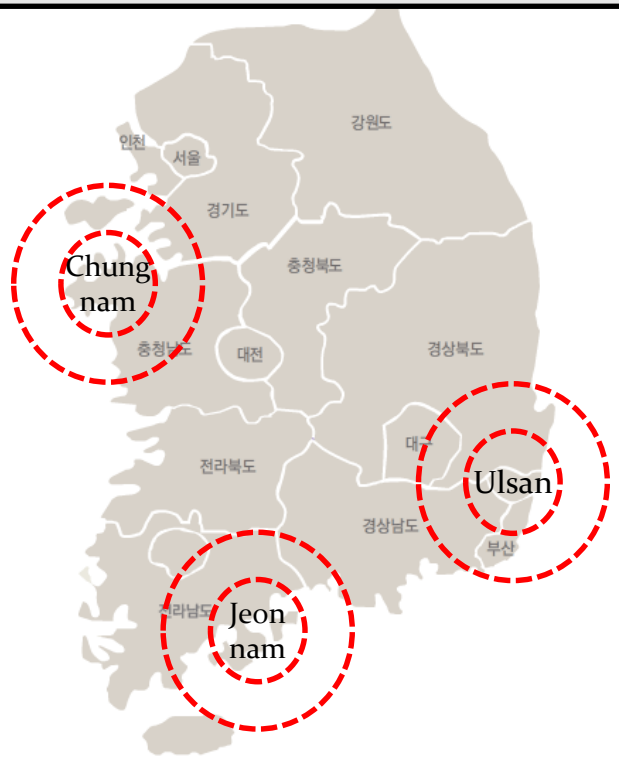
HRS expansion strategy→ FCEV supply infrastructure

Hydrogen refueling method diversification : Priority installation of by-product hydrogen refueling station

- [Refueling Type] Increase installation of HRS using by-product H2 transported by trailer trucks
  → Currently installed HRSs : 10 by-product H2 / 1 natural gas reformed H2 / 1 landfill gas reformed H2
- [HRS installation] HRSs are stalled within 200kms from the origin of H2 production

- FCEV and HRS Supply Budget: 2018 Budget $18.5 mil
- $1.5 mil government financial support per HRS
- 10 additional HRS will be built in 2018
- $27,500 government financial support per HRS
- 130 FCEVs are planned to be launched at 2018

FCEV supply is limited to H2 production origins
(H2 transport by trailer trucks)



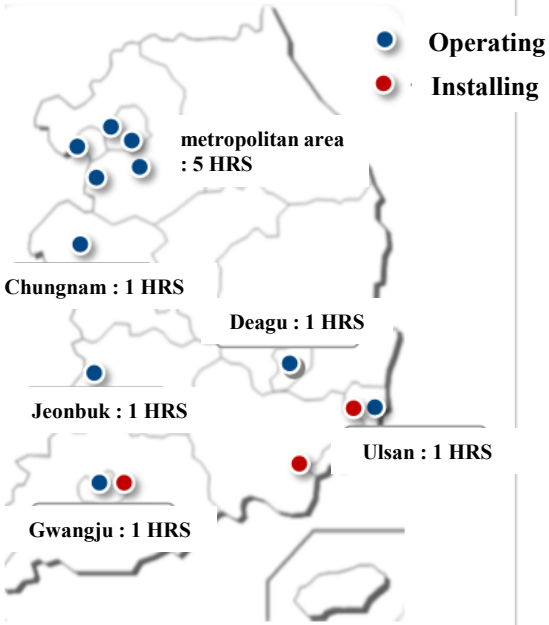
Domestic Hydrogen Refueling Stations(HRS) Status & Plan

Expansion of Refueling Station ⇒ Foundation for FCV Promotion

Hydrogen refueling station construction plan : ~20' 100 HRS , ~30' 520 HRS

- 10 stations operating in and around Petrochemical Complex and metropolitan area
- Infra. construction for hydrogen vehicle is expanding

Status	Supply Method	Area	Pressure (bar)	HRS Type
Operating	Off Site	Seoul	350	Tube Trailer
		Gyeonggi	700	Tube Trailer
		Gyeonggi	700	Tube Trailer
		Ulsan	700	Tube Trailer
		Gwangju	700	Tube Trailer
		Chungnam	700	Tube Trailer
	On Site	Seoul	350	Reforming
		Incheon	350	Reforming
		Deagu	700	Electrolysis
		Jeonbuk	700	Electrolysis
Installing	Off Site	Gwangju	700	Tube Trailer
		Ulsan	700	Tube Trailer
		Changwon	700	Tube Trailer
Stop	Off Site	Gyeonggi	700	Tube Trailer
		Ulsan	350	Tube Trailer
		Yeosu	350	Pipeline
	On Site	Jeju	350	electrolysis



※휴지중: 충전가능 차량이 없어 운영 중단 중인 상태

New Activities : Hyundai Motors '*NEXO*'

	Current	2nd Generation FCEV : 2020 (est)
Hydrogen FCEV	One model (Tucsonix FCEV)	- Two models - FC system improvement →(1) Performance(20% increase over the previous model) (2) Durability(10 year – 160 thousand km) (3) Efficiency(single charge is set at 580km)

- Hyundai aims to exhibit hydrogen powered self driving cars at the 2018 Pyeongchang Winter Olympics
- Two separate hydrogen refueling stations will installed at Gangneung and Pyeongchang city.
- During the Olympic season, 6 FC Buses, 22 FCEV will be operated.

PyeongChang Forum 2018

- Seminar Topic: Energy Conversion and Hydrogen Energy
- Date: 2018.02.08
- Speakers: Tim Karlsson (Executive Director of IPHE), Yuseung Kim (USA), Thorsten Herbert(Germany), Ju Wang(China), Daishu Hara(Japan), Jeahang Shin(Korea)

International experts will be invited to organize an international seminar in connection to the Pyeongchang Forum held before the 2018 Winter Olympic Games to lay out foundation for the proliferation of the domestic hydrogen and fuel cell industry and establishment of the special act on hydrogen.

Thank you for IPHEs significant presentation at Pyeonchang forum

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Thank You