CDTI-NEDO online Joint Workshop on Hydrogen Technology
- Green Hydrogen Production & Mobility -

# Asahi Kasei's Activities for Green Hydrogen Production

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**Clean Energy Project**
**Asahi Kasei Corporation**

@CDTIoficial

# Asahi Kasei Corporation overview

## About us


## Established

1922

## Employees

44,497

## Sales (FY2020)

$19.1B

## Operation Income (FY2020)

$1.5B

## Business Segments

*Material*

*Homes*

*Health Care*

# Asahi Kasei's products

## Chemicals
- Petrochemicals
- Performance Materials
- Performance Polymers
- Consumables

## Critical Care
- Defibrillator
- Temperature management system

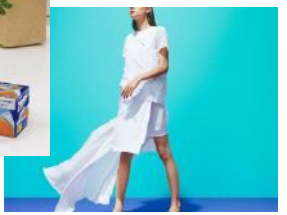
## Pharmaceuticals & Devices
- Prescription Drugs
- Hemodialysis

Health Care

Material

## Construction Materials
- Autoclaved aerated concrete
- Thermal insulation
- Structural systems and components

## Fibers & Textiles
- Bemberg
- Roica
- Nonwovens
- Leona nylon 66

Homes

## Homes
- Order-built homes
- Real estate-related operations
- Renovation

## Electronics
- Battery Separators
- Semiconductors
- Sensors


Net sales in FY2020

# Asahi Kasei's decarbonization initiative

**Reducing our own GHG emissions**

**To realize a sustainable society**
**the Asahi Kasei Group aims to achieve carbon neutrality by 2050** *1

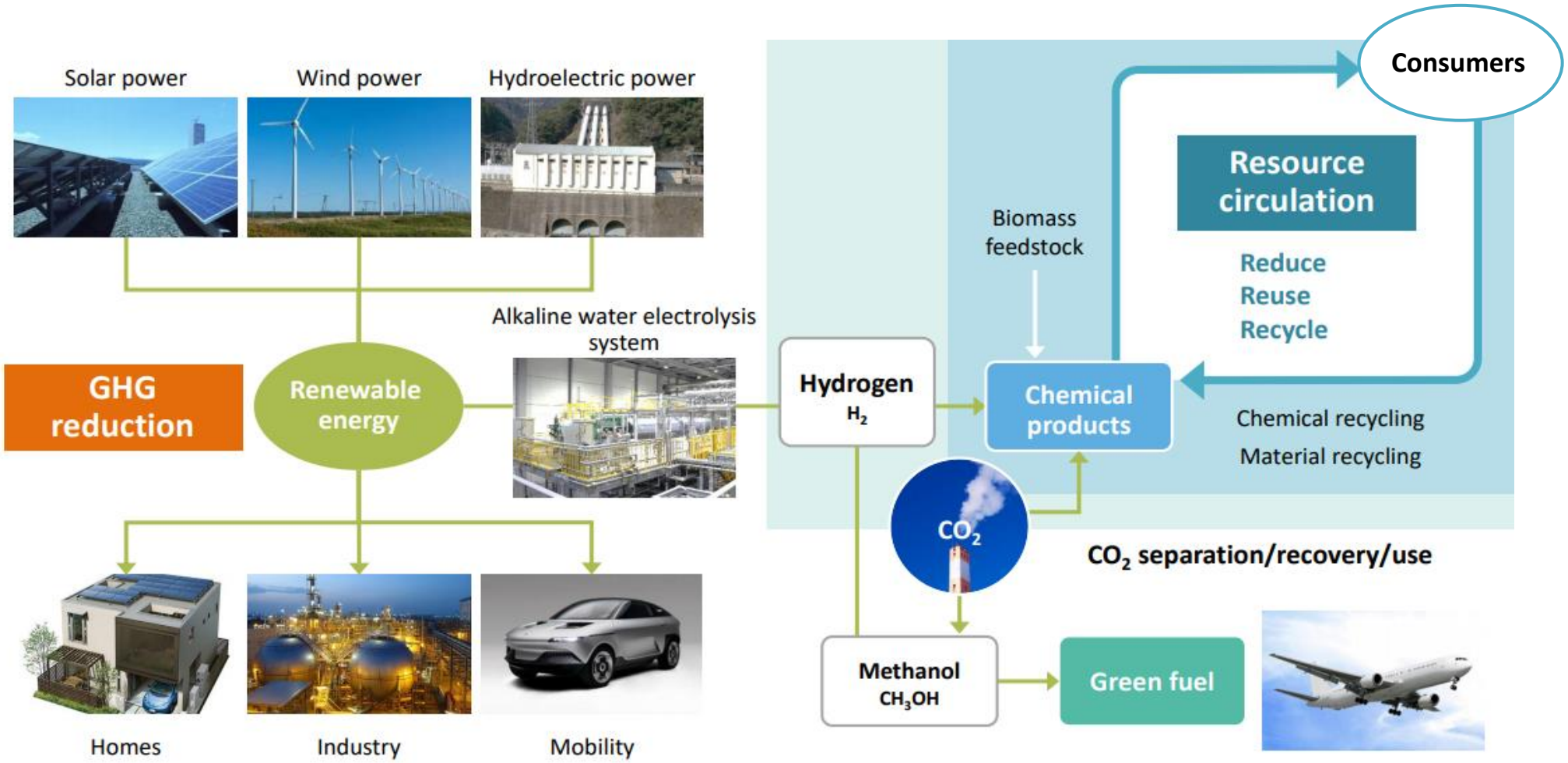
| | |
|---|---|
| **Main Measures** | ▶ Energy decarbonization (acceleration of R&D for alkaline water electrolysis, $CO_2$ separation/recovery/utilization, etc.)<br>▶ Manufacturing process innovation<br>▶ Shift to high-value-added, low-carbon businesses, etc. |
| **2030 Target** | **Reduce GHG emissions by 30% or more (compared with FY2013)*2** |

**Develop a roadmap to achieve the goal,**
**and accelerate decarbonization initiatives accordingly**

*1: GHG emissions from our business activities (Scope 1, 2)

*2: Presumption that the Japanese power supply structure will be more than 50% non-fossil in accordance with the governmental policy

# Carbon neutral way of Asahi Kasei business



# Asahi Kasei's electrolysis technology

**1923**

- Started hydrogen production by water electrolyzing for synthesizing ammonia. [Japan Chemical Heritage]

**1975**

- Launched chlor-alkali electrolysis business. Asahi Kasei becomes only one supplier which can supply all the components.

Acilyzer™

**2010**

- Started the development of alkaline water electrolyzer based on its chlor-alkali technologies.

**2020**

Aqualyzer™

- Installed 10MW-scale alkaline water electrolyzer into FH2R* and started the operation.
- Joined ALIGN-CCUS project as an electrolyzer supplier.

* FH2R is a project commissioned by the New Energy and Indsutrial Technology Development Organization (NEDO).

# 10MW alkaline water electrolyzer system

(under development)

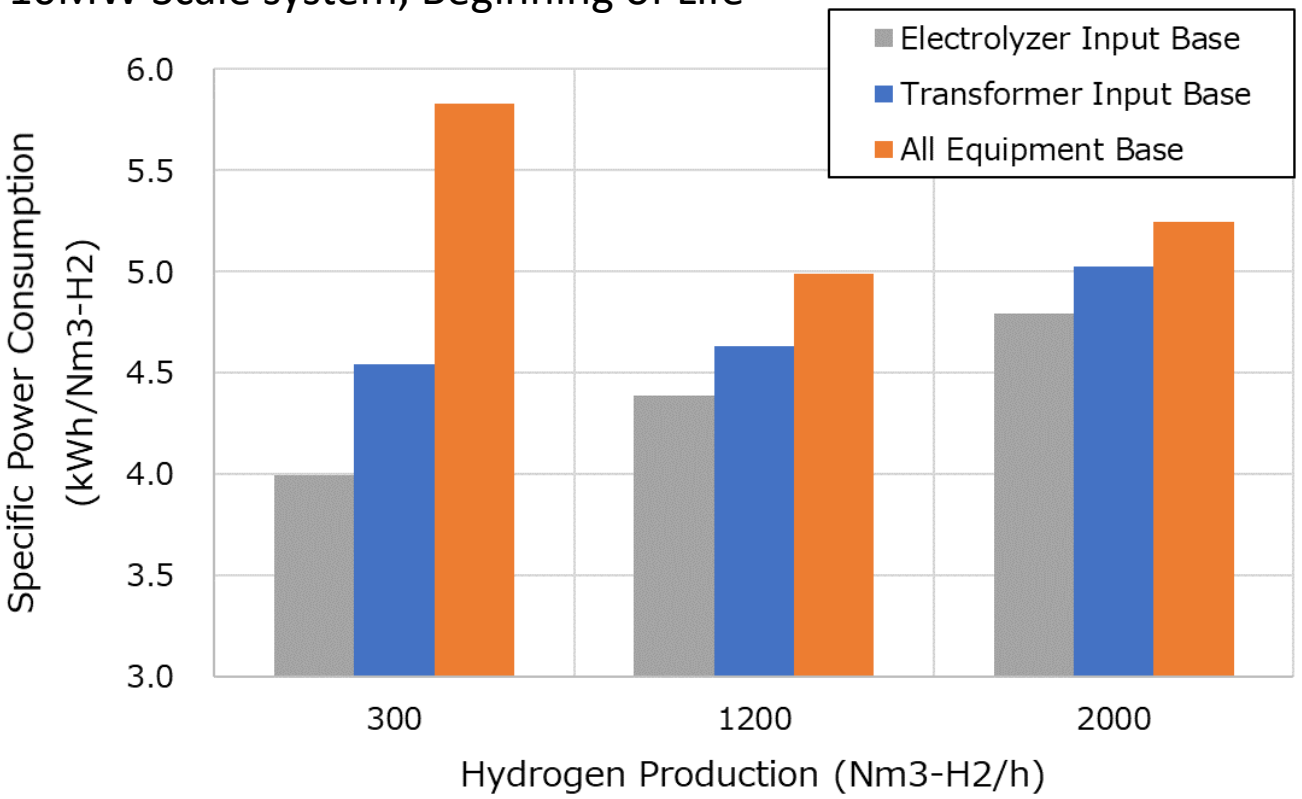
Aqualyzer™

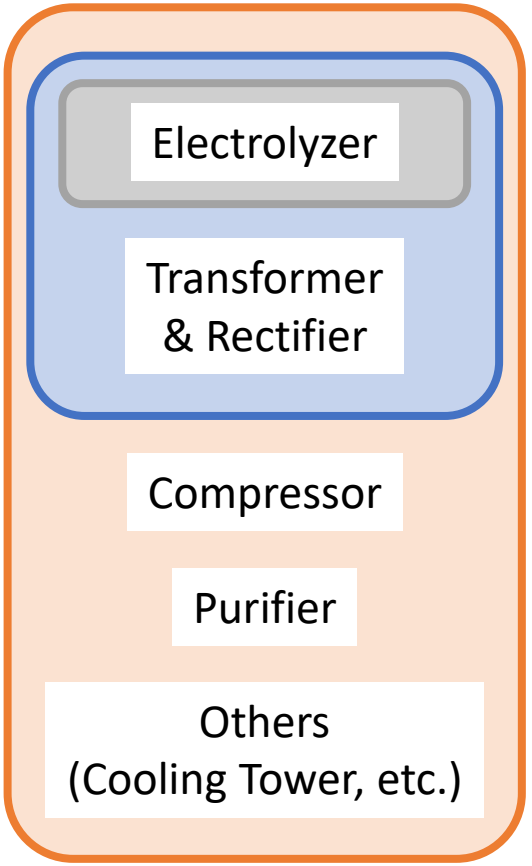
| | |
|---|---|
| Hydrogen Production | 300 - 2,000 $Nm^3H_2$/hr (27 - 180 kg $H_2$/hr) |
| DC Power Consumption | max. 10MW |
| Power Variation Rate | ±0.5MW / sec |
| Area per cell | 2.7 $m^2$ |
| Number of cells (per unit) | 170 |
| $H_2$ Purity | >99.97% (after purifier, dry basis) |

- Aqualyzer is under development, but the basic specifications have already been confirmed.
- Aqualyzer is designed to accept fluctuated power input and can be scaled up by multiplying 10MW base units. We plan to launch Aqualyzer by 2025.

# Power consumption of Aqualyzer

10MW Scale system, Beginning of Life




- In general, the specific power consumption of electrolyzer increases with the hydrogen production.
- The inversion trend in all equipment base is mainly caused by fixed power consumption of the hydrogen compressor.

# Fukushima Hydrogen Energy Research Field (FH2R)

NEDO

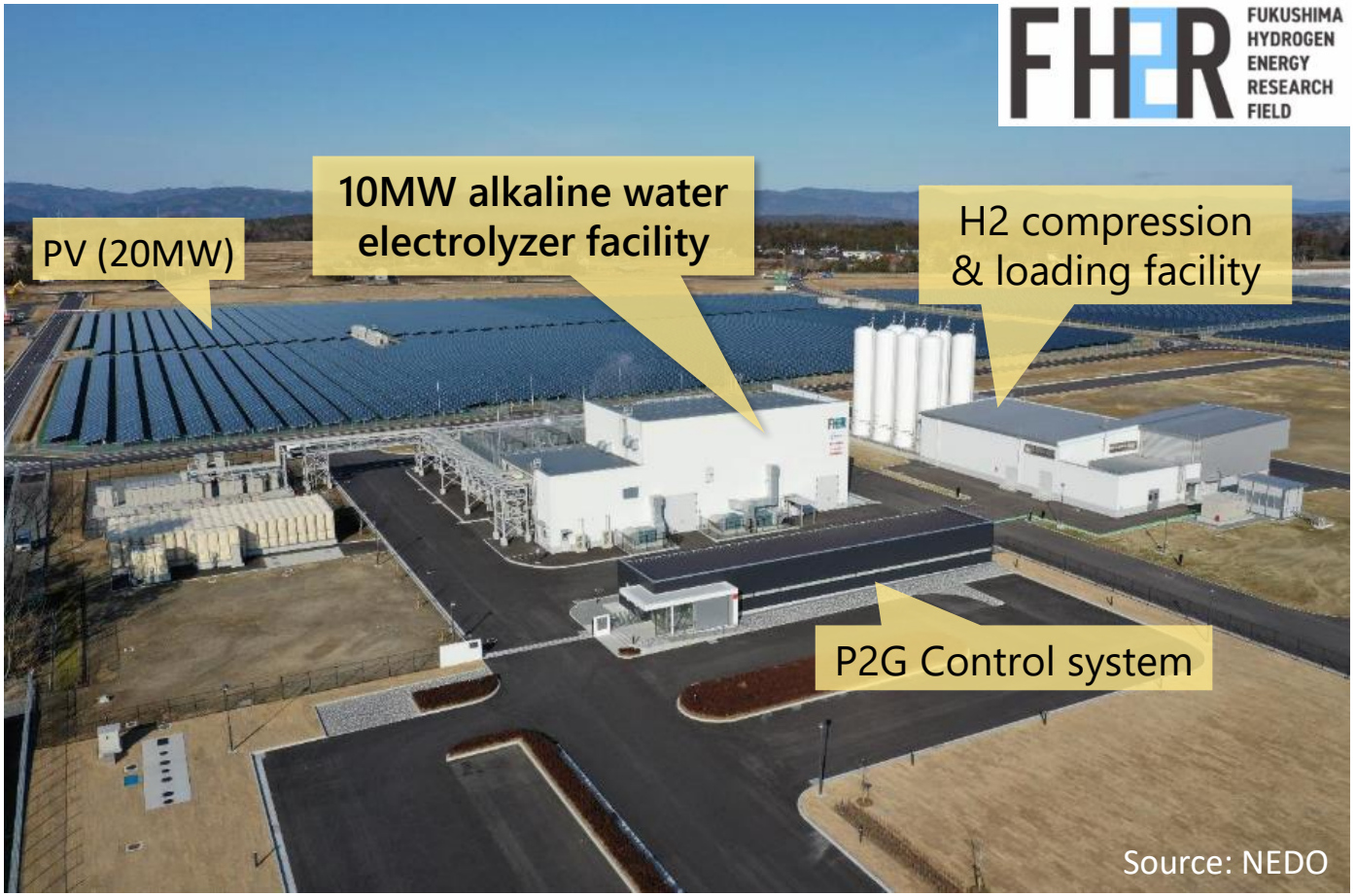
TOSHIBA

Tohoku Electric Power Co., Inc.

Tohoku Electric Power Network Co., Inc.

Iwatani

AsahiKASEI

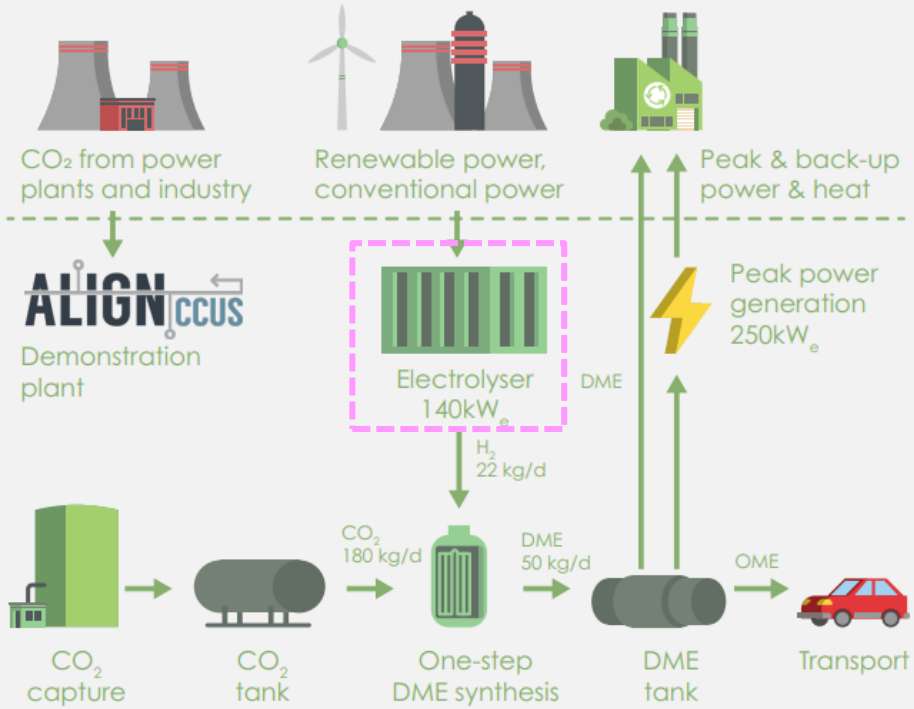

- FH2R is a 10MW-class hydrogen production plant with 20MW PV, started in Feb. 2020.
- It can supply 200 atm and FCV-class (ISO14687-2) hydrogen from fluctuated electricity input.

# Activities in Europe

## AN ENERGY REVOLUTION: SYNTHETIC FUELS FROM $CO_2$

### Making low-carbon fuel

Our first-of-a-kind project has made the synthetic fuel DME from $CO_2$ and hydrogen – produced using renewable energy – which could transform how we live and work.




### The Team

**RWE Power**
Operates $CO_2$ capture plant and demonstration plant 24/7

**Mitsubishi Power Europe**
DME synthesis and full-scale plant study

**Asahi Kasei**
Alkaline electrolyser for $H_2$ production

**RWTH Aachen University**
Adaptation of diesel engine for DME/OME use

**FEV Europe**
Retrofitting of engine for DME/OME use

**TNO**
Process optimisation & DME synthesis

**Forschungszentrum Jülich**
Technical and economic analysis, Life cycle analysis

**Bosch**
Fuel injector for DME/OME

- Asahi Kasei has joined ALIGN CCUS project as an electrolyzer supplier.
- The electrolyzer was installed at RWE plant in Niederaußem, Germany, and has been operated since Oct. 2020.

# Green chemical demonstration project

Partnership with JGC Holdings

- ✓ Accepted by NEDO Green Innovation Fund (FY2021-FY2030)
  [subsidy budget: up to approx. 500 million USD]
- ✓ Development of large alkaline water electrolysis system (100 MW scale)
- ✓ Demonstration of green chemical plant using green hydrogen and captured CO2
- ✓ Integrated control system for optimizing plant operation