

Future of Offshore Wind

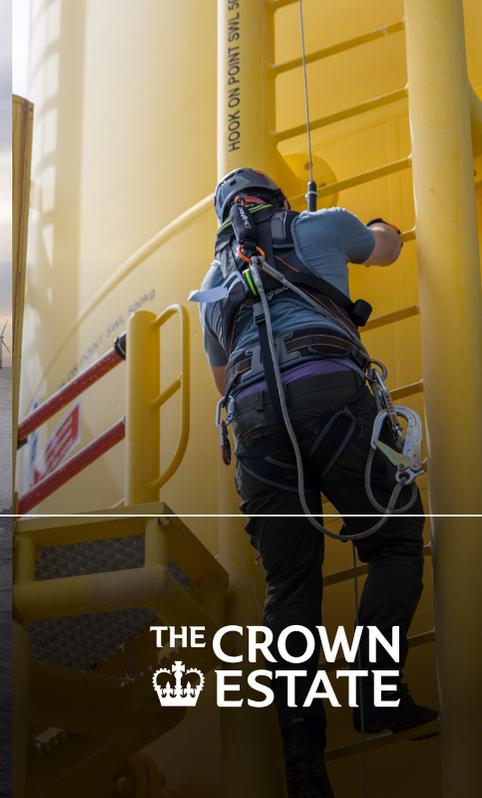
Considerations for development and leasing to 2030 and beyond

 Marine Delivery
Routemap

A Marine Delivery
Routemap publication

A report on behalf of Great British Energy: The Crown Estate

September 2024



THE CROWN
ESTATE

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"I am delighted that Great British Energy is partnering with The Crown Estate to write the next chapter of the UK's renewable energy story."



Juergen Maier
Chair, Great British Energy

Foreword

The UK is amongst the world leaders in harnessing the power of offshore wind, powering homes and businesses across the country, supporting the energy transition and attracting billions of pounds of investment into the economy. The scale of the sector is now very impressive, providing clean energy to millions of households and employing tens of thousands of people.

Great British Energy sits at the heart of the government's mission to accelerate this success and make Britain a clean energy superpower. It will be owned by the British people, for the British people, with the ability to invest to support clean power projects and create many thousands more valuable careers across the UK.

I am delighted that Great British Energy is partnering with The Crown Estate to write the next chapter of the UK's renewable energy story. There is a huge prize on offer and by bringing together Great British Energy's strategic industrial policy with The Crown Estate's internationally-recognised expertise and management of the seabed, we can ensure Britain continues setting the pace for global offshore wind. This will be backed by £8.3 billion of new money for Great British Energy, alongside new borrowing and investment powers for The Crown Estate which are currently being brought forward in Parliament.

To achieve our goals, we need to push ourselves to move faster and work harder to reach our net zero targets, unlock investment and support the growth of local supply chains. This report marks an exciting step towards unlocking the next 20-30GW of offshore wind pipeline – enough power for the equivalent of almost 20 million homes. Not only does it plot a course to bringing this new capacity to market by 2030, it sets out a number of important proposals to accelerate and de-risk the process for developers and maintain the attractiveness of the UK market for international investors.

There are exciting times ahead, both off our shores and within the onshore communities that stand to benefit from the continued success of UK offshore wind. As we continue to build Great British Energy, I look forward to working with industry and other partners for the benefit of all British people.

Juergen Maier
Chair, Great British Energy

"The UK's offshore wind industry has a long track-record of working together to rise to new challenges, and the shared depth of experience and expertise leaves us well-placed to face the future."



Julia Rose
Head of Offshore Wind
Marine, The Crown Estate

Introduction

UK offshore wind is a success story on a global scale. Each turbine rotating off our shores represents decades of commitment, research, expertise and ingenuity which have combined to make the UK one of the most attractive markets for offshore wind in the world. And with each new turbine comes more investment into the UK economy, more jobs and more onshore opportunities for coastal communities.

At The Crown Estate, we're proud of the role we have played in supporting the growth of a sector that now produces enough renewable energy for half of all UK homes and is set to employ more than 100,000 people by the end of the decade.

Given this success, it is no surprise that offshore wind has become the cornerstone of the UK's drive to net zero. But with this comes the need to do more than ever before, and at a faster pace. This report sets out how seabed rights for 20-30GW of new offshore capacity could be brought to market before the end of the decade to support the UK's net zero and energy security ambitions. It looks at the prime areas of opportunity for new wind farms and considers how a mix of fixed, deep-water fixed and floating wind projects might be brought forward and developed over the coming years.

Being able to deliver against these ambitious targets means more than simply bringing new areas of seabed to market. It means challenging ourselves to consider

how we could tackle some of the wider systemic challenges and support a move towards more predictable, coordinated offshore wind development, while enabling nature recovery amidst a changing climate.

If this sounds like a major undertaking, it's because it is. But the UK's offshore wind industry has a long track-record of working together to rise to new challenges, and the shared depth of experience and expertise leaves us well-placed to face the future.

Part of the solution lies with the development of a new Marine Delivery Routemap, with our early thinking on this published alongside this report. This exciting work, founded in partnership, builds on The Crown Estate's world-leading expertise and marine data capabilities to plot a course for a long-term vision for the competing demands on our seabed, while protecting and enhancing the marine environment. Further publications are planned as part of this work on other key sectors, such as carbon capture and storage (CCS) and minerals. We will also be taking a more detailed look at our approach to nature, including how we can continue working in collaboration with others to deliver restoration and recovery.

Continued policy support will also have an important role to play. For example, the Contracts for Difference regime has helped underpin the success of UK offshore wind, providing an investable and globally attractive route to market. This needs to continue to evolve to support our

growing ambition. And the recent announcement of the creation of Great British Energy and its new partnership with The Crown Estate will bring together investment, policy-making and offshore wind data and expertise in a way we haven't seen before. Alongside this, new legislation being considered by Parliament will modernise the way The Crown Estate can borrow and invest, unlocking new ways for us to play an even greater role in supporting the sector.

For our part, when it comes to leasing new areas of seabed for important new offshore wind projects, this report sets out an evolving approach that seeks to overcome some of the systemic challenges faced by

developers. By providing greater certainty through the process, we can create a more predictable forward path for industry and in turn, retain the attractiveness of the UK market to global investors.

Alongside all of this, feedback and the views of our partners, stakeholders and industry are crucial to shaping the future of our approach to seabed leasing. This report therefore poses a number of important questions about our evolving approach - from identifying the most attractive sites for development to looking at how we can help advance the consenting process through things like up-front surveys and working more closely with the Energy Systems Operator (ESO) on early grid design.

We understand the scale of the challenges ahead. The feedback we receive on the discussion points set out in this report will be invaluable as we work together to ensure the UK's offshore wind industry continues to deliver for generations to come. Thank you.

Julia Rose

Head of Offshore Wind
Marine, The Crown Estate



A new approach to offshore wind

The UK's offshore wind market is one of the largest and most successful in the world, with more than 50 wind farms around the UK coastline at various stages of development, producing enough renewable energy to power half of all UK homes.

The UK's offshore wind pipeline currently stands at approximately 95GW, with a Government ambition to decarbonise the power system by 2030, including a radical increase in offshore wind capacity in the same timeframe. In March, National Grid ESO published a blueprint for a decarbonised electricity system, setting out the electricity network upgrades needed to deliver this.

Recent announcements by the UK Government, including the creation of Great British Energy and its partnership

with The Crown Estate, offer an important platform to build momentum and provide confidence to meet longer term ambitions for offshore wind – whilst delivering in the context of nature and all other demands on the seabed.

We recognise that the marine environment is already under incredible pressure, with biodiversity loss affecting habitats and species along our coast and at sea. As an organisation focused on delivering lasting and shared prosperity for the nation, we acknowledge the vital need to match our ambition for offshore wind and energy security with our ambition for nature outcomes. Healthy and resilient ecosystems are fundamental for society and nature-based solutions have a critical role to play in our net zero future. Our approach for the next generation of

offshore wind responds to this nature context and the risks to infrastructure deployment of not doing so.

As part of this report, we are sharing our early thinking on the 'what, when, where and how' for future seabed development, alongside potential associated enabling and de-risking activity, to support the offshore wind industry in meeting potential demand out to 2040. A core element of this includes planning strategically to consider how this investment can also support environmental outcomes.

Much of this new offshore wind capacity is expected to be in areas of the Celtic Sea, which lies off the coasts of South Wales and South West England, and North East England. Additional smaller areas of opportunity,





Photo by Alison Pettitt | Nature-based solutions play a critical role in ensuring healthy and resilient ecosystems

that could accommodate smaller scale developments, lie off the coasts of North Wales, North West England, Lincolnshire and Yorkshire. The precise approach to development remains under consideration but is expected to include a mix of fixed and floating foundations. Further details on the spatial design and potential areas of opportunity are set out on [pages 16-27](#).

We are considering how we could tackle some of the wider systemic challenges and support a move towards more predictable and coordinated offshore wind development. This ensures that offshore wind can play its part in reaching net zero targets whilst delivering financial, environmental, and social value for the nation.

These are set out in more detail on [pages 28-32](#) but include potential steps such as:

- Drawing on our rich evidence and marine spatial modelling capabilities to play a more active role in

identifying and surveying attractive and deliverable sites for future offshore wind, helping to accelerate and de-risk deployment.

- Exploring opportunities to support the consenting process through front-loading some of our activities (i.e. environmental surveys and analysis), securing statements of common ground from key stakeholders at a plan-level and/or anticipating other activities that could de-risk and accelerate the consenting process post-lease.
- Improving the coordination between the process of seabed leasing, energy infrastructure planning and grid connections, helping further accelerate the deployment of offshore wind, while considering other seabed users and the natural environment.

This report also sets out further detail on how The Crown Estate might play a more active role in investing to support and stimulate the infrastructure and supply chain

needed to enable the future growth of offshore wind. This follows legislation currently being considered by Parliament, to modernise The Crown Estate's borrowing and investment powers, alongside the new partnership recently announced with Great British Energy. This is covered on [pages 33-36](#), including details on initial areas of focus to help unblock strategic bottlenecks to speed up the delivery of offshore wind projects, in particular offshore wind ports and wider supply chain.

The views of stakeholders will be key as we progress our thinking and further develop our future leasing programme. This report poses a number of discussion points, summarised on [pages 13-14](#), with further details of how to take part in this important conversation, and we are looking forward to hearing your views on these important matters.

The role of The Crown Estate

The Crown Estate is an independent organisation, sitting between the public and private sectors, with a purpose to create lasting value for the nation from its activities. When it comes to its role in managing the seabed around England, Wales and Northern Ireland, this means taking a holistic and long-term view of this vital resource, helping catalyse the UK's transition to net zero while playing an important role in stewarding the marine environment. By working in partnership with industry, governments and stakeholders, The Crown Estate has helped establish the UK as home to one of the most successful offshore wind markets in the world.

This also means we are well-placed to bring people together to find solutions to some of the shared systems

challenges facing our increasingly congested shores. This includes convening partners to help solve key systems issues together such as supply chain, grid connection, consenting processes and delivering beneficial outcomes for the environment.

Since the first turbines appeared in UK waters some 25 years ago, The Crown Estate has developed its expertise and capabilities, becoming a world leader for spatial mapping. By combining these skills with new digital capabilities, we have been working with partners to digitally map the seabed resource needed to meet the long-term needs of vital industries, net zero commitments and nature recovery.

Safety First

We have a unique and special role in fostering an environment where everyone who works in, supports, or visits the marine environment can do so healthily and safely. This means ensuring the minimum of personal risk but also meeting expectations of an environment where they can thrive. We are committed to continued innovation and improvement and have made 'Safety First' a central tenet of our approach across our whole business, and our marine strategy.

More details on our Safety First approach are set out in our Marine Delivery Routemap which can be found [here](#).



Our remit

Our remit covers England, Wales and Northern Ireland, so we do not make proposals in this report for offshore wind provision in Scotland, although we continue to work closely with Crown Estate Scotland on areas of shared interest, such as transmission cable routes and sharing of valuable data which can help de-risk development.

Northern Ireland

Alongside the work reported here, we are working with Department for the Economy, the Department of Agriculture, Environment and Rural Affairs and other stakeholders across Northern Ireland to develop and execute the Offshore Renewable Energy Action Plan (OREAP)¹. This is expected to put in place the policy and legislative frameworks to support future offshore wind leasing. We will be applying the insights and analysis from this report to help inform that work and envisage undertaking seabed leasing in Northern Ireland in support of OREAP at the appropriate time.



1. "Draft Offshore Renewable Energy Action Plan", Department for the Economy

Data and evidence: our Whole of Seabed Programme

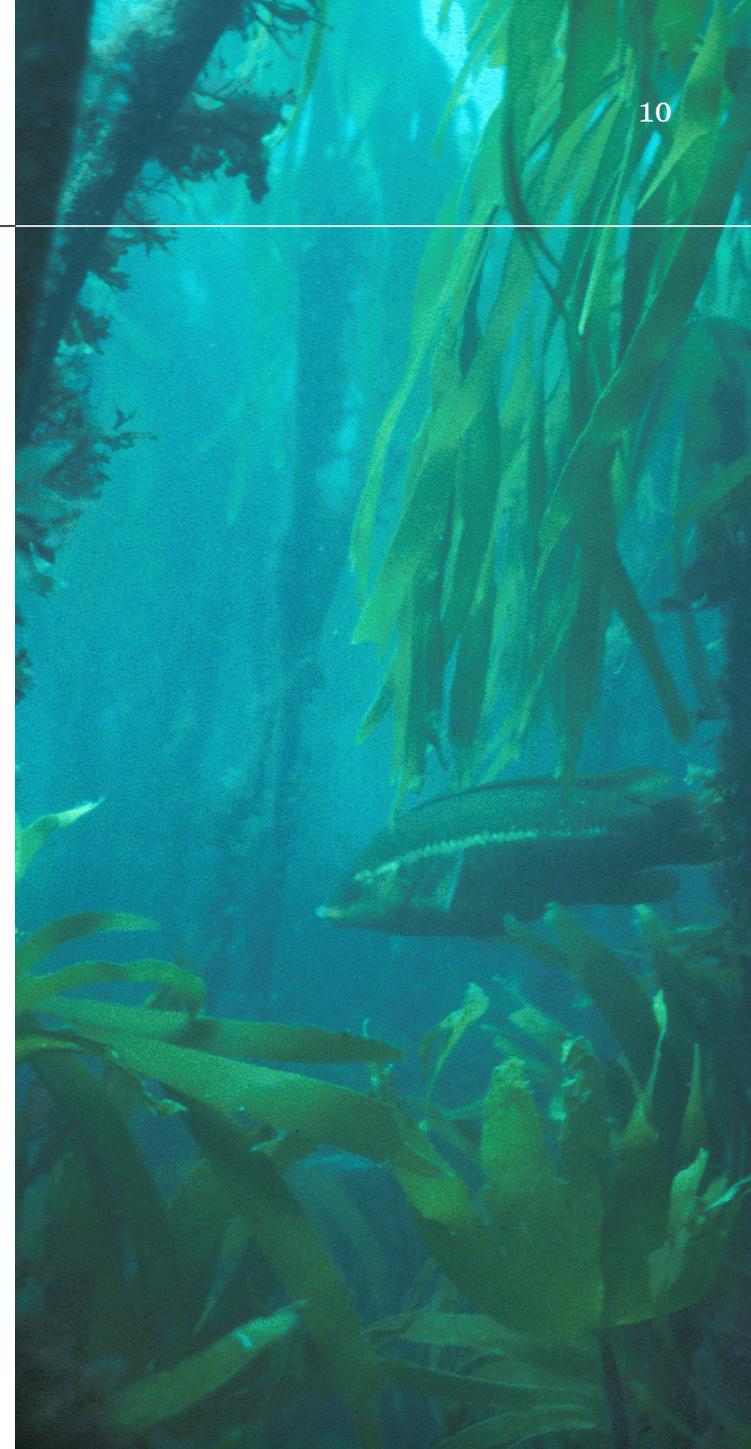
The Crown Estate's Whole of Seabed Programme combines our spatial mapping expertise, digital capabilities, an overview of seabed demands across sectors and nature, and inputs from our partners to [digitally map the seabed](#) resource needed to meet future objectives – supporting vital industries, net zero and nature recovery for the long-term. This modelling capability represents the most comprehensive and sophisticated approach to spatial mapping in our history and will be kept up to date as new data, evidence and information becomes available. The analysis covers a range of critical sectors including offshore wind, other types of energy generation, CCS, aggregate extraction, telecoms cabling and nature. Tailored approaches have been co-developed with key stakeholders to map opportunities for each sector, while considering all uses and interests in the marine space, including those beyond The Crown Estate's responsibilities, to promote co-location and minimise potential future conflicts.

Our data capability

With an increasingly constrained offshore environment, data, analysis and collaboration are fundamental to supporting accelerated growth in UK offshore sectors and building confidence in the UK market. The Crown Estate is committed to investing in and sharing pioneering research, data and digital capabilities to manage the seabed holistically and inform future delivery, in a way that works as part of the wider ecosystem – building confidence in the quality and sustainability of developments.

You can find out more in the section that starts on [page 33](#).

You can find out more about our Whole of Seabed Programme [here](#).



A Marine Delivery Routemap: working with offshore wind

The seabed and coastline are critical for net zero, nature and a wide range of marine sectors. As the sea space becomes increasingly congested, we must ensure we plan for the future of offshore wind in the context of nature and all sea users. Through our Whole of Seabed Programme, we are creating a unique picture of the anticipated demands on the seabed. It is this evidence base that underpins this next phase of working with our stakeholders to plot a course for the sustainable growth of marine industries, alongside the restoration and creation of marine habitats and the enablement of thriving communities.

We are using this insight to play our part in co-developing with stakeholders a Marine Delivery Routemap that provides a forward strategy for the marine space to deliver on net zero and nature recovery, build a thriving marine economy and benefit onshore communities.

In embarking on this journey, we have set the following objectives:

- To catalyse the UK towards a net zero and energy secure future.
- To deliver a thriving marine environment and promote nature recovery.
- To optimise value from the marine space across sectors for the economy and communities.

It is envisaged that the Routemap will support:



Spatial pathways

Identifying 2050 spatial pathways to enable the best use of the marine space in order to meet policy objectives and user needs across sectors. This will provide stakeholders with long-term visibility on the key areas of opportunity for each sector, including opportunities for co-location, and support early resolution of competing demands.



Seabed and coastal management

Informed by these pathways, developing forward plans which align the needs of industries, sectors, and the natural environment. For The Crown Estate, this means a timeline of leasing activity and investment for nature and infrastructure which it manages, while providing valuable long-term visibility for other users of the marine space.



Enabling investment

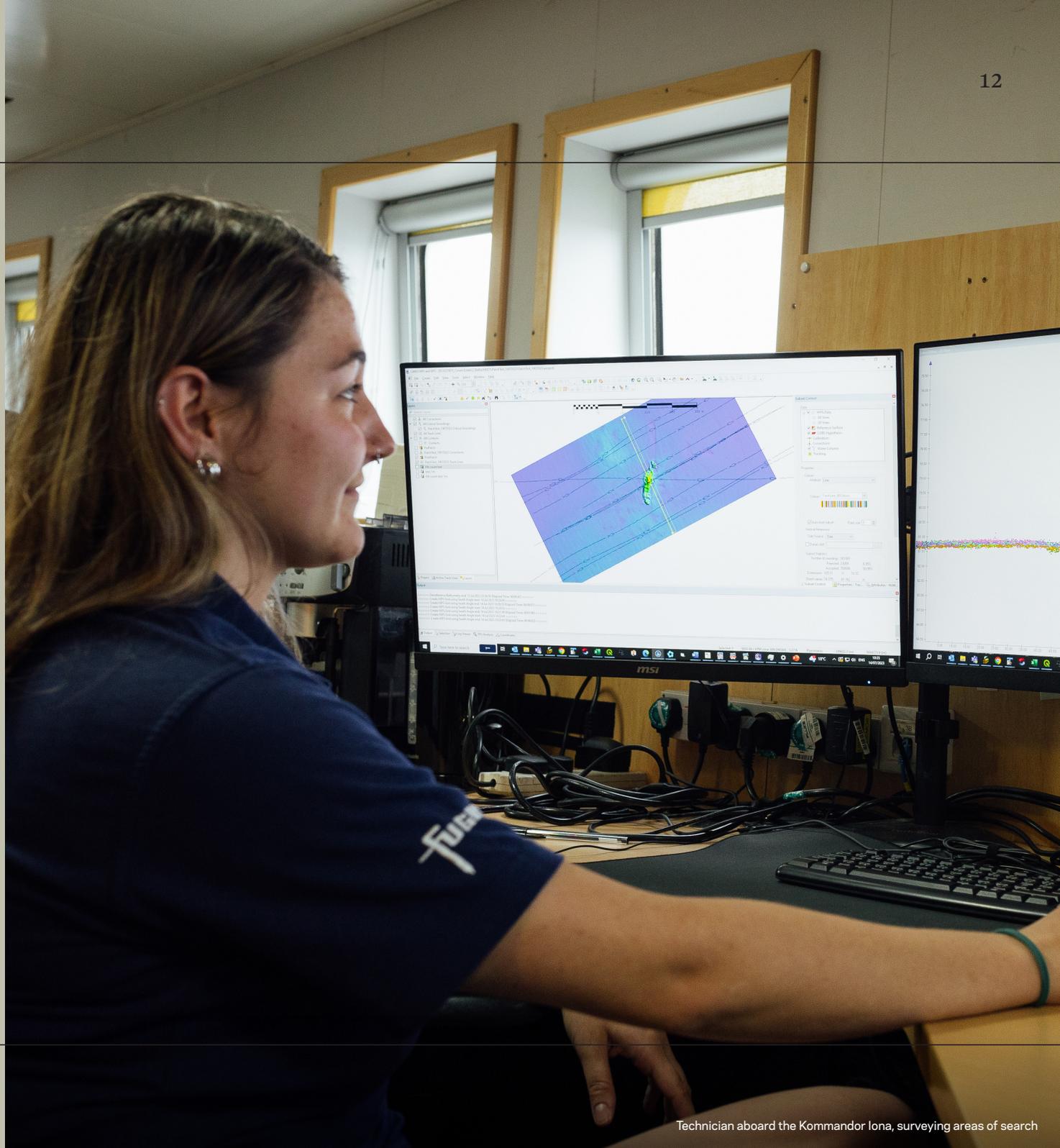
Providing forward visibility on where and when key enabling investments are needed (e.g. ports, supply chain, grid, nature). This can help underpin anticipatory investment needed and identify the opportunities these can create for impacted communities.

This will all be underpinned by The Crown Estate's world-leading data and evidence. As we progress with the development of the Routemap, we will be able to identify in advance any gaps in this data across sectors, and how they can be addressed through research, shared forums and collaborations.

Through effective collaboration across users of the seabed and other interested parties, we have identified a number of benefits of a Routemap, including:

- ✓ **Optimise the use of marine space**, securing best outcomes for the economy, the environment and society.
- ✓ **Identify high-opportunity areas for biodiversity and nature**, supporting delivery of a thriving marine environment.
- ✓ **Provide visibility and certainty** to sea users across sectors on how the seabed will be used, giving market confidence.
- ✓ **Accelerate delivery and reduce costs across sectors**: for example, in energy, working with the ESO to find low-cost pathways for net zero with low consenting risk and which fit with the needs of nature and non-energy sectors.
- ✓ **Support economic development and communities** by identifying enabling investment needs and opportunities over the long-term (e.g. skills, infrastructure, ports, supply chain).

This report forms the first in a series of Marine Delivery Routemap publications. More on the overall approach and a link to the Routemap can be found [here](#).



Discussion points



Through early analysis and engagement, we have developed our thinking on some key aspects of the approach to developing future offshore wind and bringing it to the market. These are distributed as discussion points throughout this report and are designed to underpin the next stage of a dialogue about our early thinking in terms of the 'what, where, when and how' for the future of offshore wind.

1 Cross system coordination

Forward delivery planning which works across all key marine sectors and nature for the marine space, i.e. the Marine Delivery Routemap, is critical to enhance safety, accelerate delivery, reduce consenting risks and spatial conflicts, and ensure that we make best use of scarce seabed.

2 Future demand

Our view is that there is a need to bring to market between 20-30GW of new offshore wind seabed rights in the waters off England and Wales by 2030, for delivery out to 2040².

3 Leasing rounds

Running successive leasing rounds in the period out to 2030 would deliver the best value and opportunity for developers. The timing and number of rounds, and the scale of each, remain under consideration.

4 Locations

We anticipate that the key multi-gigawatt (GW) opportunity for new leasing by 2030 will be in the Celtic Sea (off the south-western coasts of England and Wales) and in the North Sea (off the north east coast of England), with additional, more dispersed GW scale resource in other regions.

Further detailed spatial design and stakeholder engagement will refine these areas down through Areas of Search, refined Areas of Search, to final Project Development Areas (PDAs).

5 Co-location

Given an increasingly busy marine space, our view is that it is important to enable co-location in Areas of Opportunity through leasing design.

6 De-risking and accelerating HRA, offshore surveys and consenting

By bringing sites to market with a greater level of assurance, we can reduce potential stumbling blocks upfront and reduce the risk of attrition and delays in later development stages - accelerating projects, providing more certainty for investment, reducing project development costs and ultimately reducing consumer bills. This could be achieved by:

- Plan-level strategic environmental measures to ensure that future offshore wind takes full account of the UK's targets for the Marine Protected Area network.
- Undertaking pre-consent surveys.
- Developing options for additional upfront work to support consent ahead of sites moving to the market.

² The focus of this report is new offshore wind leasing in the waters off England and Wales. There is potential for additional offshore wind leasing in Northern Ireland in support of the Offshore Renewable Energy Action Plan, and we will engage on this as plans progress.

7 Grid connections

By taking a systems-led approach we can provide more coordination between seabed development and transmission design and delivery, aligned with strategic planning processes for the energy sector. Working with Connections Reform, we will explore forward design of grid connections and applying for and entering into grid connection agreements for PDAs for novation to successful bidders.

8 Broad value

Our view is that we must harness the opportunities created by the delivery of offshore wind to enable net zero commitments, steward flourishing biodiversity and marine environments, create thriving communities and support economic growth. We are exploring how we can best achieve this through how we bring developments to market.

9 Technologies

Future offshore wind leasing will include a mix of sites that accommodate the development of fixed, deep-water fixed and floating sub-structures. Our long-term ambition is to give developers the flexibility to deploy the concept they consider most appropriate for a given site, noting that a tailored approach may be needed to ensure we foster growth and development of innovative foundation technologies, such as floating foundations.

10 Hydrogen

We recognise that offshore green hydrogen has significant potential, but we anticipate that there is unlikely to be a need for spatial design and leasing focused on this during the timeframes considered here. However, we are open to developers having the option to incorporate the production of green hydrogen in their development plans, where market arrangements and system plans align with this.

These are not final positions, and represent the next stage of dialogue with industry, partners, stakeholders and governments. We have compiled this report as part of our commitment to provide early visibility of our future offshore wind leasing intentions, in the context of a Marine Delivery Routemap. The Routemap aims to complement and inform key related marine spatial programmes - for example, the Marine Spatial Prioritisation (MSPri) programme in England, and Strategic Resource Areas (SRAs) in Wales - and forward plans for specific marine sectors. By providing a holistic view of the needs of all marine sectors and nature, the Routemap will also support the ESO's development of the Strategic Spatial Energy Plan (SSEP) and we are working together to ensure these programmes are closely aligned.

Seeking views

The views of stakeholders and partners are integral to this exercise. So we look forward to ongoing conversations as we progress our thinking and further develop our future leasing programme. As part of this, we will be undertaking regular engagement with the market, statutory and non-profit organisations, governments, sea users, and delivery partners. This will include supporting bi-lateral engagement with industry via trade bodies.

Alongside this report we will be issuing a questionnaire seeking feedback from existing and potential offshore wind developers or investors (who may be interested in bidding in a leasing round, either as a sole bidder or as part of a consortium), with a return date for completion by 4 October.

If you are an existing or potential developer or investor and wish to receive a copy, please apply by emailing a request to communications@thecrownestate.co.uk. Please note that we reserve the right to decline requests from other organisations to respond, at this time, noting that The Crown Estate will engage with other categories of stakeholder at appropriate times. You can also find this information in a Prior Information Notice on the Find a Tender website: www.gov.uk/find-tender.

A parallel questionnaire is being issued to key stakeholders (including statutory, non-profit organisations, governments, sea users and delivery partners) seeking feedback; alongside this, we are running an initial call for data and evidence to support our spatial design process.

Thank you for your continued support and engagement, which is invaluable as we work together to shape the long-term future of a resource on which we all rely.



The future of offshore wind

Overview

Since the first turbines were installed off the Northumberland coast almost 25 years ago, the UK's offshore wind industry has flourished. Today, UK waters are home to more than 40% of all European offshore wind capacity. But just as important as delivering new, secure energy, the sector now also supports 32,000 jobs – [a figure set to grow to more than 100,000 by 2030](#). Through its management of the seabed, and working in tandem with a strong government policy framework, The Crown Estate has played a key role in this success, helping create the right conditions for offshore wind to thrive. By working together to plot a course for the long-term growth of this critical industry, we can write the next chapter in this exciting story.

Design of future leasing rounds will be informed by views of the market and wider stakeholders, and they will support key energy and environmental policies, as has been the case for previous rounds. However, we intend to take a more strategic approach, working in the context of the Marine Delivery Routemap discussed above and seeking to 'design out' many of the systemic challenges arising from an increasingly busy seabed. Our future approach also acknowledges the challenges of introducing additional infrastructure into a marine environment already under pressure from a changing climate and suffering biodiversity loss. Achieving a net

zero and climate resilient future requires us to realise the opportunity for offshore wind in a way that allows nature to flourish.

Discussion point 1

Cross system coordination: forward delivery planning which works across all key marine sectors and nature for the marine space, i.e. the 'Marine Delivery Routemap, is critical to enhance safety, accelerate delivery, reduce consenting risks and spatial conflicts, and ensure that we make best use of scarce seabed.



As detailed in the pages of this report, we propose that future offshore wind development by 2030 will:

- 1 Help to meet the UK's ambitions for future offshore wind demand out to 2040 - helping maintain a pathway to UK net zero.
- 2 Support development of a range of technologies that will deliver low-cost offshore wind over the long term.
- 3 Take a strategic approach to spatial design to support long-term cross-sector delivery and transmission infrastructure planning.
- 4 Include de-risking activities that not only accelerate sustainable deployment of offshore wind but also maximise the opportunities for beneficial outcomes for nature and recognise the needs of other users of the seabed.
- 5 Be designed in a manner which creates lasting financial, environmental and social value for the nation.

Additional leasing may be required beyond 2030 to enable further growth out to 2050, but this is out of scope of this report and is a topic we would come back to in due course.



Photo by Ben Barden Photography Ltd | Our Marine Delivery Routemap aims to unlock delivery of net zero and nature recovery goals

Meeting future demand for offshore wind

In order to maintain momentum to net zero by 2050 and provide necessary confidence to meet likely deployment ambitions for the mid-2030s and beyond, the time has come to consider plans for future offshore wind development.

Our long-term planning is based on external forecasts from organisations such as the ESO and the Climate Change Committee (CCC). [Figure 1](#) shows that under net zero pathways in the 2024 Future Energy Scenarios report³, 93-99GW of operational offshore wind could be needed by c.2040, and up to 103GW could be required by 2050⁴. Higher pathways published by the Climate Change Committee forecast that demand for UK offshore wind could reach 125GW-140GW by 2050⁵. The UK's Offshore Wind Net Zero Investment Roadmap⁶ referenced up to 125GW of offshore wind potentially being required by 2050. We use a mixture of these forecasts in our long-term planning to ensure that leasing acts as an enabler for the sector to meet policy and demand targets.

Discussion point 2

Future demand: our view is that there is a need to bring to market between 20-30GW of new offshore wind seabed rights in the waters off England and Wales by 2030, for delivery out to 2040.



³ "Future Energy Scenarios (FES)," National Grid ESO, accessed February 29, 2024.

⁴ CCC's scenarios are 65-140GW by 2050: "The Sixth Carbon Budget - Electricity Generation" Climate Change Committee, accessed 29 February 2024.

⁵ Reference: Sixth Carbon Budget, 9 December 2020.

⁶ "Offshore Wind Net Zero Investment Roadmap," Department for Energy Security and Net Zero, March 31, 2023.

Figure 1 also shows that the current UK pipeline stands at approximately 95GW of capacity, which includes circa 15GW operational, circa 12GW under construction/contracted, circa 11GW with consent granted, circa 16GW with planning applications submitted, circa 27GW in pre-planning, and circa 14GW of potential further capacity from leasing that has been announced, but for which seabed rights have not yet been awarded⁷. This includes potential capacity increases under consideration by The Crown Estate⁸, and the capacity currently being offered to the market through Offshore Wind Leasing Round 5 in the Celtic Sea.

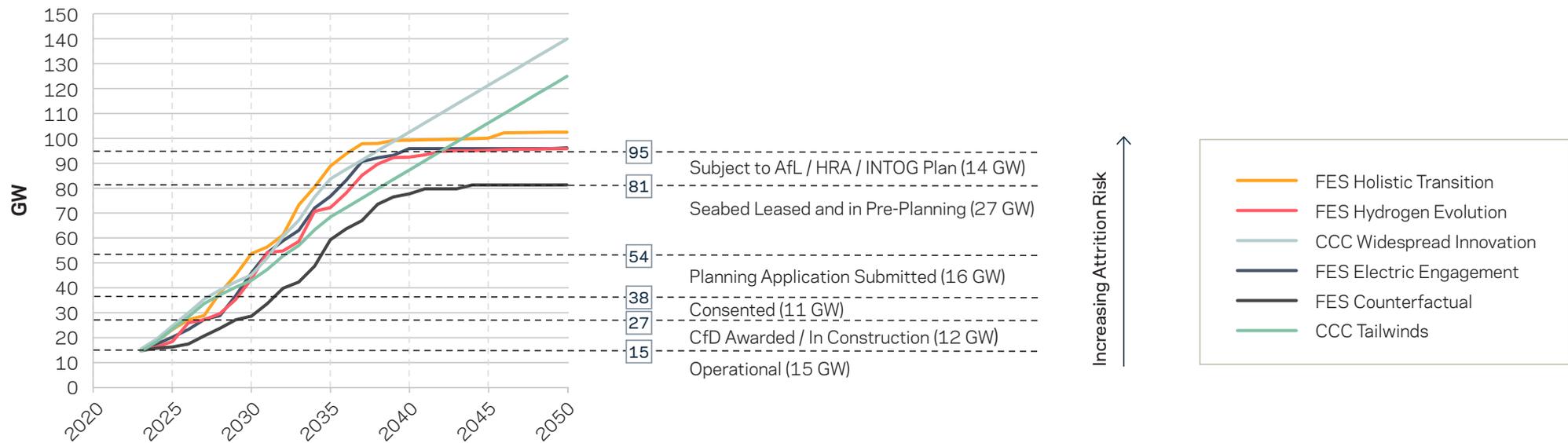
As with all major infrastructure projects, there is an increased attrition risk for developments that are at earlier development stages, therefore it is unlikely that all 95GW will be realised. Potential attrition in leased vs delivered capacity is an important factor when considering future leasing. However, potential attrition is not something that is represented in the Future Energy Scenarios (FES) or CCC numbers as these represent operational capacities needed to support the nation’s transition to net zero.

Although there may be sufficient potential to meet short-term capacity targets from the current pipeline, additional leasing will be required to supplement the pipeline capacity for delivery by 2040 in order to maintain a cost-effective

and deliverable pathway to net zero. Additional leasing can also help ensure the UK can meet its potential to export more clean electricity to continental Europe.

In light of this, having considered the risks across the current pipeline and the opportunities from new pipeline, our analysis has led us to an initial view that between 20-30GW of new offshore wind seabed rights should be brought to market in the waters off England and Wales by 2030, to meet potential demand for offshore wind out to 2040. The upper end of this range would provide more resilience against attrition in the project pipeline and for net zero scenarios with higher levels of offshore wind deployment – as well as greater optionality for lower-cost deployment.

Figure 1: Published UK future offshore wind pathways (solid lines) and capacities under agreement (dashed lines)⁹



7 Projects, leasing rounds and additional capacity subject to AfL and plan-level HRA or INTOG Sectoral Marine Plan.

8 "The Crown Estate Sets Out Plan to Unlock Enough New Offshore Wind Capacity to Power up to Four Million Homes", The Crown Estate, November 9, 2023.

9 Data correct as at 31 August 2024. Contract for Difference Allocation Round 6 results were published on 3rd September 2024, which will move approximately 4GW of offshore wind projects from 'Consented' to 'CfD Awarded / In Construction'.

Offshore Wind Leasing Round 5 - a new chapter for UK offshore wind

In December 2023, The Crown Estate [published details](#) of Offshore Wind Leasing Round 5, which subsequently launched in early 2024. This latest leasing round is for three Project Development Areas (PDAs) in the Celtic Sea, off the coast of Wales and South West England, and is focused exclusively on the development of the UK's floating offshore wind capabilities.

Alongside establishing a new market for floating offshore wind, a key objective of Round 5 is driving wider social and economic benefits arising from new developments in the Celtic Sea. This is set out in more detail on [page 37](#).

Round 5 also demonstrates the evolution of The Crown Estate's approach to leasing, with a number of up-front activities to help accelerate and de-risk the process for developers. This includes a multi-million-pound programme of marine surveys, up-front environmental assessment and working with ESO at an early stage to inform grid design.

In August 2024 we confirmed that the tender process [had reached its next milestone](#) (Invitation to Tender Stage 1) on schedule, and - thanks to groundbreaking collaboration with ESO - would be the first leasing round to come to market with an agreed plan for connecting the new wind farms to the energy grid.

The leasing process is due to proceed to an auction (Invitation to Tender Stage 2) in Spring 2025, with Agreements for Lease expected to be signed with winning bidders in Summer 2025.



Route to market

We acknowledge that having a robust route to market is critical to successful project development.

There has been a relatively consistent and stable policy environment for offshore wind for more than a decade in the UK. However, it is evolving and a number of changes are either being implemented or are on the horizon, that will alter the policy framework moving forward, which we recognise could influence the risk profile for future investment.

Other structural changes are being actively considered through the Government's Review of Electricity Market Arrangements (REMA)¹⁰ and the specifics of the Contract for Difference (CfD) scheme (such as how the scheme could be amended further to address price and volume risks associated with intermittent renewables). More generally, consideration is also being given to how renewable generators participate in the wholesale electricity market in the future, to ensure the overall system is optimised.

We are actively engaging with Government, and will continue to adapt our leasing approach to interact effectively with prevailing and new policies, in order to de-risk the route to market for projects and development.

Successive leasing rounds

One of our core aims is to provide the industry and wider stakeholders with forward visibility of a pipeline of future leasing rounds, with full consideration of other sectors and opportunities for nature – as part of the Marine Delivery Routemap. This will help enable early identification and efficient planning and resourcing of related activities, de-risking and investments. We want that pipeline visibility to drive investor confidence in upcoming development opportunities and unlock related anticipatory investment and value creation opportunities.

We believe the optimal approach to delivering that pipeline is to run successive leasing rounds in the period out to 2030 that collectively meet the future demand for offshore wind out to 2040. The precise timing and number of rounds, and the scale of each, remain under consideration at this stage, and will evolve as the leasing design progresses, with the aim to optimise deployment in support of supply chain considerations. We look forward to our engagement with stakeholders and the market as a key input into this.

Discussion point 3

Leasing rounds: running successive leasing rounds in the period out to 2030 would deliver the best value and opportunity for developers. The timing and number of rounds, and the scale of each, remain under consideration.



Locations

Successfully enabling this scale of capacity will require careful consideration of the marine space to ensure optimal locations are identified. Demand for space in the marine environment is accelerating and is predicted to at least double out to 2050¹¹. Therefore, it is critical to consider future opportunities and development costs for offshore wind in the context of nature and other potential uses of the sea.

Approach to spatial design for future leasing

Our approach will analyse the best available data and evidence, including from our Whole of Seabed Programme, combined with extensive stakeholder engagement, to refine opportunities from a national picture, down to individual offshore wind PDAs. We believe that identification of PDAs by The Crown Estate, and offering these to the market through the leasing process (as we have done on Leasing Round 5), brings a number of advantages in supporting the sustainable deployment of offshore wind. Doing so allows The Crown Estate to incorporate a strategic approach to nature, avoiding areas identified as essential in supporting the most sensitive and vulnerable habitats and species, and take account of other sea users. We can also accelerate deployment by investing in transmission design and earlier offshore surveys, as well as undertaking plan-level HRA (see De-risking and Accelerating section on [page 28](#)).

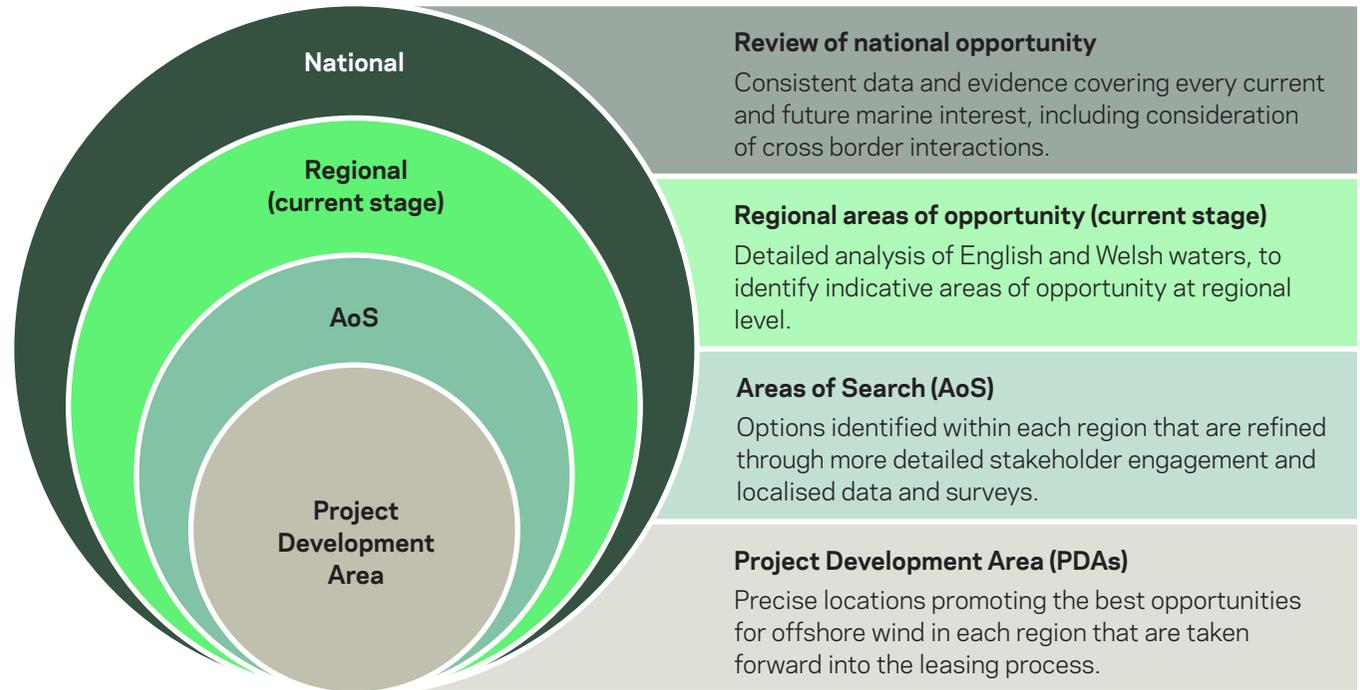
¹⁰ "Review of Electricity Market Arrangements (REMA): Second Consultation", Department for Energy Security and Net Zero, 12 March 2024.

¹¹ For the sectors The Crown Estate manages (e.g. Offshore Wind, CCS, Cables, Minerals etc) the space needed is 2 times the current seabed area out to 2050, with further space needed for nature recovery and non-The Crown Estate sectors (e.g. Oil & Gas, Fishing, Defence, Shipping etc.).

Our regional analysis and engagement to date highlights the following key findings:

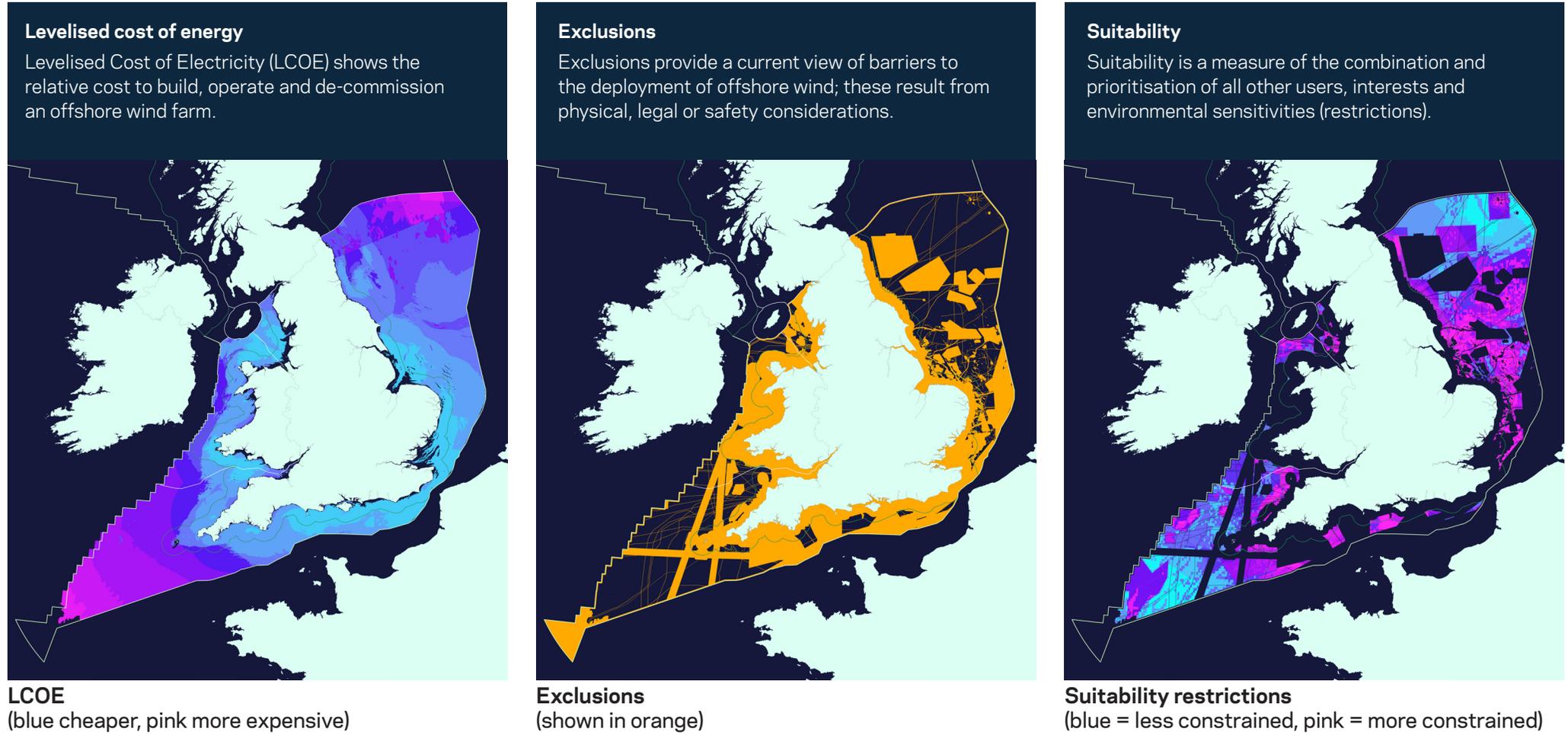
- There are substantial areas of seabed which have favourable technical characteristics for offshore wind development: high wind speed, relatively shallow seabed and proximity to shore. Consideration of other interests, however, shows that these areas are often also high value areas for nature including, but not limited to, the presence of Marine Protected Areas. They also coincide with areas of current activity and future opportunity for other sectors (e.g. shipping, fishing and nearshore leisure interests).
- While there are many opportunities for co-location (e.g. with other renewables, nature and CCS), critical decisions remain around overlaps between prime areas for sectors that need to be resolved as we refine areas for future offshore wind.
- The ESO recently published electricity network upgrade proposals¹² looking into the early 2030s, and beyond. However, further network upgrades are likely to be needed to support this scale of deployment, which is why we are committed to working closely with the ESO and National Grid Electricity Transmission (NGET) to support and inform network needs and delivery plans.

Project Development Areas are identified by working through the following steps:



¹² "Beyond 2030: A National Blueprint for a Decarbonised Electricity System in Great Britain," National Grid ESO, accessed 29 February 2024.

Figure 2: Draft maps showing the diversity of opportunity and interests



To find out more information about the data used to create the maps presented above. Please see [Appendix 1](#) of this report



Following analysis of different scenarios to find a balance between economic factors, exclusions and suitability metrics as shown in Figure 2 on the previous page, three key indicative regional areas of opportunity have been identified in English and Welsh waters¹³: the North East, the South West (Celtic Sea), and more dispersed areas in Other Regions. These are shown in Figure 3 on the next page.

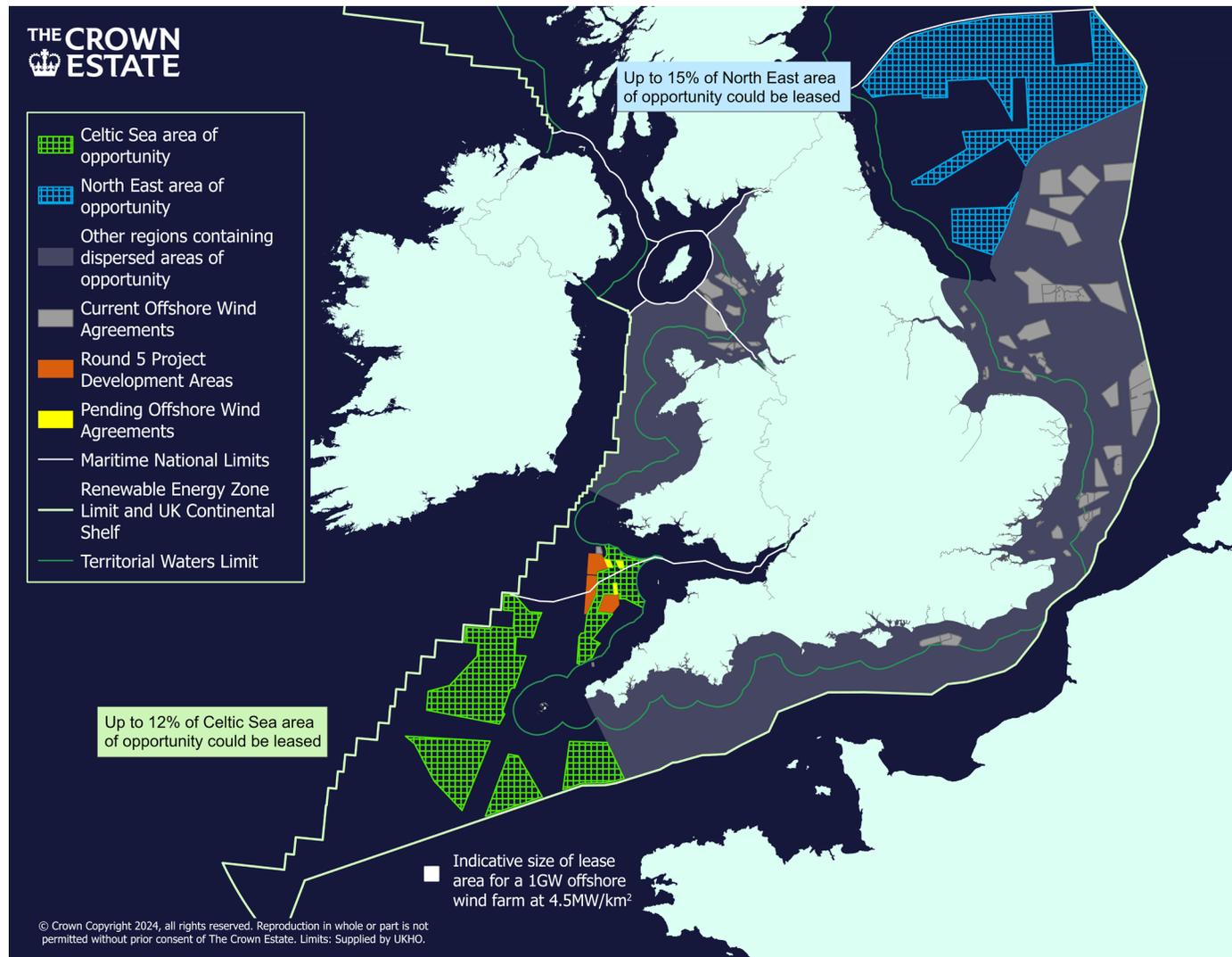
Within the North East and Celtic Sea regions, the contiguous areas of opportunity shown have been identified as the best areas for potential future development. The resource in Other Regions is more dispersed and distributed across the whole of this area.

There is significantly more space within all these areas of opportunity than will be needed to meet all net zero ambitions, meaning significant optionality exists. These areas of opportunity have been identified using our own modelling, drawing on understanding from previous leasing and engagement processes. The area of opportunity in the South West has also been informed by discussions with key government stakeholders.

Identification of more specific Areas of Search will commence shortly and will be the subject of extensive stakeholder engagement. The first stage of this engagement is the stakeholder questionnaire and call for evidence being issued to key stakeholders with this report.

¹³ Areas of opportunity in Northern Irish waters are currently being investigated in partnership with Department for the Economy, the Department of Agriculture, Environment and Rural Affairs and other stakeholders across Northern Ireland through OREAP, and so are not discussed further here.

Figure 3: Regional areas of potential opportunity for offshore wind in England and Wales



To enable additional capacity to be operational by 2040, based on the upper end of the GW ranges set out in this report, it is expected we would only need to lease a small proportion of each area of opportunity:

- Celtic Sea (up to 12% of Area of Opportunity)
- North East (up to 15% of Area of Opportunity)
- Other areas of dispersed opportunity (up to 2%)

The map shows indicative areas of opportunity for offshore wind in the waters off England and Wales, as identified in our Whole of Seabed analysis. These will be refined to Areas of Search and ultimately to precise Project Development Areas for leasing through further consideration of all marine sectors and nature, as part of the Marine Delivery Routemap.

Next steps will be fully informed by wide stakeholder engagement. Offshore wind leasing in the waters off Northern Ireland is being considered in parallel through the work under the Offshore Renewable Energy Plan.

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Figure 4: Initial view of competition for future marine space

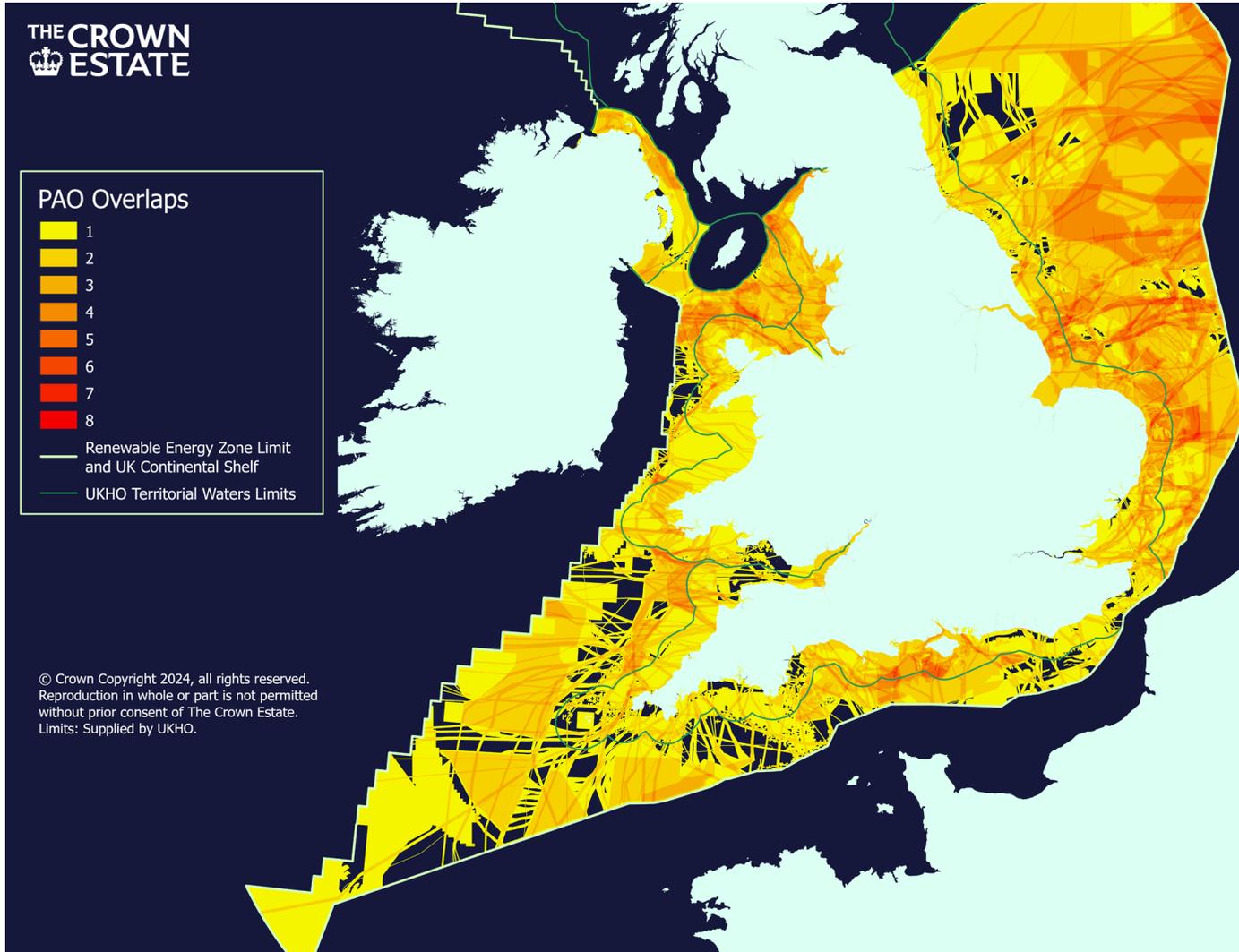


Figure 4 shows the overlaps between ‘potential areas of opportunity’ (PAOs) for marine sectors and highlights the growing competition for future space. In turn, it highlights the critical decisions around how the seabed is developed and used.

For example, the east has attractive areas for relatively low-cost future offshore wind development, but there is a lot of competition for space with environmental interests and other sectors (e.g. navigation, fisheries, defence, CCS, power cables, pipelines etc.) and areas designated to protect key environmental habitats and species. Therefore, early identification of co-location options and agreeing the best use of space are critical.

General characteristics of each regional area of opportunity

THE NORTH EAST

Spatial potential for circa 10-16GW additional capacity leased by 2030 and in operation from 2035 to 2040^{14, 15}.

- Broad region of opportunities for relatively deep water fixed, or relatively shallow water sub-structures.
- Moderate cost to construct and operate.
- Other sectoral current interests and future opportunities include marine navigation, fisheries, defence, power cables, CCS, oil and gas extraction and associated pipelines.
- Environmental interests include Marine Protected Areas, productive ocean fronts and the presence of mobile species (seabirds and marine mammals), with further work underway to better understand the context for these, including seabird foraging ranges at sea.
- To achieve the GW numbers above, we would need to lease approximately 8-15% of the area marked as 'North East area of opportunity' in [Figure 3](#) by 2030.

THE CELTIC SEA

Spatial potential for up to 12GW, of which 4-10GW could be leased by 2030 and in operation from 2035 to 2040^{14, 15}.

- Further opportunities to deploy floating technology at scale in the Celtic Sea, alongside some smaller areas of deep water fixed opportunity.
- Higher cost to construct and operate, particularly in deeper waters further offshore.
- Moderate overlap with current interests and future sectoral opportunities including marine navigation, fisheries, defence, telecommunications cables.
- Like the North East, mobile species are present in the region as well as designated Marine Protected Areas. Further evidence is required to better understand the context for mobile species in this region.
- To achieve the GW numbers above, we would need to lease approximately 5-12% of the area marked as 'Celtic Sea area of opportunity' in [Figure 3](#) by 2030.

OTHER REGIONS

Spatial potential for circa 2-8GW additional capacity leased by 2030 and in operation from 2035 to 2040^{14, 15}.

- Dispersed areas of single project scale opportunity in the Southern North Sea, English Channel, Welsh Waters and North West England.
- Shallower water suitable for fixed sub-structures.
- Lower cost to build and generally closer to onshore electricity demand.
- Overlap with current interests and future sector opportunities varies site to site but includes marine navigation, fisheries, defence, power and telecommunication cables, marine aggregates, CCS, oil and gas extraction, pipelines and civil radar.
- Environmental interests also vary site to site but include the same sensitivities found in other regions.
- To achieve the GW numbers above, we would need to lease up to 2% of the area marked 'Other regions containing dispersed areas of opportunity' in [Figure 3](#), by 2030.

¹⁴ With the aim to bring to market between 20-30GW of new offshore wind seabed rights by 2030, these regional estimates capture wide ranges to allow for optionality. By undertaking the PDA refinement process as explained on p19 we will narrow down these estimates to ensure optimum locations are prioritized.

¹⁵ Subject to grid assessment.



Our initial analysis gives us confidence that these areas could support circa 20-30GW of new capacity operational by 2040, could allow new offshore wind developments to co-exist with other industries, and be delivered in a way that is sensitive to the nature context. The mid points of the GW ranges quoted above sum up to equal the mid-point in the overall capacity range (25GW). However, in quoting ranges, we are acknowledging that uncertainty remains. We will narrow this uncertainty through the detailed spatial design process, working closely with the ESO, NGET, delivery partners, sea users and environmental stakeholders to more fully understand the implications of different scenarios on onshore and offshore transmission network needs, other sectors, and nature. We will provide further details of our plans in due course.

As part of our early thinking on leasing design we are also considering how we might best enable opportunities for co-location of offshore wind with other uses of the seabed, such as nature restoration and CCS. For CCS in particular, we have established the Offshore Wind and Co-Location Forum to bring together partners to better understand the challenges, and find potential solutions, to co-location of both technologies. We are aware that co-location poses both benefits and challenges across all sectors and will consider these further as we develop our plans.

We will also continue to convene and partner with others through our Marine Delivery Routemap and will use our Whole of Seabed Programme to contribute to key spatial programmes, including the MSPri programme in England, SRAs in Wales, the SSEP with ESO, and statutory marine plans of the Marine Management Organisation (MMO) and the Northern Ireland Executive.

Discussion point 4



Locations: we anticipate that the key multi-gigawatt (GW) opportunity for new leasing by 2030 will be in the Celtic Sea (off the south-western coasts of England and Wales) and in the North Sea (off the north east coast of England), with additional, more dispersed GW scale resource in other regions.

Further detailed spatial design and stakeholder engagement will refine these areas down through Areas of Search, refined Areas of Search, to final Project Development Areas (PDAs).

Discussion point 5



Co-location: given an increasingly busy marine space, our view is that it is important to enable co-location in Areas of Opportunity through leasing design.

De-risking and accelerating

As we move forward, we are putting the foundations in place to provide greater targeted support to the UK's offshore wind market, helping it retain its status as one of the most attractive marine markets in the world. The recently-announced partnership with Great British Energy further strengthens this endeavour by bringing together the new body's ability to invest and develop critical strategic industrial policy with The Crown Estate's world-leading expertise in marine spatial planning and seabed leasing in supporting the growth in UK offshore wind. In addition, new borrowing and investment powers being considered by Parliament will further enhance The Crown Estate's own ability to accelerate and scale up our capabilities and provide targeted investment in the supply chain.

The global offshore wind industry is fortunate to benefit from a depth of expertise and experience built up over many decades across a wide range of organisations and sectors. This industry know-how will be central to its continued success, with The Crown Estate turning its attention to how it can better use its unique position to remove some of the systems-level and macro hurdles facing developers and support the accelerated deployment of new projects.

In part, this means moving our approach to seabed development towards a systems-level approach which better recognises, anticipates and explores some of the challenges that developers may be facing. This is underpinned by the proposed Marine Delivery Routemap,

which will highlight, help address early, and de-risk issues over competition for sea space across a range of sectors, while maintaining a strong, proactive focus on nature restoration and recovery. In turn, the Routemap will enable the identification of the most attractive sites for future offshore wind, from a technical, economic and consenting perspective.

Discussion point 6

De-risking and accelerating HRA, offshore surveys and consenting: by bringing sites to market with a greater level of assurance, we can reduce potential stumbling blocks upfront and reduce the risk of attrition and delays in later development stages – accelerating projects, providing more certainty for investment, reducing project development costs and ultimately reducing consumer bills. This could be achieved by:

- Plan-level strategic environmental measures to ensure that future offshore wind takes full account of the UK's targets for the Marine Protected Area network.
- Undertaking pre-consent surveys.
- Developing options for additional upfront work to support consent ahead of sites moving to the market.



Optimising siting and surveys

Despite the rapid growth of offshore wind in UK waters, the time it takes to move from initial project conception through to the generation of new power can be up to ten years or more. Drawing on rich evidence and marine spatial modelling capabilities, The Crown Estate is well positioned to identify and survey attractive and deliverable sites for future offshore wind, helping to accelerate and de-risk deployment.

For example, by bringing sites to market with a greater level of assurance, we can eliminate potential stumbling blocks upfront and reduce the risk of attrition and delays in later development stages.

For Offshore Wind Leasing Round 5, we have already invested in surveys to inform early developer decision making and consenting, building on our early site identification and engagement with stakeholders. As we look to future leasing rounds, we are considering using surveys to inform technical characterisation, the plan-level HRA and identify sensitive environmental features to refine site selection. By better understanding early the spatial context and risks associated with the seabed being offered, we can reduce the timeline of development, accelerate delivery, take full account of the UK Government targets for the Marine Protected Area network, and deliver improved environmental outcomes.

This programme of surveys can also serve to reduce the costs and time for developers' design and consenting processes following the conclusion of the tender. In considering the potential for continuation of this approach for future rounds, we are exploring a range of options including geophysical, geotechnical, metocean and ecological surveys, and we will continue to engage with the market and key stakeholders to inform the scoping and timing of any such programme.



Supporting consent

Linked to this, one of the major challenges developers can face when progressing projects is the statutory consenting process, where increased uncertainty regarding the timeliness or likelihood of achieving consent can raise the risk associated with project decisions, such as those to do with early investments in supply chain, risking further delay to the deployment of offshore wind.

Building on our approach to optimising site selection through our world-leading spatial expertise and technical surveys, we are exploring opportunities for The Crown Estate to further front-load some of our activities (i.e. environmental surveys and analysis) to de-risk the consenting of future projects. We can further support consent through a range of actions, including reaching statements of common ground with key stakeholders at a plan level and anticipating other activities that could de-risk and accelerate the consenting process, post-lease.

This might include a range of actions aimed at streamlining the consenting process through building formal agreement with key stakeholders on critical issues, both pre and post leasing. This could extend to identifying, agreeing and implementing plan-level measures to avoid, minimise and balance environmental impacts (whether they be associated with HRA or key EIA topics) as well as other consenting considerations (e.g. interactions with other sector activity).

Working with key partners, such as Defra's Offshore Wind Enabling Action Programme, we plan to explore a variety of opportunities for de-risking consent. This could include spatial design, consideration of technical definitions or innovative mitigation, identification and application of environmental standards, providing plan-level environmental data for early stakeholder engagement and developer planning and strategic environmental compensation delivery, at a plan or sector level.

The delivery of strategic environmental compensation includes consideration of a variety of potential mechanisms which could include a Marine Recovery Fund to provide compensation across multiple projects, removing the need for project-specific compensation solutions. It might also include the potential for leasing areas for strategic compensation alongside those for development of generation and transmission assets, for example.

By taking a more strategic and systems-based approach to avoiding, minimising and balancing risks for projects, and embedding opportunities for environmental benefit across our leasing activity, we will deliver better outcomes for nature, identifying optimal sites and enabling reduced consenting and delivery timelines for sustainable offshore wind projects.

Greater certainty over grid connections

Offshore renewables are critical to net zero and are expected to provide around 50% of electricity generation by 2050. The Crown Estate is committed to ensuring there is sufficient pipeline to deliver this. However, ensuring that these critical future offshore wind projects can be connected in a timely manner is a major challenge, with planning bottlenecks for grid build-out and a long queue for grid connections.

By improving the coordination between the processes of seabed leasing, energy infrastructure planning and grid connections, there is a clear opportunity to further accelerate the deployment of offshore wind, while considering other sea users and the natural environment.

In December 2023, The Crown Estate and the ESO signed a Statement of Intent to begin a new chapter in our collaboration, which will be crucial in the development of future offshore wind leasing. The renewed agreement will see enhanced levels of information-sharing and programme alignment, to best enable future offshore development and energy infrastructure planning together.

This collaboration underpinned our approach to Offshore Wind Leasing Round 5, which [recently became the first leasing round to come to market](#) with an agreed plan for connecting the new floating wind farms to the UK's electricity grid.

Looking to the future, we will collaborate with the ESO to achieve new levels of coordination between seabed leasing and transmission design to accelerate the deployment of offshore renewable generation and infrastructure essential for successful delivery of net zero ambitions.

Building on the holistic network design of 2022, the ESO this year recommended further offshore and onshore electricity network upgrades that could integrate up to 86GW of offshore wind with a combined estimated capital cost of £112 billion¹⁵. Looking even further ahead, as we are with our future leasing plans, further network upgrades are likely. By planning further leasing and grid together, we can provide the best chance for projects and associated network upgrades to be deliverable and operational by 2040.

Our continued collaboration presents a number of benefits, in particular:

- The ability to plan areas for future offshore wind development in step with spatial energy planning and network design processes (SSEP and CSNP).
- In turn, earlier network designs will help inform and underpin anticipatory investment in the grid upgrades required to deliver new offshore wind capacity.
- Building on our experience with Round 5, we are exploring the potential to assist the securing of firm and timely grid connection agreements ahead of future auctions in the seabed leasing process, subject to the appropriate grid connection reforms.
- This partnership approach will enable a clearer pathway for the offshore wind and transmission networks industries out to 2040, increasing confidence and certainty.



Discussion point 7

Grid connections: by taking a systems-led approach, we can provide more coordination between seabed development and transmission design and delivery, aligned with strategic planning processes for the energy sector. Working with Connections Reform, we will explore forward design of grid connections and applying for and entering into grid connection agreements for PDAs for novation to successful bidders.



¹⁵ £58 billion from ESO Beyond 2030 report [Beyond 2030 | ESO \(nationalgrideso.com\)](https://www.nationalgrideso.com/beyond-2030) and £54 billion from ESO HND report [download \(nationalgrideso.com\)](https://www.nationalgrideso.com/download)

De-risking the supply chain

While the steps we have outlined above are designed to create greater assurance and streamline processes connected with offshore wind development, there is also a pressing need to support the growth of the supply chain required. This is particularly the case in areas such as the Celtic Sea region which are set to play a key role in the next chapter of the UK's offshore wind story, but which do not yet have an established supply chain.

In recent months we have seen two important steps towards transforming The Crown Estate's ability to further de-risk the supply chain. Firstly, our partnership with the

newly created Great British Energy will bring together our long-term visibility of the demands on seabed and associated supply chain needs with the new body's ability to invest and help shape critical industrial policy.

Secondly, proposals currently being considered by Parliament to modernise The Crown Estate's ability to borrow will enable us to provide more targeted investment in the supply chain. Details of how this can further support initiatives such as our Supply Chain Accelerator are set out in the Investing to accelerate delivery section on [page 33](#).

De-risking and accelerating summary

Our primary driver is to accelerate the deployment of offshore wind in a sustainable manner, and we believe that the measures above all have a potential material impact on our ability to achieve this objective. The scope, timing and sequencing of de-risking activities undertaken will have a material bearing on the timing of future leasing rounds, with a number of trade-offs to be considered. We welcome continued engagement on the options we have set out and will continue to share our thinking as it develops.



Investing to accelerate delivery

As a company for the country, one of The Crown Estate's core objectives is to catalyse the UK's transition towards a net zero and energy secure future, and we are committed to investing to support this.

We are already investing in activities that will help de-risk future offshore wind projects, for instance through our activities to support Offshore Wind Leasing Round 5. This includes both plan-level strategic measures to ensure compliance with Marine Protected Area requirements, and investing in pre-consent site investigation surveys.

In addition, we recognise the need to accelerate delivery by investing in enabling infrastructure, most specifically in the development and construction of the necessary port and supply chain infrastructure that will accelerate offshore wind development and help the UK to capture even more of the economic benefits available through the energy transition.

The announcement by the UK Government to modernise The Crown Estate's investment powers and our partnership with Great British Energy will help to support this activity. The context is set out in more detail in the pages that follow.



Rotor blades about to be lifted, ready for being transported offshore

Signpost, Stimulate, Invest

Significant market evidence exists of the need for anticipatory capital investment to help address system barriers and to provide the enabling infrastructure to support deployment of offshore wind. For example: UK Governments Offshore Wind Manufacturing Investment Scheme (OWMIS); Ports for Offshore Wind; the Net Zero Opportunity (Crown Estate Scotland); Floating Offshore Wind Manufacturing Investment Scheme (FLOWMIS); RUK Industrialisation Roadmap 2040; Industrial Growth Plan (IGP); and Port and Manufacturing Investment Models (Offshore Renewable Energy Catapult, WSP), amongst others. We are undertaking three discrete activities to support this, which we are terming **Signpost, Stimulate, Invest**:

Signpost

This Future of Offshore Wind publication is the first stage in providing greater visibility of the long-term demand requirements for the potential scale and broad location of future fixed and floating offshore wind sites in UK waters, with up to 20-30GW of new leasing expected to come forward before 2030.

By identifying the future areas of development through our Marine Delivery Routemap, this provides an opportunity to more accurately review supply chain gaps and assess potential opportunities to stimulate and build out advance capacity in strategic locations to support future deployment. This should provide confidence to private capital of the benefits from investing in direct projects and the adjacent supply chain, as well as identifying the potential locations at a high level that could be the source of this future growth.

We have undertaken similar signposting exercises in more granular detail with our funding and publication of the [Celtic Sea Blueprint](#), and co-funding of the [Offshore Wind Industrial Growth Plan](#), both of which look to articulate the onshore supply chain needs to support delivery of Offshore Wind Leasing Round 5 (Celtic Sea Blueprint) and 2050 Offshore Wind targets (e.g. Industrial Growth Plan covering 2024-2035).

Stimulate

We recognise the importance of stimulating investment activity, which is why we have established the £50 million [Supply Chain Accelerator fund](#) with the explicit objective of helping catalyse the UK supply chain capacity and capability for offshore wind.

The first £10 million of the Supply Chain Accelerator was launched in May 2024 with a focus on supporting development expenditure for the core activities identified by the Celtic Sea Blueprint. This first wave of the Accelerator closed at the end of July 2024 and we are currently considering applications received. Further updates will be provided in due course, including details of further rounds of the Supply Chain Accelerator and potential themes.



Invest

There is a need for collective and upfront capital investment to address strategic bottlenecks and accelerate delivery, particularly in respect of enabling infrastructure (UK ports and supply chain). Our aim is that the additional 20-30GW of new development being brought to market before 2030, set out in this report, will provide a visible pipeline to allow investment capital to flow into some of these projects.

The Crown Estate has an ambition to commit capital into enabling infrastructure assets and we have the conviction and desire to invest alongside others in anticipation of this future pipeline. We welcome the decision by the UK Government in July 2024 to bring forward The Crown Estate Bill which will modernise our borrowing and investment powers and help to realise this ambition. This is explored further in the section that follows.

Investment focus areas: adjacent infrastructure to support offshore wind

The passing of The Crown Estate Bill will enable The Crown Estate to allocate £200m - £400m of capital over the short to medium term towards investments in enabling infrastructure assets that will allow the accelerated delivery of offshore wind projects.

We are focused on two specific areas for investment, unlocking strategic bottlenecks to speed up the delivery of offshore wind projects.

1 Offshore wind ports: investing in the expansion of UK ports and port-based activities to support the construction, assembly, integration and delivery of fixed/floating offshore wind.

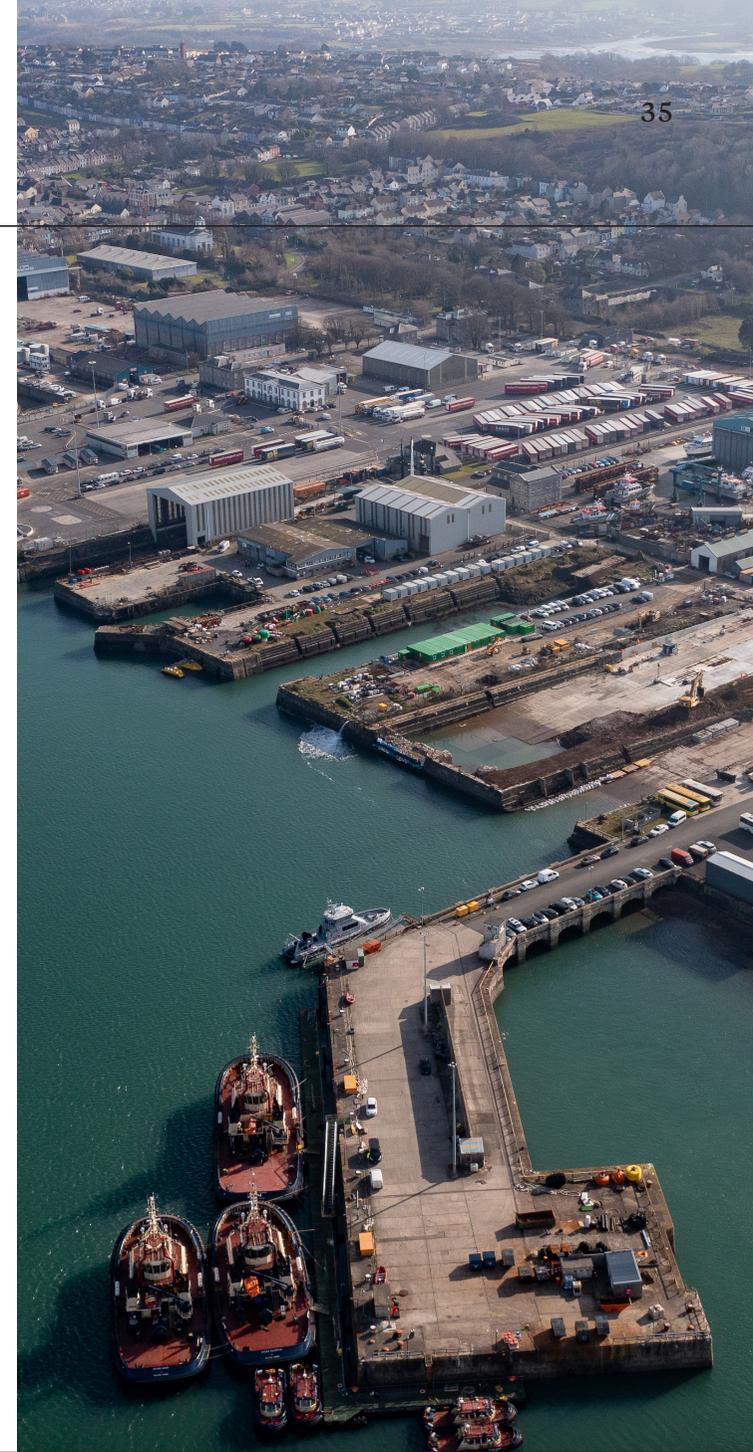
2 Offshore wind supply chain: supporting the development and enhancement of the UK's offshore wind supply chain capability and capacity including the establishment of new or expanded manufacturing facilities and the establishment of associated R&D and training facilities. This can be at the early stage to fund development activity (through the Supply Chain Accelerator) but could also cover larger investments at the capital phase for more mature and well-established projects.

In addition, as part of The Crown Estate's recently announced partnership with Great British Energy, we are exploring further opportunities to invest in order to de-risk, keep pace and accelerate offshore wind projects in the development phase. We are evaluating this further with Great British Energy and UK Government and will be developing and sharing details on this in due course.

We recognise that there is significant revenue uncertainty and volatility in the initial years for some of these enabling infrastructure requirements. The Crown Estate has an established track-record, across its 260 years, of taking a long-term approach to creating lasting and shared prosperity, which means that we are prepared to accommodate short-term volatility in order to realise long-term value for the benefit of the nation.

We will be looking to secure long-term commercial returns as a co-investor working with aligned partners and to also generate wider impact from these investments including the potential to support jobs, catalyse urban and coastal regeneration, and drive economic growth as well as facilitate accelerated deployment of offshore wind.

In addition, The Crown Estate has geographic flexibility to invest into suitable offshore wind-adjacent infrastructure assets across England, Wales, Northern Ireland and Scotland. The passing of The Crown Estate Bill to modernise The Crown Estate's investment powers will also give us greater flexibility in and using different structures to deliver responsible financial returns from those investments.





Next steps in our evolving investment approach

This publication sets out an early indication of The Crown Estate's evolving approach to investment, in particular our ambition to further support the accelerated deployment of offshore wind. In due course we will begin to engage with developers, land-owners, promoters and investors who wish to discuss specific projects or opportunities where we may be able to invest our capital.

It is anticipated that investment opportunities will be assessed against a set of yet to be determined criteria based on the potential they may offer in the context of The Crown Estate's strategic goals, and their investment characteristics of the specific opportunity.

Driving broad value

The Crown Estate's purpose is to create lasting and shared prosperity for the nation across all of our work. This means we are seeking to harness the opportunities created by the delivery of offshore wind to enable net zero, steward thriving biodiversity and marine environments, create inclusive communities and support economic growth.

Our approach to delivering such broad value will seek to use our systems-level, strategic perspective and convening power to collaborate with others and identify the best enabling activity or investment opportunities across key areas of the UK, to support sectors and places.

Building on the approach we have taken in Offshore Wind Leasing Round 5, this will include consideration of how best we can drive broader social and environmental value. As part of future leasing opportunities, we will continue to work closely with regional stakeholders, communities and industry clusters to develop our approach. This will include exploring how we can further catalyse activity and investment aimed at enhancing environmental and social value for the nation, whilst delivering cost-effective offshore wind and retaining the UK's position as a leading attractive market for offshore wind investment. We recognise the need to work with local partners to unlock onshore opportunities in support of offshore wind, and ensure these communities benefit from its long-term success. Together with engagement at an early stage of design, this will ensure that the highest value opportunities can be integrated into the leasing process.

Discussion point 8

Broad value: our view is that we must harness the opportunities created by the delivery of offshore wind to enable net zero commitments, steward flourishing biodiversity and marine environments, create thriving communities and support economic growth. We are exploring how we can best achieve this through our leasing design.



Identifying the opportunity

As part of our strategic approach, alongside Offshore Wind Leasing Round 5, The Crown Estate commissioned the Celtic Sea Supply Chain Blueprint¹⁶. Published in February 2024, the report identified the minimum infrastructure and supply chain capability required to deliver up to 4.5GW of floating wind in the Celtic Sea - highlighting opportunities for investment in plugging the capability gap - with the potential to create 5,300 jobs and £1.4bn of economic growth for the UK.

- In April 2024, the offshore wind Industrial Growth Plan¹⁷ was published, which sets out the potential 'made in the UK' contribution from offshore wind, and the investment and action required to secure this. This would not only ensure sufficient capability exists to deliver the portfolio for projects, but also capture £25bn of GVA and provide the pathway to growing the UK workforce to more than 100,000. The report, jointly-commissioned by OWIC, Renewable UK, The Crown Estate and Crown Estate Scotland, builds upon the [Supply Chain Capability Analysis](#) published in September 2023, which provided an evidence-based assessment of the products, services and infrastructure required to deliver the UK offshore wind portfolio out to 2040.

Social and environmental value

We intend to explore opportunities for The Crown Estate to deepen its support for communities and nature through building increased social and environmental value into future leasing programmes. We will seek opportunities for positive environmental outcomes, nature inclusive design, and sector decarbonisation alongside broader approaches for creating inclusive communities and supporting economic growth.



In February 2024, The Crown Estate announced a £10 million pilot fund with an initial focus on capturing some of the economic opportunities identified by the Celtic Sea Blueprint¹⁸ and supporting the UK supply chain. A further £40 million has been earmarked, which could be deployed over time to deliver on the wider Industrial Growth Plan. The initial Supply Chain Accelerator was launched in May 2024 - the submission window has now closed and proposals are currently under evaluation, with results due to be announced later in 2024.

Social and environmental value creation in Leasing Round 5

Offshore Wind Leasing Round 5 seeks to establish the next generation of floating offshore wind farms in the Celtic Sea. At up to 4.5GW it is set to be one of the biggest schemes of its kind in the world. Given the nascent nature of this technology and the absence of an established supply chain in the region, a key objective of the Celtic Sea Programme is to incentivise new onshore opportunities and create broader social and environmental value through the leasing process.

This means that Bidders are required to set out plans with clear commitments to delivering positive social outcomes aligned with core themes, such as new employment and skills, tackling inequality and diversity in the workforce, apprenticeships, volunteering and working with local communities. Bidders will also need to set out at an early stage how they intend to work with ports, which will be critical to the assembly and ongoing operation and maintenance of the new floating turbines. Successful Bidders will need to demonstrate how they will accelerate progress towards a net positive outcome for the environment and improved resilience of marine ecosystems.

The Crown Estate has also been clear that the leasing process is just one lever for driving these wider benefits, and ongoing collaboration between industry, onshore stakeholders and governments will be needed to truly realise the full potential of a new floating wind industry in the Celtic Sea.

¹⁶ "Supply Chain for Celtic Sea Floating Wind Farms Could Power 5,000 New Jobs and a £1.4bn Boost for the Economy," The Crown Estate, 22 February 2024.

¹⁷ "Offshore Wind Industry Unveils Industrial Growth Plan to Create Jobs, Triple Supply Chain Manufacturing and Boost UK Economy by £25 Billion," 17 April 2024.

Technologies and innovation

Innovation has an important role to play in the development of the seabed and the energy transition, as the UK continues to find new ways to harness energy from our natural resources in a sustainable manner. As part of reviewing our approach to future leasing, we are interested in assessing the potential to bring forward innovation and new technologies. This could include, for example, the continued development of floating wind, the integration of floating solar or wave and tidal power generation technologies, introducing offshore hybrid assets into grid connection designs and the production of green hydrogen (see Green hydrogen section on [page 41](#)). To do this, we are considering the recommendations set out in the Industrial Growth Plan (IGP). It is apparent that despite early investment in some of these areas there remain challenges in commercialising new technologies for the market. For instance, the ambition to deploy and demonstrate new technologies at scale may at times be hampered by concerns about their bankability, and by the wider objective to drive down LCOE.

We will consider our role on this agenda and continue to deliver on our actions agreed within the IGP, including building on the lessons learned from previous leasing activity; noting this report and our wider Marine Delivery Routemap is identified as a key action to increase confidence in demand, thereby de-risking investments in supply chain and innovation. We recognise the criticality

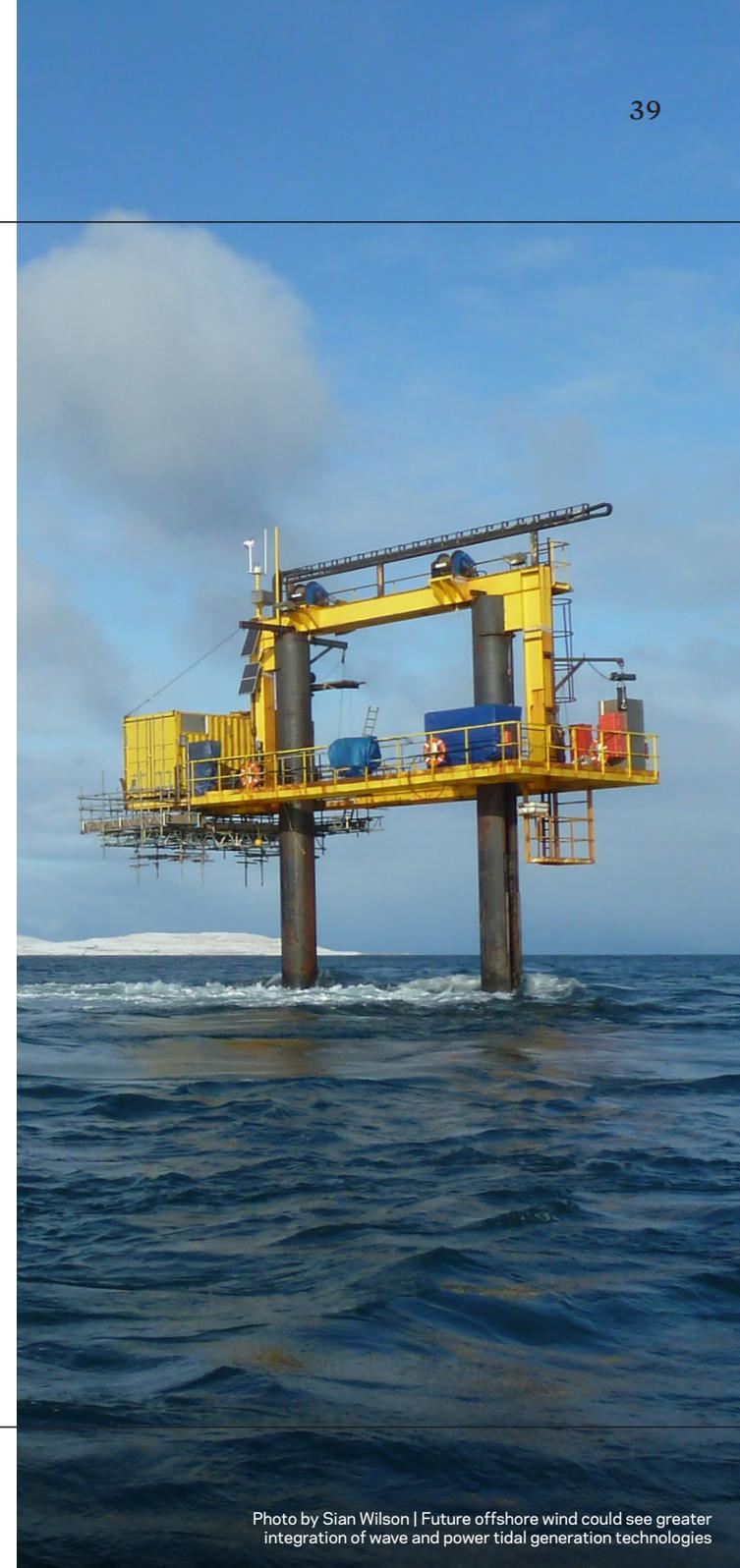
of working with others, and we will build on our existing partnerships with Government, industry, and actors such as ORE Catapult and SuperGEN ORE, as we seek to align our approach with the new IGP Delivery Body over the coming months.

Innovation is fundamental as we evolve our approach to leasing in order to support new technology development and to allow multiple technologies to access the seabed efficiently while supporting a thriving marine environment.

Three areas of current discussion are the relative mix of fixed and floating wind, and the production of green hydrogen and other complementary technologies.

Discussion point 9

Technologies: future offshore wind leasing will include a mix of sites that accommodate the development of fixed and floating sub-structures. Our long-term ambition is to give developers the flexibility to deploy the concept they consider most appropriate for a given site, noting that a tailored approach may be needed to ensure we foster growth and development of innovative foundation technologies, such as floating foundations.

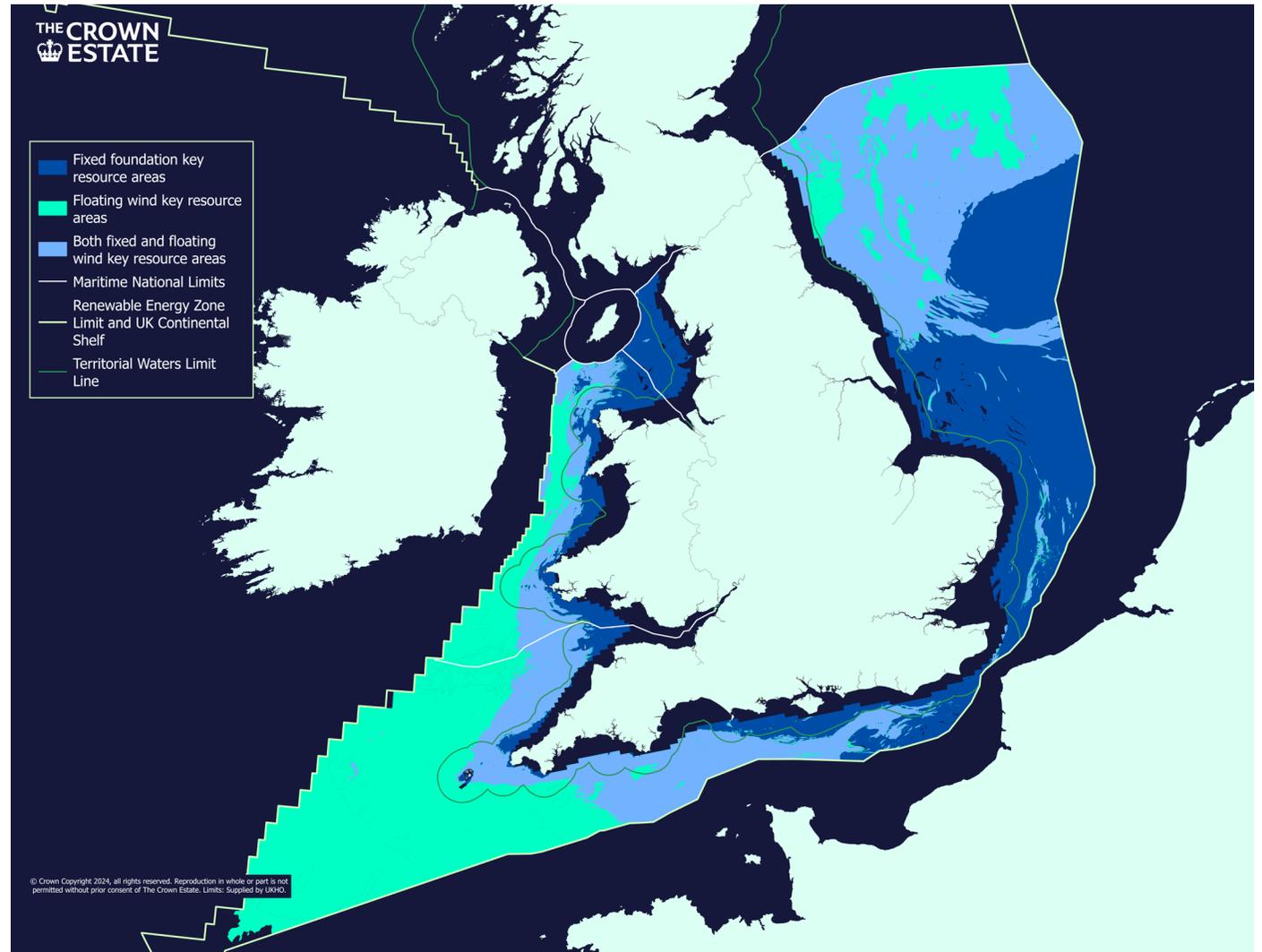


Sub-structure technology

In 2020, The Crown Estate commissioned a report¹⁸ that identified significant opportunities for both fixed and floating offshore wind in the waters off England, Wales and Northern Ireland. The report identified that fixed wind is expected to be able to be deployed in deeper waters than ever before, and floating wind will open up significant new areas of seabed to offshore wind deployment. Since publication, developing understanding of engineering solutions has led to a further increased maximum water depth for fixed sub-structures from 70 to 80m, as shown in Figure 5.

To satisfy future aspirations for offshore wind in a manner which is cost effective for the UK over the long term, there will be a need to develop offshore wind farms in a range of water depths and distances to shore. Our long-term ambition is therefore to move to an approach where we make available a mix of site types to enable the development of fixed and floating sub-structures, but give developers the choice to deploy the foundation concept they consider most appropriate and cost effective for each site, acknowledging that technology will develop over time and developers may have different approaches that would determine this choice. Due consideration will be given to technology choices in the coming rounds, to ensure we strike the right balance of flexibility for developers and foster growth and development of innovative foundation technologies, such as floating foundations.

Figure 5: Key offshore wind resource areas, Broad Horizons, 2020



¹⁸ ["Broad Horizons: Key Resource Areas for Offshore Wind."](#) The Crown Estate, 2020

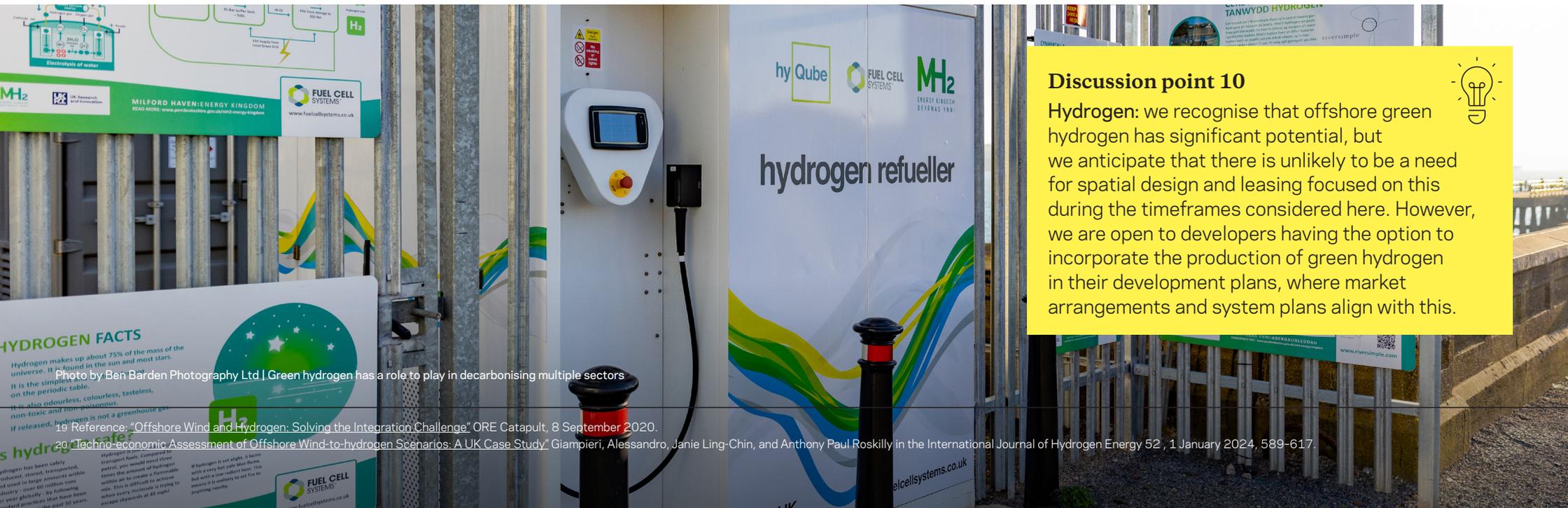
Green hydrogen

Green hydrogen has a key role to play in the drive to net zero – helping to decarbonise a range of sectors (e.g. industry, transport) and harnessing the UK's strong wind and hydrogen storage resource. Significant opportunities exist for the development and production of green hydrogen produced by electrolysis and powered directly by offshore wind. This is an exciting and developing new area, but it remains in its early stages. Researchers assessing the comparative advantages of onshore and offshore electrolysis have reached different conclusions as to how these will develop over time^{19, 20}. As the hydrogen market develops, the economics will become clearer. It is also too early to say how the development of this technology will feature in system level processes such as the SSEP.

In light of the above, we therefore do not consider that there is a need for spatial design and leasing focused solely on offshore green hydrogen production at this stage. However, we are open to developers having the option to incorporate green hydrogen production, either through onshore or offshore electrolysis, as a route to market in their development plans in the next rounds of offshore wind leasing, where market arrangements and system plans align with this. We see great potential in green hydrogen production powered by offshore wind which also uses the UK's strong offshore storage potential. We look forward to further dialogue, both on this proposed approach and how The Crown Estate can support the development of the sector. We will continue to keep this under review.

Other complementary technologies

We are following innovation and developments in the markets for other complementary technologies such as floating solar or wave and tidal power generation technologies with much interest whilst we evolve our approach for future leasing. We are exploring opportunities how we can support the development of these sectors and will continue to review our approach as these sectors continue to innovate and mature.



Discussion point 10

Hydrogen: we recognise that offshore green hydrogen has significant potential, but we anticipate that there is unlikely to be a need for spatial design and leasing focused on this during the timeframes considered here. However, we are open to developers having the option to incorporate the production of green hydrogen in their development plans, where market arrangements and system plans align with this.

¹⁹ Reference: "Offshore Wind and Hydrogen: Solving the Integration Challenge" ORE Catapult, 8 September 2020.

²⁰ "Techno-economic Assessment of Offshore Wind-to-hydrogen Scenarios: A UK Case Study" Giampieri, Alessandro, Janie Ling-Chin, and Anthony Paul Roskilly in the International Journal of Hydrogen Energy 52 , 1 January 2024, 589–617.

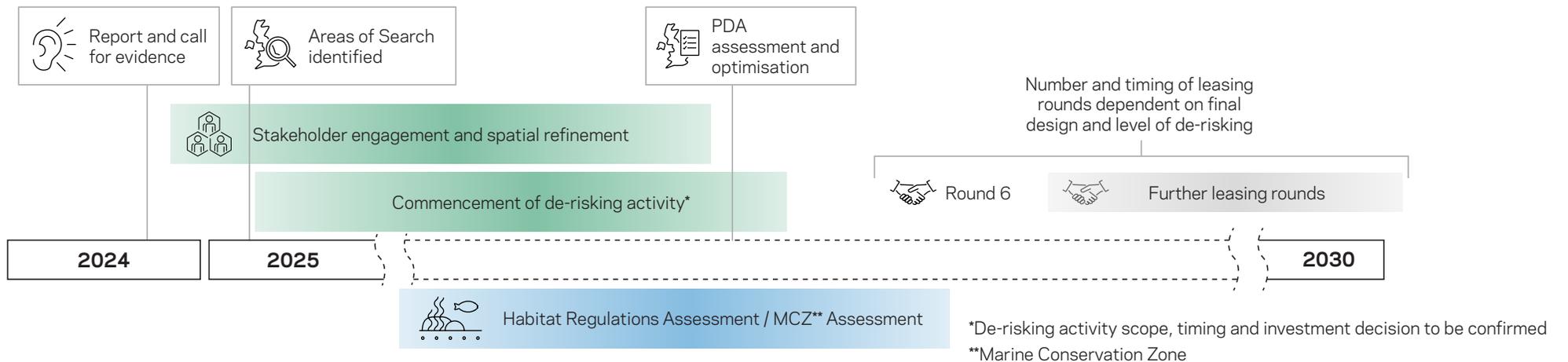
Next steps

In sharing our assumptions at this early stage, alongside our report on the Marine Delivery Routemap, we are presenting a vision of a more strategic approach to offshore wind development than ever before. Moving beyond a linear ‘round-by-round’ approach, we are looking more strategically and holistically at how we can enable the industry to play its part in delivering a sustainable energy transition for the country and supporting a thriving marine environment.

As set out, we are proposing our approach to future offshore wind to be closely informed by our Whole of Seabed Programme and our work with delivery partners and governments on the Marine Delivery Routemap. This was one of the key recommendations from the Electricity Networks Commissioner, Nick Winser, accepted as part of the Government’s TAAP²². Likewise, the de-risking options in this report addresses recommendations made by the Offshore Wind Champion, Tim Pick, in his report, [“Accelerating the deployment of offshore wind farms”](#).

This is the next stage of the conversation. As illustrated in Figure 6, we will, upon publication of the report, commence extensive stakeholder engagement, whilst progressing to refine the spatial design assumptions for our future leasing rounds. We welcome your views on the discussion points raised in the report, and will take this feedback into consideration when scoping the de-risking activities which we aim to undertake ahead of future leasing rounds. This will inform the detailed programme for our next tender rounds, and we will continue to engage with the market as we refine timings and design assumptions.

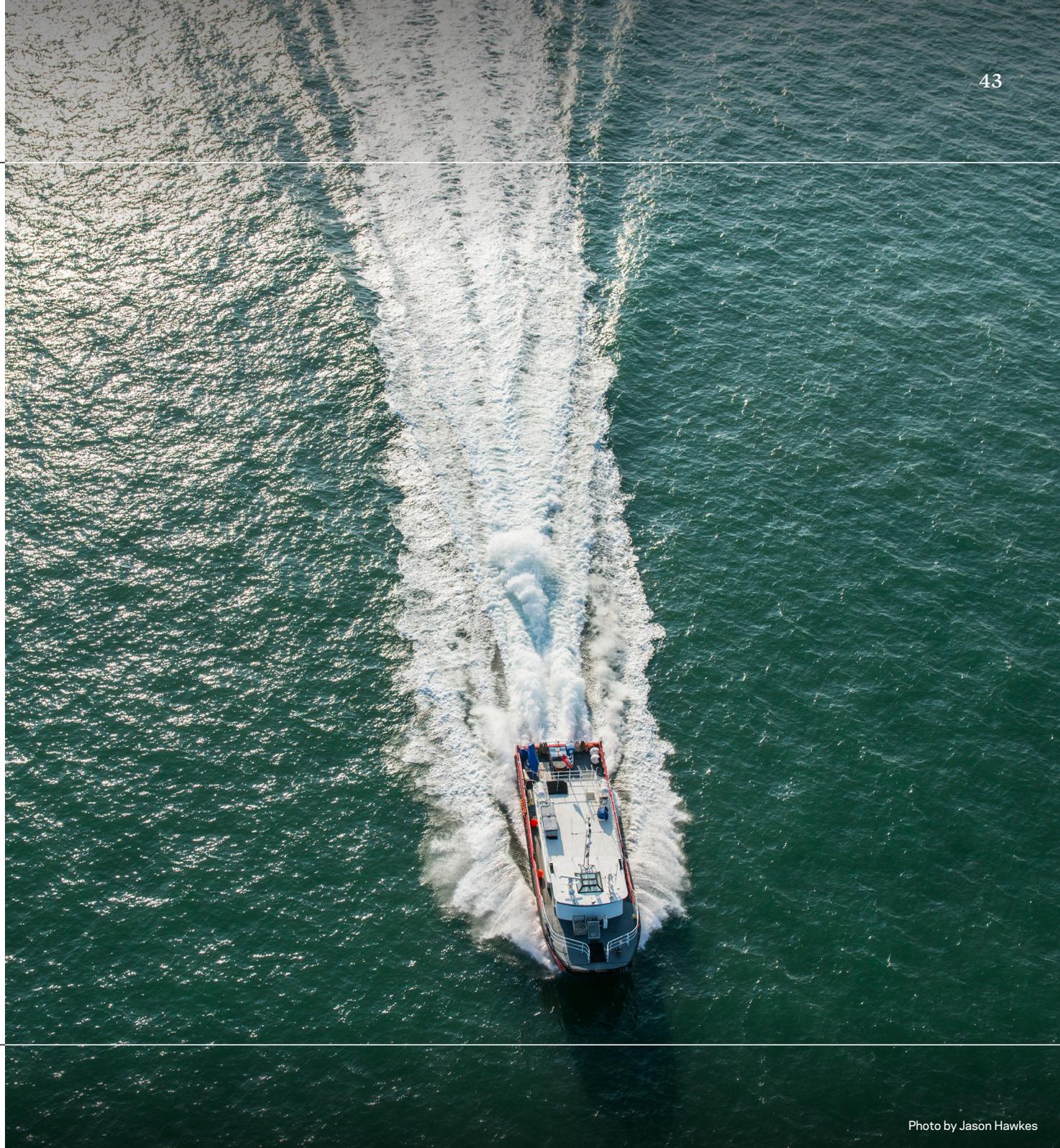
Figure 6: Illustrative timelines, including potential de-risking activities



²² [“Accelerating Electricity Transmission Network Deployment: Electricity Networks Commissioner’s Recommendations”](#), Department for Energy Security and Net Zero, 4 August 2023.

As discussed, the Routemap will complement and inform key related marine spatial programmes and forward plans for specific marine sectors. This Routemap series of publications will continue to expand, with future thinking to be shared in due course on our approach to nature, CCS, marine aggregates and other key marine sectors. A driving principle of our approach through all these will be to engage with sectors and stakeholders to test our assumptions and seek feedback on our proposals. In responding to this feedback, we will also seek to ensure that developers have an understanding of our likely requirements for our future leasing processes. As part of our broader approach, throughout the development of our future leasing programme, we will continue to seek the views of non-profit organisations, governments, sea users, and delivery partners on how we can work together to ensure our leasing programme supports biodiversity, nature recovery and the creation of broad environmental and social value.

We look forward to working with all stakeholders to refine our approach and develop a world-class programme that creates lasting and shared prosperity for the nation.



About The Crown Estate

The Crown Estate has a diverse £16bn portfolio that includes urban centres and development opportunities; one of the largest rural holdings in the country; Regent Street and St James's in London's West End; and Windsor Great Park. We also manage the seabed and much of the coastline around England, Wales and Northern Ireland, playing a major role in the UK's world leading offshore wind sector.

We are a unique business established by an Act of Parliament, tasked with growing the value of the portfolio for the nation and returning all of our net profit to HM Treasury for the benefit of public spending. This has totalled £4bn over the last ten years.

For further information please contact The Crown Estate Press Office:
www.thecrownestate.co.uk | 0845 241 2342

Through our statutory purpose, The Crown Estate creates environmental, social and financial value both for now and into the long term. This includes:

- Playing a significant role in unlocking renewable energy for millions of homes through sectors such as offshore wind and creating opportunities for new technologies like CCUS and hydrogen to deliver the UK's energy security transition, resulting in thousands of jobs for communities across the UK.
- Supporting the sustainable transformation of land use in the UK through diversified, regenerative agricultural and environmental best practice alongside a thriving natural world.
- Becoming recognised as a centre of excellence for environmental and ecological best practice across the Windsor Estate.
- Identifying and creating opportunities for thriving and resilient communities across the country to support regeneration, housing and innovation.
- Ensuring London retains its global city status, by fostering a more vibrant, greener and inclusive destination for millions of visitors and businesses.

Appendix 1: Glossary and references

Glossary

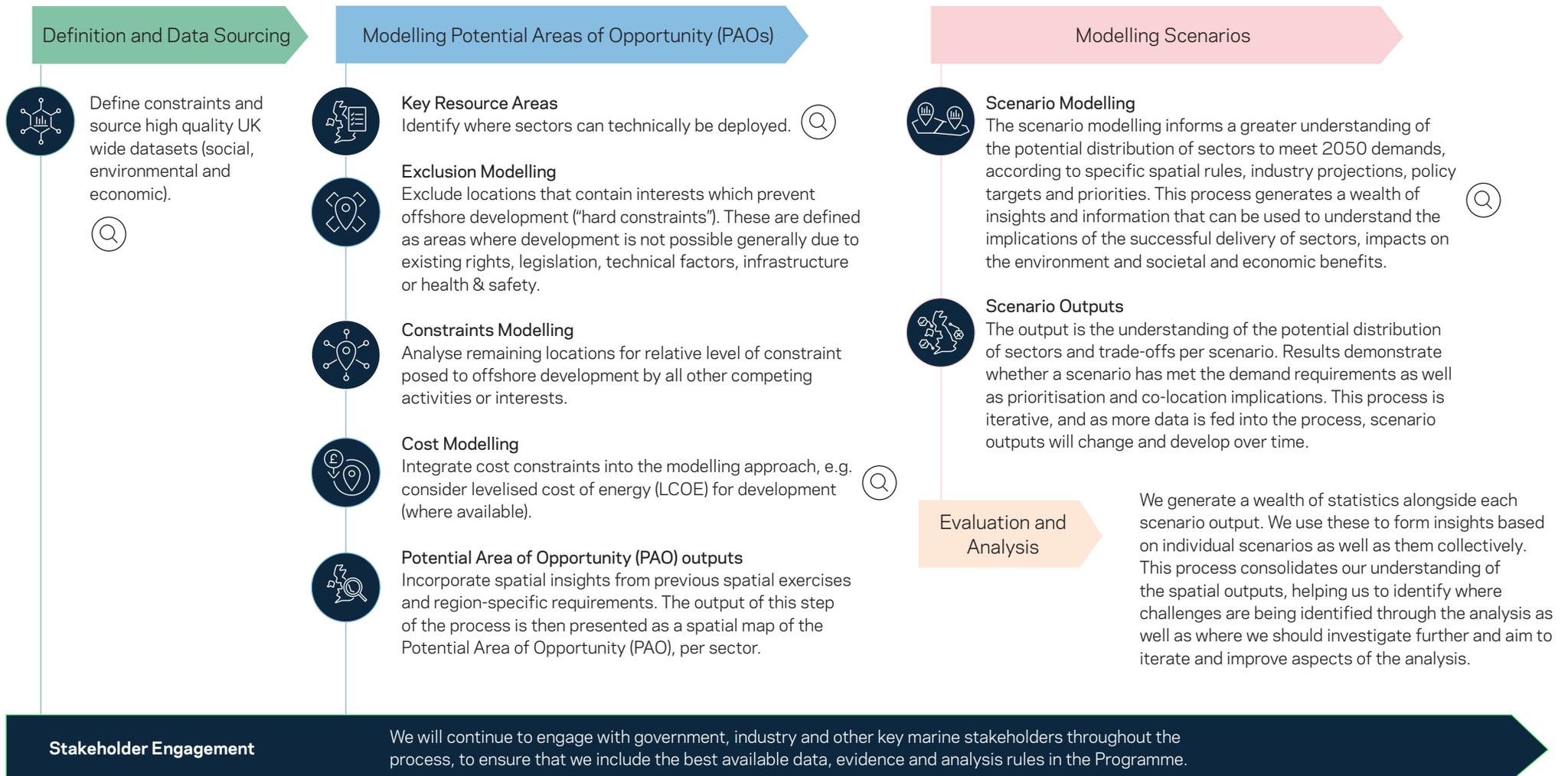
AIS	Automatic Identification System	MSPri	Marine Spatial Prioritisation
AoS	Area(s) of Search	MW	megawatt
CADW	the Welsh Government's historic environment service	NATS	National Air Traffic Services
CCC	Climate Change Committee	NE	Natural England
CCS	Carbon Capture and Storage	NIEA	Northern Ireland Environment Agency
Cefas	Centre for Environment, Fisheries and Aquaculture Science	NGET	National Grid Electricity Transmission
CfD(s)	Contract(s) for Difference	NGS	Natural Gas Storage
CSNP	Centralised Strategic Network Plan	NM	nanometer
EIA	Environmental Impact Assessment	NRW	Natural Resources Wales
EMODnet	European Marine Observation and Data Network	OREAP	Offshore Renewable Energy Action Plan
ESO	Energy System Operator	OREC	Offshore Renewable Energy Catapult
FES	Future Energy Scenarios	OSWMIS	Offshore Wind Manufacturing Investment Scheme
FLOWMIS	Floating Offshore Wind Manufacturing Investment Scheme	PAO(s)	Potential Area(s) of Opportunity
GW	Gigawatts	PDA(s)	Project Development Area(s)
HRA	Habitats Regulations Assessment	PEXA	Military exercise areas and danger areas
IGP	Industrial Growth Plan	REMA	Review of Electricity Markets Arrangements
JNCC	Joint Nature Conservation Committee	RIO	Resource Identification and Optimisation tool
km	kilometer	R&D	research and development
LCOE	Levelised Cost of Electricity	SACs	Special Areas of Conservation
MCZ	Marine Conservation Zone	SPAs	Special Protection Areas
MCS	Marine Conservation Society	SSSIs	Sites of Special Scientific Interest
MMO	Marine Management Organisation	SRA	Strategic Resource Area
MNRs	Marine Noise Registries	SSEP	Strategic Spatial Energy Plan

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Appendix 2: Whole of Seabed Methodology

 This symbol illustrates the quality assurance process, conducted to ensure outputs are reliable and that only high quality datasets have been used in the modelling process.



Appendix 3: Future Offshore Wind report – map data

This appendix provides an overview of the data used to create the Exclusion and Suitability maps presented within this report.

Datasets used in the Exclusions Map (shown in column 2 of [Figure 2](#))

The model used to create the Exclusions Map was created with The Crown Estate’s Resource Identification and Optimisation tool (RIO), an advanced mapping and analysis capability developed by The Crown Estate.

‘Exclusions’ are defined as areas where development is not possible generally due to existing rights, legislation, technical factors, infrastructure or health & safety. The model identifies hard constraint areas where development is not possible and these are excluded from further consideration. These excluded areas may also include relevant buffer distances around sensitive features.

The list of exclusions in the table below are informed by previous engagement undertaken with stakeholders in February 2022 through the Celtic Sea Floating Offshore Wind Leasing Round 5 programme, as well as informed through engagement with stakeholders via the MSPri programme in May 2023.

The datasets included in the model as exclusions are as follows:

Exclusion Model

Dataset	Source Organisation	Buffer	Notes
12NM from shore in Welsh Waters	The Crown Estate		Aligned with Welsh Government Resource Area identification
6NM from shore in English Waters	The Crown Estate		Development of future offshore wind inshore recognised as infeasible
Abandoned Wells	North Sea Transition Authority	250m	Existing infrastructure would preclude development.
Active Cables Infrastructure	The Crown Estate	250m	Current legal agreement / infrastructure.
Active Pipelines Infrastructure	The Crown Estate	250m	Current legal agreement / infrastructure.
Aggregates Tender Round sites	The Crown Estate		Ongoing leasing process
Aquaculture Agreements	The Crown Estate		Current legal agreement / infrastructure
Cables Agreements	The Crown Estate		Current legal agreement / infrastructure
HPMAs	Natural England	1km	Highly Protected Marine Areas
Inshore Traffic Zones	UK Hydrographic Office		IMO routing measures designated to maintain safety at sea.
International boundary buffer	The Crown Estate	2.5km	Buffer to avoid directly abutting international waters
Leasing Round 5 Project Development Areas	The Crown Estate	5km	Ongoing leasing process
MCMS Navigational Dredging	Marine Management Organisation		Navigational conservation and maintenance
Meteorological Equipment Agreements	The Crown Estate		Current legal agreement / infrastructure
Minerals and Aggregates Agreements	The Crown Estate	1km	Current legal agreement / infrastructure
Minerals Capital and Navigation Agreements	The Crown Estate		Current legal agreement / infrastructure
Natural Gas Storage Agreements	The Crown Estate		Current legal agreement / infrastructure
Navigation AIS – high density	EMODnet		Safety grounds

Dataset	Source Organisation	Buffer	Notes
Oil and Gas Agreements (infrastructure inside 1.2NM)	The Crown Estate		Current legal agreement / infrastructure
Open Disposal Sites	Cefas		Navigational conservation & maintenance
Outfall Leases	The Crown Estate	250m	Current legal agreement / infrastructure
PEXA danger areas ²³	Ministry of Defence		Defence requirements
Pilot Boarding Areas	UK Hydrographic Office	2NM	Safety grounds
Pipelines Agreements	The Crown Estate		Current legal agreement / infrastructure
Platform Helicopter Safety Zones - 500m	North Sea Transition Authority		Safety grounds
Protected Wrecks Exclusion Zones	English Heritage, CADW, Historic Scotland, Northern Ireland Government		Legislative protection
Shipping routes between Traffic Separation Schemes	The Crown Estate		Safety grounds
Suspended Wells	North Sea Transition Authority	500m	Legal requirement for abandonment procedures to be carried out. Existing infrastructure would preclude development
Tidal Stream Agreements	The Crown Estate		Current legal agreement / infrastructure
Traffic Separations Schemes & Deep Water Channels	UK Hydrographic Office	2NM	Safety grounds
Nuclear Power Stations	EDF	1NM	Safety grounds
Wave Agreements	The Crown Estate		Current legal agreement / infrastructure
Wind Agreements	The Crown Estate	5km	Current legal agreement / infrastructure

²³ A subset of danger areas and firing ranges were included as exclusions, as advised by the MOD via the Marine Spatial Prioritisation Programme.

Datasets used in the Suitability Map (shown in column 3 of Figure 2)

The Suitability Model combines the outputs of the Exclusion model above with a Restriction Model. Built using RIO, this model is used to analyse all economic, social and environmental interests in the marine space that are not 'hard constraints'.

For analysis purposes these are termed 'restrictions' and defined as all other activities or sensitivities which require consideration alongside offshore wind development but offer potential for co-existence.

Each restriction dataset is prioritised (weighted) according to the relative risk that offshore wind development may present to the users or sensitivities, based on stakeholder feedback gathered over the past 15 years and most recently as part of the MSPri programme in May 2023. The weightings and resulting heat-map shown in Figure 4 demonstrate the extent that co-existence may or may not be possible between other economic, social and environmental sensitivities and offshore wind.

The datasets included in the model to represent soft constraints are as follows:

Restriction Model

Dataset	Source Organisation	Buffer
2021 Aggregates Tender Round Sites	The Crown Estate	
Anchorage Areas	UK Hydrographic Office	
Bathing Beaches	MCS	1NM
Carbon Storage 1 st Round Provisional Licence Areas	North Sea Transition Authority	
Carbon Storage Licences	North Sea Transition Authority	
CCS Agreements	The Crown Estate	
Civil Radar Interference	NATS	
Closed Disposal Sites	Cefas	
Designated Feature Risk Layers (mobile species)	The Crown Estate	
Evaporites Agreements	The Crown Estate	
Fish Spawning and Nursery Grounds	Cefas	
Fisheries Areas of Importance	Marine Management Organisation	
Harbour Authority Areas	UK Hydrographic Office	
Leisure Vessel AIS intensity	EMODnet	
Licensed Field Determination Areas	North Sea Transition Authority	
MCZs & MNRs	JNCC, NE, NRW, NatureScot, NIEA	
Navigation AIS Density	EMODnet	
Oil & Gas Platform Helicopter Safety Zones	The Crown Estate	
Out of Service Cables Infrastructure	The Crown Estate	250m
Out of Service Pipelines Infrastructure	The Crown Estate	250m
Petroleum - 2 nd & 3 rd Term Licences	North Sea Transition Authority	
Petroleum - Initial Term Licences	North Sea Transition Authority	
PEXA areas ²⁴	Ministry of Defence	
Ramsars (European)	JNCC, NE, NRW, NatureScot, NIEA	
SACs (European)	JNCC, NE, NRW, NatureScot, NIEA	
SPAs (European)	JNCC, NE, NRW, NatureScot, NIEA	
SSSIs	JNCC, NE, NRW, NatureScot, NIEA	
Visibility from Coast	The Crown Estate	
World Heritage Sites	English Heritage, CADW	
Wrecks - unprotected	UK Hydrographic Office	50m

²⁴ A subset of danger areas and firing ranges were included as exclusions, as advised by the MOD via the Marine Spatial Prioritisation Programme.

Analysis used in the Regional Opportunity Map

[\(Figure 4\)](#)

This was created through analysis of the suitability model as well as consideration of development costs (Levelised Cost of Electricity - LCOE), shown in column 1 of [Figure 2](#).

This analysis was undertaken as part of The Crown Estate's Whole of Seabed Programme and identifies future locations for offshore wind to areas that have lower negative interactions with other interests and users of the marine space.

As the potential locations of future offshore wind are refined, there will be opportunity for stakeholders to flag further datasets for consideration.

Further detail on the Whole of Seabed, data and analysis will be provided as we move through the more detailed spatial design process for future offshore wind. This will include testing and refinement through stakeholder engagement as we transition from the regional opportunity identified in this report through Areas of Search to Project Development Areas that will be offered to market. General updates on the Whole of Seabed Programme, which covers all sectors leased by The Crown Estate and future usage of the seabed in English, Welsh and Northern Irish waters can be found on the following website page: [Marine | The Crown Estate](#).

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