



International Partnership  
for Hydrogen and Fuel Cells  
in the Economy

## *Japan* Update

31<sup>st</sup> IPHE Steering Committee Meeting

10 – 11 April 2019

Vienna, Austria

# Announcements and/or New Initiatives (Japan)



## 1. Schedule for International Conference

### ➤ **2<sup>nd</sup> -7<sup>th</sup> June 2019, WHTC 2019**

- Share information on the current state and future direction of hydrogen energy research, technology, social implementation, policies

### ➤ **15<sup>th</sup>-16<sup>th</sup> June 2019, G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth**

- Confirm the importance of hydrogen in the Communique of G20
- Presentation and input about hydrogen by Hydrogen Council

### ➤ **25<sup>th</sup> September 2019, Hydrogen Energy Ministerial Meeting 2019**

- Share global hydrogen target

## 2. Funding

- METI decided to have JPY 63 billion (US \$ 630 M) for Hydrogen and fuel cell budget of FY2019.

- In order to achieve goals set in the Basic Hydrogen Strategy,
- ① **Set of new targets to achieve (Specs for basic technologies and cost breakdown goals), establish approach to achieving target**
- ② **Establish expert committee to evaluate and conduct follow-up for each field.**

		Goals in the Basic Hydrogen Strategy	Set of targets to achieve		Approach to achieving target
Use	Mobility	FCV 200k by 2025 800k by 2030	2025	<ul style="list-style-type: none"> <li>● Price difference between FCV and HV (¥3m → ¥0.7m)</li> <li>● Cost of main FCV system (FC ¥20,000/kW → ¥5,000/kW Hydrogen Storage ¥0.7m → ¥0.3m)</li> </ul>	<ul style="list-style-type: none"> <li>• Regulatory reform and developing technology</li> </ul>
		HRS 320 by 2025 900 by 2030	2025	<ul style="list-style-type: none"> <li>● Construction and operating costs (Construction cost ¥350m → ¥200m Operating cost ¥34m/year → ¥15m/year)</li> <li>● HRS components cost (Compressor ¥90m → ¥50m Accumulator ¥50m → ¥10m)</li> </ul>	<ul style="list-style-type: none"> <li>• Consideration for creating nation wide network of HRS</li> <li>• Extending hours of operation</li> </ul>
		Bus 1,200 by 2030	Early 2020s	<ul style="list-style-type: none"> <li>● Vehicle cost of FC bus (¥105m → ¥52.5m)</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing HRS for FC bus</li> </ul>
	Power	Commercialize by 2030	2020	<ul style="list-style-type: none"> <li>● Efficiency of hydrogen power generation (26% → 27%) ※1MW scale</li> </ul>	<ul style="list-style-type: none"> <li>• Developing of high efficiency combustor etc.</li> </ul>
Supply	FC	Early realization of grid parity	2025	<ul style="list-style-type: none"> <li>● Realization of grid parity in commercial and industrial use</li> </ul>	<ul style="list-style-type: none"> <li>• Developing FC cell/stack technology</li> </ul>
	Fossil Fuel + CCS	Hydrogen Cost ¥30/Nm3 by 2030 ¥20/Nm3 in future	Early 2020s	<ul style="list-style-type: none"> <li>● Production: Production cost from brown coal gasification (¥several hundred/Nm3 → ¥12/Nm3)</li> <li>● Storage/Transport : Scale-up of Liquefied hydrogen tank (thousands m<sup>3</sup> → 50,000m<sup>3</sup>) Higher efficiency of Liquefaction (13.6kWh/kg → 6kWh/kg)</li> </ul>	<ul style="list-style-type: none"> <li>• Scaling-up and improving efficiency of brown coal gasifier</li> <li>• Scaling-up and improving thermal insulation properties</li> </ul>
	Green H2	System cost of water electrolysis ¥50,000/kW in future	2030	<ul style="list-style-type: none"> <li>● Cost of electrolyzer (¥200,000m/kW → ¥50,000/kW)</li> <li>● Efficiency of water electrolysis (5kWh/Nm3 → 4.3kWh/Nm3)</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstration in model regions for social deployment utilizing the achievement in the demonstration of Namie, Fukushima</li> <li>• Development of electrolyzer with higher efficiency and durability</li> </ul>

※In addition, promote development of guidelines and technology development for expansion of hydrogen use in the field of FC trucks, ships and trains.

# Examples of Lessons Learned and Impact

## *(Japan)*



Program initiative, policy, regulation or mandate	Lessons Learned/Outcomes
Basic Hydrogen Strategy	<ul style="list-style-type: none"> <li>• The first national strategy on Hydrogen.</li> <li>• Investment will be accelerated by sharing visions with industries.</li> </ul>
Strategic Roadmap for hydrogen and fuel cell	<ul style="list-style-type: none"> <li>• In order to achieve the goals set in Basic Hydrogen Strategy, detailed targets and action plans have been set by government collaborated with industry.</li> </ul>
De-regulation of HRS	<ul style="list-style-type: none"> <li>• Regulations of HRS are being revised for reducing the cost of HRS.</li> <li>• Especially, no-man operation of HRS will be allowed by 2020.</li> </ul>
Hydrogen Supply Chain Projects (Feasibility Study) <ol style="list-style-type: none"> <li>1. Japan – Australia Pilot Project</li> <li>2. Japan – Brunei Pilot Project</li> </ol>	<ul style="list-style-type: none"> <li>• Large scale hydrogen projects will be a key to reduce hydrogen cost.</li> <li>• Feasibility studies should be conducted firmly.</li> </ul>
2020 Olympic and Paralympic Games 2025 OSAKA-KANSAI JAPAN EXPO	<ul style="list-style-type: none"> <li>• Use these opportunities for hydrogen showcase by looking ahead to 5 years and more.</li> <li>• Outreach and education</li> </ul>

# Applications - Current Status and Goals

## (Japan)



Application	Status (As of March 2019)	Goal (For 2030)
Fuel cell vehicles	3,026	800,000
Hydrogen stations	103	900
Fuel cell buses	18	1,200
Electrolyzers	10.9 MW	Only Cost target only
Primary fuel cell power units	-	-
Backup power fuel cell power units	-	-
Combined Heat and Power (Ene-FARM)	276,217	5.3 M
Hydrogen Cost	Several hundred JPY/Nm3	\30/Nm3 (CIF)

# Summary of Global Hydrogen Target (@HEM 2019)

- Set “Global Hydrogen Target” to share global goal.

	April -2019	2030 Target(Proposal)
Number of FCV in the World	12,012	11,000,000
Number of HRS in the World	233	12,000
Stack Platinum Content	-	0.1 g/kW
Hydrogen production cost	-	Equivalent to Natural gas price in future considering environmental value
Electrolyser	-	4.3 kWh/Nm3

\* Targets would be based on the data and targets of each country

# Global Hydrogen Target (Hydrogen Energy Ministerial Meeting 2019)



- Based on each country's target, Global Hydrogen Target would be an agenda of HEM 2019.

Global Hydrogen Target toward 2030 (CONCEPT)*1										Additional country data are necessary to set the Global Hydrogen Target.										Global Hydrogen Target toward 2030 (CONCEPT)*1										Additional country data are necessary to set the Global Hydrogen Target.																			
		1		2		3		4		5		6		7		The sum of seven countries		The sum of all countries		Global Hydrogen Target -Proposal-		<Ref> Hydrogen Council				8		9		10		11		12		13		14		15		16		17		18		19	
		United States		Germany		France		United Kingdom		Japan		China		Republic of Korea												Australia		Austria		Brazil		Canada		European Commission		Iceland		India		Italy		Netherlands		Norway		Russian Federation		Republic of South Africa	
[Mobility]		current	2030	current	2030	current	2030	current	2030	current	2030	current	2030	current	2030	current	2030	current	2030	2030	2030	2030	2030	current	2030	current	2030	current	2030	current	2030	current	2030	current	2030	current	2030	current	2030	current	2030	current	2030	current	2030				
① Number of FCV in the World		FCV	6,315	1,000,000	500	-	324	50,000	100	-	3,026	800,000	60	-	900	2,750,000	11,225	-	-	10,000,000	15,000,000	400,000,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		Bus	20	-	16	-	0	2,000	20	-	19	1,200	200	1,000,000	-	2	40,000	286	-	-	新車販売の10%	5,000,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
		Truck	-	-	-	-	1	-	-	-	-	-	-	500	-	-	30,000	501	-	-	500,000	15,000,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		Sum	6,345	1,000,000	516	-	325	52,000	120	-	3,044	801,200	760	1,000,000	902	2,820,000	12,012	5,673,200	10,949,276	-	-	11,000,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
② Number of HRS in the World		30 MPa On-Ship Production & Delivered	20	1,000	55	1,000	3	1,000	13	100	103	900	2	1,000	14	1,200	229	6,200	11,966	12,000	15,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
③ Retail price of FCV																																																	
④ Informational communication on spec for HRS																																																	
⑤ Variety of FCV lineup (Medium to large vehicle and SUVs)																																																	
⑥ Train and Ship		Train																																															
		Ship																																															
⑦ Power Density		kWh/L								3.0		6.0	2.3 @ 2020																																				
⑧ Durability		hour										> 15 (year)	3,000	8,000																																			
⑨ Stack Platinum Content		g/kW										0.1	0.2 @ 2020																																				
[Hydrogen Production and Transportation]																				[Hydrogen Production and Transportation]																													
① Hydrogen production cost (ex. equivalent to natural gas FOB price)		USD/kg (x2)										10.1 (100~P/No.3)	1.01 (10 P/No.3)																																				
② Liquefied hydrogen tanker safety regulation												2025~P																																					
③ Informational standard for the clean hydrogen																																																	
④ Electrolyzer - alkaline electrolyzer (Capital cost, Electricity consumption, Degradation rate)		USD/kW (x2.3)				2,027	2,027			3,163		2027 (22,000)																																					
		kWh/No.3				4.3	4.3					4.3																																					
		%/1,000h				0.1	0.1					0.1																																					
[Industrial Utilization]																				[Industrial Utilization]																													
① Carbon free hydrogen used in Refinery (R&D)		USD/kg (x2)										2.33~2.74 (economically equivalent to existing energy cost)																																					
② Decarbonization of iron ore using carbon free hydrogen																																																	
③ Fertilizer			20,000	-	100	-	100	-	-	160	10,000	2	-	-	-																																		
④ "ENE-PARK"										276,000	5,200,000																																						
*1 Targets are not obligation nor assigned to each country and region																				*1 Targets are not obligation nor assigned to each country and region																													
*2 1 USD = 110 JPY																				*2 1 USD = 110 JPY																													
*3 1 g = 130 JPM																				*3 1 g = 130 JPM																													
*4 1.93 = Mean value of other vehicle in use in all countries / Mean value of other vehicle in use in seven countries																				*4 1.93 = Mean value of other vehicle in use in all countries / Mean value of other vehicle in use in seven countries																													
This number is calculated based on the data of FOURM report 2018 and estimated to be 1.95 in 2025.																				This number is calculated based on the data of FOURM report 2018 and estimated to be 1.95 in 2025.																													

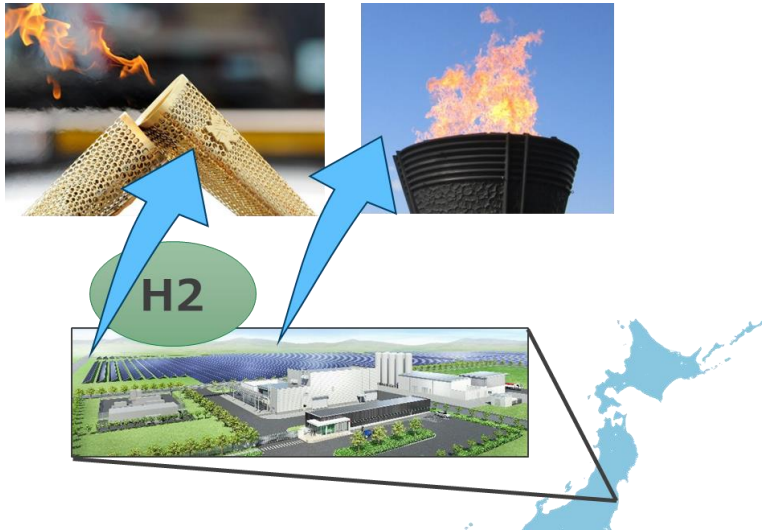


# Olympic and Paralympic game in 2020



## Olympic torch and flame

- ✓ The first Olympic and Paralympic game with Olympic Torch and flame lighted by hydrogen



Can be colored in various colors !

## Transportation





# Thank you



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