Consultation

Centralised Strategic Network Plan: Consultation on Stage 1 – modelling future supply and demand

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We are consulting on principles to shape the modelling of future supply and demand by the Future System Operator (FSO), as part of its role in developing the Centralised System Network Plan (CSNP). We would particularly welcome responses from stakeholders who utilise the current scenarios in their work. We would also welcome responses from other stakeholders and the public.

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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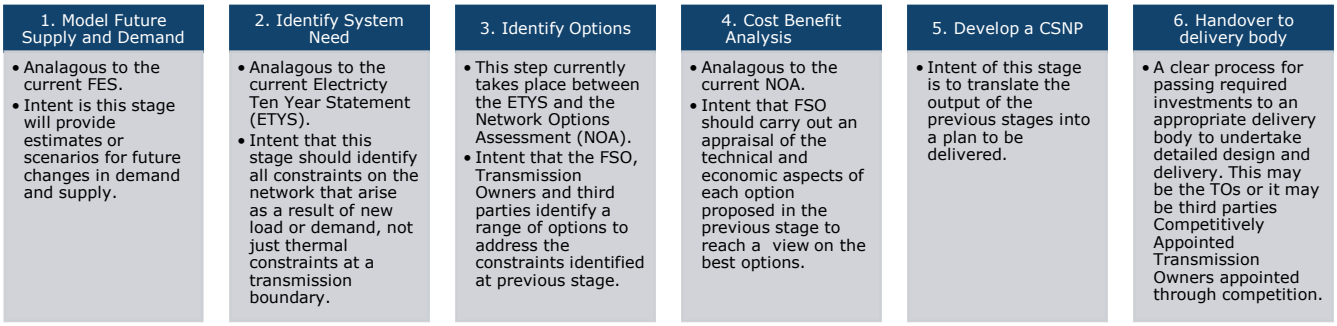
1. Introduction

What are we consulting on?

1.1 In November 2022 we published our decision on Initial Findings of our Electricity Transmission Network Planning Review (ETNPR)[1]. The decision set out the scope of the CSNP that will be created and published by the FSO. It also includes the steps to implement the regulatory framework that will govern the publication of the CSNP.

1.2 This consultation sets out our proposals for the first stage of creating the CSNP (see Figure 1). It considers the modelling of future supply and demand by the FSO to inform future network investment needs. This modelling is currently published as part of the Future Energy Scenarios (FES)[2]. We intend to consult on subsequent stages of developing the CSNP later this year (see chapter 4).

Figure 1: Stages of the CSNP



1.3 The main focus of this consultation is the FES modelling that will support the FSO to develop the first CSNP. In Chapter 4 however, we also raise the question of how the energy supply and demand modelling could develop further in the future.

1.4 We recognise that the FES has wider uses by industry, but we are not considering this within this consultation. In the coming months the ESO will be undertaking detailed stakeholder engagement to consider whether the FES needs to develop

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

[2] https://www.nationalgrideso.com/future-energy/future-energy-scenarios. For clarity, we will continue to refer to the energy supply and demand modelling as the 'FES' in this document, noting that we propose to move away from the use of scenarios. The ESO are considering whether the name of FES should change.

further to support wider areas of potential use. Stakeholders should look out for further details of their engagement on the ESO's website.[3]

Figure 2: CSNP's stage 1 consultation timetable

Stage 1	**Stage 2**	**Stage 3**	**Stage 4**
Consultation open	Deadline for responses	Responses published	Consultation decision
26/05/2023	23/06/2023	21/07/2023	end 2023

[3] https://www.nationalgrideso.com/future-energy/future-energy-scenarios/be-involved-stay-connected-fes.

2. Context for energy supply and demand modelling in electricity transmission network planning

Section summary

This section sets out the current arrangements for energy supply and demand modelling and how this is utilised for planning and building the electricity transmission network.

Background

Strategic network planning & current Future Energy Scenarios (FES)

2.1 To meet the UK's Net Zero targets, a significant increase of renewable generation needs to connect to the electricity transmission system.

2.2 The FSO[4] will have a role co-ordinating the strategic planning for load-related investment[5] at a national level. The FSO will develop a CSNP that brings together several existing network planning tools and processes (such as the Network Options Assessment (NOA)[6] and Holistic Network Design[7]).

2.3 The objective of the CSNP is to consider the Great Britain (GB) onshore and offshore transmission system as a whole to make recommendations on strategic investment to meet the 2035 and 2050 Net Zero targets. To inform the CSNP, changes are required to key inputs and processes including the FES and the

[4] This is the name currently given to the body that will be designated as the Independent System Operator and Planner (ISOP) under Part 4 of the Energy Bill that was introduced into Parliament in July 2022. References to the FSO in this document should be read as referring to that body. Subject to the passing of relevant legislation, the FSO will take on all the main existing Electricity System Operator (ESO) roles and the strategic planning functions on the gas network, enabling more coordinated, strategic and whole systems planning. Depending on a number of factors, including timings of the Energy Bill and delivery by key parties, the aim is for the FSO to be operational in 2024. The decision and rationale can be found here: https://www.ofgem.gov.uk/energy-policy-and-regulation/policy-and-regulatory-programmes/future-system-operation-fso

[5] Investment focused on increasing network capacity.

[6] https://www.nationalgrideso.com/research-and-publications/network-options-assessment-noa

[7] https://www.nationalgrideso.com/future-energy/pathway-2030-holistic-network-design

Electricity Ten Year Statement (ETYS)[8]. These are currently the responsibility of the ESO but are expected to become the Responsibility of the FSO next year.[9]

2.4 To create the framework for a CSNP, over this year we intend to work with stakeholders to develop:

- **New FSO licence conditions:** these will set out obligations for the CSNP and related inputs, eg FES and ETYS.
- The licence conditions are also expected to create a range of associated documents including:

  (1) **FES Guidance:** this guidance document will be owned by Ofgem and will set out our expectations on creating and publishing the new supply and demand outputs. This is expected to be adaptable and can be amended by us subject to consultation.

  (2) **FES Methodology:** this document would be required by Ofgem through the licence but be owned by the FSO and publicly detail the FSO's process to determine the key outputs published within the FES. This document is expected to be adapted by either us or the FSO subject to consultation.

2.5 The feedback from this consultation, along with further consultations we intend to publish over the remainder of this year, will be used to inform the development of the above. Chapter 4 provides further information on our next steps.

The use of supply and demand modelling in electricity network planning

2.6 The ESO's annual FES[10] publication provides a range of scenarios for GB to decarbonise the electricity system by 2035 and achieve Net Zero by 2050. It currently provides four scenarios, from now to 2050, to meet Net Zero based on different speeds of decarbonisation and societal behaviour change. The four scenarios are:

- Falling short: This represents the slowest credible decarbonisation, with minimal behaviour change and decarbonisation in power and transport but not in heat. Within this scenario, the UK will not meet Net Zero targets by 2050.

[8] https://www.nationalgrideso.com/research-and-publications/electricity-ten-year-statement-etys
[9] The FSO will be established using powers in the Energy Bill (as and when the Energy Bill receives Royal Assent) to transfer the existing capabilities and functions of NGESO to the FSO.
[10] https://www.nationalgrideso.com/future-energy/future-energy-scenarios

- System transformation: This includes hydrogen for heating, consumers being less inclined to change their behaviour, supply side flexibility and lower levels of energy efficiency measures being put in place.
- Consumer transformation: This scenario represents a future where there is electrified heating, consumers are willing to change their behaviour, there are high degrees of energy efficiency measures in place and demand side flexibility is widely utilised.
- Leading the way: This is the fastest credible pathway to decarbonisation with significant lifestyle changes and a mixture of hydrogen and electrification for heating.

2.7 These scenarios are used by stakeholders across the energy industry to inform national and regional policy, support investment decisions and energy network development.[11]

2.8 The ESO uses the FES for electricity transmission network planning. Data from the FES is used by the ESO to produce its annual Electricity Ten Year Statement[12] (ETYS) that identifies transmission network capacity needs. From this, electricity Transmission Owners[13] (TOs) respond with a range of options to reinforce the network. These proposals are assessed by the ESO through the NOA process[14]. The ESO then publishes a recommendation to 'proceed', 'hold' or 'stop' specific investments. These processes are all under review as part of the development of the CSNP.

[11] Some of these uses include: by electricity transmission operators to identify points on the transmission network where more transfer capacity is needed; by government as the contribution into ENTSO analysis for European system planning; by NG-Gas to explore the future role of the transmission system for gas and hydrogen; or by government to undertake analysis to determine the volume of capacity to secure through the Capacity Market auctions to meet the security of supply reliability standard.
[12] https://www.nationalgrideso.com/research-and-publications/electricity-ten-year-statement-etys
[13] National Grid Electricity Transmission (NGET) in England and Wales, Scottish Power Transmission (SPT) in central and the south of Scotland, and Scottish Hydro Electric Transmission (SHET) in the North of Scotland.
[14] TO proposals are assessed based on an economic assessment of the needs case.

Work we have done to date and stakeholder views

2.9 In our November 2021[15] and July 2022[16] consultations on the initial findings of our ETNPR we proposed that the FSO should develop transparent and plausible future energy supply and demand estimates to enable the development of the CSNP. We also proposed that the FSO develop capability to provide directive strategic analysis and co-ordination of investment. Therefore, the FES will need to play a more critical role as its outputs will help inform network build 'requirements', as opposed to 'recommendations' currently provided via the NOA.

2.10 We proposed that the FES develop to follow these principles:

- They should model future demand and supply robustly
- Transparency in model design, input data, and assumptions
- Data sources are robust and drawn from a range of sources, including taking input from stakeholders
- Include pathways which are compliant with Net Zero by 2050
- Is 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
- Future iterations of the estimates/scenarios are informed by the network impact of the CSNP.

2.11 We proposed that energy supply and demand modelling could be moved from the current broad scenario-based approached used in FES, to a less mechanistic approach which makes assumptions based on strategic thinking. A single central estimate – to increase certainty for investment in specific areas - could be developed for an appropriate time-frame where there is confidence that assumptions made are robust and/or align to government policy (eg 50GW of offshore wind by 2030). However, where there is less confidence, we proposed there may be a requirement to consider multiple scenarios.

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

[16] https://www.ofgem.gov.uk/publications/consultation-our-minded-decisions-initial-findings-our-electricity-transmission-network-planning-review. This document also contains our decision that the FSO become the central network planner.

2.12 This practice was used in the development of the Holistic Network Design[17] that formed part of the Transitional CSNP (tCSNP)[18] along with an updated NOA, that informed additional network reinforcement requirements to connect new offshore generation.

2.13 Previous stakeholder engagement (external engagement through Strategic Advisory Groups[19], and the consultations mentioned above in paragraph 2.9) identified a range of issues within the FES methodology which may create uncertainty for industry bodies, and negatively impact our ability to meet Net Zero ambitions at lowest cost to consumers. These include:

- A lack of transparency in the process that includes the use of stakeholder engagement to inform the final FES publication, evidence that data sources are robust and taken from a range of sources, and visibility of datasets
- Frequent changes to the FES which reduces certainty required to inform network planning investment decisions
- Lack of spatial detail informing scenarios, and the need to include greater regional granularity to reflect localised nature of heat and transport
- The need for refined modelling to reflect interactions between wind, electricity storage, short-term network constraints, hydrogen economy, and modelling interconnectors
- The lack of clarity around modelling assessment of high-impact, low-probability, events may negatively impact GB's ability to have a resilient and robust network which enables security of supply at lowest cost
- Use of a scenario which represents the UK not attaining Net Zero targets could result in GB "planning to fail to meet Net Zero".

2.14 This feedback has informed our proposed changes to the FES, in the context of supporting the objectives of CSNP, set out in the next chapter.

[17] https://www.nationalgrideso.com/future-energy/the-pathway-2030-holistic-network-design
[18] As the FSO will need to be in place before the first CSNP can be delivered, the ESO has been working on a 'transitional' CSNP intended to improve clarity and certainty when integrating onshore and offshore network planning prior to the implementation of the FSO's 'enduring' CSNP proposals, and the need to establish skills and capabilities within the ESO as it evolves to become the FSO. That work can be found here: https://www.nationalgrideso.com/research-and-publications/electricity-ten-year-statement-etys/etys-and-our-future-network-planning
[19] Ofgem led a Strategic Advisory Group in 2022 consisting of Ofgem, BEIS, NGESO, electricity Transmission Operators, and devolved Government, as part of the network planning review leading to recommendations to create a CSNP.

3. Proposal for Future Energy Pathways

Section summary

This section lays out the eight main areas where we are considering changes to the current FES modelling and publication processes, which should support the development of the first CSNP. It also discusses the potential for further evolution of energy supply and demand modelling to support the FSO's strategic adviser role in the longer term.

Future Energy Pathways

Proposals for change

3.1 Based on the feedback from our previous stakeholder engagement (summarised in chapter 2), there are eight areas where we propose changes to the FES to improve inputs to the first CSNP and address existing stakeholder concerns. These areas are:

1. Develop a set of strategic pathways to Net Zero
2. Type of pathways, and presentation of non-delivery of Net Zero futures
3. The time horizon for pathways
4. Treatment of high-impact, low-probability events
5. Incorporating network constraints into the modelling
6. Improvements to transparency for analysis and outputs
7. National and regional outputs
8. Timing of FES publications

1 - Develop a set of strategic pathways to Net Zero

Background

3.2 The current FES contains four scenarios which are equally credible outcomes for the energy system. It does not provide a strategic view of how the energy system should develop, either with greater certainty in the near term, or with greater whole system coherence in the mid to long term. Therefore, the current neutral

FES scenarios do not necessarily align with the future role of the FSO as 'advisor' and provider of strategic analysis to government[20].

3.3 Multiple short-term scenarios are useful to demonstrate options that can result in meeting Net Zero targets, but they create some uncertainty about where – and in what combination – investments should be made. Therefore, we propose that the outputs of the FES should be reconsidered to provide greater clarity to help inform investment planning under the CSNP.

Consultation position

3.4 We think the FES should set out strategic pathways, instead of four illustrative scenarios which would enable the CSNP to be more directive about the type and scale of investment needed.

3.5 We think these pathways should start with a shared single short-term view (length to be determined by the FSO), before branching out into different pathways as the range of uncertainties widen.

Rationale for consultation position

3.6 Under the CSNP, the role of the FSO is to provide strategic planning and credible options for investment. To support this, we think that the outputs from the FES, particularly in the short term, need to become more directional (focused on delivering Net Zero targets).

3.7 Having directive pathways that are all capable of meeting Net Zero targets should provide more certainty to industry on the type, location, and scale of investment needed. They would also provide a more strategic approach across the different energy sectors and vectors by providing more visibility of potential interactions between the various parts of the energy system. These pathways should also help clarify the interactions between wind, electricity storage, short-term network constraints, hydrogen economy, and interconnectors.

3.8 Furthermore, a single short-term pathway should enable the FSO to utilise its new capability and independence to make evidenced-based judgements on what it considers to the be the most credible pathway. This proposed change is illustrated in Figure 2.

[20] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1066720/future-system-operator-consultation-govt-response.pdf

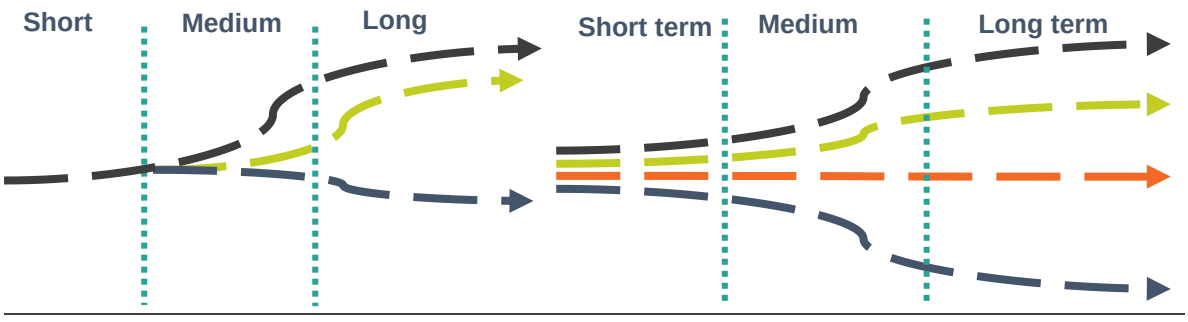
3.9 Our proposals are intended to support earlier, more ambitious, investments to come forward in the near-term due to the certainty provided by a single pathway. The single pathway should provide clear signals for investment planning to industry as well as potentially speeding up and supporting 'needs case' approvals in network investment as part of the CSNP. The potential benefits of these investments include helping to mitigate the costs of constraint payments, with more green generation being able to connect.

3.10 An indicative time span for the short-term pathway potentially could be between seven and twelve years, based on known levels of investment and infrastructure due to start or already underway. We think the FSO should be given the flexibility to determine this as they design the FES methodology but expect their decision to be evidenced as part of the FES.

3.11 Retaining the current neutral, illustrative scenarios under the FES may mean that low regret investment options are typically developed so that they are equally valid under all/majority of scenarios. While this may help reduce the risk of overinvesting in infrastructure, continuing with this approach may limit signals to industry to be more ambitious, or to plan for a particular scenario, because they are all equally credible. Given the pace of change required we think that this is unlikely to be optimal in supporting Net Zero targets.

3.12 We intend to include these requirements for pathways and the creation of a FES Methodology for the FSO to set out the design of the pathways, as elements of a licence condition.

Figure 2: single and multiple short-term pathways



Q1. Do you agree that we should move towards pathways instead of scenarios, to provide greater clarity on the type of investments required under the CSNP?

Q2. Do you agree that there should be a single forward view of the near term for all pathways?

2 - Type of pathways, and presentation of non-delivery of Net Zero futures

Background

3.13 The current FES includes a 'falling short' scenario, representing a slow but credible projected rate of decarbonisation, which fails to meet the government's 2050 Net Zero targets.

3.14 If we move to directional pathways for investment (section 1 above), it is questionable whether we should include a pathway that does not meet Net Zero targets - ie 'planning to fail'.

Consultation position

3.15 We propose that the pathways presented in the FES only show alternative routes to meeting Net Zero targets and the number of pathways are determined by the FSO, after consultation with their stakeholders.

3.16 Under this proposal, the FSO would develop a separate counterfactual (including data), that is available as part of the FES (but not presented as a pathway), so that stakeholders can understand the potential implications of falling short of Net Zero targets.

Rationale for consultation position

3.17 Given the scale of the challenge we think that having a headline pathway in the FES that fails to meet Net Zero sends the wrong signals at a point where ambition is needed. Any future pathways will form part of the evidence base for investment related decisions in the CSNP, and as such, should not include evidence that demonstrably does not support meeting the Net Zero targets.

3.18 We recognise, however, that there is potentially value in maintaining information in the FES that allows stakeholders and policy makers to understand the potential costs of Net Zero relative to not meeting it.

3.19 We intend to set out these requirements for pathways and stakeholder consultation in a licence condition and associated guidance document. The FSO will consult with its stakeholders on the optimum number of compliant pathways that will balance the widest range of future investment options, against the increased level of certainty needed. The FSO should also consult with its stakeholders on the best presentation method and data for a separate counter-factual that achieves the outcomes mentioned above.

Q3. Do you agree with our proposal to have Net Zero compliant pathways (number to be determined by FSO), with a separate counterfactual demonstrating the scale of activities and investment that falls short?

3 - The time horizon for pathways

Background

3.20 Network assets may have a 40+ year timeframe, so we need to determine the most effective time frames for energy modelling. We have considered whether to restrict pathway planning to 2050 or to extend beyond into the predictable lifespan of potential assets.

Consultation position

3.21 We propose that initial FES pathways should outline activities up until 2050. However, we will also require that the FSO consult with stakeholders over time to ensure that, as we get closer to 2050, the decision to extend the timescale of the pathways is taken at the appropriate time.

Rationale for consultation position

3.22 An initial focus on the investment needed to meet 2050 Net Zero targets is essential. Currently there are no UK targets for post 2050, so there is limited information to inform modelling beyond this. Any additional work that attempts to predict future policy goals, rather than investment to meet known goals, is not likely to provide useful enough direction to justify the effort expended.

3.23 We do recognise that, as part of the FSO's role in providing strategic advice to government, there may be a need for modelling post 2050 in response to specific requests for advice. We would require the modelling methodologies to have the capacity to undertake this, but not as a regular part of the FES cycle.

3.24 We will provide guidance to the FSO on the triggers that would require the FSO to consider whether to extend the length of the pathways beyond 2050 as part of each FES publication. The FES pathways will be updated on a regular basis in any case (see part 8 below), so will identify any new post 2050 targets or decisions on energy policy that may justify the lengthen of the period.

3.25 We intend to set out this additional guidance in an associated document attached to a licence condition to be consulted on later this year.

Q4. Do you agree that the pathways should run to 2050, and if not, why not?

4 - Treatment of high-impact, low-probability events

Background

3.26 The capability to understand the potential impacts of low-probability, high consequence events should support GB's ability to have a resilient and robust network. In this past the FES has not placed substantial focus on this but there is now a growing focus given, for example, uncertainty about the speed and scale of climate change and marked volatility of gas prices.

3.27 In particular, the transition to net zero will increase the importance of high-impact, low-probability events compared to the past. The network will have greater reliance on weather dependent renewables at the same time as the variability of weather under climate change increases, and greater electrification increases the potential for cascading impacts with other sectors (eg transport), increasing the overall consequence.

Consultation position

3.28 We think that the FES model should be capable of incorporating, and testing, extreme data ranges that are high-impact/low-probability, in order to support the FSO's strategic advisory role.

3.29 We do not expect high-impact, low-probability to be directly incorporated to the model for the FES pathways (see part 1 above). However, we do expect the FSO to demonstrate both within its FES methodology and in the FES publication how they can be considered as and when needed, and the potential impacts. We think that the FSO should publish thought leadership case studies on potential high-impact/low-probability events, either as part of the FES major publication, or as separate publications, based on stakeholder demand.

Rationale for consultation position

3.30 We think that the FES modelling should be capable of testing extreme data, recognising that this will also require the FSO to utilise its judgement and provide qualitative analysis in addition to quantitative modelling. This will provide stakeholders with a more complete picture of the future risks associated with the various pathways.

3.31 However, the role of the FES in providing information to feed into the CSNP leads away from incorporating high-impact, low-probability events into the FES pathways. These are risk-based decisions made on a perceived level of risk/impact, and as such not appropriate for the strategic investment decisions

that the CNSP will make based on data-led forecast levels of supply and demand. The FES should continue to ensure that the pathways are robust under all normal range fringe circumstances (eg 10-year weather data ranges, or 10-year gas price ranges), and to explain the application of any sensitivity analysis.

3.32 On balance, we consider the risk of including in standard pathway modelling is that if strategic insights are wrong (eg global energy crises), or high-impact, low-probability events are too heavily weighted, it could increase the risk of incorrect investment decisions. This may result in either underinvestment if the event was considered too unlikely to occur, or overinvestment if the event was weighted too heavily. It will also be difficult for the FSO to externally validate any probabilities when assessing which events may be relevant.

3.33 As part of the FSO's advisory role however, the FSO needs the capacity to advise government and Ofgem of the potential impacts on the future network should an extreme event occur. We expect the FSO to develop a methodology for how they will develop and utilise this capability separately from the main process for producing pathways.

3.34 We will set out these requirements in associated guidance to a licence condition to be consulted on later this year.

Q5. Do you agree that the model should develop the capacity to include extreme data ranges when requested of the FSO in its role as strategic advisory body?

5 - Incorporating network constraints into the modelling

Background

3.35 The current FES model does not include network constraints, ie it assumes that the necessary infrastructure will be available to convey changing supply and demand. We have considered whether the new FES pathways should continue to assume the network can facilitate all new demand and supply, or whether the model should take account of network constraints.

Consultation position

3.36 Our proposal is that the FSO's FES modelling should factor in network constraints and the impacts on generation in the near term but model an unconstrained network in the long term.

Rationale for consultation position

3.37 The current FES approach presumes the network can facilitate power flows without suffering constraints or the need for redispatch.

3.38 To perform the FSO's strategic advisory role, it should be able to advise government and Ofgem where new generation should be located. We think that it should take account of constraints in establishing the FES pathways to improve the quality of its recommendations. The impact of new generation (particularly offshore) on constraints is the basis for much network investment, so pathways not considering this impact risk being unrealistic.

3.39 There is a balance to be found between short-term and long-term constraint modelling. For example, modelling constraints further out than the near term may result in a signal to stop new generation in Scotland, contradicting the reality of growth in this sector.

3.40 For short-term planning horizons, we consider the use of a constrained network model is appropriate to ensure a focus on the currently constrained areas. However, for longer term planning, an unconstrained network model may be more appropriate to keep options open. Doing this will provide a wider range of information on the type and location of investment needed, including the possibility of alternative solutions to new electricity network infrastructure.

3.41 We propose to set out our expectations within associated guidance to a licence condition but think that the detail of how constraints will be modelled, as well as the point in time at which the model would become unconstrained, is for the FSO to determine as part of developing its FES methodology.

Q6.	Do you agree with our consultation position on modelling network constraints?

6 – Improvements to transparency in analysis and outputs

Background

3.42 Transparency surrounding the FSO's data, analysis and how outputs are generated under the FES is a key area. Transparent understanding of how pathways are established, including the datasets behind them, will help support robust decision making and be of value to wider stakeholders in shaping public policy.

Consultation position

3.43 To improve transparency, our current thinking is that:

- Energy system input and output data used in the FES should be treated as open by default[21], for all to use, with the FSO only restricting access where there is a clear reason to do so (ie by adopting the principles laid out in the ENA Data Triage Playbook[22]). This should also include the models and algorithms used to produce the data. As part of the FES publication, we think that the FSO should include a timetable (including scope) for meeting this objective, and updates on progress made.
- Within the FES publication we also propose that the FSO should demonstrate how it will ensure that its key decisions in formulating the FES outputs are transparent, including its process for considering stakeholder feedback and how future iterations of the FES have taken on board learning from the past.

Rationale for consultation position

3.44 The use of data best practice principles to produce the FES will help ensure transparency and enable more informed decision-making across industry and government. Our proposed approach provides the FSO with both ownership and flexibility to consider how best to introduce more transparent processes for creating and evolving the new FES. We recognise that the FSO will need to undertake an assessment of the practical application of our proposals, especially the transition to open data, which may not be fully achievable for the first FSO-produced FES next year. As part of this consultation we want to understand what stakeholders consider should be possible for the first updated FES.

3.45 Additional areas where the FSO should provide a clear outline in the FES publication for improvement in transparency of their wider decision-making include:

- Setting out how future iterations of the pathways will be informed by the network impact of previous iterations of the CSNP.
- Where a decision has been taken that affects wider industry, or groups such as Local Authorities, the FES should provide the underlying data for re-use, planning and future analysis.

[21] Ofgem's most recent position on open data can be found here: https://www.ofgem.gov.uk/publications/consultation-updates-data-best-practice-guidance-and-digitalisation-strategy-and-action-plan-guidance

[22] https://www.energynetworks.org/assets/images/ENA%20Data%20Triage%20Playbook.pdf

- The FSO carrying out and publishing an audit process of assumptions made to inform previous pathways. Where strategic insights were incorrect, this should transparently showcase the resultant cost to consumers of that incorrect assumption, eg via overinvestment in the wrong type of infrastructure, and how changes have been developed for future modelling. This should inform key stakeholders such as policy makers of the revised network cost of the proposed policies.

3.46 We think our proposals should be implemented by setting out our specific expectations in this area in an associated document that will provide additional guidance on the licence condition for FES. Changes to associated guidance documents will allow for speed and flexibility in adapting expectations over time (whilst still subject to public consultation). The alternative option is to seek to include these requirements on the face of the new FSO licence. However, we think this approach is not suitable in this area, as this level of detail is better to be included in an associated document and we expect the learning in this area to develop substantially over the first few lifecycles of producing the CSNP.

3.47 There is also already a data best practice licence obligation for the ESO which we expect to be carried over into the FSO. As such, before making a decision we intend to explore the potential interaction with the current ESO RIIO-2 incentive scheme[23], covering delivery of its business plan over the period April 2023 to March 2025, and any future FSO incentive designed to perform a similar function. We are due to consult on the scope of the ESO's Roles Guidance used in the RIIO-2 incentive scheme which includes the potential for the ESO to receive a financial reward, partly based on evidence of where it exceeds our expectations to make FES data more open. We think that this incentive will help support ambition in this area.

3.48 We propose to set out our expectations within associated guidance to a licence condition, to be consulted on later this year, also taking into account the feedback from the "ESO Roles Guidance" consultation.

Q7. Do you agree with our consultation position, and do you have a view on which data principles should be possible to adopt for the first FES?

[23] https://www.ofgem.gov.uk/publications/business-plan-2-final-determinations-electricity-system-operator

Q8. Are there specific stakeholder needs cases for publication of data, including the format of outputs?

Q9. Are there specific data outputs associated with the FES that we should mandate?

7 - National and regional outputs

Background

3.49 The current FES provides a GB-wide view, with some discussion and data related to regional requirements. For the FES to support the CSNP to help best direct future investment, we think it is important to set out our expectations for how granular the outputs of the FES should be, as well as its interactions with regional supply and demand factors such as the Distribution Future Energy Scenarios (DFES)[24], spatial and local area energy plans.

Consultation position

3.50 We propose that the FES provides GB-wide pathways and that the FSO looks to go further, with pathways for each region (eg North Scotland, Central Belt, South Scotland) plus, industrial hubs with high generation and/or demand.

Rationale for consultation position

3.51 We think that publishing additional pathways and data at a regional and industrial level will provide greater clarity and detail to support regional planners who use the FES. It should improve stakeholders' understanding and certainty of the need for future investment and assist decision-making within government and local authorities.

3.52 There is, however, a risk that if the FES becomes too granular that it may introduce conflicts to the roles and responsibilities of future regional planners. We are mindful of our recent consultation on the future of regional system planning[25] and that the FES needs to be both supportive of and adaptable to the potential of substantial policy changes in this area. This would require information exchange and feedback loops between regional planners and the FES to ensure that local information is a key input to inform national outputs and vice versa.

[24] DFES's are produced by the Distribution Network Operators (DNOs) in GB and are scenario projections for their region that look at electricity demand, distributed generation and storage.
[25] https://www.ofgem.gov.uk/publications/consultation-future-local-energy-institutions-and-governance

3.53 We intend to set out these requirements for the FES in an associated document to a licence condition to be consulted on later this year. This includes providing high-level guidance to the FSO to explicitly consider the interaction with regional planning and the level of data visibility that is desirable to both implement and influence the national pathways, and vice versa, within its FES methodology. We expect the ESO to explore these elements further, including the appropriate type of region and industrial hubs to focus on, with its stakeholders before the responsibility is passed to the FSO.

Q10. Do you agree that regional and/or industrial hub pathways should be included in the FES?

8 - Timing of FES publications

Background

3.54 Currently the FES is produced annually, updating its modelling and scenarios in line with more recent data and stakeholder feedback. The new pathways are expected to support more certain investment options in the CSNP. We are working with the ESO to understand the wider publication cycle of the main CSNP which is likely to be every 2/3 years, with supporting publications and updates on a more frequent basis. Therefore, the timing and frequency of the FES may need to change to accommodate the additional needs of the CSNP.

Consultation position

3.55 We propose that a 'major' FES publication is published a year prior to publication of the main CSNP, to allow for the CSNP to utilise the pathways for its investment recommendations.

3.56 Depending on the frequency of the main CSNP (potentially every two or three years[26]), we think 'minor' annual updates to the FES in each of the intervening one or two years is appropriate.

Rationale for consultation position

3.57 As we propose to move to a single forward view for all pathways for the short term, there is less need for an annual production of a 'full' FES, as the pathways will not substantially change in that time. The publication of a 'full' FES in the

[26] The frequency of the CSNP will be considered as part of our future consultations on the regulatory framework to implement the CSNP.

year prior to the CSNP will allow for due consideration of the pathways as the subsequent decisions on system need, options, and investments are made.

3.58 However, we consider that as incremental data becomes available that may impact on the assumptions made in the modelling (eg such as a material increase in EVs or connection requests over projected data), that there is value in enabling 'minor' annual updates to the FES to update pathways where a material change is likely to result. We also expect the FSO to consult stakeholders on the appropriate criteria regarding substantial events that might trigger a full refresh of the FES earlier in this cycle (such as significant changes in technology assumptions), and to include this in their published methodology.

3.59 We intend to set out the publication requirements for the FES, including timescales, in a licence condition to be consulted on later this year.

Q11. Do you agree with our proposal for a 'major' FES in the year prior to the main CSNP publication, with smaller annual updates in the intervening years?

Longer-term evolution of energy supply and demand modelling

3.60 In the long run it may be possible to move to a transmission network design under the CSNP that is part of a fully optimised system. This includes the location and temporal characteristics of supply and demand.

3.61 Therefore, the approach to the models and processes that underpin the CSNP should be adaptable as they may need to evolve further to actively shape the future world. Our proposals on pathways (part 1 of this chapter) supports this, however there are various uncertainties which may need different modelling approaches to capture their impacts, including:

- potential variations of assumptions, eg population
- 'deep uncertainty' where the range of possible futures are wide, eg future costs of storage technologies, or active participation of consumers in demand response
- low-probability, high-impact events, eg climate change and extreme weather (see also Part 4 of this chapter).

3.62 In the long run we need to be able to ensure that the system being planned can cope with the potential impacts of such uncertainties, as well as the known aspects of the transition ahead. We recognise there are many important, but unrelated key uncertainties, that may be inadequately picked up by current

modelling approaches. Therefore, future modelling approaches should explore how to account for these and model their sensitivities.

3.63 The FSO will have a role as a strategic adviser and, as such, could help inform government and Ofgem on policy and regulatory choices by identifying the implications of the uncertainties described above, as well as identifying no/low regret choices. Ensuring modelling capabilities can continue to evolve will help bolster this role.

3.64 Overall, this may require the development of new FSO capabilities over and above those set out in Chapter 3. We would welcome views on what these might be.

Q12. Do you consider that longer-term evolution of energy supply and demand modelling should head in the direction outlined above and if so how?

4. Next steps

Stage 1 of the CSNP – energy supply and demand modelling

4.1 We will continue our engagement with the ESO and other stakeholders during and after this consultation period.

4.2 Our role is to provide the strategic direction for the development of energy supply and demand modelling, in line with principles-based regulation, whilst the ESO/FSO is responsible for engaging with stakeholders to develop the detail (eg whether the 'FES' brand continues or is developed into something new).

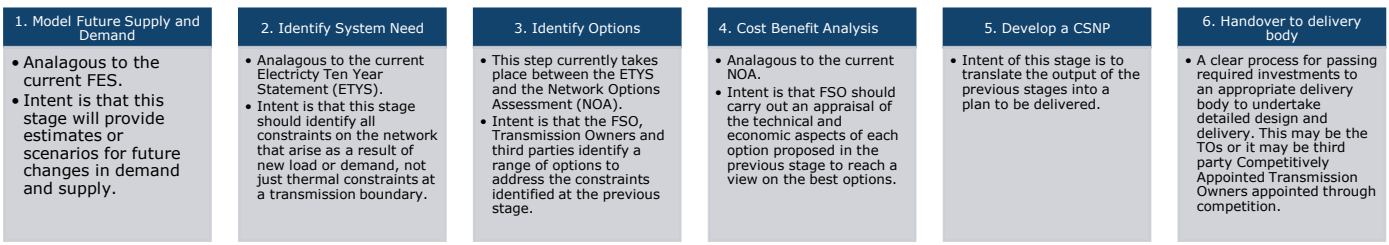
4.3 We will be developing licence conditions to implement our decisions on the future of the FES (and wider CSNP), working with stakeholders over the summer and autumn to refine licence text. In parallel we will work on an FES Guidance associated document to sit behind the licence condition, which will set out more detail on how we expect the FSO to carry out its obligations. The methodology and the model for the FES will be developed and managed by the ESO (and subsequently FSO) and will be part of the FSO licence obligation to deliver.

4.4 The ESO will also be engaging with stakeholders on developing the detail and implementing the stages of the CSNP over the summer and autumn of 2023[27].

Other stages of the CSNP development

4.5 Figure 3 below sets out a reminder of the six stages of developing the CSNP.

Figure 3 – Stages of the CSNP



[27] https://www.nationalgrideso.com/future-energy/future-energy-scenarios/be-involved-stay-connected-fes.

4.6 In the summer, we intend to publish a second consultation on the later stages required to produce the CSNP. We expect that this will cover:

- **Stage 2 - Identify system need**: This step will consult on the breadth of system needs to be assessed across the range of future demand and supply pathways within the CSNP. The current ETYS focusses on network thermal capability at transmission network boundaries and on fault currents on transmission system nodes. We expect to consult on including all power system constraints, including operational ones, as well as consider how the ETYS should sit within the wider suite of CSNP related products.
- **Stage 3 - Identify Options**: We expect that the FSO will need to lead the identification options and work collaboratively with stakeholders, to consider the possible economic and efficient solutions to address system needs. This includes identifying innovative or commercial solutions as well as capital-intensive solutions. We expect solutions to come from transmission owners, third parties through competition and from the FSO itself. We expect to consult on the principles of how the FSO should identify options when developing its CSNP methodology.
- **Stage 4 – Decision making tools including Cost Benefit Analysis (CBA)**: We expect the FSO to have the capability to appraise the technical, economic, social, and environmental aspects of each option, to form a strategic plan that meets the system needs. This assessment could consider cumulative benefits of multiple options where those may be higher than the benefits of individual options. We also expect the FSO to carry out sensitivity analysis to assess if solutions are robust under different assumptions, including consideration of the network's future resilience and security of supply, and the deliverability of the solutions. We expect to consult on the principles that the FSO should follow when developing its CBA tool and methodology.

4.7 Once we have received and considered responses to these consultations (including stage 1), we intend to publish a decision document on the CSNP later this year, alongside a consultation on the draft text of the relevant new licence conditions needed to implement these decisions.

4.8 We intend to create a Licence Drafting Working Group with the ESO to discuss the text of the licence conditions in detail before publishing our final draft of the licence by the end of 2023 for statutory consultation.

Bringing the CSNP together

4.9 In determining the timescale for the FES publication (considered in Chapter 3, part 8) we need to consider the interaction across all the CSNP products that are being developed. This includes considering the potential role and responsibilities of Ofgem and government in providing guidance and/or signing off key inputs and outputs across the full process – starting with the FES and concluding with a full CSNP setting out investment need.

4.10 This area has strong links with our FSNR project[28] which is looking at the future regulation of network companies. The project has a substantial focus on how regulation may need to change to help accelerate decision making and investment. Therefore understanding the interaction of the CSNP (and associated products like the FES) is an essential area to consider as part of both projects.

4.11 We expect to provide an update in this area as part of our next consultation.

[28] https://www.ofgem.gov.uk/publications/consultation-frameworks-future-systems-and-network-regulation-enabling-energy-system-future

Appendix 1 - How to respond

A1.1 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.

A1.2 We've asked for your feedback in each of the questions throughout. Please respond to each one as fully as you can.

A1.3 We will publish non-confidential responses on our website at www.ofgem.gov.uk/consultations.

Your response, data and confidentiality

A1.4 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.

A1.5 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.

A1.6 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.

A1.7 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

A1.8 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?

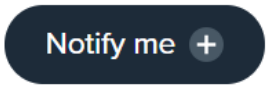
(5) Did it make reasoned recommendations for improvement?

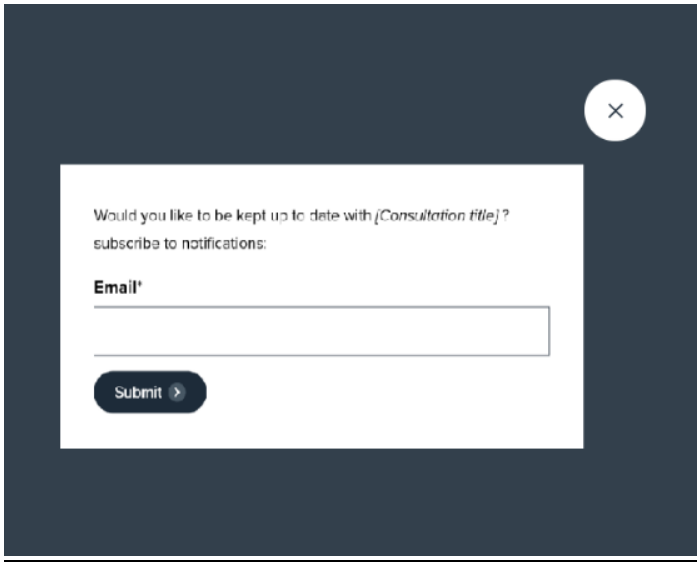
(6) Any further comments?

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:

Upcoming > **Open** > **Closed** (awaiting decision) > **Closed** (with decision)

Appendix 2 – 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 (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.

4. With whom we will be sharing your personal data

We will not share your personal data with any other individual or organisation.

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

Your personal data will be held for 12 months after the project is closed.

6. 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.

7. Your personal data will not be sent overseas

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

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

10. More information

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

Appendix 3 – Full list of consultation questions