

# Construction of a 1 GW hydrogen production plant



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3<sup>rd</sup> Hydrogen & P2X conference, Copenhagen

# The speakers

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Bright ideas. Sustainable change.



Der Wasserstoffkreislauf von heute



# Ramboll in brief

- Independent engineering, architecture and consultancy company
- 16,000 experts
- Present in 35 countries
- Particularly strong presence in the Nordics, the UK, North America, Continental Europe, Middle East and Asia Pacific
- EUR 1.8 billion revenue
- Owned by Rambøll Fonden – The Ramboll Foundation

# Markets



Buildings



Transport



Water



Architecture &  
Landscape



Environment &  
Health



Energy



Management  
Consulting

# How to make the Eco-System happen



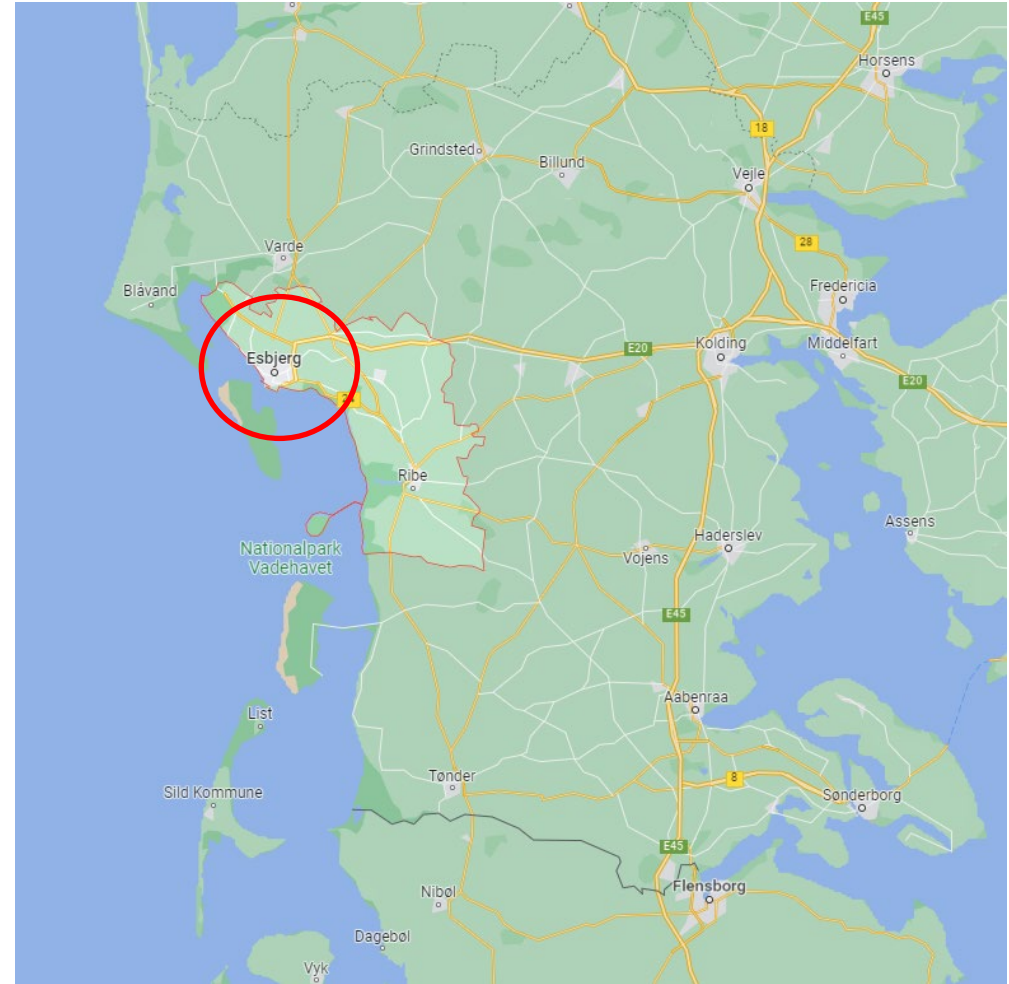
## H2 Energy mission

- We combine technical and commercial expertise in the field of hydrogen to build a giga PtX plant and to produce and sale large quantities of green hydrogen in a reliable, safe and efficient manner.
- We allow the usage of various carbon free applications by offering a unique hydrogen hub.



# The H2 Energy Esbjerg project

- Establish a 1 GW hydrogen production plant in Esbjerg, Denmark
- The plant will produce green hydrogen for light and heavy duty vehicles, e-HRS (hydrogen battery charger for electric vehicle) or directed to other industrial application such as ammonia, green fuel production or industry.



# Development of hydrogen in Denmark

## National budget 2022

- Additional 2 GW offshore wind  
*Danish government, December 2021*

## The Esbjerg Declaration

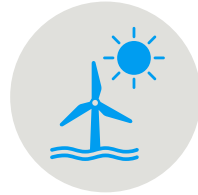
- 150 GW offshore wind in the north sea  
*State of green May 2022*

## Lup22

- Identification of needed upgrades in the danish power transmission system  
*Energinet May 2022*

## Danish PtX strategy 2022

- Goal of 4-6 GW installed electrolyser capacity by 2030
- 1.25 bill DKK support to hydrogen production
- Use of salt caverns for hydrogen storage  
*Hydrogen Hub Denmark*



## Denmark can do more II

- Harvest the full offshore wind potential
- 1-4 GW extra before 2030
- Increase production from solar and onshore wind by factor 4 before 2030  
*Danish government, April 2022*

## Upgrade of 100 transformer stations

- Ramboll modernise the first 3 stations  
*Ramboll May 2021*
- Ramboll to upgrade 3 more stations  
*Ramboll May 2022*

- More than 6 GW in known PTX projects  
*Invest in Denmark 2022*

- Phillip 66 and H2Energy to establish H2 infrastructure in Denmark, Germany and Austria.  
*Ritzau 2022*

- H2Energy plan to have 1600 hydrogen trucks on the roads  
*H2 Energy*

## Requirements

- Timelines for PtX and renewable projects must be aligned
- Power infrastructure to support development of PtX
- Fast authority handling required to achieve target
- Pipeline needed for export of hydrogen from Denmark
- Incentives for transport sector to switch from fossil fuels to hydrogen should be in place

*Our key objective:*  
**Plan, build and operate  
gigawatt-scale renewable H2 ecosystem**



**H2-Truck-Fleet**

- Buying 10'000 H2 trucks and applying 'Pay-per-use' Model
- Securing demand for gigawatt plant

**Building 100 hydrogen refueling stations**

- Dual use: commercial vehicles (35MPa) and passenger cars (70MPa)
- New sites vs. current petrol operators



**Renewable Energy**

**H2-Production**

- 1'000 MW by 2023
- Direct grid connection
- Supporting grid stability

**H2-Logistics**

- Container system
- H2 pipelines (existing and new)
- Other storage solutions

# Strong European Position with Strong Partners

## Fully Green Hydrogen Value Chain

### Upstream hydrogen production

Gigawatt Green  
Hydrogen facility in  
Esbjerg with local  
partners

### Midstream hydrogen supply chain & storage

H2 Energy and  
Pipeline Owners  
(EVIDA, Energinet,  
etc)

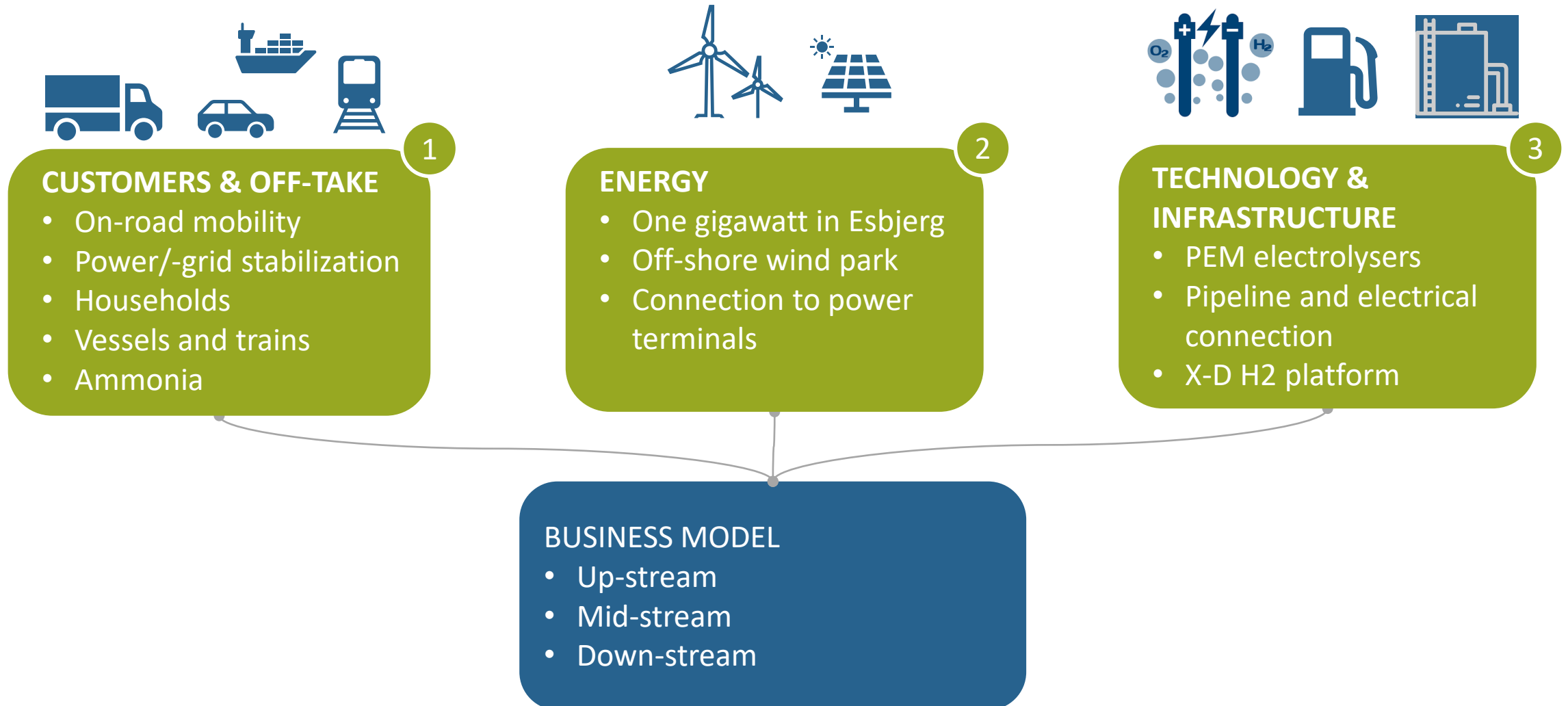
### Downstream hydrogen refueling

50/50 Joint  
Venture H2 Energy  
and Philipps 66



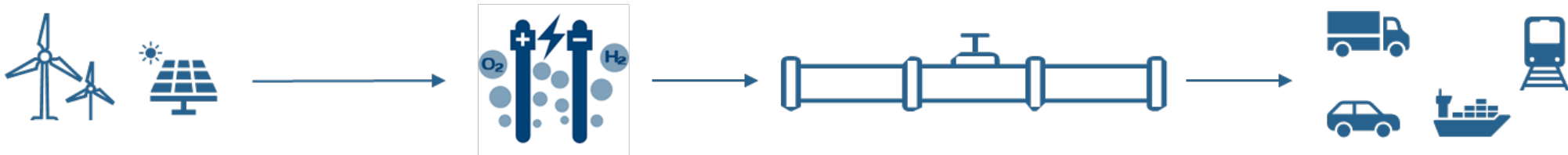
# Denmark H2 Ecosystem - Overview

## Project description



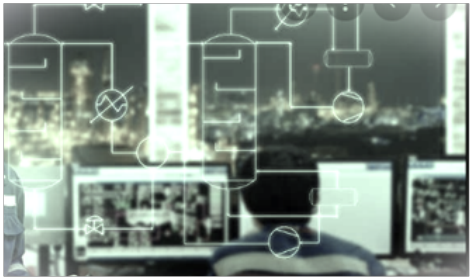
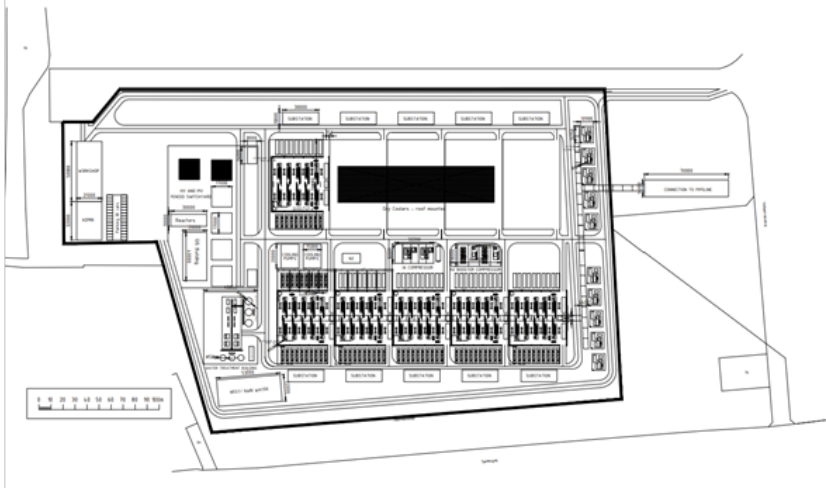
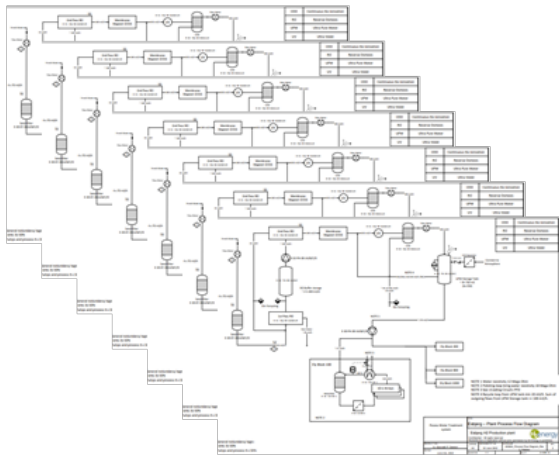
# Hydrogen production plant

## 1GW production site in Esbjerg - Timeline



Today      Start construction 1.4.2023      Frist H2 produced 1.4.2025      Fully operational End 2025

Project Planning		Project Delivery			Hand-over and operate
Project Concept and Design	Basic Engineering, Contract Award LLI, EIA	Detailed Engineering, Procurement	Construction	Commissioning into Operation	



# Insights from Switzerland regarding HRS

## Hydrogen Refueling Station in Rothenburg, Lucerne, Switzerland



Hydrogen dispenser

Middle pressure storage

Container Vernconex

Compressor, high pressure storage,  
cooler

# Thank you