The Role of "Power-to-Gas" in the coming Green Society and Asahi Kasei's Activity in Germany

- Brief introduction of us
- Role of Power-to-Gas
- Our Activities in Germany
- Summary

November 21th, 2017

Asahi Kasei Europe GmbH

Brief introduction of Asahi Kasei

AsahiKASEI

- A diversified chemical company with three business sector
- 33,000 employees over 15 countries, headed in Tokyo Japan
- Around ¥1,900 billion (€16B) net sales (2016)

Trade name
Asahi Kasei Corp.

President
Hideki Kobori

Head Office
Chiyoda, Tokyo

Paid-in capital
¥ 103.3 billion

Founding
1922

Employees*
33,720 ** As of March 31, 2017*

Fiscal 2016 results
Net sales ¥ 1,8830 billion (€15.8B)
Operating income
¥ 159.2 billion (€1.34B)

Asahi Kasei Corp. [holding company function]

Material
- Asahi Kasei Corp. [operating function]
- Asahi Kasei Microdevices Corp.

Homes
- Asahi Kasei Homes Corp.
- Asahi Kasei Construction Materials Corp.

Health Care
- Asahi Kasei Pharma Corp.
- Asahi Kasei Medical Co., Ltd.
- ZOLL Medical Corporation

Our Major Products

AsahiKASEI

- Our products range from basic chemical materials to electronic and healthcare components.
- We are a strong market leader in the world/region with these products.

● Material ● Homes ● Health Care ● Administrative & Other

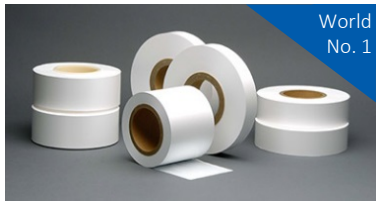
● Acrylonitrile

● Ion-Exchange Membrane

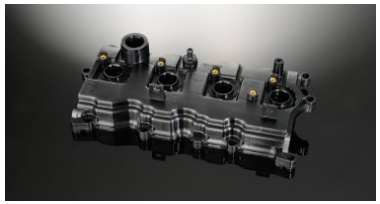
● Cupro fiber/fabric

● UVC-LEDs

● S-SBR (synthetic rubber)



● Hipore™ Celgard™
Lithium-ion battery separator

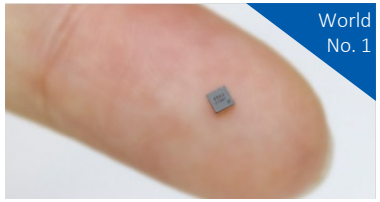


● Leona™ PA66 resin

● Hebel Haus™ unit homes

● Saran Wrap™
food wrapping film

● Planova™
virus removal filters



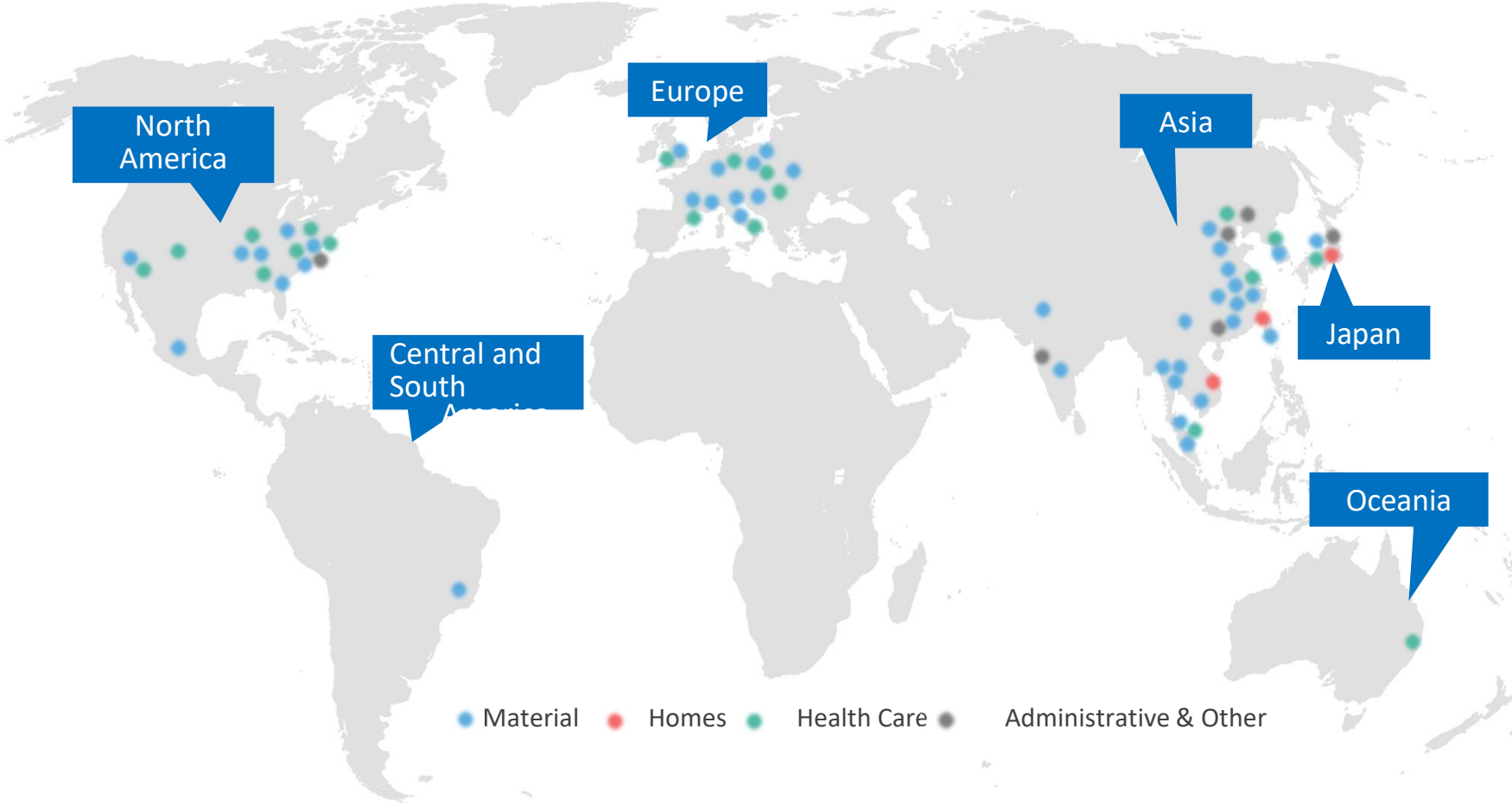
● Electronic compass

● LifeVest™
wearable defibrillator

Our Global network

AsahiKASEI

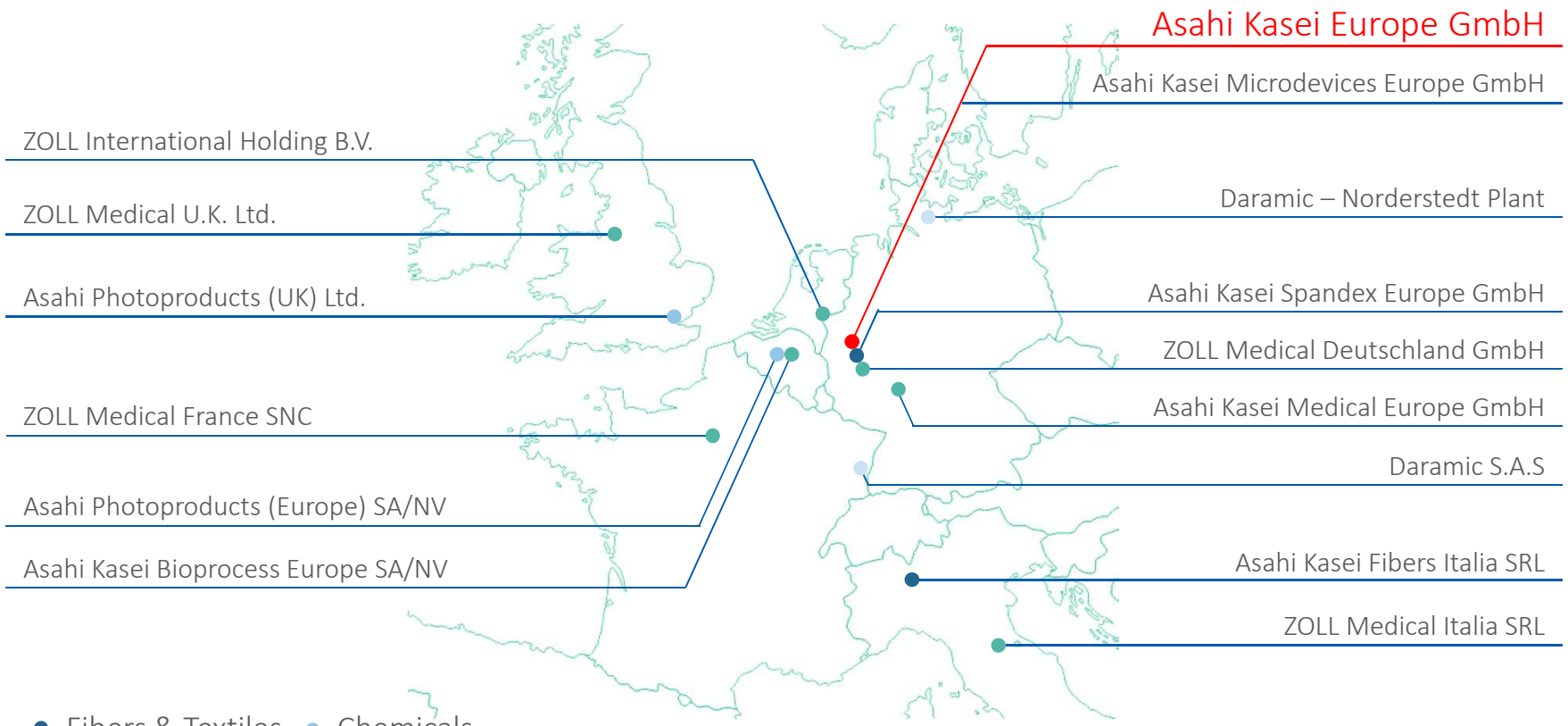
- More than 20 countries for manufacturing, sales, and R&D sites to meet a wide range of needs in the global market.



Operation in Germany

AsahiKASEI

- Asahi Kasei Europe GmbH was established in Düsseldorf, Germany as a European headquater on April 1st, 2016.
- Materials for Automotive and Chemical industries are the biggest business now. Environment related business is also the current focus-point.



Entities in Europe	15
Annual sales in Europe	700 million €
Employees	770

Historical relationship with Germany

AsahiKASEI

- We have a long history of collaboration with European, especially German, corporations.

● Material ● Homes ● Health Care ● Administrative & Other

1922 (Material)
Licensed Casale process technology for ammonia synthesis from Italy; Plant operation in Japan started in 1923

1962 (Homes)
Licensed autoclaved aerated concrete (AAC) technology from Hebel of Germany; Plant operation in Japan started in 1963

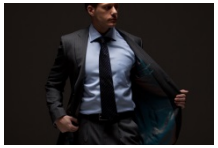
1988 (Health Care)
Started join business in Japan for MRI (magnetic resonance imaging) machines with Siemens of Germany (ended in 2010)

2005 (Administrative & Other)
Acquired spandex / elastane business from Lanxess of Germany

2016 (Administrative & Other)
Asahi Kasei Europe GmbH Established in Germany

European technology absorption

Business expansion with Europe



1928 (Material)
Licensed cupro fiber technology from J.P. Bemberg of Germany; Plant operation in Japan started in 1931

1974 (Health Care)
Started acrylic fiber plant in Ireland (closed in 1997)

1999 (Health Care)
Established joint venture in Japan for silicone with Wacker Chemie of Germany

WACKER

2011 (Administrative & Other)
Obtained exclusive sales right in Japan for Frosch products from Werner & Mertz of Germany

MARKE Frosch®

Why Europe? Energy Policy in Europe

AsahiKASEI

- EU has set a high target for renewables, having a lead over the rest of world.
- More ambitious targets are beeing discussed to be implemented (RED II).
- This is why we think Europe will be the place where new environmental business (incl. H_2) will appear.

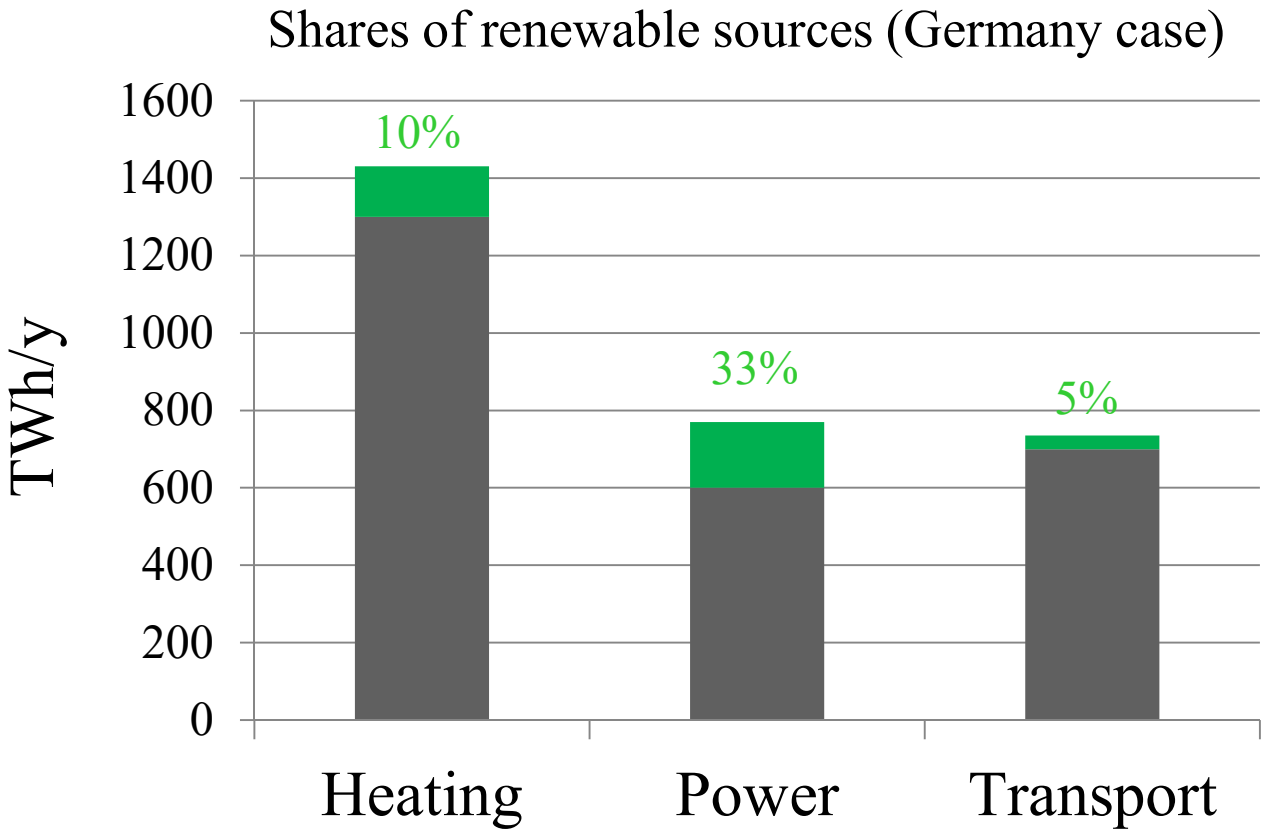
Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC (Text with EEA relevance)

(13) In the light of the positions taken by the European Parliament, the Council and the Commission, it is appropriate to establish mandatory national targets consistent with a 20 % share of energy from renewable sources and a 10 % share of energy from renewable sources in transport in Community energy consumption by 2020.

The challenge of Renewables

AsahiKASEI

- Renewable share of Power sector is increasing as expected, but those of Heat and Transport sector remain limited and should be increased.
- Curtailment of renewable power (caused by a demand/supply mismatch or a limmitation of grid capability) is also an issue.

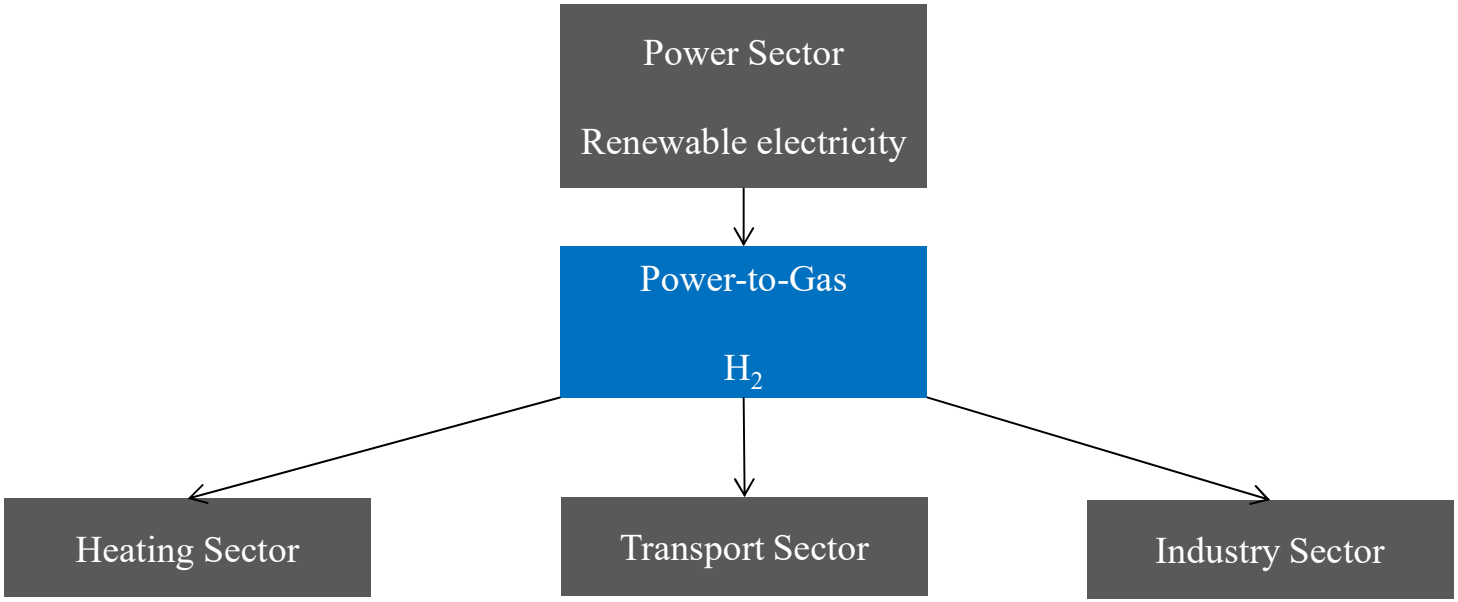


Source: RWE, BMU

Roll of Power-to-Gas

AsahiKASEI

- Power-to-Gas is an enabling technology which can increase the renewable share of Heating and Transport sectors by using the renewable power and can solve the curtailment issue at the same time.



- H_2 (for gas grid)
- CH_4 ($\leftarrow CO_2+H_2$)

- H_2 (FCV, refining gas)
- CH_3OH ($\leftarrow CO_2+H_2$)
- CH_4 ($\leftarrow CO_2+H_2$)

- H_2 (fort NH_3, reductant gas)

Our Electrolysis Technology

AsahiKASEI

- We are one of the largest supplier of Chlor-Alkali electrolyzer system, on which we will provide a technology for Power- to-Gas (water electrolysis : $2H_2O \rightarrow 2H_2+O_2$).

● Our customers around the globe

Since 1975, Asahi Kasei has supplied Chlor-Alkali Electrolyzer system all over the world and still continue to polish our system.

$$2NaCl + 2H_2O \rightarrow 2NaOH + Cl_2 + H_2$$

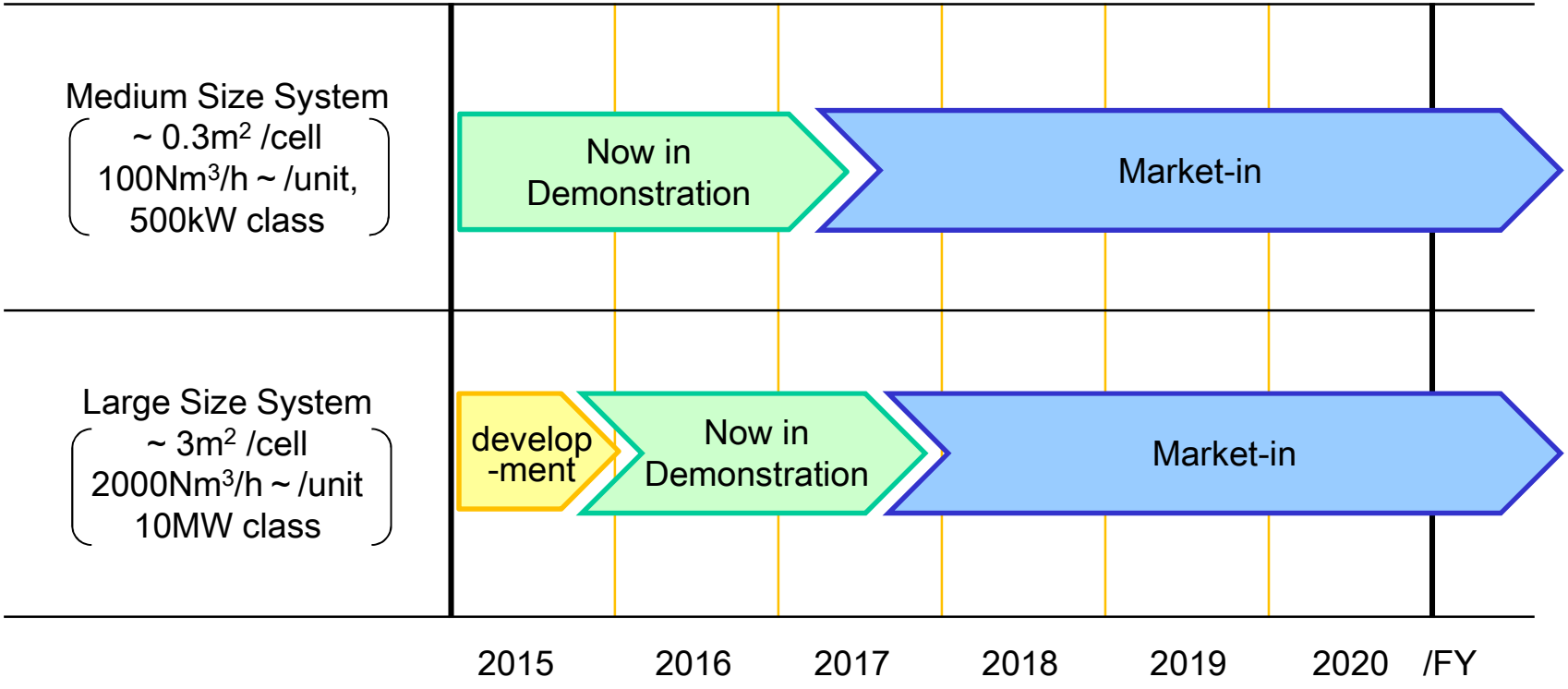
Total production capacity installed by us

- over 7.5billion Nm^3-H_2 /y (Global No.2)
- over 26 countries, 126 production sites

Our Water Electrolyser

AsahiKASEI

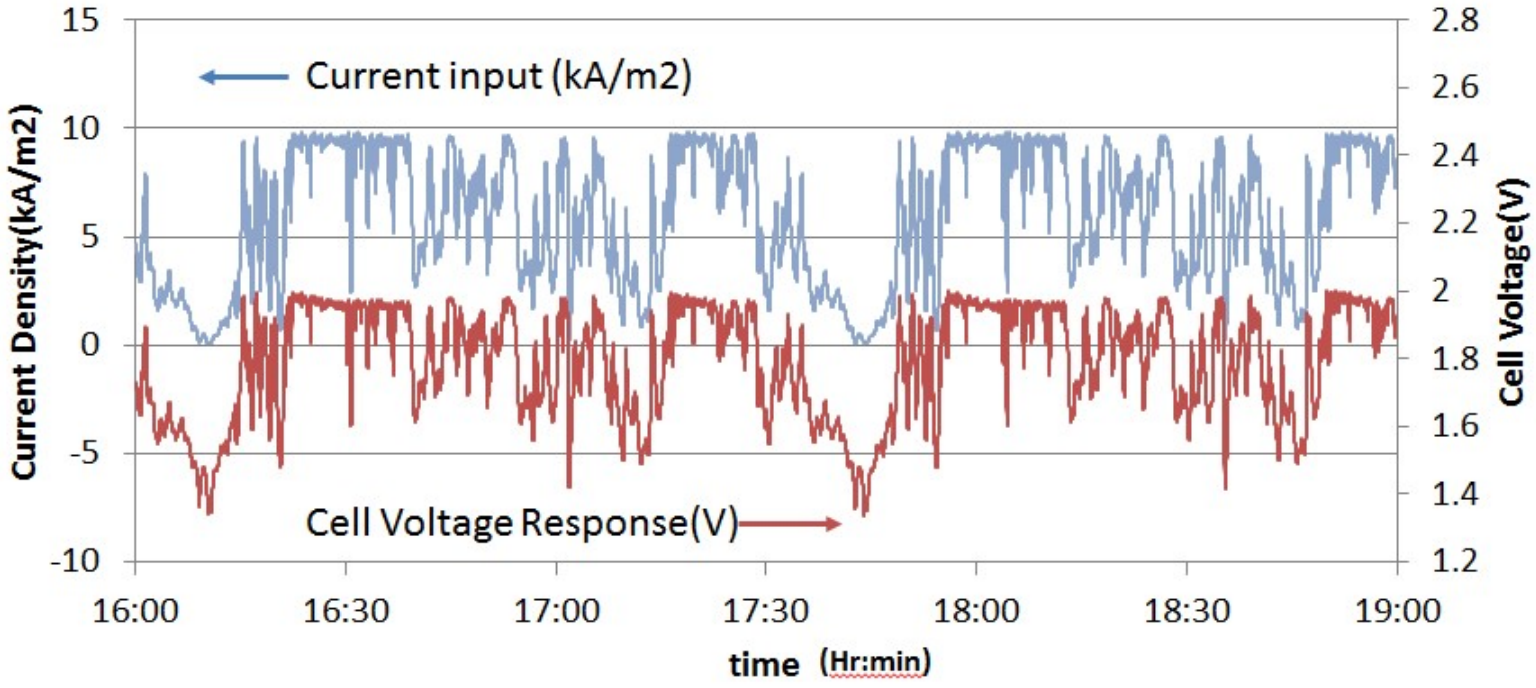
- Our water electrolyser has following distinctive features with two systems.
  1) Large-Scale (10MW as a single unit)
  2) Highly Efficient (Low power consumption)
  3) Adaptable to fluctuating input power



Our Achievements

AsahiKASEI

- Our electrolyzer responds well with simulated wind power inputs.

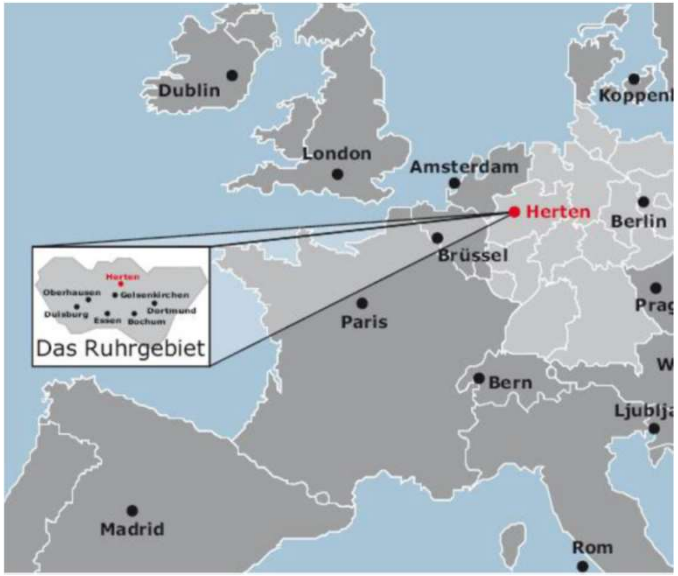


Input current data: 2MW Wind power generator (Stand-alone)
(Current density range: 0kA/m2 ⇔ 10kA/m2)

Our Demonstration in Germany

AsahiKASEI

- We will start a Power-to-Gas demonstration in Herten, NRW (Germany) from next year to show our technologies to European customers.



H2herten location
(50km from Düsseldorf)

Photo of H2herten Research Bulding

Our Demonstration in Germany

AsahiKASEI

- We have become a member of multi-national European CCUS project. (CCUS: Cabon Caputure,Utilization,Storage)
- Green Synthetic fuel (Methanol, Dimethylether, etc.) will be synthesized from CO_2 and H_2 which AK's electrolyser produces.

Large-scale energy storage and conversion

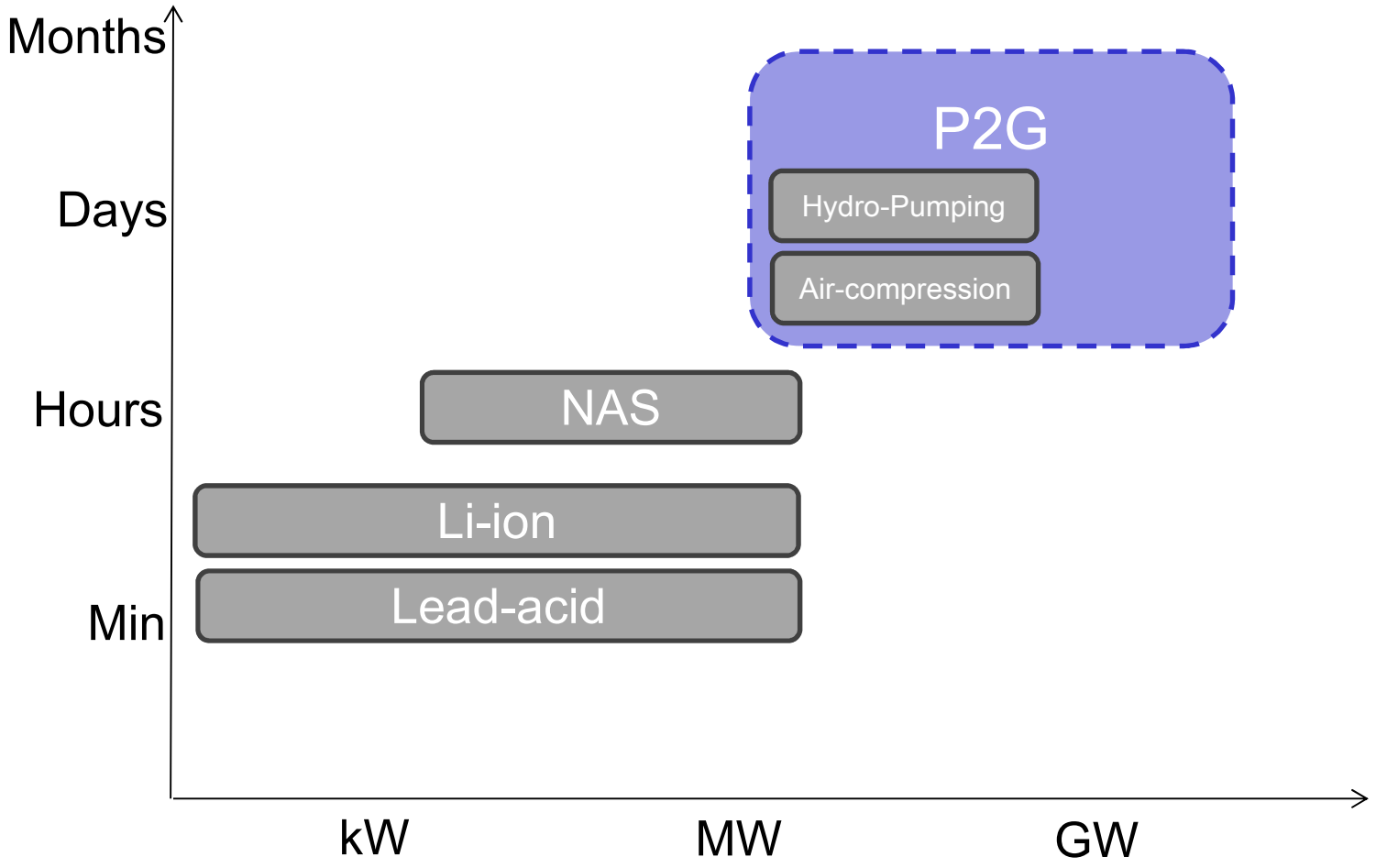
- CCU demonstrator construction
- Engine adaption
- Operation and testing
- CCU integration and scale-up

$CO_2 + H_2 \rightarrow CH_3OH$, DME

Comparison with other storage systems

AsahiKASEI

- P2G is expected to be a 1) long-time and 2) large scale storage systems. Large scale electrolyser is needed for large scale storage.



Summary

AsahiKASEI

- Power-to-Gas is an enabling technology which can increase the renewable share of Heating and Transport sectors by using the renewable power and can solve the curtailment issue of the renewable power at the same time.
- We are thinking that we would like to contribute to increase the renewable share in the energy consumption and would like to work for that with our electrolyser technology.
- We have established both a regional headquarter & and a R&D center in Germany and are ready for working with German partners. We are looking forward to such collaborations in Germany.
- Finally, we would like to thank GTAI (Germany Trade & Invest) for their continuous support for us.

Thank you so much for your attention.

AsahiKASEI