

Green Fuels for Denmark

A project vision aiming to decarbonise heavy road transport, marine shipping and aviation

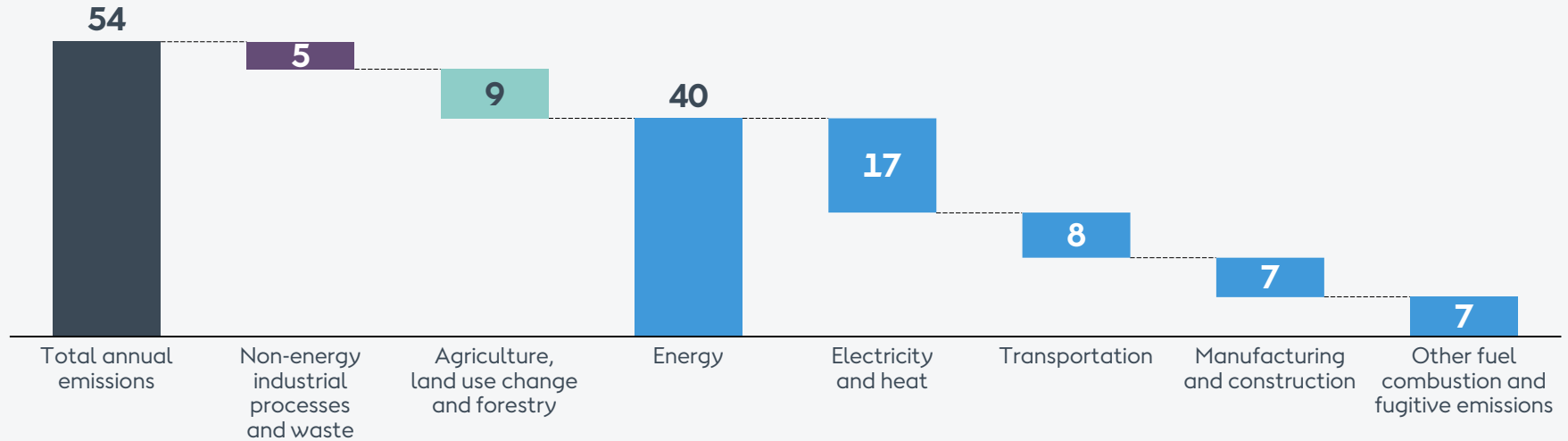
Orsted

ESIG Hydrogen Production and
Flexibility Requirements
Workshop

08 October 2020

Electricity has experienced decarbonisation but other sectors are in need of solutions to reach net-zero emissions

Annual global greenhouse gas emissions by sector (2018), GtCO₂e/year



Hydrogen and PtX offers opportunity to indirectly electrify hard-to-abate sectors currently unaddressed in the green transformation

Ørsted believes offshore wind will play a key role as an energy source for electrolysis due to scale, high capacity factor and resource availability

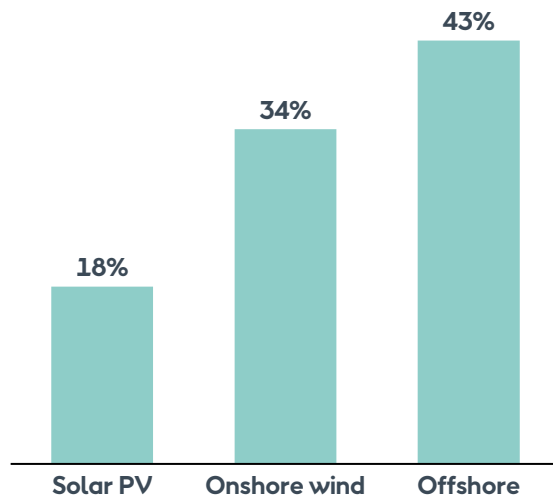
Scale

Wind farms >1.2GW currently being commissioned



Capacity factor

Highest capacity factor of variable renewable generation¹



Resource availability

450GW of realizable potential identified in Europe²



Sources: IRENA Renewable Power Generation Costs in 2018, Wind Europe 1. 2018 average global capacity factors 2. Potential towards 2050 identified by the interest organisation Wind Europe. European Commission expect 230-450GW (depending on scenario) offshore wind in 2050

Hydrogen can enable decarbonisation of various sectors with industry and transport being the most promising

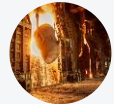
Industry



Chemicals
(eg. ammonia, methanol)

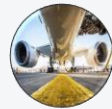


Refining



Direct steel reduction

Transport



Synthetic fuels



Fuel cell vehicles

Power



Power generation & storage



Gas grid injection

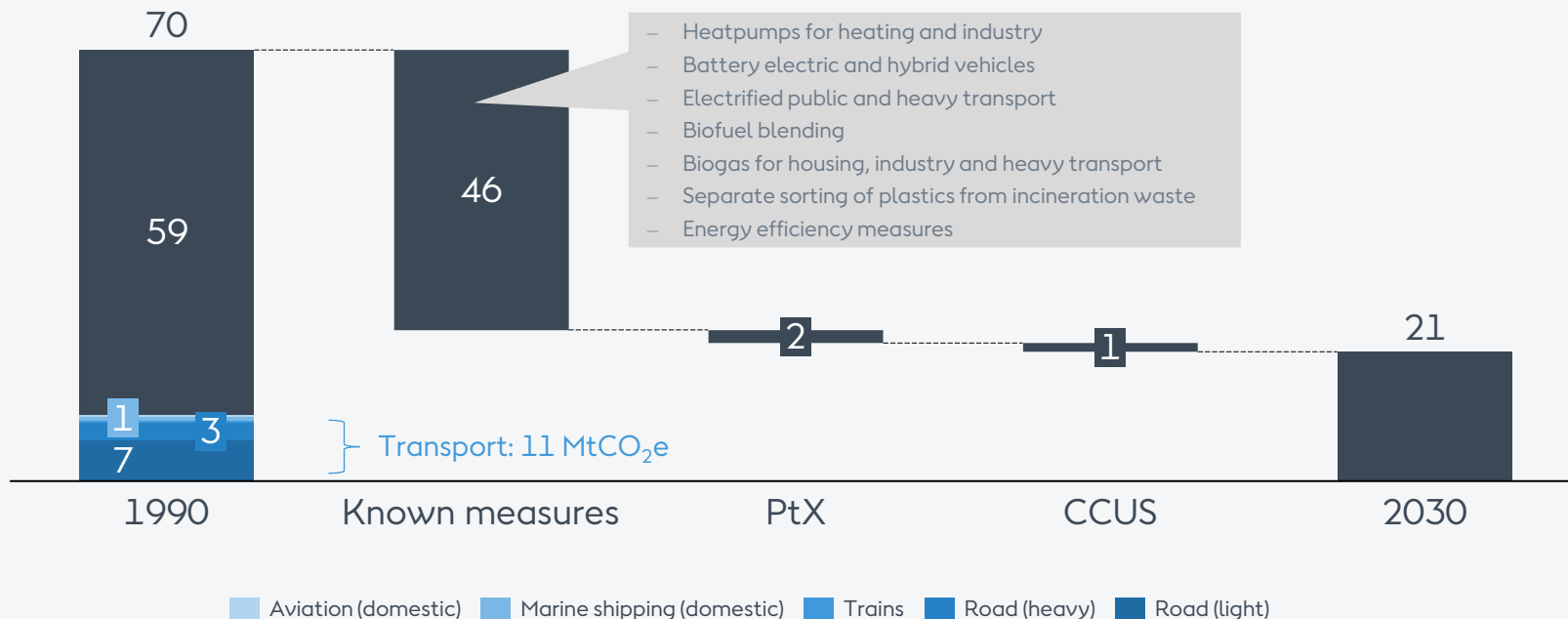
Building



Heating

Green Fuels for Denmark vision was launched in response to Denmark's introduction of a 70% emission reduction target by 2030

Emissions of Denmark¹, MtCO₂e

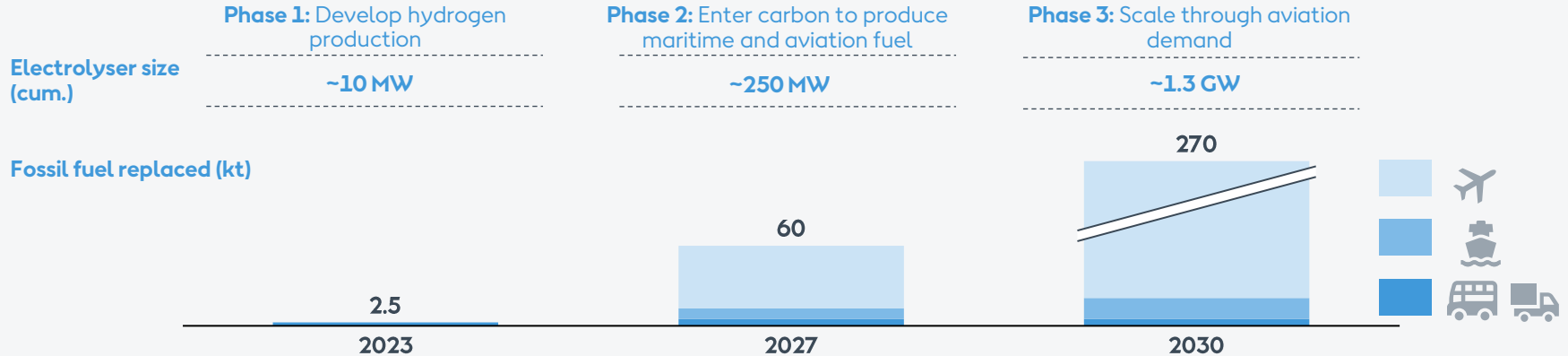


The vision builds on synergies between sustainable fuel offtakes across heavy road, marine and aviation among leading Danish companies in and around Copenhagen

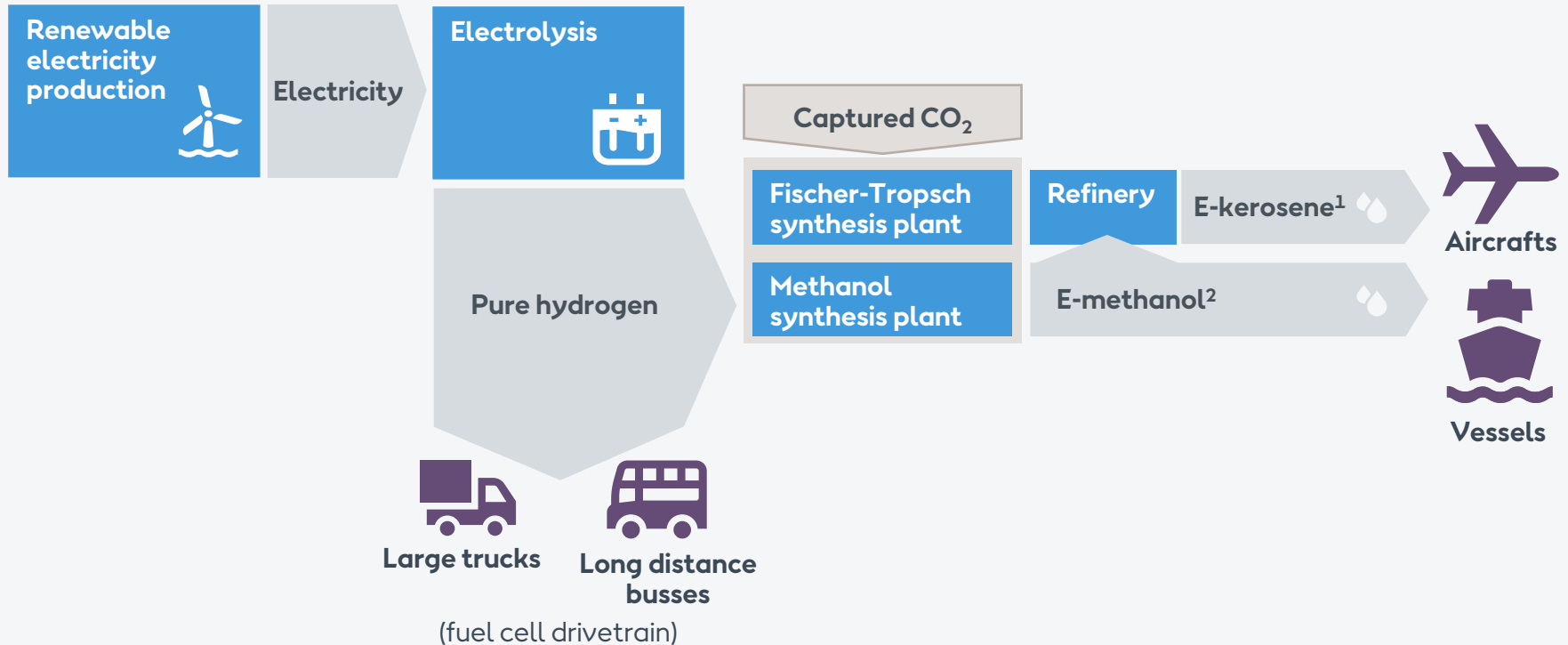
The project takes it point of departure in the partners' likely fuel offtake



Supported by



The project will convert renewable electricity into hydrogen and derived fuels through electrolysis and subsequent fuel synthesis and refining

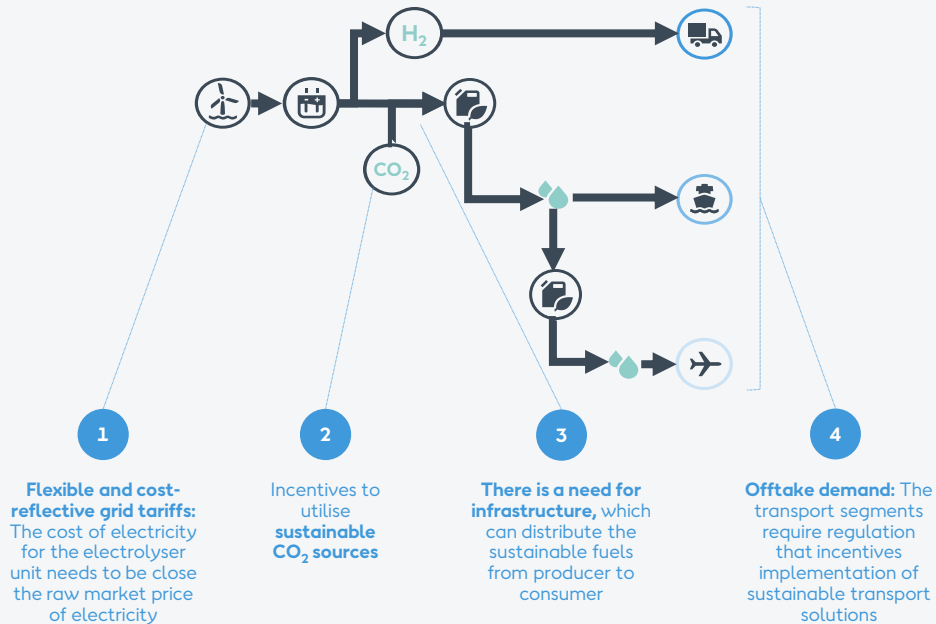


1 E-kerosene is derived by refining feedstock, e.g. synthetic crude oil or e-methanol (both based on hydrogen)

2 E-methanol can be used as input for creating E-kerosene, however procedure entails further chemical processes

Incentives to stimulate offtake for green fuels and improved framework conditions for production facilities required for realisation

Establishment of reasonable framework conditions is a pre-requisite for roll-out of large scale PtX (in Denmark)



Geographic siting is essential to project success

Siting of the fuel production needs to be optimal with regards to multiple inputs to the project:

- Renewable electricity, H₂, CO₂
- Proximity to offtakers and their infrastructure is of high importance

The ideal site has simultaneous proximity to fuel offtakers and input

Thank you

