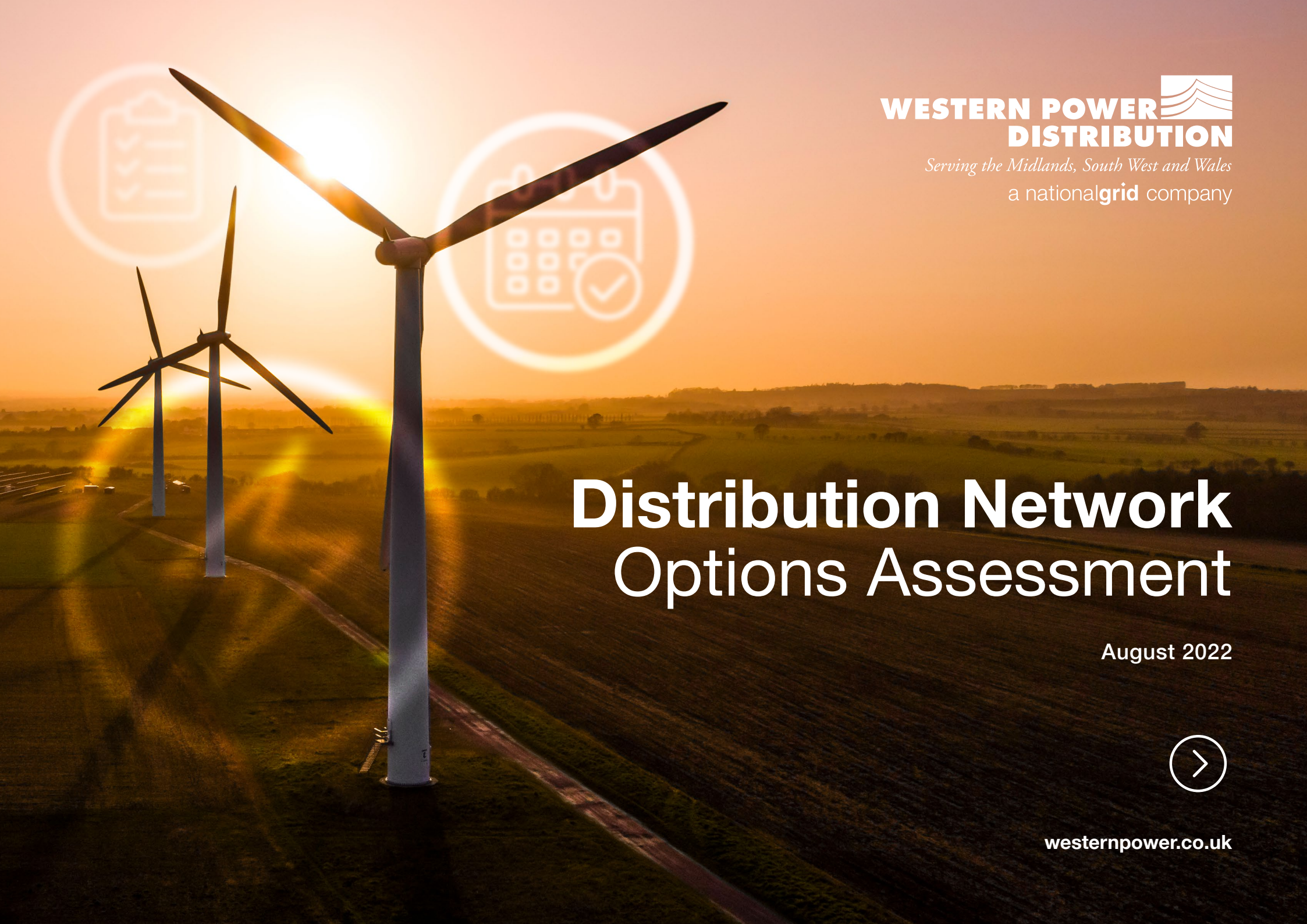

WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

a nationalgrid company

Distribution Network Options Assessment

August 2022

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Foreword

With the government's commitment to end the UK's contribution to carbon emissions by 2050, the role of electricity in helping to facilitate net zero is becoming increasingly important. As our customers shift to electrify their heating and transport needs, our network needs to be smarter and more flexible than ever.

At Western Power Distribution (WPD) we have a strong track record of delivering best in class service and, as we take a more active role in managing the electricity distribution system, we will continue to develop our business and remain at the forefront of Distribution Systems Operations.

Building on our strong background of planning and operating networks, we have been opening opportunities for distributed energy resources to help support our network.

Developing successful markets requires confidence in those opportunities continuing in the future and the market also needs to have transparency in the process and outcomes of our decision making.

This Distribution Network Options Assessment (DNOA) publication outlines our methodology for assessing the use of flexibility to defer conventional reinforcement and how we ensure every investment decision provides optimal value for stakeholders and customers.

As part of our RIIO-ED2 Business Plan we have committed to adopting a 'flexibility first' approach to maximise utilisation of the network. The DNOA process will provide transparency in our approach to meeting this commitment and ensure the optimal investment pathway is taken for all load related expenditure, minimising costs and maximising efficiency.

By providing more information to the growing distribution flexibility market about current and future network requirements across our region, we can help flexibility providers identify the opportunities to support the electricity system and bring forward investment in green technologies.

The decisions made within this DNOA will show how we are optimising our investment to deliver secure, sustainable and affordable electricity to meet the evolving needs of the areas we serve. We welcome any feedback that will help us to push the DNOA even further to drive value and benefit for our customers.

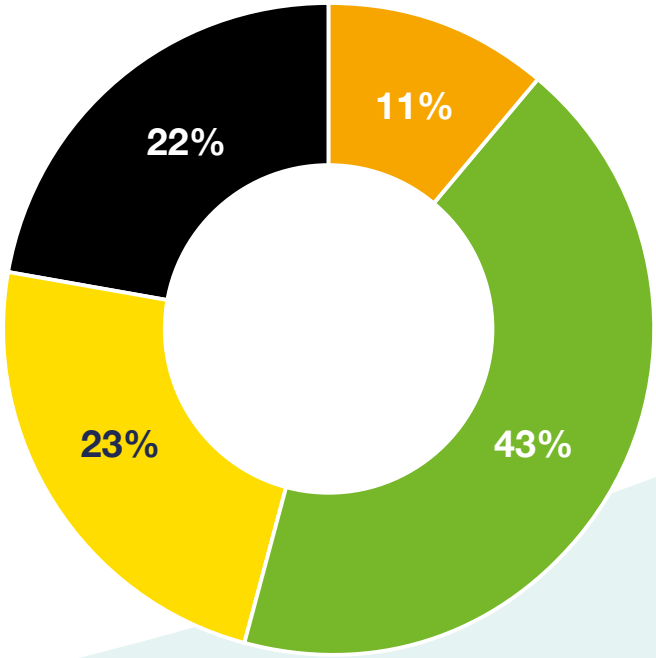
Ben Godfrey
Director of Distribution System Operator

Executive summary

This DNOA report outlines the decisions made using the Common Evaluation Methodology (CEM) Cost Benefit Analysis (CBA) tool on when to defer conventional reinforcement using flexibility services. This analysis was carried out for constraints on the distribution network across WPD's four licence areas to ensure the optimal investment pathway is taken forward based on technical network data, load forecasts and financial inputs.

Below is a summary of the investment decisions reached across the four licence areas. 81 schemes were assessed; 35 in the East Midlands, 14 in the West Midlands, 8 in South Wales and 24 in the South West.

This DNOA assesses potential reinforcement schemes with a combined cost of over £271m.



Total schemes assessed	81
Flexibility	35
Reinforce	18
Reinforce with Flexibility	19
Signposting	9
Remove	0

Flexibility

Flexibility indicates a decision to procure flexibility or to maintain the flexibility contracts currently in place to defer reinforcements.

Reinforce

Reinforce indicates a decision to pursue traditional network reinforcement immediately.

Reinforce with flexibility

Reinforce with flexibility is when reinforcement is set to begin immediately (or is already underway), but flexibility is required to deal with the constraint in the interim.

Signposting

Signposting signals a decision to inform potential providers of future flexibility requirements whilst the need requirement is monitored.

Remove

Remove signals a decision to remove the scheme from consideration in future DNOAs. All schemes will be re-assessed in future DNOAs until there is no option value left to realise.

Executive summary

This report explains the methodology and data sources for the investment decisions on our network, including how the DNOA fits into the wider load related expenditure planning process. A summary of the investment decisions made is also provided below, with more in-depth information for individual schemes available on WPD's website and on the Connected Data Portal.

Reinforcement and flexibility both have important parts to play in the efficient and economic development of the distribution system. This DNOA has both forwards and backwards looking elements when considering flexibility.

Looking backwards
Looking backwards identifies the proposed CMZ closure dates based on the DNOA decision and the outcome of flexibility tenders. A proposed CMZ closure date earlier than the CBA recommends occurs where flexibility is not available.

Looking forwards
Looking forwards identifies the proposed intervention technique using estimated flexibility market information.

Table 1: Summary of investment decisions in the East Midlands

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Wigston	Wigston BSP group demand is close to requiring N-2 restoration under P2/7.	2026+	2026	2026+	Signposting
Bradwell Abbey – Newport	Loss of the BA - NP/Hanslope Park circuit results in the Newport Pagnell demand and half the Fox Milne demand being supplied by the other 33 kV circuit.	2026+	2026+	2026+	Signposting
Milton Keynes East	Stony Stratford, Bletchley and Bradwell Abbey BSPs are near their firm capacities.	2026+	2026+	2026+	Signposting
Ashby	The Gresley-Moira 33 kV circuit are close to their firm capacity.	2026+	2026+	2026+	Signposting
Apollo – Tamworth	Apollo 33/11 kV Primary has limited capacity for an N-1 fault outage.	2026+	2022	2022	Flexibility
Chesterfield Main	The Chesterfield-Grassmoor 33 kV circuits have limited capacity for an N-1 circuit outage.	2026+	2022	2022	Flexibility
Clowne	Capacity at Clowne Primary is limited by the 11 kV backfeeds.	2022	2022	2022	Reinforce with flexibility
Coalville	FCO condition for a fault on one of the GTs at Coalville BSP could overload the remaining transformer.	2023	2022	2022	Reinforce with flexibility
Grassmoor	Grassmoor 33/11 kV Primary has limited capacity for an N-1 outage on one of the transformers.	2026+	2022	2022	Flexibility

Executive summary

Table 1: Summary of investment decisions in the East Midlands

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Hinckley	Hinckley 132/11kV Primary is out of N-1 firm capacity due to a new connection.	2026+	2022	2022	Flexibility
Alfreton	Meadow Lane 33/11kV Primary is limited by N-1 firm capacity.	2026+	2022	2022	Flexibility
Nailstone	The 33/11 kV transformers at Nailstone Primary are close to their firm capacities for an N-1 fault.	2022	2022	2022	Flexibility
Tamworth Main	The 33/11 kV transformers at Tamworth Primary are close to their firm capacities for an N-1 fault.	2022	2022	2022	Flexibility
Union Street – Rugby	The 33/11 kV transformers at Union Street Primary are close to their firm capacities for an N-1 fault.	2022	2022	2022	Flexibility
Woodbeck	Capacity at Woodbeck Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Weedon	Capacity at Weedon Primary is limited by the 11 kV backfeeds.	2022	2022	2022	Flexibility
Hawton	Generation related constraint on the Hawton tee – Hawton 132 kV circuits.	2022	2022	2022	Flexibility
Lincoln – Anderson Lane	Demand on the Lincoln – Anderson Lane T1 circuit under FCO is over the rating of the circuit.	2023	2022	2022	Reinforce with flexibility
Berkswell SGT	N-2 SGT capacity at Berkswell GSP.	2022	2022	2022	Reinforce with flexibility
Loughborough	Constraint on the circuits from Ratcliffe to the Loughborough tee during the transfer of Coalville and Hinckley 11 kV into Ratcliffe.	2026+	2022	2022	Flexibility
Mackworth	Voltage limiting firm capacity of Mackworth Primary due to lack of automatic on-load tap changers.	2023	2022	2022	Reinforce with flexibility
Manton	Manton 33/11 kV Primary has limited capacity for an N-1 outage on one of the transformers.	2022	2022	2022	Reinforce with flexibility

Executive summary

Table 1: Summary of investment decisions in the East Midlands

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
New Dove Valley	Additional load cannot be accommodated at Hatton Primary.	2025	2022	2022	Flexibility
Ilkeston	Ilkeston 33/11 kV Primary has limited capacity for an N-1 outage on one of the transformers.	2026+	2022	2022	Flexibility
Grendon – Corby 132 kV	132 kV circuits from Grendon to Corby constrained under N-2 conditions for both demand and generation.	2026+	2022	2022	Flexibility
Sharnbrook	Capacity at Sharnbrook Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Coventry	Fault level restriction at Coventry GSP.	2026	-	-	Reinforce
Willington	Fault level restriction at Willington GSP.	2026	-	-	Reinforce
Rugby	Fault level restriction at Rugby BSP.	2025	-	-	Reinforce
Clipstone	Complexity issue on the Clipstone 33 kV network.	2025	-	-	Reinforce
Regent Street	Multiple site issues; transformer compound wall and canal bridge crumbling (canal bridge contains 11kV transformer tails).	-	-	-	Reinforce
Newton Road	Fault level restriction at Newton Road 11 kV.	-	-	-	Reinforce
Staveley 11 kV	Fault level restriction at Staveley 11 kV.	-	-	-	Reinforce
Nottingham North	Fault level restriction at Nottingham North 11 kV.	-	-	-	Reinforce
Wolverton	Fault level restriction at Wolverton 11 kV.	-	-	-	Reinforce

Executive summary

Table 2: Summary of investment decisions in the West Midlands

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Bushbury	Forecast constraint at Bushbury 132/11 kV for the loss of one of the three transformers.	2026+	2026	2026+	Signposting
Madeley	Madeley 33/11 kV Primary has limited capacity for an N-1 outage on one of the transformers.	2026+	2026+	2026+	Signposting
Smethwick	Forecast constraint at Smethwick 132/11 kV for the loss of one of the three transformers.	2026+	2026+	2026+	Signposting
Brimscombe	Voltage issues for an outage on one of the Ryeford circuits and Dudbridge Primary is also reaching its firm capacity.	2023	2022	2022	Reinforce with flexibility
Hereford – Ledbury Ring	Voltage issue for an outage on one of the infeeds to the Hereford 66 kV ring.	2023	2022	2022	Reinforce with flexibility
Feckenham South	Voltage issue for an outage on one of the circuits in the Feckenham South 66 kV network.	2023	2022	2022	Reinforce with flexibility
Hereford BSP	Hereford BSP has limited capacity for an N-1 outage on one of its 132/66 kV transformers.	2023	2022	2022	Reinforce with flexibility
Kitwell	Fault level restriction on the 132 kV circuit breakers at Kitwell GSP.	2024	-	-	Reinforce
Wolverhampton	Fault level restriction on the 33 kV switchgear at Wolverhampton BSP.	2024	-	-	Reinforce
Halesowen	Fault level restriction at Halesowen 11 kV.	2024	-	-	Reinforce
Sutton Coldfield	Fault level restriction at Sutton Coldfield 11 kV.	2024	-	-	Reinforce
Coseley	Fault level restriction at Coseley 11 kV.	2024	-	-	Reinforce
Cheapside	Fault level restriction at Cheapside 11 kV.	2023	-	-	Reinforce
Tividale	Fault level restriction on the 11 kV circuit breakers at Tividale Primary.	2024	-	-	Reinforce

Executive summary

Table 3: Summary of investment decisions in South Wales

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Abergavenny – Crickhowell	Either of the 66 kV circuits from Abergavenny is close to becoming overloaded following an N-1 circuit outage.	2026+	2026+	2026+	Signposting
Llandrindod – Rhayader	Voltage issue for a fault on the 66 kV circuits from Builth Wells.	2026+	2022	2022	Flexibility
Pembroke	Pembroke South - Broadfield 33 kV circuit and connected Primary substation drop below the statutory voltage limit for the N-1 of the Golden Hill - St Florence 33 kV circuit.	2022	2022	2022	Reinforce with flexibility
Trevaughan	Additional load cannot be accommodated at Trevaughan Primary.	2023	2022	2022	Reinforce with flexibility
East Aberthaw	Limited N-2 restoration capacity for the loss of both GTs at Brynhill BSP.	2023	2022	2022	Reinforce with flexibility
Mountain Ash	Mountain Ash GT2 projected to become overloaded for a split which is carried out for an outage on an SGT at Upper Boat GSP.	2023	2022	2022	Reinforce with flexibility
Aberaeron	Capacity at Aberaeron Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Llanfyrnach	Capacity at Llanfyrnach Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility

Executive summary

Table 4: Summary of investment decisions in the South West

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Western Approach	Western Approach 33/11 kV Primary has limited capacity for an N-1 outage on one of the transformers.	2023	2023	2023	Signposting
Plymouth/South Hams	Multiple complex 132 kV network constraints.	2026+	2022	2022	Flexibility
Exeter City	Exeter City BSP has limited capacity for an N-1 outage on one of its 132/33 kV transformers.	2024	2022	2022	Flexibility
Bridgwater/Street	N-2 requirement for the Bridgwater/Street group.	2022	2022	2022	Reinforce with flexibility
Hayle – Camborne	The outage of the Rame-Hayle 132 kV circuit overloads the 132 kV circuit between Indian Queens-Fraddon-Camborne.	2024	2022	2022	Flexibility
Moretonhampstead	Capacity at Moretonhampstead Primary is limited by the 11 kV backfeeds.	2022	2022	2022	Reinforce with flexibility
Tiverton	Tiverton BSP has limited capacity for an N-1 outage on one of its 132/33 kV transformers.	2023	2022	2022	Flexibility
Taunton GSP	Constraint was for N-2 restoration for the loss of any of the SGTs at Taunton GSP or Bridgwater GSP.	2022	2022	2022	Flexibility
Weston Super Mare	Weston BSP has limited capacity for an N-1 outage on one of its 132/33 kV transformers.	2024	2022	2022	Flexibility
Witheridge	Capacity at Witheridge Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Roundswell	Roundswell 33/11 kV Primary has limited capacity for an N-1 outage on one of the transformers.	2022	2022	2022	Reinforce with flexibility

Executive summary

Table 4: Summary of investment decisions in the South West - continued

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Truro – Truro Treyew	Truro-Truro Treyew Road 4L5 33 kV circuit becomes overloaded for the loss of the Truro 1L5 and 3L5 circuits.	2023	2022	2022	Reinforce with flexibility
East Yelland	East Yelland BSP has limited capacity for an N-1 outage on one of its 132/33 kV transformers.	2026+	2022	2022	Flexibility
Hemyock	Capacity at Hemyock Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Mullion	Capacity at Mullion Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Stokenham	Capacity at Stokenham Primary is limited by the 11 kV backfeeds.	2024	2022	2022	Flexibility
Laneast	Capacity at Laneast Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Gunnislake	Gunnislake 33/11 kV Primary has limited capacity for an N-1 outage on one of the transformers.	2023	2022	2022	Reinforce with flexibility
Countess Wear	Capacity at Countess Wear Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Probus	Capacity at Probus Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Morwenstow	Capacity at Morwenstow Primary is limited by the 11 kV backfeeds.	2026+	2022	2022	Flexibility
Chewton Mendip	Capacity at Chewton Mendip Primary is limited by the 11 kV backfeeds and the transformer rating.	2026+	2022	2022	Flexibility
Exeter Main	Fault level restriction at Exeter Main GSP.	2025	-	-	Reinforce
Indian Queens	Fault level restriction at Indian Queens GSP.	2026	-	-	Reinforce

Document overview

The strategic network planning process

WPD produces a number of publications on the future of electricity across the Midlands, South West and South Wales. The Distribution Future Energy Scenarios (DFES) provides data on the predicted growth in demand and generation across the four licence areas on an annual basis.

Forecasting

The **Distribution Future Energy Scenarios (DFES)** identify how customers will use out network in future.

Network Impact Assessment

The **Network Development Plan (NDP)** uses forecasts to analyse and identify future network constraints.

Optioneering

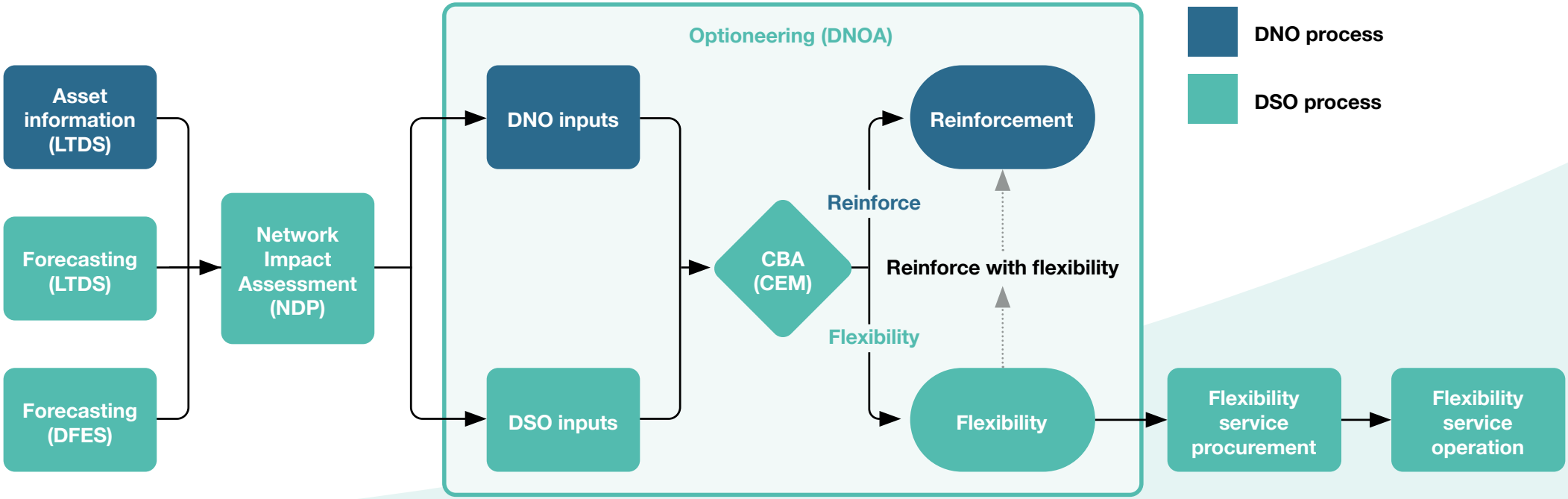
The **Distribution Network Options Assessment (DNOA)** outlines how we plan to invest in out network to solve constraints.

This scenario growth data facilitates the identification of areas on the network where constraints are expected through network impact assessment. This is carried out as part of WPD's Network Development Plan (NDP) published every two years, and as part of routine studies of the distribution network conducted by engineers.

Conventional reinforcement solutions are then developed, taking into consideration WPD's network asset data and the load forecasts from the DFES process to ensure the solution is enduring, efficient and strategic. These conventional reinforcement solutions are then assessed against the use of flexibility as part of the DNOA process.

The strategic network planning process

WPD's overall DNOA process from forecasting through to procurement is shown in the figure below. This process is carried out every six months to look forward and identify which constraints should have services procured to help mitigate them, as well as looking backwards to ensure they continue to provide value.

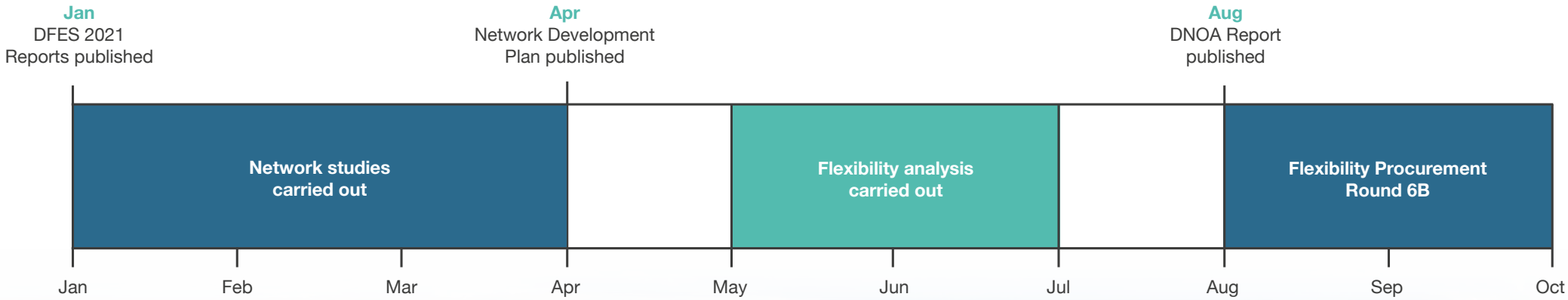


DNOA process timeline

The DNOA outcomes are published twice a year in February and August. This is based on the latest DFES data published each year, with existing schemes being reassessed periodically to ensure the investment pathway remains optimal. Any new constraints identified on the network are also assessed in the DNOA process.

After each procurement cycle WPD checks that sufficient flexibility is available to manage each constraint. This will determine whether procurement will be needed in the next cycle (or if reinforcement should be triggered due to insufficient flexibility availability).

The DNOA process repeats every six months. The processes and reports leading up to this iteration of the DNOA are shown in the timeline below, from forecasting through to the upcoming flexibility procurement round.



DFES overview

Using local planning data, demand pipeline data and local engagement, a range of credible future scenarios are created that predict growth across WPD's four licence areas over the next 30 years down to the Electricity Supply Area (ESA) level.

For this DNOA the data used has been taken from the DFES for all four licence areas. The four base DFES scenarios are Consumer Transformation, Leading the Way, Steady Progression and System Transformation.

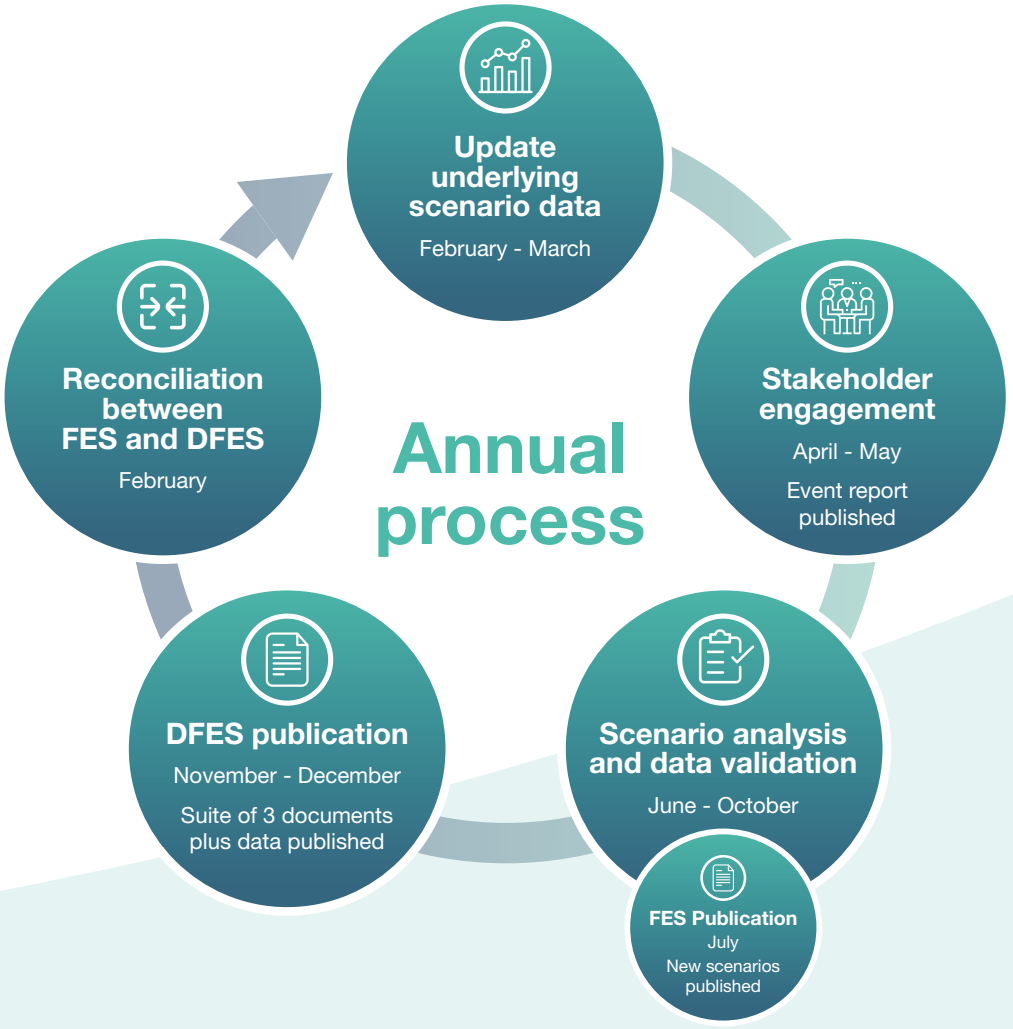
These four base scenarios encompass divergent levels of societal change and speeds of decarbonisation. The forecasting methodology used here is aligned with National Grid's Future Energy Scenarios (FES) and the projections made by other Distribution Network Operators (DNOs).

The DFES report is published once a year, with the scenarios changing to reflect the direction the energy landscape has taken, any legislative changes that have been revealed and expected customer behaviour driving increased growth rates.

Stakeholder engagement is held to get input on the approach and scenarios considered. Finally, the FES and DFES are reconciled to ensure a consistent picture. These steps form a feedback loop that acts as an annual process to continually improve upon the DFES as shown on the right.

A more comprehensive description of the DFES process can be found on the DFES page on the WPD website:

www.westernpower.co.uk/distribution-future-energy-scenarios-regional-information



Defining a WPD Best View

By amalgamating the four base scenarios, a fifth scenario is created which represents WPD's expectation of the most likely future growth, called WPD Best View, which is used to inform investment decisions.

To derive the WPD Best View, WPD uses an iterative process. DFES data and previous Best View data is used to support stakeholder and Local Area engagement, which then allows the quality of Local Area Energy Plans to be assessed using criteria derived from Ofgem guidance to gauge their ambition, engagement and deliverability.

The assessment is carried out by WPD's senior regional managers, scoring against the criteria matrix and a Local Area specific DFES scenario is selected.

The DFES scenario is chosen by closely comparing the ambition of the planned volumes across all technology types within the area, and then further ranked on how close this ambition is likely to be to the needs of stakeholders (engagement completed), how accurate the modelling is and the capability of the area to deliver.

A single DFES scenario is currently chosen to approximately represent all technologies, but there is scope in the future for differentiation between expected uptakes of technologies to also be simultaneously assessed. This process enables the scenario volumes to be summated up to a licence area level, checked against WPD strategic views of development and a new WPD Best View can then be delivered.

Before the WPD Best View is finalised, the licence area totals are checked against national ambition to ensure WPD targets are aligned to deliver government policy. Scenario boundaries across the rankings may be moved to more closely align, assuming incentives and policy is directed at achieving national net zero ambitions. Each Primary substation also receives a disaggregation of this "WPD Best View" which is used to inform the growth rates required for planning investment across the network.

Constraint identification

The load forecasts created as part of the DFES process are used to carry out network studies in order to identify any current or future constraints on the distribution network across WPD's four licence areas.

Comprehensive electrical analysis is carried out using load flow studies for each possible outage combination. This analysis is carried out for each of the five DFES scenarios for half-hours of peak loading across a number of seasons for both the existing and future network.

This process identifies where intervention is required to maintain compliance with WPD's obligations and keep the network safely operating within its technical limits.

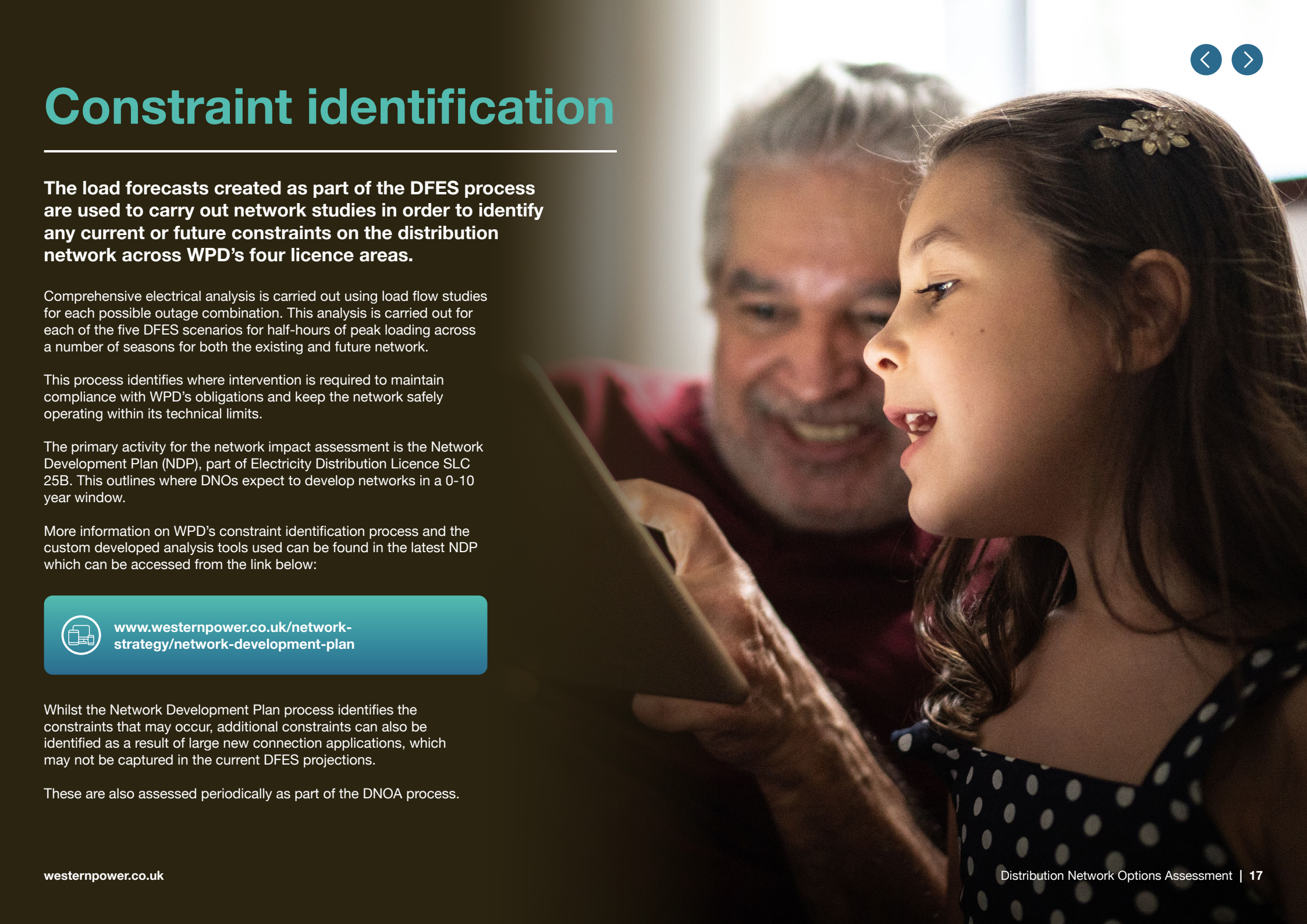
The primary activity for the network impact assessment is the Network Development Plan (NDP), part of Electricity Distribution Licence SLC 25B. This outlines where DNOs expect to develop networks in a 0-10 year window.

More information on WPD's constraint identification process and the custom developed analysis tools used can be found in the latest NDP which can be accessed from the link below:

www.westernpower.co.uk/network-strategy/network-development-plan

Whilst the Network Development Plan process identifies the constraints that may occur, additional constraints can also be identified as a result of large new connection applications, which may not be captured in the current DFES projections.

These are also assessed periodically as part of the DNOA process.



Flexibility analysis

Once a constraint has been identified (either through the NDP process or during a routine study of an area of the distribution network carried out by one of WPD's engineers) options for managing the constraint are then assessed.

Various traditional reinforcement options are evaluated to find the most cost-effective solution. This may not be the cheapest option, as the solution will need to be enduring and strategic (often multiple constraints can be alleviated using a single intervention). The cost for the optimal reinforcement scheme is then taken forward to the CBA.

In accordance with WPD's 'flexibility first' commitment in the RIIO-ED2 Business Plan all load related expenditure is assessed against flexibility. The first step in this process involves identifying constraints which are unsuitable for mitigation using flexibility (such as fault-level constraints). All load related constraints where deferral of expenditure using flexibility is deemed possible are then taken forward to the next stage of flexibility analysis.

In order to carry out a CBA on the use of flexibility against conventional reinforcement, the volume of flexibility required to manage the constraint each year needs to be calculated. This is done using WPD's custom built Flexibility Analysis Tool.

This tool takes a load profile recorded from the network over multiple years and plots it against the network capacity for each season. The network capacity is usually the thermal ratings for each season of the limiting asset under the most onerous outage condition, but for more complex constraints load flow analysis is required to understand how load may be split between multiple assets/sites.

The tool takes load growth coefficients from the DFES process along with data on accepted customer connections to assess when and by how much the loading on the network is expected to exceed the capability of the assets over the next five years for each scenario.

This is then used by the tool to calculate the volumes of flexibility required to manage the constraint each year and scenario (including any over-procurement deemed necessary to mitigate the risk of the network's needs not being met).

These volumes for each flexibility scheme are then taken forward into the CBA.

Common Evaluation Methodology

To improve transparency in how DNOs reach decisions regarding flexibility procurement and the potential to delay conventional reinforcement, a Common Evaluation Methodology (CEM) CBA tool was created by Baringa Partners. This tool is used to assess the net benefit of flexibility against a baseline of conventional reinforcement for each of the four base scenarios plus WPD Best View over a number of years.

The economic analysis is based on the Time Value of Money whereby delaying reinforcement costs creates a significant economic benefit. If this benefit is greater than the cost of flexibility required during the deferral period, then flexibility procurement is deemed the optimal solution and could create savings that can be passed on to customers and stakeholders.

The amount of flexibility availability and utilisation projected to be required to manage a given constraint is taken from WPD's Flexibility Analysis Tool and input into the CEM CBA tool.

The cost of flexibility availability and utilisation is then used to calculate the total cost of the flexibility required each year and scenario. The costs associated with the optimal reinforcement solution identified by WPD are fed into the CEM CBA tool to provide a baseline against which flexibility is assessed.

Additional functionality within the tool also for consideration of losses and other carbon and societal impacts. This functionality will be utilised further in future DNOA tranches.

By cultivating greater transparency in the decision making process and providing robust justifications for the investments made on the network, customers can be assured that their money is being utilised effectively.

Flexibility providers will also be able to plan more effectively for the future in terms of the flexibility they wish to deliver. This will help encourage a more competitive market for flexibility to develop, resulting in further savings for customers.

More information regarding the CEM CBA tool can be found on the Energy Networks Association's website:

www.energynetworks.org/industry-hub/resource-library/

Reinforcement options

Reinforcement schemes aimed to alleviate constraints on the network can involve replacing a number of different assets, or installing new assets. Most conventional reinforcement will involve some combination of the four options below.

- **Build new circuits**
- **Upgrade existing circuits**
- **Build a new substation**
- **Reconfigure existing substation**

Circuit installations and upgrades can involve replacing or installing overhead line conductors and/or underground cables for 11 kV, 33 kV, 66 kV or 132 kV circuits.

Substations considered for reinforcement include Primary substations, Bulk Supply Points (BSP) and Grid Supply Points (GSP).

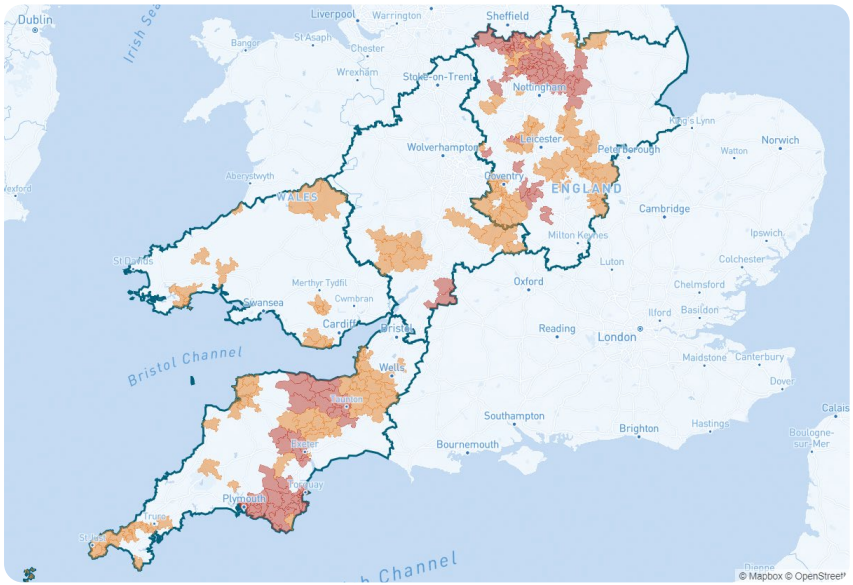
Other options for managing constraints include System Voltage Optimisation (SVO), STATCOMs for reactive power management and other innovative solutions.

In areas where multiple complex constraints are affecting a number of customers over a long period of time, Active Network Management (ANM) can also be implemented.

Flexibility services

WPD has always used the flexibility inherent in the distribution network to provide economic and secure supply ahead of undertaking conventional reinforcement. For the past few years this has also included market-provided flexibility.

This flexibility is sought following a six monthly procurement cycle in areas triggering load related reinforcement. These areas are known as Constraint Management Zones (CMZs), the figure below shows these areas as of July 2022. To give providers and operators of flexibility services advanced notification of future needs, signposting information is provided for a five year window for each area on the network with forecasted constraints.



More information on our use of flexibility and any future developments can be found in our Distribution Flexibility Services Procurement Statement:

www.westernpower.co.uk/distribution-flexibility-services-reporting

The three main flexibility products offered to providers are standardised across the industry:

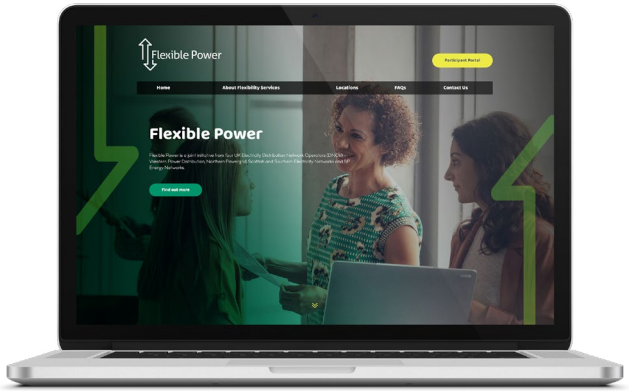
Secure
Used to manage peak demand loading on the network to pre-emptively reduce network loading.

Dynamic
Developed to support the network in the event of specific outage conditions, namely maintenance work.

Restore
Supports power restoration following rare fault conditions.

Flexible Power

The customer-facing brand for flexibility services established by WPD in 2017 is known as Flexible Power. The Flexible Power website allows businesses to confirm their eligibility for flexibility products and to begin the procurement process.



This process involves registering to be added to WPD's dynamic purchasing system, responding to a tender, setting up the API comms link required to receive stop/start signals, using the participant portal to declare asset availability and then receiving payments for utilised availability on a monthly basis.

Find out more at: **www.flexiblepower.co.uk**

Interpretation of DNOA outcomes

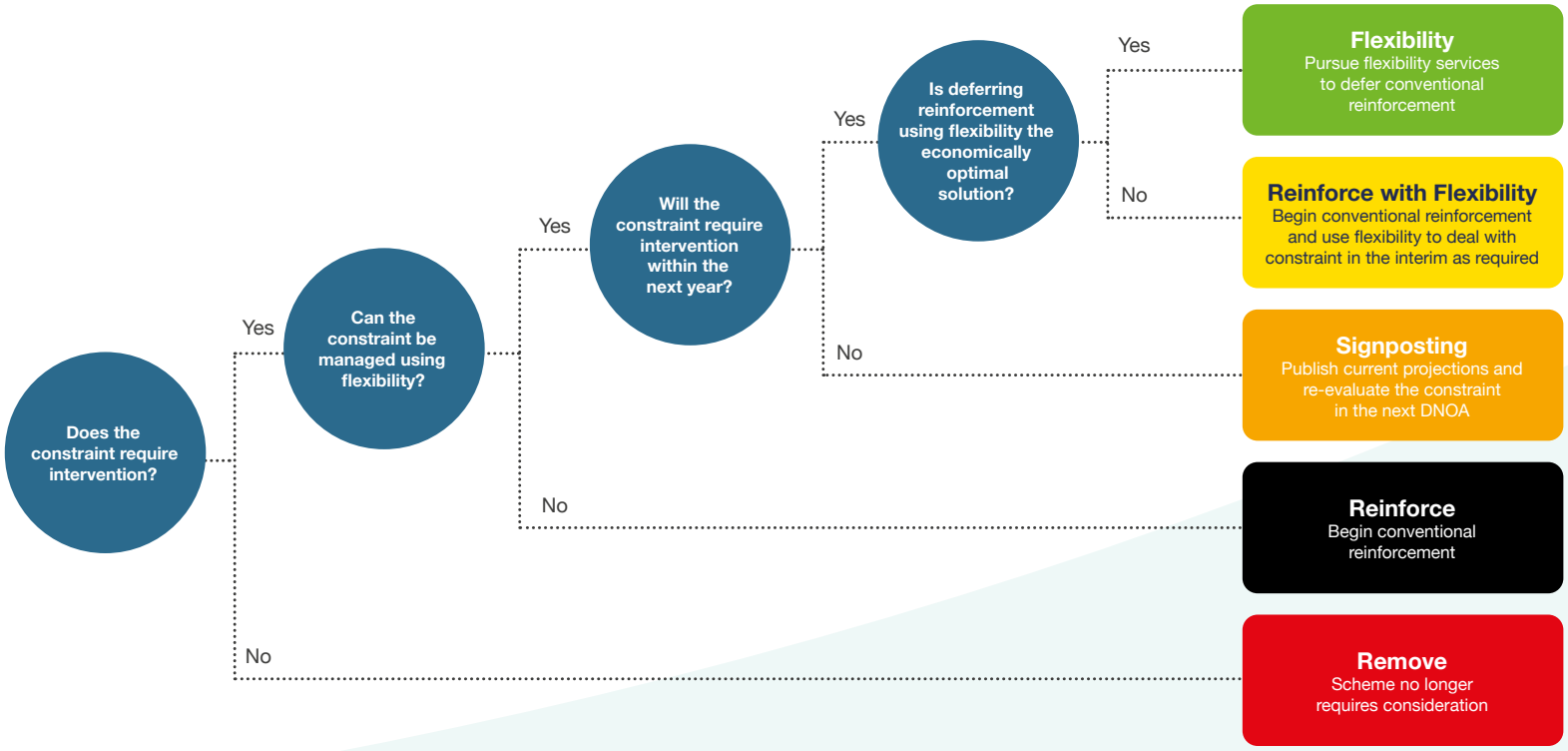
The investment decisions taken for each scheme across WPD's four licence areas are given in the scheme pages on the DNOA page on WPD's website, along with information on the proposed reinforcement schemes and CBA results showing across which years and which scenarios flexibility procurement is the optimal economic choice. This section outlines what information is reported on these scheme pages and how it should be interpreted.

The decision tree to the right demonstrates the different choices our analysis can lead to. Firstly, the schemes that do not require any intervention are removed from future DNOAs (usually because reinforcement works have been completed).

Among the schemes which do require intervention, if the constraint cannot be managed using flexibility then reinforcement is pursued. If the constraint can be managed using flexibility but no intervention is required within the next year signposting is published.

The schemes which require flexibility services within the next year undergo CBA in order to determine whether flexibility should be used to defer reinforcement.

If CBA indicates reinforcement should not be deferred, reinforcement works will begin as soon as possible (if they have not already begun). For these schemes flexibility is used as required to manage the constraint and provide additional network security before the reinforcement is completed.



Interpretation of DNOA outcomes

Scheme description
For each scheme presented in this DNOA the description will outline the constraint on the network that is being addressed, along with an overview of the proposed or ongoing reinforcement works to deal with said constraint.

For reinforcement schemes that are currently underway, the expected completion data will be given.

For reinforcement works that have not begun yet, the time it would take to complete said works is given in the EPRC.

EPRC: Earliest Possible Reinforcement Completion
This date shows when conventional reinforcement could be completed by if it were to begin immediately. For projects that have already begun, the expected end date is given.

If reinforce or reinforce with flexibility are chosen, this will reflect when the reinforcement will be completed in reality. If flexibility or signposting are chosen this date will not reflect the actual reinforcement completion timeline, as deferral will be taking place.

Scenario Key:

BV: Western Power Distribution's Best View

CT: Consumer Transformation

LTW: Leading the Way

ST: System Transformation

SP: Steady Progression

Optimal flexibility duration
For each scenario the years flexibility is expected to be required are shown.

The start of this period will be triggered when the constraint begins to need management and usually end with reinforcement.

Estimated flex utilisation required per year table
The estimated flex utilisation required per year for every scenario is given for each scheme in MWh.

This should give an idea of the expected annual flexibility energy requirements across the optimal flexibility duration for each scenario. For more detailed data on this, a link to the Flexible Power website page for each scheme is provided.

Constraint management timeline
The constraint management timeline shows what decision has been made for each scheme in each procurement cycle from when the scheme was created up to the upcoming procurement cycle.

Justification for decision
For each scheme the reasoning behind the DNOA decision is explained. For schemes where flexibility is an option, this decision is usually driven by the CBA; if this is not the case then this will be discussed.

For reinforce schemes, the reason why flexibility is not viable will be given. Likewise, for remove schemes, the reason why the constraint no longer needs intervention will be provided (e.g. reinforcement works have been completed).

Other information
Also provided is the season (or seasons) the constraint being addressed is expected to arise (and therefore the season in which flexibility services are required) and the flexibility product expected to be utilised (secure or dynamic).

For signposting schemes the flexibility product may change closer to procurement to ensure the network's requirements are met. Alongside the secure and dynamic products, the restore product will also be used.

Stakeholder engagement

We want to hear your views on the DNOA process and our report format as feedback from stakeholders will be valuable in shaping future publications.

In order to do this we aim to collect feedback after every publication and use this to improve the DNOA process and ensure the data we publish is relevant and valuable. A number of questions on the DNOA process can be found on WPD's website:

www.westernpower.co.uk/distribution-network-options-assessment

We are keen to get your feedback

It is important that we get a broad range of stakeholders' opinions and we are keen to get your feedback.

Responses should be returned to:
Network Strategy Team
Western Power Distribution
Feeder Road
Bristol
BS2 0TB

Or emailed to:
wpdnetworkstrategy@westernpower.co.uk

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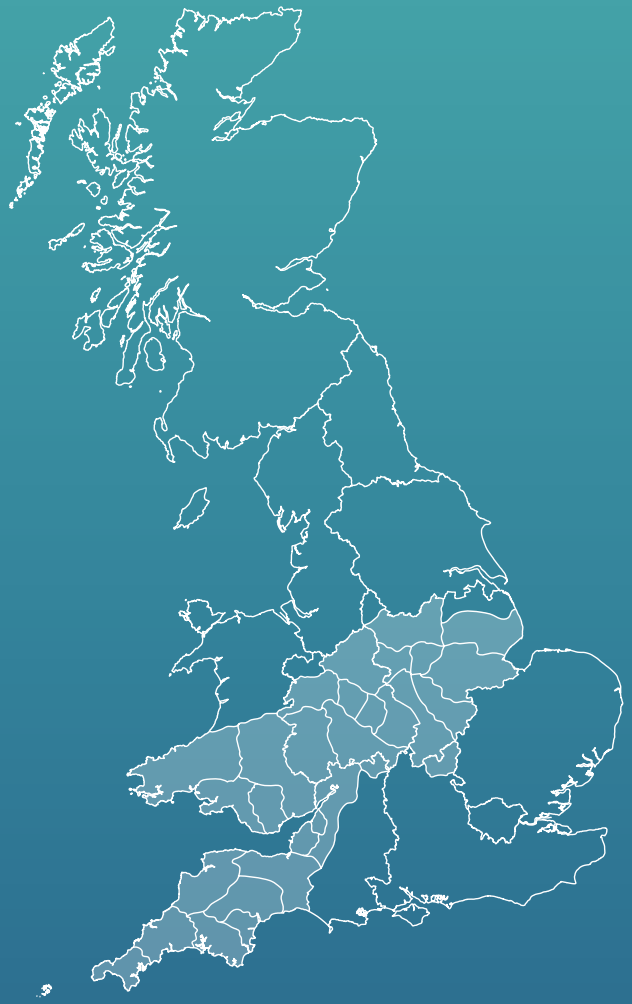

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