The Institution of Engineering and Technology

The challenges of offshore energy networks in the Humber region

Identifying clean energy network barriers and impacts in the Humber region to achieve net zero by 2050.

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The IET Energy Policy Panel would welcome any comments you may have on the contents of this guide and your ideas for future publications. Please get in touch by emailing **sep@theiet.org**.

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1. About this report

Integrated clean energy networks and large-scale renewable energy projects are essential methods to reach the UK Government's net zero emissions by the 2050 target. The Humber region is the largest industrial cluster in the UK by carbon emissions and therefore must implement large-scale clean energy projects to support these targets.

Fortunately, it is also home to a world class offshore wind resource, which is the focus of this report. Nevertheless, there remain major barriers to timely completion of projects taking advantage of this resource, as well as the potential for negative impacts on local businesses and people, particularly landowners and those who work in tourism, agriculture, and transportation. This case study outlines the key effects on onshore communities as a result of the development of offshore clean energy generation and transmission infrastructure in the region.

The East Anglia region has seen several parallel electricity infrastructure developments. A key lesson from this is that the coastal landscape is a finite resource, and potentially a major pinch point for offshore renewable development. The landfall of cable routes can have significant impacts on coastal communities which can stretch miles inland. Communities have called for joined-up-thinking, but at too late a stage in the regulated processes to have a significant effect. The same issues should be expected in Humber, especially with the addition of hydrogen and carbon capture storage (CCS) pipelines into the mix.

Key messages:

- Humber is an example of where what has happened in East Anglia could happen in other regions.
- Stakeholders such as landowners, local business and the tourism and agriculture sector should be consulted at the planning stage.
- Regulation should facilitate collaboration between local stakeholders and developers.
- Regulatory change should ensure that individual projects are no longer forced onto separate timelines and a regulated mechanism is established to construct and own optimised shared offshore assets.

Projects must be developed simultaneously to minimise the impact on local business, landowners and industry. Coordination across projects is key to avoiding a negative local response and prevent sterilisation of the coastline for future energy infrastructure. Currently, the consent for development is granted through the National Significant Infrastructure Planning, which can over-rule local interests and does not pro-actively consider and protect coastal access.

If interconnector developers wish to set up hybrid networks that link to offshore wind projects they must anticipate where sites will be allocated in future offshore wind auction rounds. This is separate to the regulatory framework for financing interconnectors. Interconnector developers are not encouraged to build infrastructure for prospective offshore wind sites before they are agreed upon, and there are no timelines on which they can base their project to accommodate future connections.

It is important that local stakeholders, such as landowners, businesses and residents, engage in the journey towards net zero, as they have a significant stake in the development of the region.

The current policies and market-based mechanisms for site allocation, planning, connection and routes to market have previously supported competition and growth in the UK energy sector but are no longer suited to meet the increased demands of both offshore and onshore stakeholders. The UK must protect the projects that are currently in the system, ready to deliver the 2030 target, whilst considering which framework is appropriate for projects to meet the 2030-2050 build-out. This is an opportunity to establish a regulatory system that supports the target of net zero, local communities and learns from previous examples to set best practice for future developments.

The report has been prepared for industry, policy and local stakeholders in the Humber region and the wider UK. The IET has been supported by the Renewables Consulting Group (RCG) in researching and authoring this case study.

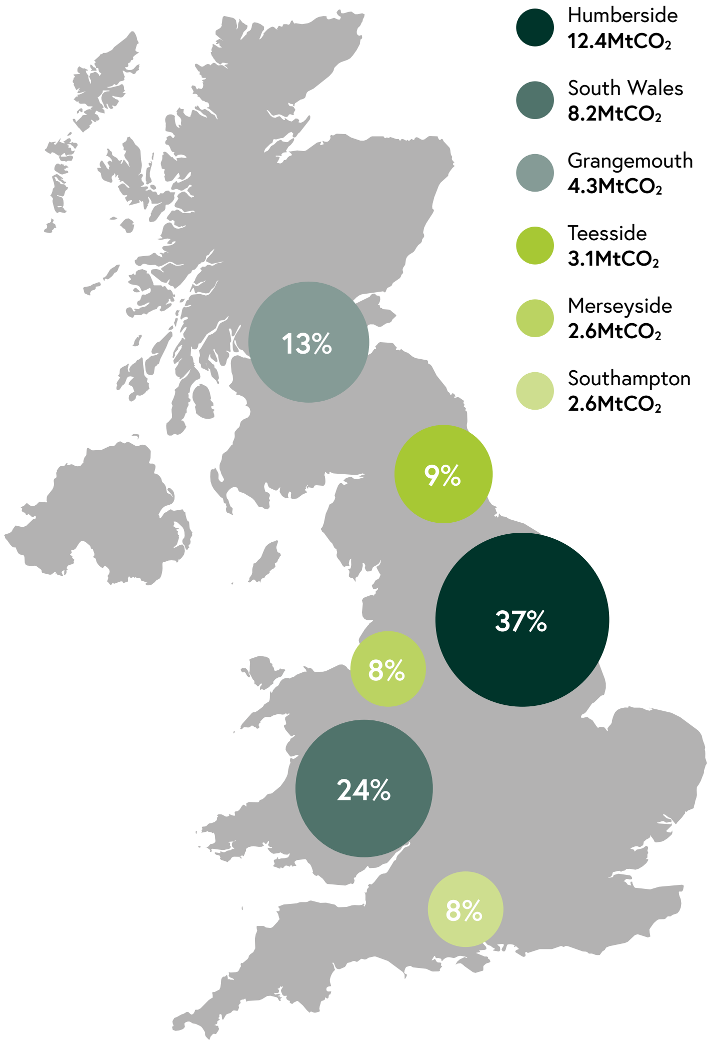
2. Characteristics of the Humber region – why Humber?

The Humber region was chosen for this case study for several reasons. Geographically, it has the potential to lead the way in striving for net zero as it has a world class offshore wind resource. Also, the underground geology offshore could allow for the capture and storage of CO_2.

In relation to benefits to the UK and the local economy, the volume of both existing and planned connections to offshore energy assets, such as offshore wind farms, is large. A significant amount of work will be needed to decarbonise the region as the UK moves towards net zero by 2050. Lastly, once local demand is met, there is potential for the region to become an exporter of energy to the rest of the UK, potentially helping political efforts to level up the region.

The Humber region is **the largest carbon emissions polluter of any industrial cluster in the UK at over 12.4 $MtCO_2$ per year**, equating to 37% of UK wide emissions.[2] Upgrading the energy infrastructure to implement more low carbon technologies is critical to reaching the national target of net zero by 2050. For this reason, Humber is taking a leading position on carbon reduction through initiatives such as Zero Carbon Humber, which uses shared hydrogen and CO_2 transmission, and integrated offshore carbon capture, utilisation and storage (CCUS).

Largest industrial clusters by emissions.[1]



[1] BEIS Industrial Clusters Mission Infographic (2019).
[2] Further information available on what drives these emissions.

Approximately 7% of all operational offshore wind capacity in Europe is located off the Humber region, and an additional up to **25 GW** could seek connection within this same region.

The Humber region also remains one of the pre-eminent offshore wind regions in the UK and Europe, with approximately 28% of current operational and potential project capacity in the UK making landfall in East Yorkshire and Lincolnshire. Beyond projects already in the initial stages of development, an additional **5 to 25 GW** of offshore wind capacity may be required in the Humber region to meet net zero by 2050.

Land use and access required for cables and pipelines

The Humber area is a mix of industrial and rural sites, with a significant tourist industry. In 2019, it was calculated that tourism was worth £9 billion to the Yorkshire economy with almost 130 million tourist day visits to the region.[3 4]

Tourism in East Yorkshire and Humber accounted for **10%** of domestic trips in the UK, and **£720m** in revenue.[5]

Onshore cable construction works at the UK's Dogger Bank 2.4 GW offshore wind farm.

The coastline between Barmston and Withernsea, which is central to the area being examined in this case study, is relatively uncongested compared to other parts of the Humber region regarding cable and pipeline landing points. It provides good proximity to the onshore electrical grid and gas networks. This 36 km of coastline is home to at least 28 coastal holiday parks (with more slightly inland), two large golf courses, and numerous other entertainment facilities.

There are few available major onshore substations for offshore wind projects to connect to in coastal areas of the Humber region. Developers will aim for the shortest reasonable cable route from the landing point to an onshore substation in order to minimise overall project costs and disruption. This means that previously uncongested areas will become more congested as development progresses. The Dogger Bank project cable routes, for example, involve cutting cross country, affecting **landowners 20 km** from the shore. The Eastern Link 2 HVDC cable will impact landowners up to **58 km from the shore**.

Landowners up to 60 km inland can be impacted by offshore infrastructure projects.

There is increased adoption of corporate power purchase agreements (PPA) in offshore wind. A corporate PPA (or electricity power agreement) is a contract between two parties, one which generates electricity (the seller) and one which is looking to purchase electricity (the buyer).[6] Because of the structure of the electricity market in the UK, purchasing a corporate PPA and building a private wire network instead of using the existing grid presents a much cheaper way to access electricity for large industrial energy customers. The Humber region has begun to see this type of corporate PPA and will continue to do so in its push toward net zero. An unintended side effect of this trend is to incentivise developers to avoid connecting to the grid and running separate network infrastructure directly to customers. The Humber region is congested but has access to substation facilities such as P66, VPI and Total refineries (as shown on the map in section 3) in North Lincolnshire. Alternatively, it may need a connection at preferred access points around Barmston with long distance onshore cables covering multiple jurisdictions.

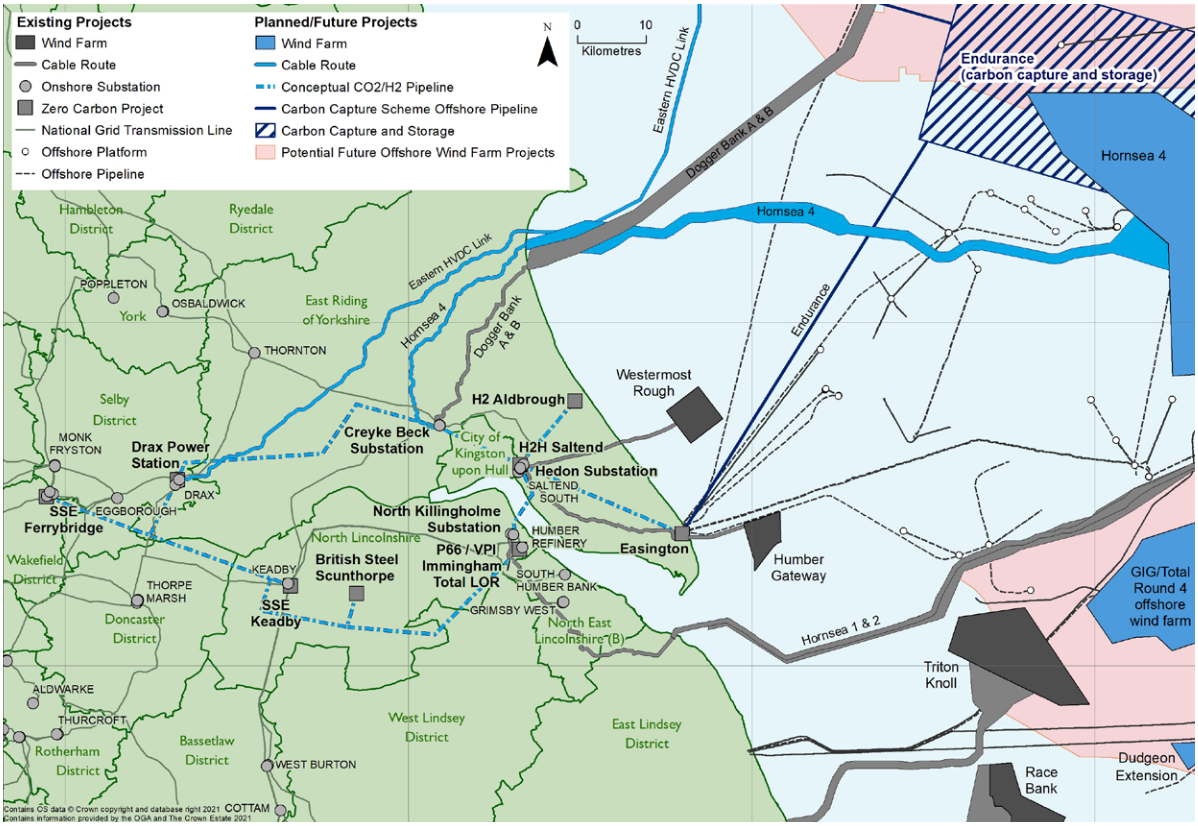
There are multiple projects ongoing in the Humber area already. For example, a shared pipeline network will transport hydrogen from Hull to industrial customers and export captured carbon emissions to the Northern Endurance Partnership's CCUS site in the North Sea. Eight major sites are involved in the Zero Carbon Humber development.

The IET Offshore energy infrastructure landscaping report for the UK and neighbouring waters, published in February 2021[7], identified the importance of integrated offshore energy networks for the UK as well as barriers preventing cohesive growth. The report looked at the integration of energy assets in the North Sea, outlining the need for projects to be developed simultaneously to minimise the impact on local businesses, people and industry. It also explored how to maximise the efficiency of this project. This case study follows on from the landscaping report, highlighting the specific barriers to energy integration in the Humber region, and the potential impacts on the interests of local authorities, landowners and communities.

3 Tourism data report July 2019 (yorkshire.com).
4 Tourism data report March 2020 (yorkshire.com).
5 This is the Yorkshire beach where cables for Britain's biggest wind farm will be laid | Yorkshire Post.
6 Power purchase agreement - Wikipedia.
7 The IET lighthouse series – coordinating offshore energy systems.

3. Humber area map, including energy project potential

Figure 1: The map and table show reasonable project expectations in the Humber region.



Status	Projects	Technology	Capacity (MW)
Operational	Operational OSW	OSW	2,670
Consented	Consented OSW	OSW	5,256
Published/ In development	Hornsea 4	OSW	3,600
	Eastern Link 2	ITC	2,000
	Endurance	CCUS	N/A
	GIG/Total Round 4	OSW	1,500
	RWE Round 4 Site A	OSW	1,500
	RWE Round 4 Site B	OSW	1,500
	Endurance Expansion 1*	CCUS	N/A
	Endurance Expansion 2*	CCUS	N/A
Future	Additional Future Offshore Wind Projects**	2050 Net Zero Low OSW scenario	5,000
		2050 Net Zero Medium OSW scenario	15,000
		2050 Net Zero High OSW scenario	25,000

*Future expansions mooted by project developers.
**Estimation based on historic and planned OSW allocation in the UK. Actual expected within the 5-25 range, depending on how sites are allocated around the UK, and how successful the UK is at achieving its national goals.

4. Project development scenarios

4.1 Current projects in development

Before 2031, six major commercial scale energy projects are due to be established in the Humber region as greenfield sites or as connections to operational facilities requiring significant onshore construction works. Two new major offshore energy connection points have been proposed as part of plans for the Hornsea 4[8] offshore wind farm and the Endurance CCUS project. High Voltage DC Link cables to Scotland will make landfall in the East, and further offshore wind connection points may also be proposed in the Humber region for new projects announced in 2021.

Generator connections versus interconnectors: explainer

Offshore wind farms need large connection circuits to bring their power to shore. The Great Britain regulatory model for building and financing these sees them developed and financed alongside the wind farm project, but then owned separately and paid for as part of the electricity price for the electricity generated. Interconnectors, conversely, connect the GB electricity market with others, and the way they are regulated and remunerated is different, reflecting their business model trading energy between different markets. Finally, there are several offshore cable projects called High Voltage DC links which are intended to form part of our national transmission system, strengthening the connection between renewables in Scotland and England. These are financed and paid for as part of the regulated national network. Whilst technically all three may be similar, the way the networks are regulated, financed and paid for means it is currently not possible to create hybrid projects which might have two purposes. For example interconnecting two markets and connecting up several wind farms along the way.

Future project development – offshore wind

The UK Committee on Climate Change (CCC) has suggested that between 65-125 GW of cumulative offshore wind capacity is required across the UK by 2050 for the UK to reach net zero, as part of the 6th carbon budget (December 2020).[9]

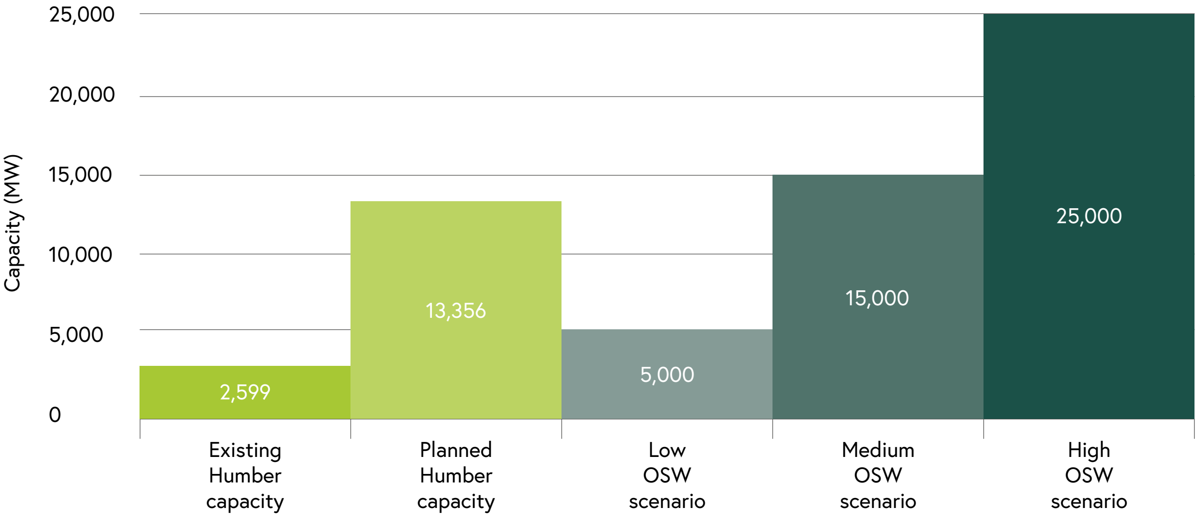
Reaching 65 GW by 2050 would require an average of over 1,800 MW per year of new capacity installed from today (2021), or 1,250 MW installed annually from 2030. Achieving 125 GW by 2050 would require over 4,200 MW to be installed annually from 2030, similar to the current forecast for installation rates in the UK from 2026 to 2030. However, 2599 MW were installed in the last five years.

It is suggested, due to feasibility and wind resource availability, that the **Humber region should deliver around 32% of UK offshore energy capacity through offshore wind**. On the road to 2050, this could add up to around 20 to 40 GW of capacity, or 5 to 25 GW more than is currently planned or in operation.

[8] Hornsea Four is an offshore wind farm that Ørsted is proposing to develop in the North Sea, approximately 69km off the Yorkshire Coast. Collaborating to accelerate progress. bp, Eni, Equinor, National Grid, Shell and Total formed a new partnership in 2020, the Northern Endurance Partnership (NEP), to develop offshore carbon dioxide (CO_2) transport and storage infrastructure in the UK North Sea, with bp as operator.

[9] Sixth Carbon Budget - Climate Change Committee (theccc.org.uk).

Figure 2: UK 2050 OSW targets and additional capacity required.



Current offshore wind allocation frameworks support the development of sites up to 1,500 MW in capacity. If new sites continue to be capped at 1,500 MW, a **minimum of four** additional commercial scale projects will be required in the Humber region. In a high offshore wind scenario, up to 25 GW of new capacity would be required in the Humber region, or **approximately 17 new 1,000 MW commercial scale projects, or approximately one project every two miles across the Humber region**.

Congestion of planned cable routes in and around Barmston may require offshore wind to install cables between Barmston and Withernsea, enabling access to the Humber Industrial Cluster, through a national tourism hotspot. Under the high offshore wind scenario, 17 new offshore wind projects would potentially require transmission infrastructure to land along this coastline. In this case, the onshore grid network would need to be upgraded to accommodate this additional generation from offshore wind as the capacity would be exceeded by energy generated. Significant numbers of cable connections between Barmston and Withernsea for multiple new sites is therefore inevitable, under all regulatory frameworks. Therefore, streamlining and coordinated planning can reduce the number of construction sites and their impact on local communities – including farmers and other landowners.

Up to 17 new offshore wind cable connections may be required along the 36-mile Barmston – Withernsea coastline. **One set every two miles.**

4.2 Future project development – gas networks

Hydrogen and CCS projects are relatively new, with significant growth anticipated. There are two types of hydrogen production projecs which could be imagined in the North Sea. Blue hydrogen projects, such as The Endurance CCUS project, envisage making hydrogen through reforming natural gas and capturing the CO_2 produced using CCUS. This is just one aspect of the Zero Carbon Humber initiative that will develop a hydrogen and CO_2 hub between major industrial facilities in the Humber region. A shared pipeline network will transport hydrogen from Hull to industrial customers and export captured carbon emissions to the Northern Endurance Partnership's CCUS site in the North Sea. Eight major sites are involved in the Zero Carbon Humber development.

The Endurance project will need to expand to support further reductions in carbon emissions for the Humber region. Carbon capture and storage is technically suited to development in far offshore areas, which also naturally limits people's exposure to the infrastructure.

Another business model being explored around Europe is exploiting the economies of scale of offshore wind to locate hydrogen production through electrolysis ('green hydrogen') offshore. A large wind farm could power offshore electrolysers, hydrogen would be transported to shore through a pipeline and injected into the onshore gas grid, like the Dutch NorthH2 project. Our regulatory model does not consider the possibility that projects might be financed on the basis that they can produce both electricity and hydrogen.

4.3 Future project development – interconnection

The Eastern Link 2 – a domestic offshore cable connecting Scotland to England through an offshore route – is also in development, improving the flow of power from new offshore wind farms off the coast of Scotland to population centres further south, throughout the UK.

International electricity interconnections are not currently present within the studied area, however they could be proposed within the timeframe under consideration.

4.4 Future project development – integrating future projects to accelerate development and minimise disruption to local communities

Integration of the Endurance CCUS project and offshore wind has benefits for all in each development, with the potential for surplus generation from offshore wind sites providing clean power to the Endurance infrastructure. Offshore wind projects located near to the Endurance will be best placed to provide surplus power through direct connection and integrated transmission systems. However, the current site allocation processes for CCUS and offshore wind do not facilitate integrated development that would maximise the clean energy potential of the Endurance project.

Offshore wind developers can build sites in large bidding areas where there is an opportunity for cross-industry innovation, but at present, there is no regulatory guidance or framework on allocation in association with other offshore energy structures. Additionally, the competitive allocation process, designed for multiple bidders and non-clustered sites, means developers with plans to connect offshore wind farms to CCUS projects may not win these sites, eliminating the opportunity to collaborate.

Projects following similar onshore cable or pipeline routes could be phased or allocated together. Encouraging shared infrastructure would avoid construction of new routes affecting local communities and preventing landowners from accessing their own land for business, tourism or agriculture. Future offshore wind projects designed to power industrial facilities could be allocated in consideration of previous planning of hydrogen and CCUS transmission systems, helping to identify onshore substation developments with the greatest need for additional clean power. Telecommunications cables currently land to the north and south of the Humber region and may also need to be considered in coordination with energy projects.

Regulatory change is required to ensure that individual projects are no longer forced onto separate timelines and a regulated mechanism to construct and own optimised shared offshore assets is established. Coordination of energy project planning can improve the allocation of wind resource areas and CCUS sites facilitating the development of integrated projects that will deliver surplus power, for example to local CCUS projects or to UK PLC.

5. Regulatory barriers to energy integration - pulling holistic thinking apart

Unfortunately, separative development policies in the UK prevent the co-ordination required to appropriately allocate coastal resources. Under current policy, the regulatory framework allocates the offshore site area, grid connection (for electricity), and a market mechanism is required.

Consent is typically granted through Nationally Significant Infrastructure Planning (NSIP) which can over-rule local interests. Our systems do not currently pro-actively consider, coherently protect and share coastal access. Projects are developed, through the necessity of multiple frameworks, on a project-by-project basis, each securing all the pieces of its own respective jigsaw before it proceeds to build.

Figure 3: Regulatory requirements for new energy infrastructure projects.

Projects	Technology	Offshore site allocation		Planning process			Route to market process		
		Crown Estate competitive leasing rounds	Crown Estate leasing* and licensing	TCPA90	DCO	Grid connection	BEIS grant funding	BEIS CfD Tenders	Merchant funding
Offshore Wind Projects	OSW	✓	✗	✓	✓	✓	✗	✓	Optional
Eastern Link 2 HVDC	Domestic interconnector	✗	✓	✓	✗	✓	✓	✗	✓
Endurance	Offshore CCUS	✗	✓	✓	✓	✗	✓	✗	✓
Zero Carbon Humber	Gas transmission (primarily onshore)	N/A	N/A	✓	✓	✗	✓	✗	✓

Figure 4

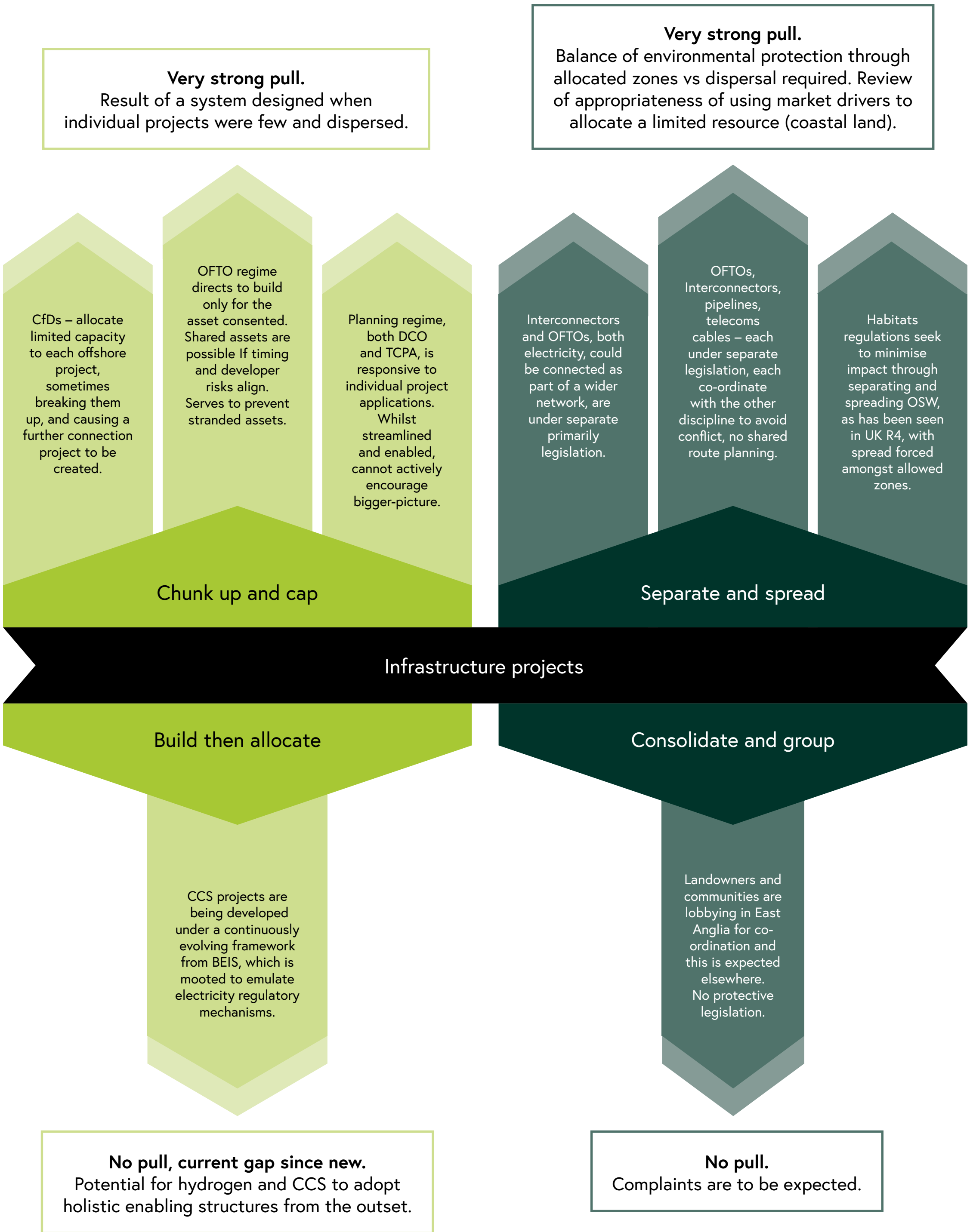


Figure 1 demonstrates that the current legislative systems covering offshore energy deployment in the UK are driving projects to think individually, pulling apart plans for integration, limiting the potential of clustered offshore wind development and integration with other technologies.

Hub and spoke connection designs, whereby developers establish export cable systems to shared offshore connection points as opposed to onshore substations, would reduce the number of onshore landing points, from the potential one per 2 km described above to a more manageable 3 to 5 landings along the entire coastal stretch. They could also support the direct delivery of power to other offshore assets such as the Endurance CCUS platforms if located within a corresponding area. This would be less disruptive to local businesses and tourism within the area.

As shown in Figure 1, no legislative systems for offshore energy technologies in the Humber region currently enable the development of the whole picture. The developments all fall under NSIP legislation, meaning there are no protections for local stakeholders as they can be overruled. This was identified by stakeholders in East Anglia, who at the end of the respective processes, found themselves exposed to multiple parallel disruptive onshore cable routes for prospective offshore wind, interconnector and coastal nuclear power projects. They are now protesting this, with the issue raised to local MPs and Government groups set up to address this issue. The East Anglia wind farm representatives have recently met with the Secretary of State due to this issue.

Habitats Regulations Assessment[10] (HRA) regulations will prevent future development of CCUS projects in the immediate vicinity of wind farms, despite potential integration and coexistence of the technologies. Shared infrastructure for carbon transmission and offshore wind cables is also only possible where the CCUS project is built after the offshore wind farm. However, this cannot happen in reverse due to current regulation. CCUS projects themselves do not yet have a formalised development process, though the UK Government has set out initial commercial principles for projects based on a similar model to energy transmission, with the carbon transmission and storage service (T&SCo) operator responsible for ownership of both onshore and offshore assets.[11]

In relation to the above, the UK's existing policy and regulatory framework does not envision the same sort of hydrogen hub projects which are being proposed on the European continent, with hydrogen being produced offshore. If the regulatory framework within the UK continued to make it hard to land electrical connections, as this case study is proposing, OSW developers may move the market by exporting hydrogen to Europe. The Netherlands approach, as shown above, has created conditions where hybrid projects can be considered.

The electricity market mechanism for offshore wind projects exacerbates issues surrounding shared transmission networks. Whilst a developer can secure a 1,500 MW project under the Crown Estate site allocation process, they may only secure a proportion of the total project capacity under the competitive Contract for Difference (CfD) auction enabling the project to progress to construction. The remaining capacity can be developed at a later date through a separate CfD auction or supported through merchant financing. Though merchant funding is becoming more viable for offshore wind projects, there remains a significant risk relative to subsidised development. Subsequently, developers mandated to split projects into phases by CfD capacity allocation are likely to develop each phase separately, increasing the likelihood of additional transmission infrastructure both on and offshore.

Should interconnector developers (domestic or international) wish to establish hybrid networks that link to offshore wind projects, they must anticipate that sites, which will be allocated in future offshore wind auction rounds, will be located within connection distance of a planned connection hub. To add to the confusion, the regulatory framework of development and financing interconnectors is a separate framework. Domestic and international interconnectors and transmission connection assets are separately regulated, built only in accordance with an approved needs case. As a result, interconnector developers are not encouraged to build infrastructure for prospective offshore wind sites before they are consented. With the consenting process managed on a project-by-project basis, there are currently no formal timelines from which an interconnector developer can base their project with a view to accommodate offshore wind connection in future.

Crown estate site allocation rules limit the number of sites that can be built in certain regions, spreading them out, which prevents shared infrastructure amongst projects. This severely limits options to develop offshore wind clusters that could share transmission assets, meaning more clusters must be built locally. The Offshore Transmission Owner (OFTO) regime favours individual development and does not actively facilitate integration with interconnectors. Project developers are incentivised to develop and construct only what individual project needs, not to look at the big picture. Streamlining is allowed, but the conditions for this to occur mean that it has not been adopted, so it must be made easier.

The current legislative process can therefore be seen to not only hinder the efficient build-out of future energy projects, but also fails to protect local stakeholders. The variety of projects being developed in the Humber region, as well as the potential for integrated energy projects and detrimental impact on local people and business, highlights the severity of the issue both here and potentially at similar locales in the UK.

[10] Habitats regulations assessments: protecting a European site (GOV.UK).
[11] CCUS transport and storage services licence: draft commercial principles (publishing.service.gov.uk).

6. Lessons learnt – the Dutch model

The Dutch undertook a fundamental re-structuring of their offshore wind regulatory framework, due to limited offshore resources. This change has also benefited the coastal cable co-ordination of the energy industry and has a single liaison point for other developers such as telecommunications. This change has maximised allocatable capacity and serves as an example of how UK regulation could be further streamlined by integrating into a holistic framework for project development.

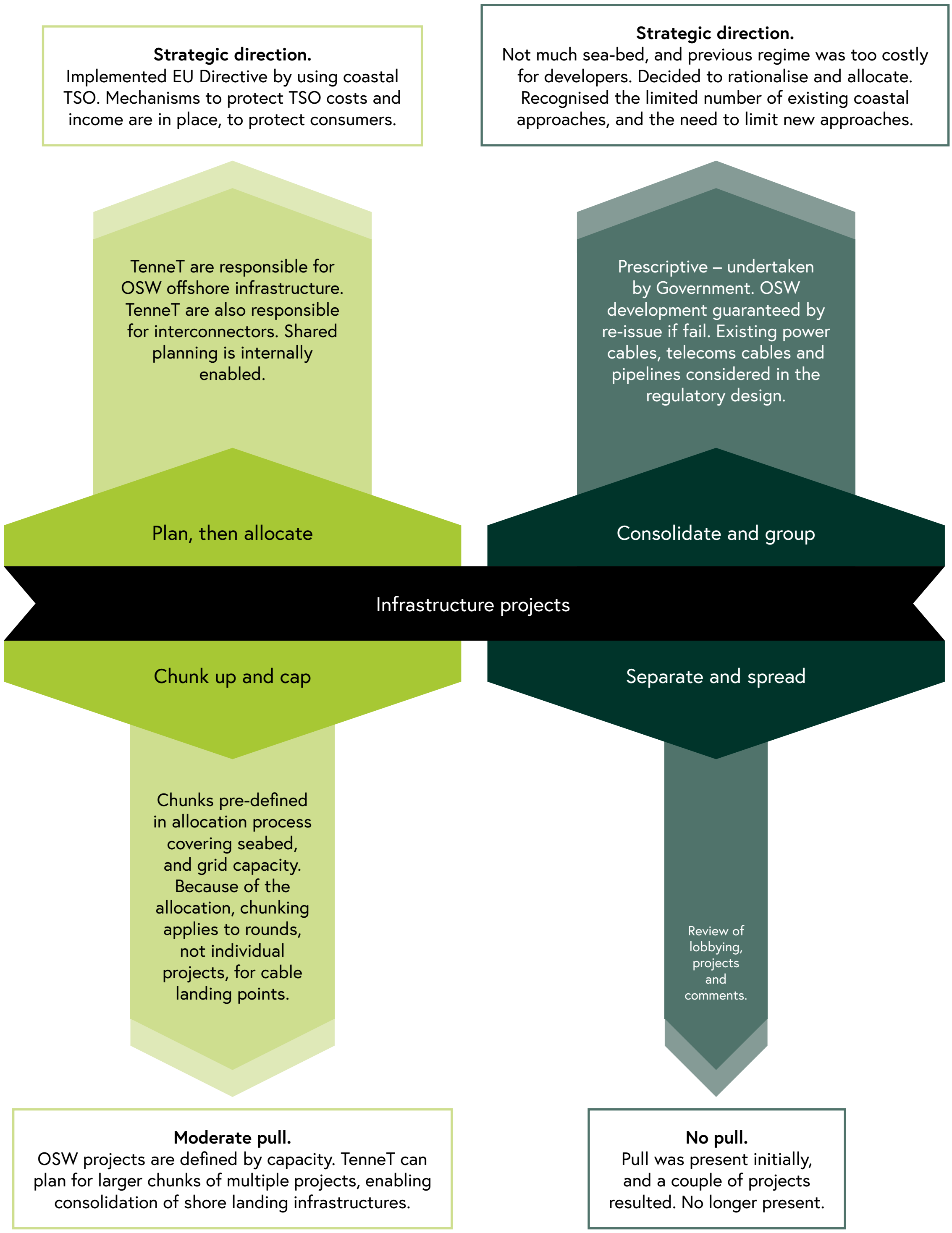
The first Dutch offshore wind project, the 17 MW Irene Vorrink, became operational in 1997. In the years that followed only a few projects were built. In July 2015, the Offshore Wind Energy Act came into force and initiated a substantial increase in the number of projects. Around 4.2 GW of capacity has secured a route to market through this framework to date.

A key driver to the introduction of new legislature was the Energy Agreement of 2013, in which over 40 cross-sector organisations laid the basis for a robust, future-proof energy and climate policy for the Netherlands. The Agreement included bolstered renewable energy targets of 14% of gross final energy consumption by 2020, in line with the EU regulation, and 16% by 2023.

The roadmap laid provisions for the development of 3,500 MW of offshore wind, expanding the country's total installed capacity to 4,500 MW by 2023.

As early as 2009 the Dutch Government recognised the need to coordinate offshore wind development with other marine industries and stakeholders. As part of the Integrated Management Plan for the North Sea 2015, the Ministry of Transport, Public Works and Water Management set out the obligation that cables and pipelines for offshore wind projects, or other offshore infrastructure should be bundled closely together, to minimise potential impacts on both offshore and onshore stakeholders.

Figure 5: The developments of infrastructure projects.



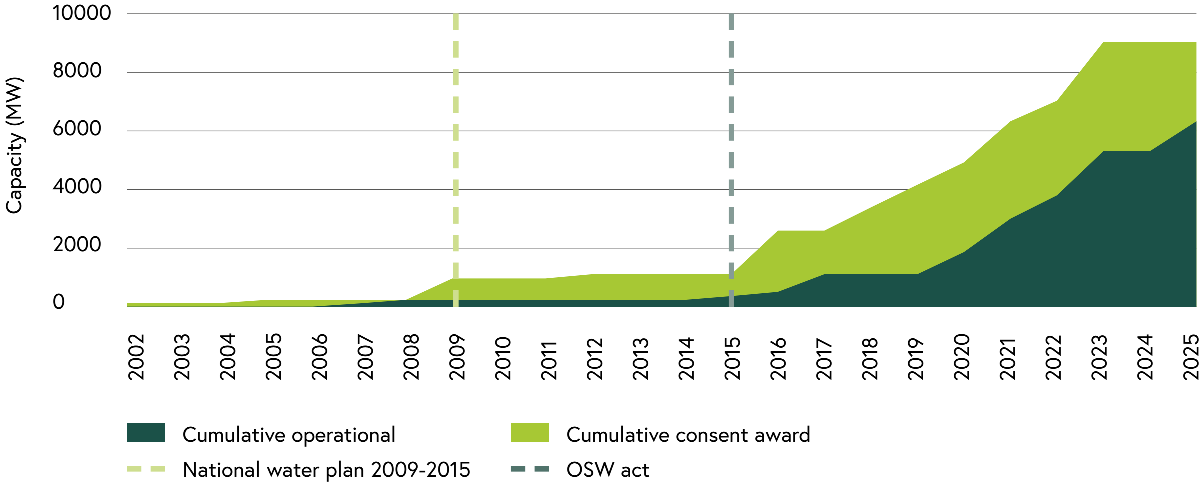
Offshore wind development areas would be selected by the Government authorities mandated to consider the interests of other stakeholders in a coordinated approach, despite the initial priority to allocate 6,000 MW of offshore wind capacity by 2020.

The Dutch Government identified the need to implement a centrally planned project allocation system for the wind energy areas of Borssele and Ijmunden Ver in 2009 and began drafting legislation to only award sites within those zones. A halt was also placed on new project development in other areas, as not to undermine the benefits of a coordinated approach through maritime spatial planning.

A roadmap[12] enabling the expansion laid out in the Energy Agreement to be achieved was presented to the Dutch Parliament in 2014. It influenced legislature

[12] Letter to Parliament Progress of implementation of Offshore Wind Energy Roadmap 2030 | Parliamentary document | Government.nl.

Figure 6: Cumulative conseted and operational OSW capacity in the Netherlands*



changes and formed the basis of the 2015 Offshore Wind Act, and the new Electricity and Gas Act (STROOM). Key features of the roadmap included:

- **Offshore grid infrastructure** being constructed and operated by the TSO, TenneT.
- **A new schedule** of 700 MW of capacity to be tendered annually.
- **Repeal** of previously granted licenses.
- **Newly designated** licence areas.
- **Combined application** procedure for licence and subsidy (SDE+).
- **Offshore wind areas** required to consider relevant interests, including existing sections of electricity grids, pipelines, telecommunications cables, and interconnectors.

Offshore wind and energy planning is now conducted under the RVO (Netherlands Enterprise Agency). This central authority also supports the planning for integrated development of offshore wind, CCUS and hydrogen projects. The RVO contributed to the establishment of an energy system outlook from 2022-2027[13] that will designate new offshore wind areas with the purpose of maintaining feasibility for connection to CCUS and hydrogen projects.

Discussion and applicability to the Humber region

The Dutch Government set out clear directives for its offshore wind industry through its policies and supporting roadmaps to ensure there was no undermining between different clusters. Marine spatial plans delivered through the National Water Plan presents details on where and when new offshore wind farms will be tendered and commissioned, amongst other items. The process for offshore grid development is a centralised process managed by the transmission system operator (TSO), TenneT, which enables it to contribute to site selection planning and optimise transmission efficiency from electrical and practical perspectives. An aim of the 2015 roadmap was to accelerate deployment of OSW but also to integrate activities that take place at sea for wind farms and connect them to the electricity grid at the lowest possible social cost. Overall, the Government has provided clarity to all stakeholders and ensures certainty for wind farm developers which has led to an acceleration in offshore wind capacity installation. Similarly, the UK Government raised its offshore wind target in 2020 from 30 GW to 40 GW by 2030. Given that the grid connection process in the UK will be key to whether this target is achieved, policy change should be considered. After recognising the need for a more coordinated approach to project development, it took around six years for Dutch authorities to implement the relevant legislation.

Whilst the UK Government has recognised the need for more offshore network coordination through assessments such as the Offshore Transmission Network Review, it is far from implementing a revised approach to defining wind development areas, and cable and pipeline routes. With new projects under-development in the Humber region that are forecast to be installed in 2034, a shift to a centralised site allocation system may not be a sustainable approach to help the UK reach offshore wind targets for 2030. However, the current processes in the UK continues to push various sectors further from a coordinated approach, as opposed to accelerating a six-year implementation process for coordination, as the Dutch had.

Maritime spatial planning and the offshore wind roadmap have been used successfully by the Dutch Government to provide certainty in achieving the capacity targets that have been set out. The roadmap clearly identifies which sites selected through a coordinated planning process are being tendered and when. This provides stability for investors, as well as landowners and businesses.

[13] Netherlands Climate and Energy Outlook 2020 - Summary | PBL Netherlands Environmental Assessment Agency.

7. Conclusions

Clean energy generation and fuel technologies are vital in supporting the UK transition to net zero by 2050. The adoption of large-scale energy infrastructure required to meet the demand of reducing emissions presents many challenges to efficiently coordinate the deployment of innovative and commercial projects.

Although there will be some disruption – in certain cases, significant disruption – to stakeholders and sectors such as tourism and farming, this is far outweighed by the need for clean energy technologies to reduce the effect of climate change in the area.

In order to minimise the number of land concessions required, landowners in East Anglia have argued for better planning, and highlighted the absence of project allocation or planning legislation that encourages cooperative offshore energy project development. The mandated development of energy projects in the Humber region will result in a massive strain on local stakeholders without coordinated planning.

The potential disruption associated with offshore energy project development in the Humber region highlights the wider issue of separative development policies across the UK. Lessons can be learned from East Anglia before conflicts arise.

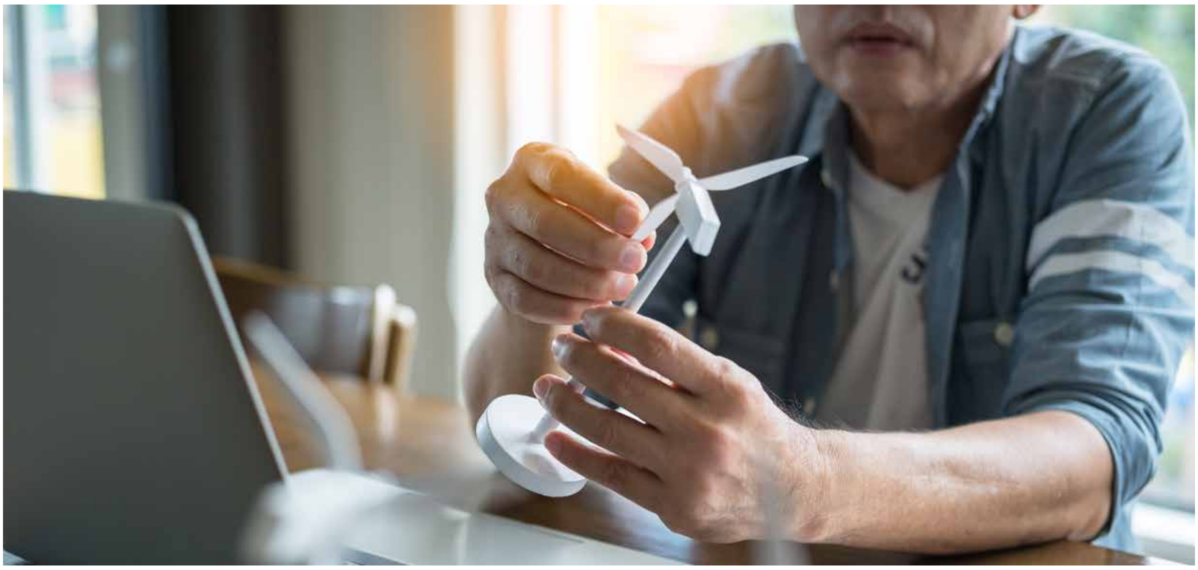
The Humber region is already home to one of the leading offshore wind industries globally. The region also has the potential to be a global hub for CCUS projects, decarbonising one of the largest industrial clusters in Europe. The strength of the offshore energy industry in the region has in-part intensified issues around separative project legislation, as operational and consented projects have congested specific cable and pipeline landing points, increasing the potential for future sites to make landfall in other areas with disruptive effects on coastal stakeholders in the Humber region's tourism hub. While current policies and market-based mechanisms for site allocation, planning, connection and routes to market have previously supported competition and growth in the UK energy sector, they are no longer suited to meet the increased demands of both offshore and onshore stakeholders.

The Dutch offshore energy market has demonstrated that a joined-up approach to legislation can be effective, but early government level involvement is required to implement legislation that can encourage sustained development and avoid decision making paralysis when issues surface later. The UK must protect projects that are currently in development to deliver the 2030 target, whilst considering what framework is appropriate for future projects to meet the 2030 to 2050 build-out.

The current regulatory model, consisting of multiple separate markets, does not recognise a market for one of the scarcest resources the UK owns, its coastal access for gas and electricity transmission infrastructure. In order to scale up to the extent the UK requires to meet its targets, this resource needs to be respected, otherwise, early use will present a new barrier to later projects.

The authorities managing the above markets, The Crown Estate, Ofgem, BEIS and the Secretary of State, are positioned to consider future project allocation processes holistically, minimising the risk for project developers' investment in meeting previously established planning and route to market mechanisms. For future developments, an overarching coordinated approach would limit the number of separate onshore cables and pipelines, whilst maximising the efficiency of both offshore wind and CCUS projects in the North Sea.

8. Acknowledgements



This report was commissioned by the IET's Energy Policy and Digital Communications Panels, expert volunteer groups that create thought leadership and policy advice to inform Government, regulators, energy, and communication sectors. The authors of this report are Elaine Greig, Maxwell Clarke and Arlen McCausland of RCG.

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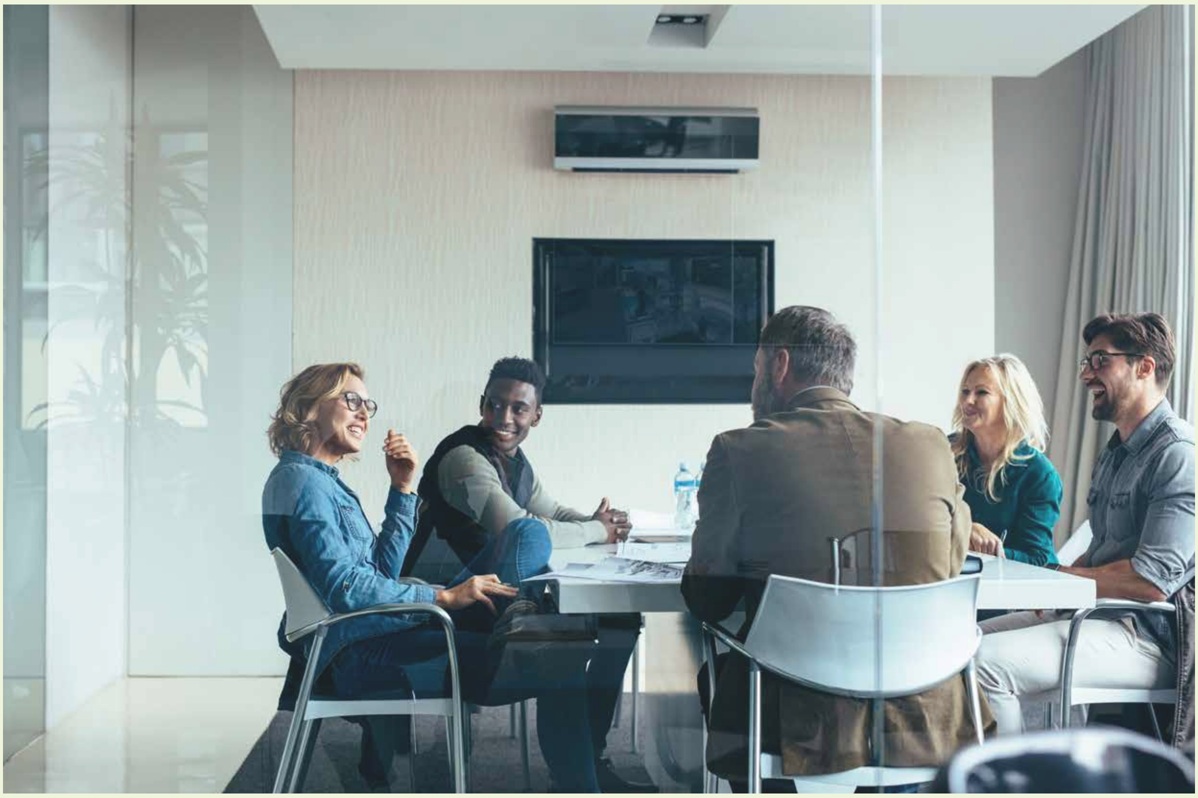
9. About the IET



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