

Freunde der Gaswirtschaft

Virtuelle Konferenz

11. November 2020

9 Jahre nach Fukushima: Die japanische Energiepolitik - ist Wasserstoff die Lösung?

Japans Aufbruch in die „Wasserstoffgesellschaft“

Dipl.-Ing. Kurt K. Heinz

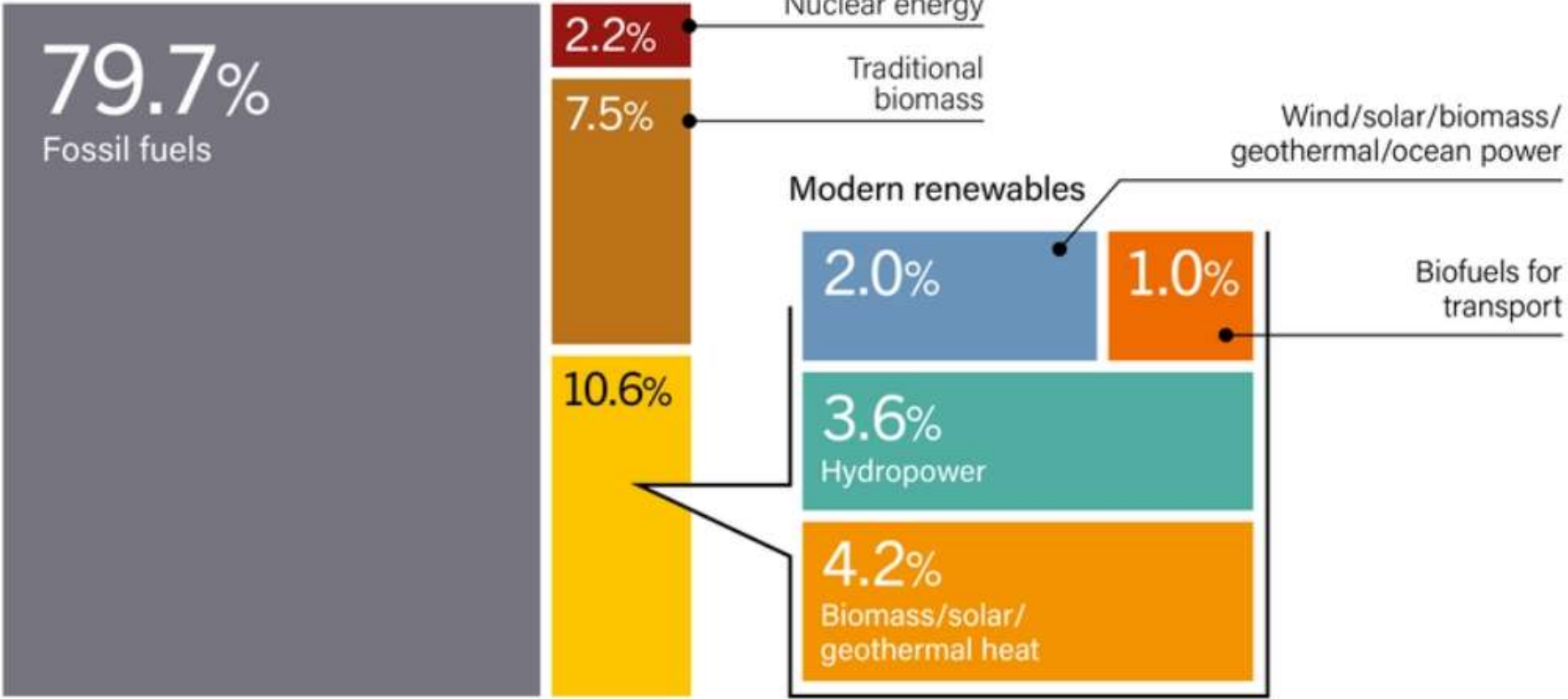
„TÜV emeritus“, Tokyo



*H*_{ein}*z**2* - *O* *Stiftung*
Foundation

hin zur Wasserstoffgesellschaft
towards the Hydrogen Society

Estimated Renewable Share of Total Final Energy Consumption, 2017



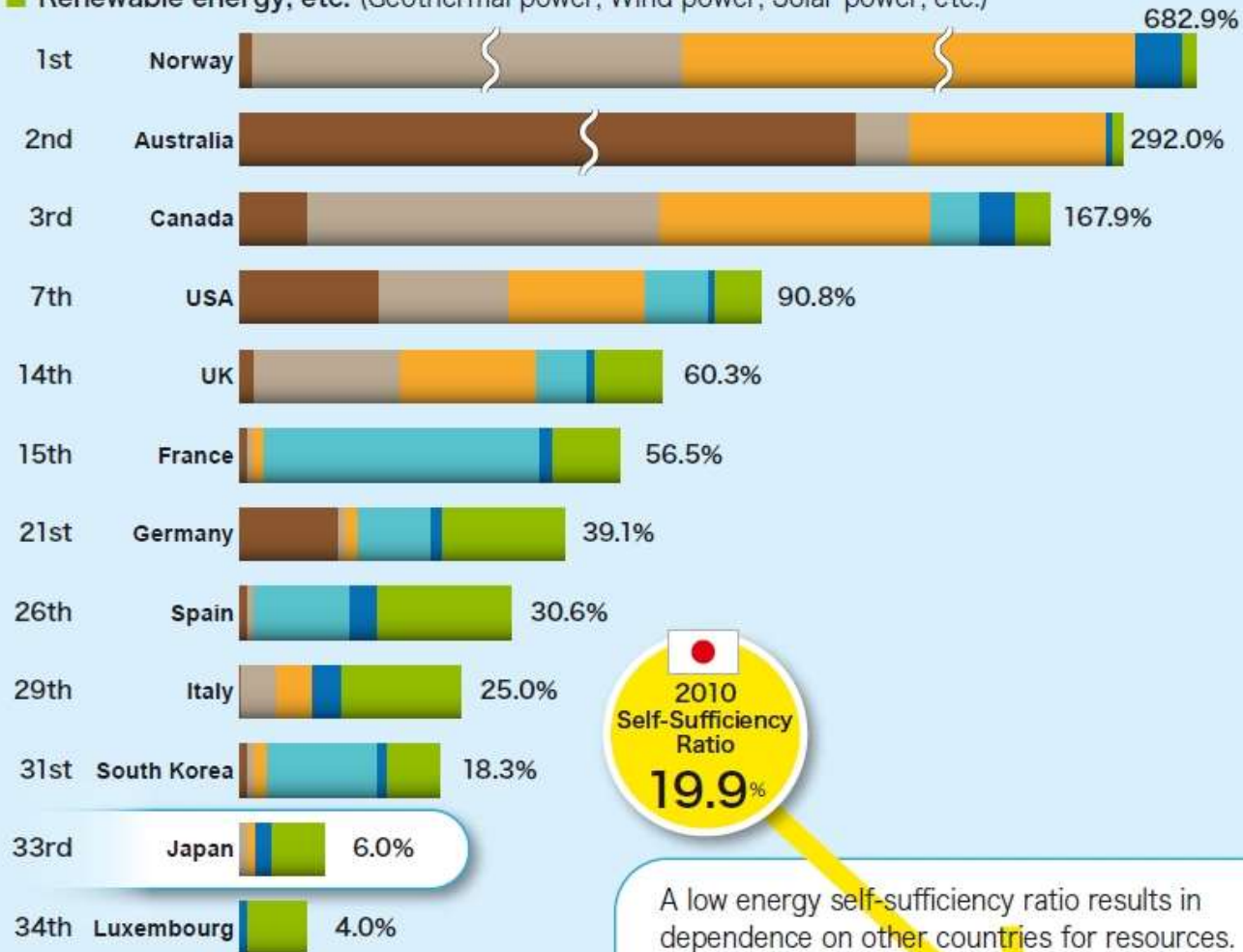
Note: Data should not be compared with previous years because of revisions due to improved or adjusted data or methodology. Totals may not add up due to rounding.

Source: Based on OECD/IEA and IEA SHC.

Comparison of Primary Energy Self-Sufficiency Ratios of Major Countries (2014)

■ Coal
 ■ Crude oil
 ■ Natural gas
 ■ Nuclear power
 ■ Hydro

■ Renewable energy, etc. (Geothermal power, Wind power, Solar power, etc.)




 2010
 Self-Sufficiency
 Ratio
19.9%

A low energy self-sufficiency ratio results in dependence on other countries for resources. Because of this, it's easy to be affected by the influence of international situations when securing resources, which raises concerns over stable energy supply.


 2014
 Self-Sufficiency
 Ratio
6.0%

Challenges for Japan's Energy Transition

- Basic Hydrogen Strategy -

February 26
2019

Masana Ezawa

Agency for Natural Resources and Energy (ANRE),
Ministry of Economy, Trade and Industry (METI), Japan

Mission/ Background

● Japan's Responsibility for Energy Transition

⇔ Energy trilemma

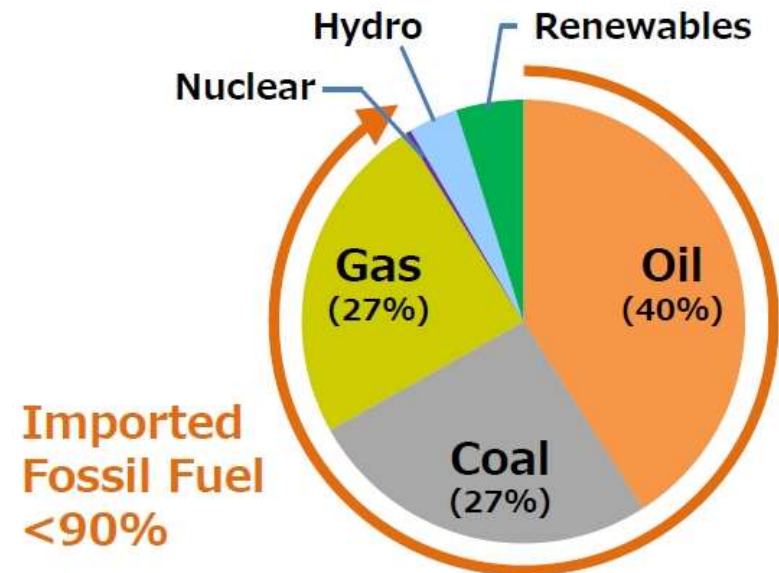
- ✓ **E**nergy security
- ✓ **E**nvironment (Sustainability)
- ✓ **E**conomic affordability (Cost)

} **3"E"** + **S**afety

● Measures;

- ✓ Energy saving
- ✓ Renewable energy
- ✓ Nuclear energy
- ✓ CCS + Fossil fuels
- ✓ **Hydrogen**

Japan's Primary Energy (FY2016)



Ongoing Projects (Supply-side)

International H₂ Supply Chain

Japan-Brunai Pilot Project

2020~



Off-gas



Steam Methane Reforming



Hydrogenation*
(TOL→MCH)



Chemical Tanker



Dehydrogenation*
(MCH→TOL)



* Image

Toluene → Methylcyclohexane

Japan-Australia Pilot Project

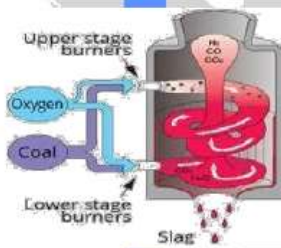
2020~



Brown Coal + CCS



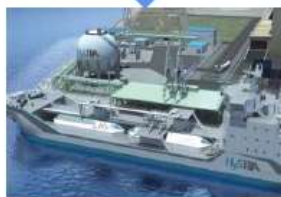
Gasification



Liquefied H₂ Carrier*



Loading Facility*



Power-to-gas

Fukushima Renewable H₂ Project

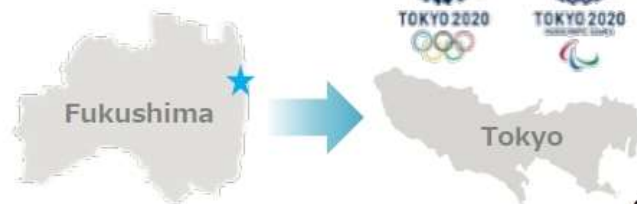
2020~



Power-to-Gas Plant*



Electrolysis System (Alkaline)



300.000 Tonnen CO₂ unter dem Meeresboden

24.01.2020

In einer Versuchsanlage in Japan konnten in dreieinhalb Jahren 300.000 Tonnen Kohlendioxid abgeschieden und im Meeresboden gespeichert werden. Das staatlich finanzierte Projekt soll zur Verbesserung der Klimabilanz des Landes beitragen – doch die Methode bleibt umstritten.

Von Martin Fritz

Hören Sie unsere Beiträge
in der Dlf Audiothek



CO₂-Verklappung auf Japans Nordinsel Hokkaido: Das Treibhausgas wird in den Meeresboden gedrückt (Japan CCS)

World's first liquid hydrogen carrier ship launches in Japan

Kawasaki Heavy's vessel will transport the next-generation fuel from Australia

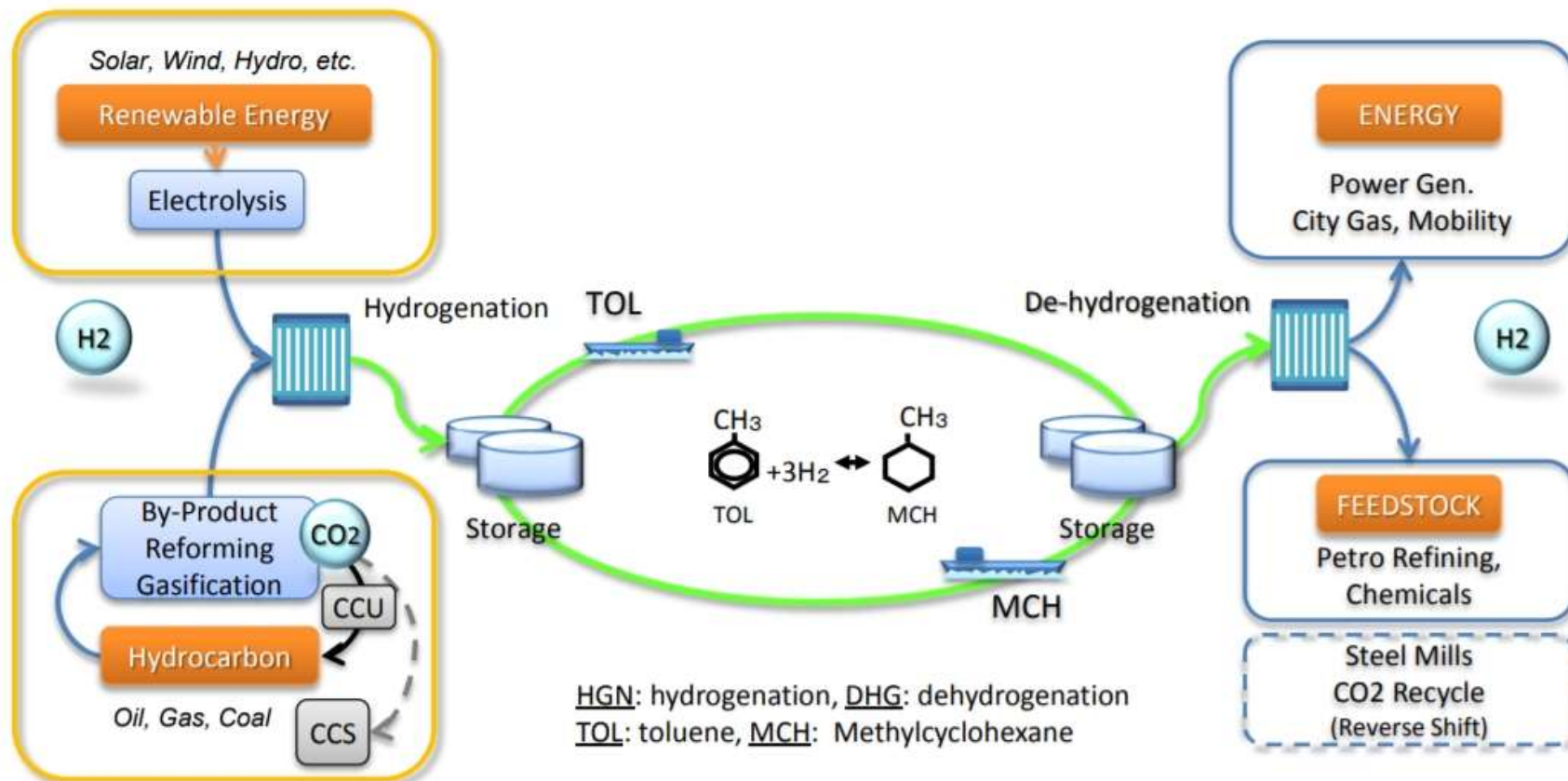
MASAMICHI HOSHI, Nikkei staff writer December 12, 2019 06:40 JST



The Suiso Frontier, the world's first liquid hydrogen carrier, is unveiled Wednesday at a port in Kobe, Japan. (Photo by Maho Obata)

Hydrogen Storage & Transportation Technology

- Chiyoda has established an efficient and large scale hydrogen storage and transportation system.
- Methylcyclohexane (MCH), Liquid Organic Hydrogen Carrier (LOHC), stays in liquid state under ambient temperature and pressure anywhere.



Key Technology is New Catalyst of Dehydrogenation.

Ongoing Projects (Demand-side)

H₂ Mobility

H₂ Station Network

2013~

*113 Stations
by November 2018



H₂ Applications

2016~



FC Bus

X 100 in 2020



FC Truck Demo

H₂ Power Generation

H₂ Co-generation Demonstration Project



Hydrogen Gas Turbine (1MW class)

2018~



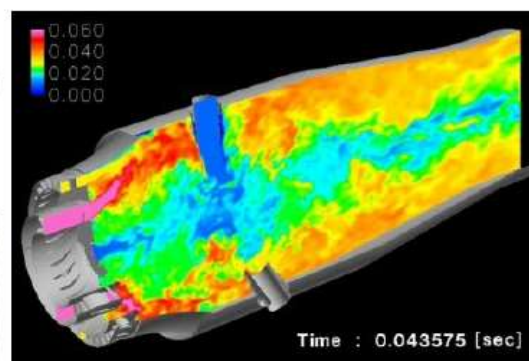
Joint Venture for H₂ Infrastructure Development

2018~

R&D of H₂ Burner Systems



For Power Generation
<500MW



Burning Simulation
(H₂ + CH₄)
Time : 0.043575 [sec]

Toyota als Ratgeber oder Die treibende “Wasserstoffkraft”



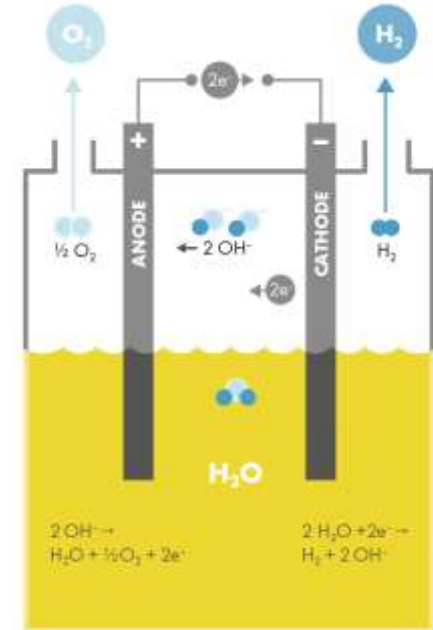
***IOC Präsident Thomas Bach mit Toyota Präsident Akio Toyoda; daneben: Toyota Mirai FCV
November 2018; Thema: Toyotas Mobilitätsinnovationen***

Quelle: IOC

Power-to-X

Umwandlung und Speicherung von überschüssiger erneuerbarer Energie

X = Gas (Ammoniak, Methan, Wasserstoff, Syngas, ...), Chemikalien, Kraftstoff, Wärme



Shell Hydrogen Study © Shell

The Hydrogen Society Starts from Fukushima

Change Text Size  

Hydrogen, a source of next-generation clean energy, holds the key to solving the problems of carbon reduction and energy supply. In Fukushima Prefecture, where the restoration from the devastating earthquake continues to gain momentum, the Fukushima Hydrogen Energy Research Field will be the world's largest-scale hydrogen production facility upon its completion in the spring of 2020.

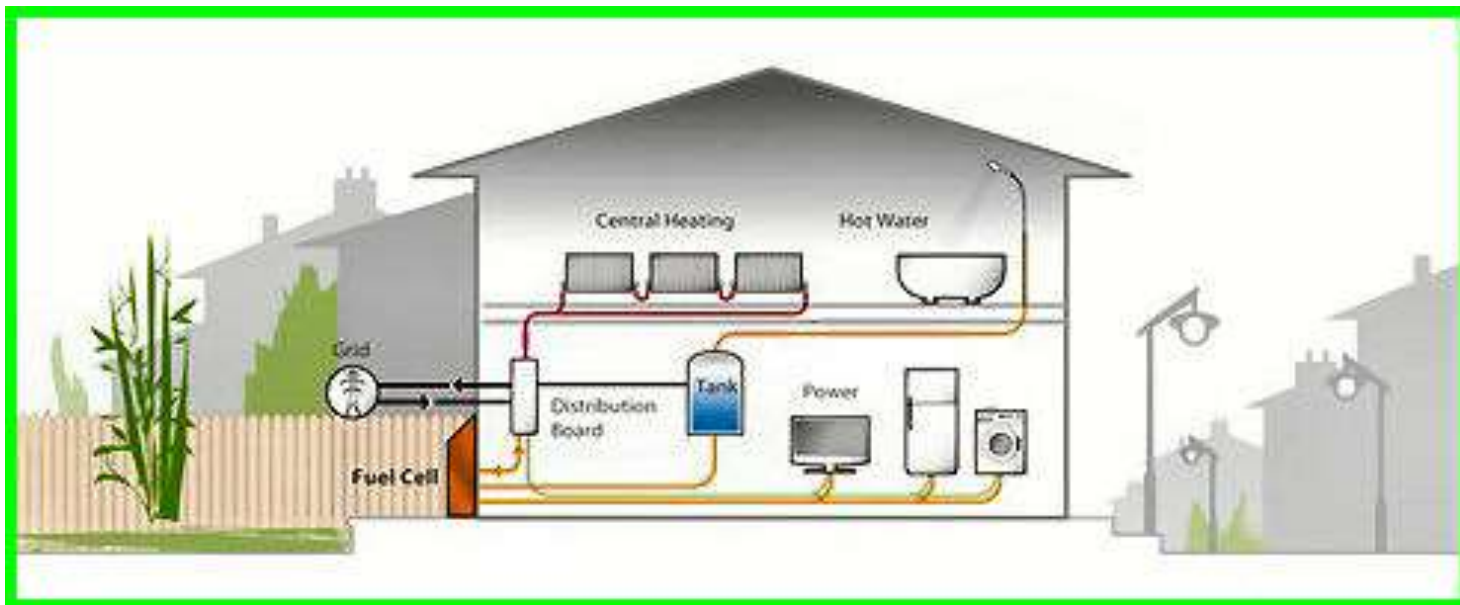


Conceptual drawing of the completed Fukushima Hydrogen Energy Research Field (FH2R), a major step towards a hydrogen-powered society.

FC EXPO Technical Conference Program

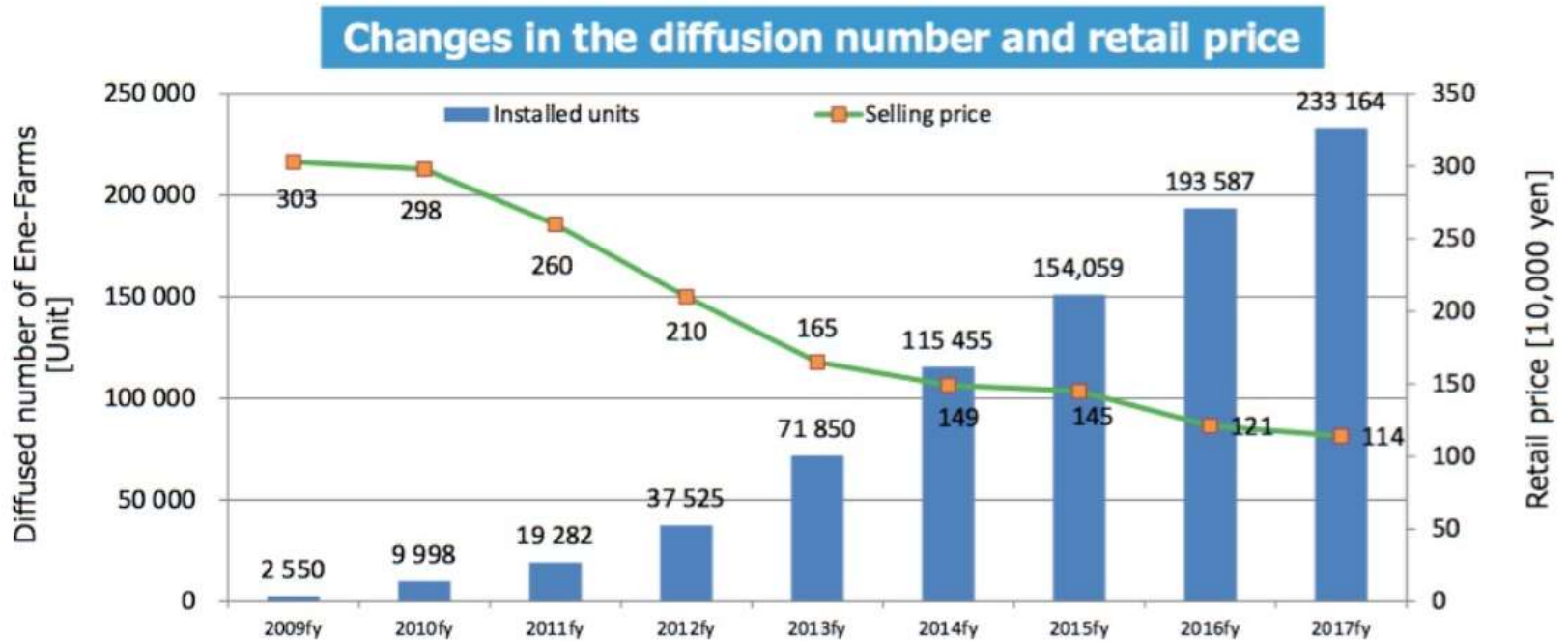
Spread and Development Trend of ENE-FARM and Residential Fuel Cells
2019-03-01

ENE-FARM
STROM UND HEISSWASSER
PANASONIC UND TOKYO GAS
Brennstoffzelle für zu Hause



FCW Exclusive: Tokyo Fuel Cell Expo 2019 – 300,000 Ene-Farms

By FuelCellsWorks | April 18, 2019



* Based on determination subsidization base

(As of the end of January 2018)

Ene-Farm micro-CHP costs and installation base.

Source: METI, *New Era of a Hydrogen Society*, February 27, 2018.



Pathway to a Competitive European Fuel Cell micro-Cogeneration Market

Japan: Eine Erfolgsgeschichte beim Einsatz der Brennstoffzellen-Mikro-Kraft-Wärme-Kopplung (KWK)

Japan ist das weltweit führende Land bei der Entwicklung und dem Einsatz von Brennstoffzellen-Mikro-KWK. Als hochindustrialisiertes Land, das große Mengen an Energie verbraucht und nur wenige natürliche Ressourcen besitzt, diversifiziert Japan sein Energiesystem und steigert seine Effizienz. Diese Bemühungen wurden nach der Katastrophe von Fukushima verstärkt. Die Entwicklung von Wasserstoff als Energieressource steht ganz oben auf der Tagesordnung des Landes. Die Verwendung von Wasserstoff bei der Mikro-KWK von Brennstoffzellen ist eine logische Wahl, um die Effizienz zu maximieren.

In Europa lassen sich aus dem ENE-FARM-Projekt, der von der japanischen Regierung finanzierten Initiative zur Entwicklung und Installation der Mikro-KWK von Brennstoffzellen, viele Lehren ziehen ...

Quelle: <http://www.pace-energy.eu/japan-a-success-story-in-deploying-fuel-cell-micro-cogeneration/>

February 20th, 2019

**“End of stone age was
not due to the lack of stone”**

Die Steinzeit ging nicht zu Ende, weil es keine Steine mehr gab.

**The technological innovation and new idea
change the society.**

**石器時代が終わったのは
石が無くなったわけではない！**

技術革新と新しいアイデアが社会を変えるのだ。