December 2025

Distribution Network Options Assessment

Future Roadmap

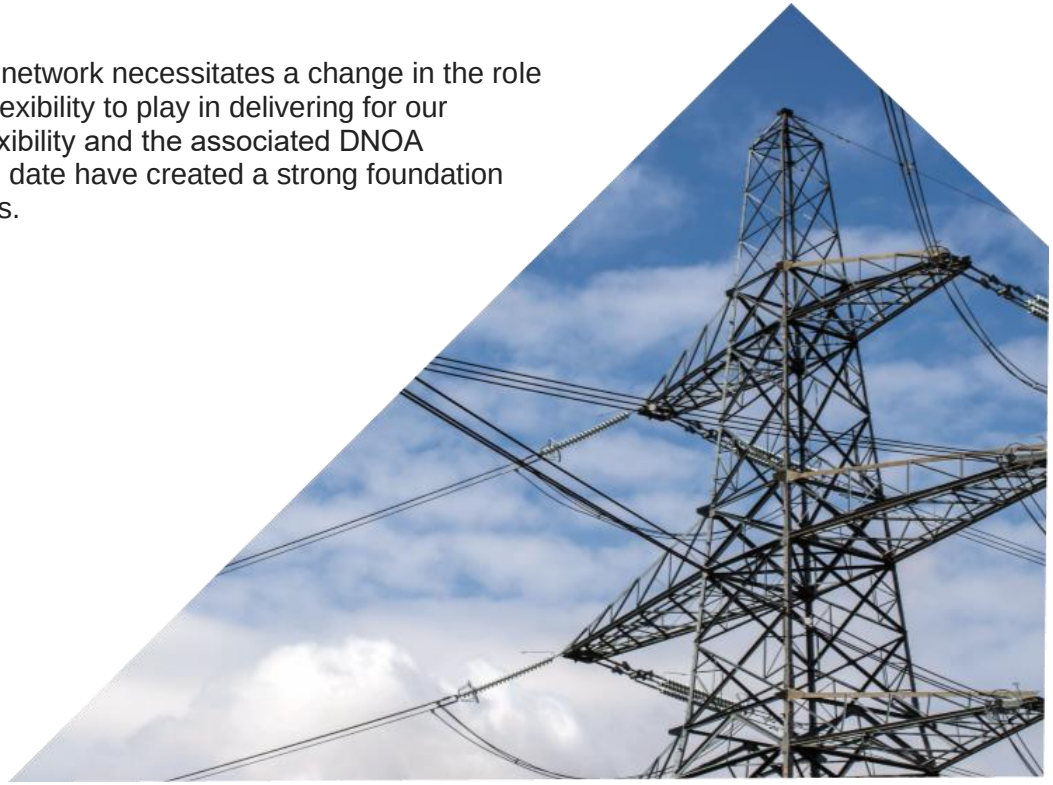
nationalgrid DSO

Introduction

The Distribution Network Options Assessment (DNOA) process is a critical stage in determining the optimal investment pathway to manage load related constraints on the network (specifically assessing the use of flexibility services as an alternative to conventional reinforcement). Since publishing the UK's first DNOA in 2021, National Grid Distribution System Operator (DSO) have continued to lead the way in building and utilising flexibility markets. Across the Midlands, South West and South Wales over 60 HV flexibility zones and over 700 LV flexibility zones were in operation to manage network constraints following the latest DNOA publication.

The DNOA process is built around utilising flexibility to manage constraints on the distribution network and defer the expenditure associated with reinforcement. Within the RIIO-ED2 price control period (2023-2028) a Flexibility First approach was taken, allowing customer bills to be reduced while maintaining a safe and secure network. As we transition into the ED3 price control period (2028-2033) the rate of network build will need to increase to facilitate the Net Zero transition and deliver Clean Power 2030.

The move to more prescriptive pathways for investing in the distribution network necessitates a change in the role of flexibility services and the DNOA. There will still be a crucial role for flexibility to play in delivering for our customers during ED3, but National Grid DSO's approach to utilising flexibility and the associated DNOA processes will need to evolve. The tools, processes and markets built to date have created a strong foundation from which to deploy flexibility to support the network in a variety of ways.



This Future Roadmap sets out our plan to develop our DNOA process in line with the new flexibility use cases National Grid DSO will be deploying. Alongside changes in how we assess the use of flexibility, we will also be improving our Cost Benefit Analysis (CBA) and overall Optioneering processes. In order to identify the optimal investment strategy across reinforcement, changes to the way the network is operated, load management and flexibility the full impacts of each of these options need to be understood and accurately quantified. This advanced Optioneering will play a key role in prioritising the network interventions capable of supporting the Net Zero transition to the greatest extent.

The DNOA Roadmap is the first in a series of publications which will outline how National Grid DSO's various processes will need to evolve for the next price control period.

Approach in RIIO-ED2

DNOA Purpose

The publication of the DNOA each year has two main aims. The DNOA provides a high level of transparency in our investment process, specifically outlining our Optioneering stage following on from the forecasting of future network needs as part of the Distribution Future Energy Scenarios (DFES) and the identification of constraints as part of the Network Development Plan (NDP). By describing National Grid DSO's entire process from end-to-end, customers can have confidence that all load related investment decisions are optimised to deliver secure, sustainable and affordable development of the distribution network in the Midlands, South West and South Wales. Stakeholders can also better understand the key role they play in informing these investment decisions and allowing a holistic plan to be created.

The second aim of the DNOA publication is to provide visibility of the current and future market opportunities for Flexibility Service Providers (FSPs) to support the network. Matching providers to opportunities helps build the flexibility markets that will be critical in delivering the Net Zero transition. Highlighting future needs also gives increased clarity to inform the plans of FSPs, helping bring forward investment in green technologies. In this aim the DNOA sits alongside the rest of National Grid DSO's suite of publications and resources related to flexibility, including the annual C31E Statement, the Flexibility Map and regular engagement/webinars with stakeholders.

The latest DNOA Methodology published in September 2024 is the 8th iteration of the report since our publication of the UK's first DNOA in 2021. Through those iterations the DNOA has evolved significantly, improving transparency in decision making and publishing more information for the rapidly expanding flexibility markets. The DNOA process which has been refined over this time-period is built around the RIIO-ED2 principle of Flexibility First which is based on the deferral of reinforcement as the predominant use case of flexibility.

Common Evaluation Methodology

The Common Evaluation Methodology (CEM) tool was developed as a standardised method of carrying out CBA for the use of distribution flexibility services. The tool is aligned to Ofgem's CBA process for the RIIO-ED2 price control period, with the main benefit of flexibility calculated from the deferral of reinforcement costs based on the Time Value of Money. The CEM tool underpins National Grid DSO's DNOA process, with the current process described below.

The amount of flexibility availability and utilisation projected to be required to manage a given constraint is taken from National Grid DSO's Flexibility Analysis Tool and input into the CEM CBA tool. The costs associated with the optimal reinforcement solution identified by National Grid DSO are also fed into the CEM CBA tool to provide a baseline against which flexibility is assessed. The CEM CBA tool is then used to calculate the ceiling price for flexibility (i.e. the break-even point at which the cost of flexibility is equal to the economic benefit of deferring reinforcement) for each year. Ceiling prices are calculated based on the NGED Best View scenario which is used to inform investment decisions.

Context for ED3

Regional Energy Strategic Plans

The National Energy System Operator's (NESO's) Regional Energy Strategic Plans (RESPs) are aimed at providing a pathway for energy networks to plan which meets local growth ambitions as part of the Net Zero transition. RESPs will inform National Grid DSO's DFES forecasts, feeding into the analysis for the NDP which will identify where investment is needed to release capacity to facilitate demand and generation growth.

As the last step in National Grid DSO's Optioneering process the DNOA will provide transparency to stakeholders in how we are aiming to invest to facilitate the growth ambitions captured in the RESPs. The DNOA will describe both the quantitative assessments carried out to prioritise investment (through our CBA process) and the qualitative assessments which consider the local factors and impacts with more nuance.

Scenarios vs Pathways

The shift to Pathways aligned to NESO's RESPs will create more coordinated direction for Distribution Network Operators (DNOs) and DSOs to follow when creating investment plans. This evolution necessitates an updated view of how flexibility services (and network investment as a whole) need to be utilised to meet local growth ambitions. National Grid DSO's Optioneering and CBA processes will need to capture how all types of network intervention should be used to provide enduring benefits for consumers, focusing on quantifiable benefits rather than comparing flexibility against conventional reinforcement.

Regulatory Background

Significant investment in the distribution network will be required in the ED3 price control period to facilitate the load growth required to meet the government's Clean Power 2030 goals and support the decarbonisation of heat and transport. With the level of growth in demand and generation forecast the risk of overinvestment leading to stranded assets is low, but underinvestment could risk networks becoming a blocker to the Net Zero transition. The move towards more investment ahead of need helps ensure we deliver the right level of network capacity at the right time and place.

A focus on investing ahead of need (in line with the Future Energy Pathways and RESPs) has led to a shift in how we think about the use of flexibility, and load related expenditure as a whole. The regulator Ofgem has recognised the need for this shift, stating "that a narrow focus on distribution-based flexibility to defer network investment is potentially not the best use case in the long term". Ofgem further pushes for DSOs "to reorientate the focus of their evaluation frameworks for network investment and flexibility to ensure that the wider-system benefits are recognised". It is clear that comprehensive CBA and Optioneering processes are required to capture all of the benefits associated with flexibility and other network interventions. Quantitative assessments of the benefits of different solutions need to be complemented with qualitative descriptions which capture the nuances of individual projects. This will be provided through the NDP and DNOA publications.

Optioneering

Overview

As discussed above the current DNOA process and associated CBA using the CEM tool is based around using flexibility to defer load related capital expenditure in line with the Flexibility First approach adopted during RIIO-ED2. Moving forward, National Grid DSO's Optioneering process will evolve to consider a wider range of factors (ensuring the whole system impact of any investment decisions is quantified). The various factors which will need to be taken into account for a comprehensive CBA are discussed in detail in the following sections.

More comprehensive CBA will need to be carried out not only for decisions related to comparing flexibility against reinforcement, but for comparing any type of network intervention (including reinforcement, changes to the way the network is operated, flexibility and other innovative solutions). This will be an expansion of the remit of the DNOA and will align to the methodologies utilised in the creation of our ED3 Business Plan. By encompassing a wider view of the Optioneering National Grid DSO carries out this will further improve transparency in our processes.

Most of the factors which should be considered in a full CBA align to potential use cases for flexibility. These show some of the main areas where flexibility is able to add value, with the different use cases not necessarily being mutually exclusive. With the move away from valuing flexibility as a counterfactual to reinforcement, the value of all investment decisions must be based on their direct tangible benefits to customers. Both flexibility and reinforcement create clear benefits for customers, and both will be required to facilitate the Net Zero transition and meet the UK's Clean Power 2030 goals.

Quantifying the direct benefits of each possible intervention is the first step towards targeting the deployment of reinforcement and flexibility to the right areas on the network. Using the two in tandem will allow us to utilise the strengths of each (the large amounts of capacity and enduring benefits of reinforcement and the agile deliverability of flexibility services). Improving our Optioneering processes will therefore help us prioritise projects within the ED3 price control period to achieve maximum impact for our customers.

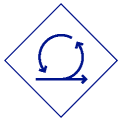
The following sections highlight the importance of considering each factor in our Optioneering, how the impacts could be quantified and where each would fit into the overall decision-making framework:

Asset Condition 

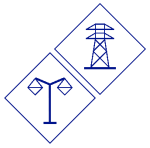
Network Risk 

Outage Availability 

Reducing Curtailment 

Option Value 

Losses 

Transmission / Distribution Interface 

Asset Condition

The replacement of assets based on their condition is carried out across National Grid Electricity Distribution's (NGED's) four licence areas at every voltage level as part of the non-load related investment programme. As part of the February 2024 and September 2024 DNOA publications an appendix on "Coordination of Load Related and Asset Replacement Expenditure" was included. This discussed why the use of flexibility is unsuitable to defer asset replacement expenditure. It also highlights how when asset replacement works are carried out there is often an opportunity to add capacity to the network at a low marginal cost.

Coordinating asset replacement and load related expenditure is crucial to the economic development of the network. This applies to both projects triggered by asset condition and projects triggered by load growth on the network. Where projects are triggered by the condition of assets, an assessment is carried out by the DSO to determine what size of new asset should be installed. This assessment aims to ensure the new assets have sufficient capacity to meet the local growth in demand and generation, facilitating the Net Zero transition to 2050 and beyond and enabling the plans and ambitions set out in the RESP. This is done based on load forecasts captured in the DFES and considers how these assets fit into the wider strategy for the area where appropriate (for example identifying opportunities for load to be transferred to support other sites and alleviate network constraints elsewhere).

Where load growth triggers investment, the condition of existing assets is taken into account in deciding the appropriate network intervention. This is carried out through the NDP process (for example, the condition benefit achieved by replacing existing assets is considered when deciding how to increase network capacity). NGED has a strong core of engineering expertise empowered to deliver holistic solutions based on qualitative assessments, but there is less focus in existing processes on quantifying the benefits of synergising investment drivers. We have an exemplary track record of making the right decisions for our customers, and further developing our CBA processes will allow us to quantify this more accurately.

Some assets on our network can be safely operated at a higher capacity for a short period of time during abnormal running arrangements (such as during arranged outages for maintenance or following a fault). For example, many of our transformers have a higher rating which can be utilised to accommodate higher loadings than usual. Utilising these ratings however can rapidly age the transformers, reducing their lifespan and necessitating replacement sooner. Where assets are required to operate in these conditions the use of flexibility services could reduce the loading and prevent the accelerated aging. As we develop our processes to more accurately quantify the impacts of an asset's condition (such as the increased risk of faults and maintenance costs) this would allow us to understand the value of utilising flexibility services in this way. This would create an additional use case for flexibility and fit into National Grid DSO's wider push to utilise market provided flexibility services to a greater extent in operational timescales.

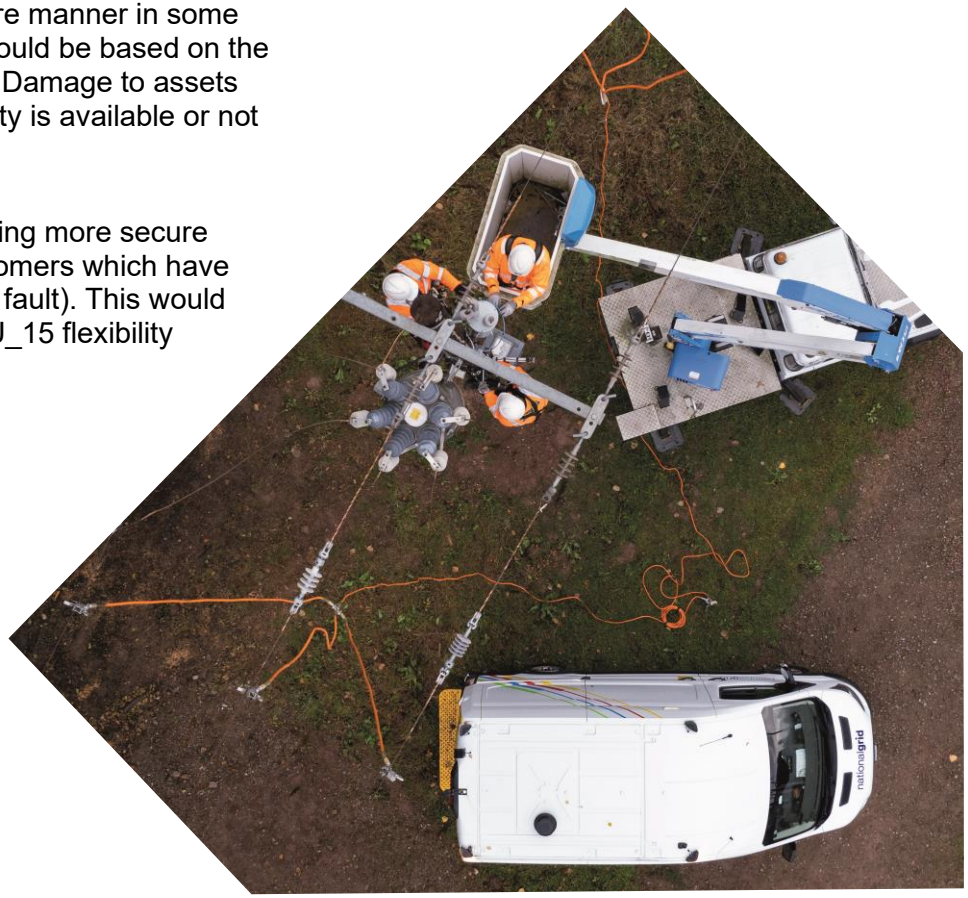
Network Risk

The distribution network is designed with a level of redundancy aimed to provide security of supply for customers and minimise disruptions. In practice this usually means running multiple circuits, transformers or other assets in parallel such that if a fault were to occur the remaining assets would maintain supply without interruption. In some cases, parts of the network need to be run split at times to manage periods of high loading. This protects assets from damage in the case of faults but can lead to increased risk of loss of supply for customers. The DNO Control Room (with support from the DSO Operations team) aims to run the network such that security of supply can be maximised without compromising network safety.

The use of flexibility services could allow the network to be run in a more secure manner in some instances, with loading reduced to protect assets. The value of this flexibility would be based on the reduction of Customer Interruptions (CIs) and Customer Minutes Lost (CMLs). Damage to assets would not be treated as a valid counterfactual as regardless of whether flexibility is available or not NGED will ensure the network is run in a safe way.

As well as reducing the risk that interruptions occur in the first place by facilitating more secure running arrangements, flexibility could also be used to restore supplies to customers which have been disconnected (such as following a significant weather event or a network fault). This would be done through the use of the OU_15 product. The value of the use of the OU_15 flexibility service would be valued based on the reduction in CMLs.

Flexibility could be utilised to increase security of supply for customers even in areas where no reinforcement is planned, increasing market opportunities significantly. National Grid DSO's development of short-term flexibility markets (and transition to day-ahead markets in 2026) will help facilitate this use case and leverage the agility of flexibility compared to traditional reinforcement alternatives. Network reinforcement can also be used to improve security of supply (whether this is the primary driver for the project or not), so being able to better quantify the impact different topologies have on network risk will also inform decision-making for traditional network interventions. National Grid DSO already have processes in place to quantify risks on the network, these just need to be further integrated into the Optioneering process.

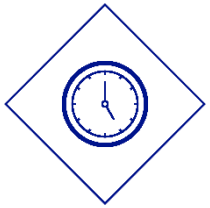


Outage Availability

In order for the electrical equipment on NGED's distribution network to continue operating safely and reliably, regular maintenance is required. Assets are usually disconnected from the network and isolated in order for maintenance to be carried out safely. These arranged outages increase the loading on the remaining assets which continue to supply customers. Outages are generally therefore taken at times when network loading is lower (this is often during the summer) to prevent constraints from occurring. As network loading increases, this can in some instances reduce the time periods during which outages can be taken to perform maintenance (the "outage window").

If the outage window is restricted too far across a large enough number of sites this could put a strain on the resources available to carry out all of the required maintenance. A potential use case for flexibility is to allow arranged outages to be taken at times of higher loading. The direct benefit of doing this for an individual project may be difficult to quantify, but there would be a clear advantage to expanding the outage window in numerous locations and freeing up maintenance resources at a portfolio level. Similarly to the use of flexibility to reduce network risk, this use case would not be restricted to locations where reinforcement projects are planned.

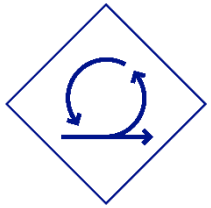
Reducing Curtailment



National Grid DSO has recently launched the "FlexUp" Demand Turn Up (DTU) service as part of our annual long-term tender launched in September 2025. This new flexibility use case is aimed at proactively aligning local demand with periods of high renewable generation, making use of surplus electricity that otherwise could have been wasted. As new generation is brought onto the network in line with the Clean Power 2030 targets, DTU flexibility could be used to reduce export curtailment (reducing costs and carbon emissions) during both normal network running conditions and during outages. The FlexUp initiative has been rolled out to over 50% of NGED's network, expanding market opportunities (in particular for the growing pool of Low Carbon Technologies).

The benefit of the DTU FlexUp service is calculated based on the reduced curtailment it will enable. Similarly, reinforcement projects which add capacity to the network will often also allow for a reduction in generation curtailment. Where this is the case, the impact on curtailment will be incorporated into the CBA carried out for these projects.

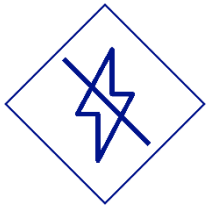
Option Value



When planning to deliver network reinforcement ahead of need, it is acknowledged that there is an inherent level of uncertainty in any future load forecasts. NGED's ED3 Business Plan will consider the impacts of the different DFES scenarios (which cover a range of credible futures) to ensure our investment plans are robust against this uncertainty. Flexibility will be a powerful tool in protecting against this uncertainty, as it can be deployed significantly faster than large scale reinforcement projects. Where flexibility is capable of managing network constraints in the short term, this could also buy time for a more strategic reinforcement project to be completed.

There are a number of ways the option value created through the use of flexibility services could be quantified. The existing CEM CBA tool is built with option value functionality, but it is mainly based around the deferral use case and assessing the different trigger years for reinforcement. If reinforcement is triggered at a later date this naturally increases option value, but also increases network risk. If flexibility is used to manage this increased network risk its benefit could be directly quantified in this way (rather than based on its indirect option value benefit). The quantification of reduced network risk as a benefit of flexibility is discussed in a previous section. This approach allows customers to see the direct impact of flexibility in reducing interruptions to supply and improving network reliability.

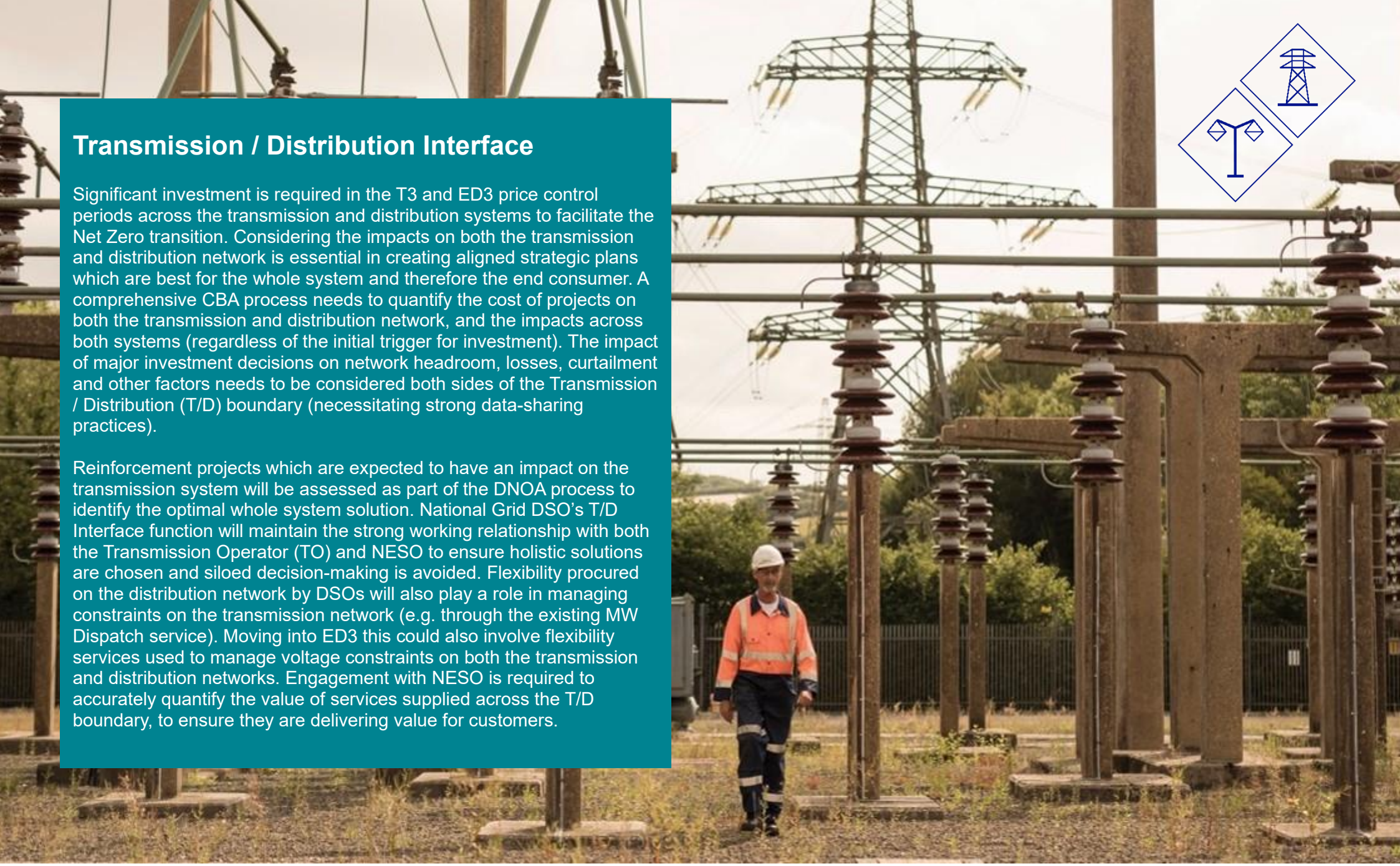
Losses



The energy lost as it passes through the transmission and distribution networks before it gets to customers is known as "technical losses". While network losses could never be eliminated completely, the way we design our network can allow us to reduce them significantly (predominantly by installing larger assets). Minimising losses on the network will be a key component in the push towards a clean energy network and reducing customer's bills. This needs to be achieved not only by incorporating the impact into our overall design principles (such as not installing transformers and cables below a certain size) but also by considering losses on a case-by-case basis in every one of our investment decisions (as set out in NGED's RIIO-ED2 Losses Strategy).

As with the other factors discussed, the first step in incorporating the impact of losses into a robust CBA and Optioneering process is quantifying the difference each investment decision is expected to make. This can be done by modelling the loading on an asset or set of assets throughout their expected lifespan (based on forecasted demand and generation from the DFES). The direct impact of the use of flexibility on losses is relatively low compared to the difference between alternative reinforcement options. In practice this means that the key time when losses need to be considered is when deciding what size of asset should be installed. Regardless of the primary investment driver, the marginal cost of installing larger units is often low. Once a larger asset is installed it will create a reduction in losses across its entire lifetime, reducing costs to customers for decades.

The reduction of losses is not expected to be the primary driver for most of the major investment projects on the network during ED3, but when these projects are planned the impact on losses is significant and cannot be overlooked. The regulator Ofgem has made it clear that losses should be an area of focus in the ED3 price control period, stating that "losses increase with asset utilisation and in this period where demand is growing, it is essential that we look more closely at the role of the regulatory framework in reducing ED losses, as part of a longer term, asset investment strategy".



Transmission / Distribution Interface

Significant investment is required in the T3 and ED3 price control periods across the transmission and distribution systems to facilitate the Net Zero transition. Considering the impacts on both the transmission and distribution network is essential in creating aligned strategic plans which are best for the whole system and therefore the end consumer. A comprehensive CBA process needs to quantify the cost of projects on both the transmission and distribution network, and the impacts across both systems (regardless of the initial trigger for investment). The impact of major investment decisions on network headroom, losses, curtailment and other factors needs to be considered both sides of the Transmission / Distribution (T/D) boundary (necessitating strong data-sharing practices).

Reinforcement projects which are expected to have an impact on the transmission system will be assessed as part of the DNOA process to identify the optimal whole system solution. National Grid DSO's T/D Interface function will maintain the strong working relationship with both the Transmission Operator (TO) and NESO to ensure holistic solutions are chosen and siloed decision-making is avoided. Flexibility procured on the distribution network by DSOs will also play a role in managing constraints on the transmission network (e.g. through the existing MW Dispatch service). Moving into ED3 this could also involve flexibility services used to manage voltage constraints on both the transmission and distribution networks. Engagement with NESO is required to accurately quantify the value of services supplied across the T/D boundary, to ensure they are delivering value for customers.

Timeline

Since the publication of the UK's first DNOA in April 2021 our Optioneering processes have continually evolved to meet the changing needs of our customers. Moving from the RIIO-ED1 price control period into RIIO-ED2 the DNOA became an integral part of the planning process for load related expenditure. Looking forward into the remainder of the RIIO-ED2 period various new use cases for flexibility will be introduced, helping us to manage the distribution network efficiently as demand and generation continues to grow. Moving into ED3 National Grid DSO will fully transition from the current Flexibility vs Reinforcement system into a new Optioneering paradigm focused on quantifying and delivering direct benefits for customers.