A photograph of two people in an office setting. One person, wearing a blue and red striped shirt, is pointing at a computer monitor. Another person is pointing at a desk. On the desk, there is a white hard hat, a calculator, a ruler, and an open notebook. The background shows a large window with a view of a city.

Distribution Network Options Assessment

March 2021

Foreword

With the Government's commitment to end the UK's contribution to carbon emissions by 2050, and the announcement of a ten point plan for a green industrial revolution, 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 will need to be smarter and more flexible than ever.

At Western Power Distribution 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 also requires confidence in those opportunities continuing in the future and the market needs to have transparency in the process and outcomes of our decision making.

Building on other WPD publications improving transparency, this Distribution Network Options Assessment (DNOA) outlines the decisions made to meet the future needs of the distribution network in the Midlands, South Wales and the South West over the next few years.

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.

A smarter network needs smarter decisions: this first DNOA outlines the options considered to provide the best consumer value in investments made on the distribution network.

The DNOA methodology describes how investment decisions are informed by the Distribution Future Energy Scenarios (DFES), and how cost-benefit analysis is employed to determine the optimal investment path.

The decisions made within this DNOA will show how we are optimising our investment to deliver secure, sustainable and affordable electricity to meet the changing 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
Distribution System
Operator Manager

Executive Summary

During 2020, the ENA's Open Networks developed and delivered a tool for all DNOs to use in evaluating future investment decisions. The Common Evaluation Methodology (CEM) tool uses financial, forecasting and technical network inputs to understand the costs involved across a number of different future outcomes. These can be compared to choose the optimal investment pathway and, most importantly, can provide a transparent rationale for choosing that pathway.

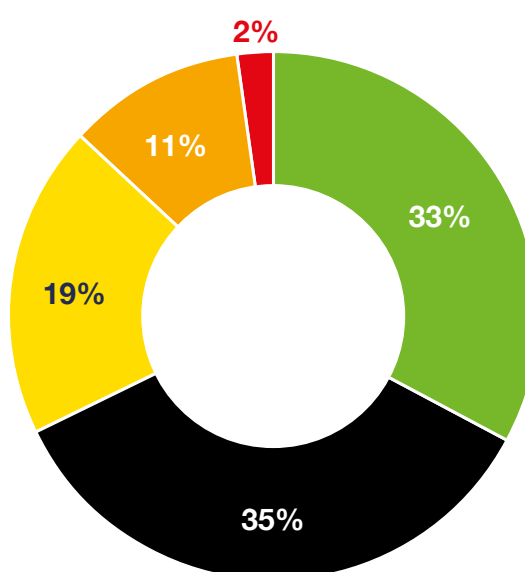
Below is a summary of the investment decisions reached across the 4 license areas. 96 schemes were assessed; split between 41 in the East Midlands, 19 in the West Midlands, 9 in South Wales and 27 in the South West.

This DNOA assesses potential reinforcement schemes with a combined cost of over £274m. The total cost of flexibility procurement over the 5 year period considered in this DNOA is predicted to be £9.3m. Flexibility indicates a decision to procure flexibility or to maintain the flexibility contracts currently in place to defer reinforcement.

Reinforce indicates a decision to pursue traditional network reinforcement immediately. Reinforce with flexibility is when reinforcement is set to begin immediately, but flexibility is required to deal with the constraint in the interim.

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

	Total Schemes Assessed	96
	Flexibility	32
	Reinforce	34
	Reinforce with Flexibility	18
	Signposting	10
	Remove	2



Proposed CMZ Closure



The year when flexibility services will no longer be required following successful completion of the conventional reinforcement.

Flexibility Start Year



The first year that flexibility is required to address a constraint, under WPD Best View and the other DFES scenarios.

DNOA Decision

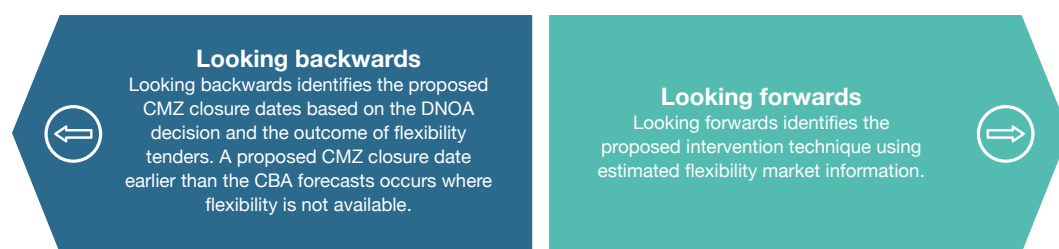


The outcome recommended by this iteration of the DNOA to manage each constraint most economically. These different possible outcomes are described above.

Executive Summary

How to use this document

The DNOA explains the methodology, information used and outcome for the investment decision on our network. Reinforcement and flexibility both have a part to play in the efficient and economic development of the distribution system. This DNOA has both forwards looking and backwards looking elements when considering flexibility.



Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Wigston	Wigston 132/33kV BSP and 132/11kV PSS group demand almost requires a P2 N-2 restoration requirement.	2025+	2025	2024 - 2025+	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 33kV circuit.	2025+	2025+	2025+	Signposting
Milton Keynes East	Load exceeds transformer rating at Milton Keynes East BSP.	2025+	2025+	2025+	Signposting
Ashby	Gresley-Moira 33kV circuit are close to their firm capacity.	2025+	2023	2022 - 2025+	Signposting
Woodhall Spa	Woodall Spa PSS was exceeding the N-1 firm capacity which was limited by 11kV back feeds.	2020	2021	2021	Flexibility
Lincoln - North Hykeham	Lincoln - North Hykeham 33kV circuit is currently overcommitted with demand.	2021	2021	2021	Reinforce with flexibility
Lincoln - Beevor Street	Lincoln - Beevor Street 33kV circuit is currently overcommitted with demand.	2021	2021	2021	Reinforce with flexibility
Mantle Lane	One of the 33kV circuits between Coalville BSP and Mantle Lane becomes overloaded for an N-1 circuit outage.	2021	2021	2021	Reinforce with flexibility
Apollo - Tamworth	Apollo 33/11kV PSS has limited capacity for an N-1 circuit outage.	2025+	2021	2021	Flexibility
Chesterfield Main	Chesterfield-Grassmoor 33kV circuits have limited capacity for an N-1 circuit outage.	2025+	2021	2021	Flexibility
Clowne	Insufficient backfeed and load growth exceeds rating of transformer at Clowne PSS.	2025+	2021	2021	Flexibility

Executive Summary

Table 1: Summary of investment decisions in the East Midlands - Continued

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Coalville	Constraint at Coalville BSP on transformers due to new connection.	2023	2021	2021	Reinforce with flexibility
Grassmoor	Grassmoor 33/11kV PSS has limited capacity for an N-1 circuit outage due to new connection.	2023	2021	2021	Flexibility
Hinckley	Hinckley 132/11kV PSS is out of N-1 firm capacity due to new connection.	2024	2021	2021	Flexibility
Alfreton	Meadow Lane 33-11kV PSS is limited by N-1 firm capacity.	2023	2021	2021	Flexibility
Nailstone	Nailstone 33/11kV PSS now has limited N-1 capacity due to new connection.	2022	2021	2021	Reinforce with flexibility
Tamworth Main	Tamworth 33/11kV PSS is running out of N-1 firm capacity due to new connection.	2025+	2021	2021	Flexibility
Union Street - Rugby	Union Street 33-11kV PSS is limited by N-1 firm capacity.	2025+	2021	2021	Flexibility
Woodbeck	Woodbeck 33/11kV PSS is limited by 11kV backfeeds for an N-1 outage.	2025+	2021	2021	Flexibility
Weedon	Weedon 33/11kV PSS is limited by 11kV backfeeds for an N-1 outage.	2025+	2021	2021	Flexibility
Hawton	Hawton 132kV circuits limited by overhead line. Triggered by growth.	2025+	2021	2021	Flexibility
Lincoln - Anderson Lane	Increased demand on Lincoln-Anderson Lane-South Carlton 33kV circuit.	2022	2021	2021	Reinforce with flexibility
Crowland	Crowland 33/11kV PSS is expected to exceed its firm capacity.	2025+	2021	2021	Flexibility
Berkswell SGT	GSP compliance.	2023	2021	2021	Reinforce with flexibility
Loughborough	Combined demand at Loughborough 132/33kV BSP and 132/11kV PSS is forecast to exceed 100MW.	2023	2021	2021	Reinforce with flexibility
Mackworth	Voltage limiting firm capacity of Mackworth PSS.	2025+	2021	2021	Flexibility
Manton	New Connections demand exceeds transformer capacity at Manton PSS.	2025+	2021	2021	Flexibility
New Dove Valley	Additional load cannot be accommodated at Hatton PSS.	2024	2021	2021	Flexibility

Executive Summary

Table 1: Summary of investment decisions in the East Midlands - Continued

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Bletchley	Bletchley 132/33kV was originally an ENTIRE trial zone. Currently no constraint.	-	-	-	Remove
Staythorpe	Three phase make fault level rating at Staythorpe B 132kV substation.	2024	-	-	Reinforce
Thurmaston	Three phase make fault level rating on Thurmaston 11kV switchgear.	2022	-	-	Reinforce
Hawton-Bowbridge	26MVA over 22/19MVA circuit rating.	2022	-	-	Reinforce
Regent Street	Multiple site issues; transformer compound wall and canal bridge.	2024	-	-	Reinforce
Staveley 33kV	Insufficient demand disconnection for LFT at Staveley BSP and Whitwell BSP.	2021	-	-	Reinforce
Willington	Fault level is likely to be overstressed for Willington 132kV.	2024	-	-	Reinforce
Newton Road	Three phase make fault level rating on Newton Road 11kV switchgear.	-	-	-	Reinforce
Staveley 11kV	Three phase make fault level of Staveley 11kV switchgear.	-	-	-	Reinforce
Nottingham North	Three phase make fault level is 99.7% of rating on Nottingham North 11kV switchgear.	-	-	-	Reinforce
Wolverton	Three phase make fault level rating on Wolverton 11kV switchgear.	-	-	-	Reinforce
Long Eaton	Willington GSP compliance due to demand transfer.	2022			Reinforce
Walpole-Boston	Ability to provide the secure post fault transfer of Skegness BSP to Walpole GSP during SGT outages at Bicker Fen GSP.	2021	-	-	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	Bushbury 132/11kV substation estimated to be 105% firm capacity within 3 years.	2025+	2025+	2024 - 2025+	Signposting
Madeley	Madeley PSS is forecast to exceed its firm capacity some time past 2025.	2025+	2025+	2025+	Signposting
Smethwick	Smethwick 132/11kV substation likely to overload when 1 of the 3 transformers is on outage.	2025+	2025+	2024 - 2025+	Signposting
Donnington	Load likely to exceed firm capacity of Donnington PSS.	2021	2021	2021	Reinforce with flexibility
Oldbury	Load growth will soon put Oldbury GSP out of P2 N-2 compliance.	2022	2021	2021	Reinforce with flexibility
Brimscombe	An outage on one of the Ryeford circuits during winter peak demand results in below statutory voltages at either Camp or Cherington. Dudbridge PSS is approaching firm capacity.	2025+	2021	2021	Flexibility
Meaford	33kV voltages drop to below 0.9 per unit in N-1 scenarios.	2022	2021	2021	Reinforce with flexibility
Hereford - Ledbury Ring	Low voltages at Ross on the 66 and 11kV bars for outage of Hereford - St Weonards - Ross. Exacerbated by new load at Ledbury.	2022	2021	2021	Reinforce with flexibility
Feckenham South	66kV voltage outside of limits at Bloxham and Epwell for fault condition outage of Stratford - Shipston circuit.	2022	2021	2021	Reinforce with flexibility
Hereford BSP	Hereford BSP (Walham) forecast to exceed its firm capacity.	2022	2021	2021	Reinforce with flexibility

Executive Summary

Table 2: Summary of investment decisions in the West Midlands - Continued

Scheme	Constraint	Proposed CMZ closure	WPD Best View Flexibility Start Year	DFES Scenarios Flexibility Start Year	DNOA Decision
Banbury	Banbury was originally an ENTIRE Zone. In 2018 it was decided to use this zone as there were large flexibility providers in this area.	-	-	-	Remove
Eastern Avenue	High fault level rating on GT1 and GT2 at Eastern Avenue BSP.	2022	-	-	Reinforce
Warndon	Section X and Y of the 11kV switchgear at Warndon are marginally stressed.	2021	-	-	Reinforce
Cheapside	Cheapside 11kV switchgear stressed.	2023	-	-	Reinforce
Penn	Penn 132kV switchgear stressed.	2022	-	-	Reinforce
Sankey	Circuit overloads after a first circuit outage .	2021	-	-	Reinforce
Burslem	Split busbar arrangement at Cellarhead results in circuit overloads of the Cellarhead - Rugeley/Barlaston circuit during 2nd outage of the Cellarhead - Stagefields circuits.	2022	-	-	Reinforce
Wapley	Improve network security.	2021	-	-	Reinforce
Cellarhead	Under N-2 summer conditions multiple circuits overload.	2023	-	-	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 66kV circuits from Abergavenny is close to becoming overloaded following an N-1 circuit outage.	2025+	2025+	2025+	Signposting
Cardiff North	N-2 outage conditions and SD11 requirements.	2021	2021	2021	Reinforce with flexibility
East Aberthaw	Network secured outage compliance SD11.	2023	2021	2021	Flexibility
Llandrindod - Rhayader	Llandrindod Wells 66/11kV PSS and Rhayder substation drop below statutory voltage limit when there is an N-1 of the T1 transformer at Llandrindod Wells.	2025+	2021	2021	Flexibility
Mountain Ash	Thermal & secured outage requirements.	2023	2021	2021	Flexibility
Pembroke	Pembroke South - Broadfield 33kV circuit and connected primary substation drop below the statutory voltage limit for the N-1 of the Golden Hill - St Florence 33kV circuit.	2022	2021	2021	Flexibility
Trevaughan	Trevaughan PSS becomes thermally overloaded for an N-1 on of the substation transformers.	2025+	2021	2021	Flexibility
Nantgaredig	Voltage (11kV backfeed issues) and improved protection for rapid fault removal.	2021	-	-	Reinforce
Cefn Gwrgan	Fault level on Cefn Gwrgan/Grange 66kV ACBs.	2022	-	-	Reinforce

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 transformer projected to exceed firm capacity.	2022	2021	2021	Signposting
Stokenham	N-1 capacity limited by 11kV back feeds at Stokenham PSS.	2022	2022	2022	Signposting
Plymouth/South Hams	Complex 132kV network constraints.	2022	2021	2021	Flexibility
Exeter City	N-1 of the 2x 132/33kV GTs at Exeter City BSP.	2023	2021	2021	Flexibility
Radstock	Circuit overload following a 33kV bar outage; 5km of 33kV overhead line overloaded.	2021	2021	2021	Reinforce with flexibility
Bridgwater/Street	An N-2 (outage - fault) has been considered at Bridgwater BSP.	2022	2021	2021	Reinforce with flexibility
Hayle - Camborne	The outage of the Rame-Hayle 132kV circuit over loads the 132kV circuit between Indian Queens-Fraddon-Camborne.	2022	2021	2021	Flexibility
Moretonhampstead	N-1 restoration capacity for Moretonhampstead PSS restricted by 11kV backfeeds.	2023	2021	2021	Flexibility
Tiverton	Loss of either 132kV circuit leads to the risk of the opposite GT overloading at Tiverton BSP.	2025+	2021	2021	Flexibility
Taunton GSP	Bridgwater GSP and Taunton GSP require N-2 restoration for the loss of any of the SGTs in the group.	2021	2021	2021	Reinforce with flexibility
Weston Super Mare	N-1 outage has been considered for Weston BSP.	2025+	2021	2021	Flexibility
Witheridge	Witheridge PSS limited for N-1 capacity by 11kV backfeeds.	2022	2021	2021	Flexibility
Padstow	Overloading of transformers at Padstow PSS.	2025+	2021	2021	Flexibility
Roundswell	Firm capacity of transformers at Roundswell PSS is an issue due to recent large battery connection.	2023	2021	2021	Flexibility
Truro - Truro Treyew	Truro-Truro Treyew Road 4L5 33kV Circuit becomes overloaded for the loss of the Truro 1L5 and 3L5 circuits.	2022	2021	2021	Flexibility

Section 1:

Introduction

1.1 Document Overview

1.2 How the DNOA fits within the WPD Strategy

1.1 Document Overview

This section aims to introduce the **Distribution Network Options Assessment (DNOA)**. The primary functions of the DNOA are described, along with how the DNOA fits within existing WPD processes. The decisions outlined in this report are underpinned by the data in WPD's distribution future energy scenarios (DFES). The contents of each section of the DNOA are described below for navigational purposes.

Section 2: Methodology



This section describes the processes behind the creation of the DNOA, explaining some of the economic theory behind the investment decisions, along with a description of the tools used.

Section 3: Investment Decisions



In this section the investment decisions for each scheme are presented, along with a more in-depth description of why investment is required and what the associated costs for the different options are.

Section 4: Stakeholder Engagement



Feedback from various groups could help improve future publications of the DNOA. This section outlines how you can provide your views, and how this discussion will shape the DNOA.

Section 5: Appendices



Other data and information not included in the main report, along with a glossary to help readers understand industry nomenclature.



1.2 How DNOA complements WPD processes

Western Power Distribution produces many 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 generation and demand across the 4 licence areas on a yearly basis.

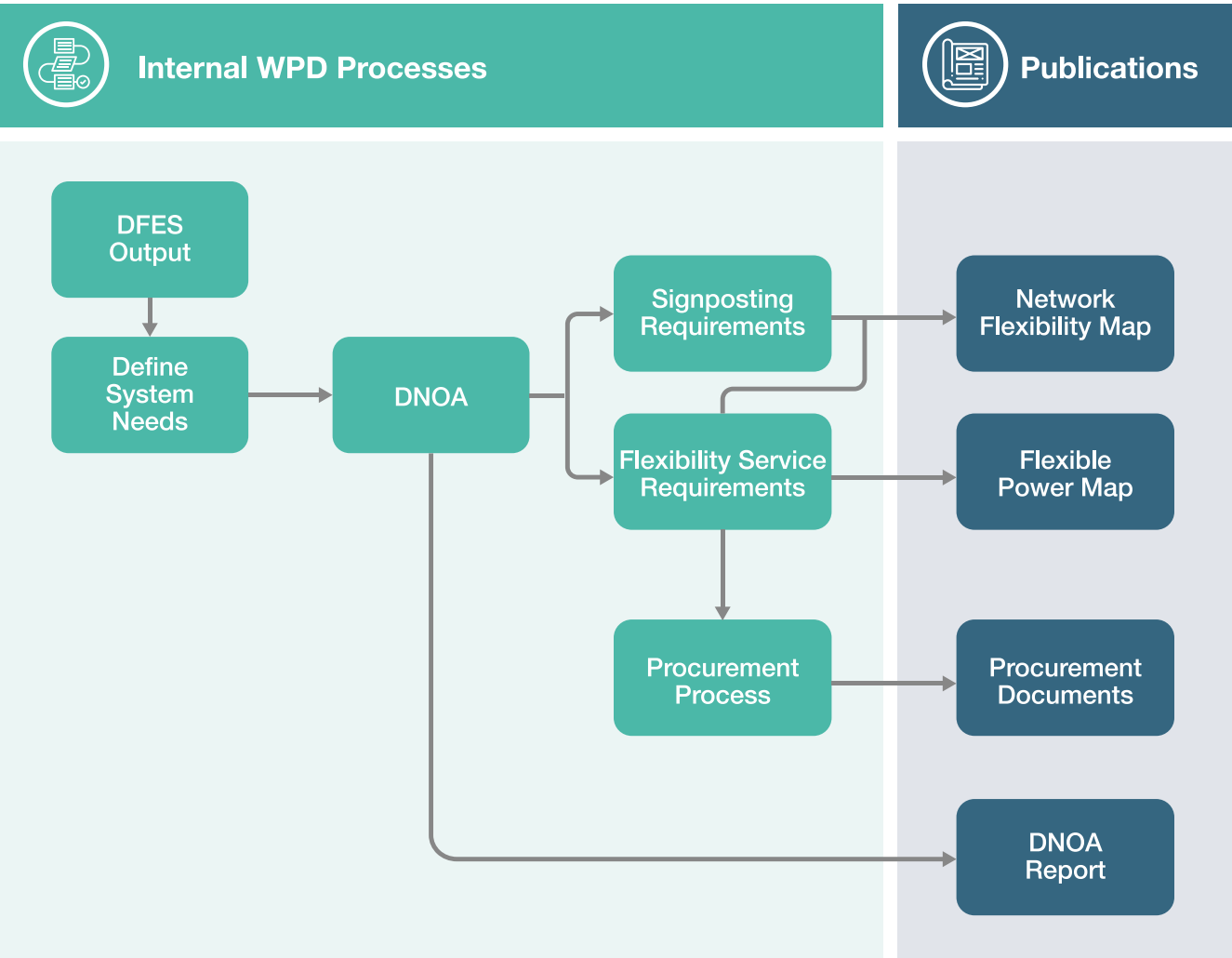
This scenario growth data allows areas on the network expected to be constrained to be identified. Forecasts carried out using this data are then used to plan conventional network build solutions and/or flexibility procurement based on system needs.

The decision making process for determining the optimal solution for each constraint is described in the DNOA. This is carried out on a biannual process, leading to two rounds of Flexibility Service Procurement each year.

The DNOA process is used to both look forward and identify which services should have services procured to help mitigate them, as well as looking backwards to ensure they continue to provide value. The outcomes of both process are summarised into a DNOA report, published every 6 months.

This process is summarised in the figure below.

The DNOA process



Section 2:

Methodology

2.1 The DNOA Process

- DFES Overview
- Defining a WPD Best View
- Other WPD Publications
- DNOA Process Timeline

2.2 Flexibility Services

2.3 Reinforcement Options

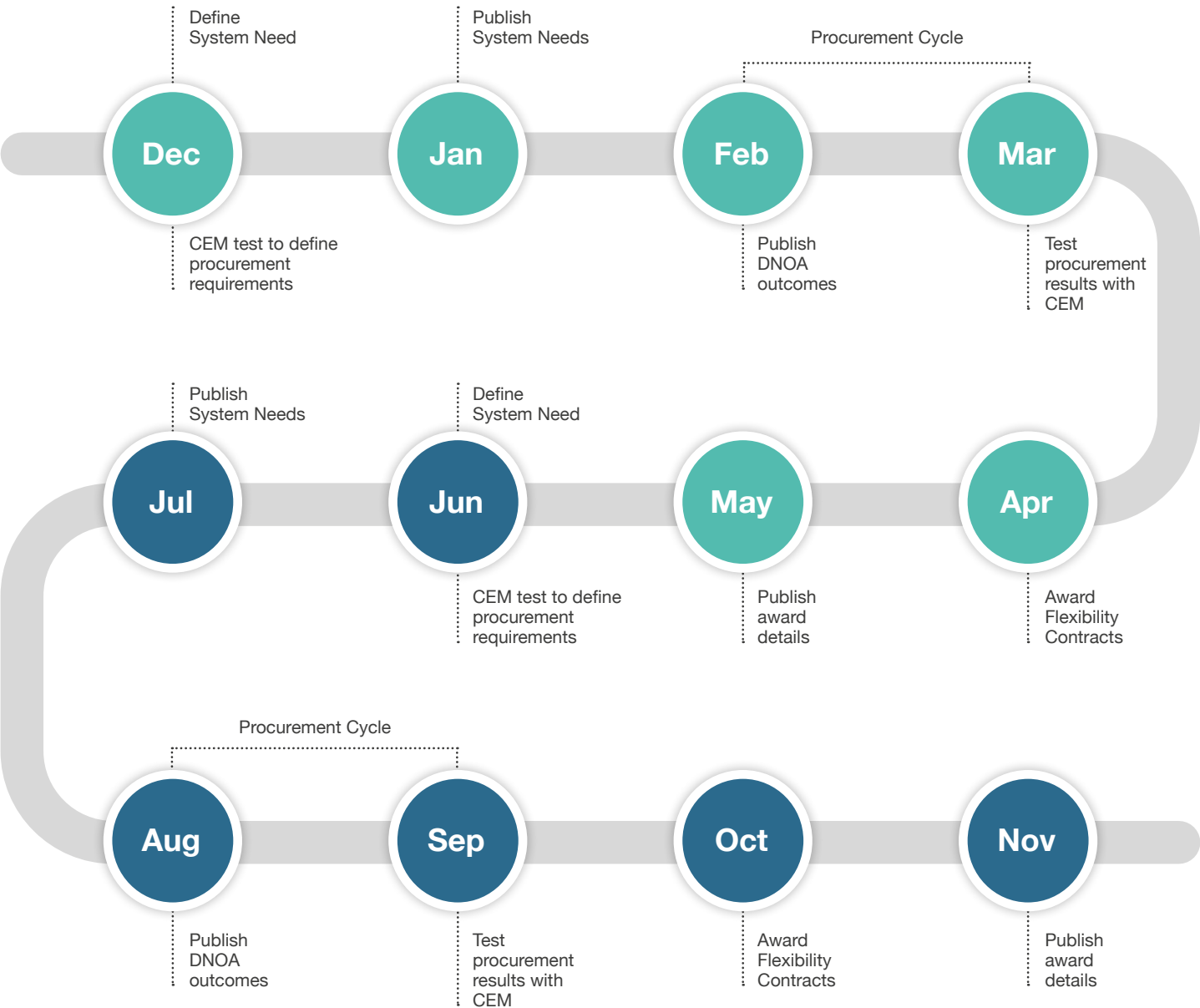
2.4 Common Evaluation Methodology

2.1 The DNOA Process

DNOA Process Timeline

The DNOA outcomes are published twice a year in February and August. In December the system needs are identified using data from the DFES. The CEM test is then used to define the procurement requirements.

The DNOA outcomes are published before the first procurement cycle between February and March. After the procurement cycle the results are tested again using the CEM to look at how much reinforcement deferral is possible with the flexibility available. Finally, the flexibility contracts are awarded in April, with the details of these awards published in May. The cycle then repeats for the following 6 months.



2.1 Scenario Modelling

DFES Overview

In this section the methodology used for the DNOA is highlighted, and the economic theory that underpins it is explained. As outlined in the introduction, the DNOA process begins with the Distribution Future Energy Scenarios (DFES).

Using local planning data, demand pipeline data and local engagement, a range of credible future scenarios are created that predict growth across WPD's 4 license areas over the next 30 years.

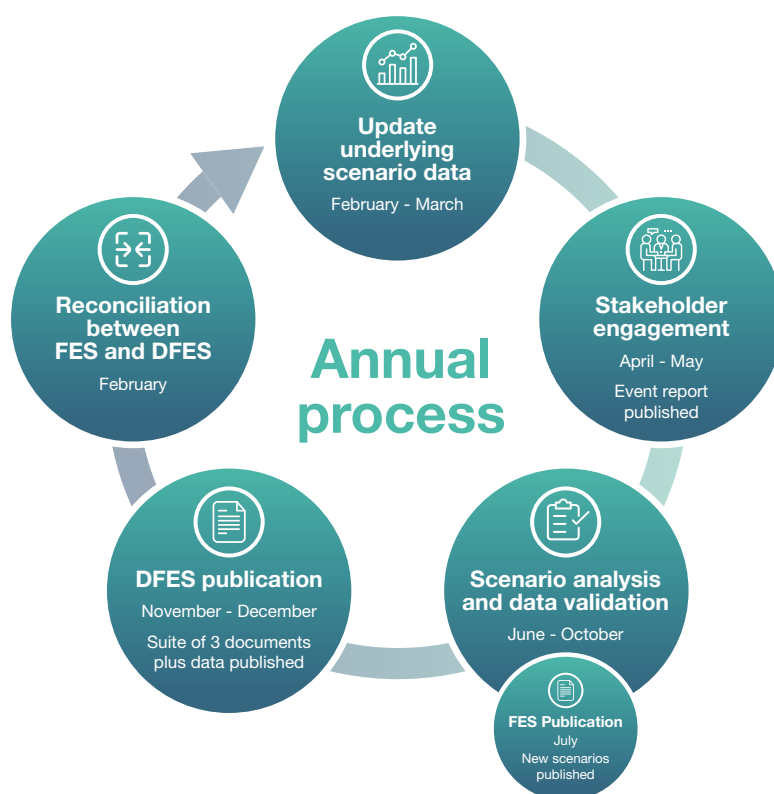
For this DNOA the data used was taken from the 2017 DFES for the West Midlands, the 2018 DFES for the South West and South Wales, and the 2019 DFES for the East Midlands. This was done as in the past the DFES was produced on a 2 year rolling cycle for WPD's 4 license areas. For this DNOA the scenarios will be referred to as Two Degrees, Community Renewables, Consumer Evolution and Steady Progression.

These 4 base scenarios encompass divergent levels of decentralisation 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 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.



[www.westernpower.co.uk/
distribution-future-energy-scenarios-
regional-information](http://www.westernpower.co.uk/distribution-future-energy-scenarios-regional-information)



[www.westernpower.co.uk/
distribution-future-energy-
scenarios-map](http://www.westernpower.co.uk/distribution-future-energy-scenarios-map)

2.1 The DNOA Process

Defining a WPD Best View

By amalgamating the four base scenarios, a 5th 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.

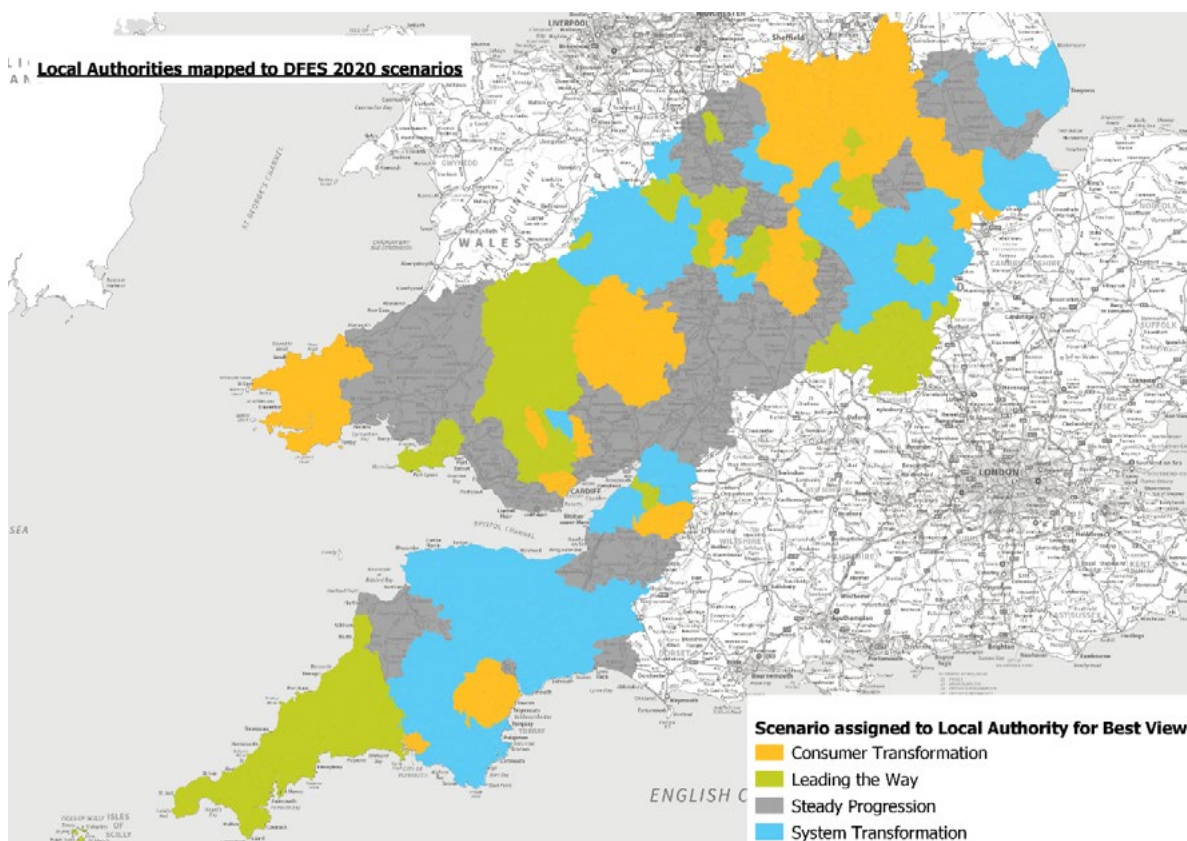
To derive the WPD Best View, WPD uses an iterative process. DFES data and previous Best View is used to support stakeholder and Local Area engagement, which then allows the quality of Local Area Energy Plans to be assessed using criteria derived from Ofgem guidance to gauge the ambition, engagement and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

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



This DNOA has been completed using data from DFES 2019. The next DNOA will use the DFES 2020 scenario framework.

2.2 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 6 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 December 2020. To date we have over 440MW of third party provided flexibility under contract.

To give providers and operators of flexibility services advanced notification of future needs, signposting information is provided for a 5 year window for each area on the network with forecasted constraints.

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.



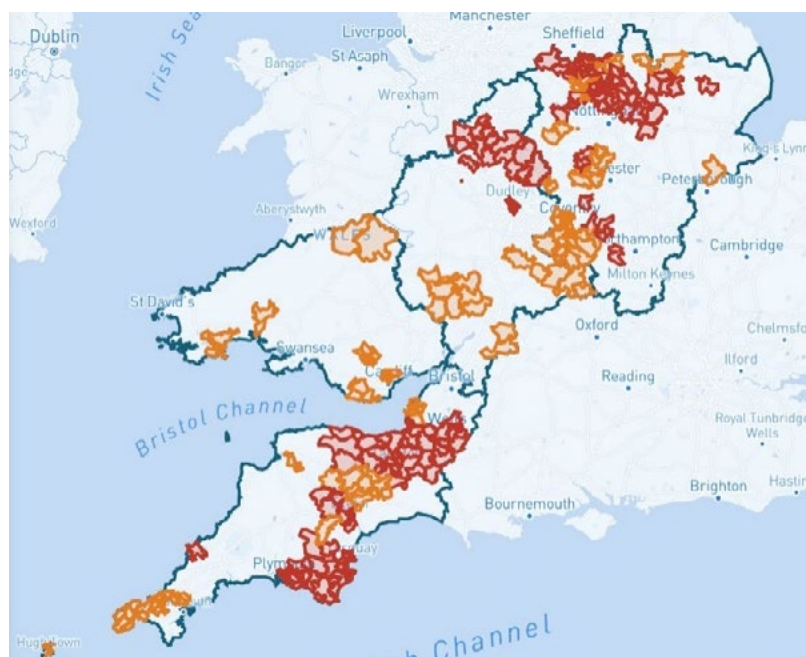
Dynamic

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



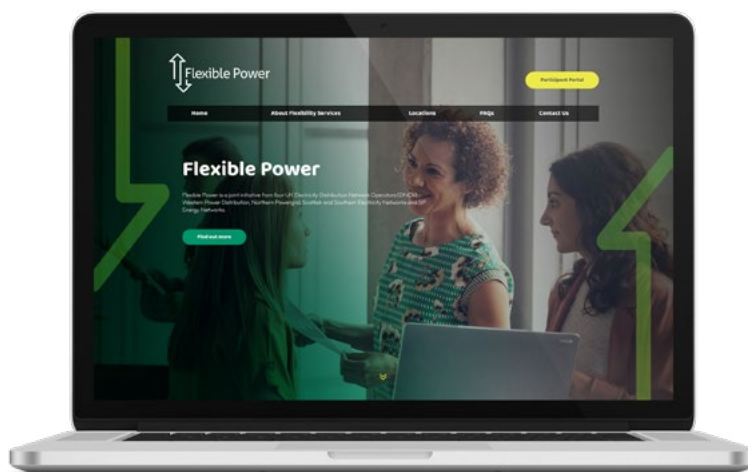
Restore

Supports power restoration following rare fault conditions.



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

2.3 Reinforcement Options

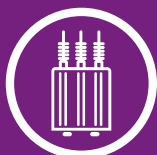
Reinforcement schemes aimed to alleviate constraints on the network can involve replacing a number of different assets, or installing new assets. Most conventional reinforcement will involve some combination of the four options below.



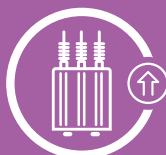
**Build
new circuits**



**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 11kV, 33kV or 66kV circuits. Substations considered for reinforcement include Primary Substations (PSS), 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.

2.4 Common Evaluation Methodology

To improve transparency in how DNOs reach decisions for the flexibility procurement and the potential to delay conventional reinforcement, a common evaluation methodology (CEM) cost-benefit analysis (CBA) tool has been created by Baringa Partners. This tool is used to assess the net benefit of flexibility against a baseline of conventional reinforcement for scenarios over a number of years.

The economic analysis is based on the Time Value of Money wherein 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.

Within the CBA tool, the current capacity of an asset or assets on the network is compared with the projected load in the future. When the load exceeds the capacity of the asset or assets determines when and what intervention (in the form of flexibility procurement or conventional reinforcement) is required.

The amount of flexibility required and the cost of flexibility availability and utilisation is used to calculate the total cost of the flexibility option for each year.

The costs associated with reinforcement are fed in from the relevant scheme provided by the Primary Systems Design team. Additional functionality within the tool also allows the amount of losses incurred on the network to be considered in the cost-benefit analysis, as this will be affected by the investment decision made. The effects of flexibility on network losses are calculated using WPD's losses calculator.

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.



[Link to ENA page with CEM](#)



[Link to WPD page with CEM](#)



Section 3:

Investment Decisions

- 3.1 Interpretation of DNOA outcomes
- 3.2 Outcomes East Midlands
- 3.3 Outcomes West Midlands
- 3.4 Outcomes South Wales
- 3.5 Outcomes South West

3.1 Interpretation of DNOA outcomes

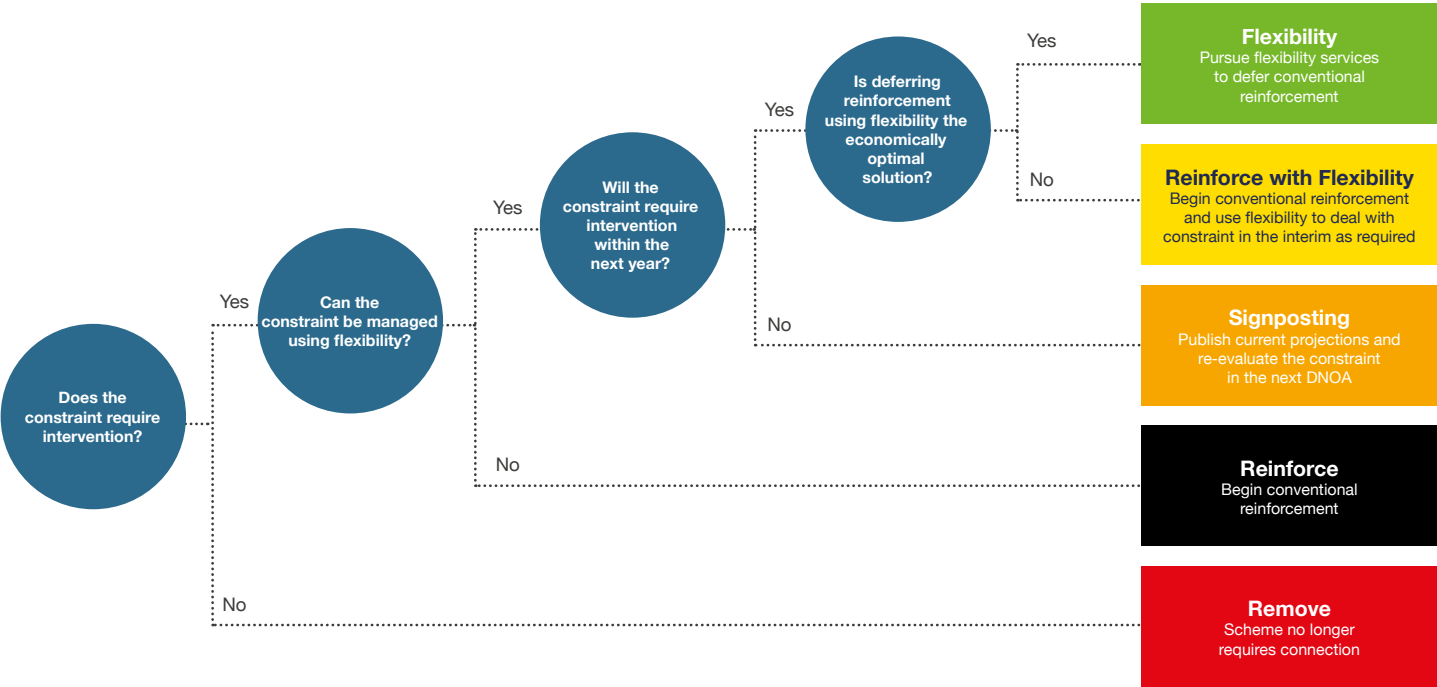
In this section the investment decisions taken on each scheme across WPD’s four license areas are given, along with information on the proposed reinforcement schemes, cost-based analysis results showing across which years and which scenarios is flexibility procurement the optimal economic choice and discussion on the other effects of the investment decisions (such as considerations of losses on the network).

The decision tree below demonstrates the different choices our analysis can lead to. Firstly, the schemes that do not require any intervention are removed from future DNOAs.

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 are put through cost-benefit analysis to determine if flexibility can be used to defer reinforcement.

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



3.1 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	TD: Two Degrees	CR: Community Renewables	CE: Consumer Evolution	SP: Steady Progression
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Optimal flexibility duration

For each scenario the years flexibility is expected to be required are shown, along with the estimated utilisation that will be required.

The start of this period will be triggered when the constraint begins to need management and 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

For each scheme the constraint management timeline shows what decision has been made for that 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 described. For schemes where flexibility is an option this decision is usually driven by the cost-benefit analysis; if this is not the case then this will be discussed.

For reinforce schemes the reason why flexibility was not viable will be given. For remove schemes the reasons why the constraint no longer needs intervention are given (e.g. reinforcement works have been completed).



Other Information

The reinforcement cost for each scheme is provided. This figure is the cost that is used in the cost-benefit analysis performed for each scheme using the Common Evaluation Methodology.

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). Alongside the secure and dynamic products, the restore product will also be used.

3.2 - Outcomes East Midlands

Over 2.7 million customers are served within WPD's East Midlands license area, with an annual maximum demand of around 4.8GW and a total of 25,638GWh distributed in 2019.

A resurgence in demand growth in the area is anticipated, driven by local authorities' plans for developments that will result in strong growth in domestic, industrial and commercial demand.

Following a wider trend across Great Britain, the East Midlands has experienced substantial growth in the connection of Distributed Generation (DG). There is now approximately 3.7GW of generation connected to WPD's East Midlands network, with a further 3GW accepted-not-yet-connected.

As both generation and demand in the East Midlands continue to grow the strain on the network increases, significant reinforcement and flexibility procurement is required.

In this DNOA, 41 schemes have been considered; an estimated £4.5m worth of flexibility procurement over the next five years is recommended to defer some of the £134m reinforcement works required to address the constraints.



3.2 - Outcomes East Midlands

Wigston



Scheme description

There are plans to modify the 132kV network at Wigston BSP in order to ensure the site remains P2/7 compliant. The demand on Wigston is nearing 100MW, meaning that there will soon be a requirement to be able to restore some demand under a SCO. It is proposed to loop in Wigston to the existing 132kV double circuit between Leicester and Kibworth and install a new 132kV double circuit from Carlton Park to Wigston.



Constraint Season
Winter

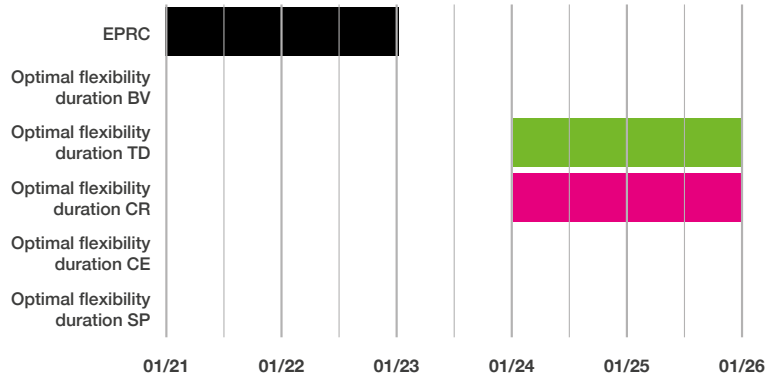


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV					
TD				1.95	5.87
CR				0.65	3.06
CE					
SP					



DNOA Decision

Signposting



Justification for decision

No flexibility requirement under any scenarios until 2024 (2025+ under Best View).



Constraint management timeline

2021 H1	Signposting
2020 H2	Signposting
2020 H1	Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Bradwell Abbey - Newport



Scheme description

Under a first circuit outage the entire Newport Pagnell demand and half the Fox Milne demand is supplied by one 33kV. To create further capacity, it is proposed to install 2 x 33kV circuits from Bradwell Abbey to the Fox Milne/Hanslope Park tees, in order to provide clean feeds from Bradwell Abbey to Fox Milne, Hanslope Park and both transformers at Newport Pagnell.



Constraint Season
None

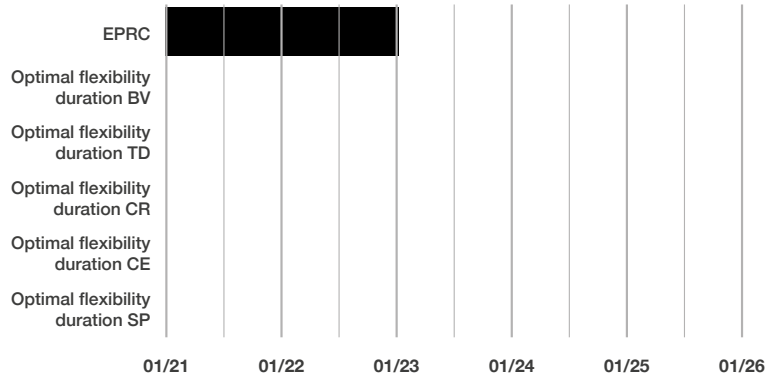


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV					
TD					
CR					
CE					
SP					



DNOA Decision

Signposting



Justification for decision

No flexibility requirement under any scenarios until at least 2025.



Constraint management timeline

2021 H1 Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Milton Keynes East



Scheme description

Rapid development in central and eastern areas of Milton Keynes is causing Stony Stratford, Bletchley and Bradwell Abbey BSPs to near their firm capacities. It is proposed to build a new BSP to North East of Milton Keynes and install two new 132kV cable feeders from Bletchley BSP. This will incorporate two new 132/11kV transformers, associated switchgear and 11kV circuits to off load neighbouring primary substations.



Constraint Season
None

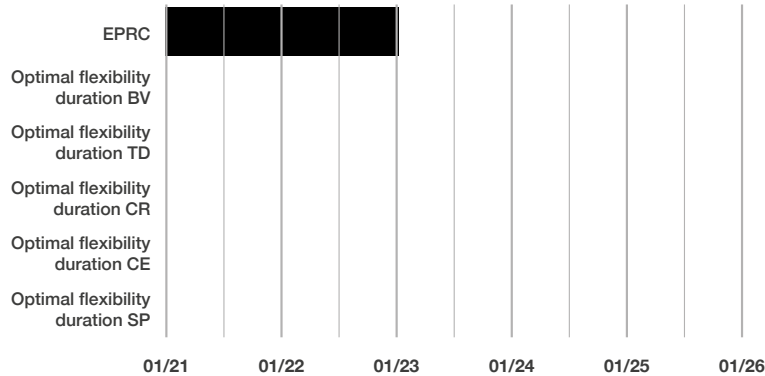


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV					
TD					
CR					
CE					
SP					



DNOA Decision

Signposting



Justification for decision

No flexibility requirement under any scenarios until at least 2025.



Constraint management timeline

2021 H1 Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Ashby



Scheme description

The Gresley-Moira 33kV circuit are close to their firm capacity. It is proposed to reinforce the 33kV circuit between Gresley and Moira to facilitate connection at Ashby De La Zouch PSS. Installation of 2 x new 3panel board is also required.



Constraint Season
Winter

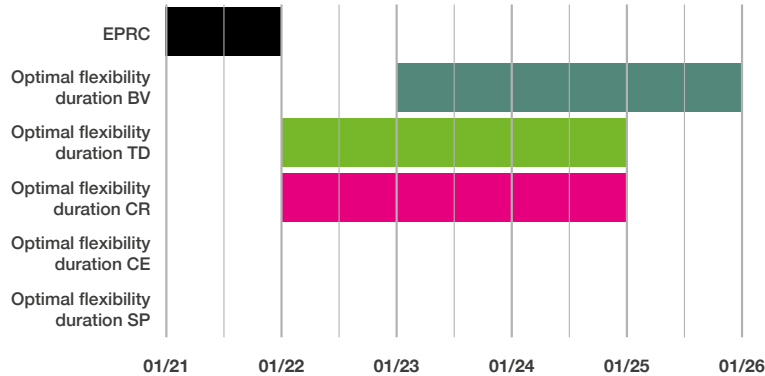


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV			0.45	0.82	0.19
TD		0.11	1.03	3.89	
CR		0.30	1.06	2.58	
CE					
SP					



DNOA Decision

Signposting



Justification for decision

No flexibility requirement under any scenarios until 2022 (2023 under Best View).



Constraint management timeline

- 2021 H1 **Signposting**
- 2020 H2 Procurement
- 2020 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Woodhall Spa



Scheme description

Woodhall Spa is a single 33/11kV transformer site with firm capacity that was limited by 11kV back feeds. Under a transformer outage, the site demand was anticipated to exceed its firm capacity. Initial plans were to install a second 33/11kV transformer, however 11kV works were done instead.



Constraint Season
Winter

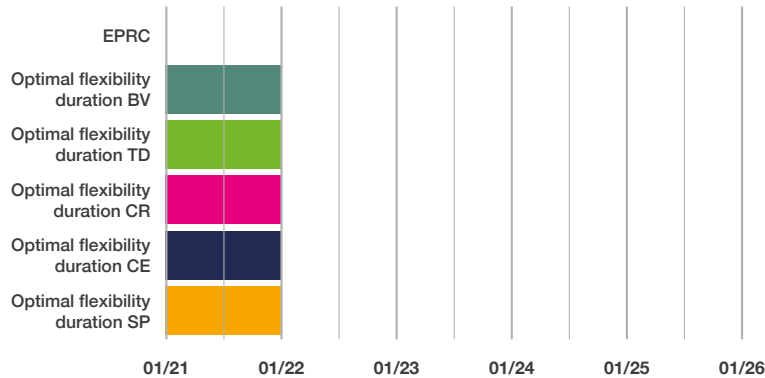


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	9.85				
TD	10.15				
CR	10.51				
CE	8.24				
SP	8.25				



DNOA Decision

Flexibility



Justification for decision

Reinforcement works have been completed; the current flexibility contracts are being continued until the end of the contract period.



Constraint management timeline

2021 H1	Maintain Active
2020 H2	Procurement
2020 H1	Procurement
2019 H2	Procurement
2019 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Lincoln - North Hykeham



Scheme description

There is a high amount of distributed generation in the area and high demand growth is expected. Potential shortfall for 11kV backfeed of North Hykeham. A new 33kV circuit at Lincoln - North Hykeham is expected to be completed in 2021.



Constraint Season
Winter

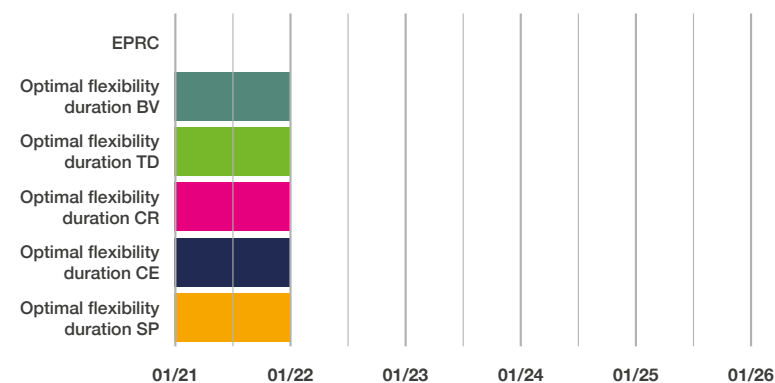


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	37.41				
TD	40.27				
CR	42.71				
CE	35.45				
SP	35.45				



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2021. Current flexibility contracts are being kept active to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 Maintain Active

2020 H2 Procurement

2020 H1 Procurement

2019 H2 Procurement

2019 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Lincoln - Beevor Street



Scheme description

High demand growth is expected. Ruston's 6.6kV network can't be transferred to the 11kV network. 11kV backfeeds primarily between Beevor Street and Rookery Lane. A new 33kV circuit at Lincoln - Beevor Street is expected to be completed in 2021.



Constraint Season
Winter/Summer

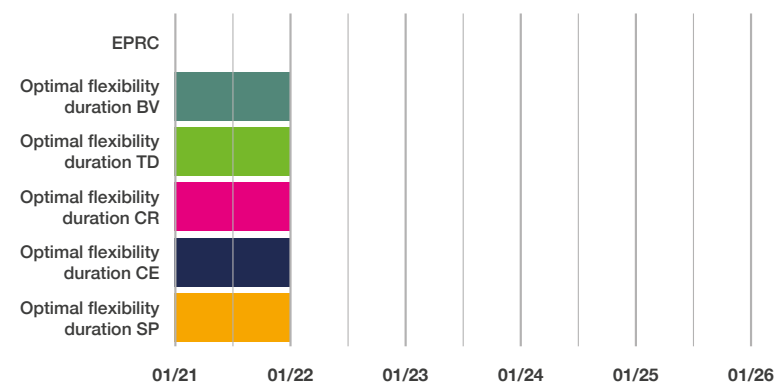


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	35.57				
TD	35.75				
CR	36.36				
CE	31.04				
SP	31.02				



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2021. Current flexibility contracts are being kept active to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 Maintain Active

2020 H2 Procurement

2020 H1 Procurement

2019 H2 Procurement

2019 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Mantle Lane



Scheme description

Reinforcement is currently underway which involves overlaying of the Mantle Lane T1 33kV circuit to the tee position with Worthington. For the section of cable which passes Bardon Road and ends at Mantle Lane, an 11kV cable shall be included to allow 2MVA of 11kV load to be transferred onto Bardon Road. These circuit works will remove the circuit restriction and ensure continued P2/7 compliance.



Constraint Season
Winter/Summer

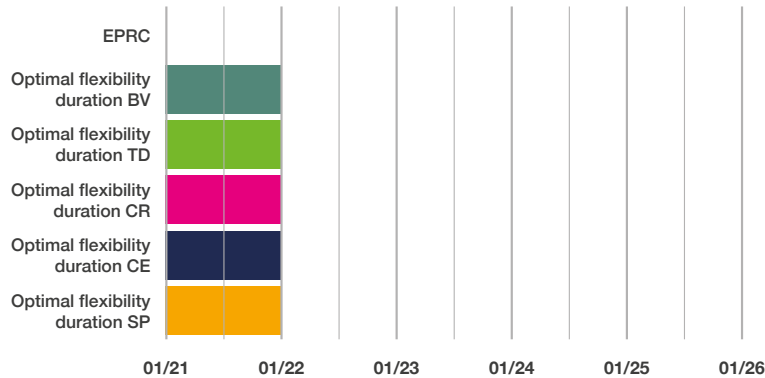


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	45.65				
TD	48.69				
CR	50.45				
CE	42.63				
SP	42.62				



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2021. Current flexibility contracts are being kept active to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Maintain Active
2020 H2	Procurement
2020 H1	Procurement
2019 H2	Procurement
2019 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Apollo - Tamworth



Scheme description

Customer driven reinforcement. Apollo 33/11kV primary substation has limited capacity for a FCO.



Constraint Season
Winter

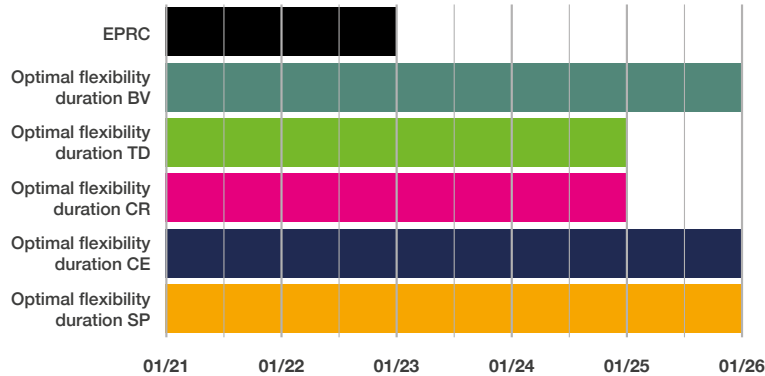


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	15.15	34.07	67.28	138.43	296.34
TD	19.02	46.84	113.89	338.22	
CR	23.61	57.77	116.50	240.75	
CE	7.43	10.80	15.95	24.07	36.10
SP	7.45	10.80	15.46	32.90	32.90



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2024 (2025+ under Best View).



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Chesterfield Main



Scheme description

A constraint is predicted to occur for the loss of the Chesterfield-Grassmoor No.2 33kV circuit, which results in the Chesterfield-Grassmoor No.1 33kV circuit picking up the entire aggregate demand of Grassmoor, Biwater and Danesmoor primaries. Proposed reinforcement is to upgrade the Chesterfield-Grassmoor 33kV circuits.



Constraint Season
Winter

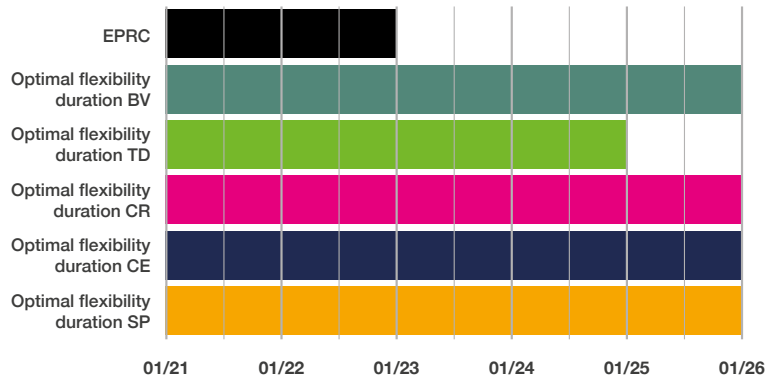


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	3.13	4.21	6.54	13.40	36.71
TD	3.35	5.02	10.17	56.76	
CR	3.54	5.69	10.27	30.92	123.21
CE	2.48	2.93	3.38	3.89	4.52
SP	2.48	2.93	3.34	4.33	4.33



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2024 (2025+ under Best View).



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Clowne



Scheme description

Clowne 33-11kV PSS is a single transformer primary. When the PSS is backfed, the 11kV backfed capacity is limited by thermal and voltage issues on the 11kV circuits to Westhorpe and Craggs Lane primaries. It is proposed to install a second 33/11kV transformer supplied by the Whitwell - Shirebrook/Bolsover/Clowne 33kV circuit, along with a new 11kV switchboard and improve the 33kV feeding arrangement utilising a 33kV ring main unit.



Constraint Season
Winter

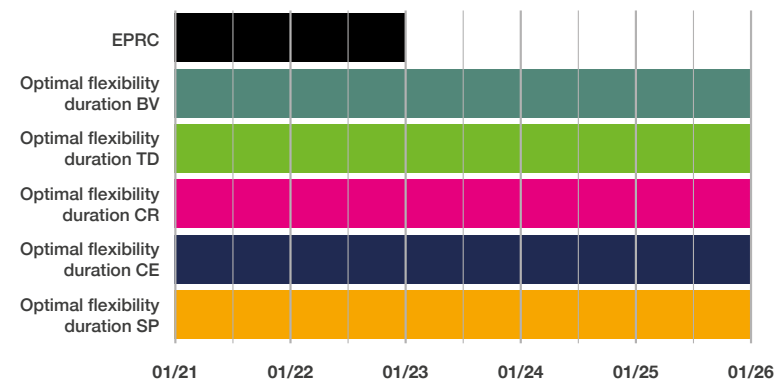


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	23.17	26.56	29.27	32.82	36.79
TD	23.01	27.31	30.22	36.56	46.89
CR	23.26	27.91	29.97	35.15	40.21
CE	21.54	23.06	24.14	26.49	27.14
SP	21.54	23.03	23.81	26.60	26.60



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2025 under all scenarios.



Constraint management timeline

2021 H1 Procurement

2020 H2 Procurement

2020 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Coalville



Scheme description

Coalville BSP consists of two 132/33kV transformers. Under FCO (loss of either transformer), the other is likely to overload when all the committed schemes energise. It is proposed to install a third GT and a new section of 33kV switchboard.



Constraint Season
Winter/Summer

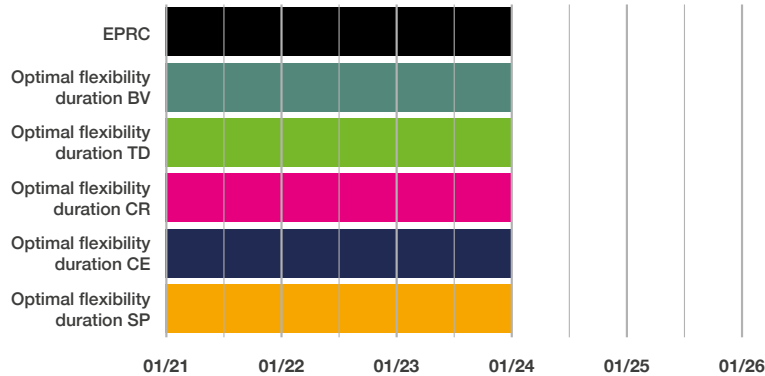


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	320.63	352.96	392.04		
TD	323.66	370.99	453.15		
CR	336.29	372.12	447.13		
CE	297.37	309.69	319.82		
SP	297.65	309.68	320.69		



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2023. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Grassmoor



Scheme description

Grassmoor 33/11kV primary substation has limited capacity for a FCO. Proposed reinforcement involves upgrading the 33/11kV transformers and 11kV switchboard.



Constraint Season
Winter/Summer

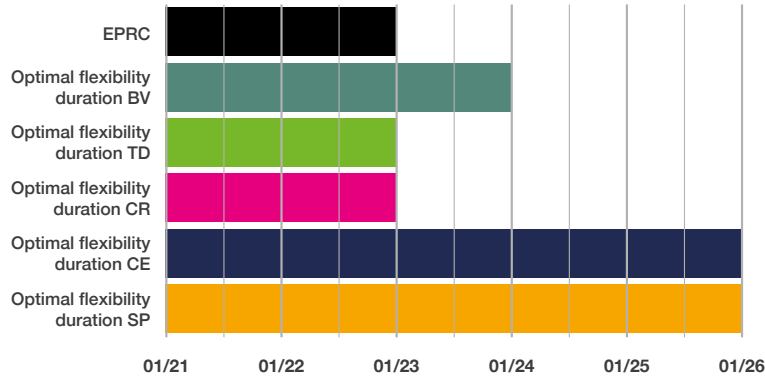


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	56.33	115.73	223.14		
TD	68.54	155.94			
CR	83.15	191.10			
CE	29.00	42.01	58.88	84.57	122.02
SP	29.08	42.01	57.34	112.07	112.07



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until 2023 under Best View.



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Hinckley



Scheme description

The local district has identified that Hinckley 132/11kV PSS is out of firm capacity. Hinckley has 2 x 132/33kV transformers (fed from Coventry) and 2 x 132/11kV transformers (fed from Enderby). The 132kV board at Hinckley runs normally open. Options to reinforce the primary to provide further capacity are currently being investigated.



Constraint Season
Winter/Summer

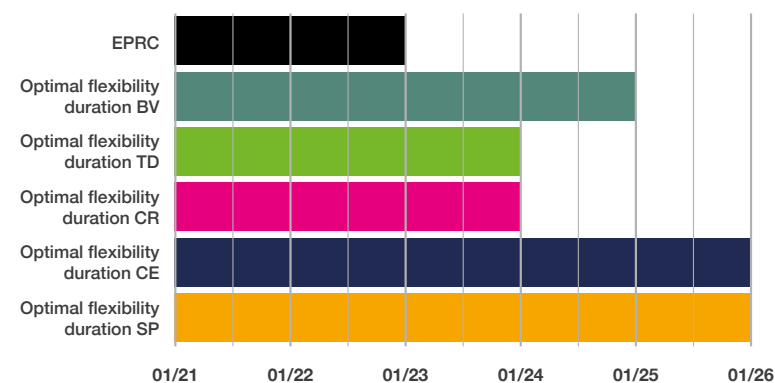


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	55.85	62.06	71.06	89.24	
TD	55.25	66.93	85.53		
CR	58.20	67.35	86.62		
CE	51.81	52.45	54.82	57.26	62.52
SP	51.88	52.44	56.32	61.74	61.74



DNOA Decision



Flexibility



Justification for decision

Current flexibility contracts are adequate to deal with the constraint, and will be kept active. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2023 (2024 under Best View).



Constraint management timeline

2021 H1 Maintain Active

2020 H2 Procurement

2020 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Alfreton



Scheme description

Meadow Lane (Alfreton) has two 33/11kV transformers. For the loss of a single 33/11kV transformer the site is supplied from the remaining transformer. Internal analysis has identified there is little remaining headroom for further demand and the local planner has live offers which will initiate uprating of the transformer capacity.



Constraint Season
Summer

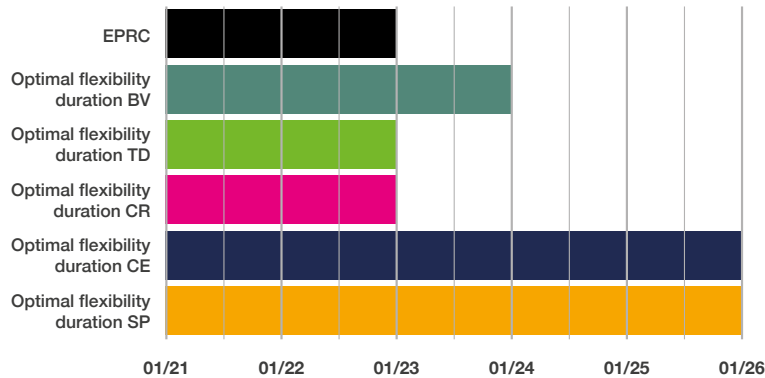


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	52.45	67.88	94.38		
TD	57.96	76.90			
CR	61.83	86.39			
CE	35.76	43.89	52.95	62.43	70.01
SP	35.83	43.88	52.09	60.85	66.64



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until 2023 under Best View.



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Nailstone



Scheme description

Nailstone 33/11kV substation has two 33/11kV transformers which are close to their firm capacities. An accepted connection offer has triggered the replacement of both transformers (along with the 11kV switchboard).



Constraint Season
Winter/Summer

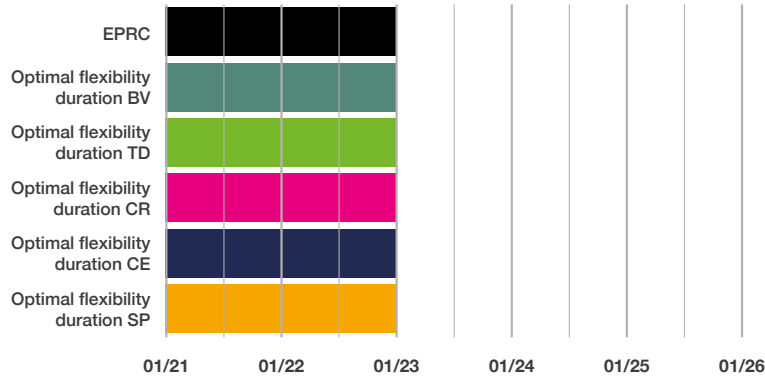


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	86.41	88.19			
TD	87.31	89.38			
CR	88.09	90.07			
CE	82.79	85.05			
SP	82.55	85.05			



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Tamworth Main



Scheme description

Tamworth 33/11kV primary substation has been identified by the 11kV planners as running out of firm capacity.



Constraint Season
Winter

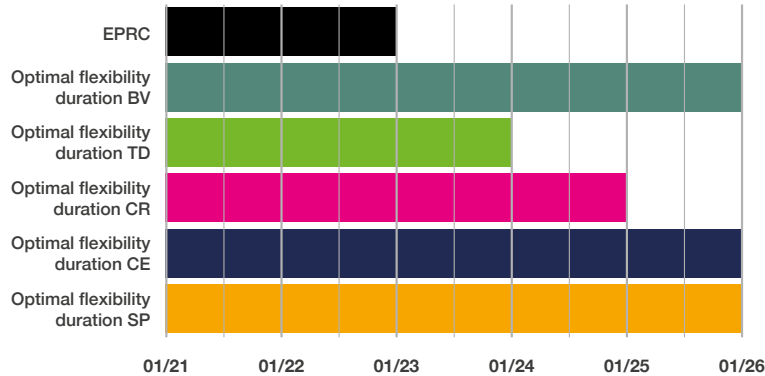


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	31.91	62.03	110.02	215.05	398.22
TD	38.55	80.35	180.11		
CR	46.39	96.02	184.10	374.47	
CE	16.67	23.72	33.31	47.13	64.91
SP	16.72	23.72	32.47	60.37	60.37



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2023 (2025+ under Best View).



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Union Street - Rugby



Scheme description

Union Street has two 33/11kV transformers. 11kV planners have identified this substation is at its limit for firm capacity.



Constraint Season
Winter

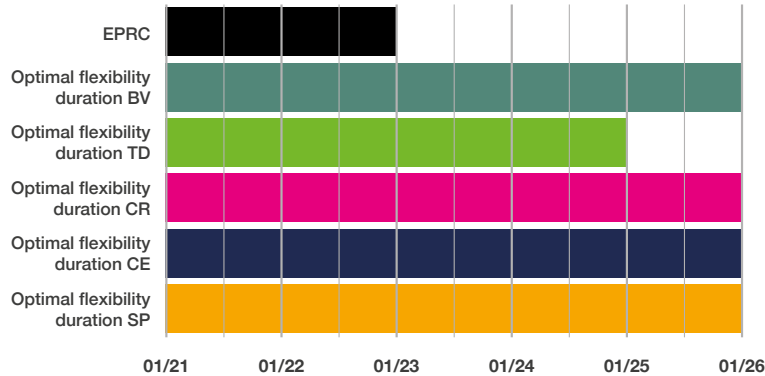


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	8.64	15.62	30.41	63.21	101.70
TD	10.21	20.39	62.75	265.38	
CR	12.01	25.31	64.95	179.99	403.98
CE	4.52	6.62	8.99	12.18	16.30
SP	4.54	6.62	8.78	15.23	15.23



DNOA Decision

Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2024 (2025+ under Best View).



Constraint management timeline

- 2021 H1 Procurement
- 2020 H2 Procurement
- 2020 H1 Procurement

3.2 - Outcomes East Midlands

Woodbeck



Scheme description

Woodbeck primary is due to exceed its winter firm capacity in the near future. It is proposed to install a second 33/11kV transformer at Woodbeck primary and a second 33kV circuit from Ordsall Road primary.



Constraint Season
Winter/Summer

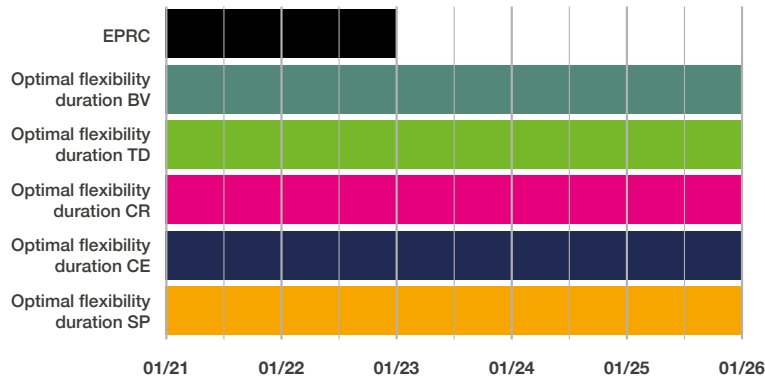


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	17.24	18.85	21.30	24.37	28.54
TD	17.66	19.96	23.16	30.71	39.81
CR	18.19	20.66	23.28	27.99	33.83
CE	15.64	16.53	17.42	18.18	19.13
SP	15.64	16.53	17.33	18.90	18.90



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2025 under all scenarios.



Constraint management timeline

2021 H1 Procurement

2020 H2 Procurement

2020 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Weedon



Scheme description

Weedon PSS is a single transformer primary with a firm capacity limited by the 11kV backfeed capability. The 11kV backfeed capability is limited by the firm capacity of Bugbrooke PSS, which is also a single transformer primary. It is proposed to install a new 11kV circuit between Bugbrooke PSS and Weedon PSS and replace the existing transformer at Bugbrooke PSS.



Constraint Season
Winter

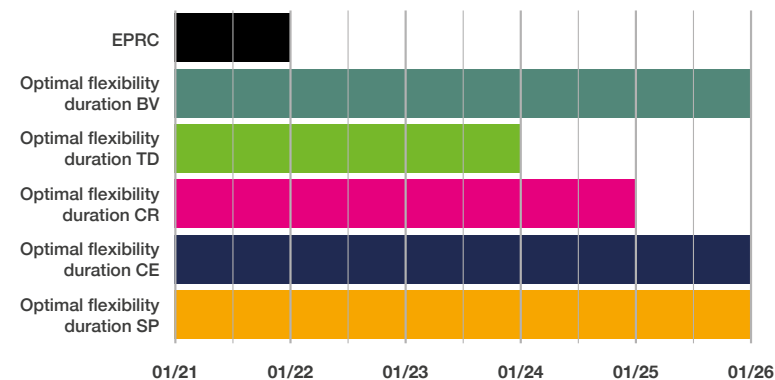


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	16.12	22.69	32.46	46.94	66.89
TD	17.70	26.49	45.09		
CR	19.34	29.66	45.74	71.66	
CE	11.64	13.96	16.48	19.50	23.30
SP	11.66	13.96	16.27	22.33	22.33



DNOA Decision



Flexibility



Justification for decision

Originally a signposting only zone. Flexibility procured in 2020 to excite the market. Current contracts will be kept active.



Constraint management timeline

2021 H1 Maintain Active

2020 H2 Procurement

2020 H1 Procurement

2019 H2 Signposting

2019 H1 Signposting

2018 Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Hawton



Scheme description

The Hawton tee - Hawton 132kV circuits require reinforcement due to generation growth. The existing Hawton tee - Hawton 132kV circuits are limited by the existing overhead line. It is proposed to re-string a section of 132kV double circuit overhead line.



Constraint Season
Summer

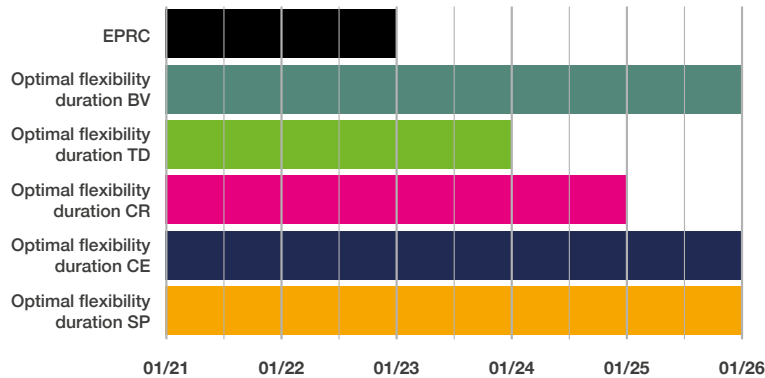


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	8.39	22.03	47.75	95.79	173.47
TD	10.77	31.56	86.90		
CR	13.95	39.93	89.08	182.39	
CE	3.23	5.60	8.90	14.31	23.58
SP	3.24	5.59	8.59	21.11	21.11



DNOA Decision

Flexibility



Justification for decision

Current flexibility contracts are adequate to deal with the constraint, and will be kept active. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2023 (2025+ under Best View).



Constraint management timeline

2021 H1 Maintain Active
2020 H2 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Lincoln - Anderson Lane



Scheme description

A reinforcement scheme has been planned to reinforce the Lincoln-Anderson Lane-South Carlton 33kV circuit due to demand. It is proposed to overlay the section between Lincoln and Anderson Lane T1.



Constraint Season
Winter

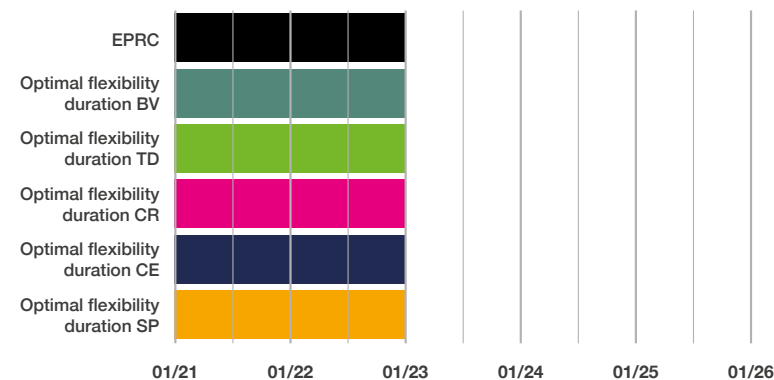


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	130.66	162.19			
TD	138.30	177.22			
CR	145.96	188.16			
CE	107.33	120.39			
SP	107.41	120.37			



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 Procurement
2020 H2 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Crowland



Scheme description

Crowland PSS currently has a single 33/11kV transformer but the site’s firm capacity is limited by the 11kV back feed capability for a loss of the transformer. It is proposed to install a second 33/11kV transformer and perform minimal 33kV works to facilitate the installation of the second transformer.



Constraint Season
Winter

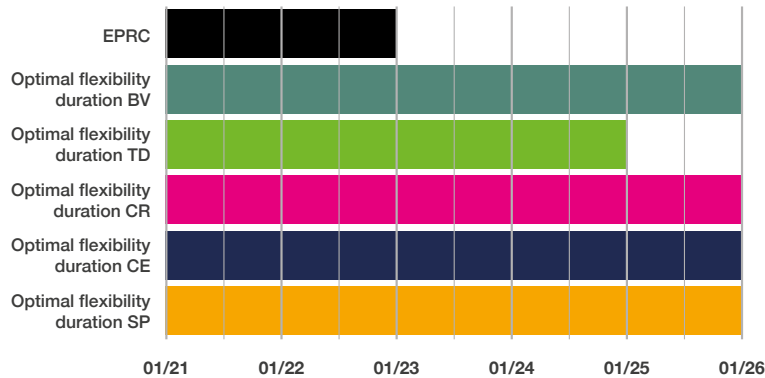


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	3.04	4.72	7.35	11.96	21.11
TD	3.44	5.72	11.16	27.22	
CR	3.86	6.59	11.34	20.22	39.29
CE	2.00	2.53	3.13	3.90	4.87
SP	2.00	2.53	3.07	4.63	4.63



DNOA Decision

Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2024 (2025+ under Best View).



Constraint management timeline

- 2021 H1** Procurement
- 2020 H2** Signposting
- 2020 H1** Signposting

3.2 - Outcomes East Midlands

Berkswell SGT



Scheme description

Berkswell GSP currents comprises 3 SGTs. Under National Grid’s current maintenance regime one SGT is taken out per year. During this period NG requests that WPD reduce the load to within the cyclic rating of 1 SGT to cover a fault on one of the remaining SGTs. To ensure future compliance of the Berkswell Grid Group a 4th SGT will be installed. 132kV works will be done to facilitate this.



Constraint Season
Summer

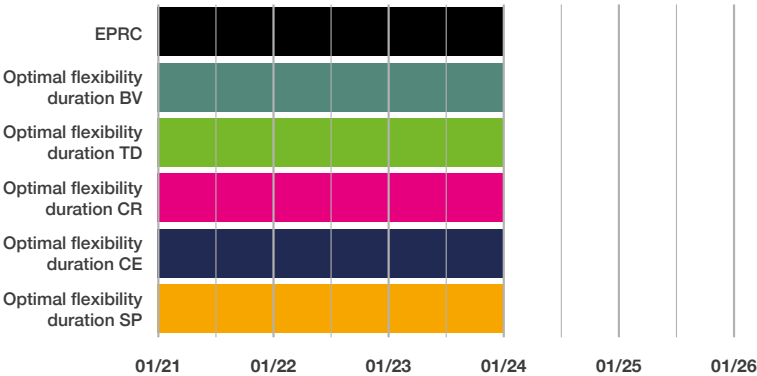


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	72.89	431.96	4278.25		
TD	113.30	569.78	5024.15		
CR	165.38	666.82	5058.16		
CE	11.76	395.15	2899.21		
SP	11.90	395.13	2876.13		



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2023. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline
2021 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Loughborough



Scheme description

It is proposed to uprate the 132kV circuits from Ratcliffe to Loughborough tee to prevent an overload.



Constraint Season
Winter/Summer

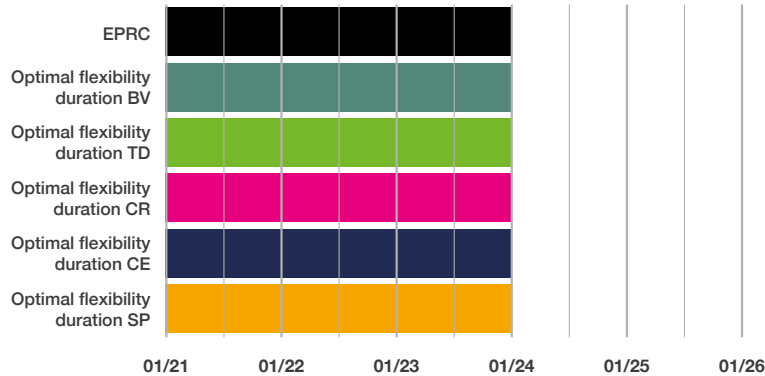


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	202.39	264.55	323.99		
TD	220.03	285.01	415.06		
CR	247.64	316.14	418.28		
CE	170.68	190.80	203.59		
SP	170.99	190.79	201.90		



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2023. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline
2021 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Mackworth



Scheme description

The transformers at Mackworth PSS are not fitted with automatic on-load tap changers, meaning that the site firm capacity is restricted in order to maintain the 11kV voltage within statutory limits. It is proposed to upgrade the transformers and replace 11-panel switchboard to prevent a constraint for the FCO loss of a transformer.



Constraint Season
Winter/Summer

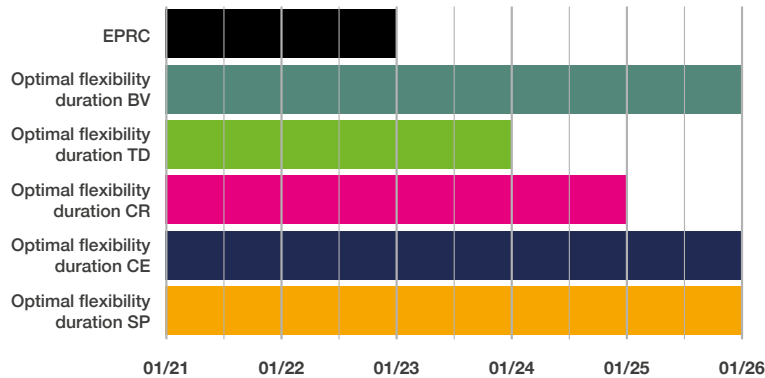


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	4.14	11.29	29.39	71.34	142.99
TD	5.45	17.19	66.80		
CR	6.96	22.48	66.18	181.81	
CE	1.66	2.83	4.88	8.10	13.40
SP	1.66	2.83	4.68	11.81	11.81



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2023 (2025+ under Best View).



Constraint management timeline

2021 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Manton



Scheme description

Manton is a 33/11kV primary consisting of 2 transformers and the demand is expected to exceed their ratings under FCO in the near future. It is proposed to install 33kV switchgear and upgrade the transformers.



Constraint Season
Winter/Summer

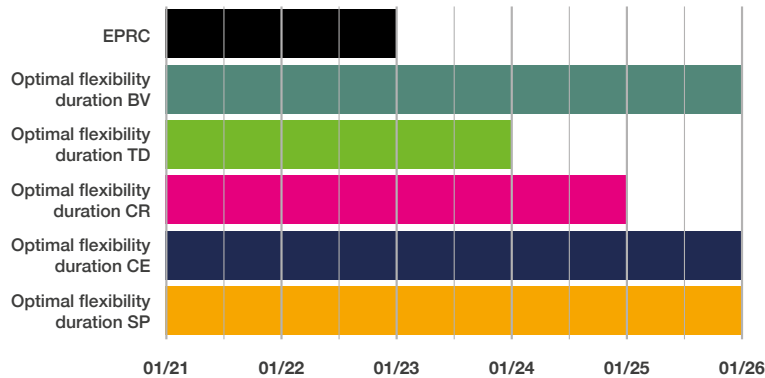


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	25.53	36.66	46.10	57.08	75.48
TD	26.91	40.01	55.16		
CR	28.45	43.16	54.62	70.14	
CE	22.16	28.06	29.77	33.40	37.47
SP	22.19	28.05	30.09	36.53	36.53



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2023 (2025+ under Best View).



Constraint management timeline

2021 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

New Dove Valley



Scheme description

Hatton is a 33/11kV primary consisting of 2 transformers and the demand is expected to exceed their ratings under FCO in the near future. It is proposed to construct a new primary called Dove Valley consisting of 2 x transformers and an 11kV board and installing a new 33kV board at Marchington PSS. The new Primary will be fed via 2 x 33kV circuits; one circuit connected directly from the new board at Marchington and other circuit being connected onto an existing overhead line at Sudbury.



Constraint Season
Winter/Summer

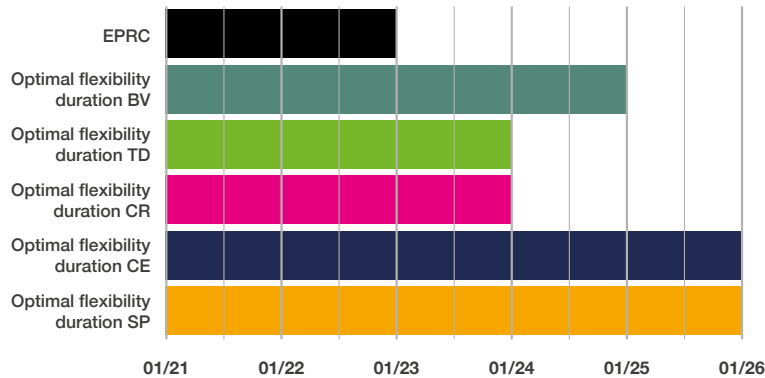


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	58.01	206.40	342.10	607.54	
TD	66.99	257.22	553.69		
CR	77.16	300.95	565.49		
CE	35.39	102.83	130.14	166.15	214.33
SP	35.47	102.83	127.77	201.80	201.80



DNOA Decision

Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2023 (2024 under Best View).



Constraint management timeline

2021 H1 Procurement

3.2 - Outcomes East Midlands

Bletchley



Scheme description

Bletchley 132/33kV was originally an ENTIRE trial zone. There is no identified reinforcement or a need to reinforce. This zone has had flexibility requirement created to give flexibility contracts to providers in the area.



Constraint Season
Winter

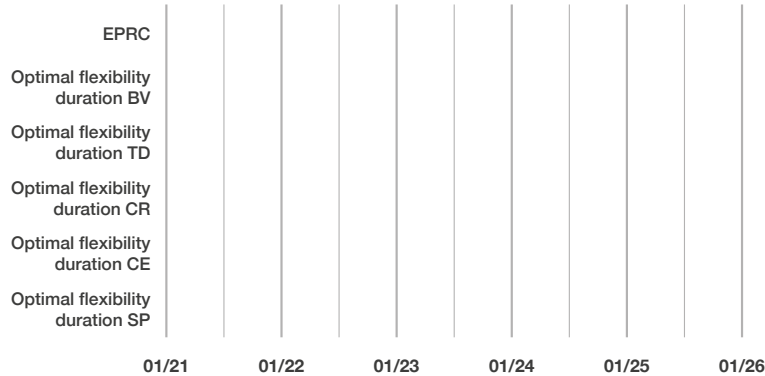


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV					
TD					
CR					
CE					
SP					



DNOA Decision

Remove



Justification for decision

Bletchley was originally created to trial flexibility services in the area. Recent analysis indicates there is no flexibility requirement.



Constraint management timeline

2021 H1	None
2020 H2	Maintain Active
2020 H1	Maintain Active
2019 H2	Procurement





For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.2 - Outcomes East Midlands

Staythorpe

	Scheme description Three phase break fault level rating. Replant Staythorpe B, total of 14 feeder bays.	Reinforcement Information Completion Year - 2024 Current Status - Preliminary	DNOA Decision  Reinforce
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Thurmaston


	Scheme description Three phase make fault level is 93.3% of rating. Replace 11kV switchgear on fault level.	Reinforcement Information Completion Year - 2022 Current Status - Preliminary	DNOA Decision  Reinforce
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Hawton-Bowbridge


	Scheme description Demand of 26MVA over 22/19MVA circuit rating. Remove overhead section and joint to connect cable to Bowbridge.	Reinforcement Information Completion Year - 2022 Current Status - Preliminary	DNOA Decision  Reinforce
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3.2 - Outcomes East Midlands

Regent Street

**Scheme description**

Landlocked site, unable to upgrade transformer on existing site. Install new primary 33/11kV switchroom and associated plant.


**Justification for decision**

Reinforcement is driven by lease expiry and thus cannot be deferred using flexibility.


Reinforcement Information

Completion Year - 2024


Current Status - Preliminary

DNOA Decision**Reinforce**

Staveley 33kV

**Scheme description**

Insufficient demand disconnection for LFT to meet Grid Code. Install LFT panels at Staveley BSP and Whitwell BSP.


**Justification for decision**

Flexibility is not financially viable as the reinforcement cost is less than £150k.

Reinforcement Information

Completion Year - 2021


Current Status - In Construction

DNOA Decision**Reinforce**

Willington

**Scheme description**

Fault level is to be overstressed. Replant offline (16 bays).

**Justification for decision**

Flexibility is not suitable to deal with this constraint as it is a fault level restriction.

Reinforcement Information


Completion Year - 2024

Current Status - Preliminary


DNOA Decision**Reinforce**

3.2 - Outcomes East Midlands

Newton Road

**Scheme description**

Three phase make fault level is anticipated to exceed switchgear rating in the near future.


**Justification for decision**

Flexibility is not suitable to deal with this constraint as it is a fault level restriction.


Reinforcement Information

Completion Year - TBD


Current Status - Preliminary

DNOA Decision**Reinforce**

Staveley 11kV

**Scheme description**

Three phase make fault level is anticipated to exceed switchgear rating in the near future.


**Justification for decision**

Flexibility is not suitable to deal with this constraint as it is a fault level restriction.


Reinforcement Information

Completion Year - TBD


Current Status - Preliminary

DNOA Decision**Reinforce**

Nottingham North

**Scheme description**

Three phase make fault level is anticipated to exceed switchgear rating in the near future.


**Justification for decision**

Flexibility is not suitable to deal with this constraint as it is a fault level restriction.

Reinforcement Information

Completion Year - TBD

Current Status - Preliminary

DNOA Decision**Reinforce**

3.2 - Outcomes East Midlands

Wolverton

**Scheme description**

Three phase make fault level is anticipated to exceed switchgear rating in the near future.

**Justification for decision**

Flexibility is not suitable to deal with this constraint as it is a fault level restriction.

Reinforcement Information

Completion Year - TBD

Current Status - Preliminary

DNOA Decision



Reinforce

Staveley 11kV

**Scheme description**

Willington GSP compliance due to demand - transfer approx. 14MW off T3 onto Ratcliffe-Toton BSP group. Lay 2x 33kV circuits from Toton BSP to Long Eaton PSS. Pick up 33kV cable section to feed through to Ratcliffe PSS. Replace 3x transformers.

**Justification for decision**

Reinforcement is driven by asset replacement and thus cannot be deferred using flexibility.

Reinforcement Information

Completion Year - 2022

Current Status - In Construction

DNOA Decision



Reinforce

Walpole-Boston

**Scheme description**

It is proposed to overlay the two short sections of 132kV cables between the terminal tower (HW116) and Boston 132kV substation to match the overhead line rating. Incoming bus bars, line isolators and ancillary equipment identified as a restriction to circuit ratings will also be replaced within Boston 132kV substation.

**Justification for decision**

Reinforcement scheme is part of asset replacement. Internal analysis has also indicated there is no flexibility requirement.

Reinforcement Information

Completion Year - TBD

Current Status - Preliminary

DNOA Decision



Reinforce

3.3 Outcomes West Midlands

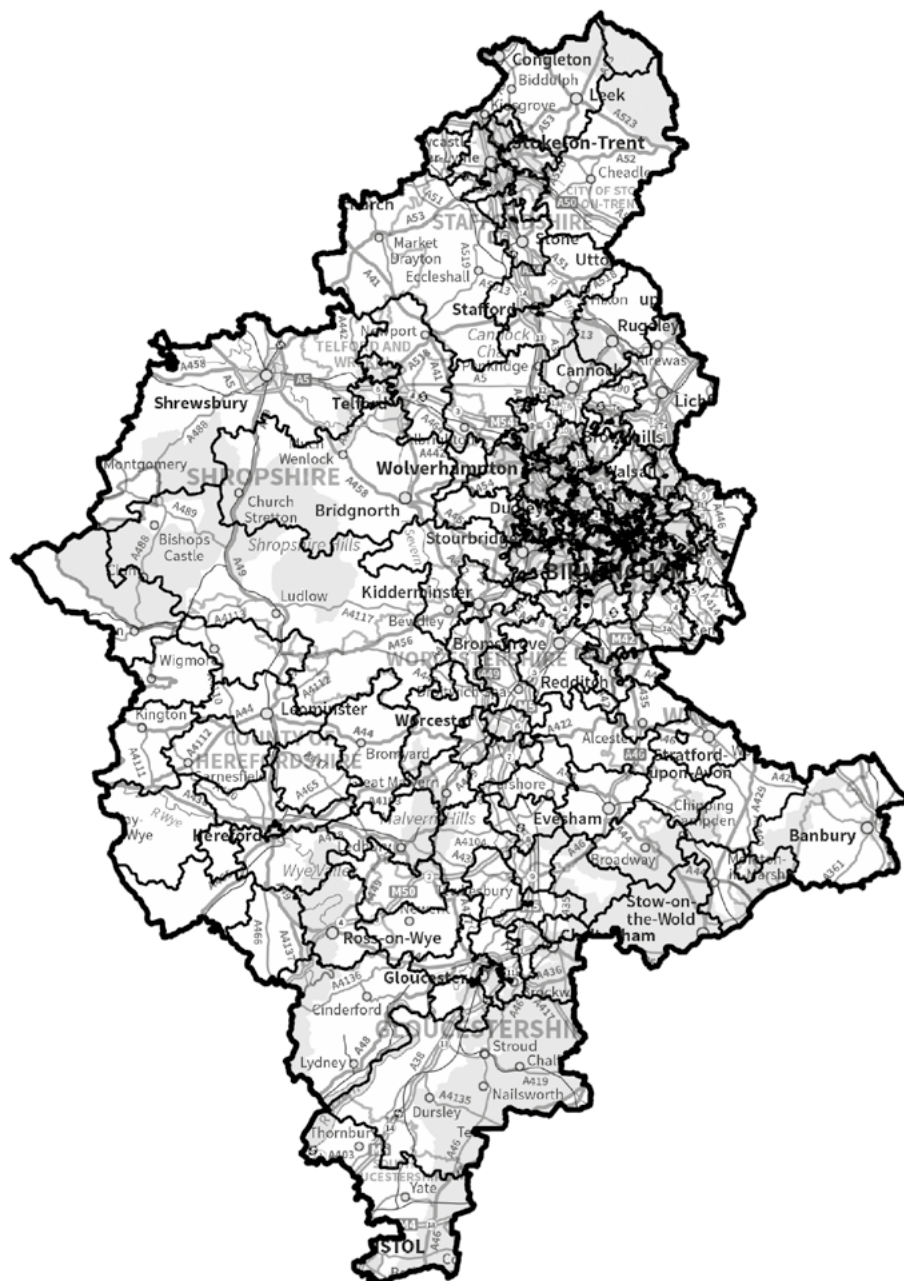
Almost 2.5 million customers are served within WPD's West Midlands license area, with an annual maximum demand of around 4.6GW and a total of 23,229GWh distributed in 2019.

The West Midlands is showing similar signs of resurgence in demand growth to the East Midlands based on planned developments by local authorities.

The West Midlands has also experienced significant growth in the connection of Distributed Generation (DG).

There is now approximately 1.7GW of generation connected to WPD's East Midlands network, with a further 2GW accepted-not-yet-connected.

In this DNOA, 19 schemes have been considered; an estimated £1.35m worth of flexibility procurement over the next five years is recommended to defer some of the £48m reinforcement works required to address the constraints.



3.3 - Outcomes West Midlands

Bushbury



Scheme description

Bushbury is a 132/11kV site consisting of three transformers. Constraint here is the flow through two of the three transformers following an outage on the third. Reinforcement likely unnecessary as significant reservation of capacity expires in 2021. Will release over 40MVA of capacity for area.



Constraint Season
Winter/Summer

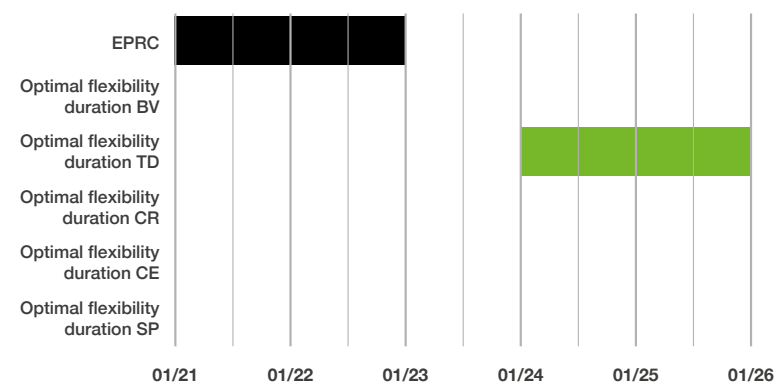


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV					
TD				0.14	5.68
CR					
CE					
SP					



DNOA Decision



Signposting



Justification for decision

No flexibility requirement under any scenarios until 2024 (2025+ under Best View).



Constraint management timeline

2021 H1	Signposting
2020 H2	Signposting
2020 H1	Signposting
2019 H2	Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Madeley



Scheme description

Madeley is a 33/11kV site consisting of two 18/24 MVA transformers fed via two 33kV circuits from Ironbridge BSP. It's likely in the future that one transformer may overload when the other is on outage. Reinforcement deferred indefinitely as anticipated demand/developments in the area now likely to be all picked up by the new Telford 54 IDNO PSS.



Constraint Season
None

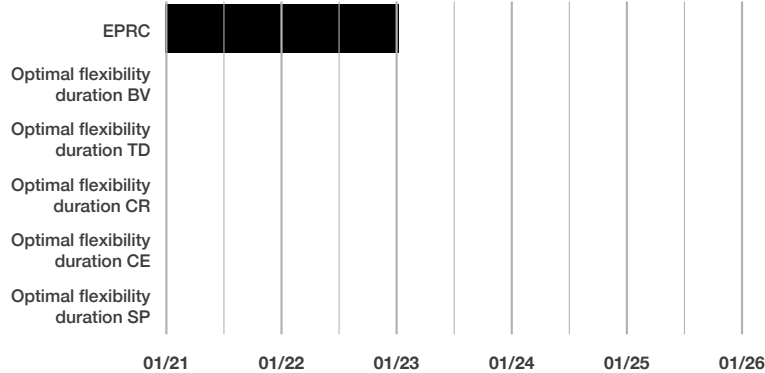


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV					
TD					
CR					
CE					
SP					



DNOA Decision

Signposting



Justification for decision

No flexibility requirement under any scenarios until at least 2025.



Constraint management timeline

2021 H1	Signposting
2020 H2	Signposting
2020 H1	Signposting
2019 H2	Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Smethwick



Scheme description

Smethwick is a 132/11kV site consisting of three transformers fed via three 132kV circuits from Bustleholm GSP. It's likely in the future that two transformers may overload when the third is on outage.



Constraint Season
Winter/Summer

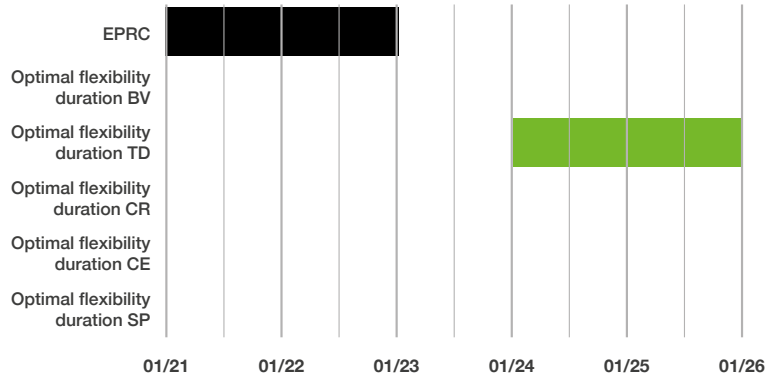


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV					
TD				0.83	16.92
CR					
CE					
SP					



DNOA Decision

Signposting



Justification for decision

No flexibility requirement under any scenarios until 2024 (2025+ under Best View).



Constraint management timeline

2021 H1	Signposting
2020 H2	Maintain Active
2020 H1	Maintain Active
2019 H2	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Donnington



Scheme description

The primary substation Donnington is a single 33/11kV transformer site fed via a single teed circuit between Ketley and Sankey substations. It relies on 11kV interconnections for backfeed and is likely to exceed its firm capacity in the near future. The proposed reinforcement is to install a second 33/11kV transformer at Donnington PSS, and a second 33kV circuit from Ketley BSP supplying the new transformer.



Constraint Season
Winter/Summer

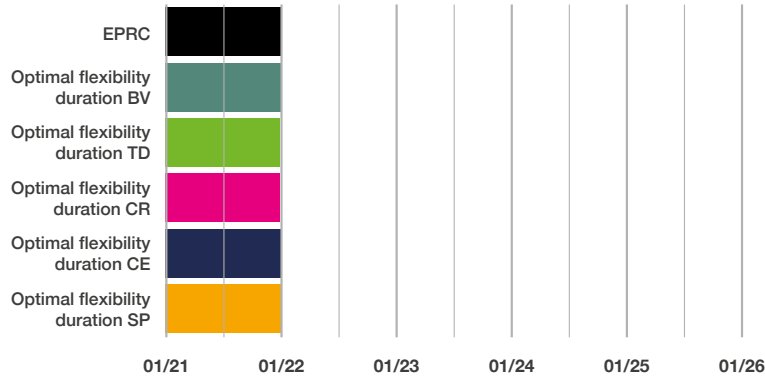


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	158.09				
TD	166.91				
CR	166.00				
CE	155.65				
SP	155.62				



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2021. Current flexibility contracts are being kept active to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Maintain Active
2020 H2	Maintain Active
2020 H1	Maintain Active
2019 H2	Maintain Active
2019 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Oldbury



Scheme description

Oldbury GSP is supplied via two 275/132kV SGTs. The demand occasionally exceeds 100MVA triggering a SCO study under P2 class D. There is very limited 11kV interconnection; this has been calculated to be 7.7MVA. The conventional solution therefore is to request for a third SGT to be installed by NGETO at Oldbury GSP.



Constraint Season
Winter

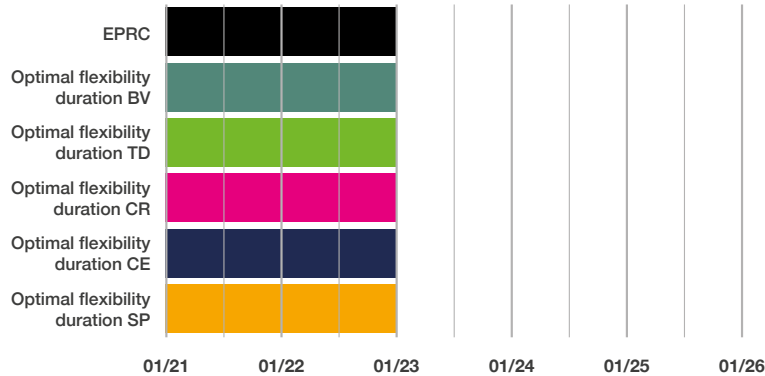


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	8.31	9.87			
TD	24.72	51.49			
CR	19.99	32.89			
CE	6.88	7.29			
SP	6.36	6.37			



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2021. Current flexibility contracts are being kept active to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Maintain Active
2020 H2	Procurement
2020 H1	Procurement
2019 H2	Signposting
2019 H1	Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Brimscombe



Scheme description

The primary substations Cherington PSS and Camp PSS are fed via two 33kV circuits from Ryford BSP to form a ring. The combined group demand exceeds the firm capacity of the network and therefore there is a conventional reinforcement scheme proposing to install a third circuit into a newly established 33kV switching site with the option to make it into a primary substation in the near future (Brimscombe PSS) to pick up neighbouring load.



Constraint Season
Winter

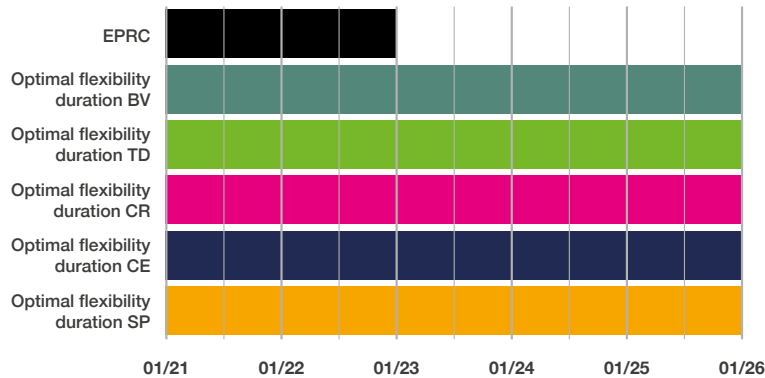


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	57.32	59.59	63.96	70.05	76.47
TD	65.76	73.80	83.98	96.84	114.29
CR	65.55	68.67	74.34	80.74	88.32
CE	55.50	56.14	58.90	64.53	68.79
SP	54.60	54.61	56.54	60.93	64.53



DNOA Decision

Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2025 under all scenarios.



Constraint management timeline

- 2021 H1 Procurement
- 2020 H2 Procurement
- 2020 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Meaford



Scheme description

Meaford BSP supplies multiple primary substations most of which are fed via four 33kV circuits meshed. Due to the meshed nature of the circuits, the distances involved, and the high impedance of some of the circuits, the voltages drop below statutory limits following a first circuit outage. The proposed reinforcement is to install a new 33kV circuit from Meaford to Eccleshall. New circuit breakers will also be installed at Meaford and Eccleshall.



Constraint Season

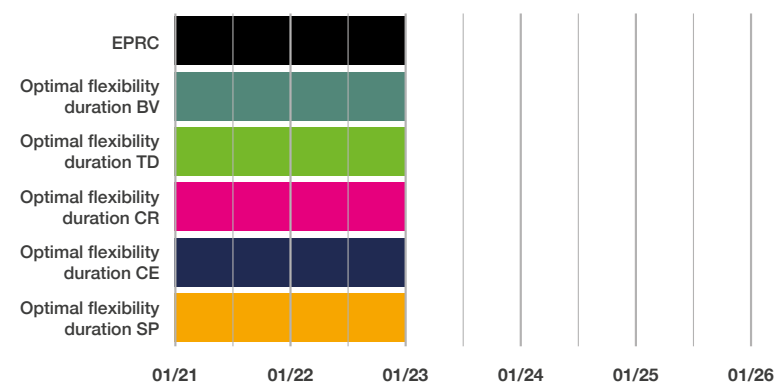
Winter/Summer

Flexibility Product

Dynamic

Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	405.75	413.96			
TD	443.41	468.02			
CR	436.32	453.86			
CE	397.66	398.46			
SP	394.11	394.18			



DNOA Decision

**Reinforce with Flexibility**

Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 **Maintain Active****2020 H2** Maintain Active**2020 H1** ProcurementFor more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Hereford - Ledbury Ring



Scheme description

The Hereford 66kV ring here consists of Wiches Solar Farm, St Weonards, Ross, Dymock, Newent, and Ledbury 66/11kV primary substations fed via two 66kV circuits from Hereford BSP (within Bishops Wood GSP). During an outage on either of these infeeds, the volts at Wiches Solar farm (a 66kV connection) drop to below statutory limits. It is proposed to install a STATCOM to improve the voltage regulation, along with upgrades to the isolators at Ledbury and installing a new 66kV feeder bay with circuit breaker and two new isolators at Brotheridge Green.



Constraint Season
Winter

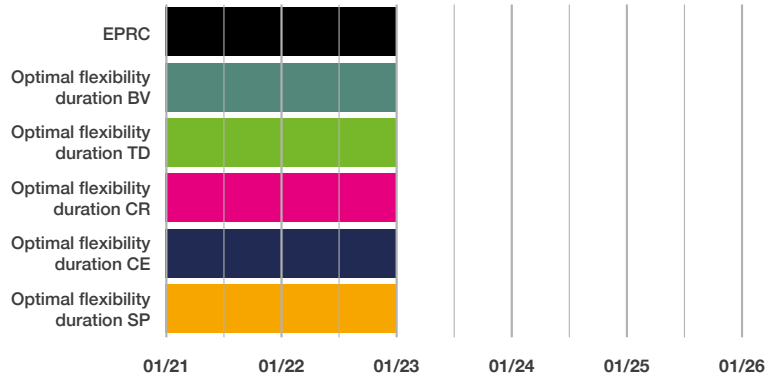


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	347.41	383.82			
TD	567.20	801.18			
CR	522.04	643.85			
CE	314.40	326.53			
SP	301.38	301.59			



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2023. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 **Procurement**
2020 H2 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Feckenham South



Scheme description

Feckenham South 66kV network supplies several primary substation and is quite meshed. Due to long feeding distances and network loads, the voltages drop to below statutory limits following FCO. Proposed reinforcement works will require establishment of a 132/66kV compound at Banbury, installation of a 132/66kV transformer and a 66kV cable circuit from Banbury to Bloxham PSS, and a new 2 switch crossbar at Bloxham.



Constraint Season
Winter

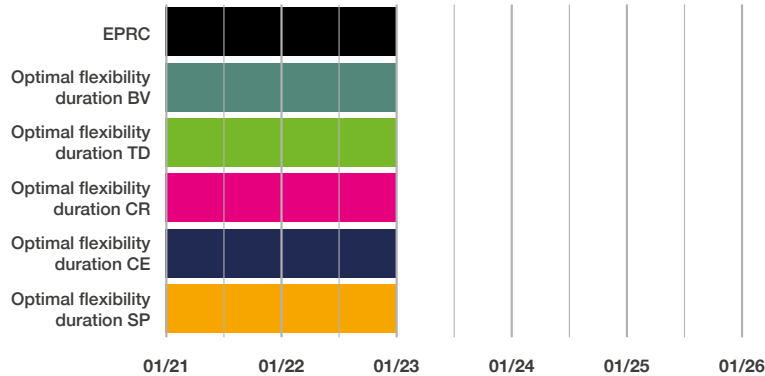


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	162.01	165.41			
TD	157.82	179.67			
CR	153.03	161.10			
CE	164.95	161.08			
SP	161.13	161.19			



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline
2021 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Hereford BSP



Scheme description

Hereford (Walham area) is a site consisting of two 132/66kV transformers (GT4 and GT5) fed via two 132kV circuits from Port Ham GSP. Load growth indicates that the site will exceed its firm capacity under FCO hence the proposal of installing a third 132/66kV transformer.



Constraint Season
Winter

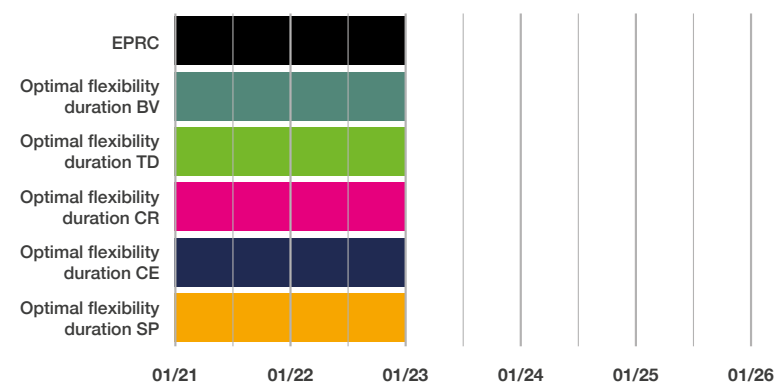


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	5.37	29.18			
TD	12.59	193.27			
CR	10.05	115.27			
CE	4.55	19.37			
SP	4.21	15.92			



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2023. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 Procurement

2020 H2 Signposting

2020 H1 Signposting

2019 H2 Signposting

2019 H1 Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Banbury



Scheme description

Banbury is a 132/11kV site consisting of three 60MVA double winding transformers fed via two 132kV circuits from East Claydon GSP. Constraint here is the flow through two of the three transformers following an outage on the third. There is currently no reinforcement planned at Banbury.



Constraint Season
Winter

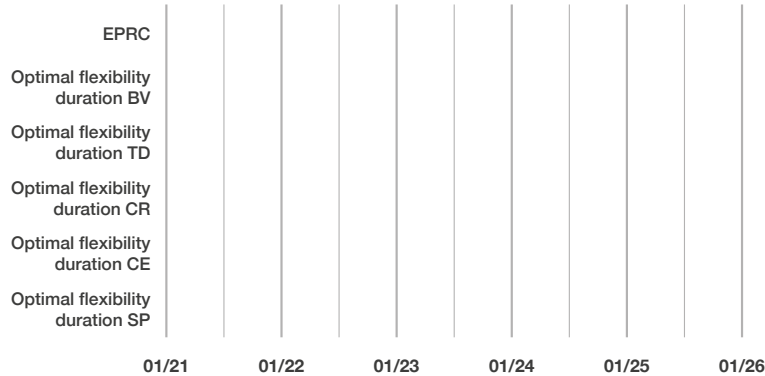


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV					
TD					
CR					
CE					
SP					



DNOA Decision

Remove



Justification for decision

Banbury was originally created to trial flexibility services in the area. Recent analysis indicates there is no flexibility requirement.



Constraint management timeline

2021 H1 **None**



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes West Midlands

Eastern Avenue

<div data-bbox="67 416 151 504"></div> <p>Scheme description</p> <p>Fault level is anticipated to exceed switchgear rating in the near future. Proposal is to install an 11kV switchboard in the new switch room, which will necessitate a new switch building.</p> <div data-bbox="67 616 151 705"></div> <p>Justification for decision</p> <p>Flexibility is not suitable to deal with this constraint as it is a fault level restriction.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2022</p> <p>Current Status - In Design</p>	<p>DNOA Decision</p> <div data-bbox="1284 548 1396 660"></div> <p>Reinforce</p>
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Warndon 11kV

<div data-bbox="67 1001 151 1086"></div> <p>Scheme description</p> <p>12 units of switchgear are marginally stressed. In-situ replacement of circuit breakers with a modern equivalent.</p> <div data-bbox="67 1176 151 1265"></div> <p>Justification for decision</p> <p>Flexibility is not suitable to deal with this constraint as it is a fault level restriction.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2021</p> <p>Current Status - In Construction</p>	<p>DNOA Decision</p> <div data-bbox="1284 1131 1396 1243"></div> <p>Reinforce</p>
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Cheapside

<div data-bbox="67 1588 151 1675"></div> <p>Scheme description</p> <p>11kV switchgear is stressed. Change switchgear.</p> <div data-bbox="67 1742 151 1832"></div> <p>Justification for decision</p> <p>Flexibility is not suitable to deal with this constraint as it is a fault level restriction.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2023</p> <p>Current Status - In Design</p>	<p>DNOA Decision</p> <div data-bbox="1284 1720 1396 1832"></div> <p>Reinforce</p>
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3.3 - Outcomes West Midlands

Penn

<div data-bbox="67 416 151 504"></div> <p>Scheme description 132kV switchgear is stressed. Change switchgear.</p> <div data-bbox="67 560 151 647"></div> <p>Justification for decision Flexibility is not suitable to deal with this constraint as it is a fault level restriction.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2022</p> <p>Current Status - In Construction</p>	<p>DNOA Decision</p> <div data-bbox="1289 555 1396 660"></div> <p>Reinforce</p>
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Sankey - Newport




<div data-bbox="67 999 151 1086"></div> <p>Scheme description Circuit overloads after a FCO (29.6MVA on a 27MVA rated conductor). Underground a span of overhead line to 39MVA rating between Sankey Tee 1 and Newport Tee 2.</p> <div data-bbox="67 1209 151 1296"></div> <p>Justification for decision Flexibility is not financially viable as the reinforcement cost is less than £150k.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2021</p> <p>Current Status - In Construction</p>	<p>DNOA Decision</p> <div data-bbox="1289 1146 1396 1252"></div> <p>Reinforce</p>
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Burslem




<div data-bbox="67 1585 151 1673"></div> <p>Scheme description Overloads of the Cellarhead - Rugeley/Barlaston circuit, with Cellarhead Split busbar arrangement during a nearby 2nd outage. Replace 2 circuit breakers at Burslem and 6 isolators.</p> <div data-bbox="67 1818 151 1906"></div> <p>Justification for decision Flexibility is not suitable to deal with this constraint as it is a fault level restriction.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2022</p> <p>Current Status - In Design</p>	<p>DNOA Decision</p> <div data-bbox="1289 1733 1396 1839"></div> <p>Reinforce</p>
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3.3 - Outcomes West Midlands

Wapley

	Scheme description Opportunity is being taken during the asset replacement to improve network security and revise the running arrangement by installing 2 bus section CBs on the proposed new 33kV board, and a spare future Naishcombe circuit CB.	Reinforcement Information Completion Year - 2021 Current Status - In Design	<div>DNOA Decision  Reinforce</div>
	Justification for decision Reinforcement is driven by asset replacement and thus cannot be deferred using flexibility.		

Sankey - Newport

	Scheme description Cellarhead 132kV operates 7x 132kV circuits in a mesh. Under various SCO conditions, various 132kV circuits potentially overload. Proposed new 132kV circuit between Cellarhead and Whitfield (with new 132kV bays at Cellarhead and Whitfield).	Reinforcement Information Completion Year - 2023 Current Status - In Design	<div>DNOA Decision  Reinforce</div>
	Justification for decision Not financially feasible for flexibility.		

3.3 Outcomes South Wales

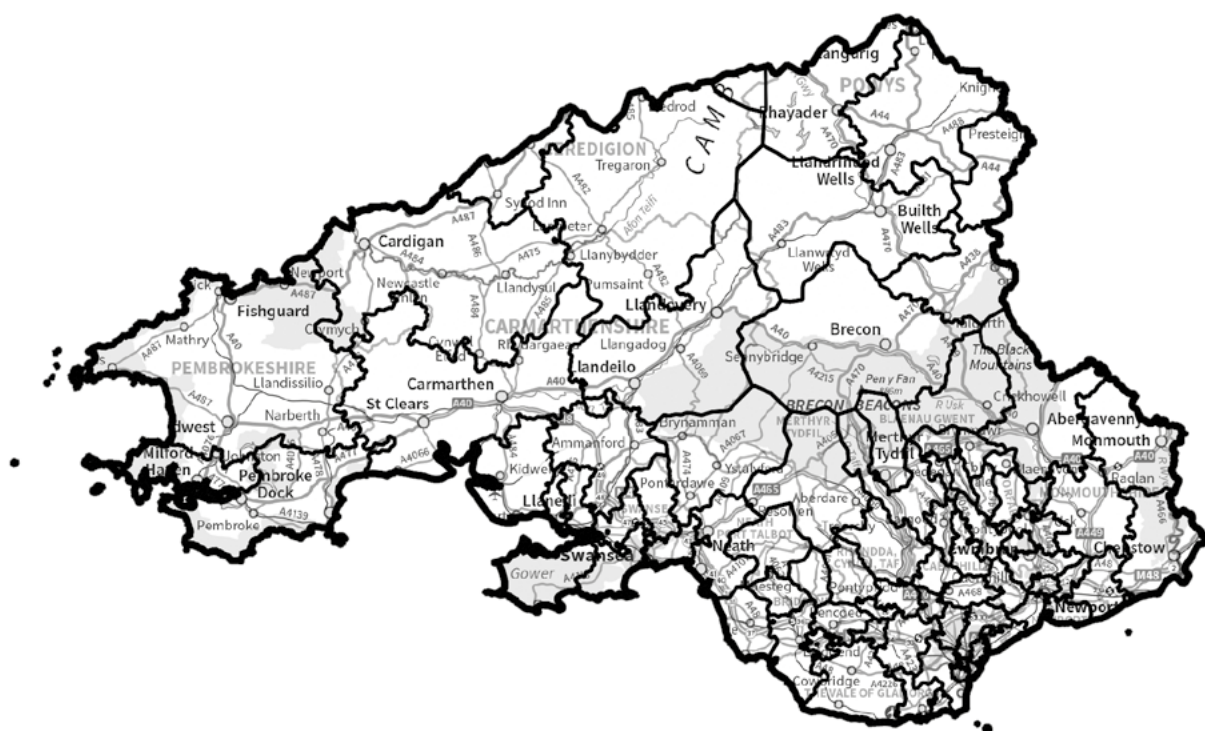
Over 1.1 million customers are served within WPD's South Wales license area, with an annual maximum demand of around 1.9GW and a total of 10,987GWh distributed in 2019.

There is now approximately 2.2GW of generation connected to WPD's East Midlands network, with a further 3GW accepted-not-yet-connected.

Despite recent changes to renewable energy subsidies driving a reduction in the volume of Distributed Generation (DG) and other Distribution Energy Resources (DER) seeking connection, there is still over 900MW of predominately low carbon generation waiting to be built in the region.

Much of this is made up of on-shore wind connections.

In this DNOA, 9 schemes have been considered; an estimated £626,000 worth of flexibility procurement over the next five years is recommended to defer some of the £34.5m reinforcement works required to address the constraints.



3.3 - Outcomes South Wales

Abergavenny - Crickhowell



Scheme description

The northern 66kV ring in Mid Wales is supplied by two 66kV circuits from Abergavenny. Either circuit is close to becoming overloaded following a FCO. Proposed solution to remove all issues associated with increasing group demand would be to construct a 3rd 66kV injection into the group by building a new 132kV circuit from Rassau GSP.



Constraint Season
Winter/Summer

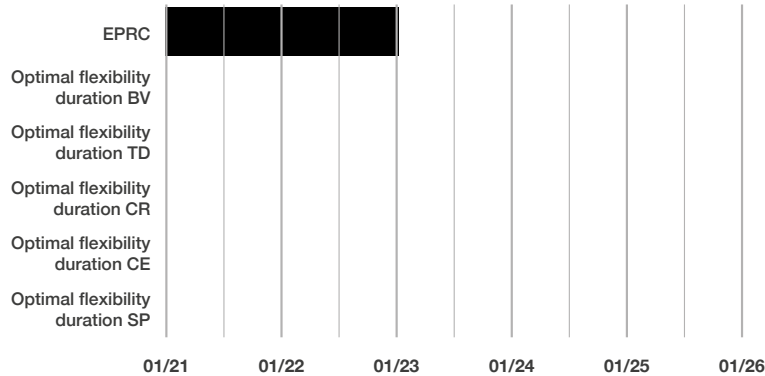


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV					
TD					
CR					
CE					
SP					



DNOA Decision

Signposting



Justification for decision

No flexibility requirement under any scenarios until at least 2025.



Constraint management timeline

2021 H1 Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South Wales

Cardiff North



Scheme description

A second circuit outage (SCO) condition resulting in both 132/33kV grid transformers at Cardiff East BSP being out of service, leaving the group demand supplied via the single GT at Cardiff North BSP. Proposed reinforcement is to install a 132kV outdoor circuit breaker bay and a 132/33kV GT to reinforce the Cardiff East/Cardiff North group.



Constraint Season
Winter/Summer

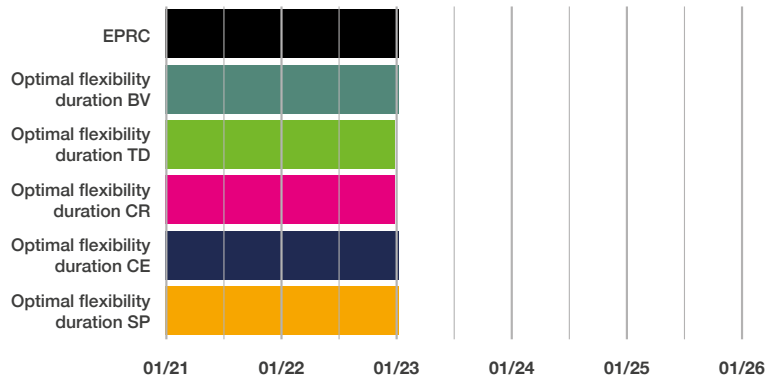


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	139.0	142.3			
TD	159.6	161.1			
CR	156.8	156.5			
CE	135.2	135.7			
SP	136.3	136.1			



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South Wales

East Aberthaw



Scheme description

A second circuit outage (SCO) condition would result in both 132/33kV grid transformers at Brynhill BSP being out of service, leaving the entire group demand supplied via the single GT at East Aberthaw. Proposed reinforcement is to install a 132kV circuit breaker bay and a 132/33kV GT.



Constraint Season
Summer

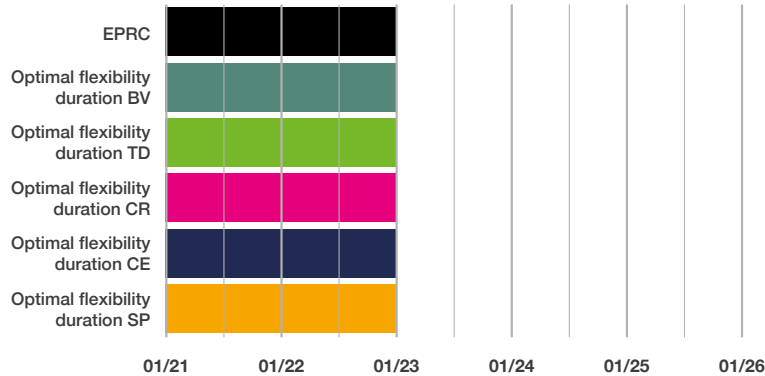


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	5.47	93.54			
TD	28.95	141.68			
CR	25.04	134.04			
CE	4.33	82.08			
SP	4.17	80.59			



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South Wales

Llandrindod - Rhayader



Scheme description

The Rhayader 11kV network voltage falls below the statutory voltage limit when there is a fault resulting in the loss of the Builth Wells to Rhayader and Llandrindod Wells T1 66kV circuits, leaving all of the Rhayader and Llandrindod Wells 11kV demand supplied via Llandrindod Wells T2. The voltage can be brought back within statutory limits by reducing demand at Rhayader.



Constraint Season
Winter/Summer

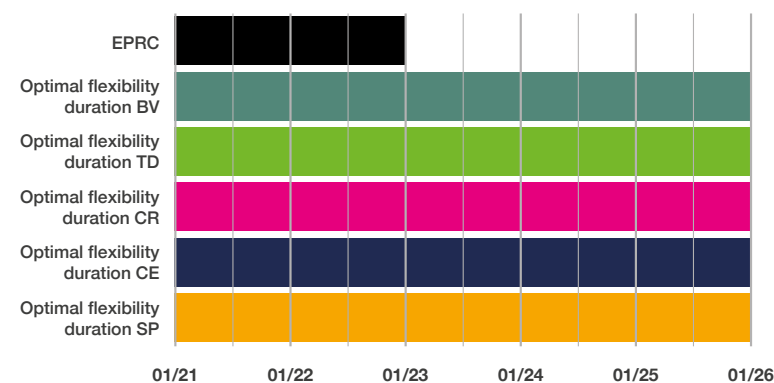


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	15.74	15.70	16.10	16.76	16.98
TD	18.31	18.59	18.85	19.84	20.47
CR	18.01	17.97	17.79	17.85	18.07
CE	15.51	15.51	15.67	16.02	15.86
SP	15.55	15.47	15.36	15.54	15.61



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2025 under all scenarios.



Constraint management timeline

2021 H1 Procurement

2020 H2 Procurement

2020 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South Wales

Mountain Ash



Scheme description

A FCO condition resulting in the loss of a 275/33kV SGT at Upper Boat GSP. It is common practice for the 33kV networks to be ‘split’ following the loss of an Upper Boat SGT by opening the 33kV 8L5 bus-section circuit breaker at Upper Boat and 4L5 circuit breaker at Wattstown towards Tonypanydy. As a result, Mountain Ash GT2 is left to supply a sizable share of the group and is projected to become overloaded with increasing group demand. Proposed reinforcement is to install a 132kV circuit breaker bay, a 132/33kV GT and a 33kV GIS circuit breaker bay.



Constraint Season
Winter

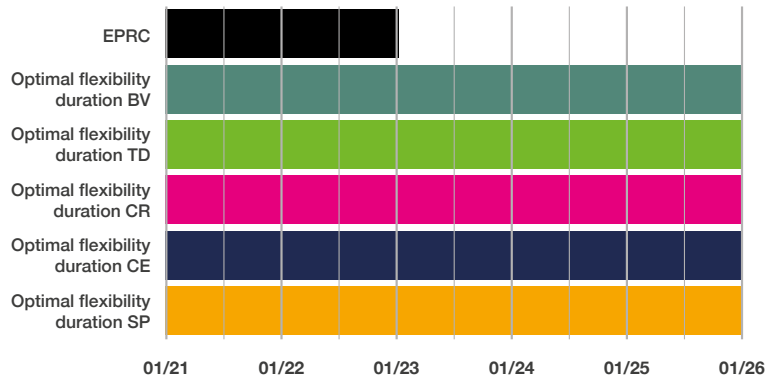


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	10.34	12.19	14.99	17.81	20.26
TD	20.58	23.34	26.51	36.59	52.74
CR	18.57	18.46	17.17	18.05	19.02
CE	9.15	9.28	9.76	11.66	14.09
SP	9.04	8.89	8.68	9.42	10.52



DNOA Decision

Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2025 under all scenarios.



Constraint management timeline
2021 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South Wales

Pembroke



Scheme description

The fault of the Golden Hill to Jordanston Farm 33kV circuit leaves a considerable length of 33kV network including St Florence, Tenby and Broadfield supplied via Haverfordwest BSP. The step voltage change in this area following this FCO condition can cause the 33kV network voltage to fall below statutory limits. This first circuit fault begins to heavily load the Haverfordwest to Broadfield 33kV circuit. Proposed reinforcement is to install a new 33kV circuit between Goldenhil BSP and Broadfield primary, plus 2 new circuit breaker bays.



Constraint Season
Winter/Summer

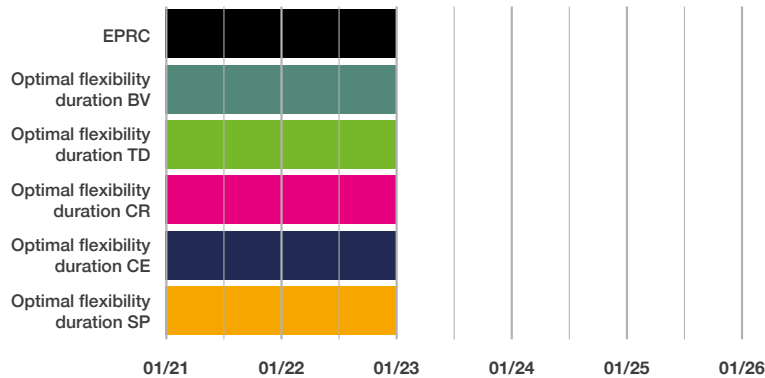


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	188.34	190.78			
TD	205.71	207.32			
CR	203.45	203.28			
CE	185.60	185.92			
SP	185.29	184.97			



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement at St Florence, Tenby and Broadfield is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

- 2021 H1 Procurement
- 2020 H2 Procurement
- 2020 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South Wales

Trevaughan



Scheme description

Trevaughan 33/11kV primary substation becomes thermally overloaded for a FCO on one of the substation transformers. Proposed reinforcement is to build a new primary substation.



Constraint Season
Winter

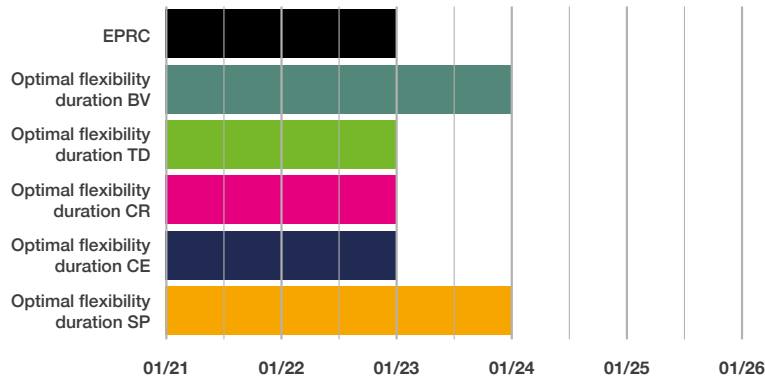


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	31.03	48.30	45.47		
TD	47.46	45.81			
CR	49.39	51.25			
CE	28.16	43.85			
SP	27.74	43.82	53.67		



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until 2023 under Best View.



Constraint management timeline



2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement





For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South Wales

Nantgaredig

 Scheme description <p>Fault rating of 33kV switchgear. Voltage (11kV backfeed issues) & improved protection for rapid fault removal. Install 2nd 33/11kV transformer and 33kV switchboard.</p>	Reinforcement Information <p>Completion Year - 2021</p> <p>Current Status - In Design</p>	DNOA Decision  Reinforce
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Cefn Gwrgan

 Scheme description <p>Fault level driven, upgrade 4 x 66kV ACBs.</p>	Reinforcement Information <p>Completion Year - 2022</p> <p>Current Status - Preliminary</p>	DNOA Decision  Reinforce
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3.3 Outcomes South West

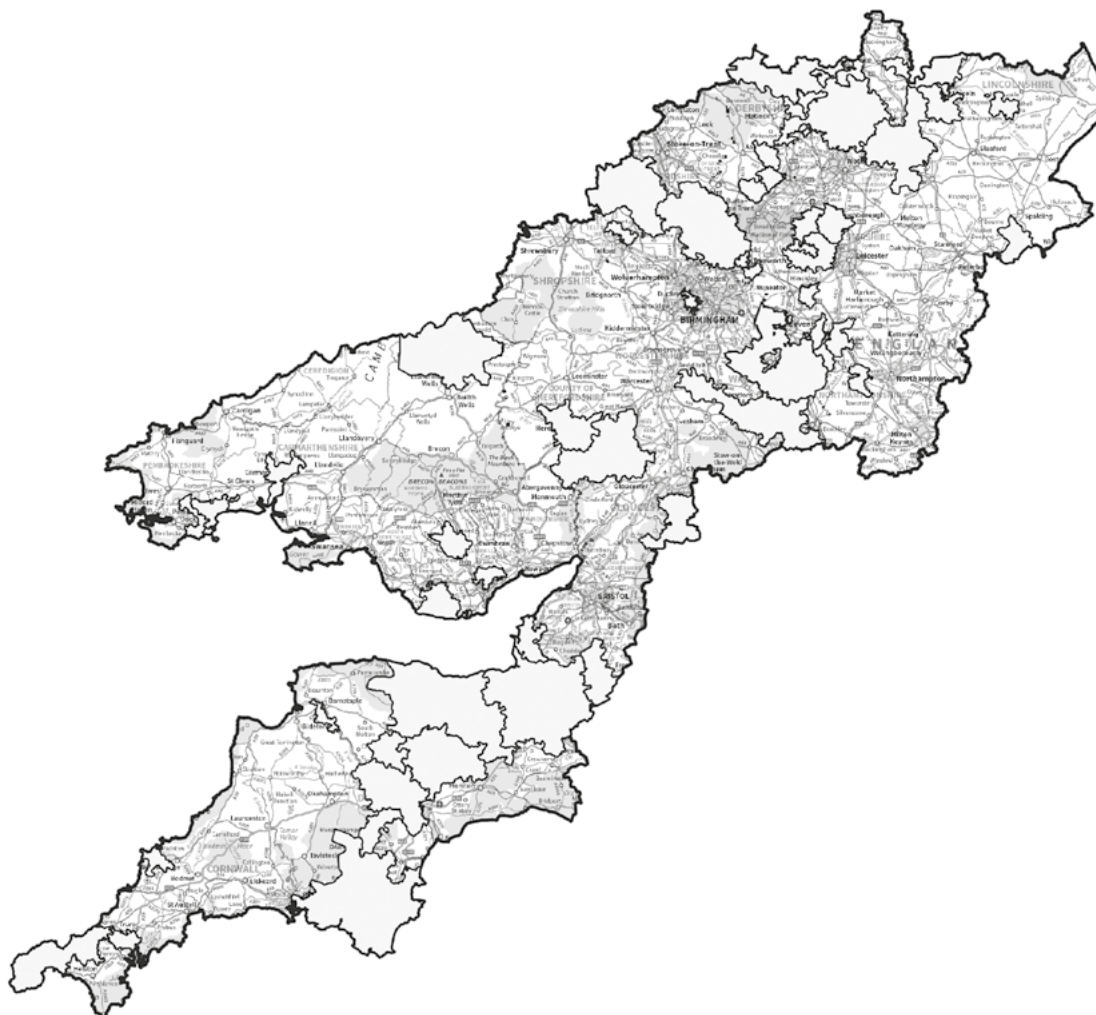
Over 1.6 million customers are served within WPD's South West license area, with an annual maximum demand of around 2.6GW and a total of 13,221GWh distributed in 2019.

The growth of Distributed Generation (DG) across Great Britain is particularly evident in the South West, driven in part by the abundance of renewable resources in the area.

There is now approximately 2.3GW of generation connected to WPD's South West network, with a further 1.1GW accepted-not-yet-connected.

Although the reduction in subsidies for generation (most notably in solar photovoltaic installations) has slowed the speed of DG deployment, the demand for new connections is still high.

In this DNOA, 27 schemes have been considered; an estimated £2.7m worth of flexibility procurement over the next five years is recommended to defer some of the £57.5m reinforcement works required to address the constraints.



3.3 - Outcomes South West

Western Approach



Scheme description

Following the connection of further demand the firm transformer capacity is projected to be exceeded in the near future at Western Approach PSS. 11kV works are proposed to deal with this constraint.



Constraint Season
Winter

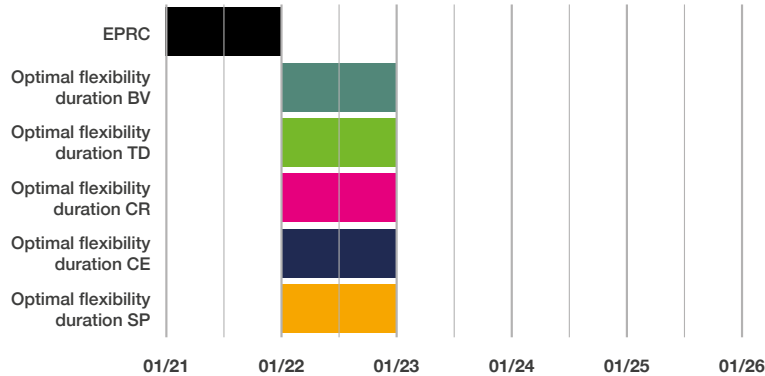


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV		15.41			
TD		23.31			
CR		22.29			
CE		10.30			
SP		9.49			



DNOA Decision

Signposting



Justification for decision

No flexibility requirements until 2022 under any scenario.



Constraint management timeline

2021 H1 Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Stokenham



Scheme description

Stokenham is a Single Transformer Primary with a FCO capacity limited by 11kV back feeds.



Constraint Season
Winter

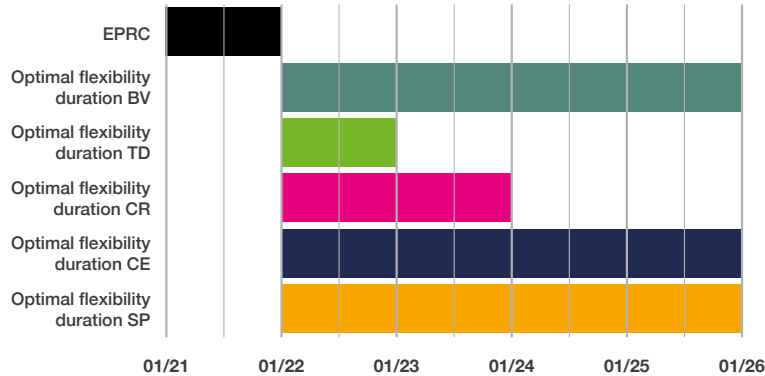


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV		0.44	1.53	3.80	9.75
TD		4.15			
CR		2.26	9.55		
CE		0.12	0.24	0.53	1.72
SP		0.09	0.16	0.32	0.86



DNOA Decision

Signposting



Justification for decision

No flexibility requirement under any scenarios until 2022.



Constraint management timeline

- 2021 H1 **Signposting**
- 2020 H2 Procurement
- 2020 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Plymouth/South Hams



Scheme description

Extremely Complicated area of 132kV network - a comprehensive network study is required. There is not a defined reinforcement scheme to address the constraints in the area. Possibilities include overlaying the 132kV cable and replacing the 132kV reactor. Alternatively, could install a new circuit between Landulph and Milehouse.



Constraint Season
Winter/Summer

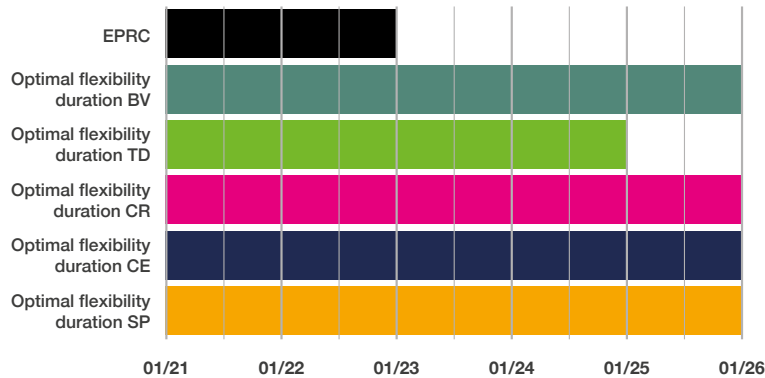


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	200.94	226.47	256.20	292.98	358.72
TD	226.76	281.20	358.75	427.25	
CR	221.53	257.17	317.18	380.68	485.82
CE	195.71	198.90	215.82	231.89	262.27
SP	194.97	196.56	207.94	221.85	242.98



DNOA Decision



Flexibility



Justification for decision

Current flexibility contracts are adequate to deal with the constraint, and will be kept active. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2024 (2025+ under Best View).



Constraint management timeline

2021 H1	Maintain active
2020 H2	Procurement
2020 H1	Procurement
2019 H2	Procurement
2019 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Exeter City



Scheme description

Exeter City BSP has a constraint for a FCO of one of the 132/33kV GTs. Proposed reinforcement is to install a 3rd transformer and a 132kV cable circuit. Would also require the upgrade of Haven Rd substation.



Constraint Season
Winter

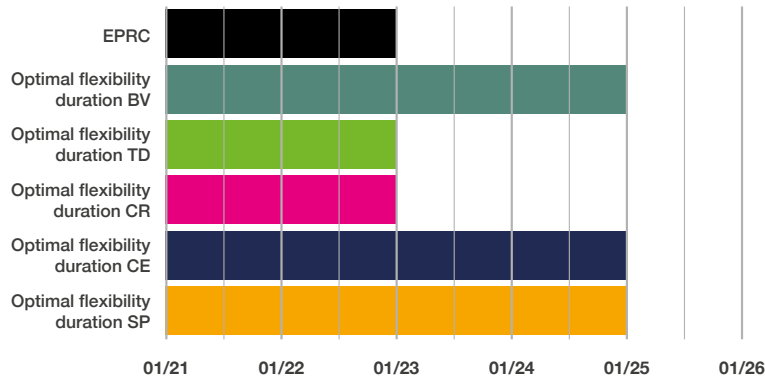


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	73.73	91.22	167.50	223.06	
TD	106.97	157.57			
CR	96.50	134.77			
CE	66.85	69.30	122.80	134.28	
SP	68.92	67.53	117.72	126.69	



DNOA Decision



Flexibility



Justification for decision

Current flexibility contracts are adequate to deal with the constraint, and will be kept active. Cost-benefit analysis indicates flexibility is the optimum solution until 2024 under Best View.



Constraint management timeline

2021 H1	Maintain active
2020 H2	Procurement
2020 H1	Procurement
2019 H2	Procurement
2019 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Radstock



Scheme description

Radstock 132/33kV substation currently has a 33kV outdoor busbar split into two sections. For an outage on one section of the 33kV busbar an overload may occur on the 3L5 circuit. It is proposed to replace the 33kV busbar indoors in three sections which will be financed by National Grid as part of the Hinkley Point C connection as seven 33kV circuit breakers require replacement due to increased fault levels.



Constraint Season
Winter/Summer

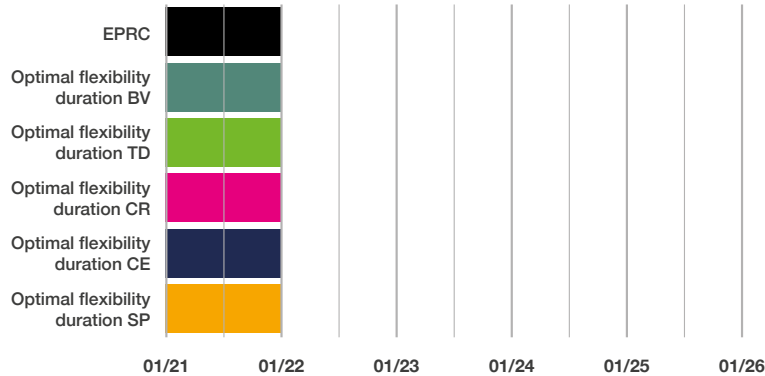


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	213.47				
TD	278.24				
CR	261.08				
CE	195.63				
SP	191.99				



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2021. Current flexibility contracts are being kept active to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Maintain active
2020 H2	Procurement
2020 H1	Procurement
2019 H2	Procurement
2019 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Bridgwater/Street



Scheme description

Overload on GT1 & GT2 at Bridgwater Grid 132/33kV substation. The Bridgwater/Street 132/33kV network runs in parallel. The group demand exceed 100 MW which means there is a P2 SCO requirement. Likely to require a fourth GT at Bridgwater, or possibly a second GT at Street. Will also require some 132kV re-arrangement for bar fault risk.



Constraint Season
Summer

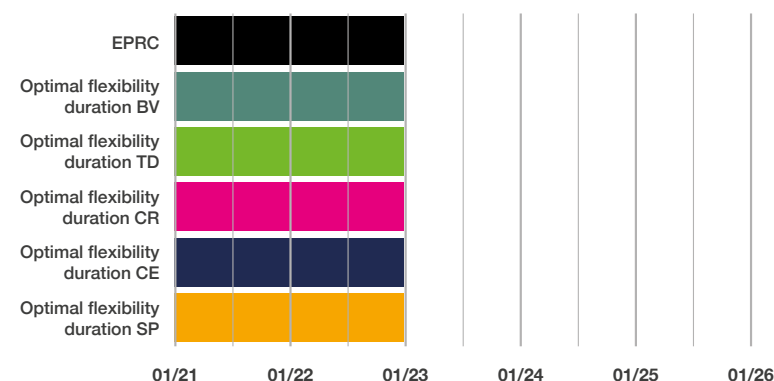


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	91.37	145.89			
TD	136.91	182.19			
CR	134.16	177.89			
CE	81.18	94.81			
SP	76.88	89.59			



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Current flexibility contracts are being kept active to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Maintain active
2020 H2	Procurement
2020 H1	Procurement
2019 H2	Procurement
2019 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Hayle - Camborne



Scheme description

An outage of the Rame - Hayle 132kV circuit overloads the 132kV circuit between Indian Queens - Fraddon - Camborne. Proposed reinforcement includes a Rame - Hayle tee split and a 132kV circuit from Rame to Camborne to split the group.



Constraint Season
Winter/Summer

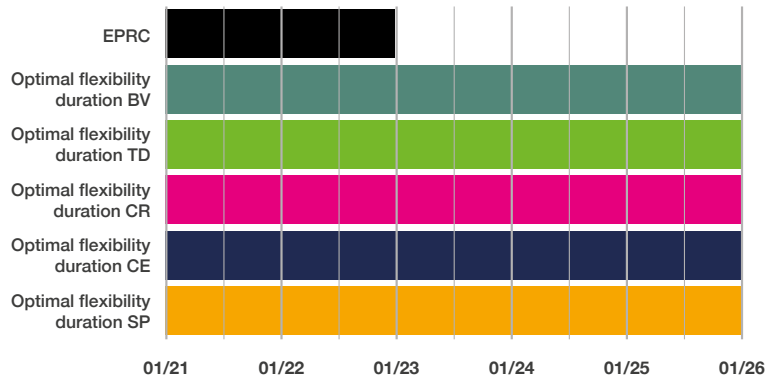


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	135.37	145.41	138.71	168.88	190.99
TD	144.51	157.48	217.78	187.52	378.38
CR	156.17	149.57	187.52	233.03	314.56
CE	118.07	123.84	133.42	141.33	142.83
SP	120.89	120.58	126.20	136.64	154.49



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2025 under all scenarios.



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement
2019 H2	Procurement
2019 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Moretonhampstead



Scheme description

Moretonhampstead is a Single Transformer Primary Substation with restricted FCO restoration capacity. The FCO restoration capacity is restricted by 11kV backfeeds.



Constraint Season
Winter

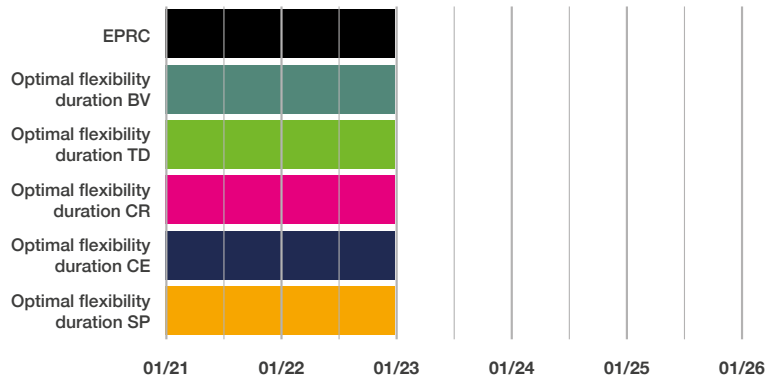


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	22.72	23.97			
TD	23.08	25.42			
CR	23.07	24.32			
CE	21.54	22.41			
SP	21.47	21.92			



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Current flexibility contracts are being kept active to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Tiverton



Scheme description

Loss of either 132kV circuit leads to the risk of the opposite Grid Transformer overloading at Tiverton BSP.



Constraint Season
Winter

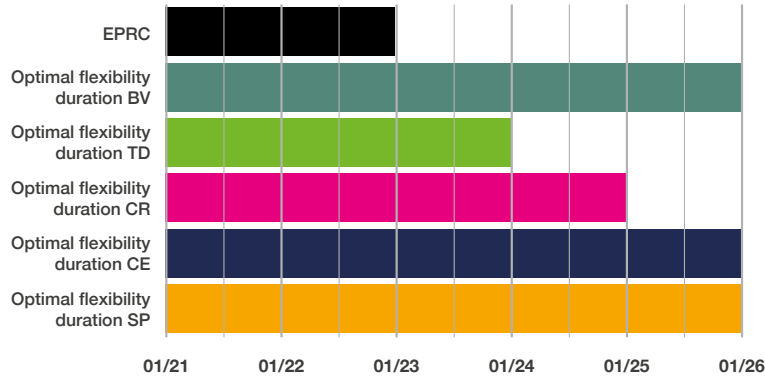


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	42.56	41.99	55.01	56.14	74.07
TD	56.97	83.67	99.15		
CR	53.88	69.60	94.38	109.53	
CE	38.19	40.21	44.14	41.69	56.85
SP	37.58	36.26	40.90	40.18	47.06



DNOA Decision



Flexibility



Justification for decision

Continued flexibility procurement is necessary due to under-participation in the area. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2023 based on current incremental growth.



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Taunton GSP



Scheme description

The Bridgwater GSP and Taunton GSP operate in parallel and are interconnected with two 132kV circuits. The group requires SCO restoration for the loss of any of the SGTs in the group. National Grid are installing a second SGT at Taunton as part of the Hinkley Point C connection works.



Constraint Season
Winter

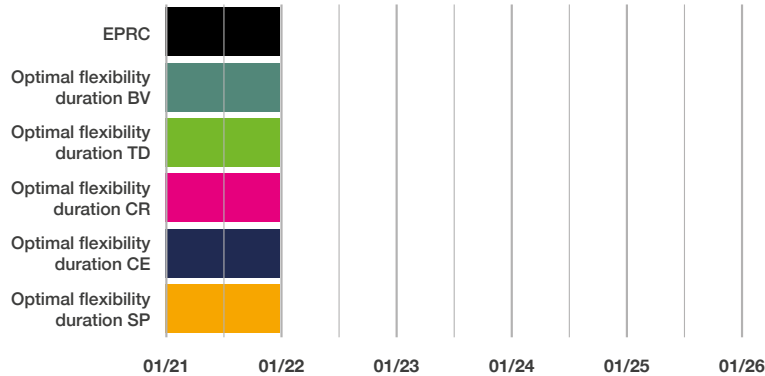


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	74.83				
TD	92.36				
CR	84.99				
CE	64.62				
SP	65.54				



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2021. Current flexibility contracts are being kept active to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Maintain Active
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Weston Super Mare



Scheme description

Western 132/33kV BSP has two transformers. A FCO has been considered as demand is currently just exceeding the transformer continuous rating.



Constraint Season
Winter

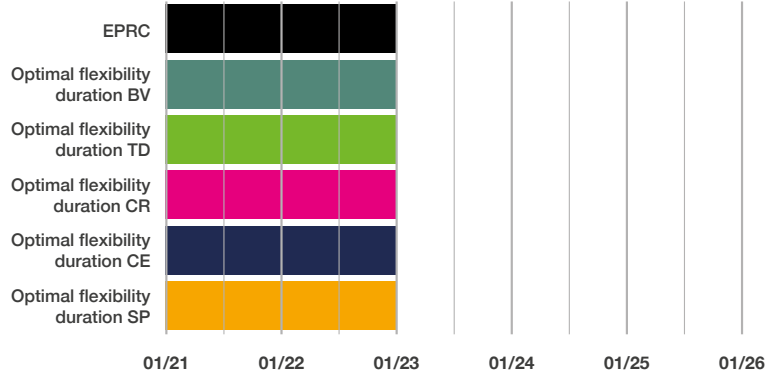


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	99.66	168.41			
TD	158.11	188.68			
CR	131.95	170.52			
CE	85.95	138.22			
SP	81.45	127.52			



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Witheridge



Scheme description

Witheridge is a Single Transformer Primary which is limited for FCO capacity by 11kV backfeeds.



Constraint Season
Winter/Summer

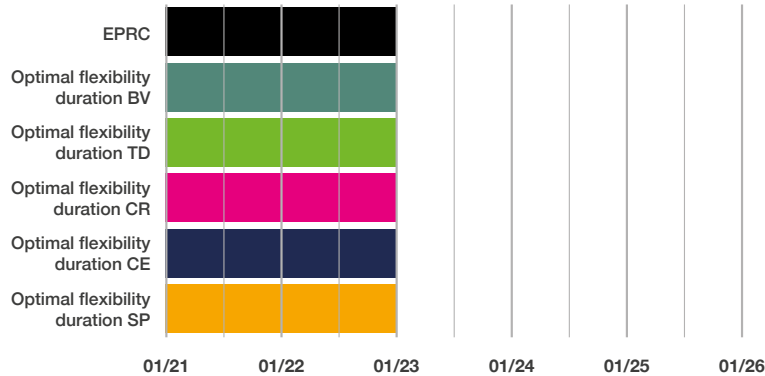


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	18.15	23.42			
TD	24.19	40.40			
CR	22.03	33.92			
CE	16.07	17.68			
SP	15.70	16.78			



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1	Procurement
2020 H2	Procurement
2020 H1	Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Padstow



Scheme description

Primary Transformers are becoming overloaded at Padstow. Proposed reinforcement is the replacement of both transformers.



Constraint Season
Winter/Summer

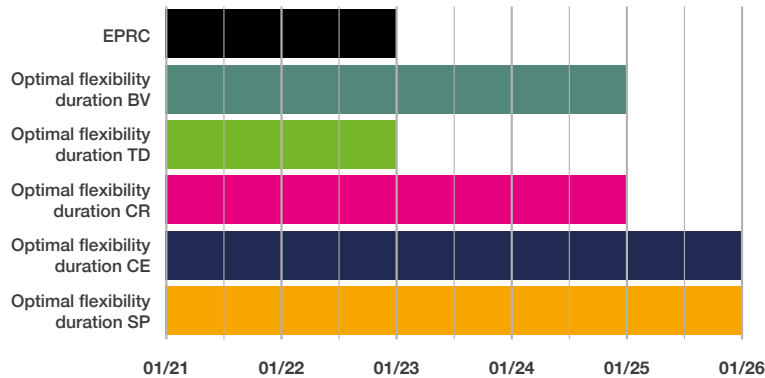


Flexibility Product
Secure



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	8.71	9.79	10.50	12.06	
TD	10.50	13.20			
CR	10.27	11.84	14.51	17.92	
CE	7.79	8.19	9.11	9.75	10.33
SP	8.49	8.04	8.50	9.22	10.15



DNOA Decision



Flexibility



Justification for decision

Current flexibility contracts are adequate to deal with the constraint, and will be kept active. Cost-benefit analysis indicates flexibility is the optimum solution until at least 2022 (2024 under Best View).



Constraint management timeline

2021 H1 Maintain Active
2020 H2 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Roundswell



Scheme description

Due to 11kV load growth the primary transformers at Roundswell Primary are due to be replaced. During the procurement and deployment period it is desired to allow further load to be connected to the site.



Constraint Season
Winter/Summer

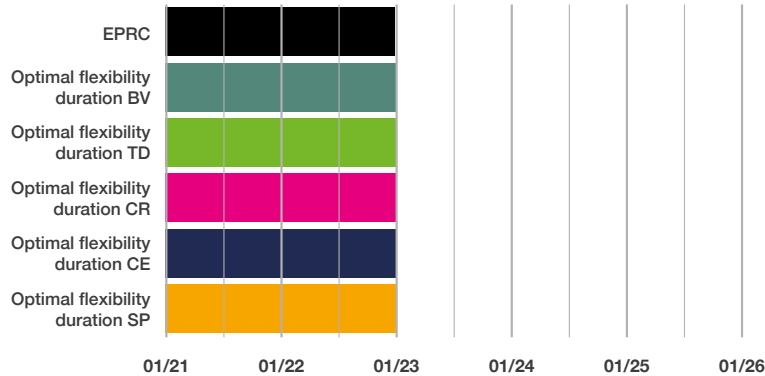


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	42.19	45.18			
TD	48.69	57.91			
CR	46.29	55.35			
CE	39.72	40.63			
SP	39.62	40.22			



DNOA Decision



Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 Procurement



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Truro - Truro Treyew



Scheme description

For SCO condition (also FCO for a 33kV busbar fault) a potential overload occurs on the Truro - Truro Treyew Road 33kV circuit following connection of additional demand at Willow Green/Langarth. This condition exists irrespective of the Truro 33kV network being run in parallel with GT1 at Fraddon.



Constraint Season
Winter

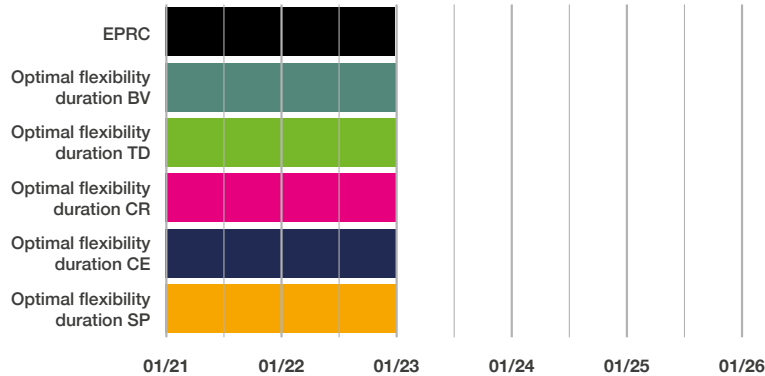


Flexibility Product
Dynamic



Estimated flex utilisation required per year (MWh):

	2021	2022	2023	2024	2025
BV	64.29	114.73			
TD	82.01	136.84			
CR	77.57	125.02			
CE	61.48	99.75			
SP	61.17	96.22			



DNOA Decision

Reinforce with Flexibility



Justification for decision

Reinforcement scheduled to be completed in 2022. Flexibility procurement is required to deal with the constraint in the interim and provide additional network security.



Constraint management timeline

2021 H1 Procurement
2020 H2 Signposting



For more information visit: www.westernpower.co.uk/network-flexibility-map-application

3.3 - Outcomes South West

Bridgwater



Scheme description

Fault level is anticipated to exceed switchgear rating in the near future. Change all 15 feeder breakers. Purchase breakers and build switchroom.



Justification for decision

Flexibility is not suitable to deal with this constraint as it is a fault level restriction.

Reinforcement Information

Completion Year - 2022

Current Status - In Construction

**DNOA
Decision**



Reinforce

Radstock Board



Scheme description

Fault level is anticipated to exceed switchgear rating in the near future.



Justification for decision

Flexibility is not suitable to deal with this constraint as it is a fault level restriction.

Reinforcement Information

Completion Year - 2021

Current Status - In Construction

**DNOA
Decision**



Reinforce

Taunton BSP



Scheme description

GT capacity and 33kV fault level.



Justification for decision

Reinforcement cannot be deferred using flexibility.

Reinforcement Information

Completion Year - 2021

Current Status - Preliminary

**DNOA
Decision**



Reinforce

3.3 - Outcomes South West

Weston - Bourneville

<div data-bbox="67 416 151 504"></div> <p>Scheme description Replacement of isolators at Weston.</p> <div data-bbox="67 537 151 624"></div> <p>Justification for decision Flexibility is not financially viable as the reinforcement cost is less than £150k.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2022</p> <p>Current Status - Preliminary</p>	<p>DNOA Decision</p> <div data-bbox="1289 555 1396 660"></div> <p>Reinforce</p>
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Chudleigh Knighton

<div data-bbox="67 1001 151 1088"></div> <p>Scheme description Overload of Chudleigh T2 for loss of Bovey and Chudleigh T1 at winter peak. Possibly install a CB at Chudleigh to prevent Chud T1 and Bovey going off simultaneously. Reinforcement alongside 11kV board change.</p> <div data-bbox="67 1234 151 1321"></div> <p>Justification for decision Flexibility is not financially viable as the reinforcement cost is less than £150k.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2021</p> <p>Current Status - In Construction</p>	<p>DNOA Decision</p> <div data-bbox="1289 1142 1396 1247"></div> <p>Reinforce</p>
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Exeter Main

<div data-bbox="67 1610 151 1697"></div> <p>Scheme description Fault current withstand rating of bars and isolators. Change 132kV bars and isolators. Now operating with an SGT on hot standby to provide fault level headroom.</p> <div data-bbox="67 1821 151 1908"></div> <p>Justification for decision Flexibility is not suitable to deal with this constraint as it is a fault level restriction.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2023</p> <p>Current Status - In Design</p>	<p>DNOA Decision</p> <div data-bbox="1289 1751 1396 1856"></div> <p>Reinforce</p>
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3.3 - Outcomes South West

Alexandra Road



Scheme description

Fault level of 33kV switchgear.
Current access limitation. Scheme required to swap circuits to allow 33kV bar to run split.



Justification for decision

Flexibility is not suitable to deal with this constraint as it is a fault level restriction.

Reinforcement Information

Completion Year - 2021

Current Status - In Design

**DNOA
Decision**



Reinforce

Hayle



Scheme description

Equipment may fault at Hayle due to EPR during 33kv faults. Proposed to install new earthing transformers.



Justification for decision

Flexibility is not suitable to deal with this constraint as it is an earthing restriction.

Reinforcement Information

Completion Year - 2021

Current Status - Preliminary

**DNOA
Decision**



Reinforce

Plymouth



Scheme description

Fault current is expected to exceed rating of bars and isolators in the near future. Change 132kV bars and isolators. Now operating with an SGT on hot standby to provide fault level headroom.



Justification for decision

Flexibility is not suitable to deal with this constraint as it is a fault level restriction.

Reinforcement Information

Completion Year - 2022

Current Status - Preliminary

**DNOA
Decision**



Reinforce

3.3 - Outcomes South West

Braunton/Ifracombe

<div data-bbox="67 416 151 504"></div> <p>Scheme description</p> <p>Thermal and low voltage issues. Moving Georham onto the West Hill PV circuit will remove voltage and thermal issues in network.</p> <div data-bbox="67 593 151 683"></div> <p>Justification for decision</p> <p>Flexibility is not suitable to deal with this constraint as it is a fault level restriction.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2021</p> <p>Current Status - Preliminary</p>	<p>DNOA Decision</p> <div data-bbox="1284 548 1396 660"></div> <p>Reinforce</p>
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Fraddon

<div data-bbox="67 996 151 1086"></div> <p>Scheme description</p> <p>First circuit outage overload in summer. Likely reconductoring of Fraddon - Burthy required.</p> <div data-bbox="67 1176 151 1265"></div> <p>Justification for decision</p> <p>Flexibility is not financially viable as the reinforcement cost is less than £150k.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2021</p> <p>Current Status - In Design</p>	<p>DNOA Decision</p> <div data-bbox="1284 1131 1396 1243"></div> <p>Reinforce</p>
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Newton Abbot

<div data-bbox="67 1579 151 1668"></div> <p>Scheme description</p> <p>Under a FCO condition one of the 33kV busbar isolators becomes overloaded. Change transformer incomer and install inter-trip for busbar fault, change 33kV isolators and busbars as full scheme.</p> <div data-bbox="67 1814 151 1904"></div> <p>Justification for decision</p> <p>Flexibility is not financially viable as the reinforcement cost is less than £150k.</p>	<p>Reinforcement Information</p> <p>Completion Year - 2021</p> <p>Current Status - In Construction</p>	<p>DNOA Decision</p> <div data-bbox="1284 1713 1396 1825"></div> <p>Reinforce</p>
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Section 4:

Stakeholder Engagement

4.1 Stakeholder Engagement

4.1 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 ensuring the data we publish is relevant and valuable.

The high level timeline for stakeholder feedback is shown opposite.

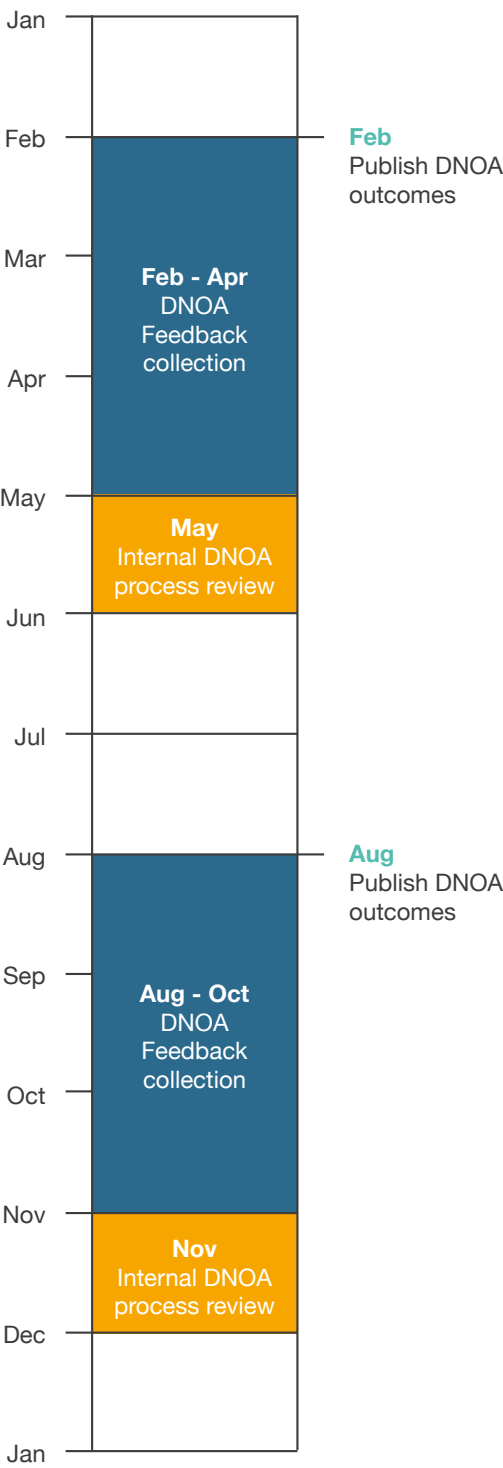
We are keen to get your feedback

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





Section 5:

Appendices

Appendix A: CBA Results Example

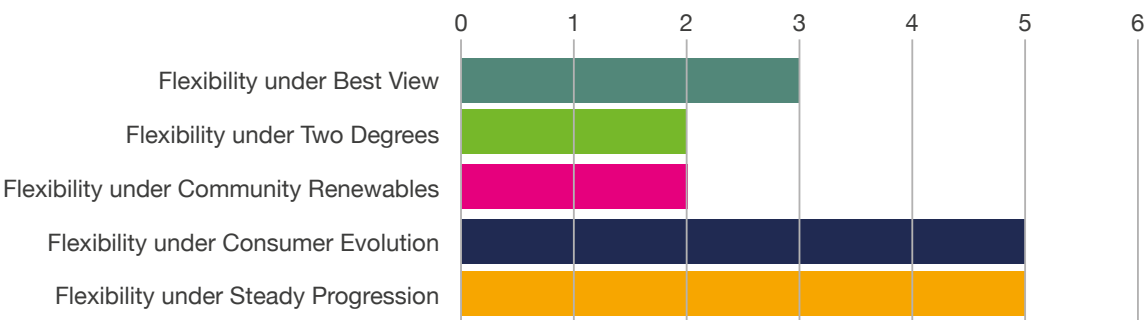
Appendix B: Glossary

Appendix A: CBA Results Example

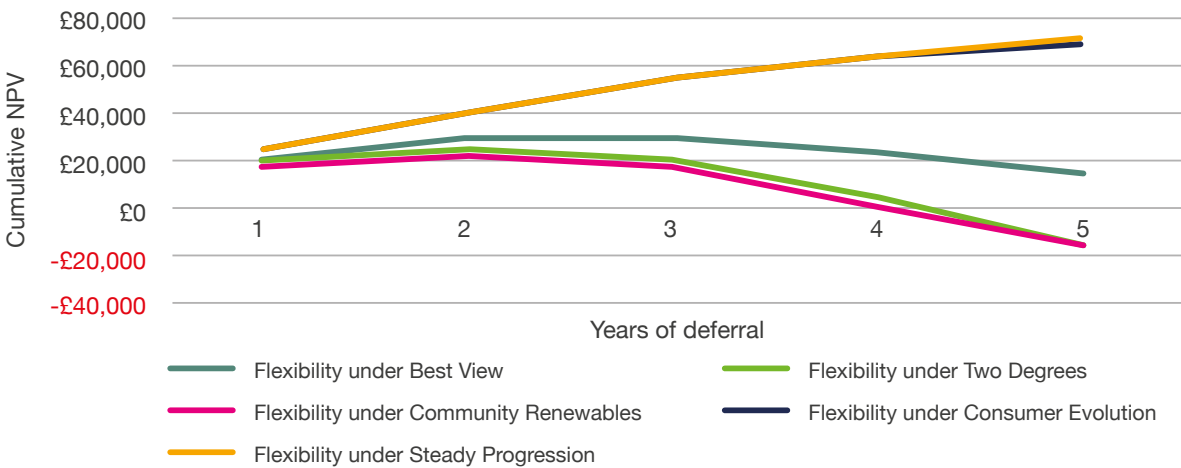
The results of the cost-benefit analysis performed using the CEM CBA tool for the Alfreton scheme are shown below.

Along with the optimum deferral length recommended, the Net Present Value (NPV) generated by flexibility procurement compared to a baseline of conventional reinforcement is given. These values may be included in future DNOAs to demonstrate the savings that are expected to be generated by the investment decisions chosen.

Optical reinforcement deferral duration by strategy and scenario

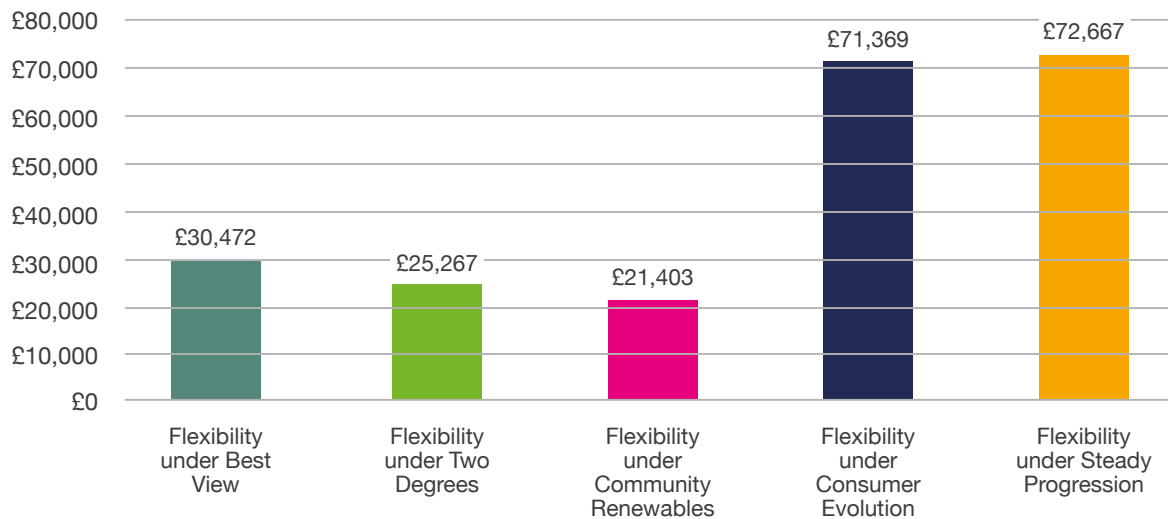


Cumulative NPV of deferring by a number of years vs the baseline strategy



Appendix A: CBA Results Example

NPV of optimal reinforcement deferral by strategy by scenario



Cumulative benefit of deferral	Baseline	1 Defer by 1 year(s) to 2022	2 Defer by 2 year(s) to 2023	3 Defer by 3 year(s) to 2024	4 Defer by 4 year(s) to 2025
Flexibility under Best View	£0	£20,830	£29,566	£30,472	£24,009
Flexibility under Two Degrees	£0	£19,211	£25,287	£20,299	£3,573
Flexibility under Community Renewables	£0	£18,018	£21,403	£16,011	£519
Flexibility under Consumer Evolution	£0	£25,738	£41,778	£54,628	£64,324
Flexibility under Steady Progression	£0	£25,719	£41,759	£54,842	£64,955

Appendix B: Glossary

Active Network Management (ANM)

The ENA Active Network Management Good Practice Guide [22] summarises ANM as: Using flexible network customers autonomously and in real-time to increase the utilisation of network assets without breaching operational limits, thereby reducing the need for reinforcement, speeding up connections and reducing costs.

Alternating Current (AC)

An electric current which periodically reverses its direction, having a magnitude that varies continuously. The rate at which the current's direction changes is known as the frequency. The frequency for UK power systems is 50Hz.

Bulk Supply Point (BSP)

A substation comprising one or more Grid Transformers and associated switchgear.

Common Evaluation Methodology (CEM)

A process used to select the most suitable solution to meet network needs (between traditional network asset solutions (reinforcement) and procuring flexibility services from generators, storage operators or demand side response). Created within an Open Networks project under Workstream 1A. By establishing a standard approach for all DNOs it is hoped that transparency in investment decision making can be improved.

Constraint Management Timeline

A timeline showing what decision has been made for each scheme in each procurement cycle from when the scheme was created up to the upcoming procurement cycle.

Constraint Management Zone (CMZ)

An area identified by WPD in which flexibility procurement could potentially be used to manage a network constraint.

Conventional Reinforcement

Network investment involving installing or upgrading infrastructure and network assets. Also referred to as traditional reinforcement.

Cost-Benefit Analysis (CBA)

Economic analysis aimed at ascertaining which network investment pathway provides the highest overall benefit relative to its costs. Performed for this DNOA using the Common Evaluation Methodology CBA tool.

Demand

The consumption of electrical energy.

Distributed Generation (DG)

Generation connected to a distribution network. Sometimes known as Embedded Generation.

Distribution Future Energy Scenarios (DFES)

A set of scenarios developed by WPD to represent credible future paths for the energy development within the Midlands, South West and South Wales.

Distribution Network Operator (DNO)

A company licensed by Ofgem to distribute electricity in the United Kingdom who has a defined Distribution Services Area.

Distribution System Operator (DSO)

A role which may be established in the future whereby the DNO undertakes some of the roles of the GBSO at a regional level to balance supply and demand.

DNOA Decision

The outcome recommended by this iteration of the DNOA to manage each constraint most economically.

Dynamic

One of the flexibility products offered by WPD. Developed to support the network in the event of specific fault conditions, namely maintenance work.

Earliest Possible Reinforcement Completion (EPRC)

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.

Energy Networks Association (ENA)

The Energy Networks Association is an industry association funded by gas or distribution or transmission licence holders.

Ethylene Propylene Rubber-insulated cable (EPR)

Ethylene propylene rubber-insulated cable is a common underground cable construction type used in the UK.

First Circuit Outage (FCO)

P2/6 defines a First Circuit Outage as: "a fault or an arranged circuit outage". Also referred to as N-1 in some contexts.

Flexible Power

The customer-facing brand for flexibility services established by WPD in 2017.

Future Energy Scenarios (FES)

A set of scenarios developed by Nation Grid to represent credible future paths for the energy development of the United Kingdom.

Great Britain (GB)

A geographical, social and economic grouping of countries that contains England, Scotland and Wales.

Grid Supply Point (GSP)

A substation comprising one or more Super Grid Transformers and associated switchgear.

Grid Transformer (GT)

A transformer that steps voltage down from 132kV to 66kV, 33kV or 11kV.

Low Frequency Tripping (LFT)

Low frequency tripping is a protection system which disconnects demand automatically under low frequency events.

Appendix B: Glossary

National Grid (NG)

The Transmission Network Operator in England and Wales.

Office for Gas and Electricity Markets (Ofgem)

Ofgem is responsible for regulating the gas and electricity markets in the United Kingdom to ensure customers' needs are protected and promotes market competition.

Optimal Flexibility Duration

The years flexibility is expected to be required for each scheme. The start of this period will be triggered when the constraint begins to need management and end with reinforcement.

Primary Distribution

The sections of an electrical distribution network which provide the interface between transmission and primary or Secondary Distribution. In WPD's network the 33kV circuits and Primary Substations are considered to be Primary Distribution.

Primary Substation (PSS)

A substation comprising one or more primary transformers and associated switchgear

Primary Transformer

A transformer that steps voltage down from 66kV or 33kV to 11kV or 6.6kV.

Procurement Cycle

6 monthly periods that cover one full cycle of WPD's flexibility analysis and procurement process.

Restore

One of the flexibility products offered by WPD. Used to support power restoration following rare fault conditions.

Second Circuit Outage (SCO)

P2/6 defines a Second Circuit Outage as: "a fault following an arranged circuit outage". Also referred to as N-1-1 or N-2 in some contexts.

Secure

One of the flexibility products offered by WPD. Used to manage peak demand loading on the network to pre-emptively reduce network loading.

Short term operating reserve (STOR)

Short term operating reserve is an ESO service which provides additional power from generation export or demand reduction.

Signposting

Data published by WPD in the DNOA and on the Flexible Power website to inform providers of potential future flexibility opportunities.

Statement of Works (SoW)

The process under which DNOs request that National Grid assesses the potential impact of the connection of DG upon the National Electricity Transmission System.

Super Grid Transformer (SGT)

A transformer that steps voltage down from 400kV or 275kV to 132kV, 66kV or 33kV.

United Kingdom (UK)

A geographical, social and economic grouping of countries that contains England, Scotland, Wales and Northern Ireland.

Western Power Distribution (WPD)

A Distribution Network Operator (DNO) company that is licensed by Ofgem to distributed electricity in the East Midlands, West Midlands, South West, and South Wales regions of United Kingdom.





Western Power Distribution (East Midlands) plc, No2366923
Western Power Distribution (West Midlands) plc, No3600574
Western Power Distribution (South West) plc, No2366894
Western Power Distribution (South Wales) plc, No2366985

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