

Chair's Summary of 2nd Hydrogen Energy Ministerial Meeting
– Global Action Agenda of Tokyo Statement –

I. Context

The Ministers and Delegates responsible for coordination of hydrogen energy policy within their respective countries met in Tokyo, Japan on 25 September 2019 to discuss strategies for cooperation toward the development of hydrogen energy. Over 30 countries and organizations attended the meeting, underscoring continued and growing momentum toward the wider production and use of hydrogen in the world.

They reaffirmed the view that hydrogen can be a key contributor to clean, safe and affordable energy for the future. The interest in hydrogen, including clean hydrogen, has increased worldwide and numerous activities are being conducted by governments, industries and research institutions to unlock its potential as clean, reliable and secure source of energy.

The Ministers and Delegates acknowledged significant progress made since the 1st Hydrogen Energy Ministerial Meeting (HEM) held in October 2018, as summarized in the Annex.

They reaffirmed the value of collaborating further to accelerate the progress in hydrogen technologies, contributing to a “Hydrogen Society¹”, as part of a broad energy portfolio – a clean, more prosperous and secure energy future worldwide supported by using hydrogen in society where appropriate, across power, heat, transport, building and industry sectors.

In the 1st Hydrogen Energy Ministerial Meeting, the “Tokyo Statement” was released, which consists of four pillars of measures for hydrogen research, development, demonstration, and deployment. During the Clean Energy Ministerial (CEM) 2019 in Vancouver, a supportive Hydrogen Initiative was launched by Canada, Japan, US, EU and the Netherlands, with the International Energy Agency (IEA) being selected as the coordinator. At the G20 Energy Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth in Japan this year, Ministers recognized the importance of hydrogen and, on request of the G20 Presidency, the IEA published a comprehensive report to support the discussions in June 2019. The International Renewable Energy Agency (IRENA) has released its perspective on hydrogen on the occasion of the 2nd HEM. In addition, the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) met in South Africa and Austria since the last HEM, convening global partners in an enabling role, including

¹ The term "Hydrogen Society," as used in the Tokyo Statement published last year, reflects a society where hydrogen is used in applications and sectors as appropriate, and does not imply that the society is fueled only by hydrogen.

dissemination of HEM plans and facilitating coordination. Now concrete actions are needed to implement the Tokyo Statement.

II. The need for a Global Action Agenda

Recognizing that the next ten years will be critical to enable wider deployment of hydrogen by scaling-up production and use of hydrogen as well as by bringing down the cost, concrete actions are needed to mobilize efforts globally. The Ministers and Delegates recognized the value of acting on the Global Action Agenda from the Tokyo Statement, a principle to guide actions for hydrogen technology research, development, demonstration and deployment to achieve the scale up of hydrogen in the future.

III. Global Action Agenda of a Tokyo Statement

The Ministers and Delegates recognize the importance of tackling challenges to scale up hydrogen comprehensively, including by formulating long-term strategies or roadmaps and identifying challenges and the necessary policies and programs to implement change. They encourage actions on the following items, where appropriate, in line with the four pillars in the Tokyo Statement, while taking into account different national circumstances:

Tokyo Statement Pillar 1

Collaboration on Technologies and Coordination on Harmonization of Regulation, Codes and Standards

Tokyo Statement Pillar 2

Promotion of Information Sharing, International Joint Research and Development
Emphasizing Hydrogen Safety and Infrastructure Supply Chain

(1) Mobility across Applications

Numerous programs are being conducted to foster the use of hydrogen and fuel cells for mobility applications, including fuel cell vehicles (FCV), fuel cell (FC) trucks, FC buses, FC trains, FC ships as well as in other applications such as forklifts, off-road vehicles and aviation. To further encourage the use of hydrogen and fuel cells in this area, it is of value to share, where appropriate, global, aspirational goals such as, but not limited to, “10 million hydrogen powered systems” and “10 thousand Hydrogen Refueling Stations (HRS)” in 10 years (“Ten, Ten, Ten”), as indicative, non-mandatory and collective goals to help incentivize and mobilize the private sector and investment community. Other possible examples include global or regional goals for clean hydrogen, which may be set based on individual national or state aims or mandates. To this end, a further study to estimate demand for clean hydrogen would be of value. With a view to achieving such

goals, the following actions, in areas of infrastructure development, market expansion, harmonization of regulations, codes and standards, R&D for next generation technology development, and ensuring safety in the use of hydrogen, are encouraged:

① Mobility infrastructure development and market expansion

- Encourage development of hydrogen infrastructure, while reducing hydrogen cost.
- Encourage collaborations to accelerate the development and deployment of infrastructure and HRS' s, for example by establishing private partnerships such as Japan H2 Mobility (JHyM) and H2Mobility in Germany.
- Explore the use of FCV and FC heavy duty vehicles as power sources for disaster management and resiliency.
- Facilitate the deployment of diverse FC mobility systems such as bus, forklift, truck, maritime, mining, and train applications, including through partnerships between governments and the private sector.
- Mobilize financial resources through innovative mechanisms and encourage investment through public-private partnerships and financial institutions.

② Harmonization of regulations, codes, and standards (RCS)

- Enable harmonization of standards and codes in areas such as refueling components (e.g. nozzles, tanks, etc.), refueling protocols for high pressure hydrogen, components for handling and using liquid hydrogen, such as for heavy duty vehicles, marine, and rail applications, while ensuring safety and reducing cost.
- Review regulations and address barriers in areas such as regulation of FCVs in tunnels and on bridges, set back distances for liquid HRS, and RCS in emerging applications including maritime, rail, etc.
- Utilize and strengthen existing global partnerships such as the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) Regulations, Codes, Standards, and Safety Working Group (RCSSWG) to create a compendium of RCS in key areas and identify areas for harmonization.
- Promote the development of international standards for the use of hydrogen as a fuel in maritime applications, such as through the International Maritime Organization (IMO).

③ Research and development (R&D) for next generation FC systems

- Promote R&D in areas including fuel cells, tanks, and hydrogen infrastructure to further reduce cost across applications.

- Share information on technologies and challenges in pre-competitive fields through international initiatives such as the IPHE, Mission Innovation and Technology Collaboration Programs (TCPs) in the IEA.
- Encourage collaboration among industry, governments and academia for technology development through government funding programs and public-private partnerships.

④ Ensuring hydrogen safety

- Share, accumulate and analyze information on best practices and incidents by using information platforms, such as the Global Center for Hydrogen Safety (GHS), HySafe, and the IPHE Regulations, Codes, Standards, and Safety Working Group (RCSSWG).

(2) Hydrogen Supply Chains

Hydrogen can be produced from multiple sources. The versatility and storage capacity of hydrogen creates potential, not only for domestic production and consumption of hydrogen, but also for trade between countries. To enable a robust and sustainable market for hydrogen technologies, it is necessary to develop clean, affordable, secure, and reliable supply chains. The following global and collective efforts are conducive to establishing such supply chains:

① R&D and Sharing Information

- Promote R&D on supply chain components such as dispensers, compressors, liquefiers, tanks, and energy carriers such as liquid organic hydrocarbons (such as methyl cyclohexane (MCH)), ammonia, etc., and other technologies for production, transportation and storage of hydrogen, including liquid hydrogen.
- Share challenges and opportunities identified in research, development and demonstration projects to help establish globally competitive and reliable supply chains.

② Promote investment and demonstration projects that work as models for hydrogen deployment and scale-up, and help prepare the regulatory environment, such as:

- Identify potential initial international shipping routes or hydrogen pipelines for hydrogen trade and opportunities for export/import of hydrogen through feasibility studies and demonstration projects.
- Encourage development of hydrogen supply chains which result in low emissions footprint hydrogen, for example, by producing hydrogen from renewable energy

and/or fossil fuels coupled with carbon capture, use and storage (CCUS) technologies.

- Support first movers taking risk and investing in developing advanced technologies through public/private funding.
- Stimulate commercial demand for hydrogen through public support to deploy hydrogen in applications across transport, industrial processes, building and power sectors.
- Promote the development of international standards for hydrogen in maritime transport such as through the International Maritime Organization (IMO).

③ Support the development of effective hydrogen trading markets including:

- Ensure regulations are transparent and facilitate efficient international trade in hydrogen.
- Support demand creation for the hydrogen market expansion.
- Promote adherence to, and where necessary, develop international standards through the relevant international standards development bodies.
- Facilitate the removal and/or reduction of regulatory barriers.
- Develop a common definition of clean/sustainable hydrogen and encourage innovative approaches, such as harmonization of guarantees of origin & certificates for clean/sustainable hydrogen.

(3) Sector Integration

Continued rapid expansion of renewable energy in the future can create a situation where abundant power generated by renewables can be utilized to produce hydrogen, which in turn can be used to decarbonize other sectors, such as power, heat, transport, building and industry sectors. In addition, hydrogen produced from fossil fuels, when combined with CCUS, can also contribute to decarbonizing sectors. To achieve this integration among different sectors, action on the following agenda, such as promotion of innovative R&D and demonstration projects is needed to establish relevant technologies and deployment of hydrogen across sectors.

① R&D

- Promote R&D for areas such as electrolysis, blending hydrogen in pipelines and hydrogen energy storage, including through the IEA's TCPs.
- Promote R&D in hydrogen purification to support FC-grade hydrogen produced using technologies other than electrolysis.

② Demonstration

- Share and disseminate the progress and outcomes of demonstration projects such as hydrogen power generation, hydrogen injection in pipelines, hydrogen energy storage (including underground storage), and hydrogen for resiliency and grid services.
 - Establish model areas to showcase the use of hydrogen including by facilitating information exchange through initiatives such as the Mission Innovation Renewable and Clean Hydrogen Innovation Challenge’s “Hydrogen Valleys”.
 - Launch demonstration projects at coastal ports and regional clusters where demand and supply of hydrogen are created at the same location, thereby reducing cost for hydrogen transport.
 - Explore the use of existing gas pipelines for hydrogen blending and assess materials as well as end-use issues.
 - Explore the use of clean hydrogen in industries such as steel production, refineries, and ammonia production.
 - Continue to identify key areas for harmonizing RCS such as for injecting hydrogen into gas pipelines and large scale hydrogen generation and storage for grid applications.
- ③ Expand the use of hydrogen in various sectors
- Promote R&D and scale-up hydrogen use in areas such as hydrogen power generation and industrial applications such as steel production.
 - Continue R&D and approaches for scaling up methanation and other synthetic fuel production with hydrogen.

Tokyo Statement Pillar 3: Study and Evaluation of Hydrogen’s Potential across Sectors Including its Potential for Reducing both CO₂ Emissions and other Pollutants.

To stimulate investment and promote hydrogen as a clean, secure and affordable energy in the future, reliable data and analyses regarding hydrogen such as those below, are encouraged.

- Conduct further analysis and study by IEA, IRENA, Economic Research Institute for ASEAN and East Asia (ERIA) and other hydrogen-related organizations, including research and evaluation on the potential of hydrogen in various applications to enable a sustainable energy future, including the use of hydrogen for synthetic fuels, environmental impact assessments, studies on resource availability for hydrogen production with CO₂ storage, water availability, alternative water sources, cost, supply chains, hydrogen business models, scenario and modeling analysis, and the creation of roadmaps or strategies as well as tracking

progress in clean hydrogen deployment, while capitalizing upon existing work and resources.

- Develop projections/scenarios on the demand for hydrogen to stimulate investment in hydrogen toward sustainable energy future.
- Share experiences of relevant projects and identify challenges and solutions to enrich further analysis on hydrogen.
- Develop international standards for life cycle assessments (LCA) of hydrogen technologies and share information and analysis results.

----- Tokyo Statement Pillar 4: Communication, Education and Outreach -----

Sufficient understanding regarding the potential for hydrogen, and its benefits as well as challenges, such as safety perceptions, is essential for further deployment of hydrogen across applications and sectors. To this end, the following actions are encouraged where necessary:

- Disseminate information through various mechanisms, including the Education and Outreach Working Group under IPHE.
- Conduct outreach campaigns leveraging on hydrogen events to increase public awareness.
- Increase global awareness of the use of hydrogen by utilizing high profile events, such as the 2020 Tokyo Olympics, and other venues where hydrogen is featured.
- Encourage industry and companies responsible for hydrogen projects to build confidence and acceptance amongst consumers and communities and undertake ongoing community education.
- Share information, for example through webinars and training materials to help increase awareness among broad stakeholder groups, including students, teachers, policy makers, the workforce, and the public.

Ministers and Delegates acknowledged the importance of working together to ensure efficient coordination among different international fora, leveraging resources, avoiding duplication, and maximizing the effectiveness and impact of their work.

Annex of the Chair's Summary of The 2nd Hydrogen Energy Ministerial Meeting

The Ministers and Delegates welcome the significant progress achieved with regard to the implementation of the Tokyo Statement as follows. (Since the 1st Hydrogen Energy Ministerial Meeting in October 2018))

“Tokyo Statement”

1. Collaboration on Technologies and Coordination on Harmonization of Regulation, Codes and Standards
2. Promotion of Information Sharing, International Joint Research and Development Emphasizing Hydrogen Safety and Infrastructure Supply Chain
3. Study and Evaluation of Hydrogen's Potential across Sectors Including Its Potential for Reducing Both CO₂ Emissions and Other Pollutants.
4. Communication, Education and Outreach

《National policies for Hydrogen》

- December 2018: Australia announced release of “National Hydrogen Strategy”
- January 2019: South Korea “Roadmap for hydrogen economy”
- February 2019: FCHJU “Hydrogen Roadmap”
- March 2019: Japan “Strategic Road Map for Hydrogen and Fuel Cells ”
- September 2019: Japan “Technology development strategy for hydrogen and fuel cells”
- Japan plan to secure approximately 30% more hydrogen-related budget than last year.
- U.S. DOE: \$58M announced in 2019 for new RD&D projects, including \$13M for new H₂@Scale demonstrations in Texas, Florida, and the mid-west.
- Norway's national hydrogen strategy to be published by 2019

《International Cooperation》

- December 2018: IPHE hosted by South Africa (1,4)
Government's representatives discussed how to implement and cooperate for realizing Tokyo Statement.

- **January 2019: Davos Meeting, Building the fast track for clean hydrogen economy hosted by World Economic Forum(1, 2, 3)**

Governments and industries discussed challenges for ramping up clean hydrogen and discussed the tools for unlocking the potential of clean hydrogen.
- **February 2019: International high-level workshop on Hydrogen, hosted by the IEA**

High-level meeting on hydrogen to support IEA analysis and recommendations to G20 on hydrogen
- **March 2019: Mission Innovation, Hydrogen Valley hosted by Belgium (2)**

Mission Innovation IC-8 have launched “Hydrogen Valley” concept to establish information platform for scaling up Hydrogen usage.
- **April 2019: Center for Hydrogen Safety launched with multiple global partners (CHS) (2)**

CHS was launched by both government and industry partners to promote hydrogen safety and share best practices worldwide.
- **April 2019: IPHE hosted by Austria (1,4)**

Government representatives discussed how to implement and cooperate for realizing Tokyo Statement.
- **May 2019: Hydrogen Initiative in the CEM hosted by Canada(1, 2)**

New Hydrogen Initiative was launched. It is coordinated by the IEA and aims to advance commercial scale hydrogen and fuel cell related deployment across sectors of the economy, via policies, programs and projects.
- **June 2019: G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable growth hosted by Japan(1, 2 ,4)**

The importance of hydrogen was referred in the Communique and Action Plan for the first time in G20.
- **October 2019:Hydrogen Symposium hosted by Oman (3,4)**

The first hydrogen symposium is going to be hosted on Hydrogen Day (October 9th) in Oman.

《Report on hydrogen by International Organizations》(3)

- **May 2019: ERIA “Demand and Supply Potential of Hydrogen Energy in East Asia”**
- **June 2019: IEA “The Future of Hydrogen” released at the G20 Summit on request of the G20 Presidency.**

《International Joint Project》(2)

- **Japan-Australia Hydrogen Supply Chain Project**

In this project, hydrogen plan to be produced by brown coal in Australia. The projects got approval by EPA, Australia in December 2018. Commencement of construction ceremony for hydrogen ship and Hydrogen Liquefaction and Loading Terminal were held in June 2019 and July 2019.

- **HYREADY**

The HYREADY joint industry project (JIP), led by DNV GL, intends to encourage the industry to “Be ready for Hydrogen” by developing practical processes and procedures for the introduction of hydrogen to the grid. HYREADY focuses on the consequences of H₂ added to natural gas in an existing specific network and on feasible countermeasures to mitigate these consequences.

- **Joint U.S.-EC workshop with global partners on H₂@Rail (2)**

Global partners met in Michigan to discuss opportunities for hydrogen rail applications

- **Joint U.S.-EC workshop with global partners on marine applications (H₂@Ports) (2)**

Global partners met in California to discuss opportunities for hydrogen in marine applications.

《Harmonization of Regulations, Codes, Standards and Outreach》(1, 4)

- **IPHE Regulations, Codes, Standards, Safety Working Group (RCSSWG)**

RCSSWG held regular meetings and prepared preliminary compendium of RCS to help identify gaps and opportunities for harmonization

Completed draft report on tunnels in collaboration with global members, based on UK workshop

- **IPHE Education and Outreach Working Group (E&O WG) (4)**

IPHE held student outreach events, most recently in South Africa, and gave recognition awards to students. Launched social media efforts and reached nearly

one thousand stakeholders, including through international fora, conferences and panels with IPHE representation.