

# CONFERENCE SUR LES TECHNOLOGIES POWER-TO-X EN TUNISIE

semi-virtual conference/webinar

## Sustainable eFuels

Contribution to Energy System  
Transformation

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29 Sep 2020

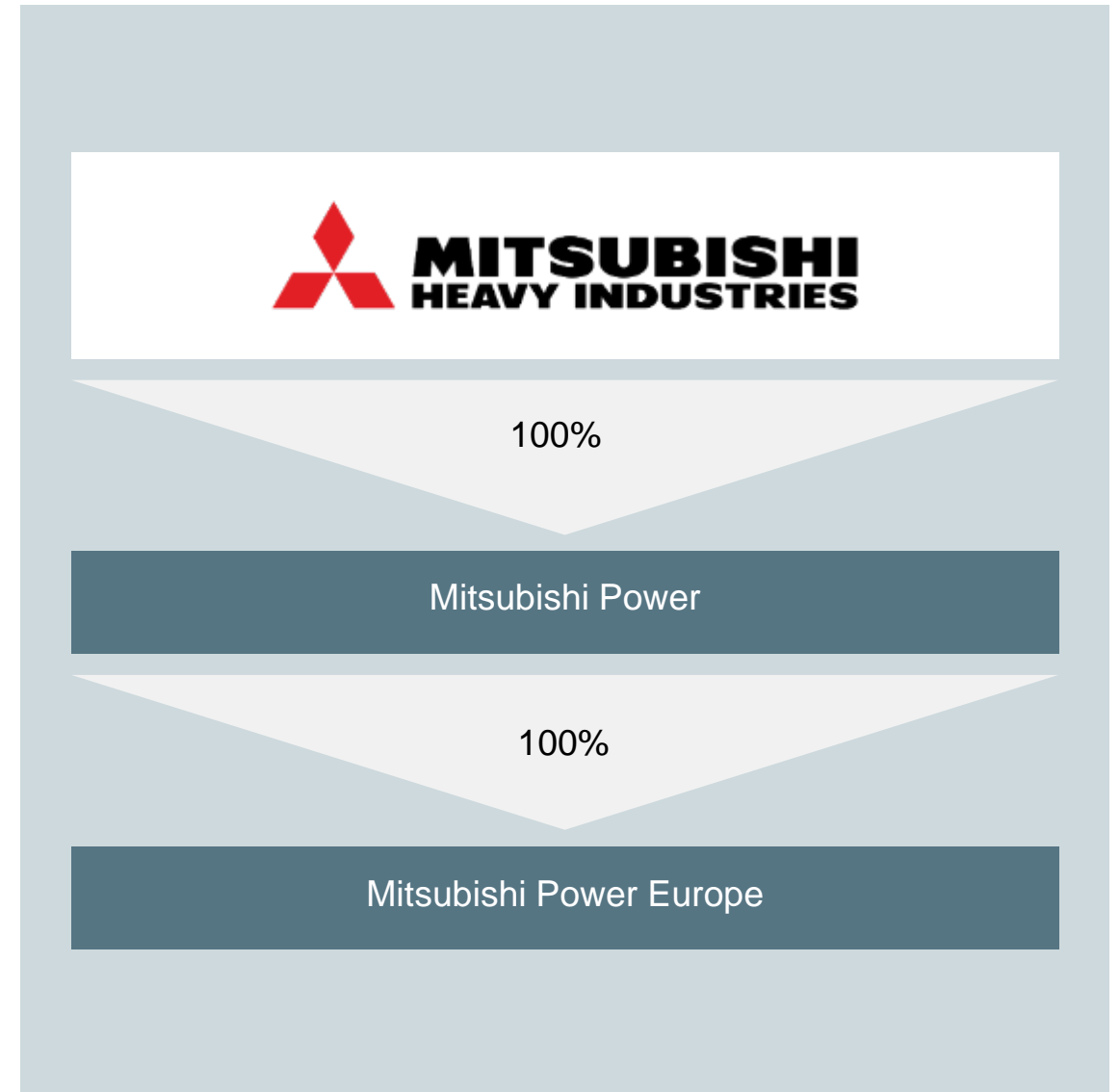
Public

**Mitsubishi Power Europe GmbH**



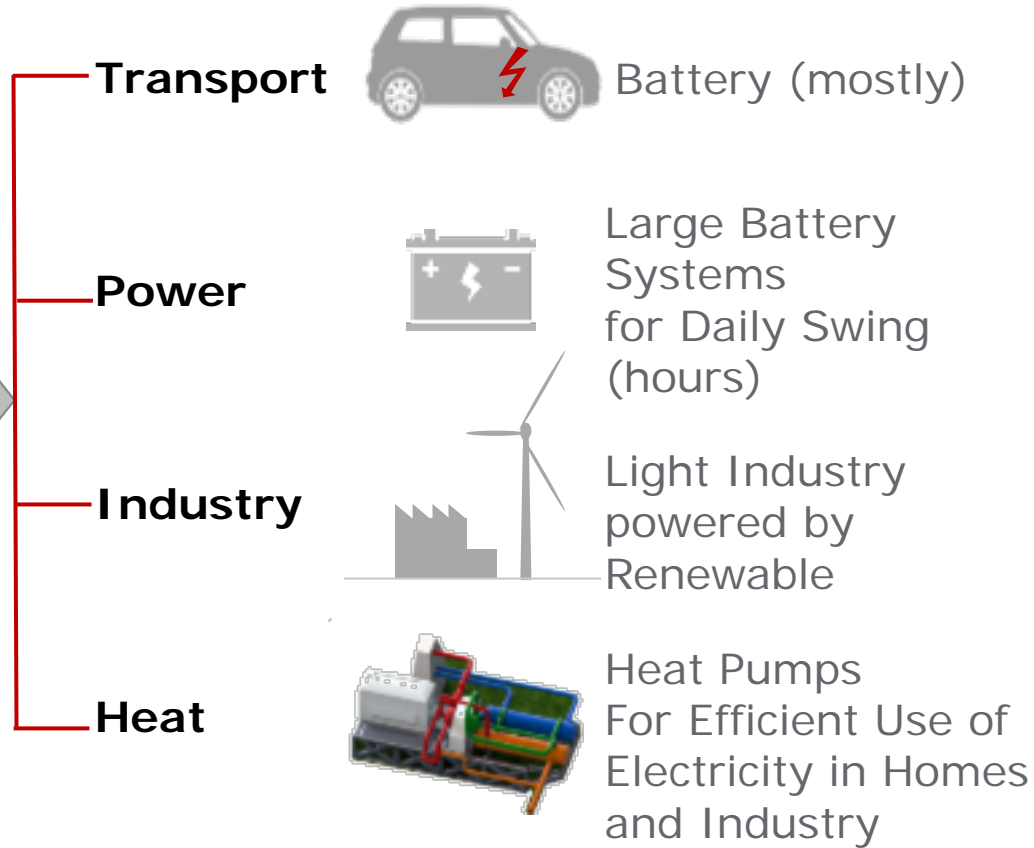
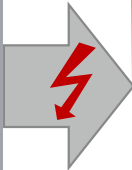
# Mitsubishi Power Overview

- HQ Location: Yokohama, Japan
- Number of group companies: 69 companies
- Total workforce: approx. 18,300
- Major operations / businesses:
  - Thermal Power Generation Systems
  - Geothermal Power Generation Systems
  - Environmental Systems
  - Fuel Cells
- Capital: ¥100b / \$892m *(USD/JPY: 112)*



**EASY:**  
to decarbonize by electrification

**RES  
electricity**



## COMPLEX

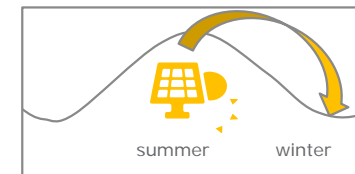
How to serve all other needs without fuels?



Trains, heavy vehicles, ships, planes?



Reserve Power, Industry, grid support?

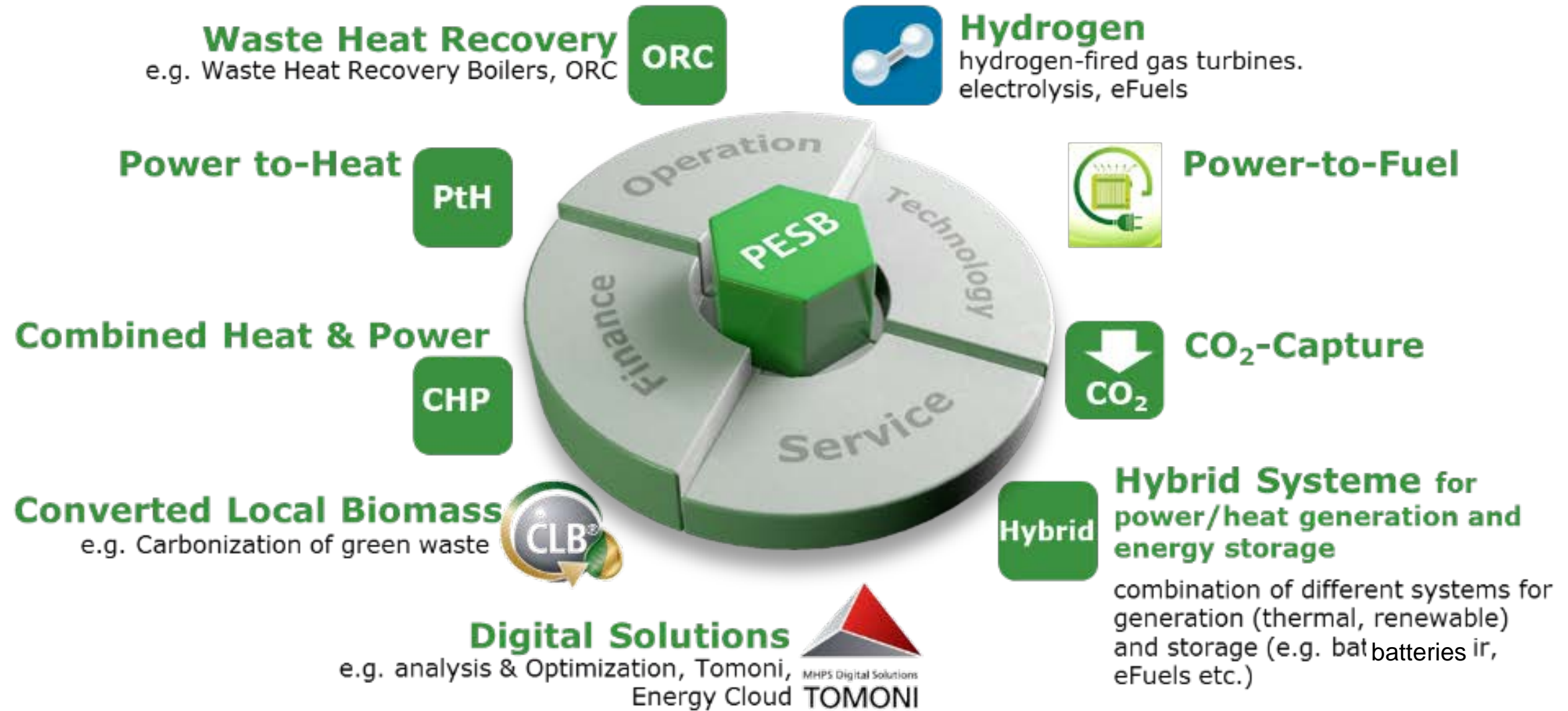


Seasonal energy storage,  
heat supply in winter?

The MHI Group has a vast range of technologies and end-to-end solutions for the hydrogen supply chain







Climate Targets in the electricity sector of the Netherland:

55-75% lower CO<sub>2</sub> emissions until 2030 than in 1990

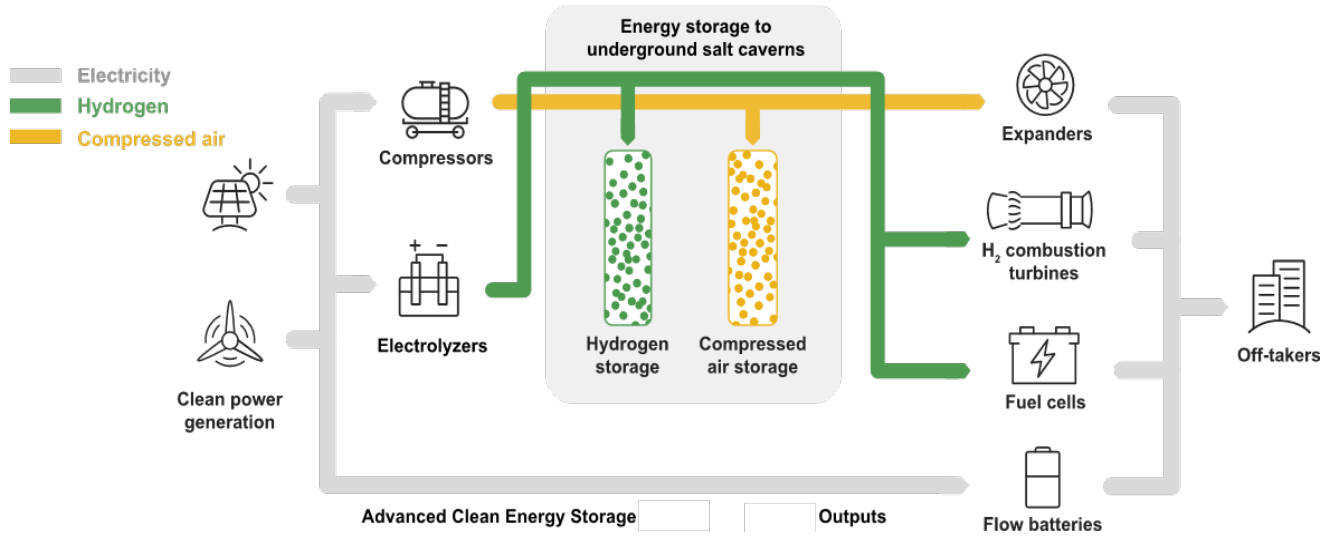
1,311 MW Natural Gas fired Power Generation, 3 units Eemshaven/Groningen, The Netherland



- **H2M Project** (NUON/VATTENFALL, EQUINOR & GASUNIE): Hydrogen Infrastructure to be established in the North of the Netherlands
- 1 of 3 units to **convert for 100% hydrogen** by 2023  
(blue hydrogen from Natural Gas processed by SMR/CCS)
- **Step 1: blue hydrogen** reduces CO<sub>2</sub> emissions significantly, acting as **market enabler for green hydrogen**
- **Step 2:** blue hydrogen to be replaced by **green hydrogen** stepwise

Mitsubishi Power proven H<sub>2</sub>-firing technology since 1970s applicable to latest J/JAC gas turbines:

3.5 million operational hours on 29 different sites



## Advanced Clean Energy Storage (ACES)

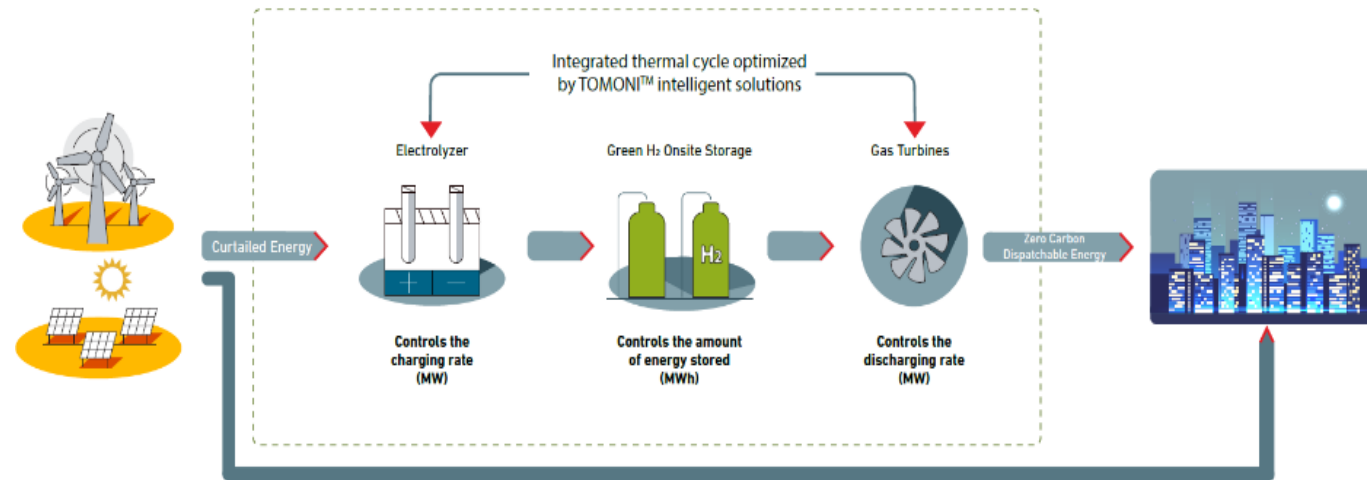
- **hydrogen infrastructure** to be established in Utah (USA)
- **Power-to-Hydrogen-to-Power:** commercial large-scale green hydrogen generation, storage and reconversion to electricity
- **H<sub>2</sub> storage in up 70 salt dome caverns** - storage capacity per cavern: up to 100 GWh electricity

- retrofit of Intermountain Power Plant **from coal to natural gas/hydrogen followed by 100% hydrogen** → 840 MW power supply
- optimized by **HYDAPTIVE™ Standard Flexibility Package**

## Further Hydrogen Retrofit Projects

- Danskammer Energy: **600 MW** in New York state (USA)
- EmberClear: **1,084 MW** in Ohio state (USA)

## HYDAPTIVE™ STANDARD FLEXIBILITY PACKAGE



The Hydaptive™ package accelerates the path toward 100% carbon-free power generation

- › Technology adapts as the grid needs larger amounts of energy storage
- › Standard packages reduce the cost and complexity of decarbonization
- › Integrated technology adds flexibility to existing dispatchable power generation

# Electrification always the best Solution?

## indicative weights of batteries



transport capacity: 40 t  
driving range: 3,000 km



dead weight tonnage: 52,500 t  
container capacity: 5,000



starting weight: 233 t  
passengers: 310  
flight range: 10,500 km



impact on tourism in  
countries like Tunisia

**long-distance with low carbon/green liquid fuels at high energy density required**

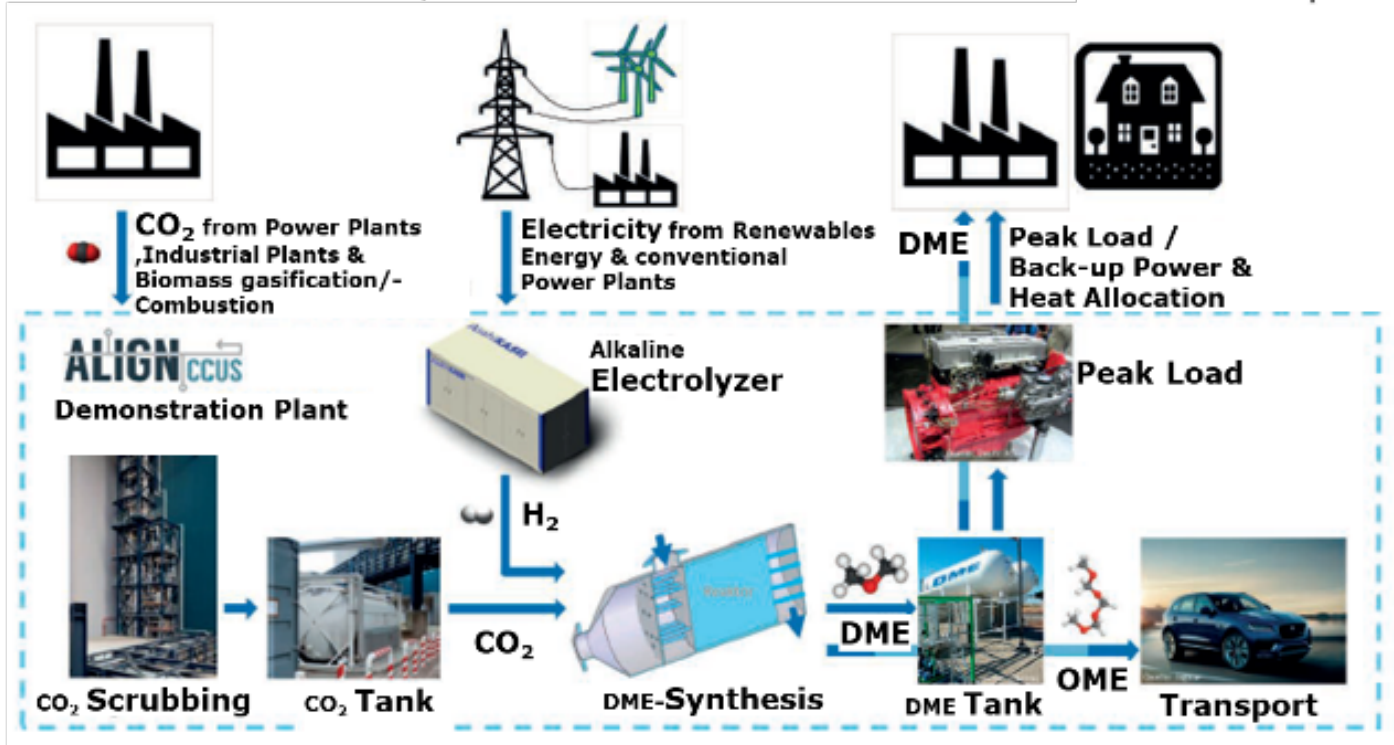


# Power-to-Fuel: From CO<sub>2</sub> & H<sub>2</sub> to Low Carbon Fuel - Dimethylether

Demonstration Site at RWE Niederaussem (Germany)



- Accelerating Low Carbon Industrial Growth through – Carbon Capture Utilization Storage
- EU funded RD project Cofund ACT 691712 – Theme: Chain Integration
- 34 partners from 5 EU countries



[www.ALIGNCCUS.eu](http://www.ALIGNCCUS.eu)

**Dimethylether:** substitute for diesel and LPG, precursor for jet fuel – a proven **long-term chemical energy storage**

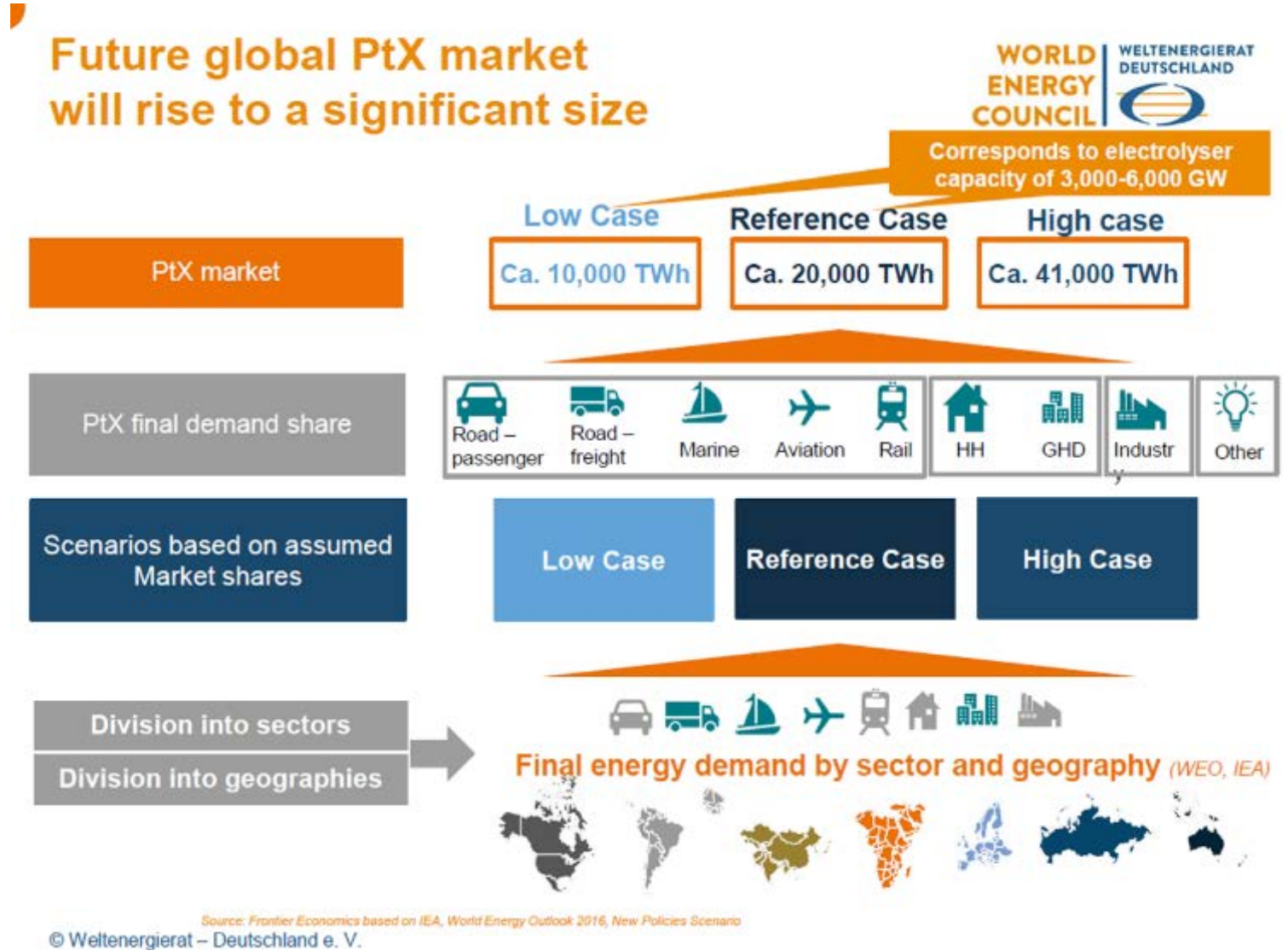
## Petra Nova Project CCS Facility Layout



- **World's largest carbon capture** facility, installed in the USA
- **commercial large-scale operation**
- up to **4,776 t CO<sub>2</sub>/d**
- connected to unit 8 (240 MW<sub>el</sub>) of power plant WA Parish (total 654 MW<sub>el</sub>)
- amine-based absorption & desorption using **KM CDR Process<sup>®</sup>**
- CO<sub>2</sub> used for enhanced oil recovery (EOR) at West Ranch Oil Field, 82 miles away



- high global primary energy demand
- electricity consumption increasing
- high demand for renewable energy sources for decarbonisation targets
- global energy network essential: energy partnerships
- long-term energy storage essential due to high volatility of renewable energies (PV, wind)
- global distribution of renewable energy: eFuels as network option
- **opportunity for Tunisia as renewable energy hub**







**MOVE THE WORLD FORWARD**

**MITSUBISHI  
HEAVY  
INDUSTRIES  
GROUP**