

North Sea Energy

offshore system integration

The North Sea: Europe's Green Hub

The action agenda for an integrated offshore energy system

The North Sea is pivotal to Europe's low-carbon energy transition towards renewables and energy independence. A reliable, affordable, and low-carbon energy system requires an integrated approach. The North Sea Energy (NSE) program identifies Offshore System Integration opportunities to reduce costs, emissions, and development time. The program focuses on infrastructure visions for four key commodities: electricity, hydrogen, CO₂, and natural gas. The Commodity and Grid Action Agenda sets out key steps for timely system integration. The potential is clear but time is short. With this Action Agenda, the NSE program provides a roadmap to guide decisionmakers, developers, and society toward a well-integrated offshore energy future by 2050.

Challenges and solutions









Delivering this action agenda isn't easy. Space is limited, markets like hydrogen are still emerging, and nine North Sea countries must align.

By treating the North Sea as one integrated system, linking offshore wind, marine energy, CCS, gas, and hydrogen, we can reduce costs, speed up development and minimize environmental and spatial impact.

A well-integrated grid for electricity, hydrogen, CO₂ and gas is key to a renewable energy system.

Three priority actions

- **Shared energy vision:** Align infrastructure and marine space planning with nature and cross-border coordination.
- **Standardization:** Set up NSEC groups to improve interoperability, safety, and cost-efficiency.
- **Supply chain strategy:** Tackle bottlenecks in materials, skills, and port capacity with joint planning and digital tools.

	Grid actions	Commodity	Commodity actions
Electricity	 <ul style="list-style-type: none"> Extend international (HVDC) interconnections Develop an international supply chain and critical material plan Develop offshore market design (bidding zones) Develop cost-sharing and financing guidelines for interconnectors 	Offshore wind	<ul style="list-style-type: none"> Appoint areas for further development Ensure parallel development of supply, (industrial) demand & storage Close the business gap with relevant support mechanisms Develop hybrid offshore tenders
		Marine energy	<ul style="list-style-type: none"> Accelerate scale-up with support schemes & demonstration areas
Hydrogen	 <ul style="list-style-type: none"> Create long-term EU H₂ grid and storage plan Develop legal, regulatory and market frameworks on offshore H₂ Standardize and harmonize H₂ interoperability (quality) 	Green H ₂	<ul style="list-style-type: none"> Create a development plan for offshore H₂ value chains Secure offtake and develop a market framework
		Blue H ₂	<ul style="list-style-type: none"> Define timeline for transition period from blue-green H₂. Align blue H₂ with natural gas demand Provide investment security on blue H₂ assets
CCS	 <ul style="list-style-type: none"> Expand cross-border infra with pan-North Sea body to coordinate efforts Develop regulatory framework & standards for transport and monitoring Develop trade and cooperation agreements (EU-UK) 	CO ₂	<ul style="list-style-type: none"> Resolve long-term cross-border liability and market alignment (EU-UK) Provide long-term market incentives
Natural gas	 <ul style="list-style-type: none"> Create a joint strategy on decommissioning efforts and timelines Improve data sharing on decommissioning Enable certification of pipeline re-use for CO₂ & H₂ 	Natural Gas	<ul style="list-style-type: none"> Create a reliable long-term market outlook for production, import, storage, demand and decommissioning Enable platform electrification Reduce spatial impact of natural gas (decreased helicopter use)
 Targets & planning  Standardization & regulation  Market development  Technology development			

Practical steps to accelerate system integration

The action agenda focuses on two levels:

1. **Commodity actions:** boosting development of electricity, hydrogen, CO₂, and natural gas
2. **Grid actions:** enabling shared infrastructure across borders and sectors

Building the bigger picture

Beyond infrastructure, broader actions are crucial:

Governance: Align rules and goals

Cooperation: Across borders, sectors and disciplines

Space & Nature: Early stage planning with nature and space in mind

Markets: Enable smart investment
Innovation: Pilot and scale new tech

Workforce & Logistics: Fix shortages and bottlenecks

Communication: Promote the North Sea's energy role

The project has been carried out with a subsidy from the Dutch Ministry of Economic Affairs and Climate, National Schemes EZK-subsidies, Top Sector Energy, as taken care of by RVO. Thanks to the project team from TNO, Arcadis, Aquaventus, BP, MSG Strategies, Net Zero Technology Centre, Norce Research, New Energy Coalition and Subsea7. Thanks to all NSE Partners.

