

OFFSHORE WIND AND HYDROGEN HUBS

Session 10: Offshore Wind Developments,
29 October 2020

Peter Markussen, Energinet, Danish Electricity System Operator

ENERGINET

THE ENERGY BACKBONE

We operate and develop the transmission grids and gas pipelines in Denmark

ENSURE BALANCE

We have the day-to-day and long-term responsibility for the overall electricity and gas system in Denmark

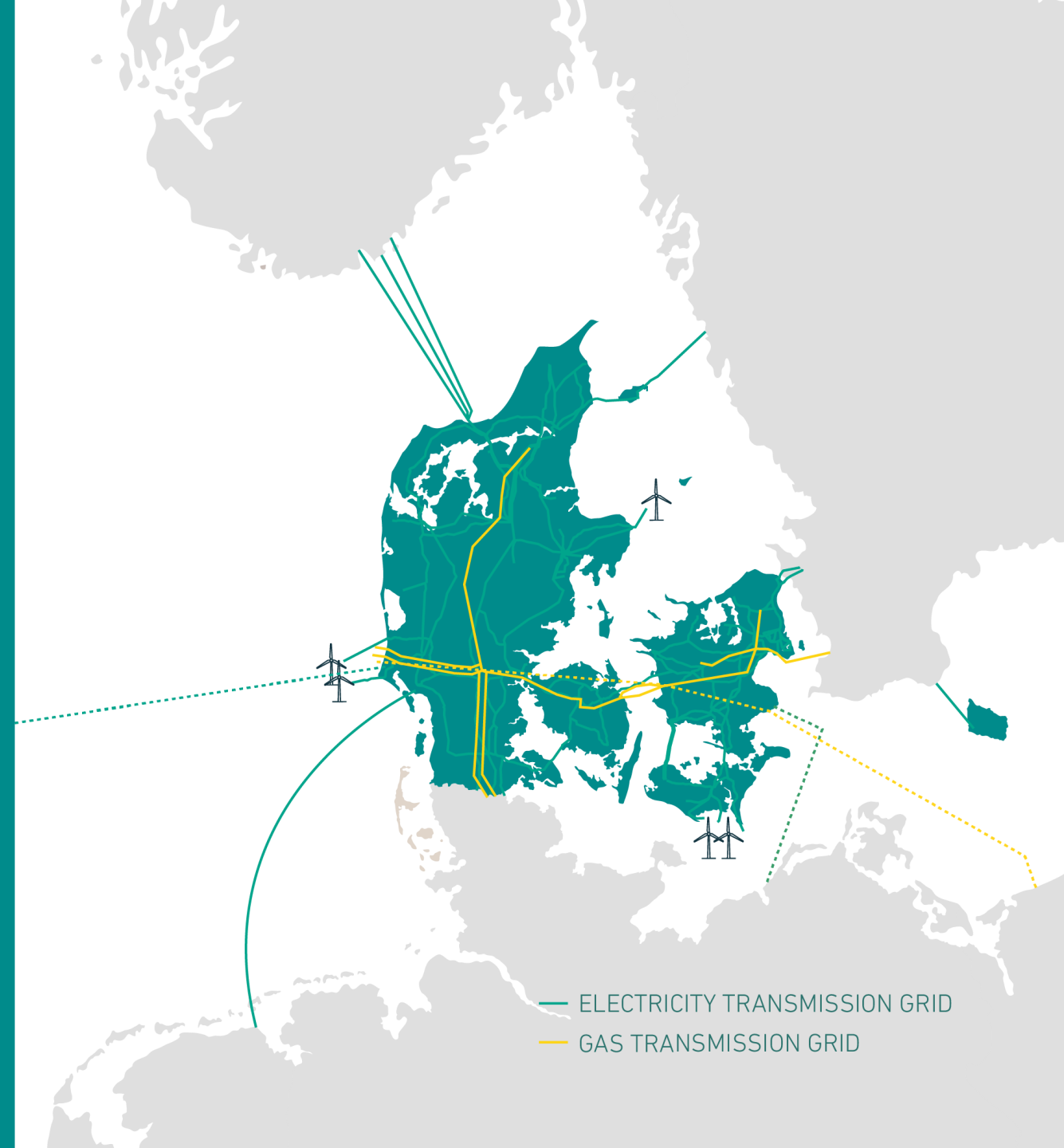
WORKING FOR THE SOCIETY

We are owned by the Danish Ministry of Climate, Energy and Utilities



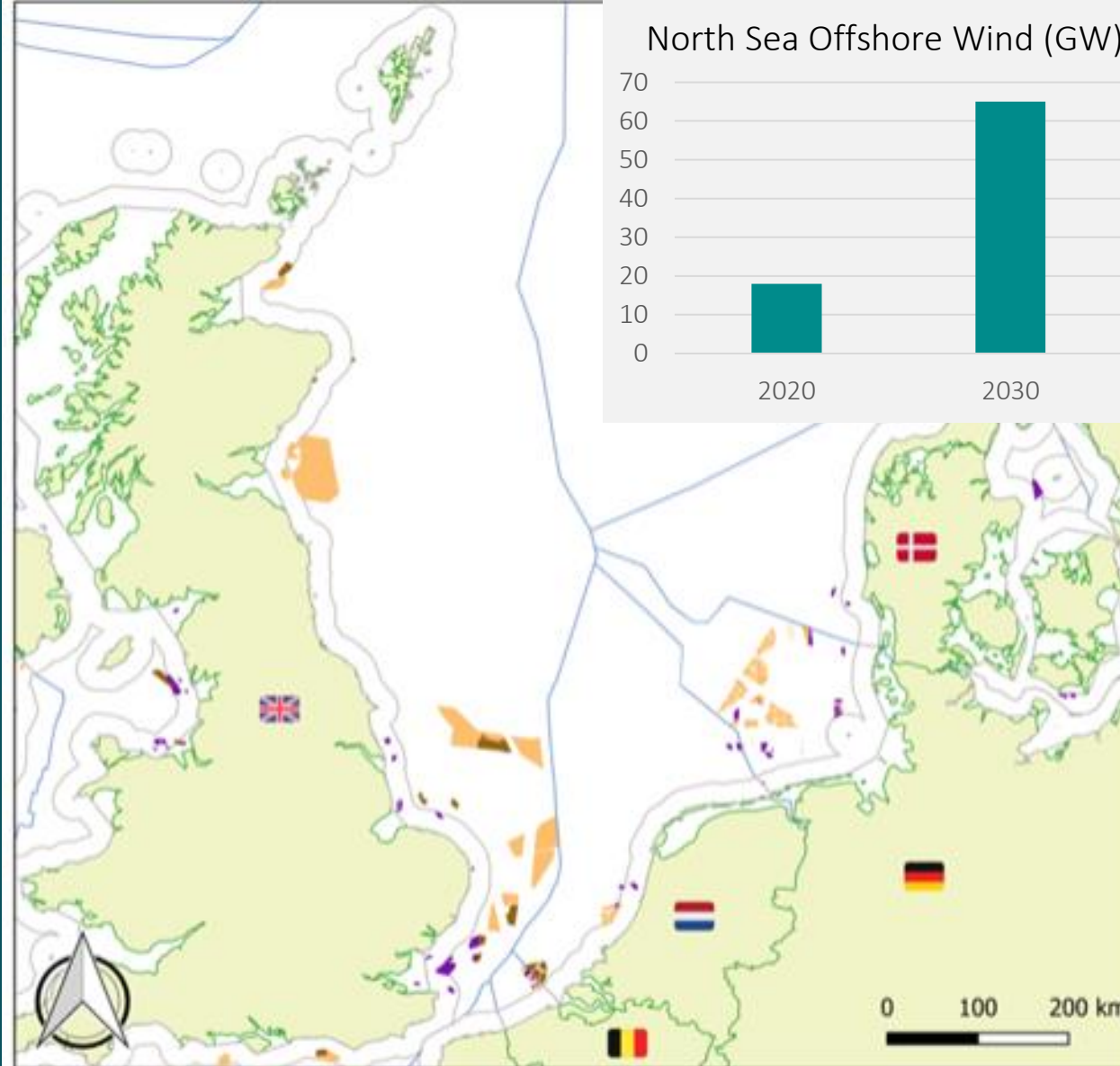
VISION

GREEN ENERGY FOR A
BETTER WORLD



AMBITIOUS OFFSHORE DEVELOPMENT IN THE NORTH SEA

- **GEOGRAPHY**
 - distance between production and consumption
- **SIMULTANITY**
 - production and consumption
- **PREDICTABILITY**
 - uncertainty and complexity
- **ACCELERATED DEVELOPMENT**
 - technologies, electricity use, digitilization



Legend

Offshore Wind Farms

- Operational
- In Planning
- Under Construction

Base Layers

- Countries
- 12 NM Zones
- EEZ Borders

Coordinate Reference System:
ETRS 89 - UTM 32N / EPSG 25832

Date:
29.09.2017

Producer:
COAST - University of Oldenburg

SOLUTIONS FOR AFFORDABLE INTEGRATION

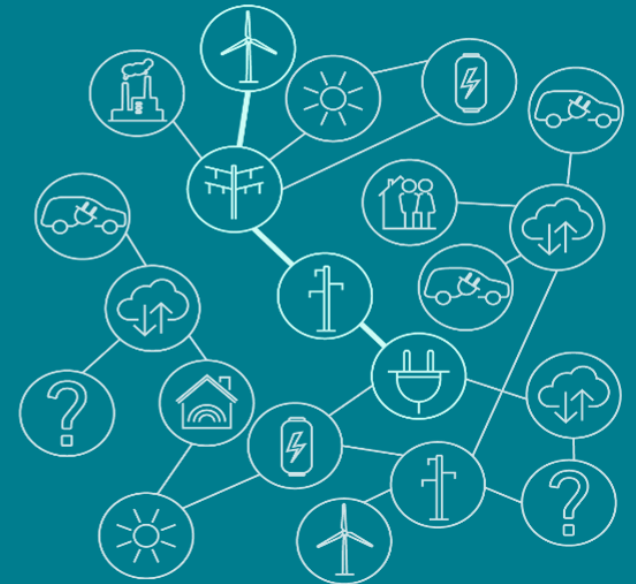
NORTH SEA WIND POWER HUB
- INTERNATIONAL COOPERATION



ENERGY ISLAND
- LARGE SCALE SOLUTIONS



SECTOR COUPLING
- INCREASING VALUE FROM ELECTRIFICATION



ENERGINET

ENERGINET EXPERIENCE WITH OFFSHORE WIND TOPOLOGIES

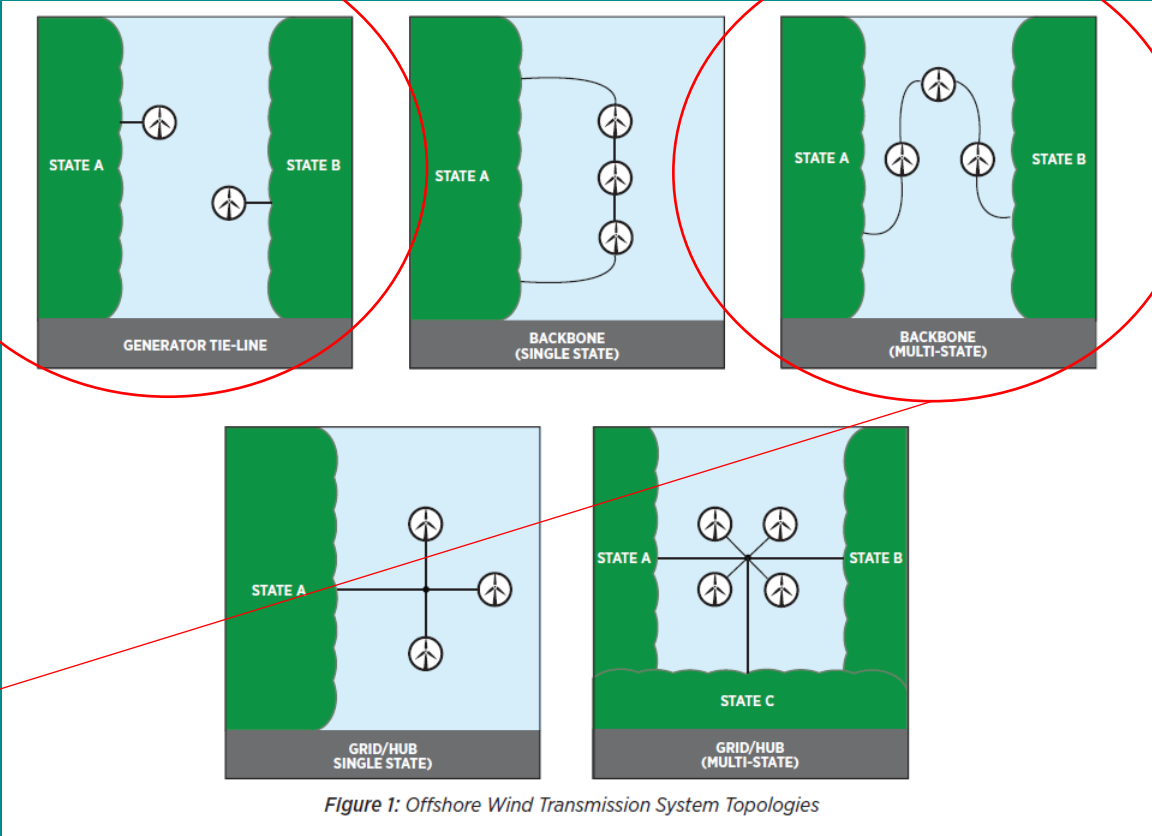
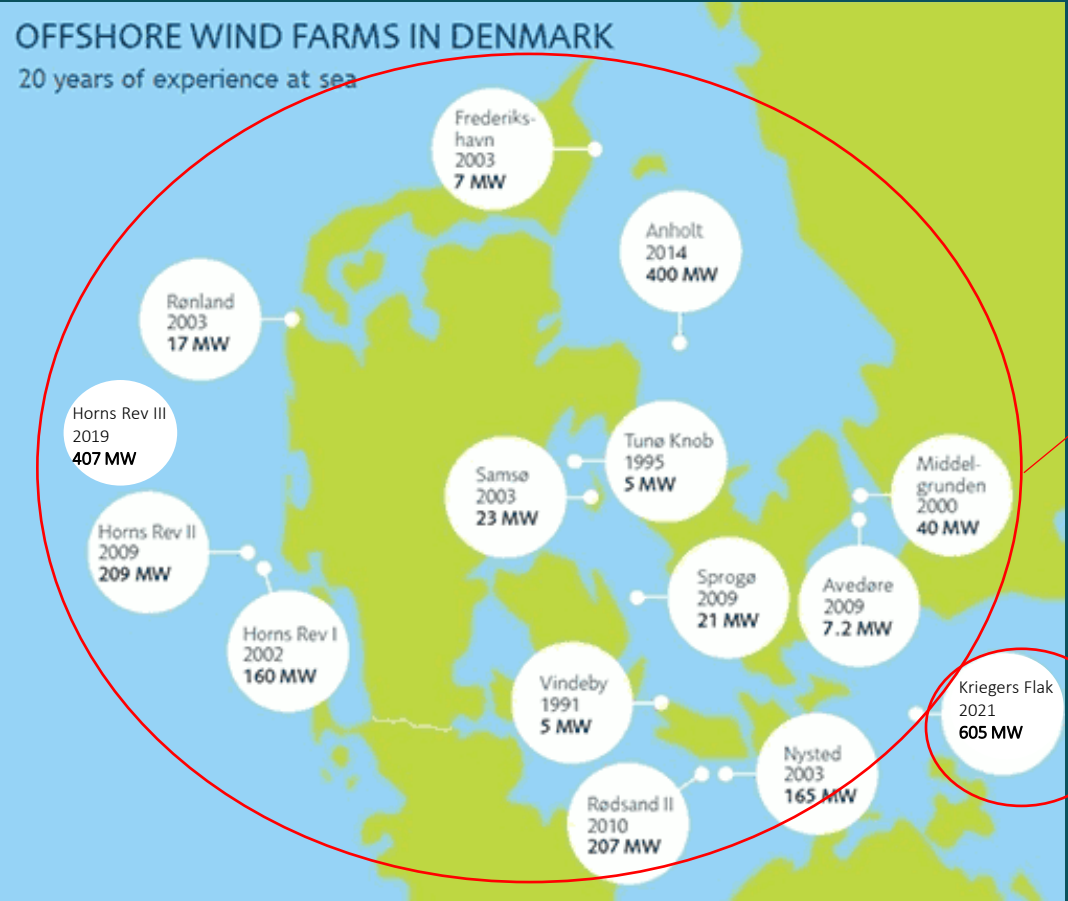
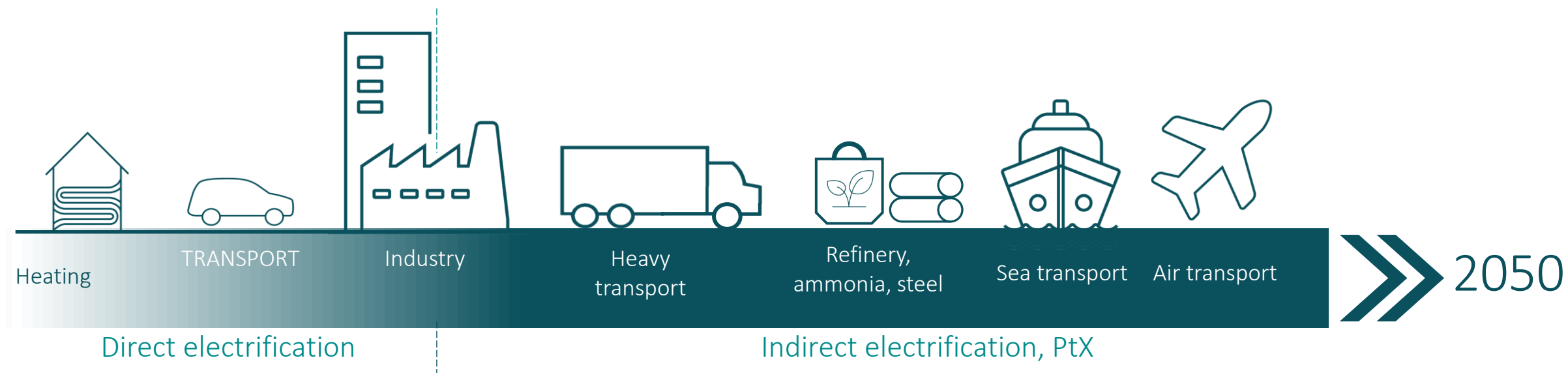


Figure 1: Offshore Wind Transmission System Topologies

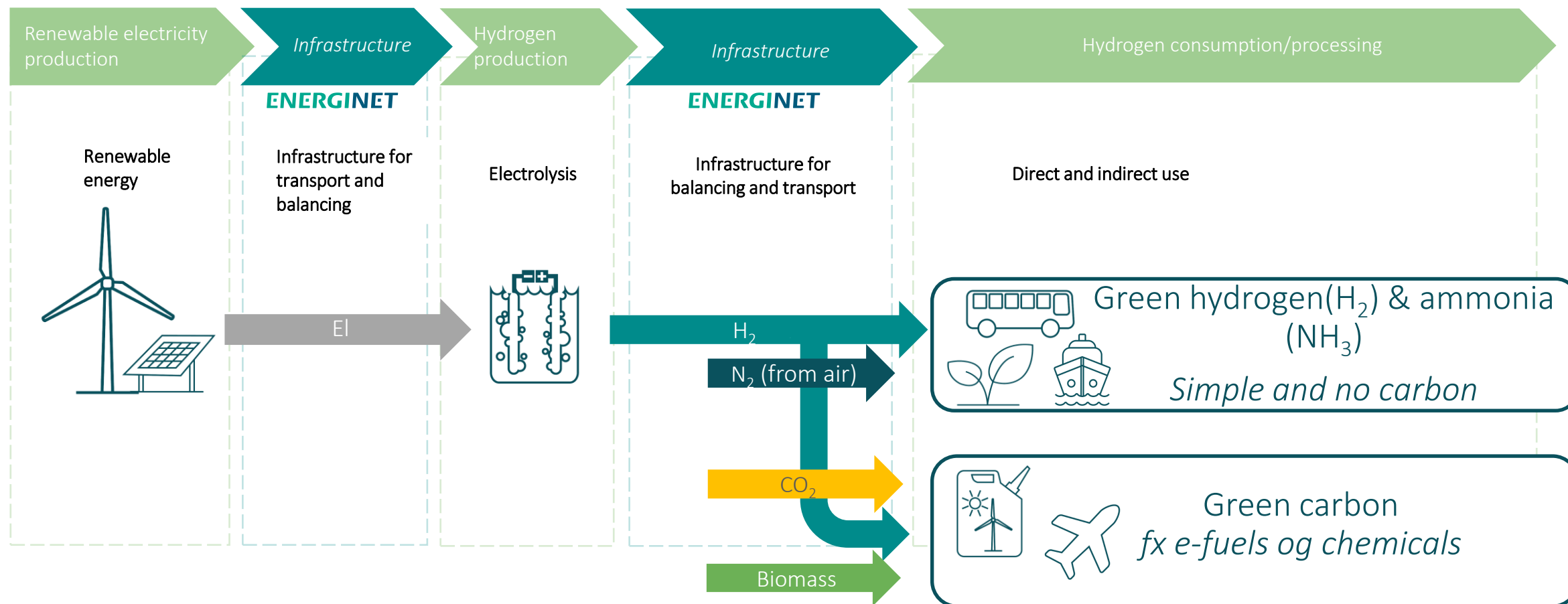
ELECTRIFICATION, SECTOR COUPLING AND POWER TO X

Denmarks large VE potential can be used to direct and indirect electrification



COOPERATION IN THE PTX VALUE CHAIN

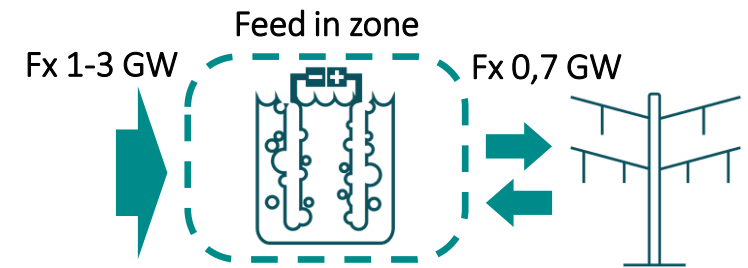
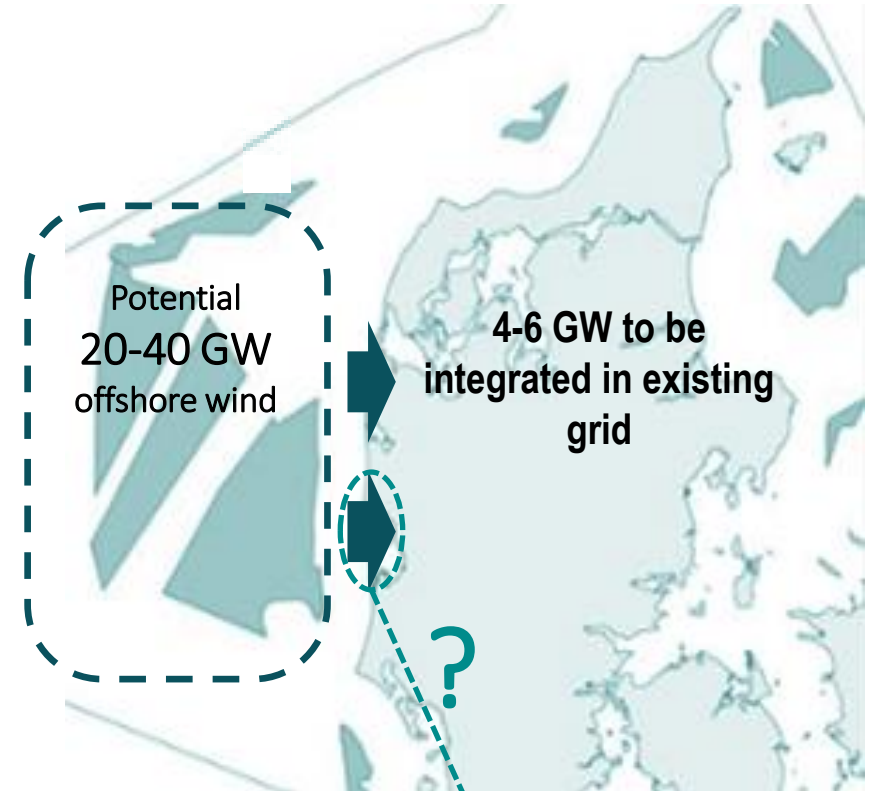
From green electrons to green molecules



INTEGRATION OF LARGE SCALE OFFSHORE WIND STORSKALA

Development of large scale electrolysis and GW offshore wind is interdependent

Without electrolysis/PtX difficult and less incentive to establish offshore wind – low prices and establishment and utilisation of infrastructure



LARGE SCALE RE AND HYDROGEN IS A COMMON EUROPEAN AMBITION



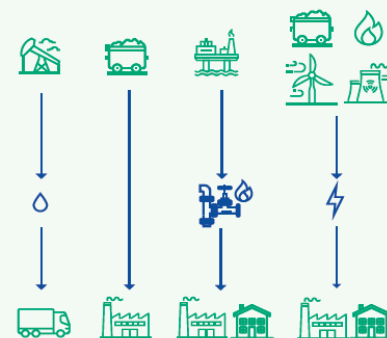
European Commission

EU Energy System Integration Strategy

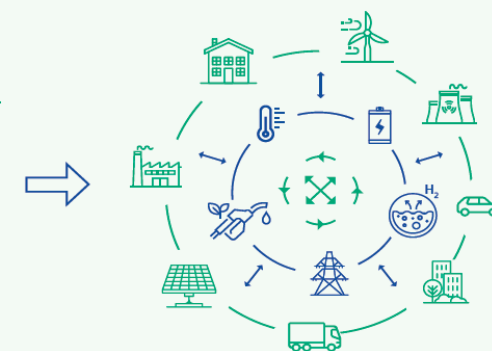
#EUGreenDeal

8 July 2020

The energy system today : linear and wasteful flows of energy, in one direction only



Future EU integrated energy system : energy flows between users and producers, reducing wasted resources and money



An Integrated EU Energy System will have **three main characteristics**:

- A more **efficient and “circular” system**, where waste energy is captured and re-used
- A **cleaner power system**, with more direct electrification of end-use sectors such as industry, heating of buildings and transport.
- A **cleaner fuel system**, for hard-to-electrify sectors like heavy industry or transport

Thank you for your attention

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