

# Future Energy Scenarios framework development

The changes required to decarbonise our energy system are unprecedented. We must facilitate this transition at pace through proactive and strategic future network planning, so Future Energy Scenario's framework is developing to underpin this critical infrastructure investment.

Future Energy Scenarios is in its thirteenth annual cycle, and has gone through a number of analytical framework shifts during this period to support industry ambitions. This year our framework has evolved once more in response to recommendations from our regulator, Ofgem, feedback from our stakeholders, and to also mirror ESO's strategic transition to the independent National Energy System Operator (NESO) in summer 2024.

A key driver for this shift is to evolve our scenarios to become more strategic, and this strategic evolution forms part of a wider industry overhaul to Great Britain's energy network planning, with FES underpinning the foundations of this network investment by feeding into NESO's Centralised Strategic Network Plan (CSNP), and Strategic Spatial Energy Plan (SSEP).

To reflect these changes, the title of our publication will be expanding to "Future Energy Scenarios: ESO Pathways to Net Zero", also known as "The Pathways".

Our enhanced framework shift and new publication name signifies the beginning of a transition for Future Energy Scenarios, and our methodology will develop over time in collaboration with Ofgem, the Department for Energy Security and Net Zero (DESNZ) and our wider stakeholders. We continually engage with our stakeholders throughout every annual publication cycle – a summary of this year's engagement can be found in our "Future Energy Scenarios 2024 Stakeholder Feedback Document", accessible through our webpages on the ESO website.

Our outputs will also evolve as strategic investment decisions are made through the CSNP process, forming part of a wider enhanced transmission investment cycle.

## Framework outputs

The Future Energy Scenarios were established to provide data for input into network planning processes, with our Five Year Forecast designed for use in security of supply planning and Capacity Market Auctions.

Our framework must continue to underpin these critical planning activities and recognise the wider applications our publication supports, including various regulated energy system activities alongside policy recommendations and private sector investment.

With this in mind and through consultation, analysis and stakeholder engagement, our new framework for The Pathways will consist of:

- The replacement of four scenarios with three net zero "pathways", with insights surrounding these found in the full Future Energy Scenarios publication
- A "counterfactual" scenario that does not meet the 2050 net zero target, and will be used to benchmark and evaluate the pathways against
- Retention of our Five Year Forecast, which will be located in the Future Energy Scenarios 2024 data workbook.

*Please note our counterfactual scenario will not be referenced in the CSNP process for electricity network planning.*

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## Scenarios to pathways

Our previous framework, used since 2021, sought to assess a wide range of possible scenarios based on extensive research, stakeholder engagement and analysis, and presented a range of credible outcomes on the route to net zero.

In comparison, our new framework seeks to explore a narrower range by identifying strategic choices that can be made on the route to net zero. This follows decisions made by Ofgem as set out in the “Decision on the framework for the Future System Operator’s Centralised Strategic Network Plan”.

The figure below sets out the key differences between our old scenarios and new framework in The Pathways.

Scenarios		Pathways
Range of credible outcomes for how the UK could meet net zero. Not all scenarios meet net zero	→	Routes showing strategic direction to net zero. All pathways must meet net zero
Wide range of possible outcomes	→	Provides a narrower strategic range
Creates scenarios that are cost agnostic	→	Brings in additional economic modelling
Potential efficiency savings through interactions between electricity and hydrogen networks are highlighted but not assessed	→	Whole system optimisation fundamental to finding most efficient future energy system across all energy vectors – (in development for future iterations)
Built to emissions and Security of Supply targets (SoS)	→	Considers whole energy trilemma
Seeks out the edges of credibility to ensure scenario range is wide enough to encompass uncertain future	→	Explores a narrower range of outcomes to drive more strategic credible routes to net zero
Assumes unconstrained network	→	Assesses the impact of network constraints

Figure 1

## The pathways and counterfactual in more detail

The Pathways will begin to identify strategic routes to net zero under different sets of levers and assumptions, which we outline in more detail below. Whilst the pathway descriptions may sound similar, how our analysis has been applied, and the drivers and decisions behind the pathways has changed, to create a strategically narrower range of pathways, as opposed to the wider credible range we have shown previously in our scenarios. Please note, our new pathways have been numbered whilst official names are being decided.

One of the most binary choices and key uncertainties for the development of Great Britain’s future energy system is the extent to which hydrogen will be utilised. This remaining uncertainty is a key reason we will still be considering various routes to net zero within the publication.

# ESO

Pathway 2 will explore an energy system with higher electrification. This pathway will focus on enabling flexibility within the energy system on both the supply and demand side. Energy efficiency and consumer engagement will be key to unlocking the potential of this pathway in an economic and efficient way.

Pathway 3 will explore what a widespread hydrogen-integrated energy system could look like and assumes strong policy support for hydrogen development. Hydrogen will become a key source of system flexibility in this pathway.

Pathway 1 will take an analytical approach to assess the trade-offs between competing energy vectors and technologies, rather than favouring one route over another. This pathway will aim to explore a more mixed energy system than the other pathways, identifying where efficiencies can be gained through whole system thinking.

Alongside the pathways, we will also develop a “counterfactual” scenario that will use similar assumptions to the “Falling Short” scenario from Future Energy Scenarios 2023. Like Falling Short, this scenario will assume there is still progress on decarbonisation compared to today, however it is slower than the pathways. This scenario will simulate a world where insufficient progress is made towards net zero and the 2050 target is missed.

Figure 2 below shows the development of the detailed framework as it currently stands, plotted on a spider chart. The scale of the levers shown on the spider are indicative only and will be confirmed through modelling, analysis and stakeholder engagement in the coming months. Pathway 1 is not currently plotted on the spider graph, as the levers will be determined through our modelling process. For the publication, we are developing a simplified framework visualisation graphic, but the spider diagram will still feature in the publication.

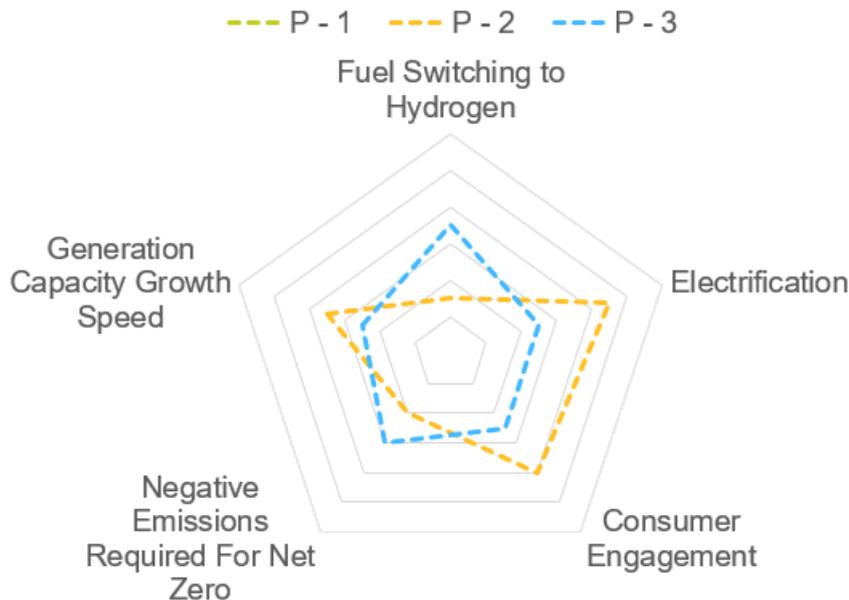


Figure 2

## Conclusion

With the development of our enhanced framework, The Pathways will provide data and insight for strategic network development, provide more clarity on the direction of travel to industry and network planning, whilst continuing to support public and private sector decision-making.

Underneath the pathways, our "counterfactual" scenario will serve as a key check-and-balance to understand the gap between successful tracking of the pathways versus enabling change too slowly and missing key targets.

Together, these three products will create a dynamic and comprehensive suite of analysis that will seek to enable a better transition to net zero.