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Consultation

Consultation on the initial findings of our Electricity Transmission Network Planning Review

Publication date:	05 November 2021	**Contact:**	Konark Anand, Senior Manager
		Team:	Electricity Transmission Development
Response deadline:	17 December 2021	**Tel:**	020 7901 7000
		Email:	RIIOElectricityTransmission@ofgem.gov.uk

We are consulting on the initial findings of our Electricity Transmission Network Planning Review. We would like views from people with an interest in connecting to, using and developing electricity transmission networks. We particularly welcome responses from network companies and potential third party network developers, as well as the electricity system operator. We would also welcome responses from other stakeholders and the public. The consultation closes on 17/12/2021.

This document outlines the scope, purpose and questions of the consultation and how you can get involved. Once the consultation is closed, we will consider all responses. We want to be transparent in our consultations. We will publish the non-confidential responses we receive alongside a decision on next steps on our website at **Ofgem.gov.uk/consultations**. If you want your response – in whole or in part – to be considered confidential, please tell us in your response and explain why. Please clearly mark the parts of your response that you consider to be confidential, and if possible, put the confidential material in separate appendices to your response.

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Executive summary

Context

To meet the government's Net Zero target by 2050, the energy system is expected to go through radical change over the next few decades. The need to decarbonise society will see an overhaul of electricity generation to make it a net zero emitter of harmful greenhouse gas emissions, and we are also likely to see a significant shift to low carbon demand, e.g. through electrification of transport and heat.

The electricity transmission (ET) network[1] will be a key enabler of those changes as it is needed to move large amounts of electricity across Great Britain (GB), from where it is produced, to where it is used. Since new ET network generally takes a long time to develop, any new network required to facilitate these changes must be planned well in advance.

The significant uncertainty around the timing, location, size and technology type of many of the large-scale changes in generation and demand presents particular challenges to the planning of the ET network. Recent developments like the Prime Minister's Ten Point Plan for a green industrial revolution[2] and the Net Zero Strategy[3] have set out clearer directions for some of the key changes over the next 10 years. Ofgem and The Department of Business, Energy and Industrial Strategy (BEIS) are currently carrying out an Offshore Transmission Network Review (OTNR)[4] that looks into the way that the offshore transmission network is designed and delivered with a view to improving coordination within network planning to help support delivery of offshore wind generation by 2030.

In light of the above changes to the energy system, we consider that this is the right time to review the existing ET network planning processes across GB (i.e.onshore and offshore) and consider the need for improvements that will enable GB's ET networks to efficiently meet anticipated future needs of the changing energy system to meet decarbonisation targets.

[1] The Electricity Transmission network transmits high-voltage electricity from where it is produced to where it is needed throughout the country. In Great Britain, the onshore ET network is mainly made up of 400kV, 275kV and 132kV networks connecting separately owned generators, interconnectors, large demands and distribution networks.
[2] Ten Point Plan for a green industrial revolution | HM Government
[3] Net Zero Strategy: Build Back Greener | BEIS
[4] Offshore Transmission Network Review | Ofgem

Our objectives for planning of the electricity transmission network

Since June we have been working with key stakeholders to review the existing ET network planning processes, with the aim of ensuring the ET network can efficiently support the delivery of Net Zero at lowest cost to consumers. In this document we set out our objectives for efficient ET network planning, which include:

- Proactive identification and progression of low regret 'strategic investments' (SI) in the ET network that are key to delivering the Net Zero target and the government's plans to decarbonise the UK power system by 2035.

- Facilitating strategic planning of the energy system such that ET networks and the energy system more generally, are planned alongside each other to maximise efficient utilisation of electricity networks.

- Ensuring that the onshore and offshore ET networks, including potentially interconnection, are planned holistically, together.

- Providing viable routes for fair and transparent assessment and delivery of innovative and/or non-network solutions developed by third parties competing against other options.

We recognise that delivering all of the above objectives may take some time given the changes likely to be required to existing ET network planning arrangements. But we are also mindful that there should be no unnecessary delays to the development of critical ET network. We therefore set out in this consultation, our vision for both the 'enduring' arrangements that can deliver all our objectives, as well as pragmatic 'transitional' arrangements that can start to realise some of the objectives from next year onwards.

'Enduring' arrangements - Centralised Strategic Network Planning

In the longer term, we are proposing the introduction of a new 'Centralised Strategic Network Planning' model and process (CSNP), to deliver our objectives for efficient ET network planning. We propose that the CSNP will be led by a single, independent, expert body – a 'central network planner'. In line with our recent joint consultation with BEIS, we're proposing that the central network planner would be the Future System Operator (FSO)[5], i.e. the FSO

[5] Proposals for a Future System Operator role | BEIS and Ofgem

should lead and deliver the CSNP. We would expect the FSO to work closely with key stakeholders, including the three incumbent Electricity Transmission Owners (TOs)[6] to ensure that the CSNP is robust and deliverable.

We set out in this consultation our initial views on the key stages of the CSNP process, including the modelling of supply and demand, the identification of options for addressing system needs, and how to make decisions on which options to progress, including through the use of cost benefit assessments that appropriately balance cost and environmental and community impact. We propose that detailed design, development and delivery of solutions (i.e. obtaining planning consent and land rights where applicable, and construction and operations) would be carried out either by an incumbent TO or a third party, who may be selected through competition.

Transitional arrangements

Before introduction of the enduring CSNP arrangements, we propose that the Electricity System Operator (ESO)[7] should develop 'transitional' ET network planning arrangements, to apply from next year onwards. These should as a minimum:

- clearly and transparently identify low regret SI on the onshore and offshore ET network that is key to efficient delivery of 40GW of offshore wind generation by 2030;

- be based on transparent, plausible future energy demand and supply scenarios or estimates; and

- assess options for addressing system needs based on a robust cost benefit assessment methodology that strikes an appropriate balance between cost and environmental and community impact.

We consider that there should be strong leadership from the ESO to scrutinise and challenge inputs from other parties and to coordinate network needs and developments. In practice, we

[6] National Grid Electricity Transmission (NGET) in England and Wales, Scottish Power Transmission (SPT) in the south of Scotland, and Scottish Hydro Electric Transmission (SHET) in the North of Scotland.
[7] 'ESO' or 'NGESO': National Grid Electricity System Operator. The ESO has a central role in our energy system. It performs several important functions from the real time operation of the system, through to market development, managing connections, and advising on network investment. In April 2019 National Grid ESO became a legally separate business within National Grid PLC

anticipate that the ESO would need to work with the three incumbent TOs and other key stakeholders to ensure that analysis is robust and that appropriate and deliverable SI options are identified.

The Holistic Network Design (HND) being developed under the 'Pathway to 2030' workstream within the OTNR[8], which is due to be finalised in early 2022, could meet the above requirements. We continue to work with the ESO to understand the extent to which this will be the case. Once the scope of the HND output is confirmed, we would welcome further clarity from the ESO on the specific network planning deliverables that it will achieve from aligning and iterating the HND and the next Network Options Assessment9 (NOA) report (NOA 7 - which will follow on after the HND). We can then decide whether the HND and/or NOA 7 would form a suitable transitional output for the CSNP.

Next Steps

Following consideration of responses to this consultation, we intend to decide in early 2022 whether and how to take forward any 'transitional' and 'enduring' CSNP arrangements. This will include consideration of key aims and objectives, roles and responsibilities, outputs and delivery timings for any enduring CSNP. Our intention is that the transitional arrangements would be put in place from 2022.

[8] Offshore Transmission Network Review | Ofgem
[9] Network Options Assessment | NGESO. Each year the ESO produces the NOA Report to facilitate the development of an efficient, coordinated and economical system of electricity transmission consistent with the National Electricity Transmission System Security and Quality of Supply Standard and the development of efficient interconnection capacity.

1. Introduction

What are we consulting on?

1.1. This consultation summarises the initial findings of our Electricity Transmission (ET) Network Planning Review which is aimed at ensuring that ET network[10] planning can efficiently support the delivery of Net Zero at lowest cost to consumers. A key area that we have considered is how to efficiently plan and progress strategic investments (SI) driven by changes in future energy demand and supply in a holistic way.

1.2. A summary of the sections in this consultation is provided below.

Section 1: Introduction

1.3. This section provides an introduction to the consultation.

Section 2: Context for the Electricity Transmission Network Planning Review

1.4. This section gives a background to the current arrangements for planning and building the ET network and provides an overview of changes to the energy system that are impacting those arrangements. It sets out the case for considering changes to current ET network planning arrangements and introduces our Electricity Transmission Network Planning Review (ETNPR) and its aim and objectives. Finally, it sets out key interactions between ETNPR and other related workstreams.

Section 3: How we have structured the ETNPR and Success Criteria

1.5. This section outlines how we have structured the ETNPR, and how we have engaged with external advisory groups so far. It also sets out what criteria we propose to use to assess the likely success of future ET network planning arrangements.

[10] The Electricity Transmission network transmits high-voltage electricity from where it is produced to where it is needed throughout the country. In Great Britain, the onshore ET network is mainly made up of 400kV, 275kV and 132kV networks connecting separately owned generators, interconnectors, large demands and distribution networks.

Section 4: Centralised Strategic Network Planning

1.6. This section sets out our vision for potential new ET network planning arrangements (Centralised Strategic Network Planning, CSNP) that would take a GB-wide holistic view to develop an optimised plan for taking forward low regret anticipatory SIs. We also set out how this could include making recommendations to inform strategic energy system planning so as to achieve the Net Zero target in the most efficient way. This chapter sets out our enduring vision and proposals for transitional arrangements

Section 5: Next steps

1.7. This section provides information on the next steps in the ETNPR, the timelines for implementing CSNP and conducting the remainder of the review, and future areas of focus for the review.

Appendices

Appendix 1 - Success Criteria for network planning

Appendix 2 - Potential stages of the CSNP model

Appendix 3 - Future work of the ETNPR

Related publications

Net Zero Strategy: Build Back Greener (October 2021)

https://www.gov.uk/government/publications/net-zero-strategy

The Climate Change Act 2008 (2050 Target Amendment) Order 2019 (June 2019)

https://www.legislation.gov.uk/uksi/2019/1056/contents/made

The Sixth Carbon Budget (December 2020)

https://www.theccc.org.uk/publication/sixth-carbon-budget/

Energy White Paper: Powering our net zero future (December 2020)

https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future

The Ten Point Plan for a Green Industrial Revolution (November 2020)

https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

Proposals for a Future System Operator role (July 2021)

https://www.gov.uk/government/consultations/proposals-for-a-future-system-operator-role

Consultation on changes intended to bring about greater coordination in the development of offshore energy networks (July 2021)

https://www.ofgem.gov.uk/publications/consultation-changes-intended-bring-about-greater-coordination-development-offshore-energy-networks

Offshore Transmission Network Review: proposals for an enduring regime and multi-purpose interconnectors (September 2021)

https://www.gov.uk/government/consultations/offshore-transmission-network-review-proposals-for-an-enduring-regime

Consultation on our views on Early Competition in onshore electricity transmission networks (August 2021)

https://www.ofgem.gov.uk/publications/consultation-our-views-early-competition-onshore-electricity-transmission-networks

Future Energy Scenarios (July 2021)

https://www.nationalgrideso.com/future-energy/future-energy-scenarios/fes-2021

Digest of UK Energy Statistics (DUKES) 2021: Chapters 1-7 (July 2021)

https://www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2021

Network Options Assessment (January 2021)

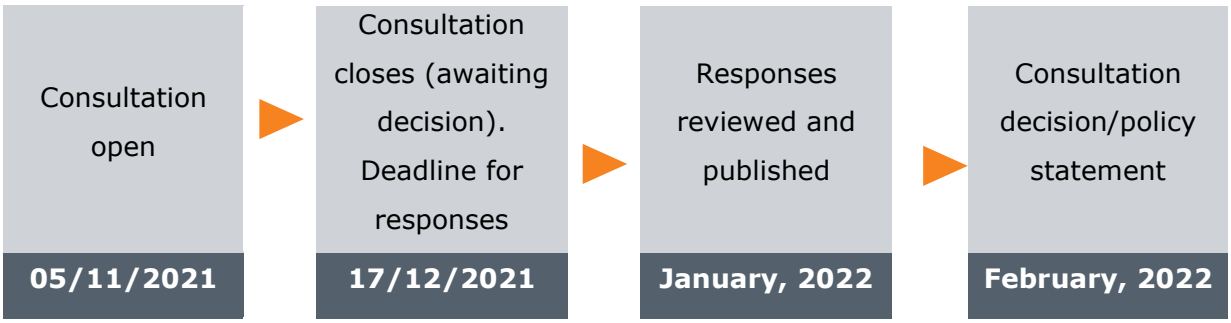
https://www.nationalgrideso.com/research-publications/network-options-assessment-noa

Electricity Ten Year Statement (November 2020)

https://www.nationalgrideso.com/research-publications/etys-2020

Consultation stages

Figure 1: Consultation stages



How to respond

1.8. We want to hear from anyone interested in this consultation. Please send your response to the person or team named on this document's front page.

1.9. We've asked for your feedback in each of the questions throughout. Please respond to each one as fully as you can.

1.10. We will publish non-confidential responses on our website at www.ofgem.gov.uk/consultations.

Your response, data and confidentiality

1.11. You can ask us to keep your response, or parts of your response, confidential. We'll respect this, subject to obligations to disclose information, for example, under the Freedom of Information Act 2000, the Environmental Information Regulations 2004, statutory directions, court orders, government regulations or where you give us explicit permission to disclose. If you do want us to keep your response confidential, please clearly mark this on your response and explain why.

1.12. If you wish us to keep part of your response confidential, please clearly mark those parts of your response that you *do* wish to be kept confidential and those that you *do not* wish to be kept confidential. Please put the confidential material in a separate appendix to your response. If necessary, we'll get in touch with you to discuss which parts of the information in your response should be kept confidential, and which can be published. We might ask for reasons why.

1.13. If the information you give in your response contains personal data under the General Data Protection Regulation (Regulation (EU) 2016/679) as retained in domestic law following the UK's withdrawal from the European Union ("UK GDPR"), the Gas and Electricity Markets Authority will be the data controller for the purposes of GDPR. Ofgem uses the information in responses in performing its statutory functions and in accordance with section 105 of the Utilities Act 2000. Please refer to our Privacy Notice on consultations, see Appendix 4.

1.14. If you wish to respond confidentially, we'll keep your response itself confidential, but we will publish the number (but not the names) of confidential responses we receive. We won't link responses to respondents if we publish a summary of responses, and we will evaluate each response on its own merits without undermining your right to confidentiality.

General feedback

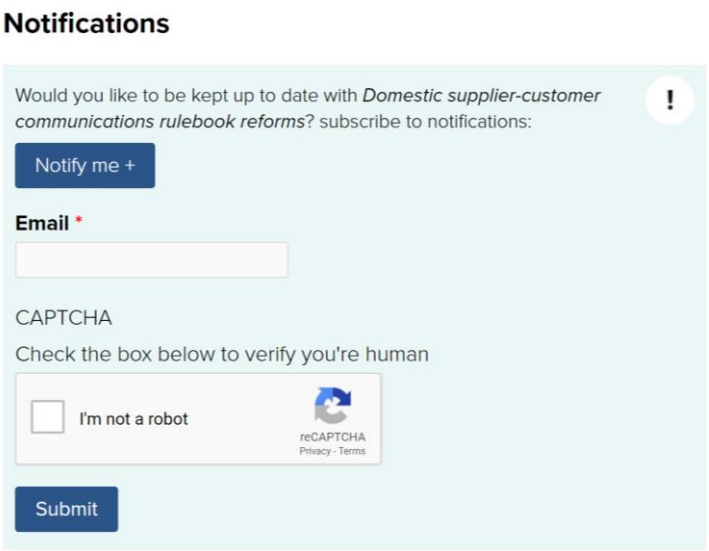
1.15. We believe that consultation is at the heart of good policy development. We welcome any comments about how we've run this consultation. We'd also like to get your answers to these questions:

1. Do you have any comments about the overall process of this consultation?
2. Do you have any comments about its tone and content?
3. Was it easy to read and understand? Or could it have been better written?
4. Were its conclusions balanced?
5. Did it make reasoned recommendations for improvement?
6. Any further comments?

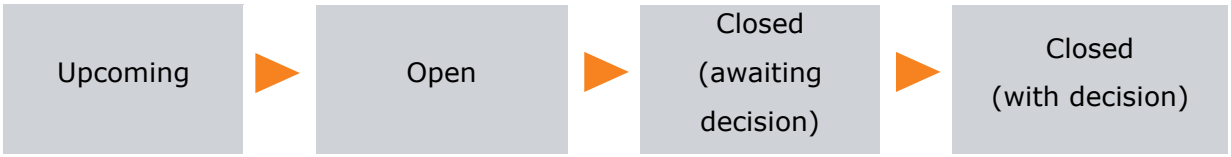
Please send any general feedback comments to stakeholders@ofgem.gov.uk

How to track the progress of the consultation

You can track the progress of a consultation from upcoming to decision status using the 'notify me' function on a consultation page when published on our website. Ofgem.gov.uk/consultations.



Once subscribed to the notifications for a particular consultation, you will receive an email to notify you when it has changed status. Our consultation stages are:



2. Context for Electricity Transmission Network Planning Review

Section summary

This section gives a background to the current arrangements for planning and building the ET network and provides an overview of changes to the energy system that are impacting those arrangements. It sets out the case for considering changes to current ET network planning arrangements and introduces our Electricity Transmission Network Planning Review (ETNPR) and its aim and objectives. Finally, it sets out key interactions between ETNPR and other related workstreams.

Questions

Question 1: What are your views on our key objectives for future ET network planning arrangements that can deliver Net Zero at lowest cost to consumers?

Question 2: Are there any other key workstreams that interact with this review that we need to align with?

How the ET network is currently planned and built

2.1. The onshore ET network[11] in GB is currently planned, constructed, owned and managed on a regional monopoly basis by three transmission owners (TOs)[12]: National Grid Electricity Transmission (NGET) in England and Wales, Scottish Power Transmission (SPT) in the south of Scotland, and Scottish Hydro Electric Transmission (SHET) in the

[11] The Electricity Transmission network transmits high-voltage electricity from where it is produced to where it is needed throughout the country. In Great Britain, the onshore ET network is mainly made up of 400kV, 275kV and 132kV networks connecting separately owned generators, interconnectors, large demands and distribution networks.

North of Scotland. As they are monopolies, we regulate the cost allowances, outputs and incentives of these TOs through the RIIO price control framework[13].

2.2. The RIIO framework provides TOs with funding for forecast work that has a sufficiently clear needs case and design through baseline allowances, and through uncertainty mechanisms (e.g. Large Onshore Transmission Investments (LOTI)[14] or Medium Sized Investment Projects (MSIP)[15]) for other work which has a less clear needs case or design at the time of setting the price control.

2.3. Planning of the ET network falls into two broad categories, load related and non-load related. **Load related** planning covers the assessment of the current and future needs of the ET network due to changes in demand and generation, and making network investments that meet these needs. This includes planning for a future network that is compliant with applicable technical standards in relation to security of supply and that is resilient to change. **Non-load related** planning pertains to maintaining the health of the existing network, and ensuring that existing networks are resilient to a range of factors like environmental impacts, e.g. floods, impacts of climate change, operational resilience, and resilience to cyber security threats among other factors.

2.4. In our ETNPR we have decided to focus on load related network planning processes and investments in ET networks, although this also includes investment that is driven by a combination of load and non-load factors (e.g. replacement of existing network assets because of the health of those assets and because of the need to move more electricity across the network). This is because the changes to the energy system that are described in chapter 2 are likely to require significant new load related investments. We intend following this review to ensure that future approaches to load and non-load related planning are coherent.

2.5. ET network investment is informed by the Future Energy Scenarios (FES)[16] (scenarios for future supply and demand of energy), which are developed and published annually by the Electricity System Operator (ESO)[17]. The FES are designed to reflect the

[13] RIIO Price Control | Ofgem
[14] Onshore transmission project delivery | Ofgem
[15] RIIO-2 Final Determinations Electricity Transmission System Annex (REVISED) | Ofgem
[16] Future Energy Scenarios | FES
[17] ESO' or 'NGESO': National Grid Electricity System Operator. The ESO has a central role in our energy

uncertainty about future supply and demand of electricity set out later under 'Changes to the energy system'. The ESO develops the FES scenarios through stakeholder engagement, research and modelling.

2.6. The ESO uses the FES to assess network requirements for power transfers across the GB National Electricity Transmission System (NETS). The requirements are published in the Electricity Ten Year Statement (ETYS)[18].

2.7. Each TO responsds to the ESO's identification of network requirements with options for reinforcing the ET networks. Based on these options, the ESO then annually conducts the Network Options Assessment (NOA)[19], which is an economic analysis to identify and recommend major NETS reinforcement options ("projects") to meet the future network requirements identified in the FES and ETYS. It makes annual recommendations of "proceed", "delay", "hold", "do not start", or "stop", thereby recommending which projects to progress over the course of that year.

Changes to the energy system

2.8. The energy system has evolved rapidly over the last decade and is expected to go through even more radical change over the next few decades.

2.9. Influencing this change are a number of external factors like the critical need to decarbonise society (eg power production, transport, heating, etc.), socioeconomic factors, technological advancements, and the increasing need for systems to be resilient to climate change and to cyber-security threats. This includes anticipated advancements in low carbon demand and generation technologies and their uptake.

2.10. The main driver for change to the energy system is the UK Government's Net Zero target[20], to be achieved by 2050. Another key driver is the 6th Carbon Budget[21] (6CB),

system. It performs several important functions from the real time operation of the system, through to market development, managing connections, and advising on network investment. In April 2019 National Grid ESO became a legally separate business within National Grid PLC.

[18] Electricity Ten Year Statement

[19] Network Options Assessment | NGESO. Each year the ESO produces the NOA Report to facilitate the development of an efficient, coordinated and economical system of electricity transmission consistent with the National Electricity Transmission System Security and Quality of Supply Standard and the development of efficient interconnection capacity.

[20] The Climate Change Act 2008 (2050 Target Amendment) Order 2019 | HM Government

[21] Sixth Carbon Budget | Committee on Climate Change

which sets a legally binding cap on UK greenhouse gases (GHG) across a five-year period.[22] As a result of the 6CB, the government set out its Net Zero Strategy[23] on 19 October 2021, which commits to decarbonise the power sector by 2035[24], affirming the commitment to bring about major changes in the way energy is produced and consumed to achieve the above decarbonisation targets. In addition, the Prime Minister's Ten Point Plan[25] for a Green Industrial Revolution in November 2020 set out ambitions to connect 40GW of offshore wind generation to the onshore network by 2030, which is driving the Offshore Transmission Network Review referred to later in this chapter.

Changes to supply and demand

2.11. Historically electricity has been generated primarily from onshore conventional fossil fuels and nuclear power stations. However, over the last decade, there has been a marked growth in renewable generation, both in terms of installed capacity and as a proportion of total electricity production, with the proportion of electricity produced from renewable generation having outstripped fossil fuels for the first time in 2020. In 2020, renewable electricity represented 43 per cent of the total electricity generated (135 TWh out of a total of 312 TWh) [26].

2.12. It is expected that this pace of change will continue due to the critical need to decarbonise energy production and consumption in line with the Net Zero target and other decarbonisation targets. It is expected that offshore wind generation will play a major role in this shift[27], but other technologies will also grow in use and there is still significant uncertainty about whether future heating will be provided predominantly through electricity (e.g. heat pumps) or through hydrogen gas, or a combination of the two.

2.13. With the shift towards renewable generation, the points of entry for electricity generation into the ET network are changing. Renewable generation could be directly connected to the ET network, or to the distribution networks, which are connected to the ET network at 'grid supply points'[28]. The location of renewable generation plants depends

[22] Similar to FES, the 6CB creates five different scenarios which explore the areas required to meet Net Zero by 2050, at the latest. However, one key difference is the single baseline scenario.
[23] Net Zero Strategy: Build Back Greener | BEIS
[24] Plans unveiled to decarbonise UK power system by 2035 | BEIS
Ten Point Plan for a green industrial revolution | HM Government [25]
[26] DUKES 2021 Chapter 6: Renewable sources of energy | BEIS
[27] As per the Government's Net Zero Strategy.
[28] The point of interface between a transmission network and a distribution network.

on a number of factors like 'load factor'[29] (which itself is dependent on aspects like weather, wind speed, sun hours among other dependencies), type of technology, locational availability, environmental considerations, and cost to connect to the onshore electricity network.

2.14. This power needs to be transmitted from the new points of entry to where the demand is, which in the case of some technologies like offshore wind is often quite a distance away. Existing ET network circuits may not have sufficient capacity to meet the new power flow requirements, which can often result in the need to reinforce the ET network by upgrading existing circuits and/or installing large amounts of new network infrastructure. Other challenges attributable to renewable generation can include intermittency, power system stability issues, and voltage problems, all of which need timely mitigation. The gradual phasing out of conventional thermal power plants to decarbonise energy, further adds to the above issues e.g. by reducing power system stability further, which also needs mitigation.

2.15. In addition to the increase in renewable power generation, it is also likely that other means of power production and storage will come forward. These could include new nuclear power plants, Carbon Capture Utilisation and Storage (CCUS) plants, hydrogen electrolysis plants and both long and short duration battery storage plants to name a few.

2.16. It is also expected that decarbonisation of transport and heating will cause significant changes in power consumption. Uptake in electric vehicles has been rising and with the government's target of ending the sale of new fossil fuel powered vehicles by 2030[30], it's expected to cause a significant rise in electricity consumption. The uptake in electricity vehicles may also bring with it potential new means of energy storage as electricity could be fed back to the electricity network when vehicles are stationary.

2.17. Low carbon hydrogen may significantly change the future of gas and electricity in the UK energy landscape[31]. The process to produce 'green' hydrogen could require a large amount of electricity. If significant amounts of green hydrogen (produced from

[29] Load factor is the ratio of how much electricity is generated as a proportion of the total generating capacity.
[30] Government takes historic step towards net-zero with end of sale of new petrol and diesel cars by 2030 | DfT, OVEZ and BEIS
[31] UK hydrogen strategy | BEIS

electrolysis) is required in future, this will need to be factored into the planning of the ET network.

2.18. Finally, it is also expected that more interconnectors to other countries will be part of the GB electricity infrastructure mix as they provide a range of benefits like improving security of supply, allowing for the import of power including that from low carbon sources at times of need, and allowing for the export of excess power to other countries in order to earn revenue and advance international trade. The location and amount of interconnection is an important consideration when planning efficient ET networks because of the large capacity of electricity that they transmit between GB and other countries.

Impact of changes to the energy system on the ET network

2.19. While the decarbonisation targets have been set, there are various different ways in which the technologies and changes referred to above could lead to those targets being met. There is great uncertainty (in terms of timing, location, size, technology type etc.) about many of the large-scale changes in generation and demand.

2.20. The ET network needs to be developed in response to that uncertainty, to facilitate the changing energy system and be fit for purpose to address the changes of the future.

2.21. When transmission capability on the network is insufficient to support required electricity flow this is known as a constraint. The ESO manages these constraints by taking actions - by paying generators (or demand) in different locations to change their output (or consumption), thus changing the flow on the ET network. The amount the ESO pays network users to manage constraints in this way is known as the constraint cost. Analysis from the ESO forecasts that unless the ET network is upgraded, this will lead to significant constraints costs across the ET network over the next decade[32]. The cost of this would ultimately feed into consumer bills. It is therefore important that the ET network is planned and delivered efficiently to minimise these constraints and their costs.

2.22. New investments in the ET network typically take a long time to plan, design and deliver. Lead times for large ET projects can be up to ten years or more. This means that any new ET network required to cope with future changes to demand and generation must

[32] Modelled Constraint Costs | NGESO

be planned well in advance of certainty of need. This gives rise to the need for anticipatory investments in the network in the face of uncertainty. Network planners need to consider robust scenario planning and use economical methods of decision making that can adapt to change while balancing the risk of stranded assets (the risk of assets not being needed), against the risk of constraints (i.e. not having sufficient capacity on the network to meet the requirements of the future in time) or the risk that the ET network is a blocker to decarbonisation targets by not having the network ready in time for need.

2.23. The design of the ET network affects the feasibility and deliverability of new generation and demand, or the operational cost of accommodating them. This increasingly means that strategic thinking should be at the core of planning of both electricity networks and of the energy system as a whole.

The objectives of our Electricity Transmission Network Planning Review

2.24. The current ET network planning processes, particularly the NOA, have helped coordinate plans for major investment in the ET network over the last few years[33] and have helped provide some transparency on how the ET network is planned and what investments may come forward over the next 10 years. The NOA has also provided helpful signals to TOs to make informed decisions on network investments necessary for efficient development of the ET network to meet Net Zero and other decarbonisation targets.

2.25. However, the NOA process has certain limitations in planning the ET network to facilitate the changes to the energy system mentioned above, especially due to the lack of an overarching strategic outlook that takes a GB-wide holistic[34] view.

2.26. The current NOA is fairly narrow in scope (focusing on load related investment and mainly on delivering additional boundary capacity[35] only). The ESO has made some

[33] For example, the NOA helped identify options for two 'Eastern HVDC' links, which are High Voltage Direct Current (HVDC) links with capacity of 2GW each down the east coast from Scotland to the north-east of England, to predominantly help move renewable electricity from north to south GB. Eastern HVDC - Consultation on the project's Initial Needs Case and initial thinking on its suitability for competition | Ofgem

[34] 'Holistic' here refers to considering the GB ET network as a whole, without being constrained by TO or onshore/offshore boundaries, and includes consideration of the changing requirements of the energy system as a whole.

[35] Boundary transfer capacity: To provide an overview of existing and future transmission requirements,

progress over the last few years expanding the scope of the NOA methodology to wider operability issues through its NOA Pathfinders[36]. However, we believe the current level of coordination between the various different network planning processes may not result in the identification of the best overall solutions to the ET network's needs, and results in the lack of a joined up view and approach to the design and operability of the ET network across GB.

2.27. Additionally, in our view, the existing network planning processes are largely reactive in that they: a) don't seek to coordinate the development of the ET network with the development of supply and demand; and b) largely rely on network studies and investment options being led and put forward by the incumbent TOs, who are not responsible for the entire ET network. This may result in more efficient ET network investment options being missed, including innovative or commercial options that could address issues earlier or more proactively, or could potentially buy more time for major investments to be delivered.

2.28. This means that clear signals aren't always sent to project developers, Ofgem and government, of the need for critical, strategic investments that should be prioritised and taken forward immediately. This could lead to delays in the early stages of project development, resulting in significant additional constraints costs, or issues with reaching decarbonisation targets.

2.29. We therefore consider that this is the right time to review the existing ET network planning processes across GB (i.e. onshore and offshore) and consider the need for improvements that will enable GB's ET networks to efficiently meet anticipated future needs of the changing energy system to fulfil the decarbonisation targets.

2.30. We commenced our ETNPR in June 2021 with the aim of ensuring the ET network can efficiently support the delivery of Net Zero at lowest cost to consumers. As part of the

and report the restrictions on the NETS, the concept of boundaries is used. The NETS is split by boundaries that cross critical circuit paths that carry power between the areas where power flow limitations may be encountered. Boundary transfer capacity is the maximum pre-fault power that the transmission system can carry from the region on one side of a boundary to the region on the other side of the boundary while ensuring acceptable transmission system operating conditions will exist following one of a range of different faults. (NOA 2021)

[36] NOA Pathfinders

review we have considered our objectives for efficient ET network planning arrangements, as set out below:

2.30.1. The arrangements should promote **proactive identification and progression of low regret 'strategic investments'[37] in the ET network** that are key to delivering Net Zero and other decarbonisation targets efficiently.

2.30.2. The arrangements should create the right conditions for **efficient co-optimisation of the design of the ET network with the location of new demand and generation across GB**. At this stage in the development of major new demand and generation to support the decarbonisation pathway to Net Zero, there is an opportunity to help strategically plan the energy system such that the ET networks, and the energy system more generally, are planned more proactively alongside the location, timing, sizing and technology of new demand and generation, so as to maximise efficient utilisation of electricity networks. For example, strategic energy system planning might provide opportunities to strategically locate hydrogen production facilities close to renewable generation plants.

2.30.3. The arrangements should ensure that **onshore and offshore ET networks, including potentially interconnection, are planned holistically, together**. To date offshore co-ordination has not been a key consideration of the onshore electricity transmission planning process[38] and ET and interconnector networks have not been planned holistically together. The arrangements should align with and build on the work being undertaken as part of the Offshore Transmission Network Review (OTNR)[39] as set out in section 2.34. The potential inclusion of interconnection in strategic planning arrangements would be subject to the outcome of the Interconnector Policy Review (ICPR).

2.30.4. The arrangements should **provide a coherent framework for coordinating the planning and delivery of ET networks across GB**. The arrangements should create a joined up overall process that encompasses

[37] Refer to section 4.12 for what we mean by Strategic Investments in the ET network in the context of meeting Net Zero, and in the context of this consultation.
[38] In the last two years the NOA has started to consider theoretical offshore links between a number of known locations of future offshore wind development
[39] Offshore Transmission Network Review | Ofgem

complete assessment of the ET network against all issues that may arise due to changes in demand or generation. For example, the ET network planning arrangements should consider operability issues relating to power system stability and voltage, and the design of new connections should consider the wider impacts on the overall network rather than just the cheapest local option.

2.30.5. The arrangements should **provide viable routes for third parties to develop innovative and/or non-network solutions that can be considered fairly and transparently against other options**. Currently, the lack of these routes means a reliance on incumbent TOs putting forward innovative solutions, without the incentive of competition from other parties.

2.30.6. The arrangements should **provide clearer information, at an earlier stage, to planning authorities and local communities on the inter-relationship between ET network projects, and how environmental and community factors have been taken into account in design of the network**. The arrangements should also enable early engagement by local authorities, other stakeholders and local communities to the process and to the need for and design of ET networks. This will help inform the work on the balance between cost, timing and community and environmental impact. It will also help support delivery of projects through planning and consenting processes.

2.31. Our aim through this consultation is to test the above objectives, and to test our initial views and recommendations (as set out in chapter 4) on how they can be achieved.

Interaction with other workstreams

2.32. A number of different workstreams are either directly considering changes to the current arrangements for planning and delivering ET networks or may indirectly impact on those arrangements. Below we set out the key interdependencies that will have an affect on, or be affected by, the ETNPR.

Offshore Transmission Network Review (OTNR)

Background to the OTNR

2.33. The offshore ET network is currently planned and built by offshore electricity generators[40] seeking to connect to the onshore network and we appoint offshore transmission owners (OFTOs) using competitive tenders, to own and operate the offshore ET network.

2.34. The Department of Business, Energy and Industrial Strategy (BEIS) and Ofgem launched the OTNR in July 2020 to review and address deployment barriers in the current regime and to deliver a more coordinated transmission network for offshore wind, with a view to support delivery of the UK's 2030 deployment target (of 40GW of offshore wind) and wider Net Zero ambitions by 2050. The OTNR looks into the way that the offshore transmission network is designed and delivered and aims to deliver a more coordinated approach that minimises the need for radial connections and reduces the cumulative impacts of transmission. Whilst the OTNR focuses mainly on the offshore networks, it also aims to ensure that future connections for offshore wind are delivered holistically across onshore and offshore, whilst ensuring an appropriate balance between environmental, social and economic costs.

2.35. To achieve the deliverables of the OTNR there are five workstreams operating in parallel. Three of these are temporal, these are 'Early Opportunities' (near term), 'Pathways to 2030' (medium term) and 'Enduring Regime' (long term); and two cut across other workstreams: Multi-Purpose Interconnectors (MPI) and Planning and Environment.

2.36. The Early Opportunities workstream is focussed on facilitating the coordination of relatively well-advanced 'in-flight' projects through making changes within the current regulatory framework. The Pathways to 2030 workstream focuses on less-advanced projects (projects which have won seabed leases in 2021 or will do so by 2022). It aims to develop the regulatory framework to allow the optimum engineering solution ('holistic network design' (HND)) and a delivery model to connect 40GW of offshore wind to the system by 2030 in a more coordinated way. The Enduring Regime workstream aims to develop a new, more strategic approach to developing and delivering offshore transmission for projects that have not yet started the development process (with the exclusion of projects already covered by the Pathway to 2030 workstream), and will come through future seabed leasing rounds and ScotWind. The MPI workstream works across all three

[40] So far these have all been offshore wind generators

temporal workstreams to make tactical changes that will enable the delivery of early opportunity MPIs, while also considering changes required to implement an enduring framework to effectively support MPI projects from 2030 onwards. The planning and environment workstream also works across all three temporal workstreams and MPIs to support changes needed to ensure better and quicker consenting and that environmental considerations are addressed early on.

2.37. Further details on the Early Opportunities, Pathway to 2030 and Multi-Purpose workstreams are available in our July 2021 consultation of the OTNR[41].

2.38. The Pathway to 2030 chapter within the July 2021 consultation of the OTNR refers to the intention for the ESO to work with key stakeholders to produce a HND by January 2022 to then be taken through the OTNR Governance. The aim of the HND is to deliver a holistic onshore and offshore ET network design to connect 40GW of offshore generation by 2030.

2.39. Setting the direction for the longer term, the Enduring Regime consultation[42] published by BEIS in September 2021, proposes to develop an enduring regime that takes a more strategic approach to windfarm and related network (offshore and onshore) development holistically and in a more coordinated way.

Relationship between OTNR and the ETNPR

2.40. The ETNPR considers planning of the entire NETS (onshore and offshore) in the context of broader energy system developments and is not limited to investment triggered by offshore wind generation.

2.41. However, as the HND is being produced first and will consider some parts of the onshore network, the ETNPR will need to be informed by and align with the HND. As such we are seeking to ensure as much consistency in analysis and decision-making tools and roles and responsibilities as possible, and to avoid duplication of work or different

[41] Changes intended to bring about greater coordination in the development of offshore energy networks
[42] Offshore Transmission Network Review: proposals for an enduring regime and multi-purpose interconnectors | BEIS

recommendations for network investment. We are working closely with the ESO, BEIS and other key stakeholders to ensure that this is the case.

2.42. In their ongoing Enduring Regime consultation, BEIS set out an enduring vision for offshore networks in their proposals for a 'strategic plan'. This considers that there is also an opportunity to potentially remove the current regime's distinction between onshore and offshore and move towards a single integrated approach. This aligns with our objectives for ETNPR as set out in section 2.30.3 and with our recommendations for a Centralised Strategic Network Planning model as set out in chapter 4. We will undertake further work to manage key interactions and to explore the potential for taking an integrated approach to network design and delivery across onshore and offshore. As such we envisage aligning the enduring network planning arrangements for OTNR (which are set out in OTNR proposals for a 'strategic plan' and 'holistic network design') and ETNPR. Although we expect alignment in terms of network planning, we consider that there may potentially be a case for some different delivery models for onshore and offshore ET networks, given the different parties involved and the different characteristics of some of the assets.

RIIO uncertainty mechanisms

2.43. In section 2.2 we referred to the relevant reopeners – LOTI and MSIP – for large and medium sized uncertain ET projects coming forward during the RIIO2 price control period. We expect that these reopeners will continue to apply, i.e. major new onshore ET projects coming forward either as a result of our proposed transitional arrangements for ETNPR (as set out in chapter 4) or as a result of the OTNR HND will need to be submitted for approval via the LOTI or MSIP process before Ofgem can award construction funding.

2.44. We anticipate however that processes developed under the ETNPR or OTNR HND can help facilitate and streamline the 'needs case' approval process under the uncertainty mechanisms, including for example for strategic clusters of large onshore investments as described in chapter 4.

Competition in ET networks

2.45. We have previously confirmed that all projects that come forward for assessment via the LOTI reopener during the RIIO-2 period will be considered for their suitability for delivery through one of the late competition models we have previously developed. We

also recently published a consultation[43] on our intent to work with the ESO to continue developing an early competition model.

2.46. We see competition as an important part of any future ET network planning arrangements. Early competition could be used to help shape the high level design of the ET network, including through the identification of efficient non-network solutions. Late competition could be used to promote more efficient delivery of ET network projects by delivery bodies.

ESO Regulation and Future System Operator (FSO)

2.47. In the July 2021 consultation by BEIS and Ofgem on the Proposals for a Future System Operator[44] role, we set out our proposals for an expert, impartial FSO with responsibilities across both the electricity and gas systems, to drive progress towards Net Zero while maintaining energy security and minimising costs for consumers. Our proposal was for all the current ESO roles and functions to be carried out by the FSO, and that the FSO should undertake new functions in system planning and network development, with a greater focus on the energy system as a whole (including both electricity and gas).

2.48. We consider that the aims for ETNPR set out in this chapter are aligned with the above key messages in the FSO consultation. We set out further detail in chapter 4 on the potential future ET network planning roles we consider could be played by the FSO.

Electricity Distribution and Distribution System Operator (DSO)

2.49. The next price control that Ofgem is in the process of setting for the electricity distribution (ED) sector, the RIIO-ED2 price control, will set the outputs that the 14 Electricity Distribution Network Operators (DNOs) will need to deliver for their consumers and the associated revenues they are allowed to collect for the five-year period from 1 April 2023 to 31 March 2028.

2.50. This review doesn't specifically cover ED network planning arrangements, as they are planned differently to ET networks, with more localised drivers and planning methods that are more suitable for ED. The majority of network investments in ED take less time to

[43] Consultation on our views on early competition in onshore electricity transmission networks | Ofgem
[44] Proposals for a Future System Operator role | BEIS and Ofgem

deliver than the significantly longer time taken for ET networks, which gives rise to a greater need for strategic anticipatory investments in ET networks. We believe that the work being done as part of the ED and DSO workstreams in Ofgem, and the guidance issued by Ofgem as part of our RIIO-ED2 Business Plan Guidance45, cover network planning within ED networks, and any further work to review the arrangements will be taken forward by the appropriate workstreams as required.

2.51. Interactions between ED and ET network planning are set out below, and where there are benefits from whole system planning of ET networks that include solutions at ED level, this review will look to establish planning arrangements that are an enabler for such whole system planning. We'll also work together with the ED and DSO workstreams to inform each other's thinking and enable cross-sector whole system planning and sharing of best practice.

2.52. There are three potential levels of interaction between the ETNPR and the work underway at ED, as set out below.

2.53. Firstly, DNOs, alongside TOs, have an existing licence requirement to consider whole electricity systems solutions to more efficiently manage their systems. In RIIO2, network companies are incentivised to look at whole system solutions[46][47][48], including those that go beyond electricity systems. So, we expect greater stakeholder input to help identify and progress new whole system solutions.

2.54. Secondly, we expect there to be improved information flows across network companies, to better inform planning and operation. Work is underway through the ENA Open Networks project to improve data and planning exchange and we expect to see more informed, robust plans to be made as a result. Ofgem is also making changes to the obligations on the DNOs for producing Long Term Development Statements. This is an obligation for DNOs to publish detailed information on their network development plans in the forthcoming five years on their network. The current DNO licence is being reviewed to update its content and how the information is shared. Industry working groups have been set up to shape the new requirements. From April 2022, DNOs will also need to start

[45] https://www.ofgem.gov.uk/publications/riio-ed2-business-plan-guidance
[46] RIIO-2 Transmission, Gas Distribution and Electricity System Operator licences
[47] Chapter 8 of RIIO-2 Sector Specific Methodology – Core document for Transmission, Gas Distribution and Electricity System Operator
[48] Chapter 5 of our RIIO-ED2 Sector Specific Methodology Decision

publishing Network Development plans at least every two years, that provide a best view on the planned developments and expected flexibility use over the 5-10 year planning horizon.

2.55. Thirdly, RIIO-ED2 has a particular focus on developing more active Distribution System Operation functions. These include expansion of existing or creating new planning, operation, and market facilitation roles. DNOs will need to ensure that they manage any real or perceived conflicts of interest between any DSO and DNO functions. Alongside the work to develop the RIIO-ED2 framework, Ofgem are looking at whether the governance arrangements at Distribution level will support the efficient delivery of Net Zero, or whether new arrangements are needed to more efficently meet local needs.

BEIS' and Ofgem's Electricity Networks Strategy

2.56. Ofgem is working with BEIS to develop a joint Electricity Networks Strategy, which will outline the opportunities and challenges that electricity networks face in the transition to Net Zero. The strategy aims to outline the range of policies and regulation that Government and Ofgem are putting in place to ensure networks are able to capitalise on these opportunities and challenges. The strategy focuses on onshore electricity networks across England, Wales and Scotland, covering all voltage levels.

2.57. We expect that future network planning arrangements, as a result of the ETNPR, will enable networks to achieve the aims set out in the strategy, We also anticipate that the aims of any new ET network planning arrangements should facilitate achieving the aims of policies that are set out in the strategy.

Interconnector policy review (ICPR)

2.58. The ICPR aims to establish whether there is a need for further GB interconnection capacity beyond those projects that currently have regulatory approval, and to consider Ofgem's approach to the regulation of future GB interconnection. Our initial conclusions and proposals across four ICPR workstreams were consulted on in June and July 2021 and are pending a decision this year. Those initial proposals consider the need for enhanced and more proactive network planning processes to help inform future interconnector investment rounds.

2.59. As noted earlier, future strategic ET network planning arrangements may potentially include planning of interconnectors, but this will be subject to the outcome of the ICPR.

Network Charging

Ofgem is leading on two broad areas of reform within Network Charging:

2.59.1. Our minded-to position under the Access & Forward-Looking Charges Significant Code Review (SCR) is to levy Wider Transmission Network Use of System (TNUoS) charges (those generation charges which recover part of the cost of the Main Interconnected Transmission System (MITS)) on all Embedded Generation >1MW; and

2.59.2. The current TNUoS regime needs to be reassessed for fitness for purpose in the context of Net Zero and OTNR. We have issued a Call for Evidence which closes on the 12th of November. Based on discussions with Industry so far, we expect the outcome to be an SCR looking at the methodology underpinning the TNUoS charges for the MITS and possibly some parts of the NETS, although this is less certain (generation circuits). There will be several fundamental questions linked to the ETNPR, including the extent to which it is still necessary to link the Security and Quality of Supply Standard (SQSS)[49] to the TNUoS methodology, whether regional Maximum Allowed Revenue (MAR)[50] should be recovered regionally and the extent to which we should reflect within charging, Average Cold Spell (ACS)[51] demand's current and future role in transmission investment.

2.60. Both of the above will be assessed simultaneously. We do not expect this work to influence the ETNPR, although we note the current link between MAR, LOTI, SQSS and TNUoS. Depending on the network planning arrangements set out through the ETNPR, questions on how to recover costs through network charging will need to be considered (i.e. the costs of Anticipatory Investment, the funding arrangements, MAR applicable to competitively appointed transmission owners, etc.). At this stage we anticipate that any work to consider these questions as a result of the ETNPR will fall under Ofgem's normal

[49] Security and Quality of Supply Standard (SQSS) - The SQSS sets out the criteria and methodology for planning and operating the National Electricity Transmission System (NETS).
[50] Maximum Allowed Revenue (MAR): The annual portion of the total Price Control settlement value that the TO is entitled to recover in any given year.
[51] Average Cold Spell (ACS) demand: The weather-adjusted peak demand at each GSP or node as per the SQSS.

code processes for network charging, or within the scope of an SCR launched through/by Ofgem, rather than being part of a separate TNUoS review.

Planning, consenting and priorities in the marine space

2.61. Work underway across government including the Nationally Significant Infrastructure Planning (NSIP)[52] reform led by the Department for Levelling Up, Housing & Communities (DLUHC) will be important for enabling improved and quicker consenting of onshore ET network projects. The draft National Policy Statement (NPS)[53] currently out for consultation, in particular, EN-5 on Electricity networks, is important in setting out the planning policy and requirements for ET projects. In addition, work is due to commence, led by Defra, identifying spatial priorities in the marine environment which will be important for offshore ET networks. This parallel work is important in considering the delivery of the ETNPR and in particular the CSNP arrangements covered in Chapter 4.

[52] National Infrastructure Planning Reform Programme | DLUHC
[53] Planning for new energy infrastructure: review of energy National Policy Statements | BEIS

3. How we have structured the ETNPR and Success Criteria

Section summary

This section outlines how we have structured the ETNPR, and how we have engaged with external advisory groups so far. It also sets out what criteria we propose to use to assess the likely success of future ET network planning arrangements.

Questions

Question 3: Do you have any views on the scope of the review? Are there any key topics that we have missed?

Question 4: Do you have any views on the success criteria? Are there any key areas that we have missed?

How we have structured the ETNPR

3.1. We have structured the ETNPR to focus on the following key topics in order to try and deliver the objectives set out in chapter 2:

1) **Strategic clustering of large projects and centralisation of planning.** Clustering relates to grouping together two or more large projects which share a common set of drivers and/or are mutually dependent to derive the full extent of system benefit under the regulatory approval and planning consent processes. Centralisation of planning relates to whether and how to move to a more centrally planned approach to: a) identifying and designing SIs required on the ET network across GB; and b) seeking to better and more proactively facilitate the coordination bewteen ET network planning and wider energy system planning (e.g. the planning of new sources of generation and demand).

2) **Analysis and decision-making methods for network planning against uncertainty**. This considers the best ways to make decisions where there is uncertainty about the future. It considers strengths and weaknesses of the

current ways that analysis is carried out to determine ET system needs and the ways decisions are made on what options to progress to address those needs. It includes the link between FES and network planning tools such as the NOA, and also includes the extent to which power system studies are carried out as part of different processes so as to ensure that the assessment of system needs are robust. It also includes consideration of how to ensure efficient, accurate and robust data exchange between parties, including the need for transparency and quality assurance of data. Finally, it considers how to value/consider longer-term versus shorter-term solutions and wider issues such as environmental and community impact.

3) **Breadth of solutions, covering whole system solutions and innovation**. This topic considers how network planning arrangements can enable adoption of whole system solutions across regulated networks and beyond, for example by considering the broader energy system. These could be solutions that could be transmission or distribution, onshore or offshore, build or non-build. This involves a review of processes for integration of market and/or non-network solutions and flexibility to resolve network problems. It also considers to what extent whole electricity system solutions can be robustly factored into options analysis for ET network needs, e.g. electricity distribution solutions for ET issues. It also considers barriers, e.g. commercial, legal, or regulatory, to considering such solutions, and if so, how these can be removed. Finally, the intent is that this workstream can also consider, at a high level, how to identify 'whole energy system solutions', i.e. solutions that could be electricity, gas, demand or generation.

4) **Roles and responsibilities in network planning, including the early development of solutions and designs**. This considers the current division of roles and responsibilities in ET network planning. It considers the best options for divisions of roles and responsibilities for delivering any future proposed ET network planning arrangements, including consideration of what skills exist in relevant organisations and what regulatory incentives and obligations might apply to key parties, and how performance could be monitored. Finally, it considers any legal or regulatory barriers to changing roles, and if so, how these can be addressed.

3.2. To date we have focussed mainly on topic 1 in the ETNPR; however we have also given some high level consideration to topics 2 and 4, which have informed our view to

date on topic 1. We intend to focus on topics 2, 3 and 4 in more detail following this consultation. Our reasoning for this approach is to prioritise developing the high level framework for ET network planning via topic 1, and then using findings from topics 2, 3 and 4 to develop the more detailed arrangements necessary to implement that framework, so that we maintain the pace of delivery for key ET network investment while developing a longer-term regime for ET network planning.

Advisory Groups

3.3. In order to conduct the review and to supplement our internal analysis and review, we set up an external Strategic Advisory Group (SAG) that would bring together a range of key stakeholders in ET networks. Underneath the SAG, we formed four sub-groups, one for each of the key topics to be covered in the review.

3.4. The SAG comprises members from Ofgem, who chaired the meetings, BEIS, National Grid ESO, NGET, SPT, SHET, and other members including from academia, the National Infrastructure Commission, and non-network or third party developer companies.

3.5. The purpose of the SAG is to receive updates on the ETNPR, for Ofgem to bring forward key policy questions that stemmed from the review, and for the SAG to provide steer on key policy aspects of the review, namely:

3.5.1. the objectives and scope of the review and success evaluation criteria;

3.5.2. key policy and process recommendations emerging from the review;

3.5.3. key interdependencies and how to efficiently manage them;

3.5.4. the focus, key deliverables and membership of sub-groups to consider specific workstreams of the review; and

3.5.5. key risks and issues and how to manage them.

3.6. The sub-groups (from here on referred to as 'Working Groups' or 'WGs') focus on different topics of the review in detail, with the purpose of analysing policy questions and making recommendations related to the review. Members of WGs who weren't represented on the SAG, can be invited to SAG meetings to discuss the outputs of WG discussions.

3.7. The membership of the WGs has been drawn from the member organisations of the SAG, plus environment and community bodies, representation from devolved governments, and representation from Planning teams from BEIS.

3.8. For each area of the review considered so far, we presented the problem, initial views to resolve it, and sought feedback from the WG on detailed aspects. WG members also gave alternative views and approaches that helped us shape our views further. Once discussions on a particular topic were completed at the WG level, we took the findings to the SAG and sought their views, advice and steer on all aspects of the topic presented. This then helped us shape our view further.

3.9. We have led the work on topics 1 and 4, and the ESO has led the work on topic 2 so far, which has informed our initial views on topics 1, 2 and 4 as set out later in this document. In chapter 5 we set out our views on roles and responsibilities for progressing each topic following this consultation.

Success criteria

3.10. We have considered how we would assess the likely success of any proposed future ET network planning arrangements. Where we propose to make material changes to existing arrangements, we propose to test these new proposed arrangements against a set of success criteria that assess benefit to consumers and the network. The existing ET network planning arrangements will also be scored in order to allow for comparison. Table 3 in Appendix 1 sets out the success criteria that we have developed with input from the SAG.

3.11. The scoring for proposed arrangements will be tentative until more details are developed to underpin the arrangements, and we may not be able to score some areas until these details are more developed.

3.12. In Table 5 in Appendix 1 we have provided our initial view of scores for a Centralised Strategic Network Planning model (as described in chapter 4) compared to the existing ET network planning arrangements. We intend to review this assessment more fully after this consultation, once we have more clarity on some of the underpinning detail.

4. Centralised Strategic Network Planning (CSNP)

Section summary

This chapter sets out our vision for potential new network planning arrangements (Centralised Strategic Network Planning) that would take a GB-wide holistic view to develop an optimised plan for taking forward low regret anticipatory SIs in the ET network. We also set out how this could include making recommendations to inform strategic energy system planning so as to achieve the Net Zero target in the most efficient way. This chapter sets out our enduring vision and proposals for transitional arrangements.

Questions

Question 5: What are your views on our enduring vision for Centralised Strategic Network Planning?

Question 6: Do you have any views on the proposed central network planner's role, who that planner might be, and how it may perform this function?

Question 7: What are your views on the proposed stages and focus of the enduring CSNP model? If you can suggest alternative approaches to any of the stages then please do so.

Question 8: What are your views on closer stakeholder co-working to break longer-term uncertainty deadlocks?

Question 9: What are your views on allocating risks and accountability for various aspects of the CSNP, and for delivering the options finalised under CSNP? Do you have any suggestions to mitigate any of the risks?

Question 10: What are your views on the proposed Transitional arrangements?

4.1. This chapter sets out further detail on what we have considered so far in relation to centralisation of planning, then covers strategic clustering of large projects. In this chapter we set out our proposal for a new network planning model and process called Centralised Strategic Network Planning (CSNP) that we consider could deliver the objectives for future network planning arrangements that we set out in section 2.30.

4.2. We recognise that delivering all of the objectives may take some time given the changes that will be required to existing arrangements. But we are also mindful that there should be no unnecessary delays to the development of critical ET network. Therefore we set out in this chapter our vision for both the 'enduring' CSNP arrangements that can deliver all our objectives, as well as pragmatic 'transitional' arrangements we consider might apply from next year in order to help move towards the enduring vision.

Our enduring vision

4.3. Our enduring vision is to introduce a new CSNP model and underlying processes that:

4.3.1. will take a GB-wide holistic view to **develop an optimised plan for necessary investment in the ET network** to meet anticipated future needs of the changing energy system to meet the Net Zero targets. This will **include** (but not be limited to) **identifying and specifying the high level design of low regret SI.**

4.3.2. will **facilitate a move to strategic energy system planning** so as to achieve Net Zero targets in the most efficient way. This would be achieved by proactively coordinating ET network planning with wider energy system planning (eg the planning of new sources of generation and demand).

4.3.3. will **be led by a single, independent, expert body – a 'central network planner'**. The central network planner will still need strong support from the incumbent TOs and third parties to develop feasible and deliverable options.

Developing an optimised plan for necessary investment in the ET network, including identifying and specifying the high level design of low regret SI

4.4. The scope of the enduring CSNP should cover all load-related ET network investment in GB, including onshore, offshore and potentially interconnection (subject to the outcome of the ICPR as set out in section 2.59). This should ensure that all load-

related ET network developments are considered as part of a single strategic network planning function that includes complete oversight and coordination of all network needs and developments by a single independent body. We set out below the key stages of the proposed enduring CSNP process, which would be predominantly led by the central network planner. Table 1 in this chapter illustrates and summarises the various potential stages of the enduring CSNP process.

Modelling supply and demand

4.5. We propose that the central network planner should design and develop transparent, plausible future energy demand and supply scenarios or estimates in order to develop an optimised plan for necessary investment in the ET network. Those scenarios or estimates should adhere to the following principles:

4.5.1. They should model future demand and supply robustly.

4.5.2. They should be transparent in the design of the model and in the input data used and assumptions made.

4.5.3. Data sources should be robust and drawn from a range of sources, including taking robust input from stakeholders.

4.5.4. They should include pathway(s) which are compliant with Net Zero by 2050.

4.5.5. They should be based on both a top down GB wide approach to forecasting and a bottom-up approach which takes regional factors like approved local energy plans into account.

4.5.6. Future iterations of the estimates/scenarios should be informed by the network impact of CSNP.

4.6. In terms of modelling supply and demand, we consider that a case could be made to move away from the current broad scenario-based approach used in the FES to a less mechanistic approach that makes assumptions, at least for the nearer term future, that are governed more by strategic thinking. This could lead for example to consideration of whether to use central estimates based on assumptions of supply and demand in certain sectors and/or locations (eg such as future hydrogen production or offshore wind deployment), at least over a time horizon where there can be reasonable confidence that

these assumptions are robust and/or aligned with government policy intentions. Where central estimates are used these would need to be underpinned by qualitative justifications and would need to test for the impact of deviations in possible future outcomes.

4.7. In terms of estimating supply and demand in the longer term future, where there is less clarity or where assumptions are likely to be less robust, there may be a need to consider multiple possible scenarios. Under such an approach, there could be a case for allocating probabilities to the scenarios materialising, but where this is done, the allocations of probabilities would need to be caried out in a robust and transparent way, and based on robust input data and assessments.

4.8. There may be value in closer stakeholder co-working to break uncertainty deadlocks, e.g. through providing greater transparency in the mutual impacts between ET network investments and the siting, sizing and timing of developing supply or demand. One way this could be done would be to develop alternative ET network plans to cover a longer term period, one plan for each eventuality. This could help provide a signal on network costs and charges that could allow more informed engagement with key stakeholders and decision makers in order to co-optimise development of network and supply/demand.

Identifying system needs

4.9. The central network planner would use the outputs from modelling supply and demand to carry out an assessment of the impact on the ET network. This should consider all system issues and not be limited to thermal capability of assets. It should include operability assessments where appropriate and compliance with technical standards like SQSS.

4.10. This assessment should result in identifying system needs and network issues that will materialise during the time periods considered in the supply and demand modelling, and that will require mitigation through strategic or non-strategic investments in the network. This assessment should also consider if opportunities exist to shape the energy system in a way that better resolves the overall needs of the ET system as a whole.

Options for addressing system needs and specifying the high level design of SI

4.11. The future network planning arrangements should identify a broad range of possible options to meet the system needs referred to above. This should include options for SI and non-SI.

4.12. A critical part of the CSNP is the identification of SI. By SI we refer to ET network investments that are critical to delivering Net Zero or other agreed decarbonisation targets efficiently. Our initial view is that SI, at least at first, should be 'key' parts of the GB ET network that are necessary for the bulk transfer of electricity and/or that are strategically important to the GB energy system for other reasons. SI would not be expected to be limited by arbitrary demarcations like voltage of the transmission system. Our expectation is that the 'bar' for qualifying as SI may be set quite high, at least initially, in order to avoid over-specifying the network and reducing the ability to manage more localised change and introduce innovation.

4.13. However, we would like to provide flexibility for the central network planner to consider this further and propose to us what type of system needs should be classified as SI.

4.14. The arrangements should identify multiple potential solutions for each need, also considering options that resolve multiple needs.

4.15. The arrangements should address all system needs such that solutions resolve key technical issues, which if left untackled, can pose a barrier to timely changes in the energy system and ultimately in achieving the aim of Net Zero. We expect that cost estimation and evaluation of earliest in service dates for options should be robust, based on sound information exchange processes between the central network planner and parties putting forward options. Robust assumptions should also be made around key features of the route or location of the assets that might impact on deliverability.

4.16. For SI, because of the criticality of that investment to delivering Net Zero or other agreed decarbonisation targets efficiently, we consider that the central network planner should specify the high level design of that SI in order to ensure that the design can appropriately address the strategic system need. We anticipate that development of the high level design would require a dedicated team of network planning engineers in the central network planner who would 'own' the SI options that are being developed and spend time developing them to an appropriate level of detail. We do not think this should preclude the central network planner from using competition or collaborative stakeholder engagement to develop those high level designs, where it is appropriate to do so.

4.17. We do not think that it would be necessary or appropriate for the central network planner to develop the high level design for non-SI. This is because we would like to avoid overspecification of the ET network design by the central network planner in order to allow

for innovation and more efficient options to be brought forward. For non-SI, we consider that high level designs of options would be taken forward by incumbent TOs or by third parties, who may be selected through competition, so long as these high level designs appropriately addressed system needs and aligned with the overall CSNP.

4.18. In general, we consider that the CSNP arrangements should provide viable routes for third parties to propose innovative and/or non-network options that can be assessed fairly and transparently against other options. This might be for example through using early model competition to determine the high level design for certain parts of the network where there can be more flexibility in that design or where there can be significant differences in technology to address a system need.

Decision making, including the use of cost benefit assessments

4.19. The relative merits of the options considered by the CSNP for addressing system needs (as referred to above) should be assessed by the central network planner based on a robust methodology that covers the technical and economic aspects of each option. That methodology should allow the central network planner to robustly make decisions about which options should be taken forward as part of the CSNP. The decision making should be governed by strategic thinking, such that assumptions can be made at least for the nearer term future, on the need to invest, where there is reasonable confidence that these assumptions are robust and/or aligned with government policy intentions.

4.20. We consider that the economic assessment should include a cost benefit assessment methodology that strikes an appropriate balance between cost and environmental and community impact. This should reduce the chances of material changes to option design or delivery timing at later stages due to adverse stakeholder engagement and/or major issues with planning consents. For the community and environmental impact assessment, qualitative assessment should be supplemented where possible, with robust mechanisms to quantitatively assess impact. Any quantitative measures should be based on appropriate, consistent and reproducible methodologies.

4.21. For the purposes of CSNP, our initial view is that environmental impacts would include the impact of new network on the local natural environment like water bodies, Sites of Special Scientific Interest (SSSIs), Areas of Outstanding Natural Beauty (AONBs), animal and plant habitats; and impacts on the wider the environment like through the use of SF6 in new networks, or through network losses.

4.22. For the purposes of CSNP, our initial view is that community and social impact would relate to the impact of new network on communities during the construction stage e.g. road closures, and the lasting impact of the network once it is built e.g. visual impact of electricity towers or substations.

4.23. Finally, we expect that there will be a potential feedback loop between the "Modelling supply and demand" and the "Decision making, including the use of cost benefit assessments" stages above (and the stages in between) to inform better decision making using outputs from a later stage to reconsider assumptions made in a previous stage.

Detailed solution design and delivery

4.24. Once the preferred option has been identified in the CSNP, we propose that detailed solution design and delivery (i.e.obtaining planning consent and land rights where applicable, and construction and operations) would be carried out either by an incumbent TO or a third party, who may be selected through competition[54].

Facilitating strategic energy system planning

4.25. While a number of aspects relating to decision making for the energy system are currently owned by Government or are left to the market, the central network planner, through the CSNP, could have a role in whole energy system planning that draws on its expertise, so as to give decision-makers targeted advice and recommendations that would enable them to make informed choices. These could include engineering insights into system operability challenges due to new technologies, advising on the impacts across the energy system of various developments so that decisions support other sectors, and on siting of demand or generation that would maximise efficient utilisation of ET network infrastructure.

4.26. An example of such energy system planning is to get mutual benefits by locating demand or generation in such a way so that the overall energy system can benefit from the close proximity of the two to each other. For example, normally electricity from offshore wind generation in the north of GB would need to be transmitted to where the

[54] Note that where a late competition model is used, the detailed network design and planning consent would be taken forward by one party, and the construction and operations would be taken forward by another party (appointed following a late model competition)

major demand is located, typically in the south of GB. However, locating hydrogen production plant in close proximity to offshore wind generation, or at least close to where that generation connects to the ET network, could ensure that a majority of the electricity produced by the offshore wind generation is consumed by the hydrogen production plant. This hydrogen could be used to provide energy to the local area via distribution networks or be connected to the gas transmission network to be transported to other parts of the country. This may lead to savings in costs that would have been required to install new ET network links from the north to the south of GB.

A single, independent, expert body – a 'central network planner'

4.27. Once the FSO is established, we foresee the FSO taking on the central network planner role as a core part of its overall role.

4.28. In order to ensure an efficient and timely transition from the current network planning arrangements, and subject to considering responses to this consultation, we intend to work with the ESO to develop the methodology that would underpin the enduring CSNP arrangements. If the methodology underpinning the enduring CSNP arrangements is agreed and finalised prior to establishment of the FSO, we will consider whether the enduring CSNP arrangements could potentially be carried out by the ESO. However, our current view is that they are likely to require implementation of the FSO in order to be taken forward most effectively. This is because of the benefits of greater independence and the nature of the skills and capabilities required to carry out the role. For example, our initial view is that the central network planner would need to establish dedicated teams comprising of power system engineers, economists and planning experts, among others, in order to develop the CSNP.

4.29. For the purposes of this consultation, we refer from now on to the FSO as the future central network planner, but note that it is possible that this role could be played by the ESO.

4.30. We consider that having the FSO lead the CSNP has the following potential benefits:

4.30.1. It can develop a rounded and fully formed whole electricity system GB-wide view of system requirements, risks from uncertainties and mitigating solutions, without being constrained by network ownership boundaries.

4.30.2. It can combine system operability and enhanced planning and coordination functions and anticipate the operability impacts of new technologies and cross-system solutions and proactively consider opportunities and challenges across a range of energy markets and networks.

4.30.3. It should mitigate potential bias in identification of solutions, decision making and setting delivery timescales and other key delivery requirements of solutions.

4.30.4. The FSO should possess unparalleled insight into how the system operates, established engineering expertise, expert knowledge on existing interactions across the energy industry, an understanding of the challenges and opportunities of different technologies and approaches, as well as access to industry-wide data.

4.31. We consider that the FSO will still need strong support from the incumbent TOs and third parties to develop feasible and deliverable options.

Potential stages of the CSNP process

4.32. Table 1 below, illustrates and summarises the various potential stages of the enduring CSNP process.

Table 1: Potential stages of the CSNP process

Stage	Responsible Body	Key Aims/Actions	Key characteristics
1 - Model Future Supply and Demand	Central Network Planner	- Develop future energy demand and supply scenarios or estimates by scanning for future changes in demand/generation, in order to develop an optimised plan for necessary investment in the ET network and to identify SI.	- Estimates to adhere to principles such as being developed transparently, with stakeholder input and be plausible. - Could be modelled mechanistically or through strategic assumptions. - Nearer and longer-term estimates could be derived differently, depending on levels of clarity.
2 - Identify System Need	Central Network Planner	- Analyse power system based on demand / generation estimates from Stage 1, to identify all network issues. - Investigate if network issues require intervention on the ET system, or if opportunities exist to efficiently shape energy system. - Identify issues that are critical to delivering Net Zero or other key targets, and would need SI.	- Network assessments to include all power system studies and operability assessments, and shouldn't be limited to identifying thermal constraints on NETS boundaries.
3 - Identify Investment Options	Central Network Planner and TOs / Third Parties	- Identify options to meet ET network needs. This could include SI or non-SI in the ET network, or wider strategic energy system solutions. - Identify multiple potential solutions for each issue, also considering options that resolve multiple issues. - Assess technical robustness and of robustness of key assumptions (eg cost and EISD)	- Non-SI options to be identified by TOs or third parties, e.g. through early competition. Central network planner to ensure that these address system needs and align with the overall CSNP. - High level design for SI options to be specified by central network planner. - Central network planner to get strong support from TOs and third parties in developing options to ensure feasible and deliverable options are developed. - High level environmental/community impact assessment, and site and route assessment to be carried out by central network planner.
4 - Cost Benefit Analysis	Central Network Planner	- Carry out an appraisal of the technical and economic aspects of each option (for SI and non-SI), using robust methodology including CBA, to make decisions about which options are preferred and should be progressed via the CSNP. - Undertake CBA to determine any preferred wider energy system options.	- CBA to include quantitative and qualitative factors including environmental and community impact.

5 - Develop CSNP	Central Network Planner	- Develop an optimised Centralised Strategic Network Plan comprising of SI, non-SI and energy system design options finalised in earlier stages.	
6 - CSNP Finalisation and Handover to Delivery Bodies	Central Network Planner and Ofgem	- Preferred options in the CSNP go through relevant regulatory approval process. - Make recommendations on strategic energy system solutions to Government/Ofgem. - Handover to relevant delivery body (TO or third party)	
7 - Detailed Solution Design	Delivery Body (TOs / Third Parties)	- Carry out site surveys and route assessment. - Carry out environmental and community impact assessment. - Assess requirements for planning consent and land rights. - Produce layout drawings and establish functional specifications.	

4.33. We are proposing that the CSNP would not be produced every year, and would be subject to a periodic review; however, the review should not be so frequent or mechanistic such that it affects deliverability of options by pausing them and restarting them repeatedly as a result of a mechanistic approach. Our initial expectation is that the review should normally happen once in every two to three years, but the central network planner should also consider whether major changes in the energy landscape (e.g. significantly greater or reduced certainty in certain areas) merit an earlier review of the CSNP.

4.34. The stages of the model outlined within Table 1 are set out in further detail in Appendix 2 in order to provide some additional context to how the CSNP might apply in practice. The detail set out in Appendix 2 reflects initial thinking only, and is subject to further consideration and change following this consultation. We would welcome any stakeholder feedback on the overall process and the detail in Appendix 2 as part of responses to this consultation.

Benefits of CSNP

4.35. We consider that development of the CSNP by the FSO could bring the following benefits over the current approach to network planning:

- Greater coordination of onshore, offshore and cross-border ET network investments to meet whole electricity system needs more efficiently. The FSO could more broadly apply lessons from operability challenges into the strategic long-term planning of the network, by proactively shaping the system to help manage system operability challenges.
- Clearly and transparently identifying SI based on independent expert advice should provide key stakeholders (including Ofgem) with greater confidence in making early and quick decisions for major load-related ET network investment. This could provide Ofgem with assurance that SI provides good overall value so that consumers can take appropriate major anticipatory investment risk.
- Could give BEIS greater confidence in network development so as to inform its wider energy system policies to deliver Net Zero at efficient cost.
- Could send clear earlier signals to users of the system (e.g. offshore wind, hydrogen electrolysis plant etc.) about where and when key parts of the ET network will be built, their high level design, and potential impact on network charges. This could help inform their decisions on siting, capacity etc. and could enable efficient and timely investment by those users.

- Potentially provides confidence to planning consent bodies and local community groups that there has been a coherent and joined-up approach to develop the ET network, that strikes an appropriate balance between cost, and environmental and community impact. This in turn could reduce planning consent times and reduce risks for project development and speed up connection dates, thereby also reducing potential future constraint costs.
- Potentially reduces costs and overall number of new assets required due to more coordinated designs and a more efficient utilisation of assets.

Risks of CSNP and mitigations

4.36. We consider that development of the CSNP by the central network planner could also carry some risks. These are listed below with potential mitigations.

Table 2: Potential risks and mitigations of the CSNP process

Risk	Mitigation
The central network planner may not have the sufficient knowledge, skills and capabilities (eg due to lack of knowledge of the assets that are installed on the network, or lack of high level option design experience) which may lead to delays or sub-optimal options designs.	• We expect that the FSO will be able to establish dedicated teams comprising of engineers and planning experts and other experts who can develop the CSNP. This will bring in relevant experience and capability into the organisation to deliver the objectives of CSNP at an optimal level. • We expect that the FSO will get strong support from the incumbent TOs and third parties to determine feasible and deliverable options. • We expect that the FSO will be able to communicate and consult with the network licencees and relevant third parties as required, to be able to access knowledge and data across organisational borders. Suitable process channels need to be designed that allow for this communication to take place effectively. In addition, we also expect robust data exchange requirements to be put in place such that the FSO has access to all the network models and data that the TOs

	possess. We also expect that TOs will be required to keep the FSO formally updated on plans for all current and future network investments, both load and non-load related, such that the FSO can take interactions between different drivers into account when making decisions in order to come up with efficient solutions.
The CSNP output may be of sub-optimal quality, resulting in risks on the network such as operability issues, significant amounts/cost of stranded assets, or not addressing system needs on time or efficiently.	• We expect appropriate risk allocation and accountability to be set out, such that risk relating to the quality of the high level design that relates to SI (for which the central network planner is responsible), will be accounted to the central network planner. • The incumbent TO will still be accountable for any risk from the options that it has put forward, and for all aspects of delivery where it is the delivery body. TOs will retain their responsibility to identify and resolve any shortfalls in the system that would lead to potential non-compliance with the Security and Quality of Supply Standard (SQSS). Any third party that has been included in the early stage design of options or for the delivery of options, will bear the risk of their activity accordingly.
The role of the central network planner for CSNP creates duplication of resources across the central network planner and TOs.	• We recognise that there might be some duplication of skills and resources between the FSO and TOs (e.g. staff with expertise ET network project delivery, obtaining planning consents etc), where the TOs will retain certain network planning functions like those relating to non-load related investments, or for developing high level designs for load related non-SI. However, we consider that the benefits of CSNP outweigh any additional costs, particularly given the benefits from economies of scale due to the large amount of infrastructure projects that are expected over the coming years to deliver Net Zero ambitions.

Transitional arrangements

4.37. As set out earlier, we recognise that delivering all the objectives reflected within our enduring vision for the CSNP may take some time given the changes likely to be required to existing arrangements and the skills and capabilities that will need to be built up within the central network planner.

4.38. We therefore propose that the ESO should work with key stakeholders to introduce pragmatic 'transitional' arrangements from next year that are practical and can efficiently begin to implement the necessary changes in an incremental manner. This would provide a pathway to the enduring vision by achieving some of the key objectives, whilst maintaining pace of delivery for key ET network investment and providing appropriate input or alignment with the outputs of other key relevant workstreams, most notably the OTNR HND and the next NOA. This would align with and support the ESO's current roles in the OTNR HND and NOA and align with the expectations[55] we have set in the ESO's RIIO-2 incentive framework.

4.39. We propose that the primary purpose of the transitional arrangements would be to ensure that the ESO identifies key SI on the onshore ET network that can integrate 40GW of offshore wind generation that is expected by 2030, in a timely manner such that the onshore ET network isn't a blocker to the upcoming generation. This should also ensure that the onshore ET network design is produced strategically and efficiently.

4.40. As such we propose that the ESO should work with key stakeholders to develop 'transitional' ET network arrangements' in 2022 that, as a minimum:

4.40.1. Clearly and transparently identify low regret SI on the onshore and offshore ET network that is key to delivery of the OTNR HND, i.e.SI on the onshore ET network that is key to integrating 40GW of offshore wind generation that is expected by 2030.

[55] Role 3 of the ESO Roles Guidance

4.40.2. Are based on transparent, plausible future energy demand and supply scenarios or estimates that at least meet the principles set out in sections 4.5.1 to 4.5.4.

4.40.3. Assess options for addressing system needs based on a robust cost benefit assessment methodology that strikes an appropriate balance between cost and environmental and community impact.

4.41. We consider that there should be strong leadership from the ESO to scrutinise and challenge inputs from other stakeholders and to coordinate network needs and developments. In practice, we anticipate that the ESO would need to work with TOs and other key stakeholders to ensure that analysis is robust and appropriate and deliverable SI options are identified.

4.42. Our current view is that the OTNR HND, due to be finalised in early 2022, could meet the above requirements. We continue to work with the ESO to understand the extent to which this will be the case. Once the scope of the HND output, due in early 2022 is confirmed, we would welcome further clarity from the ESO on the specific network planning deliverables that it will achieve from aligning and iterating the HND and NOA 7 (which will follow on after the HND). We can then decide whether the HND and/or NOA 7 would form a suitable transitional output for the CSNP.

4.43. As set out in section 2.43, we expect that the LOTI and MSIP reopeners will continue to apply during at least the transitional period of CSNP, i.e. major new onshore projects coming forward either as a result of the transitional CSNP or the OTNR HND will need to be submitted for approval via the usual LOTI process before Ofgem can award construction funding. We think this is important in order to ensure that the projects being taken forward by TOs align with the CSNP, including both their high level and detailed design. However, the transitional CSNP should help streamline the LOTI process for SI by providing confidence that underpinning options analysis and cost benefits assessments are robust, reducing the level of scrutiny required by Ofgem.

Clustering of large projects

4.44. As part of our review of Topic 1, we considered whether and how there might be strategic or efficiency benefits in grouping together two or more large projects under the regulatory approval and planning consent processes.

4.45. Currently, large projects (such as those submitted under the LOTI reopener) are mostly developed, and submitted to Ofgem for regulatory review and approval, in isolation of other potentially strongly interrelated developments. While there are sometimes practical reasons for doing this (eg project timelines not aligned), we consider that this approach risks the potential to miss some strategic and process benefits that could otherwise be realised.

4.46. Whilst the CSNP will allow for a more joined up approach to strategic network planning, until the enduring CSNP process is in place, we are proposing that **during the transitional period TOs should strongly consider clustering two or more large interrelated projects for regulatory submission and planning consents purposes where it is appropriate to do so**. We expect that projects that will benefit from clustering will be those that share the same drivers or are in close geographical proximity, or those that provide strategic network or system benefits by being clustered together. Whilst we consider that this may mainly be likely to apply to large projects worth £100m or more that go through the LOTI process, it could also apply to smaller projects.

4.47. When we discussed this with stakeholders in working groups and at the SAG we proposed that clustering projects together under current regulatory arrangements and within the planning consent process could create two key areas of benefits:

4.47.1. Increasing process efficiencies by consistency of analysis and decision-making, allowing decision makers to understand inter-relationships between projects and the 'bigger picture', so that they can consider projects holistically, for example in terms of overall risks and benefits.

4.47.2. Potentially capturing benefits to the ET network and system that are greater than the sum of the individual benefits of each of the projects that make up the cluster. Or put another way, potentially avoiding dis-benefits to the ET network and system by inefficient coordination or alignment of projects (for example additional constraint costs caused by the location or timing of two highly interrelated projects not being co-optimised).

4.48. We consider that the first area above should be a potential 'quick win' for projects being developed over the next 6-12 months and invite the TOs and ESO to actively consider this approach.

4.49. We recognise however that the type of benefit related to the second area above is more challenging to maintain if there are changes over time to the design (eg as a result of local planning consent considerations) or need drivers (eg as a result of material changes to local generation or demand) of constituent projects. We would however be willing to consider regulatory proposals from TOs and the ESO on clusters of projects that could deliver these benefits, so long as those benefits could be clearly and robustly quantified and underpinned by robust analysis. We note that those could include qualitative as well as quantitative benefits, if these could also be robustly justified. We would also expect TOs to have strong change control processes to manage and coordinate change to constituent projects within a cluster over time.

4.50. A potential barrier to this practice may be the approach to apply for planning consent as planning applications are currently made on a project by project basis. The planning consent processes may be able to accommodate a coordinated approach for ET projects, especially where they share geographical proximity. For now however, the baseline assumption for clusters of ET projects is that they would need to be taken forward under the existing planning consent arrangements.

4.51. We also note that two projects, jointly named Eastern HVDC (EHVDC), which involve the construction of two high voltage direct current (HVDC) links between two different boundaries of the NETS, having a total capacity of 2GW, have already been successfully clustered for the LOTI Initial Needs Case stage submission. These two projects are closely linked in their drivers and geographical proximity and therefore clustering them could help realise the benefits highlighted in this chapter. Moreover, this real example serves as evidence that clustering of projects is possible under the current regulatory framework.

4.52. Due to clear, immediate benefits that could be realised by clustering of large projects we propose that, whilst the CSNP enduring process is still under development, the ESO and TOs identify any strategic clusters of large projects to be submitted for consideration under regulatory processes (eg LOTI).

5. Next steps

Section summary

This section sets out the next steps in the ETNPR, the timelines for implementing CSNP and conducting the remainder of the review, and future areas of focus for the review.

Questions

Question 11: Do you have any views on the next steps to implement CSNP?

Question 12: What are your thoughts on our initial view of the areas to be covered in the next phase of the review? Are there other areas that aren't included that you would like us to include?

5.1. Once this consultation closes, and subject to consideration of consultation responses, we intend to decide in early 2022 whether and how to take forward any transitional CSNP arrangements. We also intend to decide on whether and how to progress any enduring CSNP arrangements. This would include consideration of key aims and objectives, roles and responsibilities, outputs and delivery timings for any enduring CSNP. Our intention is that the transitional arrangements would be put in place from 2022.

5.2. Our work to date on the ETNPR has mainly focussed on topic 1 (as described in section 3.2), with some consideration given to topics 2 and 4, which have informed our views on topic 1. The primary output from the work done so far has been to develop the scope of our review, and form our initial thinking on the CSNP process (enduring and transitional).

5.3. As part of the development of any enduring CSNP we propose to cover topics 2, 3 and 4 in more depth. We may also identify other topics to progress, or may decide to focus on additional topics as a result of feedback to this consultation.

5.4. Our current view is that the ESO would be best placed to lead the work on topic 2 - 'Analysis and decision-making methods for load related network planning' and on topic 3 - 'Breadth of solutions, covering whole system solutions and innovation' as part of the next phase of this work in 2022. However, we would anticipate helping set the scope for topics 2 and 3 and ensuring stakeholder engagement is thorough and robust.

5.5. We would anticipate continuing to lead the work on topic 4 - 'Roles and responsibilities in network planning, including the early development of solutions and designs'.

5.6. We've set out in Appendix 3 our initial views on what might be covered in topics 2 and 3 in the next phase of the ETNPR. The content of these topics will be finalised over the next few months and take account of responses to this consultation.

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Appendix 1

Success Criteria of ET network planning models

Table 3 sets out the success criteria that we have developed with input from the SAG.

Table 3: Evaluation criteria

A. Timing	B. Innovation	C. Benefit to network	D. Process and methodology	E. Environment and Community
A1. Support timely delivery of solutions to system needs	B1. Avoids acting as a barrier to adoption of smart/innovative solutions	C1. Support delivery of robust[56] solutions to ET system needs	D1. Support clear, transparent, robust[57] and reproducible analysis and decision making	E1. How likely to consider and mitigate impact of networks on Environment and Community
A2. Enable progress on strategic transmission investments required for the Sixth Carbon		C2. Support delivery of robust[58] whole system solutions	D2. Simple to develop and implement	

[56] Robust solutions refers to the extent to which all needs of the ET system are being considered efficiently within network planning, and if all gaps in system requirements are investigated, considered and resolved. It also includes the need to consider local planning decisions and how these impact on the wider network, for example how a connection solution might impact the wider system boundary capabilities and operability.
[57] Here, robust refers to the need to have robust analysis and decision-making tools, allowing for decision-making under uncertainty when carrying out all network investments including SI.
[58] Robust whole system solutions refers to non-ET network solutions that may solve ET network problems e.g. distribution network solutions.

Budget and Net Zero targets				

In the criteria set out above, we have not explicitly included cost as a stand-alone criteria, as we believe that cost is a fundamental minimum consideration that will be taken into account robustly in all planning models. Cost is also implicitly covered within several of the criteria above, particularly areas A and C.

The scoring is intended to evaluate the network planning model and what it enables, rather than assessing individual network solutions. Within this, we are proposing a scoring range of 1-4, with 4 being the highest score against the criteria. Table 4 shows the scoring metrics. Within this, red signifies a score of 1, amber represents a score of 2, blue is a score of 3 and green indicates a scoring of 4.

Table 4: Scoring metrics

Score	Description of score	Graphical representation
1	Does not meet the evaluation criteria	
2	Meets the evaluation criteria to a limited degree	
3	Meets the evaluation criteria substantively	
4	Wholly meets the evaluation criteria	

Success Criteria initial assessment – NOA and CSNP

As outlined in section 3.12, we have provided our initial view in Table 5 of scores for the proposed transitional and enduring CSNP approach compared to the existing network planning arrangements, as assessed against the evaluation criteria set out in Table 3. The scoring for proposed arrangements will be tentative until more details are developed to underpin the arrangements, and we may not be able to score some areas until these details are more developed.

Table 5: Scoring of NOA, Transitional CSNP and Enduring CSNP

Process	A. Timing		B. Innovation	C. Benefit to network		D. Process and methodology		E. Environment and Community
	A1.	A2.	B1.	C1.	C2.	D1.	D2.	E1.
NOA								
Trans. CSNP								
Enduring CSNP			Yet to be scored	Yet to be scored	Yet to be scored		Yet to be scored	

We intend to review this assessment more fully after this consultation, once we have more clarity on some of the underpinning detail for both the transitional and enduring CSNP arrangements. Table five shows that the NOA meets the evaluation criteria to a limited degree (score of 2) on timing, innovation, support and delivery of robust whole system solutions, supporting clear, transparent, robust and reproducible analysis and decision making, and on environment and community. The NOA meets the evaluation criteria substantively (score of 3) in supporting delivery of robust solutions to ET system needs, and the NOA wholly meets the evaluation criteria (score of 4) on being simple to develop and implement.

In comparison, the Transitional CSNP meet the evaluation criteria substantively (score of 3) across timing, supporting delivery of robust solutions to ET system needs, and environment and community. However, the Transitional CSNP meets the evaluation criteria to a limited degree (score of 2) with regards to innovation, delivering robust whole system solutions, and process and methodology.

The Enduring CSNP is proposed to wholly meet the evaluation criteria (score of 4) across Timing, and Environment and Community, and substantitively meet the criteria (score of 3) with regards to supporting clear, transparent, robust and reproducible analysis and decision making. Innovation (B), benefit to the network (C) and being simple to develop and implement (D2) have yet to be scored as the methodology is still to be developed.

Appendix 2: Potential stages of the CSNP model

This appendix sets out more information on the potential stages of the enduring CSNP model that are outlined within Table 1 of Chapter 4. It is intended to supplement the information on the proposed approach for the enduring CSNP outlined in chapter 4 - it does not repeat the information already set out in chapter 4. The additional information below is still an early view of how this model may work. We welcome views on these stages through this consultation and expect that a CSNP methodology will set out the exact details which could be different to those proposed below.

For context and to provide an understanding of how the ET network is currently developed and built, Figure 2[59] below illustrates the typical development process of a large onshore ET project that might be identified through the NOA process.

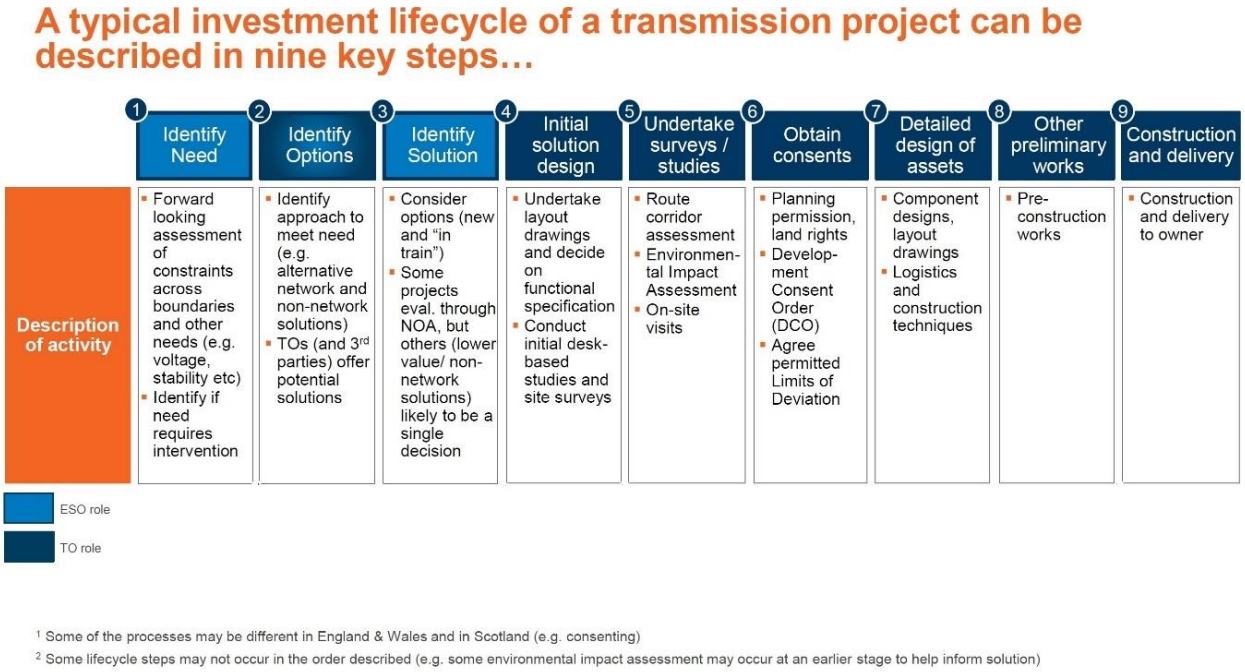

Figure 2 : A typical development process of a large onshore ET project

[59] 'Investment lifecycle of a transmission project…' diagram taken from National Grid ESO's 'Early Competition Models - Summary of stakeholder model development' publication.

Potential stages of the CSNP model

Stage 1 – Model future supply and demand

Within Stage 1, the central network planner should look ahead to the future and consider what changes in demand and generation are coming up to allow it to strategically plan GB's ET networks and make recommendations to decision makers on design of the energy system.

The central network planner should create a database of information that is used for developing plausible future energy demand and supply scenarios or estimates, which should be easily accessible by users and independent bodies. There should be a requirement for open data standards, protocols and platforms, so as to improve trust.

Development of plausible future energy demand and supply scenarios or estimates should consider if one central estimate or a combination of a range of estimates are most appropriate. This could consider looking at either one scenario of the most likely future, or a range of different scenarios which reflect the various potential futures within energy supply and demand. In addition, we consider it vital that robust data sources should be used in developing these estimates or scenarios, including (but not limited to):

i. Government policy, positions, and published data.
ii. Ofgem policy and positions.
iii. Approved Government and Ofgem funding decisions for developments like EV infrastructure upgrade programmes.
iv. Recent offshore leasing round results and likely results for upcoming leasing rounds using information from The Crown Estate, including the OTNR's Generation Map.
v. Potential future interconnectors to other countries, taking account of timing and likelihood of progress through regulatory approval processes.
vi. An assessment of potential future onshore generation and demand growth that is likely to be on the system. It is suggested that retrospective analysis of estimated growth vs outturn growth in historical FES or CCC data could be used for sensitivity analysis.
vii. Work by the CCC[60] on future changes in the energy sector.

[60] Climate Change Committee

viii. Future iterations of energy estimates for CSNP should be informed by the impact of the new network from previous CSNPs on energy system development, as part of a feedback loop (i.e. take account of growth in generation and demand due to the availability of new network as a result of previous CSNPs).

One possible approach would be to create a hybrid methodology, looking at ensuring that uncertainty is managed as efficiently as possible, as illustrated in Figure 3. This approach could work as follows:

- Create a central estimate governed by strategic thinking, based on assumptions of supply and demand in certain sectors and/or locations, for an initial time horizon where the central network planner can have reasonable confidence that its assumptions are robust and/or aligned with government policy intentions. An initial assumption is that the initial time period could be 10 years, but it could be more or less as it will depend on the certainty arising from data, policy and other key factors.

- This is then supplemented with a range of plausible upper and lower ranges of supply and demand estimates until a backstop date (initially assumed to be 2050 to align with the Net Zero target deadline, but may be extended further if required). Probabilities of estimates materialising could be used when designing the ranges, if these can be justified, as this may help the scenario planning to be more robust than assuming equal probability of all estimates materialising.

- Conduct sensitivity testing on the impact of changing the central estimate by a certain percentage (perhaps 10 - 20% as an initial view) based on the level of confidence in the input data and the level of certainty of the assumptions made. This sensitivity analysis should allow for certain deviations in possible future outcomes and could be used in planning considerations in later stages of CSNP, so that plans that accommodate slight deviations at low cost should be factored in the design of solutions.

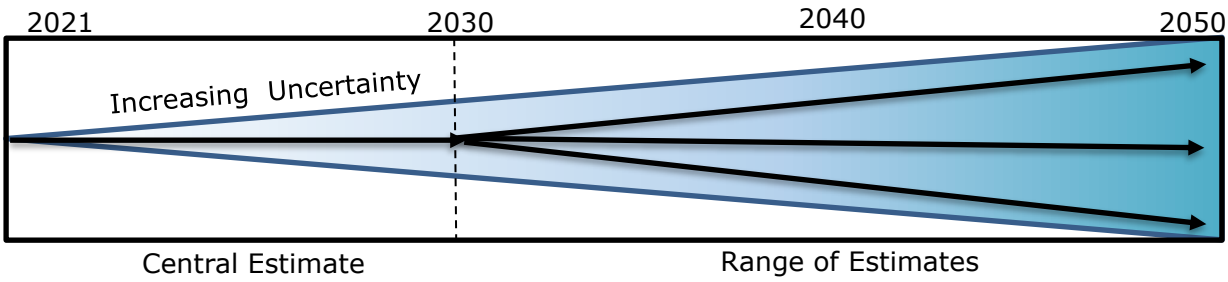

Figure 3: Illustrative hybrid energy demand and supply estimate model

Due to the uncertainty in creating a central energy estimate, a range of factors would need to be taken into consideration. These include but are not limited to:

- The impact of policies which have not yet been determined (e.g. future of heat).

- The impact of new technologies that could emerge and heavily influence actual outturn energy demand and supply.

- The impact of commercial risk e.g. generation that needs to secure CfDs to be viable, but where there is limited funding available.

- The impact of geographical uncertainty e.g. where there might be significant variations in supply or demand across different areas of GB.

When developing the estimates there is a need to consider whole energy systems thinking. Within this, developments on the electricity distribution networks should be considered, as should local area energy plans which impact upon ET. The central network planner should also consider other wider areas of policy such as gas, hydrogen, CCUS and strategic siting of generation and demand. The central network planner should engage with these policy streams when creating the estimates and ensure a constant feedback loop between CSNP and policies.

There is also a need to consider the effects of high impact events, like those that are a result of climate change, e.g. rising sea levels, which may influence the needs of the future energy system and of society.

Stage 2 - Identify system need

The central network planner would use the output from stage 1 to carry out an assessment of the impact on the onshore and offshore ET system. This should consider all system issues and not be limited to thermal capability of assets. It should include operability where appropriate and compliance with technical standards like SQSS.

This assessment should result in identifying network issues that will materialise during the time periods considered in Stage 1, and that will require mitigation through SI or non-SI in the network. This assessment should also consider if opportunities exist to shape the energy system in a way that better resolves the overall needs of the network and system as a whole.

Stage 3 – Identify investment options

In Stage 3, the central network planner should consider SI or non-SI options in the ET network, or wider strategic energy system solutions, that resolve the key issues of the network that emerge from assessments in Stage 2. In order to enable a robust cost benefit analysis of each option, a number of options should be conceived for every given problem, and solutions that solve multiple problems should also be conceived. In line with the aims of the CSNP model, a strategic GB-wide network plan should be conceived as part of this stage that considers the entire NETS holistically in coming up with solutions. Solutions should seek to resolve key issues that if left untackled, can pose a barrier to timely changes in the energy system and ultimately in achieving the aim of Net Zero.

In particular options should aim to resolve problems that persist in most or all future estimates, and where deferring investment would result in the system being unable to cater for known future needs, or be non-compliant with technical standards. However, investments should consider the timing of the need, and the timing of delivery of the solution, such that investments aren’t made and left stranded for a considerable time.

Where there is a doubt over the needs of the future system, and certain low cost and low regret actions or options can secure a wider range of options in the future, these options should also be considered, as they may help ‘buy time’ for key decisions to allow the planner to have a better understanding of emerging needs in time.

The central network planner should ‘own’ this stage but would be expected to engage with TOs to get any information on their assets or sites to be able to make informed solutions. The central network planner should also engage with other relevant stakeholders to seek their inputs as necessary. The central network planner should also consider using the services of

specialists in planning consents and project delivery to ensure that viability of solutions to get planning consents is considered at an appropriate level at the early stages of network planning, and the impact of any solution on local communities and the environment is also considered to avoid deliverability issues later on.

The following steps may be part of conceiving of options (items i-iv are expected to be largely desktop based):

i. High level single line drawing of proposed solution, i.e. set out a schematic of the solution, including proposed assets and ratings and any additional key specifications needed to resolve the issue.
ii. High level route and site assessment of proposed solution (using desktop-based GIS tools), with consideration given to choice of over-land vs. sub-marine routes, and underground vs. overhead line routes, aiming to appropriately mitigate environmental and community impacts. This step could potentially result in a high-level desktop based indicative geographical route and site drawing.
iii. Cost estimation of all options using robust cost data. For data that is sourced from other parties, the central network planner should be responsible for scrutinising and challenging the data together with Ofgem at regular intervals.
    a. Unit costs should include procurement, delivery, installation and commissioning of assets, and a guidance document should be devised in conjunction with Ofgem to define what should be included in unit costs for each asset or activity type.
    b. It is expected that processes would be put in place for transparent accounting system data exchanges between other parties and the central network planner for incurred asset costs (e.g. SAP data on cost and quantity), which should be used for checking asset procurement costs in the unit cost breakdowns provided.
iv. Planning of Earliest in Service Date (EISD) based on outage planning and estimated delivery timescales. For data that is sourced from other parties, the central network planner should be responsible for scrutinising and challenging the data together with Ofgem at regular intervals.
v. Cost and EISD estimates should be informed by robust assumptions around the features of the route, e.g. number and nature of crossings and any specialist techniques required to address these (e.g. drilling, cable tunnels, etc).

Within stage 3, based on the estimates identified in stage 1 and network issues identified in stage 2, the central network planner could also identify solutions that shape the wider energy system where these have wider benefits over ET network solutions. The central network planner may do this by using its engineering insights into system operability challenges due to new technologies, advising on the impacts across the energy system of various developments so that decisions support other sectors, and advising on siting of demand or generation that would maximise localised utilisation of ET network infrastructure.

Stage 4 - Cost Benefit Analysis

In this stage the central network planner would assess options developed in stage 3 in order to identify options in the CSNP that should be progressed.

Through initial stakeholder engagement, we have identified a number of approaches to decision making under uncertainty. We have not taken a firm view on the exact approach that should be utilised for CSNP, however, we highlight in this section some minimum expectations for decision making for SI.

The central network planner should carry out a Cost Benefit Analysis (CBA) exercise that considers both quantitative and qualitative factors to determine the most appropriate options, including low regret SI. It may be beneficial to also conduct a CBA of the combined network plan, as clusters of investments may have benefits that are greater than the sum of the constituent individual options. Appraisal of individual options and the strategic plan as a whole will enable robust comparison of cost vs benefits for each solution or cluster of solutions in order to make robust and economical decisions.

The central network planner should also include any energy system option that has been identified in Stage 3 in the CBA, in order to compare different combinations of energy system options and ET network solutions, where appropriate and beneficial to do so as part of developing the overall strategic plan.

Stages 3 and 4 of the CSNP process should be subject to some form of an open and ongoing consultation with potential delivery bodies, so that there are opportunities for any potential issues to be brought to the attention of the planner, so as to mitigate against undeliverable options being proposed or recommended.

The decision making approach should allow the central network planner to adopt an adaptive planning approach as part of a mix of economical methods to achieve the future needs of the

energy system. This could include solutions from stage 3 that will buy time to defer investments. There may need to be an iteration between stages 3 and 4 to allow adaptive solutions to be designed and considered following an assessment of the problem and the standard range of full solutions and under stage 4.

When considering solutions from Stage 3 that aim to resolve problems that persist in most or all future estimates, and where deferring investment will result in the system being unable to cater for known future needs, or be non-compliant with technical standards, the decision making approach should consider not discarding these simply as a result of an analytical assessment. However, investments should consider the timing of the need, and the timing of delivery of the solution, such that investments aren't made and left stranded for a considerable time.

When considering ways to improve decision making in the face of uncertainty, we assessed various models which look to reduce risk and create more robust decision making. The models considered include:

- 'Investing for net zero in the face of uncertainty: Real options and robust decision-making'[61] (Frerk, 2021), which looks at meeting Net Zero in the face of uncertainty.

- Multiple papers by Keith Bell[62] [63] and the Generally Accepted Reliability Principle with Uncertainty modelling and through probabilistic Risk assessment (GARPUR) model[64].

We expect that these will be considered as part of working groups on Topic 2 and by the central network planner in developing the methodology for the enduring CSNP.

Best practice in environmental management should be incorporated when considering environmental impacts. The benefits and drawbacks of any trade-offs should be thoroughly assessed. Examples of this include:

[61] Investing for net zero in the face of uncertainty: Real options and robust decision-making (Frerk, 2021)
[62] The Impact of Generation Market Uncertainty on Transmission System Thermal Constraints and Plant Procurement Volumes (Bell et al., 2016)
[63] Development of Methods for Long-Term Transmission System Planning Under Uncertainty (Bell et al., 2016)
[64] Generally Accepted Reliability Principle with Uncertainty Modelling and through probabilistic Risk assessment (Bell et al., 2016)

- Reduced volume of assets as much as possible. There is a risk that this may result in larger size assets and may involve more 'crossings' of third party infrastructure/assets, therefore any decision should weigh benefits and drawbacks appropriately.

- Habitat regulations, impact on local plant and animal habitat.

- Consideration towards impacts on Sites of Special Scientific Interest (SSSIs), Areas of Outstanding Natural Beauty (AONBs) and other protected sites.

- The Crown Estate study of biodiversity, physical environment and historical environment

- Regional environmental impacts e.g., peatland in Scotland

- Supporting decarbonisation and Net Zero carbon emissions through low embodied carbon throughout the supply chain and production, as required within the National Policy Statement for energy (EN-1)[65].

- Seeking to limit or mitigate as far as reasonably practicable, SF6 and other harmful GHG emissions. Not all options have similar GHG emissions and this could be assessed within the CBA and compared by utilising carbon values as outlined within BEIS' Carbon Valuation[66].

- Considering the environmental impact of network losses.

- Environmental and economic impacts of crossing a water body.

When considering community and social impacts, the following should be taken into appropriate consideration, and the benefits and drawbacks of any trade-offs should be thoroughly assessed:

- Considering the visual impact of electricity networks.

[65] Draft Overarching National Policy Statement for Energy (EN-1) | BEIS
[66] Carbon Valuation | BEIS

- Proximity of above ground assets to residential area (socio-economic impacts) and built environment impacts (including heritage/listed building impacts).

- Considering community and social impacts of work on protected or sensitive areas.

- Considering noise and traffic impact during construction.

- Additional socio-economic impacts, especially during construction phase.

Stage 5 Development of the Centralised Strategic Network Plan

The above steps will result in the development of an optimised CSNP comprising of SI, non-SI, and options relating to the wider energy system.

Stage 6 Centralised Strategic Network Plan finalisation and handover to delivery bodies

Once the CSNP is developed, investment options which are recommended to progress will go through any regulatory process or competition as appropriate, to ensure delivery.

The CSNP should reference all assumptions made, and the results of any assessments, together with a narrative justifying the needs case for investment. The CSNP should allow for full transparency of the inputs into the plan and the workings of the various stages to develop the plan.

Stage 7 Detailed solution design

Following allocation or award of a project recommended in the CSNP to a delivery body, the delivery body would develop the detailed design of that project. We would anticipate that this would include carrying out site surveys to assess the proposed routes and sites for deliverability, as well as route corridor assessment. The delivery body would need to fully investigate environmental and community impacts and potential mitigation, so as to increase the likelihood of attaining planning consents efficiently. Consideration would also need to be given to any requirement for easements, obtaining other rights and land procurement at this stage.

Appendix 3: Future work of the ETNPR

This appendix sets out our initial views on what might be covered in topics 2 and 3 in the next phase of the ETNPR. The content of these topics will be finalised over the next few months.

Topic 2 - Analysis and decision-making methods for load related network planning

This topic could consider and assess the ways in which analysis and decision making should be carried out to determine ET system needs and investments to meet those needs. This could include forming further views on of the development and use of future energy scenario(s)/estimate(s) in network planning as described in sections 4.5 – 4.8.

This topic could also consider decision making tools, including cost benefit assessments, to determine the most appropriate options to address system needs. It could consider the appropriate balance between cost and environmental and community impact, as described in sections 4.20 - 4.22.

The SQSS set out a coordinated set of criteria and methodologies that transmisision licensees shall use in the planning and operation of the GB NETS. The planning criteria set out the requirements for the transmission capacity for the NETS. The planning criteria also require consideration to be given to the operation and maintenance of the NETS. This topic could also consider the extent to which compliance of the NETS with SQSS standards is being reflected in specific network planning processes. It could also consider whether planning for achieving compliance with SQSS should be the duty of the ESO or the TOs (or both).

This topic could assess the range of power system assessments (including on operability) that should be carried out as part of various processes in network planning so as to ensure that the assessment of system needs is robust and done in a timely way, so that the system remains compliant with applicable technical standards.

This topic could assess whether additional processes need to be put in place to ensure efficient, accurate and robust data exchange between key parties (eg ESO, TOs, Ofgem, third party deliverers and BEIS), including for transparency of constraint costs. The topic could consider if quality assurance of data is required.

This topic could review whether analysis and decision making tools in network planning are appropriate for considering and comparing long and short-term solutions and smart, innovative or non-network solutions.

This topic could review the extent to which impacts of DNO connected loads and generation on the transmission system are assessed and addressed, in a timely way. As part of this, this topic could also review the costs and timeliness of transmission connection and reinforcement works to enable new distributed demand and generation to connect in a timely and cost efficient way.

Topic 3 - Breadth of solutions, covering whole system solutions and innovation

This topic could review to what extent whole electricity system solutions can be robustly factored into options analysis for ET network needs, e.g. electricity distribution solutions for ET issues, and if there are barriers, consider how these can be addressed. This could link with the work done under RIIO ED2 and DSO that is mentioned in sections 2.49-2.55.

This topic could review how long term impacts of choices in network planning can be better understood, for example understanding the likelihood of the need for intervention on other parts of the electricity system (today or in the future) due to the decisions made through network planning processes today. This review could include the analysis and decisision making process for new connections, including the impact of connection designs on the wider network. It could also review the role of the ESO in scrutinising or assessing connection designs and the impacts that they may have on system operability or on the wider NETS.

This topic could review the extent to which innovative, short-medium term network or non-network solutions are proposed and considered under each area of network planning to meet network needs. It could review if there are any barriers, e.g. commercial, legal, or regulatory, to considering such solutions, and if so, consider ways to resolve these barriers.

- NOA Pathfinders are used to help meet a variety of system needs. The System Operability Framework highlights operability risks arising from decline in transmission connected synchronous generation, and the ESO seeks distribution, market, and transmission-based solutions to improve issues such as stability and voltage. The ESO conduct technical and economic assessments and recommend solutions via commercial contracts or regulated arrangements.

- However, the interface between pathfinders and the NOA and wider network planning arrangements requires further consideration in order to make it robust and fit for purpose under the CSNP. Traditional network investments have typical lifetimes of at least 40 years whilst pathfinders have sought solutions for shorter timeframes of around 10 years for stability and voltage issues. Further work could be done to systematically consider the duration of system needs and the balance between shorter and longer-term options as the most appropriate solutions to those needs.

Finally, this workstream could also consider, at a high level, how to identify 'whole energy system solutions', i.e.solutions that could be electricity, gas, demand or generation.

Appendix 4 – Privacy notice on consultations

Personal data

The following explains your rights and gives you the information you are entitled to under the General Data Protection Regulation (UK GDPR).

Note that this section only refers to your personal data (your name address and anything that could be used to identify you personally) not the content of your response to the consultation.

1. The identity of the controller and contact details of our Data Protection Officer

The Gas and Electricity Markets Authority is the controller, (for ease of reference, "Ofgem"). The Data Protection Officer can be contacted at dpo@ofgem.gov.uk

2. Why we are collecting your personal data

Your personal data is being collected as an essential part of the consultation process, so that we can contact you regarding your response and for statistical purposes. We may also use it to contact you about related matters.

3. Our legal basis for processing your personal data

As a public authority, the GDPR makes provision for Ofgem to process personal data as necessary for the effective performance of a task carried out in the public interest. i.e. a consultation.

3. With whom we will be sharing your personal data

We may share consultation responses with BEIS. Please note that responses not marked as confidential will be published on our website. Please be mindful of this when including personal details.

4. For how long we will keep your personal data, or criteria used to determine the retention period.

Your personal data will be held for six months after the project is closed, including subsequent projects or legal proceedings regarding a decision based on this consultation, is closed.

5. Your rights

The data we are collecting is your personal data, and you have considerable say over what happens to it. You have the right to:

- know how we use your personal data
- access your personal data
- have personal data corrected if it is inaccurate or incomplete
- ask us to delete personal data when we no longer need it
- ask us to restrict how we process your data
- get your data from us and re-use it across other services
- object to certain ways we use your data
- be safeguarded against risks where decisions based on your data are taken entirely automatically
- tell us if we can share your information with 3rd parties
- tell us your preferred frequency, content and format of our communications with you
- to lodge a complaint with the independent Information Commissioner (ICO) if you think we are not handling your data fairly or in accordance with the law. You can contact the ICO at https://ico.org.uk/, or telephone 0303 123 1113.

6. Your personal data will not be sent overseas

7. Your personal data will not be used for any automated decision making.

8. Your personal data will be stored in a secure government IT system.

9. More information For more information on how Ofgem processes your data, click on the link to our "Ofgem privacy promise".