



Nordic Energy Technology Perspectives 2016

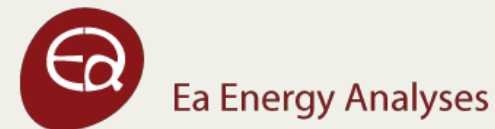
Cities, flexibility and pathways to carbon-neutrality



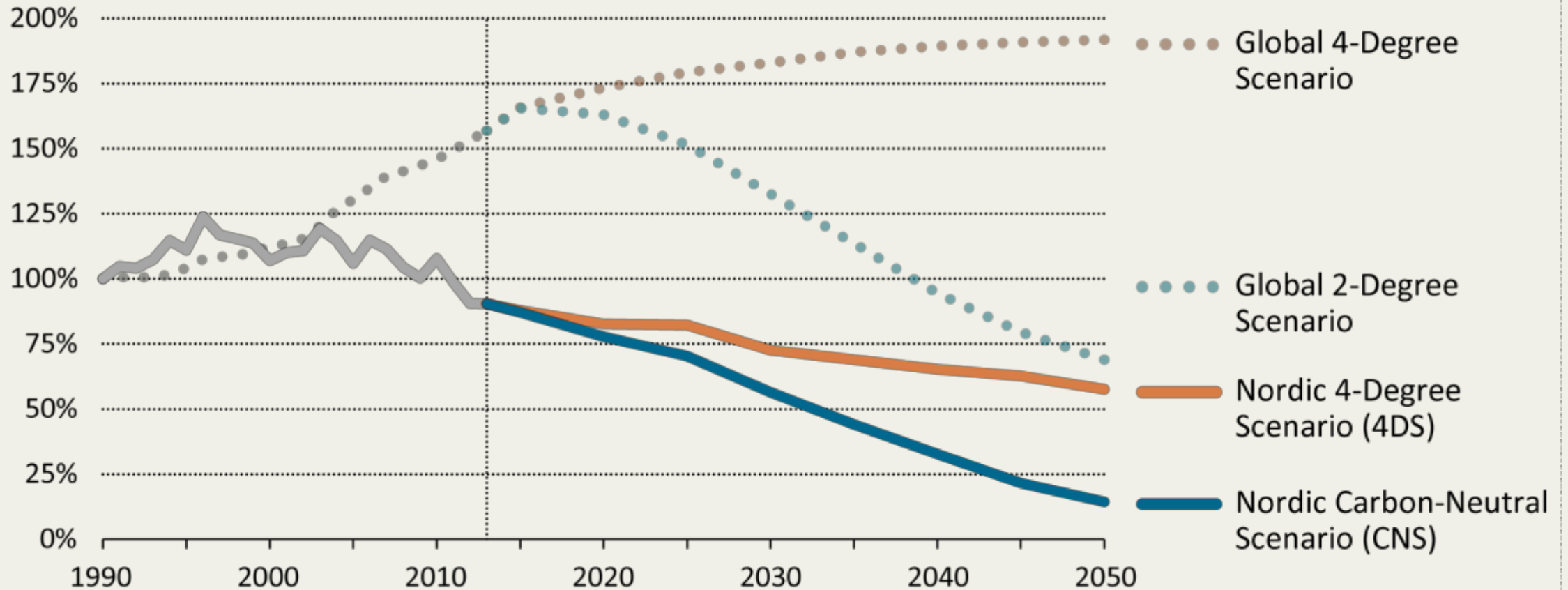
Presentation of key results

Benjamin Donald Smith,
Nordic Energy Research
Klimafrokost 31.05.2016, Oslo

Partners in Nordic Energy Technology Perspectives 2016



Global and Nordic scenarios in CO₂ emissions



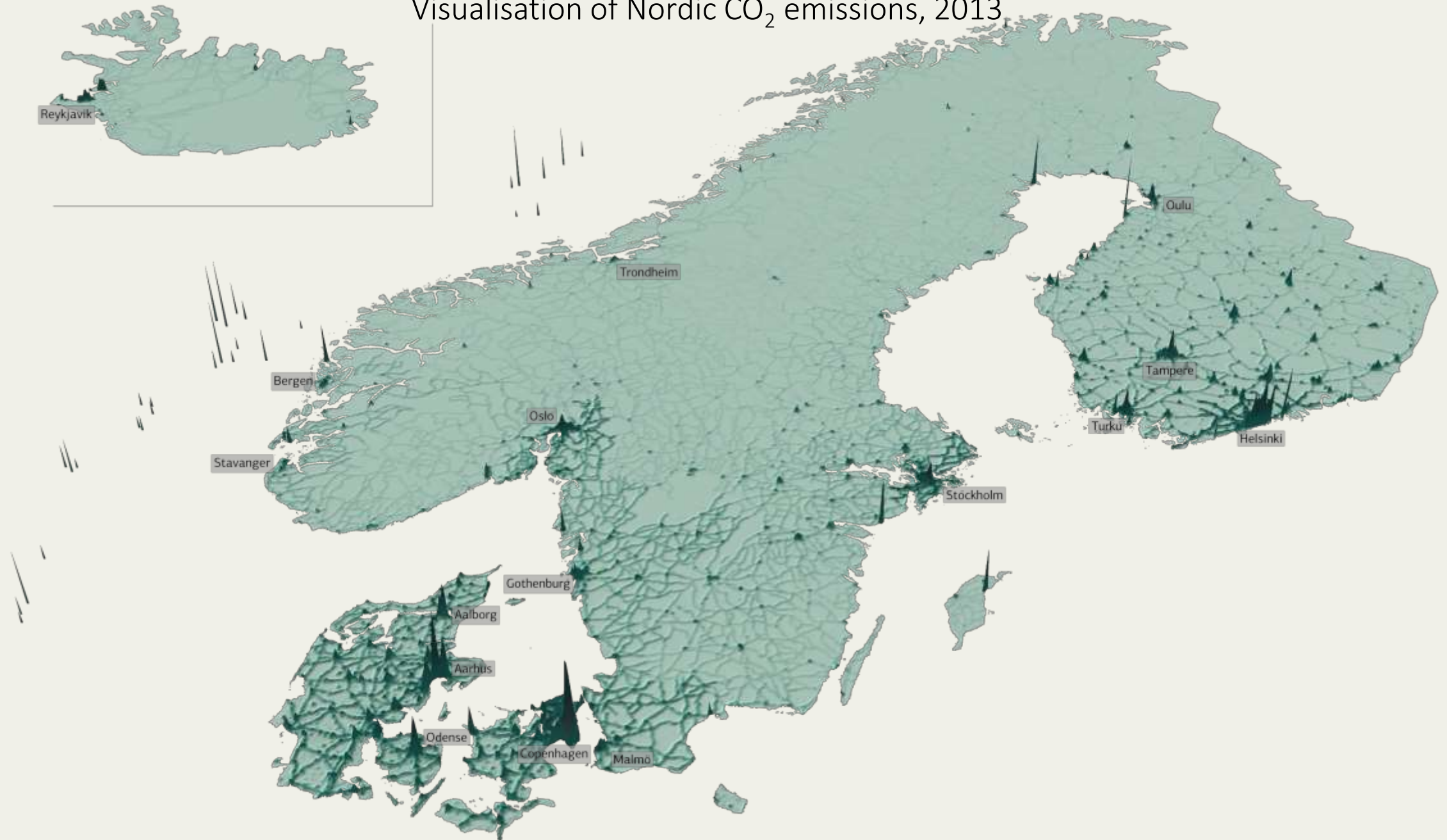
In the Carbon-Neutral Scenario (CNS), Nordic CO₂ emissions drop by 85% in 2050 compared with 1990 levels

Three strategic actions

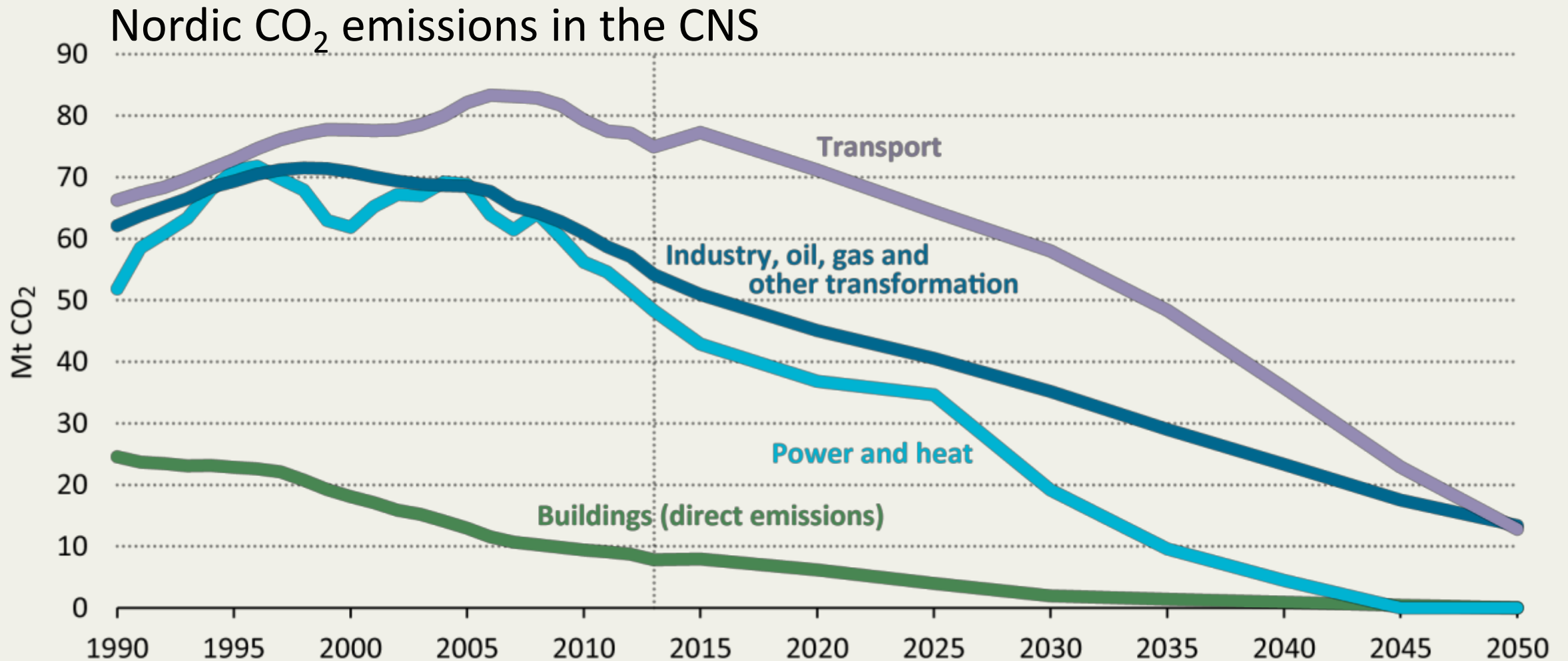
1. Incentivise and plan for a more distributed, interconnected and flexible energy system
2. Tap into the positive momentum of cities in transport and buildings
3. Ramp up decarbonisation of long-distance transport and the industrial sector



Visualisation of Nordic CO₂ emissions, 2013

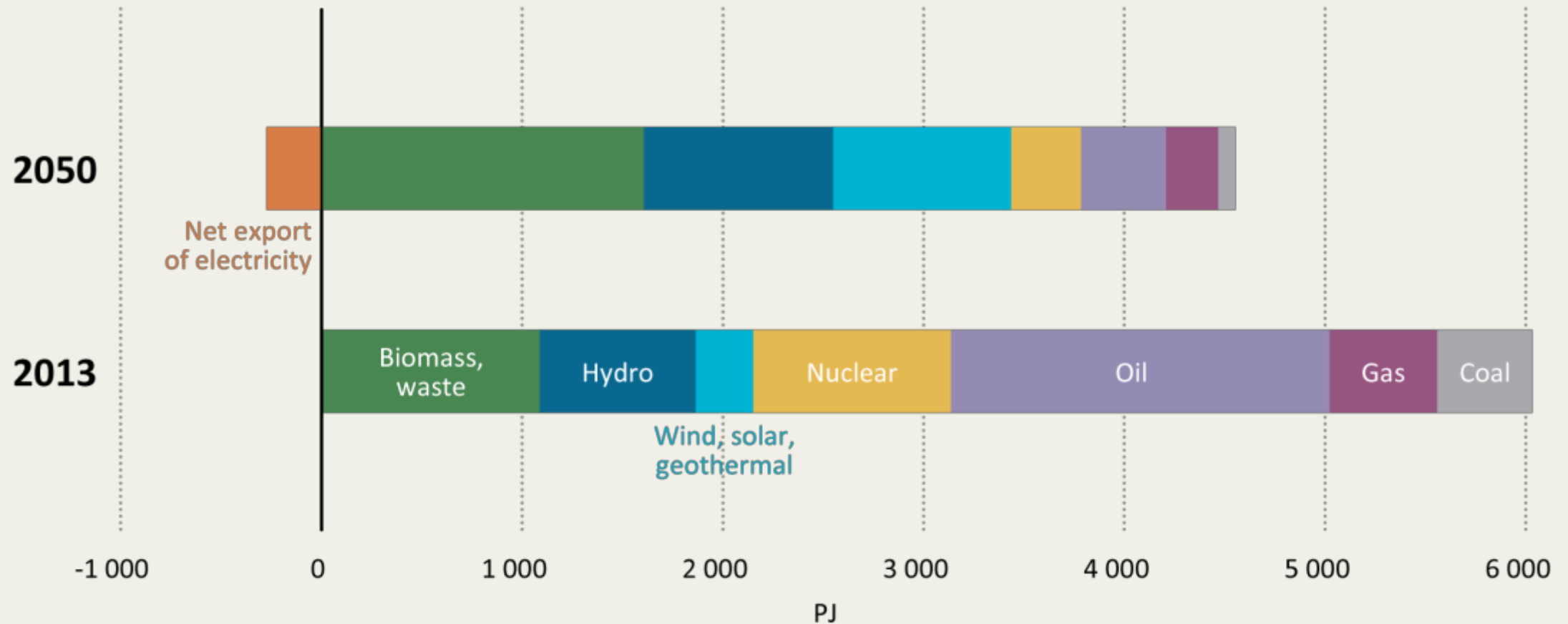


Demand sectors most challenging



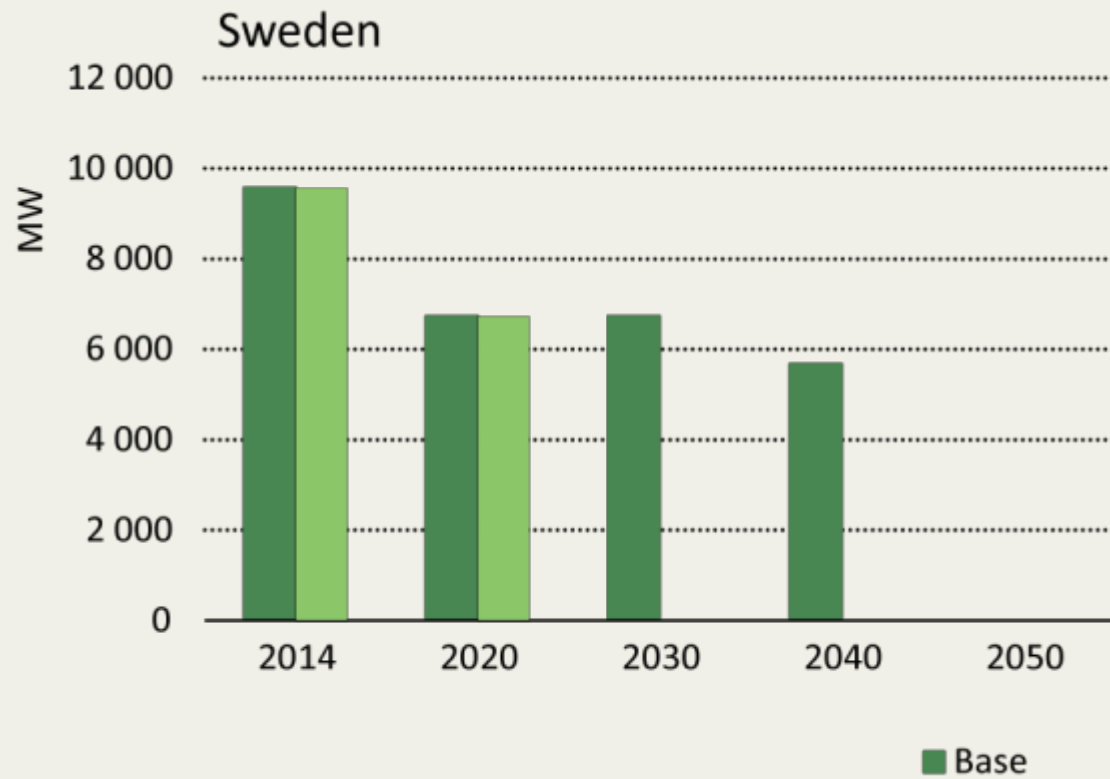
Transforming the energy system

Nordic Total Primary Energy Supply in the CNS



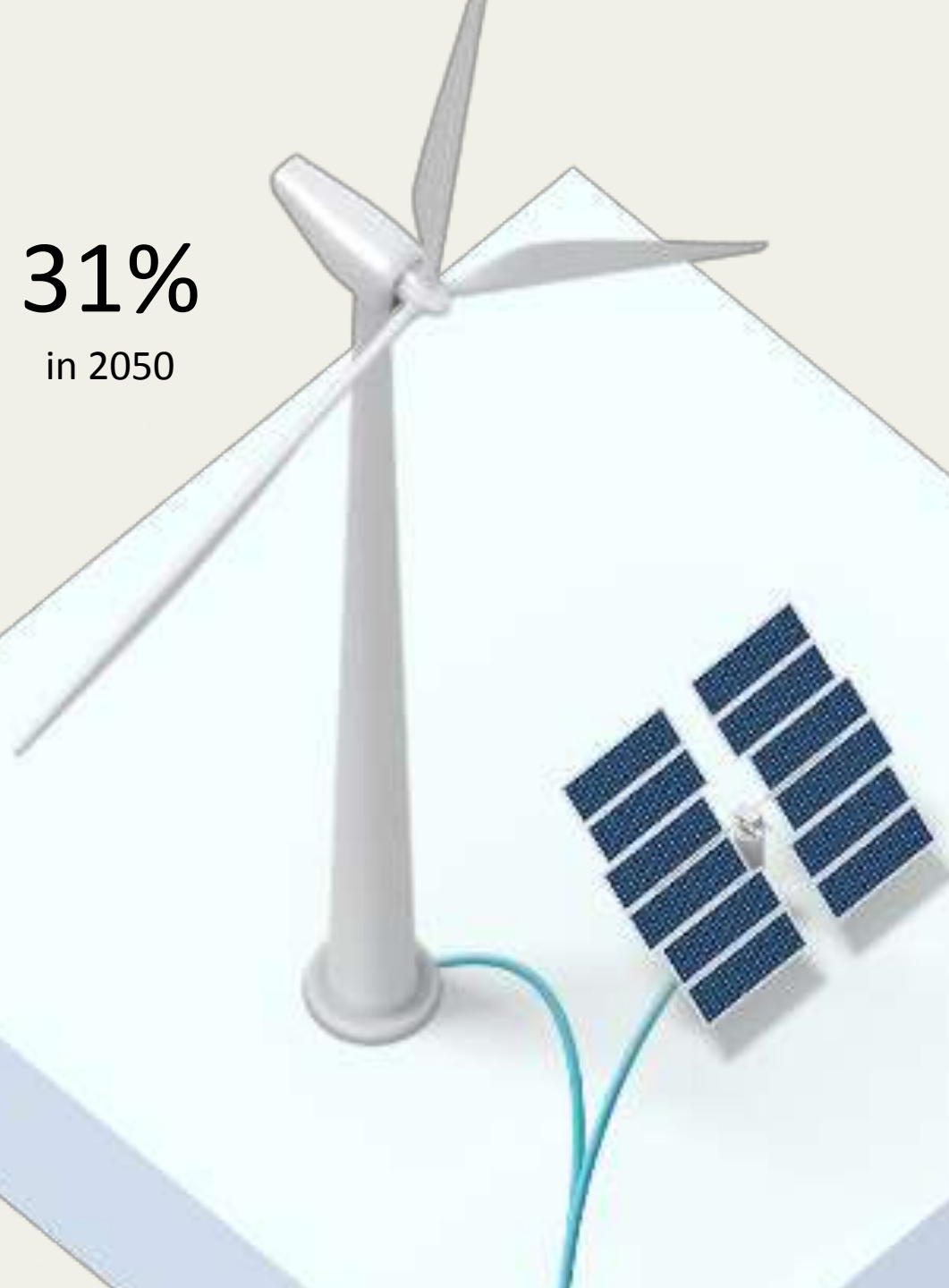
Early nuclear phase-out increases emissions

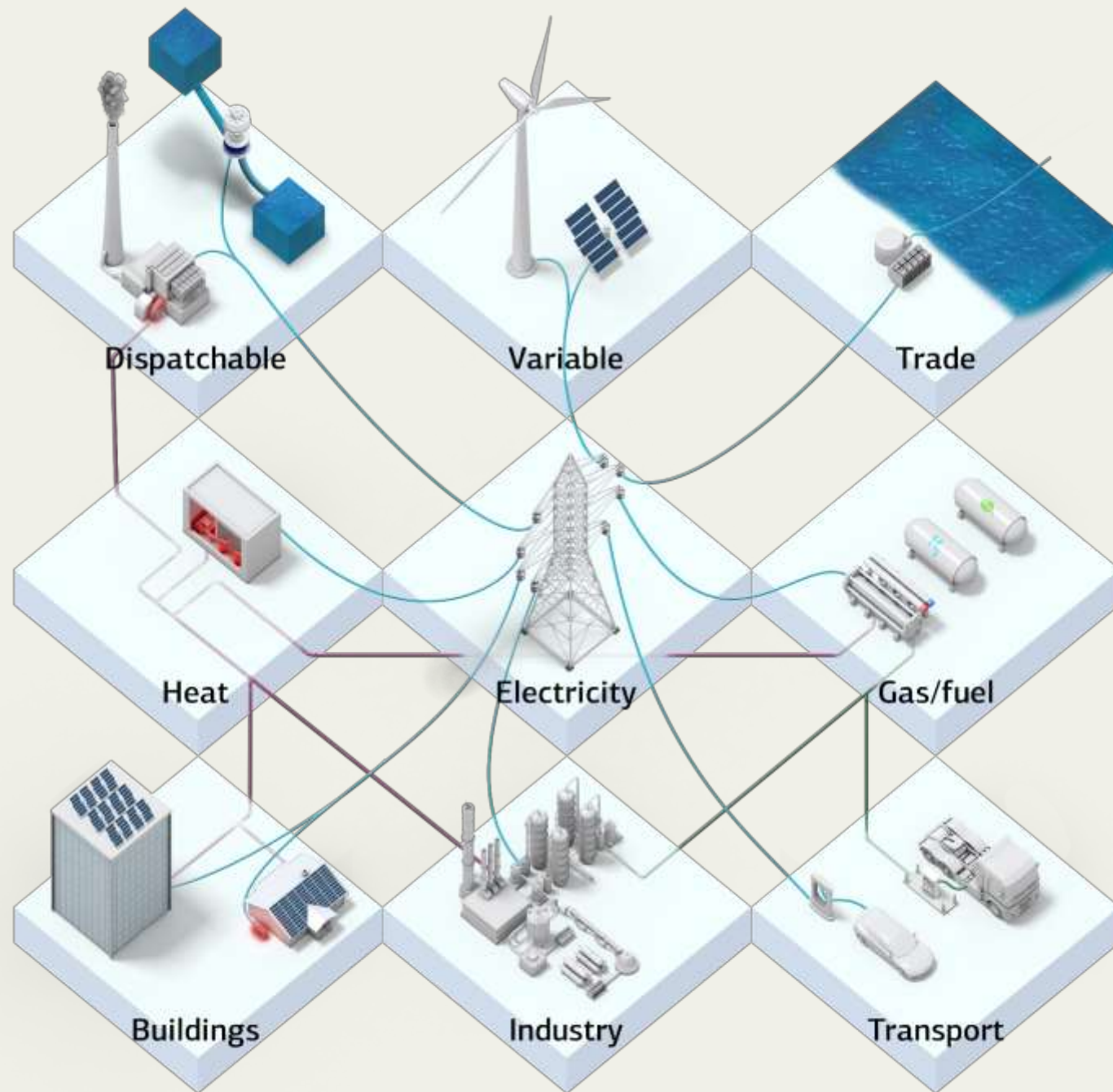
Nordic nuclear capacity in the CNS and a fast phase-out sensitivity analysis

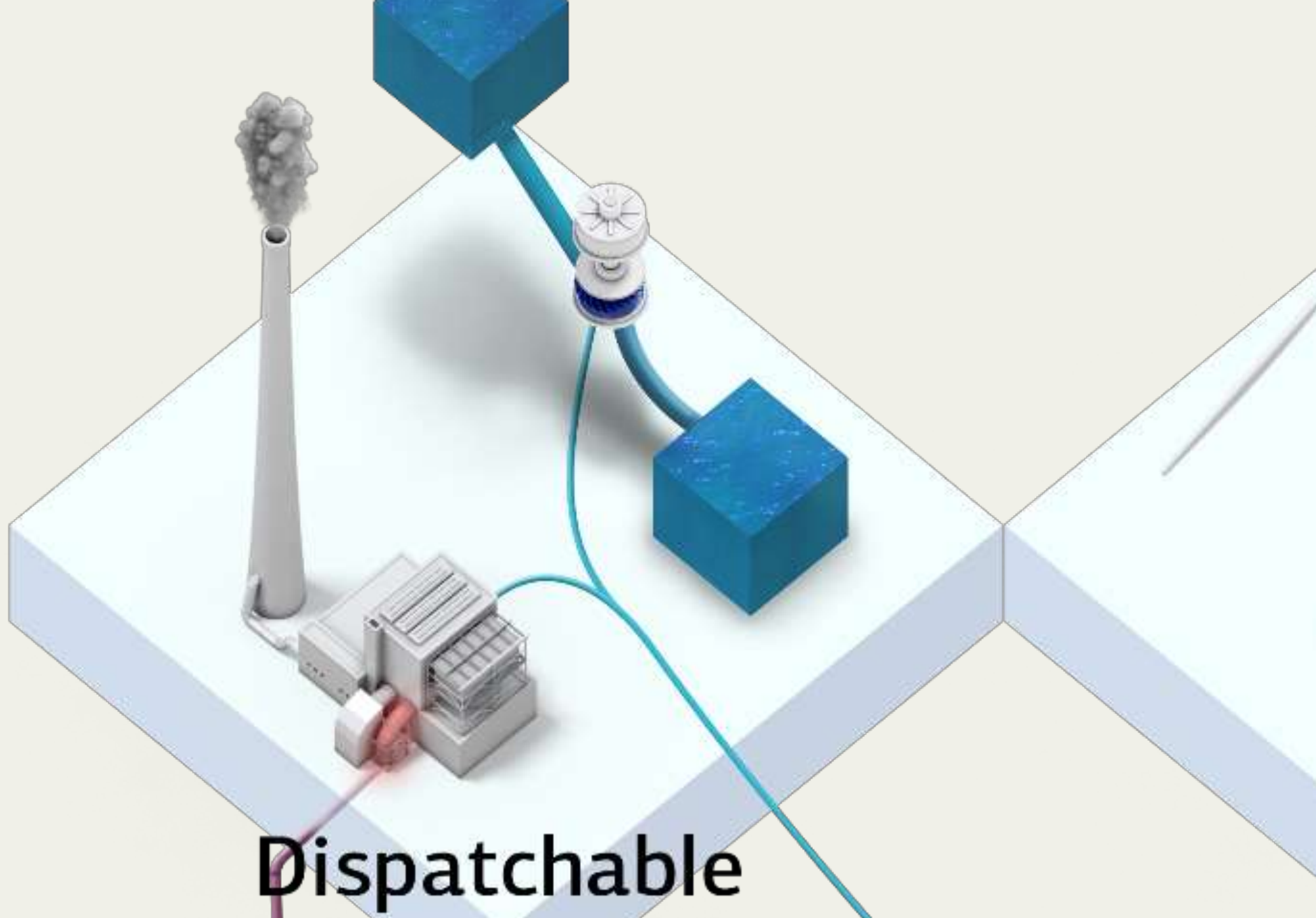


7%
today

31%
in 2050







Dispatchable

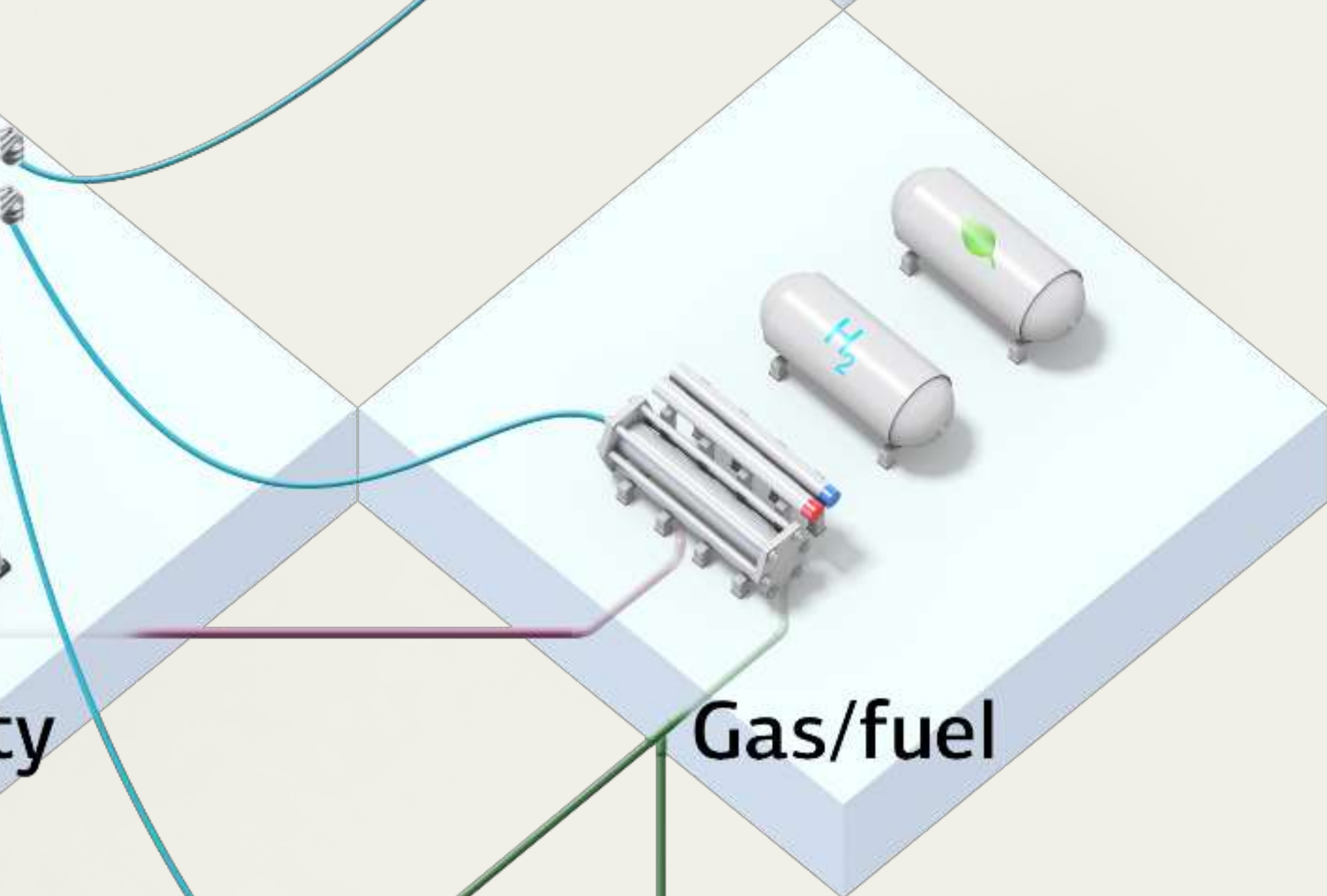


A 3D perspective diagram of a utility-scale heat pump system. A grey rectangular box, representing the heat pump unit, is situated on a light blue platform. Inside the box, red mechanical components are visible. A network of purple lines, representing the heat distribution system, originates from the box and branches out across the platform. The platform is divided into sections by blue lines. The word 'Heat' is written in large black letters on the platform. The text '3-4 GW of utility-scale heat pumps in 2050' is displayed in the upper left area of the diagram.

3-4 GW

of utility-scale
heat pumps in 2050

Heat





Trade

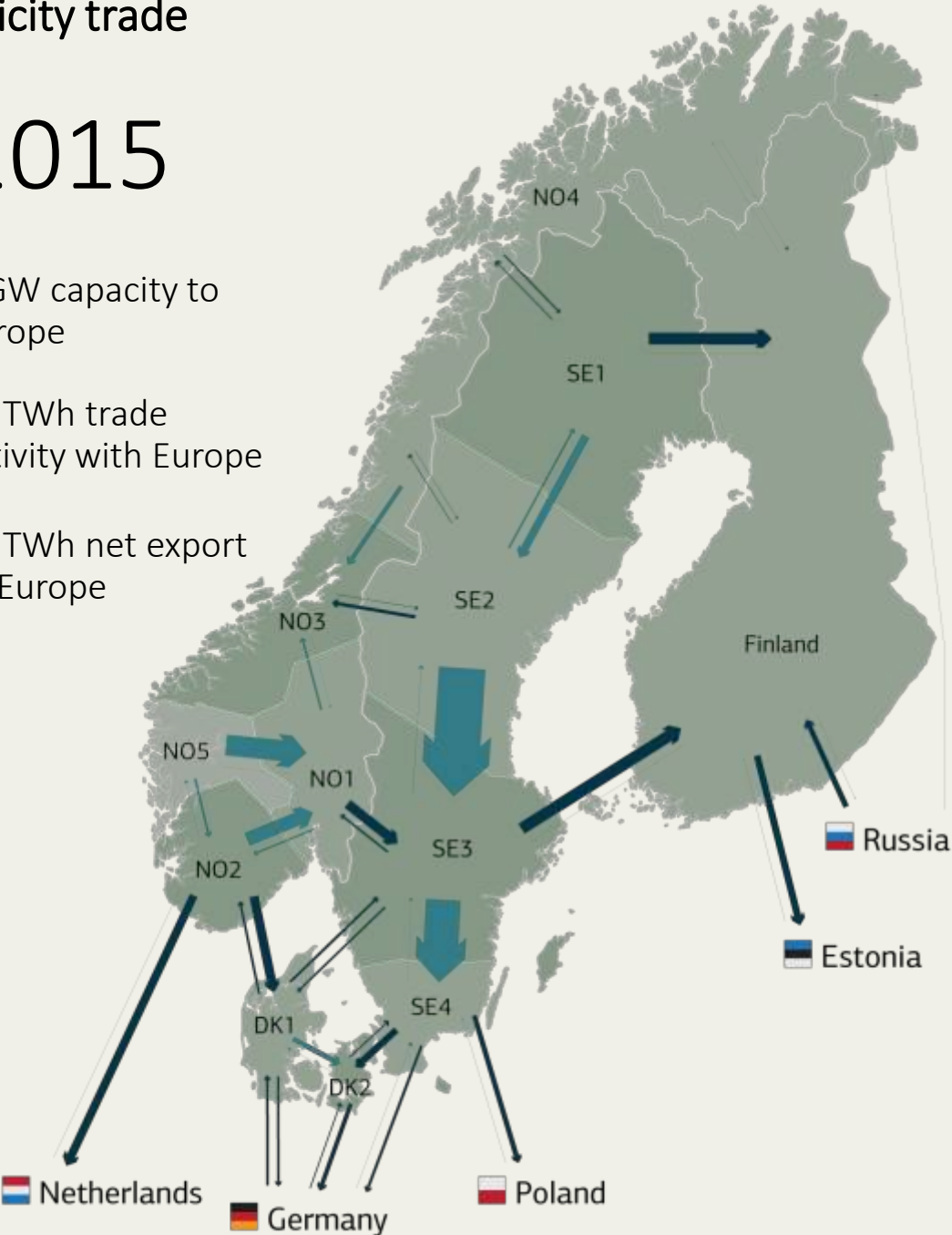
Electricity trade

2015

5 GW capacity to Europe

28 TWh trade activity with Europe

14 TWh net export to Europe

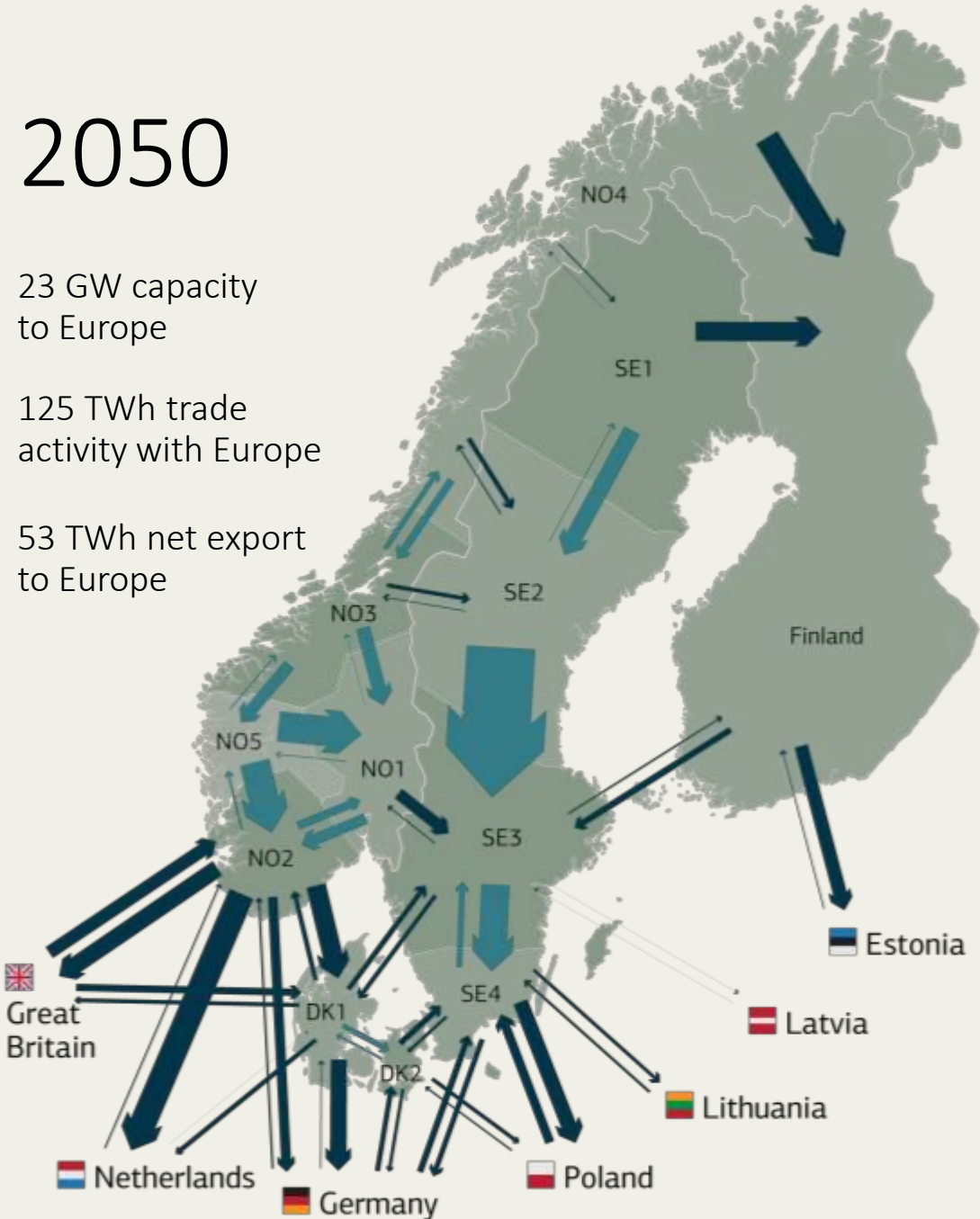


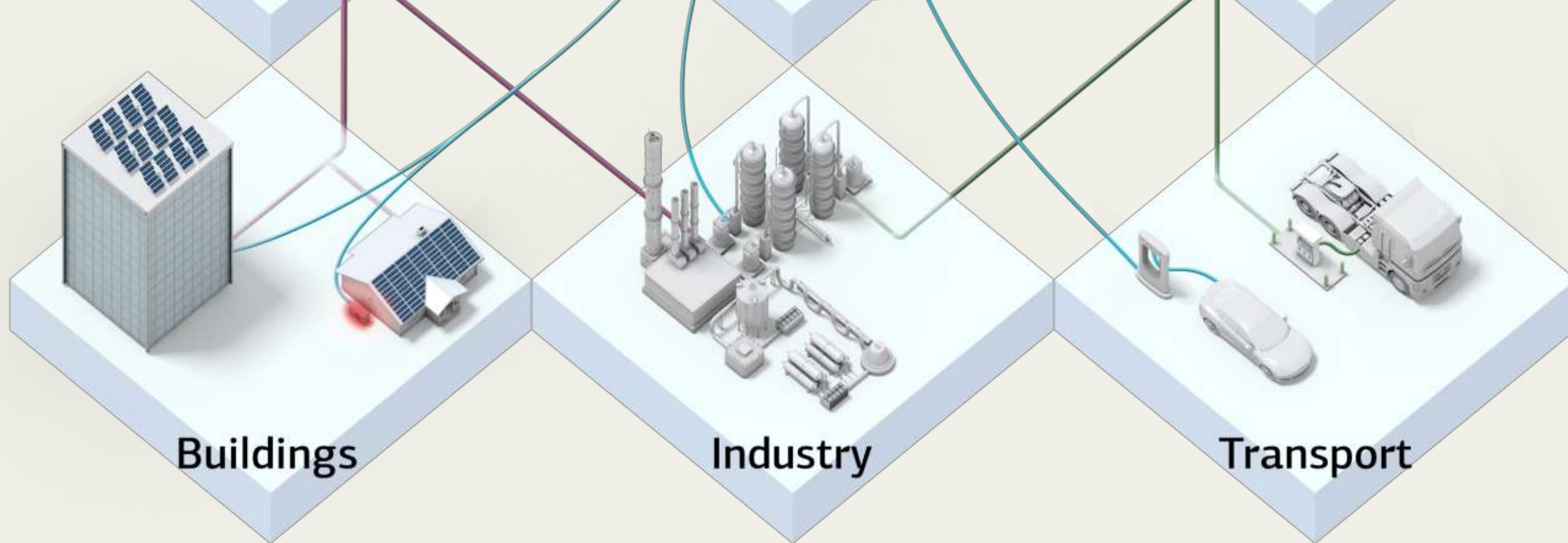
2050

23 GW capacity to Europe

125 TWh trade activity with Europe

53 TWh net export to Europe





5-6 GW
in 2050

5-6 GW
in 2050

1-2 GW
in 2050



Space heating energy intensity in Nordic buildings

126

kWh/m² in 2013

0.8%

annual improvement,
1990-2013

60

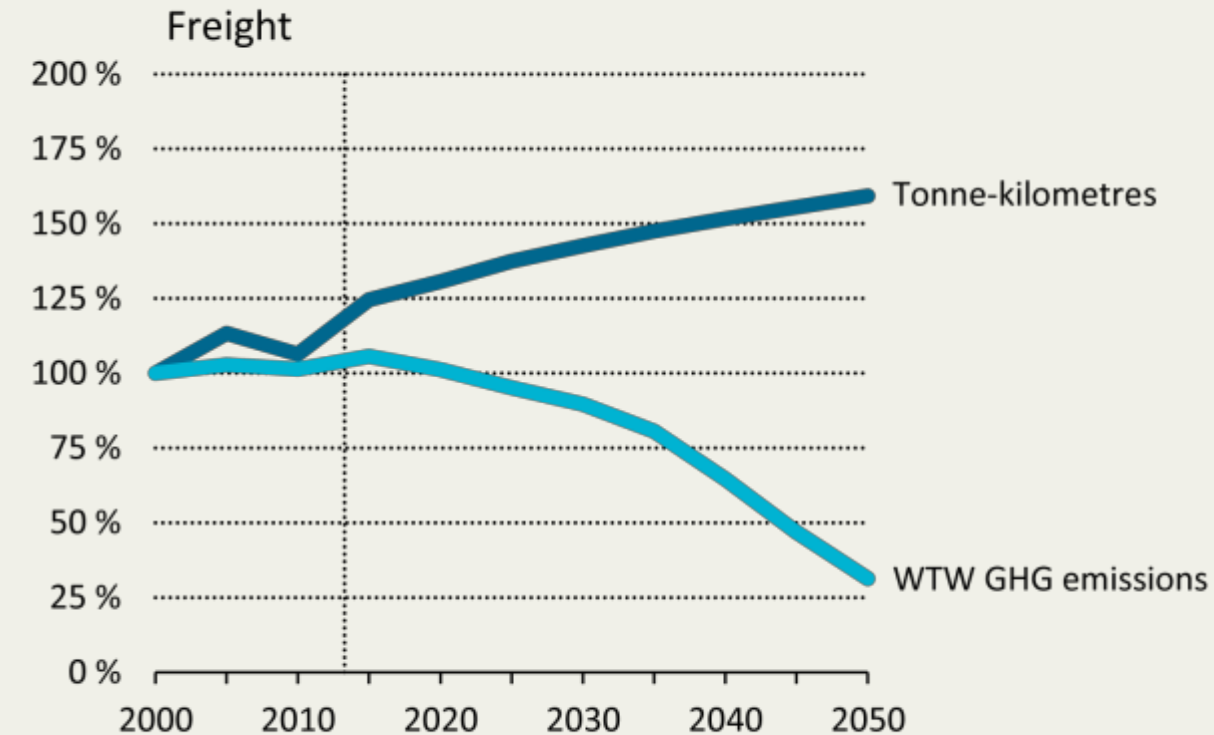
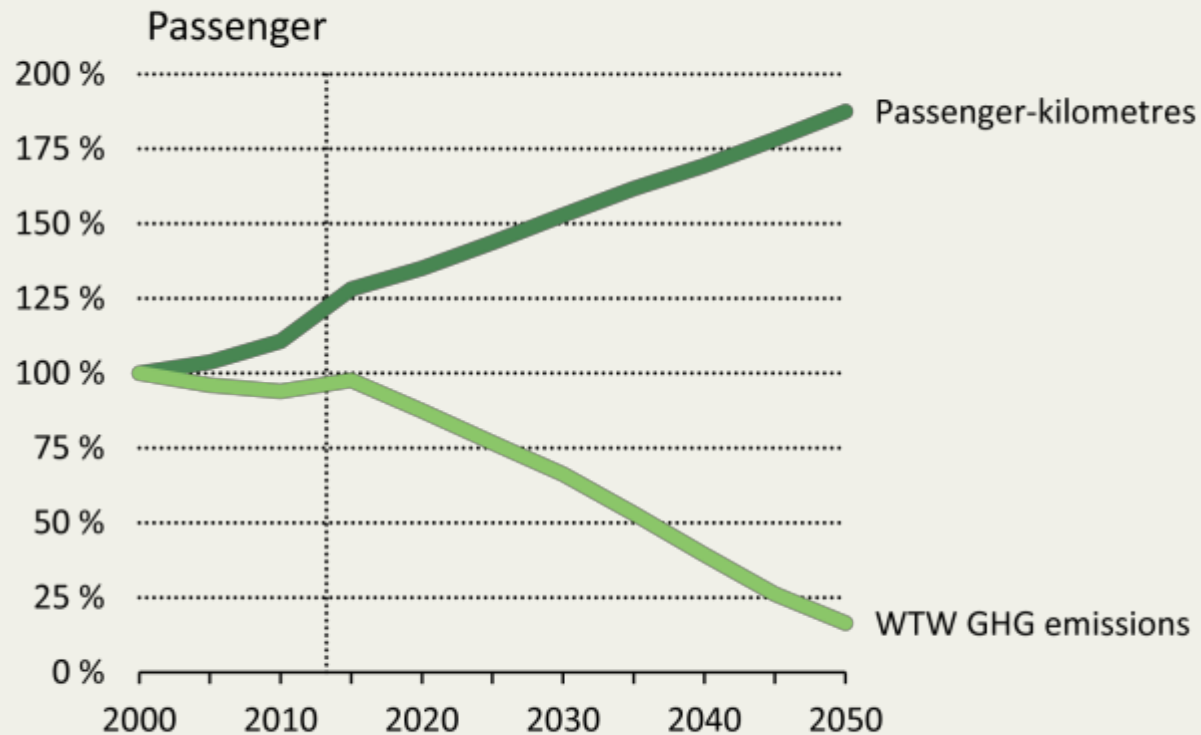
kWh/m² in 2015

2.2%

annual improvement,
2013-2050

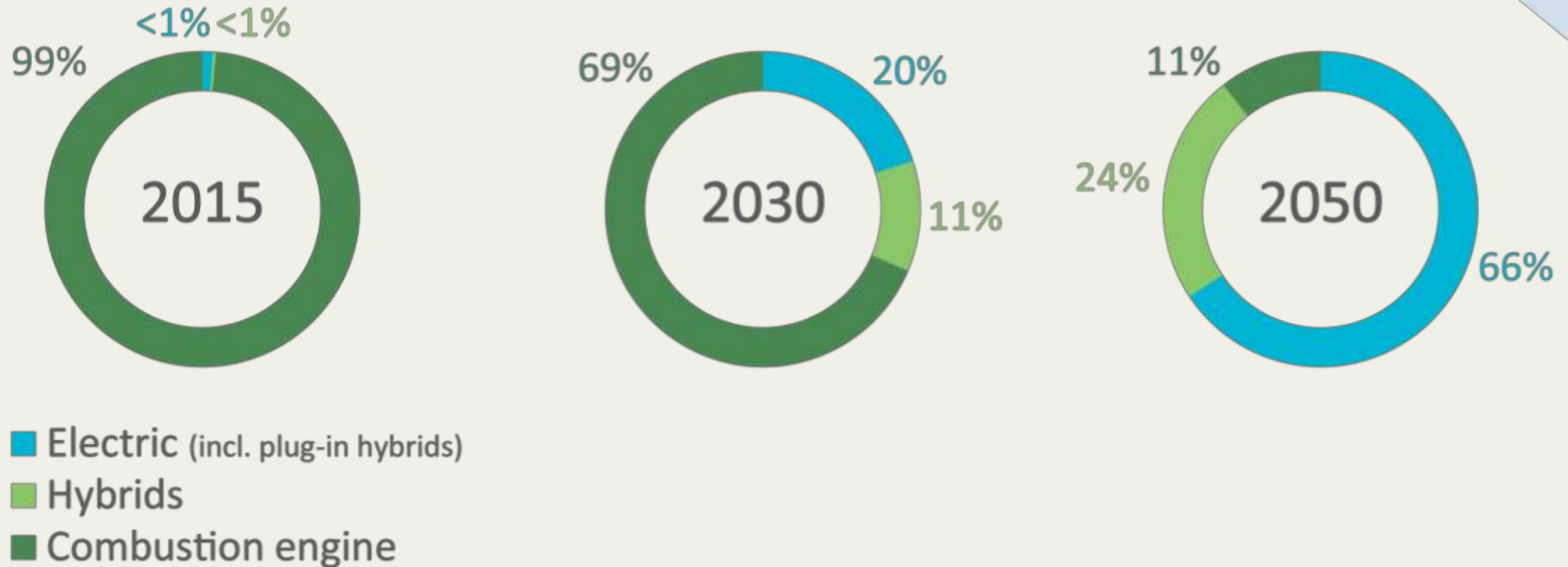


Decoupling transport activity from emissions

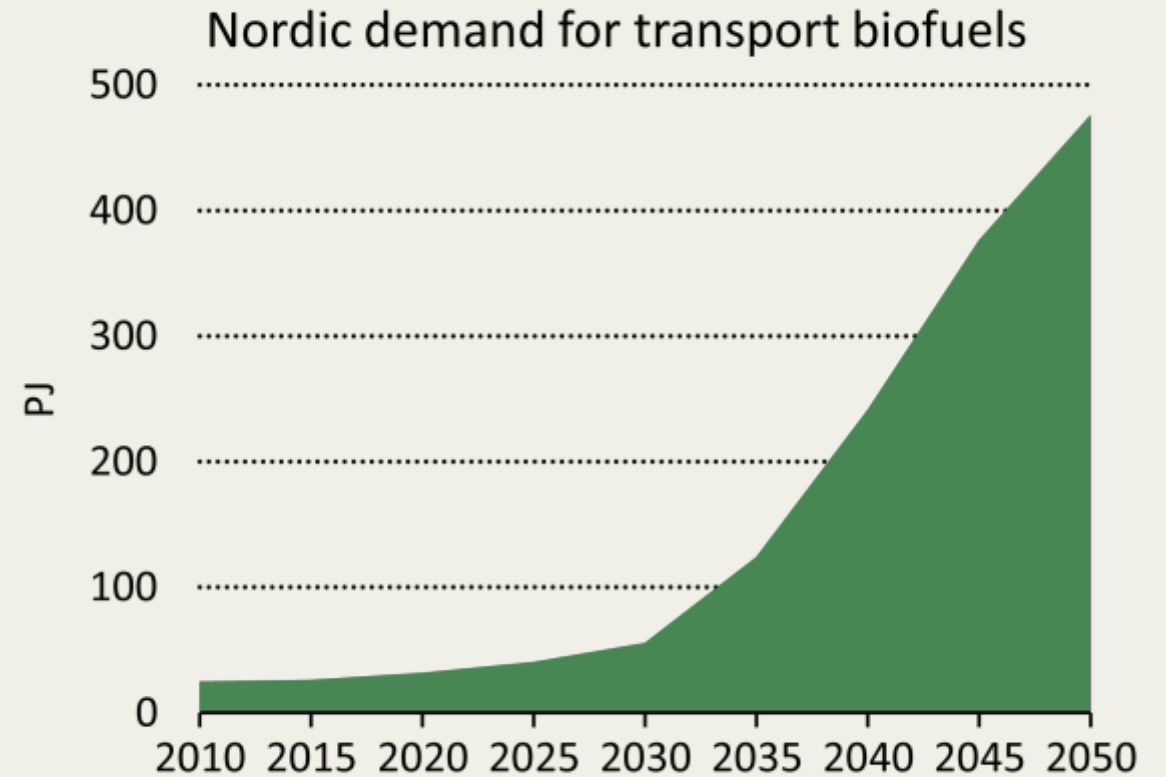


Rapid electrification of transport

Nordic stock of cars and light commercial vehicles in the CNS



Long-distance transport

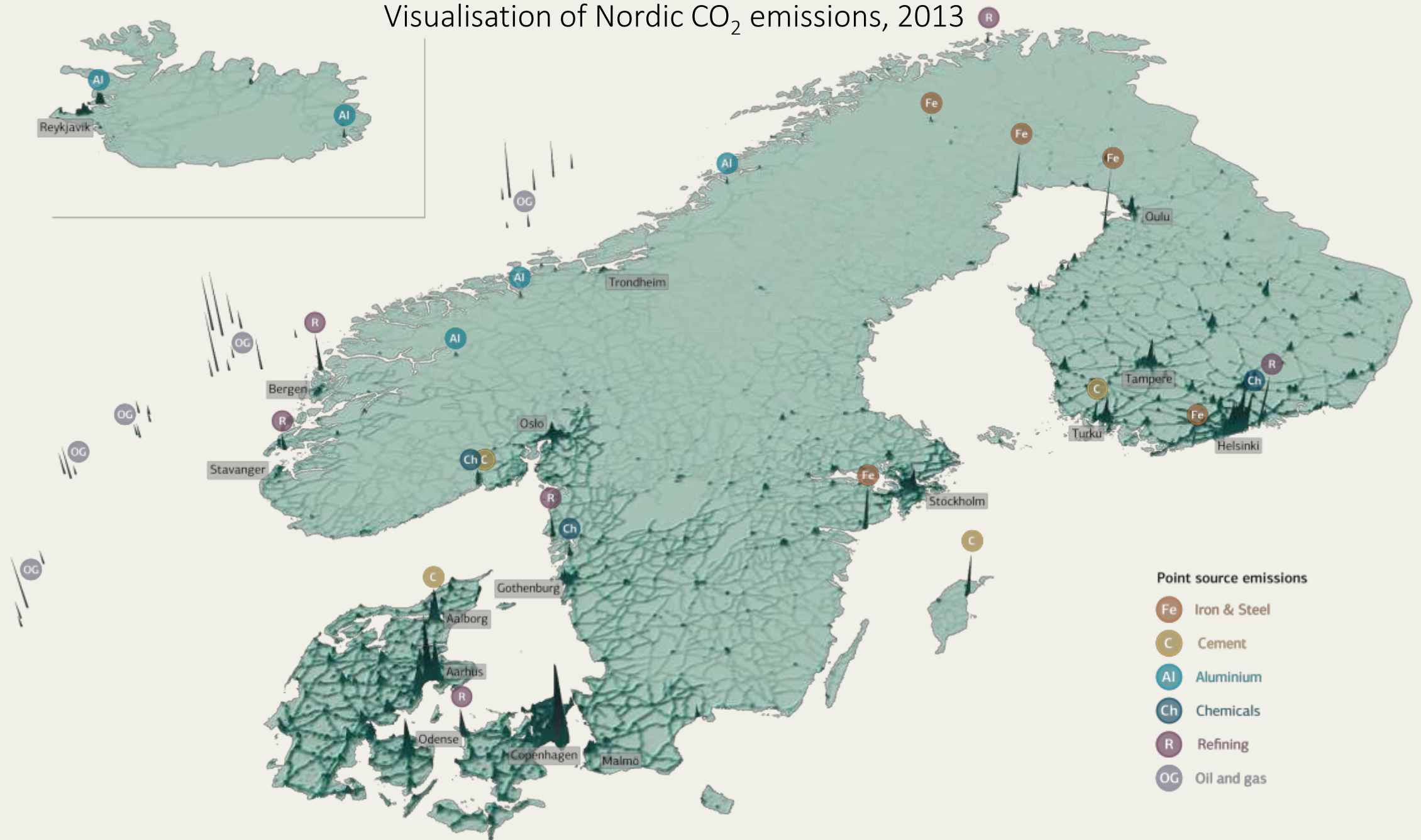


15%

import dependency
for biomass in 2050,
up from 8% in 2013

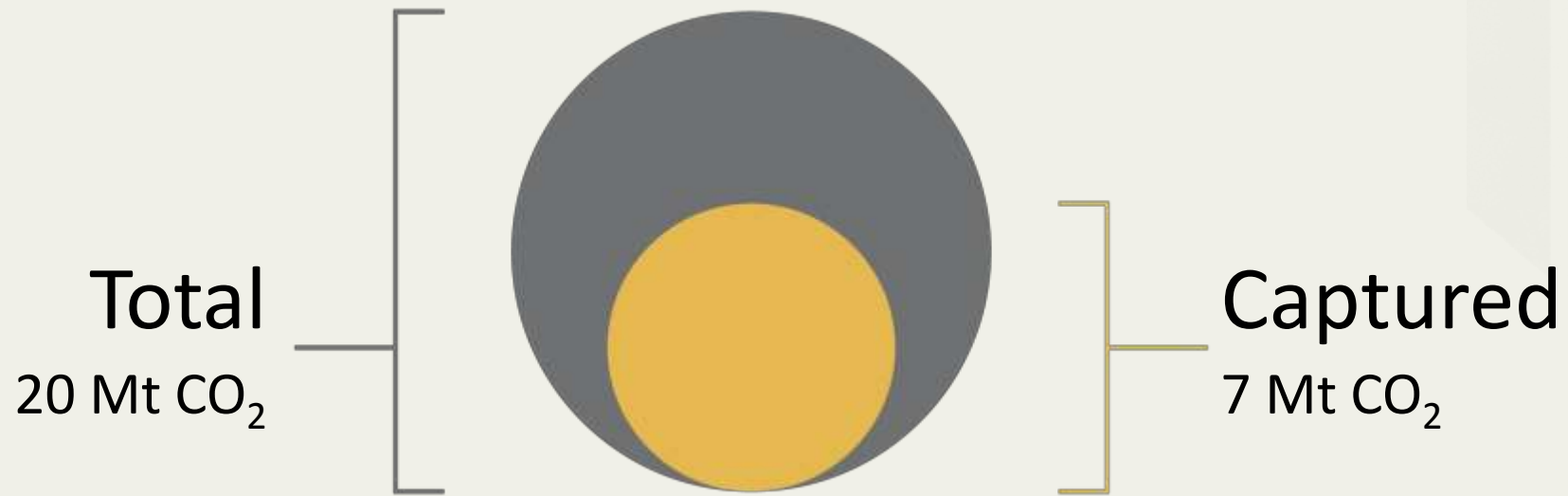


Visualisation of Nordic CO₂ emissions, 2013



CCS critical in industry

Nordic industrial emissions in 2050



Policy recommendations

1. Strengthen incentives for flexibility
2. Nordic cooperation on grids and markets
3. Ramp up industrial innovation
4. Utilise proven policies in transport

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Thank you

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