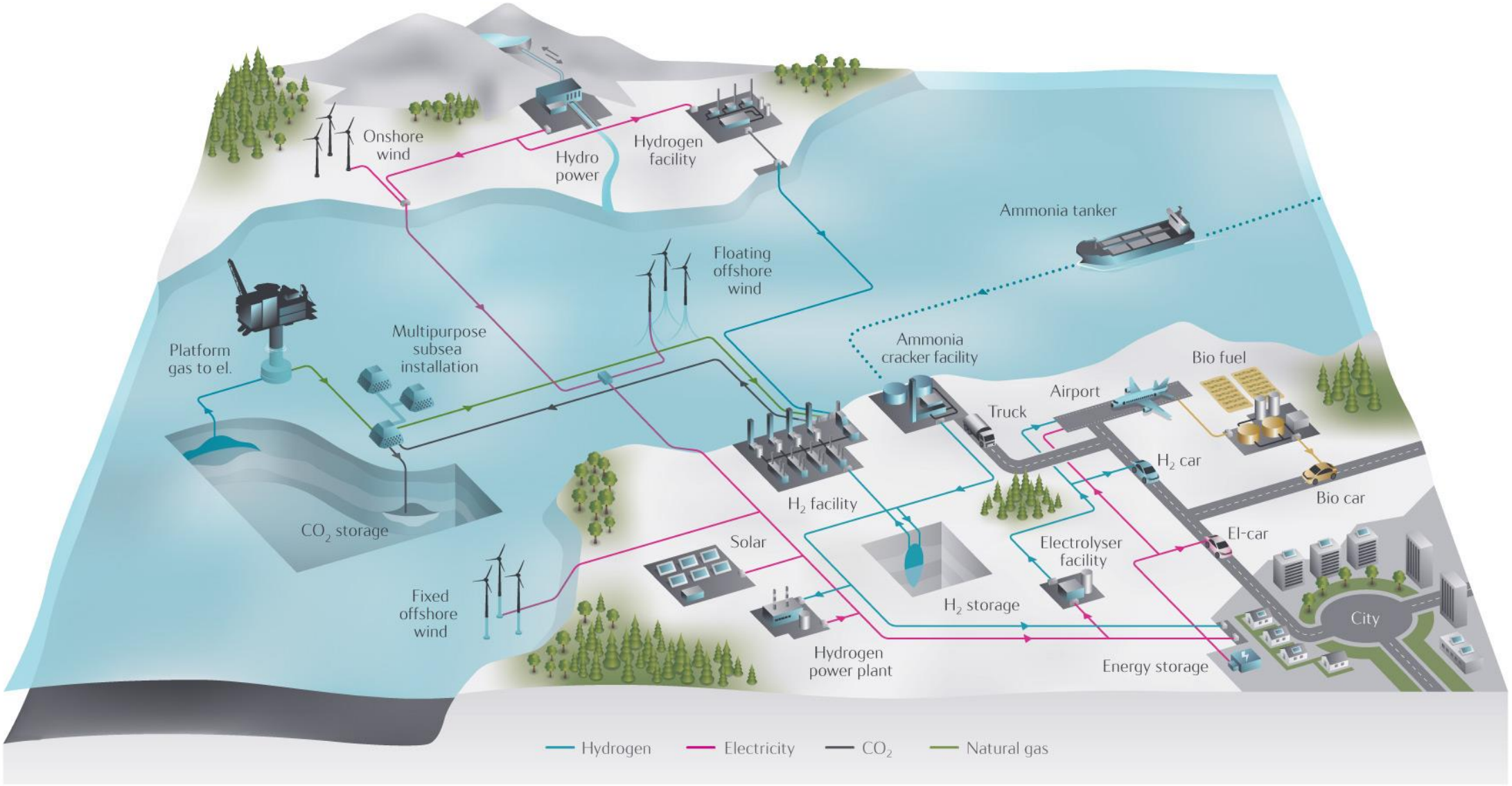
Low Carbon Solutions

Steinar Eikaas – Equinor



Four Main Decarbonization Strategies

Hydrogen

Electrification

Transformational Blue Hydrogen
Establish major hydrogen infrastructure supplemented by renewable





Transformational Renewable
Electrification based fully on renewable solutions (including electrolyser and fuel-cell hydrogen solutions)

Incremental Renewable
Small/Medium scale electricity solutions (limited market intervention



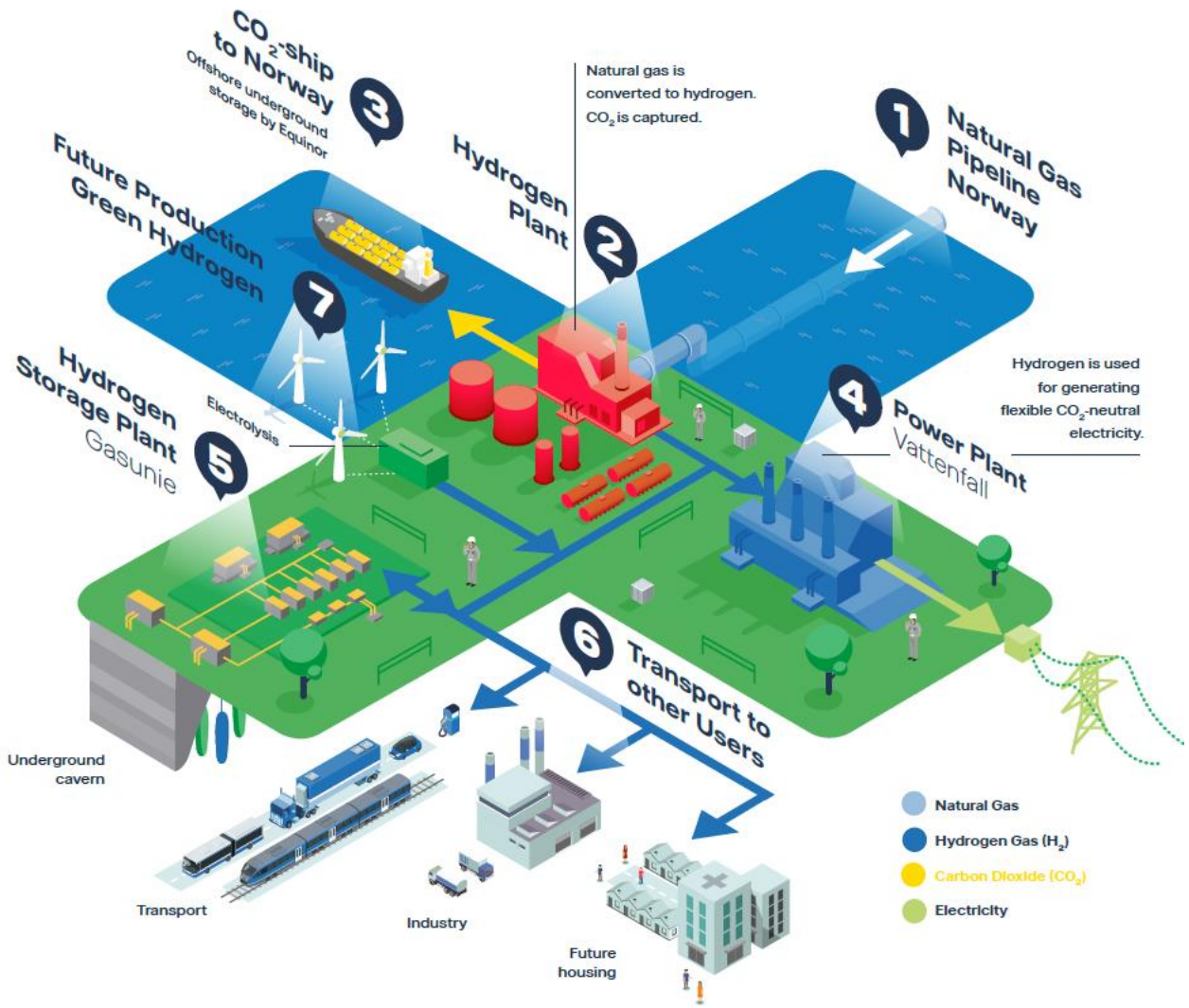


Pragmatic Electrification
Full electrification based on renewable, but fossil based back-up and massive nuclear

H2M – Magnum, Netherlands

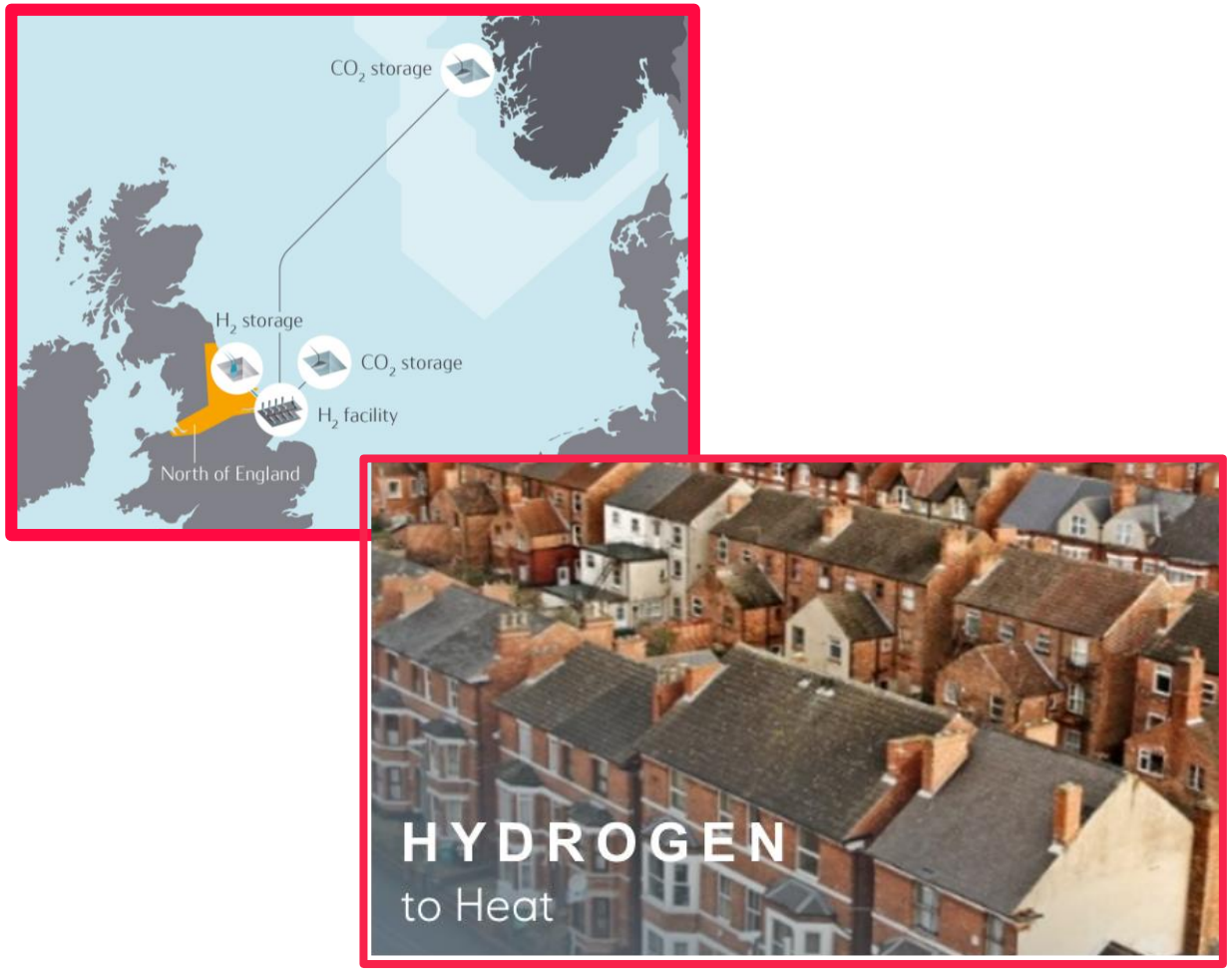


equinor



- Energy: 8-12 TWh
- CO2 emissions reduction of 2 Mton/year
- Utilise existing gas power plants and gas infrastructure
- Switch fuel from natural gas to clean H2
- Clean, flexible electricity as back-up for solar and wind
- Launch large-scale H2 economy
- Partners: VATTENFALL & gasunie

H21 North of England



- System approach to decarbonise residential heating and distributed gas use

  Fuel switch from natural gas to hydrogen

- Large-Scale: 12.5% of UK population , ~85 TWh
- 12,5 Million tons CO2 reduction per year
- 12 GW hydrogen production
- 8 TWh storage of hydrogen
- CO2 footprint 14,5 g/KWh
- Offshore CO2 storage in either UK or Norway
- Facilitating unlimited system coupling between gas and electricity
- CAPEX: £23 billion

Decarbonising Energy Systems



Easy ⟵ complexity to decarbonise ⟶ Hard

Transport



Battery (mostly) plus Hydrogen for Heavy Duty



Hydrogen Fuel-Cell Trains

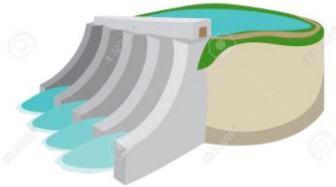


Liquid Hydrogen and Fuel-Cells for long haul Big Ships

Power



Large Battery Systems for Daily Swing (night-to-day)



Hydro-Power as Battery for Small Scale Intermittency



Hydrogen fired CCGTs Clean Back-Up Power for Large Scale Intermittency

Industry



Light Industry powered by Renewable



Heavy Industry powered by Hydrogen from Natural Gas + CCS

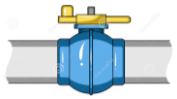


CCS for Industry without other Alternatives

Heat



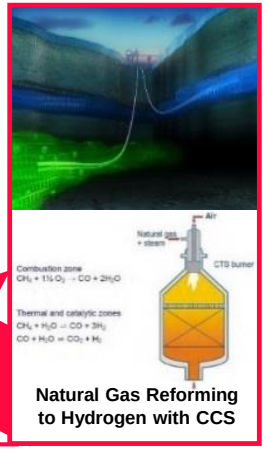
Heat Pumps For Efficient Use of Electricity in Homes



Hydrogen for Efficient Transfer of Energy from Production to End-Users



Hydrogen for Large Scale Seasonal Storage



Natural Gas Reforming to Hydrogen with CCS

Multiple technologies to address the challenge

Low Carbon Solutions

Steinar Eikaas
VP Low Carbon Solutions – Equinor
steik@equinor.com

© Equinor ASA

This presentation, including the contents and arrangement of the contents of each individual page or the collection of the pages, is owned by Equinor. Copyright to all material including, but not limited to, written material, photographs, drawings, images, tables and data remains the property of Equinor. All rights reserved. Any other use, reproduction, translation, adaption, arrangement, alteration, distribution or storage of this presentation, in whole or in part, without the prior written permission of Equinor is prohibited. The information contained in this presentation may not be accurate, up to date or applicable to the circumstances of any particular case, despite our efforts. Equinor cannot accept any liability for any inaccuracies or omissions.