

## **CSNP Consultation on framework for identifying and assessing transmission investment options.**

The following response builds on The IET's submission to Ofgem's earlier CSNP Stage 1 consultation - modelling future supply and demand - which provides context for our answers to Ofgem's questions relating to this consultation:

<https://www.theiet.org/media/11598/s1205-centralised-strategic-network-plan-modelling-future-supply-and-demand.pdf>

In that response we identified a number of key requirements ...

- **The CSNP should be part of a Strategic Whole Energy System Plan.**
- **A strategic spatial and temporal development plan for generation is particularly important.**
- **There is a need to begin developing proposals for an accompanying delivery plan.**
- **Government policy and plans should be clear and consistent so that transmission and distribution networks can be planned and built accordingly.**
- **The CSNP should include data and data communication infrastructure requirements.**
- **Attention needs to be given to Ofgem's role as regards the CSNP.**
- **Moving to the front foot for further governance improvements, beyond current proposals, is a necessary enabler.**

We would particularly emphasise that the CSNP should be part of a Strategic Whole Energy System Plan and we note that this view is supported by the Electricity Commissioner's report to DESNZ on how to accelerate the deployment of strategic electricity transmission infrastructure in Great Britain<sup>1</sup>, wherein two of his recommendations are as follows ...

**SS1** - A Strategic Spatial Energy Plan (SSEP) should be developed to bridge the gap between Government policy and Network Development Plans. Government targets across the whole energy system would be spatially mapped across GB and over a time-period of several years. For example, green hydrogen production targets would be translated into volumes in specific locations. This plan would create an overarching reference for many energy network plans such as the Centralised Strategic Network Plan (CSNP), a Hydrogen Network Plan, a Carbon Capture Utilisation and Storage (CCUS) Plan and Regional Energy Plans (REP).

**SS3:** Two Centralised Strategic Network Plans (CSNP) should be developed from the Strategic Spatial Energy Plan (SSEP) by the Future System Operator (FSO) – a shorter-term plan and a longer-term plan. The shorter-term plan should cover a ten-year period and be refreshed on a yearly basis. While recommendations suggested within this report are being implemented to achieve a seven-year end-to-end process, a shorter-term CSNP with a timeframe longer than ten years may be required to ensure all projects are identified in time to be delivered. The longer-term plan should cover a minimum of twenty-five years and be refreshed every five years. In the near-term there may be a

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<sup>1</sup> Accelerating electricity transmission network deployment -

<https://www.gov.uk/government/publications/accelerating-electricity-transmission-network-deployment-electricity-network-commissioners-recommendations>

need to refresh the plan more regularly due to changes in Government policy, learning gained through moving to new processes and as the pace of decarbonisation increases.

We agree with these two recommendations and based on the above contextual background; we offer the following responses to each of Ofgem's consultation questions.

**1. Do you agree with our broad regulatory approach to establishing the FSO's obligations to deliver the CSNP products?**

We agree that an approach based on CSNP licence conditions, governance and methodology can provide a foundation for Ofgem's regulatory framework for the FSO. However, Ofgem's remit in respect of the ISP (and the CSNP) needs to be quite different to its remit in respect of SOs, TOs, DNOs and GDNs, for example with regard to their business plan submissions. We would re-iterate the view expressed in our response to the previous consultation that the centralised strategic network (and whole-energy) planning process would benefit from a 'light-touch' regulatory approach, with Ofgem approving the methodology (only) as being sufficient to identify justifiable infrastructure investment, leaving the FSO to develop whole energy system strategies in liaison with DESNZ, and to advise Ofgem on the implications for energy (and energy-related) infrastructure investment.

To that end we would envisage the development of the CSNP being an iterative and inclusive process, involving a wide range of stakeholders, including both DESNZ and Ofgem. From the perspective of an economic regulator protecting customers' interests and having a net zero mandate, we would expect Ofgem to be a signatory (by way of endorsement) to the CSNP. In order to be in a position to do so, we acknowledge that Ofgem would need to be both assured by the strategic network planning methodology and the deliverability of the plan. For quality assurance, we would anticipate the methodology being documented and ISO 150001 certified.

Once the CSNP has been finalised and agreed by relevant stakeholders (subject to periodic review as suggested by the consultation) we would then anticipate Ofgem applying its wider regulatory oversight to the TOs, DNOs, GDNs, CCUS operators, heat network operators, etc. focussing on optimising cross-vector efficiencies and synergies in its capacity as an economic regulator with a specific net zero mandate under the Energy Security Bill, and protecting existing and future consumers' interests, including through markets. To that end, we would expect Ofgem to continue to ensure TOs and DNOs are delivering the plans in an efficient coordinated and economic manner, in accordance with their licence obligations. However, Ofgem should not be the arbiter of the technical content of the Centralised Strategic Network (or Strategic Whole Energy System) Plan or of the high-level design options.

**2. What are your views on the types of system need that we have proposed are covered by the CSNP? Are there any gaps?**

We support the proposal that the FSO should incorporate a wider set of system needs in the CSNP for strategic load-related network planning, including network capacity and operability requirements, the latter including frequency and voltage stability, and minimum system fault levels and inertia. We also agree that the FSO should set out in its CSNP methodology an integrated approach to identifying system needs. However, we note in table 1 that fault levels (in the context of short-time plant ratings) and system restoration are not considered by Ofgem to be a function of the CSNP process. Our view is that these are important factors to be considered in the design of a strategic network plan, particularly given the anticipated growth in generation capacity and demand, and both transmission and distribution system-connected energy storage.

We are however concerned that table 1 refers exclusively to ‘electricity’ system needs and hence fails to consider the interactions with other energy vectors such as hydrogen as a potential source of electrical power production and long-duration energy storage, and with carbon dioxide infrastructure as a facilitator of CO<sub>2</sub> abatement for methane-fuelled generation. A Strategic Whole Energy System Plan would consider the impact of each individual vector on the whole energy system. For example, producing green hydrogen using surplus wind generation output could significantly improve the annual load factor of wind generation whilst potentially reducing constraint payments and/or the need for additional transmission system capacity to relieve constraints, due for example to high north-south power flows arising from high wind generation output at times of low national demand.

The current uncertainty over the future role of other energy vectors and the future generation mix (in terms both of location and technology) poses a limitation on the ability of the FSO to produce either a CSNP or Strategic Whole Energy System Plan. For that reason, we broadly agree with the Electricity Networks Commissioner that the objective should be to develop a Strategic Spatial Energy Plan (SSEP) wherein green (and blue) hydrogen production and storage (and CCUS facilities) would be translated into volumes in specific locations, as we believe should the 24GW of nuclear plant (both conventional and AMR/SMR) proposed under Energy Security Strategy and the circa 100GW of offshore wind generation by 2050 envisaged by NGESO’s FES. It follows that the FSO must be empowered to require information from those parties responsible for strategic decisions relating to the development of hydrogen and CCUS infrastructure.

Because it is not currently possible to establish the geographical disposition of these technologies and volumes with any certainty, the SSEP process would necessarily be based initially on credible pathways and continuously adapted as further information becomes available. Nevertheless, once created it would provide an essential overarching reference for not only the Centralised Strategic Network Plan (CSNP), but also a Hydrogen Infrastructure Plan, a Carbon Capture Utilisation and Storage (CCUS) Plan, and hence ultimately an integrated Strategic Whole Energy System Plan extending across energy vectors and interdependent sectors.

In that regard we agree with the Electricity Commissioner's conclusion that the Strategic Whole Energy System Plan<sup>2</sup> should address the spatial, temporal, functional and operational structure of the energy system, its enablement requirements (planning and consents, digitalisation, markets, regulation, for example) and other considerations such as relationships with interdependent sectors (water, agriculture, land use, for example). This would include the SSEP and CSNP within its scope.

**3. Do you agree that the time horizon for system need assessment should be extended to 2050?**

We agree that the time horizon needs to be extended beyond the current 12-year horizon. However, whilst 2050 is a key net zero milestone we would suggest that as well as the 12-year horizon moving forward each year, the longer-term horizon should move forward every three years so that a (say) 25-year horizon is continuously maintained. Longer-term horizons are particularly important in providing emerging clarity over decarbonisation pathways, including the contribution of other energy vectors and their implications for the electricity transmission system. Longer-term horizons are also helpful in keeping track of nascent technologies currently under development which have the potential to play a role in the future overall design of the electricity system.

It will also be important for the regulatory framework (RIIO) to reflect these forward planning horizons such that strategies and projects beyond the 5-year horizon of each review period are at least approved in principle such that any forward investment (including advanced feasibility studies and options assessments) are accounted for in regulatory settlements, and that justified 'anticipatory investment' in actual infrastructure is not delayed.

**4. Do you agree that the FSO should move to a year-round nodal assessment of system need as part of the CSNP?**

Whilst it will be important to maintain an annual assessment of transmission boundary flows (and actual or emerging constraints) we agree that nodal assessments should be undertaken selectively on a continuous basis where there is evidence of potential localised constraint or emerging operability issues (for example voltage management). Nodal assessments should be undertaken with relevant DNOs such that the effects of both existing and anticipated future distribution system power flows (including transmission exports) can be taken into account.

Annual assessments will need to consider all operability aspects of system needs across each season taking into account maximum and minimum system demands and seasonal variations in electricity production from renewables.

A key requirement for this process to be effective is the creation and maintenance of a spatial and temporal forward plan identifying (based on best available information) the quantum and characteristics of transmission flows at each entry and exit point over a (say) 12-year horizon.

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<sup>2</sup> We note that the Energy Networks Commissioner's report refers to both an 'Energy System Strategic Plan' and a 'Strategic Spatial Energy Plan' (SSEP)

**5. We welcome stakeholders' views on how the FSO can communicate effectively about future system needs?**

We would acknowledge the already comprehensive nature of communication (including two-way communication where appropriate) achieved through the current ESO's annual publications and supported by stakeholder forums and webinars. These are usefully supplemented by ad hoc reports into specific aspects of system needs and operability. Four such reports are listed in the current Operability Strategy Report that are scheduled to appear over the coming year. However, we note that some of these appear to be behind schedule - e.g., a report on 'System Strength' scheduled for May and a report on 'Management and Mitigation of Oscillations on the GB Transmission System' - which is due in August but we understand will not now appear until September.

The ongoing transition from dispatchable fossil-fuelled synchronous generation to self-dispatching weather-dependent renewable generation and energy storage, connected through either Grid-Following (GFL) or Grid-Forming (GFM) converter technologies will give rise to numerous operability challenges, as will the increasingly active nature of the electricity distribution system with increasing levels of distributed energy resources (DER) and consumer energy resources (CER). It will therefore be important to ensure that stakeholders are regularly updated on emerging challenges, and on progress with developing potential solutions (including those emerging from Pathfinder projects).

For those requiring detailed technical information, NG ESO's 'Virtual Energy System' (digital twin) should prove a valuable shared industry asset for improving simulation and forecasting for all stakeholders, including those with assets having a direct interface with the electricity system who may therefore require such information for their studies. This would include generators and energy storage operators but increasingly DSOs/DNOs with whom operational data sharing will become increasingly important for forward planning, operational planning, and co-ordinated real-time operations.

It is important to note however that data sharing is not simply a matter of having open access to data, it also requires a framework that can deliver data interoperability whilst ensuring integration with the necessary communication channels. The outcomes from the current joint work of the Energy Systems Catapult, Arup and The University of Bath investigating the feasibility of an energy system digital spine should be helpful in establishing the potential scope and the data infrastructure required to deliver it<sup>3</sup>.

**6. What are your views on the FSO establishing minimum design requirements for high-level option designs and are there areas where exceptions are needed?**

We agree that ensuring consistency in the high-level design of options is important, albeit subject to continuous improvement and refinement of high-level design criteria reflecting opportunities arising from innovation. In that regard we agree there would be benefit in the FSO developing and providing best-practice guidance on the minimum level of detail needed for high-level designs without being overly prescriptive.

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<sup>3</sup> <https://www.arup.com/news-and-events/arup-appointed-to-research-energy-system-digital-spine-feasibility>

**7. Do you have any views on our proposals for considering environmental and community impacts as part of high-level design of options?**

Given the scale and pace of transmission (and distribution) infrastructure investment required to achieve both the 2035 (decarbonised electricity system) and 2050 (net zero) targets, it is clear that community and environmental stakeholder acceptance will be essential. Without such acceptance no amount of planning reform will be effective. In that regard we welcome and support the recommendation in the Electricity Networks Commissioner's report to the Secretary of State 'Accelerating Electricity Transmission Network Deployment'.

Whilst each new transmission route will have case-specific needs requiring early stakeholder engagement, it would be helpful to have the ability to present broadly costed generic assessments of feasible options for any given circumstance, for example the circumstances under which T-pylons, gas-insulated lines or even subsea options might (or might not) be justified, but also the mitigating or compensatory actions that might increase the acceptability of conventional transmission line designs.

In terms of community stakeholder engagement, in addition to explaining the need for transmission infrastructure, there is also value in promoting energy communities which offer the potential to socialise within their communities the benefits of DER and CER. This can be helpful in raising community awareness of the benefits arising from decarbonisation of the national electricity system.

Taken together, these measures should improve the effectiveness of advanced community engagement and support the Strategic Environmental Assessment (SEA) process.

**8. Do you have any views on our proposal for the FSO to independently decide which network needs it may lead the high-level design of?**

We agree with the ETNPR conclusion that the FSO should be empowered to determine its own options to address network needs (with appropriate input from TOs) rather than relying solely on TOs. We also agree that it would be impracticable and possibly counter-productive to establish a rigid definition of 'strategic' (as opposed to non-strategic) investment. However, irrespective of which party leads the high-level design, it must be a collaborative approach engaging with all relevant stakeholders, including but not limited to TOs.

**9. Do you have any views on our proposal for the FSO to set out how and when third parties can be involved within the CSNP?**

Notwithstanding our response to Q8 above, it will be important that the FSO maintains ongoing liaison with TOs and third parties in developing best practice and ensuring that innovation and fresh thinking supports continuous improvement. This includes but is not restricted to the Pathfinder approach to find market solutions to operability and constraint management needs, some of which solutions might involve third parties (for example providing flexibility and other ancillary services).

**10. Do you have any views on our proposals on data exchange to enable the implementation of CSNP?**

We agree that sharing of network and asset data will be crucial to support third parties in participating in the CSNP. In that regard we would reiterate the importance of NGESOs 'Virtual Energy System' (digital twin) as a facilitator of open access to data. However, referring to our response to Q5, we would again emphasise the importance of a framework that can deliver data interoperability and is integrated with the necessary communication channels.

**11. Do you have any views on our proposals regarding the principles to be followed in the CSNP decision-making framework?**

The consultation is right to note that decisions over large investments in the electricity transmission networks are often made with some uncertainty about the future. Whilst this has always been true to some extent, a lack of clarity over the future of alternative vectors such as hydrogen and supporting infrastructure such as CCUS is now creating further uncertainty over the future requirements for electricity infrastructure. This is one reason for our advocating the development of a Strategic Whole Energy System Plan which will at least enable credible energy decarbonisation pathways to be considered and help inform the level of optionality to be incorporated into the CSNP.

**12. Do you have any views on our proposals on the decision-making framework for selecting potential projects to address longer-term system needs?**

We note the decision-making / decision-support tools and techniques referred to in the consultation. These should be complemented by DCF studies and Incremental Cost-Benefit Analyses which are able to identify cost-effective options for bringing forward or deferring investment (that latter for example through temporary constraint relief measures such as procured flexibility) and also cost-effective opportunities for betterment (for example in terms of increased operational resilience and/or flexibility or reduced losses). Whilst all are valid when applied in appropriate context, a particular value that is relevant to the current uncertainty in energy futures is that of optionality, i.e., investments which maintain (rather than close-down) optional future pathways. A further complement to 'least-worst regrets' decision making is risk-based assessment which can be helpful in dealing with uncertainty and mitigating risk through optionality.

**13. Do you have any views on the decision-making framework to bring potential projects into the 'delivery pipeline' for nearer-term needs?**

We broadly agree with the approach set out in the consultation. We would also reiterate the point made in our response to Q12, i.e., that decisions over timing of investment (and hence the point at which projects need to be brought into the delivery pipeline) can be helpfully influenced by optioneering. As well as representing a superior cost-benefit in NPV terms through optimum timing, this can be helpful in reducing the risk of economically stranded investment arising either because the scale of investment (e.g., in terms of additional capacity) subsequently proves unnecessary and/or sub-optimally located, or due to the scale of investment (e.g., again in terms of additional capacity) subsequently proving inadequate.

**14. We would welcome views on our proposal to not re-evaluate projects that are in the delivery pipeline, and whether a materiality trigger is appropriate and what criteria might be used.**

For pragmatic reasons we agree with this proposal. At a time when the FSO is managing its transition from the ESO whilst also taking on new responsibilities, it would be unhelpful to burden the FSO with a requirement for retrospective evaluation of projects already in the pipeline. An exception would be where a new or unexpected development materialises or where the proposed 12-year planning horizon (or interim nodal assessments) identifies previously unaccounted for challenges. In such cases, re-evaluation should be limited to examining the impact of the changed parameters on the original project proposal rather than triggering a full reappraisal and should be addressed through a robust project change management process.



**15. Do you have any views on our proposal on inclusion of environmental and community impacts in the CSNP CBA?**

We agree in principle that an assessment of environmental, societal and community (including aesthetic) impacts should be part of the overall cost-benefit assessment of a project (in addition to consideration of tangible costs of obtaining landowner/tenant consents, environmental impact assessments, planning permissions, and any associated costs of mitigation). However, consistency in evaluation of intangible costs and benefits would require clear guidelines and documentation of agreed 'best practice' principles. In addition to being guided by 'The Green Book' such documentation would logically be developed in consultation with stakeholders such as National Trust, English Heritage, RSPB, and parties such as the Country Landowners' Association and the National Farmers Union on whose members' consents for accommodating new infrastructure will depend.

**16. Do you have any views on our proposal for the CSNP to include a methodology for assessing and taking forward system operability solutions?**

We agree that forward-looking longer-term operability challenges must be a function of the CSNP process. Of necessity this will be a continuous refinement process as new or more advanced modelling techniques are developed in response to either foreseen or unexpected experiences. An example of the latter would be oscillations observed on the SSEN-T transmission system in August 2021 which are still under investigation through tools such as EMT analysis. Given the changing nature of supply and demand, the ability to extrapolate observed or modelled phenomena to reflect the ongoing evolution of the power system will be important. This applies to all the system operability aspects listed in table 1 of the consultation. The Pathfinder projects will play a key role in trialling potential solutions, as will NIA and SIF projects undertaken by or with DNOs.

**17. Do you agree with our proposal for the ESO to review its current approach to assessing short and long-term solutions, and for the FSO to set out its approach in the CSNP Methodology?**

We agree with this proposal and would refer to our response to Q 11 above.

**18. Do you have views on our proposals for FSO to develop capabilities to consider different combinations of options and how this should be implemented?**

The capacity and siting of future offshore wind generation, hydrogen electrolysis plant, hydrogen transportation and storage infrastructure, CCUS infrastructure, and new nuclear build, etc. will be a significant determinant of required transmission system capacity and functionality. It follows that these would be key inputs to the spatial and temporal Strategic Whole Energy System Plan we advocate in our response to Q 12 above. This is an area which we believe would be facilitated through digitalisation and the selective application of AI.

Whilst the FSO will not have the authority to specify the locations of these assets, we agree that an important part of the FSO's role will be to provide independent advice to government, and guidance to stakeholders, on the implications of options, taking a whole energy system perspective and ultimately identifying optimum integrated energy vector strategies.



**19. Do you agree with our proposal to introduce a requirement, as part of the new CSNP licence condition, for the FSO to make recommendations on additional interconnection and OHAs opportunities between GB and other markets?**

We agree with this proposal since, from a whole electricity system perspective, the strategic planning of interconnectors (including multi-purpose interconnectors or OHAs) and their integration with the onshore transmission system, is an important element of Holistic Network Design, and an essential consideration in regard to security of supply.

**20. Do you agree with our proposal that the FSO should use reasonable endeavours to support relevant stakeholders as part of the offshore asset development process?**

We agree that the FSO has a role in identifying the optimum future seabed leasing areas from an electricity system security and operability perspective, and also as an input to the SEA. This should help identify priority (or best option) locations for undertaking strategic marine environmental assessments.

**21. Do you agree with our proposal that the FSO assess third-party options under the CSNP and recommend delivery by competition where proposed solutions meet the relevant competition criteria?**

We agree that the FSO (as an independent strategic planner) should have the authority to assess third-party options, including non-network options, and determine where delivery by competition is (or isn't) appropriate.

**22. What are your views on whether changes to the SQSS or obligations on licensees are needed to support the CSNP – where specifically are these changes needed and when do they need to happen by?**

Whilst we understand the concern over potential conflicts between the FSO and TOs regarding some aspects of the SQSS, this could equally apply to the current position between the ESO and TOs. Our view is that in the short-term the FSO should simply assume the existing role of the ESO on the SQSS Panel. In the longer-term, a more fundamental review of industry governance might suggest changes to the role of the SQSS or at least to the make-up of the panel.

**23. Do you agree that the FSO should evaluate the climate resilience of the long-term whole system CSNP?**

Irrespective of decarbonisation and net zero objectives, it is reasonable to assume that climate change will continue to present increasingly challenging weather events for the electricity transmission and distribution systems, and indeed the supply characteristics of weather-dependent generation (including wind-drought phenomena). We therefore agree that assessment of climate resilience and mitigation should be a CSNP deliverable. Importantly this should extend to infrastructure on which the electricity system is critically dependent, such as resilience of telecommunications to direct weather impacts, cyber-attack, and prolonged power outages.

**24. Do you agree with the proposed position on the treatment of connections in the CSNP?**

Our view is that, so far as is practicable, future substantial connections should be factored into the CSNP process as part of a spatial and temporal strategic network development plan. Only through a whole electricity system approach will it be possible to determine the required capacity and operability of the transmission and distribution systems, and hence timing of investment, with any confidence. The consequences of not taking such an approach can be observed in the current 'connection queue' for both prospective transmission and distribution system-connected generation and battery energy storage which is at least partly a consequence of uncoordinated planning of new generation connections and speculative connection requests.

In that regard, we would see value in the development of the CSNP being proactive in identifying the optimum locations of generation and energy storage (taking account of any development constraints) rather than simply reacting to proposed developments. In practice this will inevitably be an iterative process between the FSO and developers at a national level, and between RSPs, DNOs and developers at a regional level (for example in the case of onshore wind and solar generation, and battery energy storage) but one which should help avoid speculative developments of energy sources without consideration of system need or benefit.