July 2022

Network Options Assessment 2021/22 Refresh

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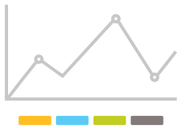

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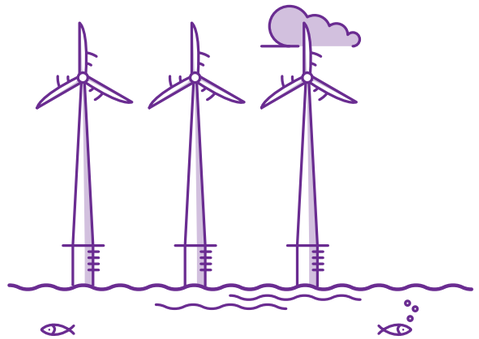

Report Summary

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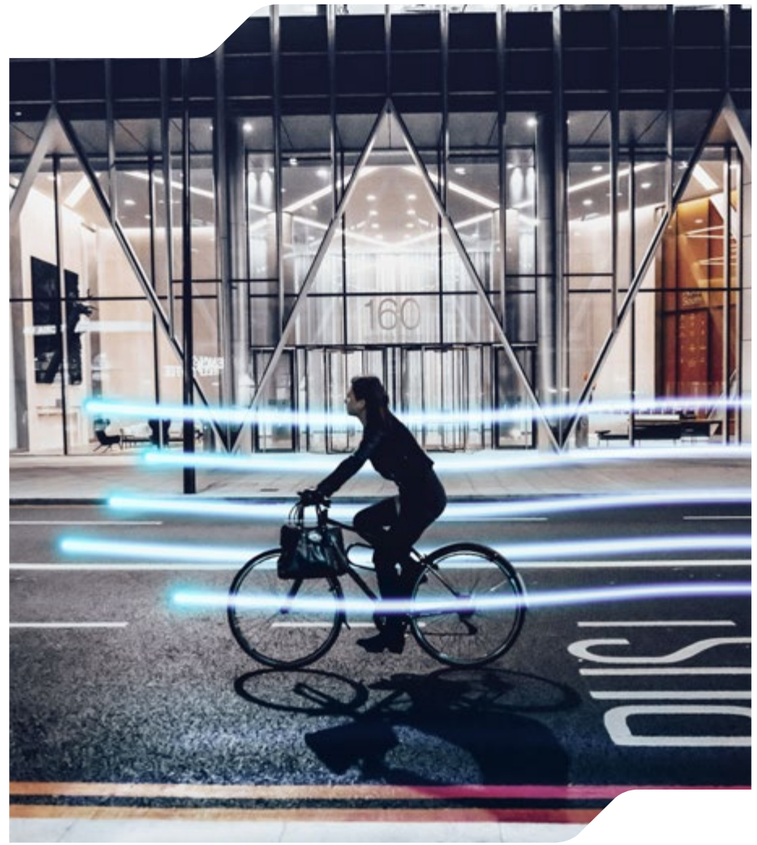
Report Summary

The electricity system in GB is undergoing significant change as we decarbonise our electricity supply. Whilst our network meets our needs for today, as we look to the future, and the ambitious targets set by the Government, we need to expand the transmission network to ensure we have a power system capable of delivering on our 2030 offshore wind ambition and the UK's broader net zero target.

The *Network Options Assessment (NOA) 2021/22 Refresh (*this *NOA 2021/22 Refresh)* is one of the documents that sit under the Pathway to 2030: A holistic network design to support offshore wind deployment for net zero. This *NOA 2021/22 Refresh* is an update to the *NOA 2021/22* that was published in January 2022 in accordance with standard condition C27 of the NGESO transmission licence. It now fully integrates the *HND*'s offshore network and confirms the wider onshore network requirements beyond those fundamentally required to facilitate the connection of each in-scope offshore wind farm. The *NOA 2021/22 Refresh* also indicates when these reinforcements will be required to deliver the most value to consumers.

As well as this *NOA 2021/22 Refresh* publication, the other main documents under the Pathway to 2030 are:

- *Holistic Network Design*
- Industry Code, Standard and Licence Recommendation
- Stakeholder Approach, Engagement and Feedback
- *HND* Methodology



Report Summary

The *NOA 2021/22 Refresh* has updated the recommendations of the *NOA 2021/22* based on the recommended offshore design to connect 50 GW by 2030. The offshore network topology, and wind farm connection sites are updated to assess the long term benefits of coordinating with the existing onshore transmission network. This is different from the *NOA 2021/22* (published in January 2022), which was developed under the assumption of radially connected offshore windfarms.

The methodology used in the *NOA 2021/22 Refresh* report follows the *NOA* methodology used in the *NOA 2021/22*, with some adjustments to align to the *HND*. For more details on the *NOA 2021/22 Refresh* methodology please see Chapter 2.

Together, the *HND* and the *NOA 2021/22 Refresh* have identified 94 schemes that are required to meet the Government's ambition for 50 GW of offshore wind by 2030. This comprises of 56 schemes that have been identified as *HND* essential options (options needed for 2030 for delivery of 50 GW offshore wind), and 38 optimal schemes from this *NOA 2021/22 Refresh* analysis. These scheme together are a total cost of £21.7bn.

Working closely with TOs we have identified 11 *HND* essential options whose delivery is currently estimated beyond 2030 and require acceleration to facilitate current Government targets. This acceleration would require the Government action suggested in the April 2022 British Energy Security Strategy (BESS) and equivalent activities in Scotland.

In addition, the *NOA 2021/22 Refresh* has also recommended 26 asset-based options for delivery from 2031 onwards with a total cost of £6.2bn. Four of these schemes received a "Proceed" recommendation showing they are needed on their earliest in service date. This shows the continued need for investment in the transmission network post-2030 as the generation and demand mix continues to evolve to meet our 2050 net zero target.

What happens next?

The *Holistic Network Design* is a first, significant step towards a more strategic approach to transmission network planning as set out in Ofgem's Electricity Transmission Network Planning Review consultation[1].

Going forward, we will continue to work in partnership with stakeholders, to reform the network planning processes, to deliver a Centralised Strategic Network Plan as envisaged in Ofgem's consultation.

We are currently developing the *HND* follow-up process with an expectation that this will commence following this publication of the *HND* in July 2022, and with an aim to provide in-scope developers with our *HND* follow-up process recommendations in Q1 2023. Our plans for further analysis – as part of a transition to a Centralised Strategic Network Plan – are being developed and we will share more information with Stakeholders this autumn. This will include changes and enhancements to the assessment of the onshore network considered by the *NOA* process.

1 https://www.ofgem.gov.uk/publications/consultation-initial-findings-our-electricity-transmission-network-planning-review

Chapter 1

Introduction

Introduction

The *Network Options Assessment* (*NOA*) is our recommendation for which reinforcement projects should receive investment for the next financial year. These projects are major electricity transmission network reinforcements, as defined in the *NOA* methodology.

The *NOA 2021/22 Refresh* is an update to the previously published *NOA* and incorporates the impact of offshore coordination resulting from the *Holistic Network Design (HND)*. It is important to note that this *NOA 2021/22 Refresh* is a standalone document.

Holistic Network Design (HND)

The purpose of the *HND* is to provide a recommended onshore and offshore network to meet the Government ambitions of connecting 50 GW of offshore wind in Great Britain (GB) by 2030. This forms a key milestone on the route to net zero by 2050 for England and Wales and by 2045 for Scotland. To do this, the *HND* provides an economic, efficient, and sustainable National Electricity Transmission System (NETS) that includes the offshore assets required to connect the large volume of offshore wind and onshore reinforcements where relevant to achieve the ambition. The *NOA 2021/22 Refresh* updates the most recent *NOA* to accommodate those connections informing the overall *HND*.

We are delivering the *HND* as part of the Offshore Coordination Project, which contributes to the Offshore Transmission Network Review (OTNR) led by the Department for Business, Energy, and Industrial Strategy (BEIS).

This is an important milestone in our pathway to meet the Government's 2030 ambition. To do this, we strategically assess connection points and coordinate offshore and onshore transmission network designs to recommend a *Holistic Network Design.*

Network planning process

Network assessment begins with our *Future Energy Scenarios (FES)* which provide the network requirements for electricity power transfer across GB and enables system requirements to be calculated and published in the *Electricity Ten Year Statement (ETYS)*. Where reinforcement requirements are identified, Transmission Owners (TOs) then respond with options for reinforcing the network and the *NOA* is an economic analysis of these options.

While we provide recommendations for the options to meet system needs, the TOs, Ofgem or other relevant parties will ultimately decide on what, where, and when to invest. The specific designs of any option, such as the choice of equipment and route will be developed by the TOs.

Some customer connection agreements have major reinforcements which need enabling works for connection. If the *NOA* recommends a change to the delivery of these works, we will work with these customers and the TO to identify if their agreement requires any updates and minimise the impact as much as possible.

NOA 2021/22 Refresh / Chapter 1 Introduction / 08

Introduction

What's in the *NOA 2021/22 Refresh*

- Revised recommendations for the options in *NOA 2021/22* and additional options assessed for a coordinated offshore and onshore network design along with providing connection points for offshore wind. These recommendations supersede those in the *NOA 2021/22* published in January 2022.
- This *NOA,* unlike previous *NOA*s, uses a single future energy scenario. This is a revised **Leading the Way** *FES 2021* scenario which now includes updated offshore connection locations for all generators in scope of *HND*. This scenario is used to align with and support the outputs of the *HND*, and therefore achieves the UK government's 2030 ambitions. The adjusted scenario will be referred to as **'LW21+'**.
- The *NOA 2021/22 Refresh* has a fully optimised set of onshore reinforcement recommendations assessed against this **LW21+** scenario that complement the recommended offshore design, forming the *HND*.
- *NOA* for Interconnectors remains the same as for *NOA 2021/22*, so this *NOA* does not contain the *NOA* for Interconnectors.

What *NOA 2021/22 Refresh* can and cannot do?

The *NOA 2021/22 Refresh* can...

Recommend the most economic reinforcements, whether infrastructure build or alternatives, for investment over the coming years, to meet bulk power transfer requirements.

Recommend when investments should be made under the single **LW21+** scenario to deliver an efficient, coordinated, and economic future transmission system.

Recommend whether the TOs should start, continue, hold, or stop reinforcement projects to make sure they are completed at a time that will deliver the most benefit to consumers.

Inform the *HND* of the most economic reinforcements for the onshore system that complement the *HND* offshore network for 2030.

The *NOA 2021/22 Refresh* cannot...

Address network compliance with the NETS SQSS. Additional onshore reinforcements may be identified for network compliance, which is an integral part of designing a secure, operable, transmission system capable of facilitating net zero.

Recommend customer connections. The *NOA* only recommends the most economic reinforcement to resolve wider network issues.

Insist that reinforcement options are pursued. We can only recommend options based on our analysis. The TOs or other relevant parties are ultimately responsible for what, where and when they invest.

Comment on the details of any specific option, such as how it could be planned or delivered. The TOs or other relevant parties decide how they implement their options.

Evaluate the specific designs of any option, such as the choice of equipment, route, or environmental impacts. These types of decisions can only be made by the TOs or other relevant parties when the options are at a more advanced stage.

Assess network asset replacement projects which don't increase network capability or individual customer connections.

Procure products or services. The *NOA* may highlight a need to explore options further, either through the *NOA* Pathfinder projects or further engagement with the industry.

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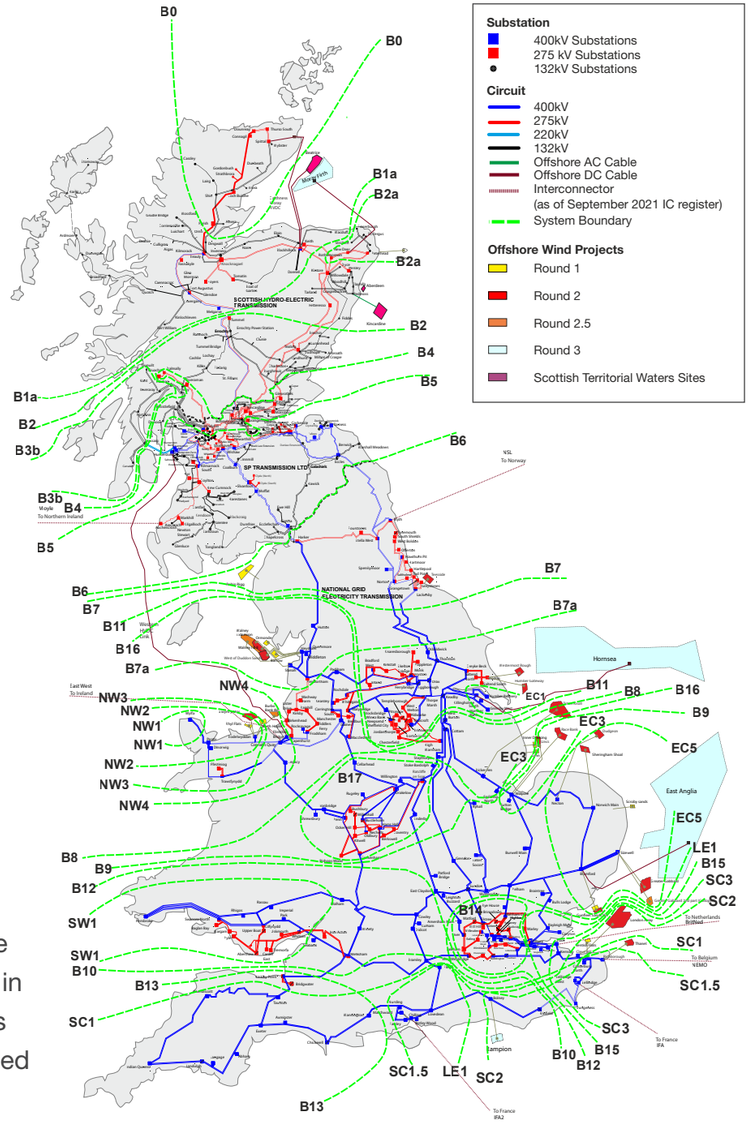
Constraints and reinforcement types

The *NOA* makes economic recommendations by comparing the cost of managing system constraints against the cost of reinforcing the network. This is done by evaluating reinforcement options that increase the capacity of the network.

We use boundaries to study the power flows on the electricity transmission network. A boundary splits the system into two parts, crossing critical circuit paths that carry power between areas where power flow limitations may be encountered.
A boundary becomes constrained if more electricity is planned to cross the boundary than its capacity can handle. How constrained boundaries are varies from hour to hour, throughout the year. Power flow across the system is significantly impacted by changing demand and generation.

Thermal constraints are the most common type. Following secured events these can lead to overloads on the weakest component on the boundary. As the generation mix changes, the overload can shift from one area to another within a single day. Its magnitude and how much it shifts influences the choice of investment option.

There are several types of options the TOs can propose to reduce constraints as well as alternative options and ESO-led commercial solutions.

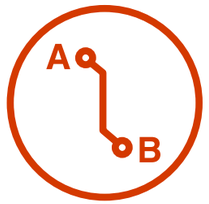
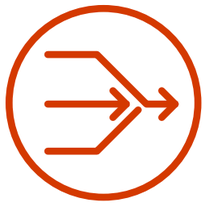


Disclaimer

Please note this map shows the existing network, as presented in the ***ETYS* document**. This does not show the *HND* recommended offshore network.

Constraints and reinforcement types

Options fall under the following categories: Hover over the following icons for more information

						
Developing new circuits	Control power flow	New substation or reconfigure an existing substation	Upgrading circuits	Voltage and stability constraints	Operational and reduced-build options	ESO-led commercial solutions
Total 39	**Total 16**	**Total 5**	**Total 42**	**Total 16**	**Total 2**	**Total 8**

Developing new circuits:

This can include high voltage direct current subsea links and new onshore circuits.

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Chapter 2

Methodology

Methodology

The *NOA* methodology is how we assess major NETS reinforcements to meet the requirements from our analysis of the *Future Energy Scenarios* (*FES*). This chapter describes the methodology for this *NOA 2021/22 Refresh*.

Network Options Assessment

The first stage of the *NOA* process starts with the *FES*, which defines the outlook for the energy system in GB. The *Electricity Ten Year Statement* (*ETYS*) is the second stage in the *NOA* process. We apply the *FES* to transmission system models and calculate the power flow requirements across the network. To do this, we use the concept of boundaries, which are a virtual split of the network into two separate areas. As power transfers between these areas, we can see which parts of the network are under the most stress and where reinforcement would be most needed.

To create an electricity transmission network fit for the future, all TOs propose options to meet system capability requirements outlined in the *ETYS*, this is the third stage in the *NOA* process.

We encourage options that include upgrading assets or installing new assets to give a wide selection of options. As well as these build options, both ourselves and the TOs can propose alternative options. These are solutions requiring very little to no build and instead maximise use of existing assets. A full list of the options we analysed is included in Appendix A economic analysis results.

With these options, we move onto 'Selection' which is the fourth stage of the *NOA* process. We use our understanding of constraint costs to carry out economic analysis, which gives us the options we believe provide the most benefit for consumers. The full list of our recommended options is in Chapter 3 – 'Investment recommendations'.

How we perform the economic analysis is described in greater detail in the latest *NOA* report methodology.

The *NOA* Committee, consisting of our senior management, and with Ofgem and TOs present, gives an additional, transparent level of scrutiny to our *NOA* recommendations. The *NOA* Committee also provides wide-ranging energy industry insight and considers future policy requirements and the commercial landscape in considering marginal investment recommendations.

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It is important to understand why we recommend investment in the transmission network.

The transfer of energy across network boundaries occurs because generation and demand are typically in different locations. When the power transfer across a boundary is above its capability, the Control Room must reduce the level of transfer to avoid overloading the transmission assets following secured events. This is called 'constraining' the network. When this happens, we ask generators on the exporting side of the stressed boundaries to limit their output. To maintain an energy balance, we replace this energy with generation on the importing side. Balancing the network by switching generation on and off costs money, and if we are regularly constraining the network by large amounts, costs begin to accumulate.

Assessment of future constraint costs is an important factor in our decision-making process. It enables us to evaluate and recommend investment options such as adding new overhead lines and underground cables to the network. Although these potential investment 'options' cost money, they also increase the network's capability, meaning more power can be transferred across boundaries without the need to constrain. We work with the TOs to upgrade the transmission networks at the optimal time and location to give the best balance between investing in the network and constraining it.

Changes to integrate with *HND*

Typically, the *NOA* process follows the previously published and approved *NOA* methodology. However, to align with the *HND* and ensure a consistent approach, some adjustments are necessary for this *NOA 2021/22 Refresh*. To facilitate this the *NOA 2021/22 Refresh* follows the existing methodology where practicable but differs in the following ways:

Use of a single scenario

To carry out the *HND* analysis, the Pathway to 2030 workstream of the OTNR requires a 2030 snapshot aligned with the scope of the terms of reference. The **Leading the Way** scenario was selected as it most closely matched the renewable ambitions outlined by the Government's latest 2030 offshore wind targets.

Leading the Way was adjusted to maintain consistency with the approach used to develop the *HND*'s offshore network. These amendments also included changes to the connection location of in-scope offshore generators as a result of the recommended offshore network design.

Additionally, to maintain a balanced scenario, a small number of out of scope projects are assumed to have a later connection date than in *FES 2021*. This adjusted scenario will be referred to as '**LW21+**'.

The *NOA 2021/22 Refresh* will also use this **LW21+** adjusted version of the *FES 2021* **Leading the Way** scenario. This will ensure the onshore recommendations made through the *NOA 2021/22 Refresh* align with the recommended offshore network requirements creating a Holistic Network Design.

To ensure consistency in future analysis, the *HND* has informed the treatment of offshore wind in the *FES 2022* publication.

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Methodology

Since the *NOA 2021/22 Refresh* is based on a single scenario, it is not possible to carry out Least Worst Regret (LWR) analysis as it requires multiple scenarios. Instead, recommendations will be based on whether there is a clear need for the reinforcement against the **LW21+** scenario. The "Delay" recommendation is a direct output of the LWR process and is omitted from the list of possible recommendations, which has an impact on some of the recommendations which are explained in more detail in Chapter 3. Apart from this, the *NOA 2021/22 Refresh* will continue to make recommendations in line with those defined in the *NOA 2021/22* methodology.

HND essential options

As we look to facilitate connecting a significant level of offshore wind to the system by 2030, a number of network reinforcements will be essential. During the connection assessment process of the *HND*, detailed analysis identified a number of works that are essential to meet the 2030 targets.

The majority of works identified as essential are *NOA* options that have consistently received a "Proceed" recommendation in previous iterations of the *NOA* process. It is important to recognise that these *NOA* options are crucial to delivering the 2030 targets especially when considering their previous *NOA* recommendations.

As part of the *HND*, we have recommended an offshore transmission network to be delivered for 2030 to meet the Government's targets. We also note that these essential onshore options must also be delivered for 2030. For the purpose of the *HND* all essential options (both onshore and offshore) identified by the connection assessment are deemed to be delivered by 2030 and should not be assessed in the *NOA 2021/22 Refresh*. Instead, these options are identified as "*HND* essential options" that deliver 2030 targets and form part of the background.

Within the *NOA 2021/22 Refresh*, projects that are essential to facilitate the 2030 targets are clearly distinguished from other wider transmission works. In addition, to realise the benefits of our holistic approach, we are working closely with the TOs to identify and highlight which onshore reinforcements require acceleration in their delivery to facilitate 2030 targets. To emphasise our ambition to accelerate the delivery of onshore works, we have introduced a new term for the *NOA Refresh*: Required in Service Dates (RISDs). RISDs only apply to reinforcement options that the TOs have determined have an EISD of later than 2030.

Accelerating the delivery of a project beyond an EISD would require government intervention in the form of legislative changes, as suggested in the recent publication of the British Energy Security Strategy (BESS) and similar activities in Scotland and Ofgem intervention in regulatory processes. Other factors may also impact the expected delivery dates of a project and it is anticipated that relevant industries and suppliers will also need to scale up to support the 2030 ambition.

The inclusion of RISDs in the *NOA 2021/22 Refresh* serves to differentiate what is currently achievable from what could be achieved with greater change and intervention. Delivering onshore reinforcements on their RISDs will allow earlier network reinforcement and drive greater consumer benefit.

Since the *HND* is effective from 2030, there is minimal change to the *NOA 2021/22* results prior to 2030. Options falling into this category have been assessed ahead of the *NOA 2021/22 Refresh* analysis. It was concluded they all justify maintaining their *NOA* recommendation based on no change to their original driver and hence inherit their *NOA 2021/22* recommendation.

Based on the methodology just described, we have published our analysis combining the *HND* recommended offshore design with the *NOA 2021/22 Refresh* in Chapter 3 Investment recommendations. This refreshes and supersedes our *NOA* report published in January 2022.

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Chapter 3

Investment recommendations

Key statistics

This *NOA 2021/22 Refresh h*as determined the most economic investment strategy for network reinforcements and outlines our pathway to 2030 and beyond. The Pathway to 2030 enables the coordinated connection of 50 GW of offshore wind which we see as a key stepping stone in our journey to net zero.

You can view all the elements of the *ETYS*, *NOA* and the *HND* on our dynamic and interactive maps on our website. It includes a view of all the options assessed and you will be able to use its filter functionality to customise different views of the options.

120
asset-based options

128
total options assessed

8
ESO-led solutions

£2bn
of consumer benefit from ESO-led solutions

111 options recommended with a total investment of **£28bn**

requiring

£215m
of investment this year

Pathway to 2030 and beyond

To meet the 2030 ambitions, 94 onshore reinforcement projects totalling £21.7 billion are required to be delivered by the end of the decade.

Through the *HND* connection assessment process, a sub-set 56 options were determined to be essential for 2030 to provide a network compliant with the rules we must follow when designing the transmission system. These *HND* essential options have not been reassessed through the *NOA 2021/22 Refresh* CBA.

In addition to these essential works, the *NOA* has identified a further 38 options that are optimal to be delivered on or before 2030 which work together to significantly reduce constraint costs.

Almost 90% of these options are expected to be delivered by 2030. However, we have identified 11 that are required for 2030 but will not be delivered in time under the current regulatory and consenting processes. Accelerating these projects would require Government intervention.

Pre 2030

£21.7bn Investment*

94 Asset-based options

required to meet 2030 targets

56 *HND* essential options

38 Options optimal for 2030

45 Options that are deliverable for 2030

11 Options which require acceleration to meet 2030

The 2030 ambition is a key milestone towards the 2050 net zero target. Therefore the *NOA 2021/22 Refresh* has stated the need for the continual development and coordination of network reinforcements as we transition to net zero.

Looking beyond 2030, the *NOA 2021/22 Refresh* has signalled a requirement for a further 17 onshore reinforcement options at a cost exceeding £6 billion. These reinforcements alongside new proposals will be evaluated to provide a coordinated view beyond 2030 in our *HND* follow up process.

Post 2030

£6.2bn Investment*

17 Asset-based options

supporting the transition to net zero

4 "Proceed"

13 "Hold"

**This is the sum of each option's total cost in 2021/22 base prices, as fitting with those originally submitted for NOA 2021/22.*

NOA outcomes explained

Recommendations are given in two distinct ways within the *NOA 2021/22 Refresh*. The first is through a determination of whether an option is essential to facilitate the connection of 50 GW of offshore wind by 2030. These options are classified as "*HND* essential options".

For the remaining options, those found optimal prior to 2030 in *NOA 2021/22* retain their recommendation, as their driver has not changed. New options, and those optimal on or after 2030, are assessed through the *NOA 2021/22 Refresh* and receive a new recommendation. All options receive an optimal delivery date advising on the most economical year to deliver.

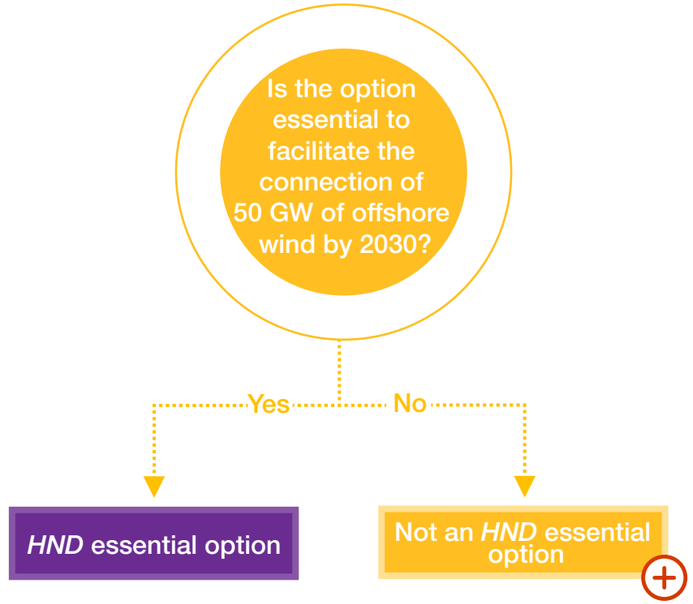
Analysis outcomes

The earliest in service date (EISD) is the earliest date the TOs can deliver the option. If an option's optimum delivery date falls on its EISD this option receives a **"Proceed"** recommendation. These options require an investment decision to be made by the TOs and/or relevant parties this year to meet the optimum delivery date.

If the optimum delivery date of an option is later than its EISD, a final decision can be put on hold until there is greater certainty. These options receive a **"Hold"** recommendation.

It is important to note that options that receive a **"Hold"** recommendation are still 'optimal' and we see benefit in these being delivered, just not on the EISD. We expect the TOs to undertake some work on these options in the next year if they believe it is required to do so to keep the option deliverable on its 'optimal' date.

If an option is not found optimal then it receives a **"Do not start"** recommendation if work has not yet begun, or a **"Stop"** recommendation if work has already started. It should be noted that this recommendation is solely based on the analysis performed in *NOA 2021/22* or *NOA 2021/22 Refresh*, and gives the signal that no need was seen for the option at this moment in time. However, some of these options may be identified as necessary as part of other SQSS connection works or as part of future assessments or developed sufficiently to be able to be used as part of the optioneering for the planning and consultation process.



NOA outcomes explained

Commercial solutions

For the *NOA 2021/22 Refresh,* the boundary capability provided by commercial solutions were reassessed. Note the benefit provided pre-2030 has not been considered as the network has not changed here, and the *NOA 2021/22 Refresh* recommendations are maintained for this period. However, the situation may change in 2030-2041. We have investigated what benefit they provide, giving a signal for where they are useful.

There is no change for commercial solutions that were 'optimal' pre-2030.

Eligibility for onshore competition

We conducted eligibility assessments for *HND* essential options and those options recommended to "Proceed". We list the options that meet Ofgem's proposed eligibility criteria.

In the *NOA*, projects that get a recommendation and are undergoing further development are assessed for their eligibility for late (build and own) competition. Further details on the assessment can be found on our NOA methodology webpage.

Early competition (design, build and own) processes are currently being established following Ofgem's decision to proceed with implementation. Our future planning processes will consider eligibility for early competition, in addition to late competition.

The British Energy Security Strategy (published on 7 April 2022), stated that certain infrastructure identified in the *HND* and Centralised Strategic Network Planning (CSNP) will be exempt from the introduction of onshore network competition. However, at this time, we have listed all projects eligible for competition as per Ofgem's criteria.

North Scotland

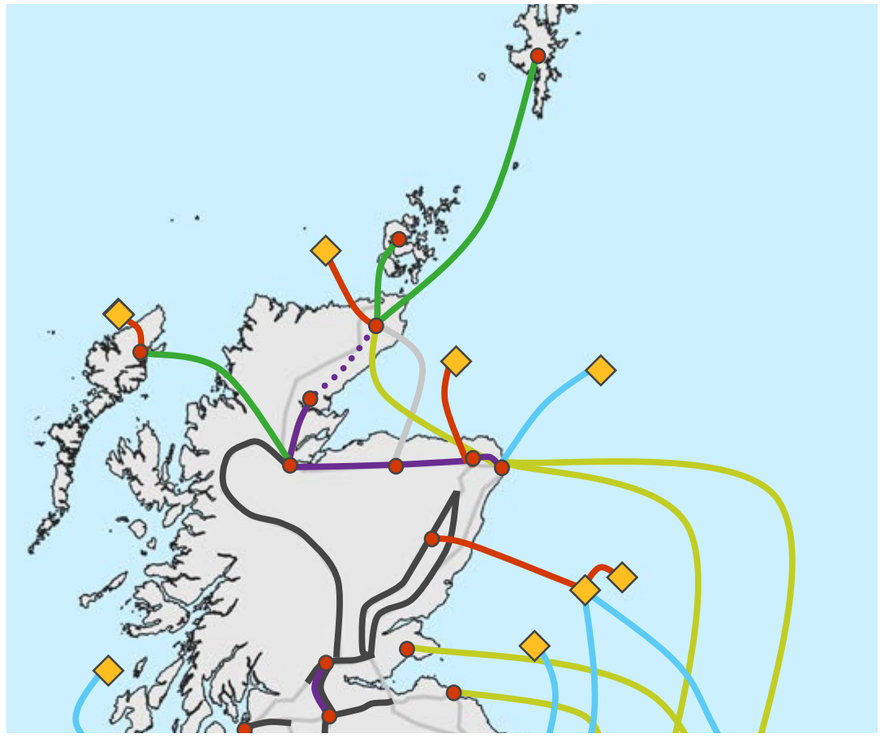
The North of Scotland typically exports to the rest of Britain. This is due to the large amount of installed renewable generation capacity exceeding local demand

The *HND* has found the recommended solution in this region to be one with mostly radial connections. Four of the six in scope *HND* projects in this region are radially connected to the main transmission system with a coordinated solution recommended off the coast of North East Scotland. Those generators connected to the coordinated network were previously assumed to land further south in Scotland. This change of assumed landing point has resulted in an increased need for network reinforcement up to and beyond 2030 in the region.

Notable options in this region include the reinforcement of the route from Spittal to Peterhead (PSDC), both offshore via a 2 GW HVDC link and onshore through Loch Buidhe, Beauly and Blackhillock (SLU4, BLN4, BBNC, BPNC). Bringing power to Beauly, Blackhillock and Peterhead is key, as from these nodes power can be exported south across the shared SSEN and SPT boundary. Reinforcements proposed for this boundary include the uprating on onshore circuits from Kintore to Westfield on the east (TKUP), and Beauly down to Denny on the west (BDUP), two Eastern Link HVDC subsea cables from Peterhead to England (E4D3, E4L5) as well as a number of established *NOA* options.

The image on the right shows a snapshot of some of the works required to meet our 2030 targets. A full list of proposed options for the region and their recommendation can be found on the following pages.

Figure 3.1 Illustrative map of options in the North of Scotland. The map is illustrative and highlights an identified need to transmit volumes of energy from point A to point B and does NOT represent specific routes. The next steps involve more detailed network design which will include specific locations and designs for projects. These will be designed and consulted on in future by the organisations appointed to fulfil the needs identified.



Disclaimer

All reinforcement routes and locations are for illustrative purposes only.

North Scotland

The following table presents a list of the options that have been identified as ***HND* essential options**. These reinforcements are essential to deliver the *Pathway to 2030*. Options that have their EISD after their RISD require acceleration in their delivery** to meet 2030 targets.

Table 3.1: *HND* essential options for North Scotland

Code	Option description	EISD*	RISD**	Earliest optimal delivery date	Eligible for competition?
BBNC	Beauly to Blackhillock 400 kV double circuit addition	2030		2030	✓
BLN4	Beauly to Loch Buidhe 400 kV reinforcement	2031	2030	2030	✓
BPNC	A new 400 kV double circuit between Blackhillock and Peterhead	2031	2030	2030	✓
E4D3	Eastern Scotland to England link: Peterhead to Drax subsea HVDC Link	2029		2029	✓
E4L5	Eastern Scotland to England 3rd link: Peterhead to the south Humber subsea HVDC Link	2031	2030	2030	✓
PSDC	Spittal to Peterhead HVDC reinforcement	2030		2030	✓
SLU4	New network need between Loch Buidhe and Spittal	2030		2030	✓
TKUP	East Coast Onshore 400 kV Phase 2 reinforcement	2032	2030	2030	✓ (Part)

* EISD is currently based on the current regulatory and consenting process and acceleration

** Accelerating these projects would require the Government intervention as suggested in the April 2022 BESS and equivalent activities in Scotland

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North Scotland

The following table presents a list of options that the ***NOA 2021/22 Refresh*** has found optimal and their corresponding recommendations.

Table 3.2: List of options and their recommendations for North Scotland

Code	Option description	EISD*	Earliest optimal delivery date	Recommendation	Eligible for competition?
BDUP	Uprate the Beauly to Denny 275 kV circuit to 400 kV	2029	2030	Hold	
DLUP	Windyhill-Lambhill-Denny North 400 kV reinforcement	2029	2029	Proceed	
DNEU	Denny North 400/275 kV second supergrid transformer	2025	2026	Hold	
DWNO	Denny to Wishaw 400 kV reinforcement	2028	2028	Proceed	
DWUP	Kincardine - Wishaw 400 kV reinforcement	2026	2026	Proceed	
LWUP	Kincardine 400 kV reinforcement	2027	2027	Proceed	
TFPC	Power flow control device along Tealing to Westfield	2025	2027	Hold	

* EISD is currently based on the current regulatory and consenting process and acceleration

The following table presents a list of the options that were not found optimal in the *NOA 2021/22 Refresh* and have therefore received a recommendation of “Stop” or “Do not start”. These options have not been found optimal at this time and they may be considered in future assessments.

Table 3.3: List of options with “Do not start” recommendations for North Scotland

Code	Option description	EISD*	Recommendation
DLNC	Loch Buidhe to Dounreay 400 kV reinforcement	2031	Do not start
DSDC	Dounreay - Thurso - Spittal 400 kV reinforcement	2030	Do not start
TKU2	Alternative East Coast Onshore Phase 2 reinforcement	2031	Do not start

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Central Belt and Anglo-Scottish Border

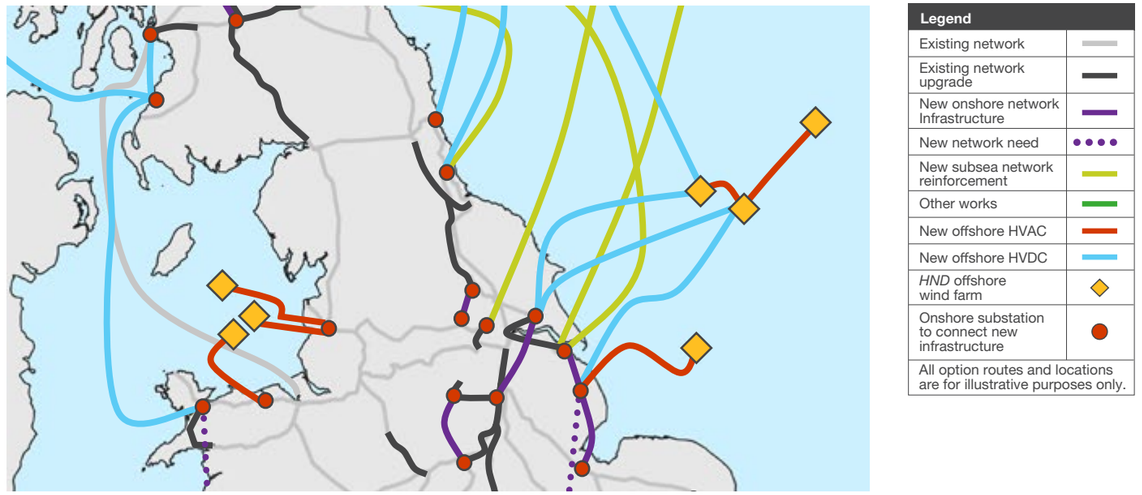
The region encompassing the Central Belt of Scotland and north of England typically sees high power flows from north to south across the Anglo-Scottish border. This is a by-product of high volumes of wind generation in Scotland coupled with lower demand, leading to an overall north-south power flow through the region.

The *HND* has recommended coordinated designs for both the east and west of the network. This coordinated connection of offshore wind is in addition to the existing Western HVDC Link and the four proposed Eastern HVDC Link subsea cables (E2DC, E4D3, TGDC, E4L5) that received "Proceed" recommendations in the *NOA 2021/22*, highlighting the need for greater power flow capacity in this region. The *NOA 2021/22 Refresh* has recommended a number of offshore and onshore options to meet the power transfer requirements of over 20 GW by 2030 and 30 GW by 2035 across the Anglo-Scottish border; these newly proposed reinforcements will enable Scotland to continue as a major exporter of low carbon energy.

The *NOA 2021/22 Refresh* recommends the continued development of significant cross-border transmission routes, providing additional corridors to export power south. These include new double circuit routes extending from the south of Scotland through to the north of England on both the east and west coast (CMNC, TLNO). Following the introduction of these new routes, the North of England needs further reinforcement; two 2 GW HVDC subsea cables from North West England to North Wales (LPDC and LPD2) are proposed to meet this increased bulk flow requirement.

The image on the right shows a snapshot of some of the works required to meet our 2030 targets. A full list of proposed options for the region and their recommendation can be found on the following pages.

Figure 3.2 Illustrative map of options in Central Belt and Anglo-Scottish Border. The map is illustrative and highlights an identified need to transmit volumes of energy from point A to point B and does NOT represent specific routes. The next steps involve more detailed network design which will include specific locations and designs for projects. These will be designed and consulted on in future by the organisations appointed to fulfil the needs identified.



Disclaimer

All reinforcement routes and locations are for illustrative purposes only.

Central Belt and Anglo-Scottish Border

The following table presents a list of the options that have been identified as ***HND* essential options.** These reinforcements are essential to deliver the *Pathway to 2030*. Options that have their EISD after their RISD require acceleration in their delivery** to meet 2030 targets.

Table 3.4: *HND* essential options for Central Belt and Anglo-Scottish Border

Code	Option description	EISD*	RISD**	Earliest optimal delivery date	Eligible for competition?
CDP3	Additional alternative power control devices along Cellarhead to Drakelow	2024		2027	
CGNC	A new 400 kV double circuit between Creyke Beck and the south Humber	2031	2030	2030	✓
CKPC	Power control device along Creyke Beck to Keadby to Killingholme	2024		2025	
CWPC	Power control device along Cottam to West Burton	2024		2027	
E2DC	Eastern subsea HVDC link from Torness to Hawthorn Pit	2027		2027	✓
EHRE	Elvanfoot to Harker reconductoring	2028		2030	
GWNC	A new 400 kV double circuit between the south Humber and south Lincolnshire	2031	2030	2030	✓
KCEU	Creyke Beck to Keadby to Killingholme circuits thermal uprating	2022		2025	
KCRE	Reconductor Cottam to Keadby 400 kV double circuit	2025		2025	
KWHW	Keadby to West Burton circuits thermal uprating	2024		2024	
KWP2	Additional power control devices along the Keadby to West Burton number 1 circuit	2025		2026	

* EISD is currently based on the current regulatory and consenting process and acceleration

** Accelerating these projects would require the Government intervention as suggested in the April 2022 BESS and equivalent activities in Scotland

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Central Belt and Anglo-Scottish Border

Table 3.4 continued: *HND* essential options for Central Belt and Anglo-Scottish Border

Code	Option description	EISD*	RISD**	Earliest optimal delivery date	Eligible for competition?
KWPC	Power control device along Keadby to West Burton	2024		2024	
LNRE	Reconductor Lackenby to Norton 400 kV single circuit	2024		2030	
NOR4	Reconductor a short span of the Norton-Osbaldwick 2 400 kV circuit	2024		2030	
NOR5	Reconductor a short span of the Norton-Osbaldwick 1 400 kV circuit	2024		2027	
OPN2	A new 400 kV double circuit between the existing Norton to Osbaldwick circuit and Poppleton and relevant 275 kV upgrades	2027		2027	✓ (Part)
SHNS	Upgrade substation in the south Humber area	2031	2030	2030	
TGDC	Eastern subsea HVDC Link from east Scotland to south Humber area	2031	2030	2030	✓
VERE	Strathaven - Elvanfoot OHL conductor replacement	2030		2030	
VSRE	Strathaven - Smeaton OHL conductor replacement	2027		2027	
WRRE	Reconductor West Burton to Ratcliffe-on-Soar circuit	2028		2030	

* EISD is currently based on the current regulatory and consenting process and acceleration

** Accelerating these projects would require the Government intervention as suggested in the April 2022 BESS and equivalent activities in Scotland

Central Belt and Anglo-Scottish Border

The following table presents a list of options that the ***NOA 2021/22 Refresh*** has found optimal and their corresponding recommendations.

Table 3.5: List of options and their recommendations for Central Belt and Anglo-Scottish Border

Code	Option description	EISD*	Earliest optimal delivery date	Recommendation	Eligible for competition?
BSHW	Blyth to Stella West circuits thermal uprating	2024	2031	Hold	
CDHW	Cellarhead to Drakelow circuits thermal uprating	2023	2023	Proceed	
CLNC	New North West England to Lancashire reinforcement	2034	2036	Hold	✓
CMNC	South east Scotland to north west England AC onshore reinforcement	2033	2033	Proceed	✓
CS05	Commercial solution for Scotland and the north of England - stage 1	2024	2024	Proceed	
CS06	Commercial solution for Scotland and the north of England - stage 2	2024	2024	Proceed	
CS11	Commercial solution for the north of England - stage 1	2024	2024	Proceed	
CS12	Commercial solution for the north of England - stage 2	2025	2025	Proceed	
HAE2	Harker supergrid transformer 6 replacement	2023	2023	Proceed	
HAEU	Harker supergrid transformer 5 and supergrid transformer 9A banking arrangement	2022	2022	Proceed	
LCU2	Eastern B5 400 kV reinforcement	2031	2037	Hold	

* EISD is currently based on the current regulatory and consenting process and acceleration

Central Belt and Anglo-Scottish Border

Table 3.5 continued: List of options and their recommendations for Central Belt and Anglo-Scottish Border

Code	Option description	EISD*	Earliest optimal delivery date	Recommendation	Eligible for competition?
LPD2	Additional new HVDC link between North West England and North Wales	2035	2037	Hold	
LPDC	New HVDC link between North West England and North Wales	2035	2036	Hold	
MRP2	Additional power control devices at both Harker and Penwortham	2022	2022	Proceed	
NEMS	225 MVAr MSCs within the north east region	2025	2026	Hold	
NEP1	Power control device along Blyth to Tynemouth and Blyth to South Shields	2025	2025	Proceed	
NEPC	Power control device along Blyth to Tynemouth and Blyth to South Shields	2024	2024	Proceed	
NOR6	Reconductor the existing double circuit which runs from Norton to Osbaldwick	2028	2037	Hold	
PWMS	Two 225 MVAr MSCs at Penwortham	2025	2027	Hold	
SNHW	Spennymoor to Norton circuit thermal uprating	2024	2027	Hold	

* EISD is currently based on the current regulatory and consenting process and acceleration

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Central Belt and Anglo-Scottish Border

Table 3.5 continued: List of options and their recommendations for Central Belt and Anglo-Scottish Border

Code	Option description	EISD*	Earliest optimal delivery date	Recommendation	Eligible for competition?
SNRE	Reconductor the existing double circuit which runs from Spennymoor to Norton	2027	2037	Hold	
SPRE	Reconductor the existing double circuit which runs from Spennymoor to Stella West	2027	2037	Hold	
SSHW	Stella West to Spennymoor circuit thermal uprating	2024	2027	Hold	
TLNO	East Coast Anglo-Scottish onshore reinforcement	2037	2037	Proceed	✓
WCNC	West Coast onshore Anglo-Scottish new circuit	2036	2036	Proceed	✓

* EISD is currently based on the current regulatory and consenting process and acceleration

The following table presents a list of the options that were not found optimal in the ***NOA 2021/22 Refresh*** and have therefore received a recommendation of “Stop” or “Do not start”. These options have not been found optimal at this time and they may be considered in future assessments.

Table 3.6: List of options with “Do not start” recommendations for Central Belt and Anglo-Scottish Border

Code	Option description	EISD*	Recommendation
WCD2	Second West Coast HVDC Link - Scotland to North Wales	2036	Do not start

The Midlands, South and East of England

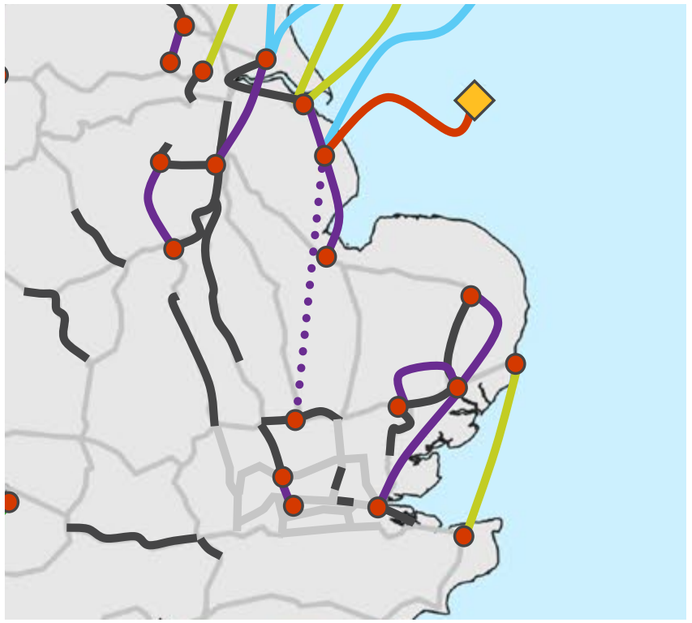
This region extends from the Midlands to the South and East of England and has high demand across major cities with high generation capacity on the East Coast, spanning from the Humber in the North to East Anglia and the Thames Estuary in the south. The South Coast benefits from several interconnectors that influence power flows in the region through the import and export of power with the Continent.

The *HND* has recommended a coordinated offshore network to connect many of the Round 4 wind farms. Onshore connection points have taken into consideration both environmental and social impact. This has resulted in some connections moving away from more environmentally constrained regions such as East Anglia to more northerly connection points. This has an impact on network power flows and an overall increased reinforcement requirement across many of the boundaries in this region whilst also causing a reduction to power flows in other parts of the region.

Notable reinforcements include a new double circuit coastal route from North Lincolnshire to South Lincolnshire to enable the connection of more offshore wind whilst reinforcing the East Coast of the network (GWNC). To meet this requirement, a number of options still at an early stage of development have been submitted into the *NOA* which has recommended the continued development of an option with similar capabilities to a new network need from North Lincolnshire to Hertfordshire (LRN4). This is an *HND* essential option and the TO detailed design work will consider the potential for both onshore and offshore solutions (the line shown in the diagram is not indicative of actual routings). As this option has been shown to provide significant benefit, further detailed design assessments will need to be undertaken to ensure a solution which balances the needs of the electricity system, environment and cost to energy consumers is taken forward.

The image below shows a snapshot of some of the works required to meet our 2030 targets. A full list of proposed options for the region and their recommendation can be found on the following pages.

Figure 3.3 Illustrative map of options in the Midlands, South and East of England. The map is illustrative and highlights an identified need to transmit volumes of energy from point A to point B and does NOT represent specific routes. The next steps involve more detailed network design which will include specific locations and designs for projects. These will be designed and consulted on in future by the organisations appointed to fulfil the needs identified.



Legend	
Existing network	
Existing network upgrade	
New onshore network Infrastructure	
New network need	
New subsea network reinforcement	
Other works	
New offshore HVAC	
New offshore HVDC	
HND offshore wind farm	
Onshore substation to connect new infrastructure	
All option routes and locations are for illustrative purposes only.	

Disclaimer

All reinforcement routes and locations are for illustrative purposes only.

The Midlands, South and East of England

The following table presents a list of the options that have been identified as ***HND* essential options.** These reinforcements are essential to deliver the *Pathway to 2030*. Options that have their EISD after their RISD require acceleration in their delivery** to meet 2030 targets.

Table 3.7: *HND* essential options for the Midlands, South, and East of England

Code	Option description	EISD*	RISD**	Earliest optimal delivery date	Eligible for competition?
AENC	A new 400 kV double circuit in north East Anglia	2030		2030	✓
ATNC	A new 400 kV double circuit in south East Anglia	2030		2030	✓
BMM2	Install new MSCs at Burwell Main	2022		2022	
BPRE	Reconductor the newly formed second Bramford to Braintree to Rayleigh Main circuit	2028		2028	
BRRE	Reconductor remainder of Bramford to Braintree to Rayleigh route	2023		2023	
BTNO	A new 400 kV double circuit between Bramford and Twinstead	2028		2028	✓
CDP1	Power control device along Cellarhead to Drakelow	2024		2027	
CDP2	Power control device along Cellarhead to Drakelow	2024		2027	
DFRE	Reconductor Drax to Fenwick Tee 400 kV circuit	2026		2030	
DREU	Generator circuit breaker replacement to allow Thornton to run a two-way split	2025		2025	
EBRE	Reconductor Enderby to Patford Bridge to East Claydon 400 kV double circuit	2026		2030	
EDEU	400 kV upgrade of Brinsworth to Chesterfield double circuit and Chesterfield to High Marnham double circuit. New High Marnham and Chesterfield 400 kV substations	2027		2028	✓(Part)

* EISD is currently based on the current regulatory and consenting process and acceleration

** Accelerating these projects would require the Government intervention as suggested in the April 2022 BESS and equivalent activities in Scotland

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The Midlands, South and East of England

Table 3.7 continued: *HND* essential options in the Midlands, South, and East of England

Code	Option description	EISD*	RISD**	Earliest optimal delivery date	Eligible for competition?
EDN2	New Chesterfield to Ratcliffe-on-Soar 400 kV double circuit	2032	2030	2030	✓
ESC1	Second Elstree to St John's Wood 400 kV circuit	2026		2029	
GCHW	Cottam to Market Harborough to Grendon circuit thermal uprating	2025		2030	
HWUP	Uprate Hackney, Tottenham and Waltham Cross 275 kV to 400 kV	2027		2027	
IFR1	Feckenham to Ironbridge circuit reconductoring	2025		2030	
LRN4	New network need from North Lincolnshire to Hertfordshire	2033	2030	2030	✓
NBRE	Reconductor Bramford to Norwich double circuit	2023		2023	
SCD1	New Offshore HVDC link between Suffolk and Kent option 1	2030		2030	✓
SER1	Elstree to Sundon reconductoring	2024		2024	
SER2	Elstree to Sundon 2 circuit turn-in and reconductoring	2026		2029	
WSEU	Thermal upgrade for Sundon and Wymondley 400 kV substation	2024		2025	
WYTI	Turn-in of the Pelham - Sundon 400 kV circuit into Wymondley substation	2024		2028	

* EISD is currently based on the current regulatory and consenting process and acceleration

** Accelerating these projects would require the Government intervention as suggested in the April 2022 BESS and equivalent activities in Scotland

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The Midlands, South and East of England

The following table presents a list of options that the ***NOA 2021/22 Refresh*** has found optimal and their corresponding recommendations.

Table 3.8: List of options and their recommendations in the Midlands, South, and East of England

Code	Option description	EISD*	Earliest optimal delivery date	Recommendation	Eligible for competition?
BFHW	Bramley to Fleet circuits thermal uprating	2024	2025	Hold	
BFPC	Power control device along Bramley to Fleet	2025	2029	Hold	
BFRE	Bramley to Fleet reconductoring	2025	2026	Hold	
BWRE	Reconductor Barking to West Ham double circuit	2025	2028	Hold	
CS07	Commercial solution for East Anglia - stage 1	2025	2025	Proceed	
CS08	Commercial solution for East Anglia - stage 2	2025	2025	Proceed	
CTRE	Reconductor remainder of Coryton South to Tilbury circuit	2022	2022	Proceed	
ERPC	Power control devices along the Enderby to Ratcliffe circuits	2026	2033	Hold	
FHRE	Reconductor the existing 400 kV single circuit which runs from Feckenham to Hams Hall	2027	2033	Hold	
GCRE	Reconductor the existing double circuit which runs from Cottam to Grendon	2028	2037	Hold	
MBHW	Bramley to Melksham circuits thermal uprating	2024	2026	Hold	
MBRE	Bramley to Melksham reconductoring	2026	2027	Hold	
NBEU	Thermal upgrade for Bramford and Norwich 400 kV substations	2025	2028	Hold	
NTP1	Power control device north of Tilbury 400 kV	2024	2024	Proceed	
PEM1	225 MVAr MSCs at Pelham	2024	2024	Proceed	
PEM2	225 MVAr MSCs at Pelham	2024	2024	Proceed	
RHM1	225 MVAr MSCs at Rye House	2024	2024	Proceed	
RHM2	225 MVAr MSCs at Rye House	2024	2024	Proceed	

* EISD is currently based on the current regulatory and consenting process and acceleration

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The Midlands, South and East of England

Table 3.8 continued: List of options and their recommendations in the Midlands, South, and East of England.

Code	Option description	EISD*	Earliest optimal delivery date	Recommendation	Eligible for competition?
RTRE	Reconductor remainder of Rayleigh to Tilbury circuit	2022	2022	Proceed	
SEEU	Reactive compensation protective switching scheme	2024	2024	Proceed	
TGP1	Power control device along Tilbury to Grain	2024	2024	Proceed	
TKP1	Power control device along Tilbury to Kingsnorth	2024	2026	Hold	
TKRE	Tilbury to Grain and Tilbury to Kingsnorth upgrade	2028	2028	Proceed	
TWNC	Upgrade Wymondley, Waltham Cross and Tilbury 275 kV to 400 kV	2033	2033	Proceed	✓(part)
WAM1	225 MVAr MSCs at Walpole	2025	2025	Proceed	
WAM2	225 MVAr MSCs at Walpole	2025	2025	Proceed	
WCC1	Cable replacement at Hinksey	2027	2037	Hold	
WWNC	New South Lincolnshire to East Anglia double circuit	2032	2033	Hold	

Table 3.9: List of options with "Do not start" recommendations for Central Belt and Anglo-Scottish Border. The following table presents a list of the options that were not found optimal in the *NOA 2021/22 Refresh* and have therefore received a recommendation of "Stop" or "Do not start". These options have not been found optimal at this time and they may be considered in future assessments.

Code	Option description	EISD*	Recommendation
LRN2	New network need from South Lincolnshire to East Midlands	2033	Do not start
LRN3	New network need between South Lincolnshire and the South East	2033	Do not start
LRNC	South Lincolnshire to Rutland reinforcement	2032	Stop

* EISD is currently based on the current regulatory and consenting process and acceleration

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Wales and South West

This region covers both North and South Wales and extends to South West England encompassing the Celtic Sea. The main driver for reinforcement in this region is to bring power into North Wales from the *HND's* offshore network then transmit this power to larger demand centres across the country.

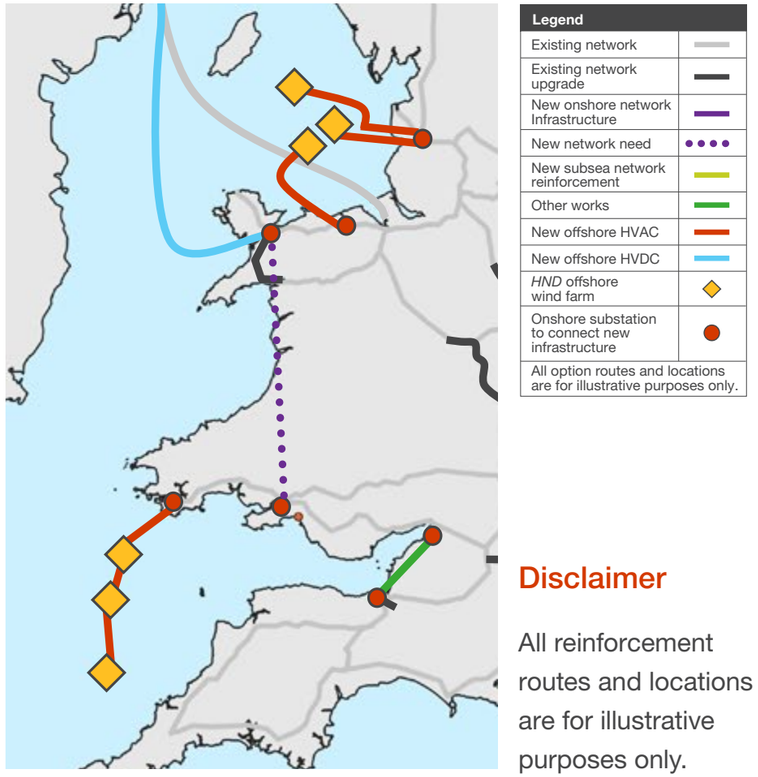
The *HND* has recommended a coordinated network on the west coast of the country resulting in a significant power import to North Wales and therefore a requirement to export this power to areas of the country with greater demand and to satisfy boundary transfer requirements.

To meet this requirement, a number of options still at an early stage of development have been submitted into the *NOA* which has recommended the continued development of an option with similar capabilities to a new network need between North Wales and South Wales (PSNC). This is an *HND* essential option and the TO detailed design work will consider the potential for both onshore and offshore solutions (line shown in the diagram is not indicative of actual routings). As this option has been shown to provide significant benefit, further detailed design assessments will need to be undertaken to ensure a solution which balances the needs of the electricity system, environment and cost to energy consumers is taken forward.

The *HND's* offshore design demonstrates the value of coordination in South Wales. However, as the volume of new generation projects currently considered is relatively small, the impact to the *NOA 2021/22* is limited. As a result, South Wales and South West England are not considered in the *NOA 2021/22 Refresh* as there is no need beyond that identified in *NOA 2021/22*. It is likely that this region will see significant development in the future which may instigate the need for onshore network investment, or further offshore coordination.

The image below shows a snapshot of some of the works required to meet our 2030 targets. A full list of proposed options for the region and their recommendation can be found on the following pages.

Figure 3.4 Illustrative map of options in Wales and South West. The map is illustrative and highlights an identified need to transmit volumes of energy from point A to point B and does NOT represent specific routes. The next steps involve more detailed network design which will include specific locations and designs for projects. These will be designed and consulted on in future by the organisations appointed to fulfil the needs identified.



Disclaimer

All reinforcement routes and locations are for illustrative purposes only.

Wales and South West

The following table presents a list of the options that have been identified as ***HND* essential options.** These reinforcements are essential to deliver the *Pathway to 2030*. Options that have their EISD after their RISD require acceleration in their delivery** to meet 2030 targets.

Table 3.10: *HND* essential options for Wales and South West

Code	Option description	EISD*	RISD**	Earliest optimal delivery date	Eligible for competition?
PSNC	New network need between North Wales and South Wales	2037	2030	2030	✓
PTC1	Pentir to Trawsfynydd cable replacement	2027		2028	
PTNO	A second transmission circuit on the existing Pentir to Trawsfynydd route	2028		2029	

The following table presents a list of options that the *NOA 2021/22 Refresh* has found optimal and their corresponding recommendations.

Table 3.11: List of options and their recommendations in Wales and the South West

Code	Option description	EISD*	Earliest optimal delivery date	Recommendation	Eligible for competition?
CS20	Commercial solution for north of Wales - stage 1	2026	2033	Hold	
CS21	Commercial solution for north of Wales - stage 2	2026	2033	Hold	
HBUP	Uprate Bridgewater to 400 kV and reconductor the route to Hinkley	2024	2027	Hold	

The following table presents a list of the options that were not found optimal in the *NOA 2021/22 Refresh* and have therefore received a recommendation of “Stop” or “Do not start”. These options have not been found optimal at this time and they may be considered in future assessment.

Table 3.12: List of options with “Do not start” recommendations for Wales and South West

Code	Option description	EISD*	Recommendation
NWNC	New network need from North Wales to West Midlands	2037	Do not start
WPDC	New network need (alternative option) between North Wales and South Wales	2035	Do not start

* EISD is currently based on the current regulatory and consenting process and acceleration

** Accelerating these projects would require the Government intervention as suggested in the April 2022 BESS and equivalent activities in Scotland.

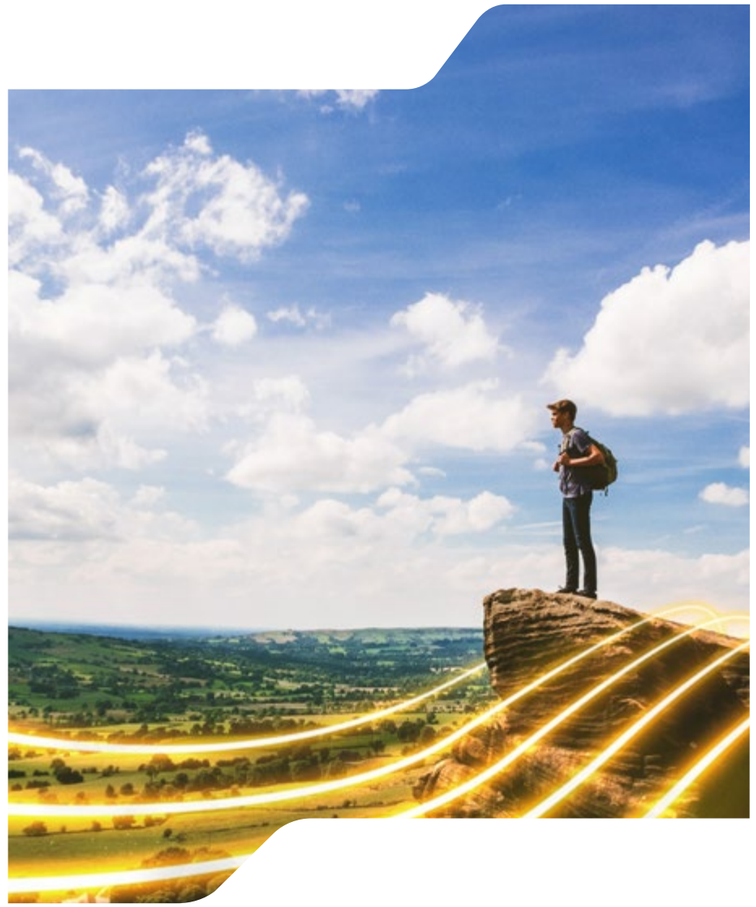
Clean Energy Package

Regulation (EU) 2019/943 on the internal market for electricity (recast) as retained in UK law, also known as the Clean Energy Package, places requirements in Article 13 on planners and operators of networks.

The requirement, as part of the network planning process, is to limit the annual redispatch of generation from renewable sources to 5% of total annual electricity generation, unless more than 50% of total annual electricity is produced from renewable and high-efficiency cogeneration.

The *Holistic Network Design* has not affected GB achieving the Clean Energy Package requirement. In 2030, in the adjusted **Leading the Way** scenario used in the *NOA 2021/22 Refresh* study, over 80% of the total annual electricity is forecasted to be produced from renewable and high-efficiency cogeneration. It's been forecast that the renewable penetration will further increase in the 2030s. Given the *NOA 2021/22 Refresh* study period of 2030 onwards, *NOA 2021/22* analysis has been applied to analysing renewable generation performance between 2022 and 2029. It shows that GB electricity generation could reach the 50% threshold in renewables and high-efficiency cogeneration in the next three years (**Leading the Way** 2022, **Consumer Transformation** 2022, **System Transformation** 2023 and **Steady Progression** 2024). In the years before meeting the 50% annual renewable generation threshold, the renewable electricity curtailment is below the 5% annual limit.

Therefore, it can be concluded that the network keeps compliant with the Clean Energy Package regulations under the *NOA 2021/22 Refresh* analysis.



Chapter 4

Way Forward

Way Forward

This *NOA 2021/22 Refresh* report provides recommendations for the options required to develop the onshore electricity transmission network, that complements the offshore network developed through the *HND* process. As common with other *NOA* reports, the onshore Transmission Owners (TOs) will now use the information to help decide which transmission projects to proceed with.

This *NOA 2021/22 Refresh* report is part of the *HND* suite of reports that together form part of the transitional arrangements for the Centralised Strategic Network Planning. These transitional arrangements are envisaged as part of Ofgem's Electricity Transmission Network Planning Review[2] (ETNPR). In parallel, we have established the Network Planning Review (NPR) to ensure that network design and investment processes are fit for the future.

Beginning this summer, we will work in partnership with Ofgem and stakeholders to define the 'enduring' arrangements for the Centralised Strategic Network Planning process. In parallel, we will be working on the follow up process for 2023 and further work on the *NOA* assessments.

These transitional and enduring regimes are very likely to see changes to the timescales and regularities of some elements of network planning, and adaptions to our network planning processes reports including the *NOA*. We also expect an evolution as to how Ofgem and the TOs will use our recommendations to ensure that the future network is fit for purpose and meets net zero aspirations at an efficient cost to consumers.

Connect with *NOA*

Contact us if you have a question or want to share some insight using our mailbox noa@nationalgrideso.com. Your feedback on the *NOA* publication helps us improve year-on-year. Our stakeholder engagement programme, in conjunction with the *HND,* runs from when the *NOA 2021/22 Refresh* report is published.
We look forward to hearing from you.

2 https://www.ofgem.gov.uk/sites/default/files/2021-11/Consultation_Electricity_Transmission_Network_Planning_Review_v2.pdf

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