



Hydrogen Mobility International: Country Reports



International Partnership
for Hydrogen and Fuel Cells
in the Economy

Tim Karlsson
Executive Director,
International Partnership for Hydrogen &
Fuel Cells in the Economy (IPHE)

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Fuel Cell Electromobility in Germany and
throughout the World

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Outline of Today's Presentation

Brief Introduction to the IPHE

International Trends in Development

International Drivers and Commitments

Conclusion

Caveat: Views expressed today are those of the Executive Director of the IPHE and are not those of any specific IPHE member country or organisation.



Brief Introduction to the IPHE

The IPHE is an inter-governmental partnership that provides a forum to share information and advance collaborative initiatives to accelerate the cost-effective transition to the integrated use of fuel cell and hydrogen (FCHs) in the economy.

- Member partners are undertaking significant research, development, demonstration and/or implementing policy initiatives to increase the use of FCHs in the economy.



Australia



Austria



Brazil



Canada



China



European Commission



France



Germany



Iceland



India



Italy



Japan



Republic of Korea



Norway



Russian Federation



South Africa



United Kingdom



United States



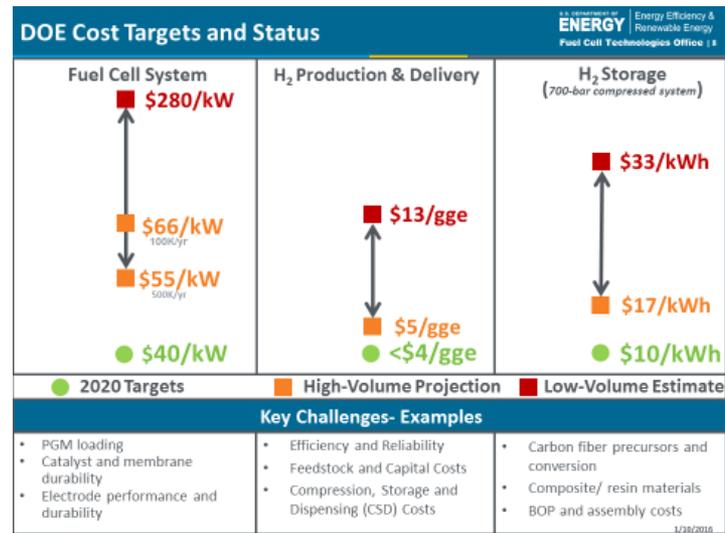
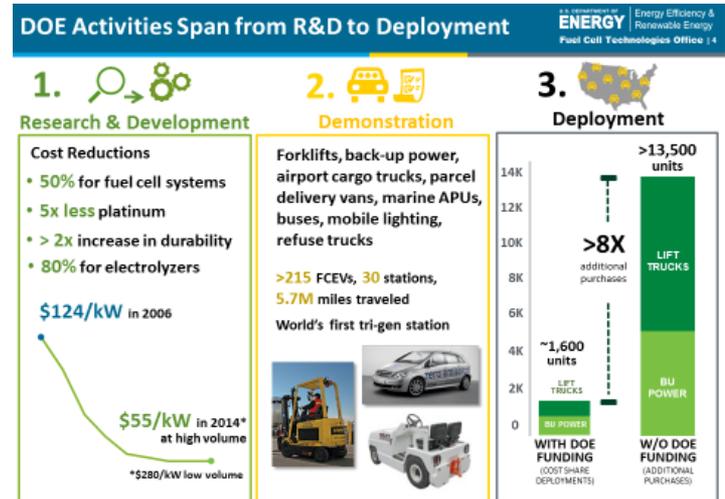
International Trends

1. Significant Cost Reductions:

- Sustained global research, development, and demonstrations by industry and government have led to a significant level of technology maturity and early market deployment.

2. Significant Effort to Continue Reducing Costs

- Work across the innovation spectrum is still needed to make further gains in the market and broaden the product suite.





International Trends

3. Initial Commercial Sales Underway

- With cost reductions and leadership by industry, commercial sales are here.
- Initial market introduction also includes range extenders to BEV especially for fleet applications.
- With hydrogen from renewable and low carbon sources the FCEV is a key component in response to Climate Change goals.

FCEVs are on U.S. Roads Now!

Available for commercial sale in the U.S.: Toyota Mirai Fuel Cell Vehicle

Now Leasing...: Hyundai Tucson Fuel Cell SUV

In Auto Shows...: Honda Fuel Cell Electric Vehicle

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy | Fuel Cell Technologies Office | 3

Source: 23rd IPHE SC Meeting Wuhan China, May 2015

Fleets of vehicles

Fleet definition:
Fleet vehicles with predictable driving and refuelling patterns, as well as regular visits to or overnight parking at a depot

Potentially suitable market segments:

- Fleet cars
- Delivery/utility
- Medium duty logistics
- Taxis

Rationale

- ❑ Lower cost 'range-extended' fuel cells could reduce ownership costs of early vehicles
- ❑ Can allow lower pressure fuelling
- ❑ Benefits from existing fleet regulations e.g. zero emissions logistics/urban access restrictions
- ❑ H₂ stations and fleets could be matched to improve utilisation and economics
- ❑ Fleet 'anchor loads' can support early clusters, which can then be connected to form corridors and national coverage

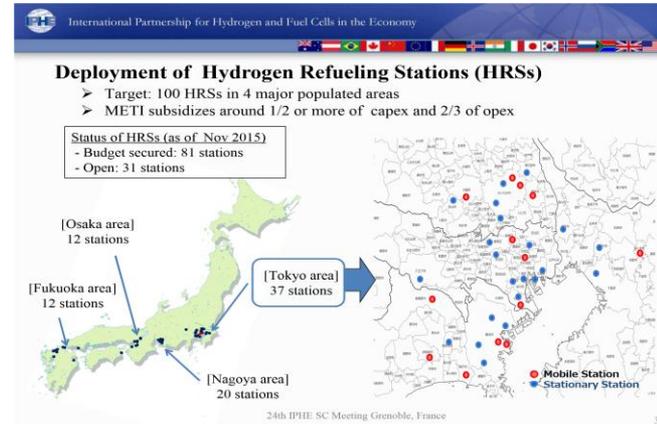
Source: H2 Mobility France



International Trends

4. Focus on Market Frameworks and Market Activation

- International market framework structures are needed such as consistent and robust technical Codes, Standards and compatible Regulations.
- Countries are undertaking significant projects to enable initial stages of infrastructure necessary to take advantage of these emerging FCEVs and other FCH technologies

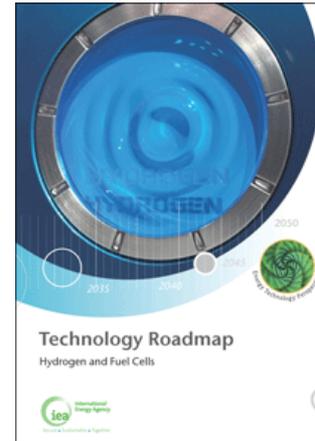




International Trends

5. Energy & Transportation System Integration

- Increasing recognition that the longer-term opportunity and need for hydrogen as an integrator.
- Significant technical research and economic analysis is necessary to understand the efficient and effective integration of the systems and the business cases to make it happen.



Vast Promise, Huge Challenges – IEA outlines critical steps to advance hydrogen and fuel cells.
30 June 2015

International Partnership for Hydrogen and Fuel Cells in the Economy
8. Renewable Portfolio Standard (RPS)
 KOREA ENERGY MANAGEMENT CORPORATION

Overview

- Enforces 17 power producers to supply certain amount of the total Power generation by NRE (Implemented in 2012)
- ※ Obligators: power producers with capacity of 500MW or above

Goal and Current Status

- Goal : ('12) 2.0% → ('13) 2.5% → ('14) 3.0% → ('17) 5.0% → ('20) 8.0% → ('22~) 10.0%
- Current Status : RPS achieved 1.7 times of total FIT installed capacity(proceeded for 10 years) in 2 years

RPS('12~'13)	FIT('02~'11)	Rate of change
1,751MW (Solar PV 589MW)	1,030MW (Solar PV 497MW)	170.0% (Solar PV 116.5% ↑)

- [Fuel Cells Power plants in RPS]** 22 power plants (152.2MW capacity, Mar.'15)

Best Practice

- Gyeonggi Green Power Plant(Fuel Cells)
 - 58.8MW(2013, Hwasung City)
 - MCFC / 2.8MW × 21 Units

23rd IPHE SC Meeting Wuhan, China



International Drivers: Sustainability

National circumstances drives their actions:

1. Energy Security

- Security of energy supply with ability to switch sources, if necessary:

2. Energy Efficiency

- More effective use of variable generation – at grid and at community/facility scale; and,
- A move from centralized to distributed energy generation.

3. Economic Growth

- Transition of energy and transport systems are leading to new products and supply chains; and,
- Governments (taxpayers) need to realize their R,D&D investments through jobs and economic wealth driven by the private sector.

4. Environmental Performance

- Climate change goals for energy and transportation systems; and,
- Clean Air obligations (e.g., NO_x, SO_x, Particulates) in Air Sheds.



International Drivers: Policies

The sustainability objectives also get realized through policies driven by international initiatives such as:

1. **Follow-up to Decisions at COP21**
2. **Actions related to Goals and Objectives under Mission Innovation**
3. **Work within the “Break-through Energy Coalition”**
4. **Components of the work in support of the “Clean Energy Ministerial”**



International Drivers: Political Commitment

Recognition of FCHs in the future Energy & Transportation systems

- The China State Council issued *The Energy Development Strategy Action Plan (2014-2020)* ... identifies hydrogen and fuel cells in the list of 20 key innovation directions of energy technology. (Source: Country Update, 23rd IPHE SC Meeting Wuhan, China)
- “[Prime Minister] Abe has declared hydrogen-powered fuel cell vehicles “the ultimate eco-car,” praising their promise for the environment and the nation’s automakers, which are ahead of the pack.” (Source: Japan Times Nov 30, 2015)
- “As part of an all-of-the-above energy approach, fuel cell technologies are paving the way to competitiveness in the global clean energy market and to new jobs and business creation across the country.” Secretary Moniz, U.S. Department of Energy, Dec 19, 2013
- The president [President Park Geun-hye] also asked Hyundai to quickly develop buses powered by hydrogen fuel cells to showcase South Korea's technological prowess at the 2018 Winter Olympics... (Yonhap News Agency March 18, 2016)



Conclusion

1. **Significant technical developments have been reached but much more is needed**
2. **Marketplace frameworks are continuing to evolve with an increasing focus on commercial application and opportunities**
3. **A group of countries are taking leadership roles in technological and market development while others are developing niche capabilities based on unique circumstances**
4. **There are a number of global policy objectives where FCV and Hydrogen can contribute significantly**



Thank You

Tim Karlsson
Executive Director, IPHE

e-mail tim.karlsson@iphe.net

Phone: +32 (0)2 541 82 76

website: www.iphe.net