

# North Sea Energy

offshore system integration

## Energy hubs as key to system integration

### From scenarios to spatial blueprints

The North Sea Energy (NSE) program explores synergies between energy activities at the Dutch North Sea. This specific research refines long-term visions into step-by-step development plans for three offshore energy hubs: Hub West, Hub East, and Hub North. These hubs combine energy production, conversion, storage, and transport of electricity, hydrogen, natural gas, and CO<sub>2</sub>. Two future scenarios were developed and nature inclusive design was central to the process. The result: spatial blueprints that show how these hubs could evolve between now and 2050.

#### Two scenario's

1. NSE5 - NAT: The North Sea is central to the Dutch energy transition. It targets 70.3 GW of offshore wind by 2050 — an ambitious goal that requires rapid development, increasingly constrained by limited space in designated hub areas.
2. NSE5-DEC envisions a smaller role for the North Sea in the energy transition, with a 2050 offshore wind target of 45 GW. It is significantly easier to realize in terms of space and nature inclusivity.

#### Our recommendations

1. Integrate spatial planning and nature-inclusive design early on.
2. Further investigate and develop offshore hydrogen production, transport and storage solutions.
3. Enhance transparency and cross-border harmonisation



#### Key findings

**Hub West & East:** Fully electric, hydrogen production upscaling to tens to hundreds of MW

**Hub North:** Focus on deploying GW-scale offshore hydrogen production (up to ~20 GW by 2050) due to distance from shore

**Hydrocarbon production:** Remains relevant until ~2050, mainly from Hub West

**CO<sub>2</sub> storage:** Starts before 2030 (~10Mt/yr), with room to expand to ~25Mt/yr by 2040

**Ecology:** Embedded in all hub designs (nature-inclusive)

**Hydrogen storage:** Considered but not in all hubs. Techno-economically challenging

**Pipelines:** Some may be reused, but new ones will be needed.

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