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Regional Development Programme
Battery Energy Storage
WPD West Midlands

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WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

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Technical Report

Design phase - Final V1.0

1. Introduction

1.1 Regional Development Programme

The Regional Development Programmes (RDPs) were set up to provide detailed analysis of areas of the network which have large amounts of Distributed Energy Resources (DER) and known transmission / distribution network issues in accommodating that DER. The idea is to use this analysis to innovate and push the boundaries of current thinking with a "design by doing" approach to resolving the issues pushing towards DSO type solutions and informing thinking for the DSO debate.

By solving a specific case study that has a pressing need to improve outcomes for customers in innovative ways, it is possible to make progress faster than the more conventional method of agreeing changes in approach at industry forums before making changes to the way the industry works. While there are risks that working in this way leads to a lack of standardisation across the GB network, this has been successfully managed by close cooperation and using the regional development programmes as case studies for the Energy Networks Association (ENA) Open Networks Project. Techniques and processes used within the RDPs will be replicated across other network areas as appropriate, resulting in innovative approaches being deployed much more rapidly.

Initially the RDPs have been set up on a project basis, but as the techniques and findings of the RDPs move into regular practice, it is envisaged that the RDP approach will continue to develop into a series of Business as Usual (BAU) developments.

1.2 Battery Energy Storage in the West Midlands Network

Prospective activity for this technology in the West Midlands is high, the number of industrial locations in need of reinvestment and close to existing infrastructure makes the West Midlands an ideal location to develop this technology. While it is difficult to generalise about the very local electricity network, there will be many locations across the West Midlands where the local connections were sized to take industry which is no longer functioning in energy intensive ways. Moving further up the distribution system and onto the transmission system the addition of generation is generally not a significant issue. In fact, over the last 25-years around 6GW of generating capacity has closed in the region. Addition of Energy Storage operating as a demand does not cause any capacity issues most of the time but could do so if the large volumes applying for a connection on particular nodes on the network acted as a demand under peak operating conditions. While this is not something that would be economic to do, traditionally there would be little control over how these players operate and so network companies' assessments assume a worst case which can block the connection of the technology, that would otherwise be very helpful if allowed to connect.

This RDP investigates how to change the way Battery Energy Storage (BES) should be assessed during the connection and planning process and how the network companies can manage and incentivise BES to connect and operate in a way that brings benefits to themselves and consumers. This will ensure the West Midlands area remains open and able to accept volumes of this technology into the future.

1.3 Executive Summary

It is no longer appropriate to consider all demands equally in one category as historic processes suggest. Instead demand will be split into 2 categories: Consumer Demand – this is the traditional demand for which the network companies need to ensure capacity is available so that it can always be met under the conditions described in the required standards; and Flexible Demand – this is demand that can or should be flexible to meet the needs of securing the network.

The existing RDP (or sometimes known as Mk2) Appendix G process can be amended to ensure economic and efficient flexible connections for BES are consistently administered across the

Transmission / Distribution (T/D) boundary. Where the developer agrees, the process can also be applied to other demand side flexibility providers.

BES and other demand side flexibility will be treated as generation for this process - this is consistent with Ofgem's 'minded to' statement on the licensing of storage. Where there is doubt on what constitutes BES and flexible demand, reference will be made to the proposed definition of storage in the Ofgem licensing consultation, together with consultation with the customer - as is most appropriate in each case.

Most of the current (T/D) issues around connection of BES relate to the Grid Supply Point (GSP) assets. There are currently 2 different charging regimes for these assets: Connection and Infrastructure. While it is not desirable to have differing treatment of similar customers owing to the historic charging regime, this RDP must work within the existing charging rules, aligning the connections process to ensure there is always an incentive towards reducing consumer costs. As a result, constraint management needs to align with the responsible body for investment decisions and therefore, it is appropriate GSP assets classified as 'Connection' will align with the distribution constraint process; and 'Infrastructure' GSPs with the wider transmission constraint process.

For wider transmission limitations (where they exist or have a risk of becoming active in the foreseeable future) an obligation will be placed on the BES or demand side flexibility to provide NGESO with visibility and control of their output. The Connect and Manage process will be used to allow connection, which will be backed by a CBA process to determine where and when it is necessary to reinforce as wider works to meet full SQSS compliance. While it is possible that there will still be some enabling works e.g. fault level mitigation, it is unlikely the connect and manage criteria will require enabling works in most cases. (Note: a new CBA tool, that has recently been developed, will be used to enable local CBAs at a GSP level on BID3 / FES data, without the resourcing and time delays of using the full BID3 package.)

For DNO limitations including connection assets; a 2-stage process will be used. Stage 1 will assess the capacity available for a BES or flexible demand to connect, and allow connection on a limited basis, which will define the access rights available for that individual customer. The DNO will define the access regime they wish to apply to their customers; typically, WPD would do this allowing a DER to use whatever residual capacity was available in the network on a Last in First off (LiFo) basis, usually controlled by Active Network Management (ANM) technology. To enable this on transmission Connection assets, a Connection Asset Flexible Forward Power Limit will be required in the Appendix G technical limits to complement the existing Connection Asset Reverse Power Limit.

During stage 2, developers and the DNO can trade the access rights obtained by an individual customer in stage 1, to allow that customer to provide a further service avoiding DNO reinforcements. E.g. a BES may agree to further restrictions / changes to its output to allow for the connection of new consumer demand in the constrained group. The fee for providing that service will be funded from cost savings on distribution reinforcements that are, or would otherwise be, chargeable to further customers / consumers in the area. In the opposite example, a BES may increase their access rights if there is another party than can provide a counter acting service cheaper than the reinforcement that were initially rejected in favour of a flexible connection. To ensure fairness and prevent capacity hoarding by BES, just in case a constraint opportunity arises in the future, a strong queue management and progression policy needs to be in place, which is already a consistent requirement of previous RDPs. Stage 2 is mentioned in this summary for completeness but is beyond the scope of this paper.

Transition to these RDP arrangements will be on a 'per GSP' need-case basis and will be initiated by a Modification Application or Project Progression from the DNO. NGESO will offer the standard RDP terms modified to add flexible demand side limits.

Distribution networks are designed to provide sufficient capacity to deliver the level of security for demand as detailed in ENA Engineering Recommendation P2. This design standard has a methodology for establishing group demand and a corresponding table detailing the security

required for each group class size. There is no corresponding standard for generation, but the network security requirement for the import capacity for energy storage will be assessed by this method.

1.3.1 Engineering Recommendation P2/6 Security of Supply - Issue 6 July 2006

Under P2/6, the group demand is simply defined as the DNO's estimate of the maximum demand of the group being assessed with appropriate allowance for diversity. P2/6 also notes that this assessed maximum demand must be consistent with the demand submitted to the transmission company under the terms of the GB Grid Code.

Large energy storage systems without any contractual restrictions could contribute to group demand, potentially up to the full import capacity, hence the existing treatment of the import requirements.

Further guidance for assessing this demand can be found in EREP130.

1.4 Key Recommendations

- Flexible demand or BES will need to provide visibility and control of their output to allow their impact to be managed if this is not achieved via either Balancing Mechanism (BM) or Wider Access (WA). It should be noted that discussions are still ongoing to decide the best way to implement visibility and control of DER on the south coast. It is envisaged that the same principles would be applied in this case as well when successfully agreed with the DNOs on the south coast.
- All storage will be considered as flexible demand. The definition of storage will be taken from Ofgem's review on licensing, to ensure consistency.
- Any other demand can nominate themselves as flexible if it suits their business case - otherwise will be counted as consumer.

2. Background of the Network

2.2 The Region

The Western Power Distribution West Midlands area is shown in Figure 1 below:

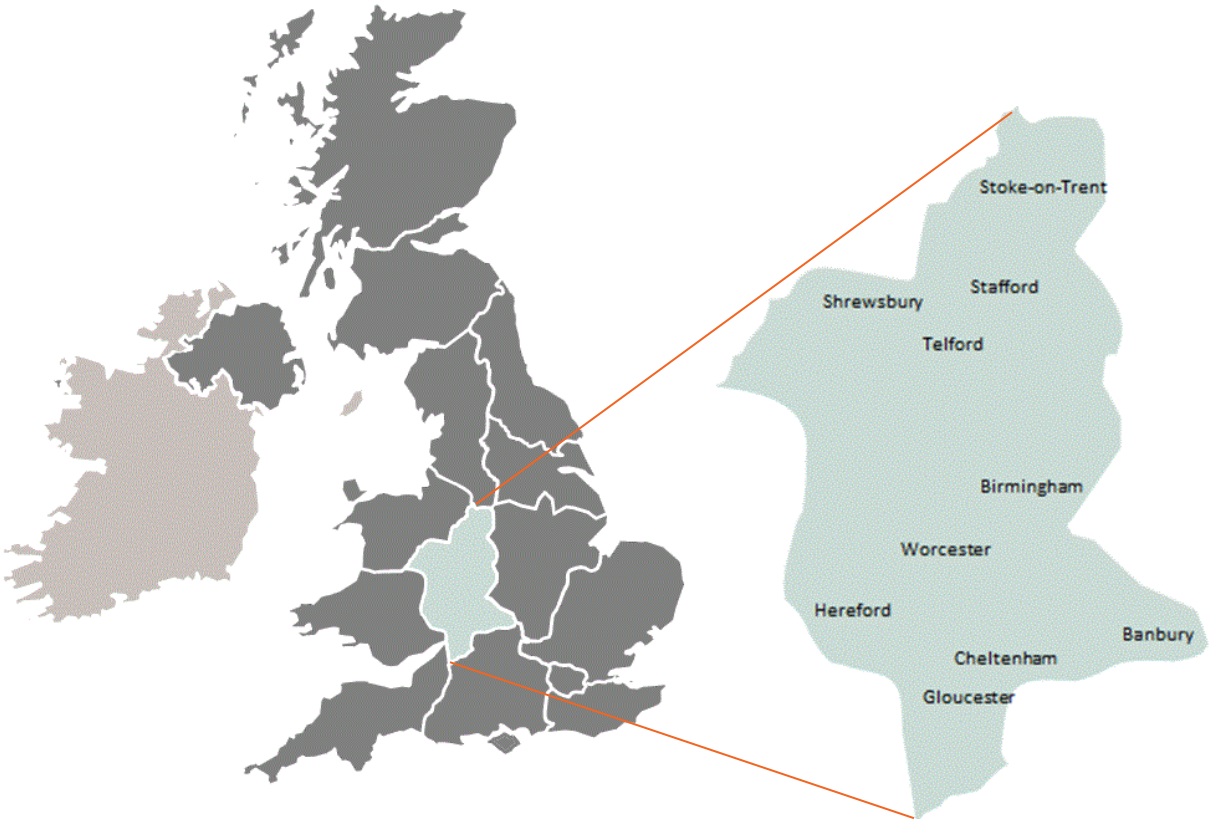


Figure 1: WPD West Midland Area

2.3 History of DER connections in the West Midlands

The West Midlands is a mix of urban / industrial and intense agricultural areas, the climate is not windy. Some of the agricultural areas have attracted considerable solar PV, particularly those in the south of the region. The urban areas have very little renewable potential but have suitable brownfield locations for small thermal power stations and particularly Battery Storage. While generation in this high demand area does not generally cause a problem, storage acting as a demand coincident with the consumer demand peak would do so and therefore, if not controlled, there are some GSPs which are approaching a theoretical capacity limit. GSPs of particular interest where more proactive connection and management processes will benefit energy storage are Feckenham, Iron Acton and Rugeley. These GSPs have been analysed in detail in this RDP.

Initially it was intended that the scope of this RDP would cover the WPD West Midlands licence area. While using the traditional approach where storage is treated as consumer demand, there are a number of GSPs in the West Midlands that are near to their forward power limits although- that is not the case on all GSPs. Similarly, there are GSPs that are at, or are approaching, a restriction outside of the West Midlands, particularly in the East Midlands. Across the Midlands, there is very little evidence of wider network issues, beyond the GSP, as a result of connecting BES in a flexible way. It is therefore proposed to roll out this RDP solution for any individual GSP in the WPD area where capacity for BES is becoming a limitation. In the Midlands, this will result in RDP roll-out on an 'as needed' basis; and in the South West it will add the demand side requirements to the existing RDP terms and conditions. In South Wales, the process is equally valid, although it will not unblock the wider system winter peak security issue, where levels of fully controllable generation including storage are greater than the regional system capacity available and constraining that generation off

at system peak risks not meeting national demand during coincident low renewable generation conditions.

2.4 Future System Needs

It is believed that the transmission system capacity, and the higher levels of capacity in the distribution system in the West Midlands are largely adequate to meet future system needs on an economic and efficient basis. With the correct coordination of access rights and commercial terms, it should be possible to allow the connection of BES in the West Midlands and use the BES to enhance the system capability rather than need more system capability to allow connection of the technology.

2.5 Overview of the Principle Transmission Issues

2.5.1 Technical

At transmission level the West Midlands group is now devoid of large scale generation and so adding distributed generation to a demand dominated importing group has a positive effect on wider transmission flows. Adding storage in demand mode is also advantageous under off-peak conditions as there are very limited thermal constraints at that time and the addition of demand will help to reduce the high voltage issues that this part of the network can suffer from. On peak demands the addition of significant volumes of additional storage demands would cause thermal issues, but this is not considered credible - this would be counter intuitive to the natural economics of the network and so will not occur on a wide scale. At a more local level, particularly at GSP level thermal issues are possible. E.g. a large storage device on a small GSP may take a rapid charge just before the time when demand in that GSP is already approaching peak, in order to be able to sell back the energy over the worst part of the peak when prices spike, or when mechanisms such as the capacity mechanism encourage generation in particular half hour periods. Transmission analysis has therefore concentrated at the GSP level.

2.5.2 Operability issues

As most BES installations will be classified as small and will be distribution connected there are currently no code requirements / UK industry facilitation to ensure the BES have to provide the visibility and control to ensure network operability under the conditions highlighted above.

2.6 Overview of the Distribution System Issues

2.6.1 Technical

On the distribution network within the West Midlands, 1.8GW of generation has been connected, with a further 2.1GW accepted and in construction, with almost 500MW of this being attributed to energy storage. Demand consumption peaks at 4.6GW, but can reduce as low as 1.5GW, highlighting the variability of loadings within the network.

For generation and demand connections (including storage), Active Network Management connection can provide an accelerated pathway for connection but requires flexibility on the part of the connectee itself to enable this. For generation connections, this is acceptable, depending on the economics of the scheme and likelihood of curtailment. However, for demand connections, it is much less likely that curtailment will be viable.

WPD's network capacity map (www.westernpower.co.uk/network-capacity-map) shows that there are a number of areas within the West Midlands which are demand constrained.

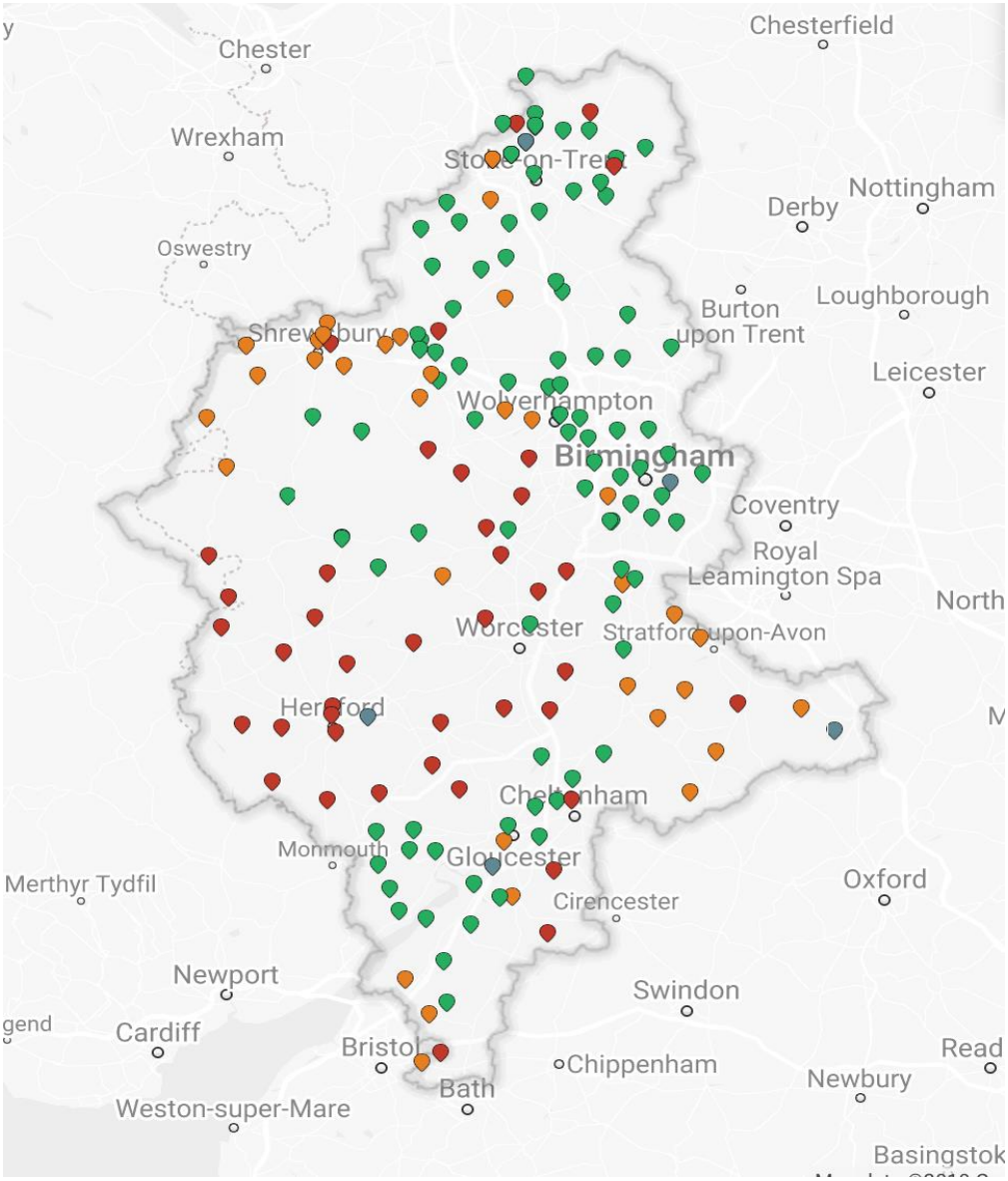


Figure 2: WPD's network capacity map (West Midlands)

Storage may contribute to reducing the volatility of loadings if it is run in synergy with what the network requires; but can also contribute to import and export peaks if the national markets are driving market cost signals opposite to local distribution constraints. Energy storage under ANM control can be guaranteed to remain within limits, but other connections will only have a small price signal through DUoS to operate in alignment with network constraints.

The large import requirements of storage connections and the security requirements universally applied to all types of demand can mean demand headroom within the distribution network can be quickly eroded when storage is prevalent.

2.6.2 Commercial

Connections which would cause the distribution network to exceed limits require reinforcement or other mitigation prior to energisation. Under the current charging methodology, the costs for this would fall to the connecting customer to pay. These costs are apportioned in line with capacity

requested versus capacity released, except where these may be fully chargeable when the costs relate to sole user works.

Generation connecting in export constrained areas triggering large reinforcement costs are additionally liable for all costs in excess of £200/kW.

This shallow-ish system of charging can present a large cost barrier to new connections in constrained areas, particularly for more costly interventions on EHV or transmission assets.

Flexibility may be able to mitigate distribution export constraints more economically than conventional reinforcement, but the costs of those mitigations would need to be paid for by other new connections seeking capacity rather than being funded from BSUoS like the ESO does for transmission constraints.

Further work is being done in the context of ongoing charging review work.

2.6.3 Operability

Traditionally distribution network operators are not able to control demand or generation output except under exceptional conditions e.g. network outage.

Active Network Management connections were brought in to enable control of output to maintain network limits and avoid immediate reinforcement costs, but the commercially simple approach to the principles of access (LIFO) does not always lead to optimum utilisation of the network.

3. Key areas of RDP Focus and Analysis

The table below summarises the key activities to be carries out to achieve the RDP recommendation.

Initiative	Main Objective
Analysis and data exchange.	To revise the data exchange requirements between DNO, ESO and TO, to enable flexible demand to be identified separately from consumer demand and show that a group is secure. Where a group is not secure, devise a process to determine what the service (or additional service) requirements from BES would be in order to secure the group with BES rather than building infrastructure.
Standards and regulations compliance.	Ensure that separating demand into consumer and flexible and effectively treating storage demand as negative generation is compliant with all industry standards and regulations
Contracting with storage providers and purchase of flexibility.	At Transmission level ensure the standard methods for contracting and purchasing flexibility remain appropriate in this case, including use of similar RDP arrangements proposed in the WPD south West RDP. At distribution level devise a method to be able to fairly compensate storage providers for providing flexibility over and above that required in their initial connection agreement and a means to allocate costs and pay for it.
Connections Process and Access Rights.	Working on the deep connect and manage principles developed for the WPD South West RDP. Develop the changes required in the connections process, transmission to distribution and distribution to customer including contractual arrangements to provide improved outcomes on the basis of demand side flexibility.

Implementation Systems and Plan.	Develop systems requirements and plan for the contractual and systems to roll out across the West Midlands area. See Appendix A for high level next steps

3.1 Analysis and Data Exchange

NGET assessment is primarily driven by DNO's demand data submission. When implementing this RDP outcome, NGET is expected to treat flexible demand as non-contributory for compliance assessment. This is based on the assumption that DNO and ESO will take necessary steps to control flexible/storage demand.

Distribution networks are designed to provide sufficient capacity to deliver the level of security as detailed in table 2 of ENA ER-P2 for the maximum demand. EREP130 (2019) states that the DNO's estimate of the maximum demand should be known as Group Demand. Group Demand should be determined using measured demand plus latent demand[1].

To calculate the Group Demand, the directional net flows at the boundary interface are taken on a half hourly basis and the embedded generation is added back in using time series meter data. Energy from other flexibility sources such as Energy Storage and contracted DSR are also added back in/removed where appropriate.

The Group Demand is used to determine the demand class as per P2.

This RDP is looking at the future state of the network after additional changes in demand, generation and storage capacity. To complete the analysis for the future network requirements, the following process was used:

1. Find net transfers across T-D boundary, including directional MVA power flows to a synchronised time base.
2. Use distribution level data to unmask the demand, using a mixture of measured flows and metering data (both captured with respect to half-hourly timings).
3. Rebase the annual demand curve against a future planned peak, determined from assessment of connections pipeline data, using appropriate diversity levels.
4. Use distribution level data to strip out the constituent DG components and analyse the DG components against installed capacity to determine representative DG curves.
5. Format this information into similar annual load profiles, against the same time base used for the demand profiles.
6. Identify future predicted demand peak and DG installed capacities, separately identifying storage installed capacities
7. Scale the demand and generation profiles to feed into the analysis
8. Complete power/energy analysis using half hour data, summating scaled future demand data and expected SOW identified DG (excluding storage)
9. Undertake a sensitivity analysis by superimposing the maximum storage demand import on top:
    a. Gross demand flows plus maximum storage demand import (security analysis)
    b. Net demand flows plus maximum storage demand import (credible worst case)
    c. Net demand flows plus maximum storage generation export (best case)
10. Calculate the curtailed energy in each scenario (peak MW exceedance and MWh energy required)

[1] Latent Demand is demand that would appear as an increase in Measured Demand if the Distributed Generation was not operating. Latent Demand for an Energy Storage exists when there is export or restricted import, at the time of Measured Demand.

3.2 Standards and Regulations Compliance

3.2.1 Principles

Starting from first principles, one of the main reasons the industry has standards and regulations are to protect the consumer and ensure the industry works to provide the consumer with the high reliability required in the UK at the lowest possible cost. Within the industry itself, frameworks need to be in place to ensure all players are treated fairly and are given opportunity to meet the end goal of providing secure and reliable electricity at the lowest possible cost on an equitable basis. The purpose of storage is to provide services to the industry and allow the better matching of generation to consumer demand requirements rather than being an end consumer. It would therefore seem that the most appropriate standards to apply to storage would be those that apply to generation rather than those intended to protect the end consumer. That would already be the case when the storage is acting as generation and for the reason above should also be applied in principle when acting as demand.

3.2.2 Consistency

Ofgem has recently consulted on "Clarification of Licensing Framework on Electricity Storage" and, while the determination is outstanding, the steer from the publication is clear and is that treating electricity storage in a similar way to generation is the most appropriate way to fit in with the industry framework. The following quote is taken from the consultation document "Ofgem and the Government have agreed that it is important to ensure consistency between both storage and electricity generation (generation). We consider that the existing electricity generation licence is best placed to clarify the regulatory framework for storage. This is because generation and storage share similar characteristics and perform similar functions in terms of generating and exporting electricity to the grid and because a modified generation licence is the most practical way of providing regulatory clarity." Treating storage as generation for the applications process, capacity allocation and technical standards ensures consistency.

Large transmission pumped storage schemes have historically always been treated that way and so treating smaller distributed storage this way helps "Whole System" consistency.

In effect storage is considered generation that can act in a positive and negative direction.

3.2.3 P2 Compliance

The DNO demand security requirements have recently been revised. The revised standard (P2/7) has been designed to add clarity, where it is appropriate, for the DNO to rely on generation rather than assets to secure demand. P2/7 also requires flexible demand to be added to the consumer (metered) demand to form the 'Group Demand'. The security standard is then set based on this 'Group Demand' then, where appropriate, the flexible demand is removed again. If the flexible demand does not take the 'Group Demand' through a security band, then it will be able to self-secure. If the flexible demand takes the group into a higher security band, the increased security requirements of that higher band mean the flexibility will now not be adequate to meet the standard, even though there is no change in the power systems actual operating point under the crucial condition. The EREP130 guidance on the application of P2/7 states the DNO must add the storage demand to the metered demand, even if there is a contractual arrangement in place to prevent the storage from operating as a demand at that time. Only if the DNO has knowledge that the storage does not want to act as demand (on peak) can it be discounted. In doing so, P2/7 has made it harder for a flexible demand to use its ability to proactively alter active power input/output to secure its own security requirements under all circumstances, than P2/6, however it does ensure than resilence is maintained. The approach taken by WPD for this RDP will be to discuss with the customer what their costs will be if they want to take demand on peak and what they will be if they don't, explaining to the customer that if they want the cheaper option that they will need to state that they have no intention of taking demand on peak in their application. A commercial contract for export services at

demand peak may also evidence to the DNO that the BES will not be likely to take import at those times.

P2/7 also states that the DNO 'Group Demand' at a GSP must be consistent with the demand data submitted to the transmission company under the Grid Code. This can be achieved by the P2/7 work-around above in setting the Group Demand. It is better achieved by separately identifying the consumer demand and flexible demand and positively taking into account any flexibility in the security studies required to demonstrate compliance with SQSS. It is intended to modify the App G process standard data to reflect this. There is an ongoing ENA Open Networks work group looking at alignment of the Appendix G/ revised Statement of Works process and Grid Code data and any outcomes/learning from this RDP can be fed into this work.

3.2.4 SQSS Compliance

Treating BES as generation with flexible demand will require compliance with both Chapter 2 (generation) and Chapter 3 (demand) of the SQSS. Compliance with Chapter 2 is not likely to cause difficulty in the demand direction and will be subject to the connect and manage provisions already adopted in previous RDPs in the generation direction. Chapter 3 can be met by taking account of the DNO estimate of the Group demand, after taking due account of demand diversity and the expected operation of any small and medium power stations. The proposals of this RDP do just that, thus chapter 3 is met. The contribution of generation to group security is further clarified in SQSS 3.14. The proposed assessment process will take due regard to points noted in this clause and so again this will be met. It should be noted that, the clauses in chapter 3 around DER's interaction with capacity requirements would benefit from further clarity, particularly with the likely growth of storage assets with the potential to provide capacity.

3.2.5 D-code, G-code and RfG

The D-code via ER G99 obliges all generation between 1MW and 10MW to provide curtailment control, and all generation above 10MW to provide 'set point' control. G99 is specific that this control is provided to a DNO interface and therefore any compulsion to provide control to small and medium DER can only be via the DNO interface.

Note that, unlike the European 'Requirements for Generators' network code, the GB interpretation (G99) does specifically include a storage device in the definition of generation; and hence the requirements to curtail or move Active Power to a set point apply. Active power can be positive or negative, so storage demand is already included in this requirement. A flexible demand that is not storage is not included in this requirement, and so can only be controlled in this way if agreed to via customer agreement during the connection process.

3.3 Contracting with Storage Providers and Purchase of Flexibility

3.3.1 Network Access

Since 2017, all export connections above 500kW within WPD areas require a connections control panel, which can provide visibility and control. All connections allow for this visibility as standard and also for control to be enacted under emergency outage conditions. ANM connections also allow for this control to be enacted when triggered by network load conditions.

Under the RDP in the South West, connections falling within the constraints considered also allow for control to be enacted by network load conditions, and this could be extended to storage providers and other forms of flexibility across the whole of WPD's area.

3.3.2 Contracting with Flexibility

Under Flexible Power, WPD has been procuring demand side flexibility for demand constraints since 2017. WPD's procurement process consists of bi-annual flexibility tenders run under an OJEU compliant dynamic purchasing system.

Areas of constraint, CMZs (Constraint Managed Zones), are defined by geographic boundaries and market information is published which includes the type of product required (Secure, Dynamic, Restore), the volume and direction of response required and temporal information on when that service is needed.

Contracts are awarded for up to four years, based on either fixed pricing or pay-as-clear auctions, depending on the level of competition and market liquidity within an area.

Demand side flexibility is dispatched via WPD's Flexible Power platform through an electronic API and settlement is done automatically through the same system.

3.4 Connections Process and Access Rights

There are currently 2 Appendix G processes in use in England and Wales. These are commonly known as Original (or Mk1) and RDP (or Mk2). Currently only 8 WPD GSPs in the South West are using RDP Appendix G (Mk2); the remainder of the WPD area is using the Original App G (Mk1) process.

The original Appendix G has limited ability to vary site-specific conditions, it would therefore be difficult to add in the necessary visibility and control requirements. The RDP Appendix G process is more flexible and better meets the objective that Ofgem set for the industry, to ensure that all transmission and distribution terms and conditions for a distribution connection are available in 90-days, not just their distribution terms. On this basis, it is proposed to convert all GSPs with additional requirements through this storage RDP to the RDP format Appendix G.

To cover BES, only minor changes to the RDP App G process are required. These are needed to reflect that technical limits can now be applied in the demand scenario as well as generation:

- Connection Asset Flexible Forward Power Limit to mirror Connection Asset Reverse Power Limit.
- Transferable limits to transfer flexible demand capacity between GSPs (to mirror the arrangements for transferable limits to transfer generation capacity between GSPs). Note this will be included to ensure a consistent and future-proof process, but as most of the GSPs concerned initially in this RDP will be limited by GSP assets, it is unlikely these will be used immediately.
- Separate Materiality Triggers and Total MW (table 1) figures in the generation and demand direction, to ensure the Appendix G reassessment process is triggered at an appropriate time.

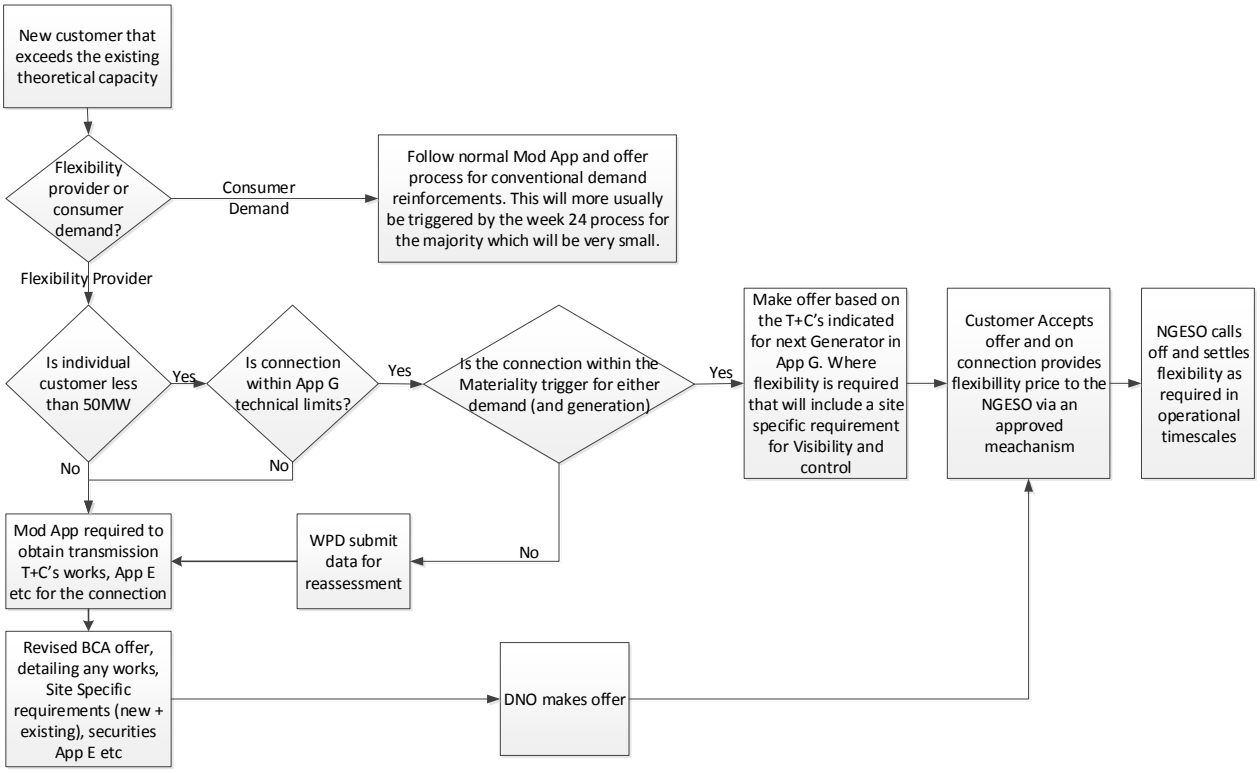
By definition, in the CUSC and Grid Code, it will be possible to compel any DER with a generation element wishing to connect in the distribution system to go through the Appendix G process. This will cover off the volume of BES applications the DNOs are receiving. It would not be possible to compel a purely demand side flexibility device, even though the customer requires only flexible capacity and not consumer demand. This is because their apparatus does not "produce" electricity and therefore doesn't meet the code definition. A customer that did not want to be consumer demand or have any generation capability may be able to be taken through the process on a customer choice voluntary basis (to avoid additional distribution charges they would otherwise incur). Such customers are likely to be few and far between but should be given the opportunity to compete equally in flexibility markets.

3.5 Implementation Systems and Plan

There are two type of GSPs, a) Infrastructure Asset GSPs and b) Connection Asset GSPs. The following sections summarises the potential ways to implement the recommendation of this RDP in both categories.

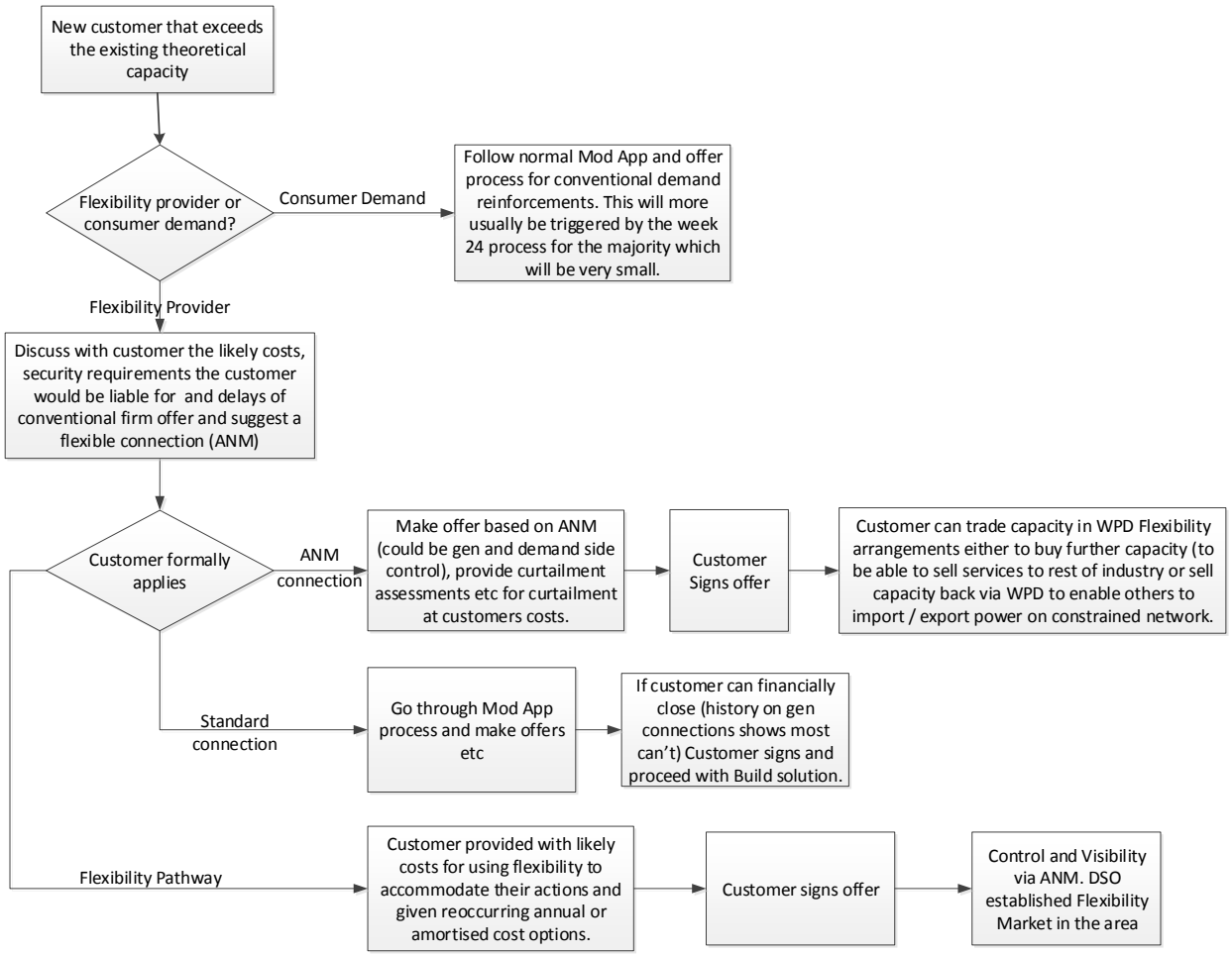
3.5.1 Infrastructure Asset GSP with Limited or no remaining demand side capacity

Given capacity for a connection against an infrastructure asset will often depend on plant type, how other connectees / GSP's in the group are changing and the cost benefit of build versus operational solutions, a set figure is not practical so lends more towards a flexible demand materiality trigger that would work in the same way as a generation materiality trigger.



3.5.2 Connection Asset GSP with Limited or no remaining demand side capacity

Assumes the connection asset capabilities are agreed with DNO in advance via revised App G technical limits process.



4. Next Steps

The following activities are either completed or planned to provide network access

Project	Timescales	DNO Connection Agreements	ESO BCA
RDP2 South West	Completed	Connection agreements in place with DER to enable Distribution ANM and Transmission Export Constraint Management Service	BCA in place to enable Transmission Export Constraint Management Service
RDP4 West Midlands	Q2 2020	Connection agreements in place with DER to enable Distribution ANM and Transmission Import and Export Constraint Management Service	BCA in place to enable Transmission Import and Export Constraint Management Service

The following activities are planned to provide Commercial Flexibility

Project	Timescales	DNO Service		ESO Service	
RDP2 South West	TBC*	No WPD product		Export Constraint Management Service	Turn to zero only for export DER
RDP4 West Midlands	Q2 2020**	Dispatchable Constraint Management Service	Flexibility reserve procured for both import and export constraints	Import Constraint Management Service	Timed Import blocking for DER
	Q4 2020**			Dispatchable Constraint Management Service	Flexibility reserve procured for both import and export constraints

* The way forward on the RDP 2 recommendation of visibility and control of DER is being discussed. The delivery of this will determine the timescales of this RDP's implementation of the same.

** The deliverability of import constraint management services and the systems required to facilitate these from a transmission perspective is reliant upon the successful delivery of the RDP 2 outcomes.

Appendices

Appendix A: Proposed Implementation Program

Item	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020
Develop internal policy document (WPD)					
Brief internal staff on process					
Brief other DNOs via Open Networks project					
Start roll out for connection requests at 132, 66, 33kV or needing facilitating works at these voltages where cost exceeds £100k/MW					→

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Gallows Hill, Warwick, CV346DA

nationalgrideso.com

nationalgridESO