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Exhibitor Sponsored Workshop
at AAAS Annual Meeting 2018
Urban Nexus; Harnessing Science, Technology and Innovation for Sustainable Urban Cities

# Creating Sustainable Energy Society by Renewable Hydrogen

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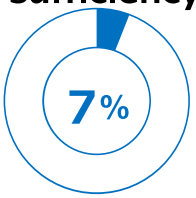
## What Hydrogen can Contribute to SDGs


http://www.un.org/sustainabledevelopment/wp-content/uploads/2017/12/UN-Guidelines-for-Use-of-SDG-logo-and-17-icons-December-2017.pdf

# Japan's Energy Issues and Advantages of $H_2$

## Japan's Energy Issues

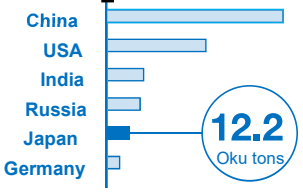
### Low energy self-sufficiency




33rd of the 34 OECD members

IEA Energy Balance of OECD Countries 2017

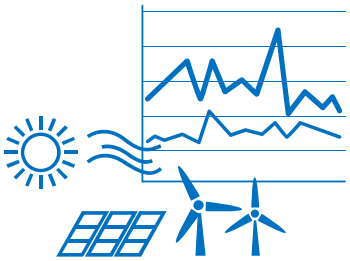
### Unsatisfactory $CO_2$ emissions




5th of $CO_2$ emissions by country

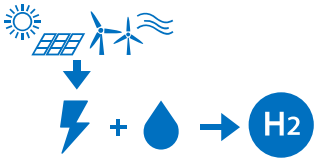
Energy & Economic statistics in Japan 2015

### Unstable renewable energy



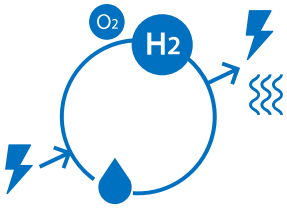
## Advantages of Hydrogen

### Self-supplyable energy



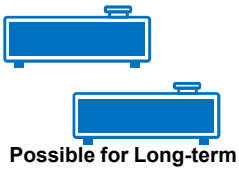

Possible to produce hydrogen from renewable energy as stable energy

### No $CO_2$ emissions




$CO_2$-free clean energy

### Convertible to stable energy



Possible for Long-term stable storage and utilization

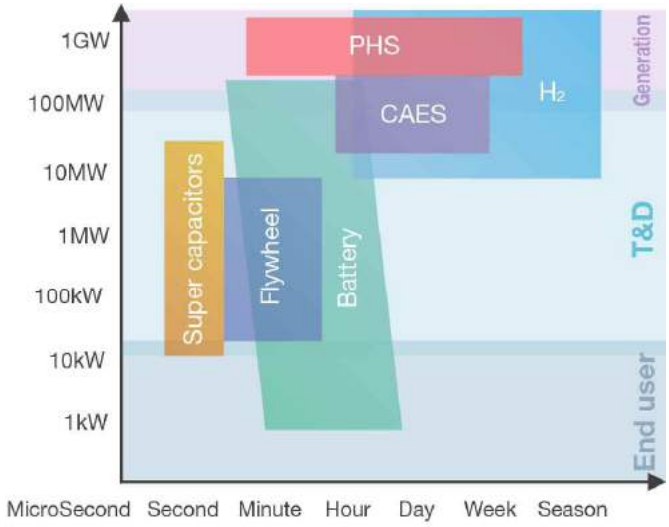




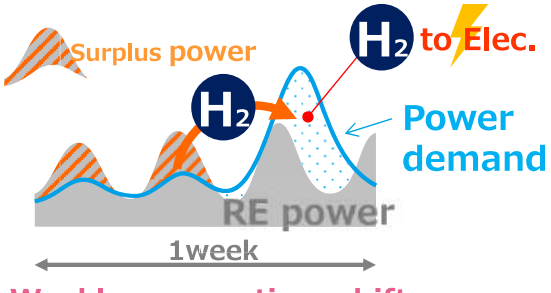
# Advantages of Hydrogen –Time Shift–

## Energy Time Shift: Daily, Weekly, Seasonally, Annually

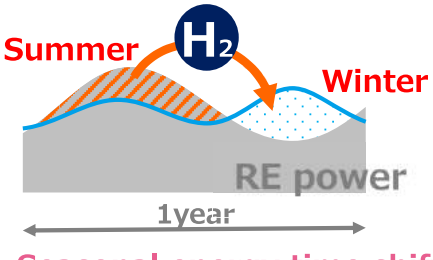
- Store unstable RE and surplus power as Hydrogen
- High potential to level long variation of RE




Source:" Technology Roadmap – Hydrogen and Fuel Cells, IEA, 2015 "




Weekly energy time shift




Seasonal energy time shift

# Toshiba's Hydrogen Technologies

**Production** | **Storage** | **Application**

**Hydrogen EMS** Hydrogen Energy Management System

**Renewable Energy**

**Electrolyzer**

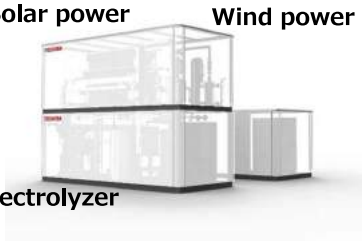
**$H_2$ Power Storage**

**Fuel Cell**

Solar power

Wind power

Hydrogen station



Electrolyzer

$H_2$One™

700W 3.5kW 100kW

Fuel cell

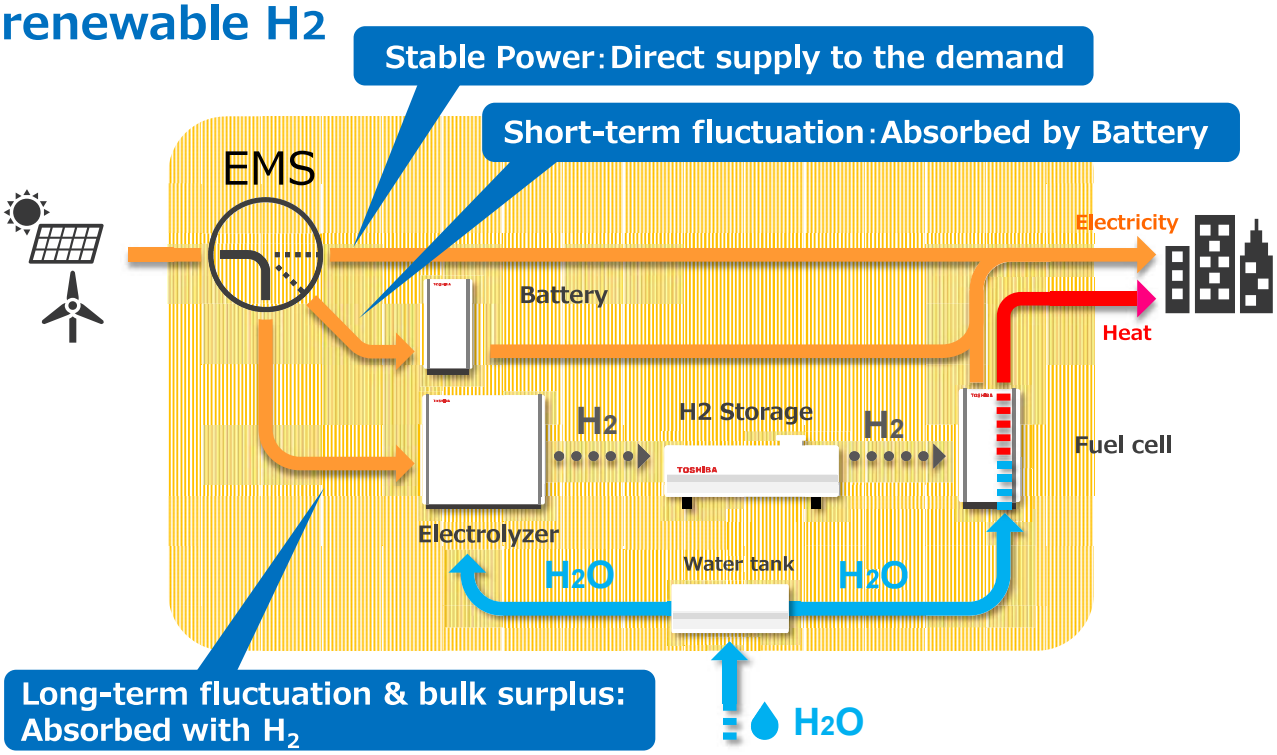
**We can supply one-stop solutions for $H_2$ business**





# Effective Utilization of RE by Power Leveling

## Maximize the amount of electricity generated by renewable H2



# Autonomous Energy Supply System

- Hydrogen to local production
- $CO_2$–free energy by storing and using $H_2$ from renewable energy
- Excellent portability


Usual — Reduction of energy cost by effective use of energy

Emergency — Emergency energy supply as BCP*
(Supply electricity and heat only with stored hydrogen)



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＊BCP ： Business Continuity Plan

 

# H2One™ Demonstration for Resort Hotel

**The 12 hotel rooms are operated all year around by renewable energy only in disconnected to power grid from 2016.3**


| | Spec. |
|---|---|
| PV | 60kW |
| H2 production | Max. 2m3/h |
| H2 storage | Max. 900Nm3 (1.4MWeh) |
| Output power | Max. 55kW |
| Occupied space | 30m2 |

**Foot print 1/3, CAPEX 2/5 against Li-ion battery system**

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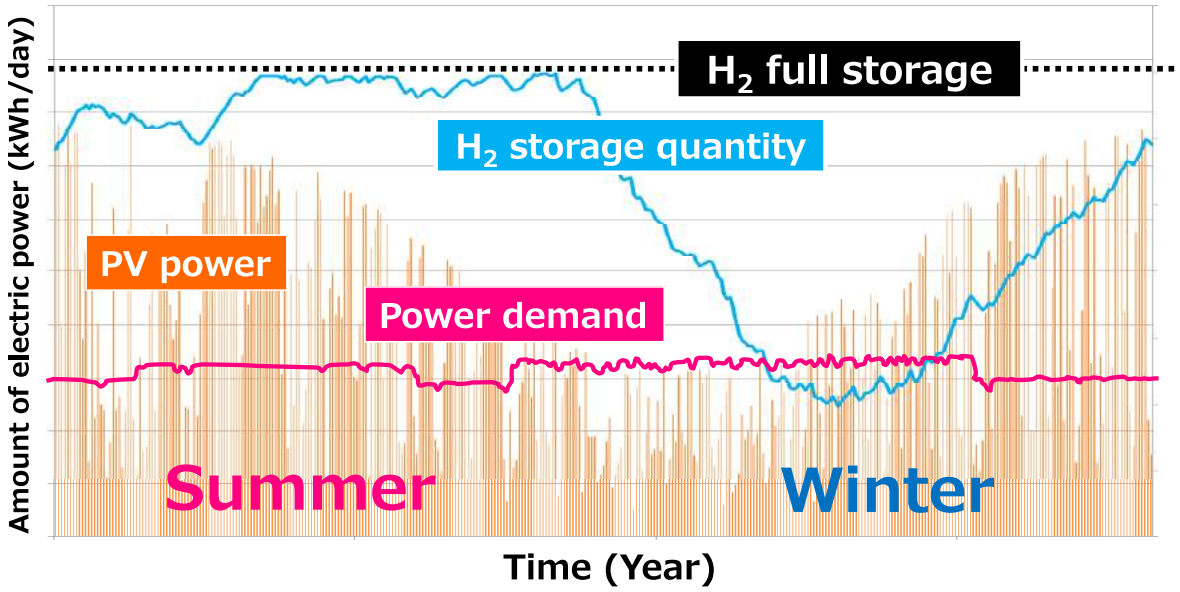
# The Action of Hydrogen Power Storage

## Realize 100% self-sufficient electricity supply through the year




**Summer** : Produce and store hydrogen by surplus PV power in summer

**Winter** : Generate electricity using the stored hydrogen in winter


Subsidized Company; Huis Ten Bosch
Sponsored by Ministry of Economy, Trade and Industry(METI)

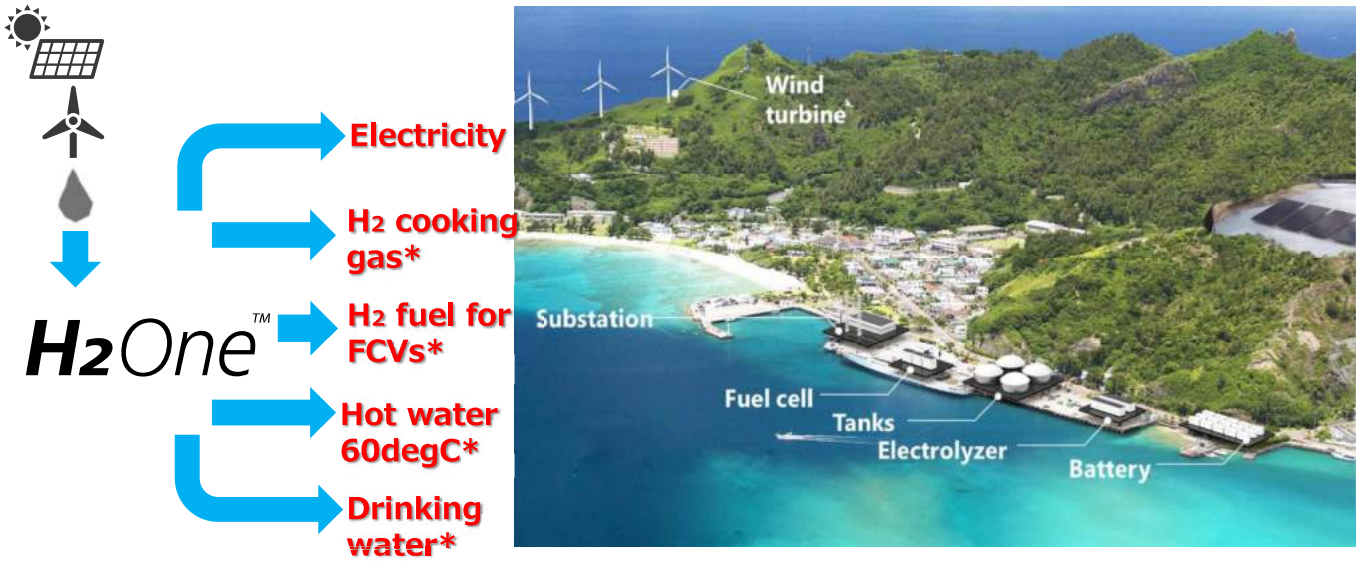


# H2One™ The Other Applications




# Large H2One™ for Off-Grid and Remote Areas

- 100kW to MW scale autonomous energy supply suited to islands or weak power grid areas
- Supply stable energy all year around regardless of weather by only renewable energy and water without fossil fuel
- Competitive total electricity cost against DG in remote areas




**Good resilience, hygiene, environment and comfortable life**



* Optional

# What Hydrogen can Contribute to SDGs

**⇒ Hydrogen has big potentials to promote many aspects of SDGs**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