Strategic Innovation Fund – Discovery Phase

DIVERSIFIED FLEXIBLE QUEUE MANAGEMENT

WP2: Review of existing network congestion and queue management arrangements

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CONFIDENTIAL

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1 QUEUE MANAGEMENT

1.1 PROBLEM STATEMENT

Achieving net zero ambition relies on the integration of renewable energy and storage (RES) within the Great Britain power network. These RES are connected within the distribution network at specific locations that favour maximum generation, such as locations that are windy (for wind farms) or locations that are shade-free and southerly (for solar farm). Such requirements on location increases the loading at specific points within the distribution network. The connection requests for generation and storage traditionally consider the rated capacity of the generation units that typically results in significant restrictions on the generators operation or queues with long delays and expensive costs due to reinforcements.

It is known that the RES are unlikely to operate at their rated capacity at the same time. The actual capacity available is therefore higher than the headroom obtained through the conventional conservative approach. It can also be hypothesized that greater generation capacity can be incorporated within the distribution network if the diversity of the generation resources is varied, enabling effective utilisation of the headroom available.

The Diversified Flexible Queue Management (DFQM) project seeks to investigate the viability of data to drive network operation and adaptive management of distribution connections. It will assess the diversity of customer loads and the flexibility of their assets. It aims to identify actual existing and potential available capacity on the network, enabling faster connections for customers.

The project is divided into three work packages, with this report summarising the first of the tasks undertaken as part of work package 2, a brief description of which is presented below.

1.2 WORK PACKAGE 2

Work package 2 focuses on the identification and review of existing network congestion, queue management processes, and the associated technical and commercial arrangements. In particular, it aims to:

- Identify implemented schemes and NPg planning documents and their technical and commercial requirements, building on the distribution queue management;
- Analyse risks associated with the diversified flexible DNO queue management of connection, and associated mitigation actions and their effectiveness;
- Investigate regulatory and technical restrictions placed on the connection queue promotion of a flexible resource being connected which could benefit other connected projects;
- Determine the status of any existing processes for coordination across transmission, distribution, and connection customers.
- Develop a comprehensive stakeholder engagement plan and engage with the relevant stakeholders.

Of these tasks, the stakeholder engagement has proceeded independently and the learnings will not be covered in this report, the remainder of which will focus on the existing queue management landscape and the documentation and initiatives that govern it.

2 EXISTING REGULATIONS PERTAINING TO QUEUE MANAGEMENT

This section discusses the key existing codes, projects, and arrangements that govern applications to the connections queue, sorted by those administered by or applying Distribution Network Operators (DNOs) and the Energy Networks Association (ENA) specifically. The ENA represents the energy networks in the UK & Ireland, and its members include the major distribution electricity network operators as well as National Grid ESO which operates the electricity system in Great Britain.

2.1 DISTRIBUTION CONNECTION AND USE OF SYSTEM AGREEMENT

The Distribution Connection and Use of System Agreement (DCUSA) is essentially the contract between electricity distributors, generators, and suppliers, and is specifically concerned with the use of the distribution network and with connections to it. It is governed by a panel and board members, and changes are managed by the code administrator via DCUSA change proposals (DCPs).

The DCUSA governs the process for connections to the distribution network, and it is highly likely that any changes to the queue management process proposed as part of DFQM would require associated changes to be made to the DCUSA via one or more DCPs.

2.2 OPEN NETWORKS PROGRAMME

The ENA's Open Networks programme[1] aims to adapt the networks to the increasing uptake of low carbon and smart technologies, aiming to 'map the road' for the transition from DNOs to Distribution System Operators (DSOs), where a DSO monitors and manages distribution power flows to ensure best use of distributed energy resources (DER) and allow customers to become both consumers and producers of energy.

The Open Networks programme has delivered a range of projects from 2017 in a number of distinct workstreams (WS), covering:

- WS 1a: Flexibility services
- WS 1b: Whole electricity system planning
- WS 2: Customer connections
- WS 3: The DSO transition
- WS 4: Whole Energy Systems

Of these, WS2 relates most to queue management and the potential for movement within the queue. This delivered three key initiatives, the most pertinent of which are discussed in Section 2.2.1 and Section 2.2.2.

[1] https://www.energynetworks.org/creating-tomorrows-networks/open-networks/

In 2023, the ENA have stated that 'Open Networks will focus on increasing participation and volume in the local flexibility market in line with actions from BEIS' and Ofgem's Smart Systems and Flexibility plan (2021).' This aligns with the goals of this project, in that DFQM aims to prioritise connections capable of providing flexibility to the network.

2.2.1 QUEUE MANAGEMENT USER GUIDE

WS2 of the Open Networks programme delivered the Queue Management User Guide, currently in version 5.0 as of July 2021.[2] This guide sets out the practices currently followed by DNOs for managing their connection queues, and forms the basis for NGESO's proposed structure for doing the same (covered in more detail in Section 2.4.1).

2.2.2 UPDATING THE EMBEDDED CAPACITY REGISTER

WS2 of the Open Networks programme also investigated the potential of updating the Embedded Capacity Register (ECR) to include assets of <1MW size.[3] There were many proposed benefits from doing so, including the use of the improved information accuracy to allow connection projects to be more efficiently located, ideally saving time and costs. The conclusions of the project however were that the benefits may not outweigh the costs of the update, given the scale and complexity of the data involved. As of December 2021, the aim was to begin to incorporate this data from 2022 onwards while migrating the ECR to a database system.

Currently, the ECR available from NPg contains only assets >1MW. Assuming that in the future, the ENA's ambition to incorporate lower capacity assets is realised, this could improve the accuracy of the modelling underpinning the proposed DFQM. It is noted that the aim of changing the lower capacity limit of the ECR has been proposed in a change to the Distribution Code (DCP-399, as per Section 2.1), the expected implementation date of which is 29th June 2023 at time of writing.

2.3 DISTRIBUTION CODE

All DNOs are required to operate according to the same version of the GB Distribution Code, administered by the Distribution Code Review Panel and change controlled by Ofgem. The Distribution Code 'is a comprehensive document containing the minimum technical specifications for operation and development of distribution networks in Great Britain, and for the connection of equipment to them,'[4] and adherence to it is a licence obligation for DNOs. Clearly elements of this code will affect the management of connection queues, and in particular, the Distribution Planning and Connection Code (DPC) section covers the technical, operational, and design aspects of connections.[5]

In general, while the Distribution Code governs the exchange of data during the connection application and offer process, it does not stipulate that the connections queue operate in any particular fashion.

[2] https://www.energynetworks.org/industry-hub/resource-library/on21-ws2-p2-updated-queue-management-user-guide-(30-jul-2021).pdf
[3] energynetworks.org/industry-hub/resource-library/open-networks-2020-ws2-p1-inclusion-of-smaller-assets.pdf
[4] https://dcode.org.uk/assets/uploads/DCode_Summary-May_2017.pdf
[5] https://www.dcode.org.uk/assets/uploads/DCode_v32_180516_1.pdf

The DPC5.3 section of the code in particular covers connection arrangements between DNOs and connectees, but does not impact the management of connection dates within the connection queue.

2.4 CONNECTIONS AND USE OF SYSTEM CODE

Per NGESO, 'the Connection and Use of System Code is the contractual framework for connecting to and using the National Electricity Transmission System (NETS).' In essence, this sets out the legal structure that applicants to the transmission connection are committing to when applying. The code covers 15 distinct sections ranging from system use terms to enabling works and charging methodologies. In particular, Section 2 of the CUSC covers connections to the NETS.

2.4.1 UPCOMING CHANGES IN CMP376

The CUSC is subject to change management via CUSC Modification Proposals (CMPs), with changes administered by NGESO and modifications reviewed by Ofgem and an independent panel. In particular, CMP376 proposes to implement a formal queue management process to the CUSC similar to the system of queue management used by the ENA (as described in Section 2.1), partly in order to improve consistency between transmission and distribution management processes.

Initially raised in July 2021, CMP376 has been delayed and subject to review since then. The current iteration was re-introduced in July 2022 and has since been subject to working group review, with a report published on 23rd March 2023 and a final proposal expected on 7th June 2023. Assuming the change is subsequently implemented, all new applications to connect to the transmission system will be subject to milestones set out in the CUSC. These milestones will have tolerances for delay, with scope for out of tolerance projects to be terminated by the ESO. This in order to ensure that applications proceed in a timely manner and that stalled applications can be removed from the queue to free up capacity for other applicants. This represents an initial change to the 'first come, first served' basis of queue management, but does not include clear processes on movement of in-tolerance projects within the queue, and as such does not go as far as DFQM in alleviating queue stress.

2.5 SECURITY AND QUALITY OF SUPPLY STANDARD

Transmission licensees in the UK are required to adhere to the system Security and Quality of Supply Standards (SQSS) as part of their licence conditions, which defines the standards to which the operation of the transmission system must be held. Sections within the SQSS govern the standards for connections to the network, noting connections should not be made that would overload or destabilise local transmission equipment.[6]

However, under the Connect and Manage process introduced in 2007, Ofgem have the ability to allow exceptions to these rules – in particular, this allows generation to connect in advance of upgrade works to the transmission system. This can expedite the connection of renewable generation to the network under flexible operation contracts. As such, a framework does exist within which flexibility providers can connect to the network in advance of network reinforcement works.

[6] GB Security and Quality of Supply Standard, https://www.nationalgrideso.com/document/189561/download

It is noted in the WPD West Midlands RDP on battery energy storage that treating batteries as generation with flexibility in demand will impose requirements on compliance with both chapter 2 (on generation) and additionally chapter 3 (on demand) of the SQSS. The proposals outlined in the RDP aim to meet the requirements of chapter 3. As such, the treatment of flexibility in the method of DFQM is expected to be compliant with the SQSS.

2.6 INCENTIVE ON CONNECTIONS ENGAGEMENT

The Incentive on Connections Engagement (ICE) is a penalty based incentive operated by Ofgem designed to ensure that DNOs engage positively with large customers seeking to connect to the distribution network, where failure to do so can result in a penalty charge.

The ICE does not directly impact the ability of DNOs to implement DFQM, but it is noted here that the implementation of DFQM could assist with DNOs making their annual ICE submissions and help to avoid any non-compliance penalties.

2.7 DNO INTERACTION PROCESSES WITH NGESO

DNOs are obligated to keep NGESO informed about projects connecting to their networks. This involves several processes, covered below.

2.7.1 STATEMENT OF WORKS

A Statement of Works (SoW) is submitted by the DNO to the ESO informing them of the potential connection of a new project to the distribution network. The ESO then responds with either a confirmation that the network is not constrained for the addition of that project, or that a constraint may have been identified. If a constraint is identified, the DNO is obliged to submit a Project Progression for projects above a defined capacity threshold (currently 1MW), which involved the submission of various data detailing the project.

2.7.2 APPENDIX G

Appendix G is an appendix to the Bilateral Connection Agreement between the ESO and the DNO for each Grid Supply Point. This provides an alternative route for the DNO to notify the ESO of connection applications in addition to the SoW process. Each DNO submits a monthly Appendix G notice to the ESO detailing the connection offers accepted in that month. If the total required headroom of these does not exceed the allowance given to that DNO, then the Appendix submission will be accepted.

2.7.3 MODIFICATION APPLICATIONS

Modification Applications (Mod Apps) are submitted by applicants who wish to change the terms of their connection application in some way. This could include queue members wishing to delay milestones, connection dates, or contracted capacity. There is usually a fee involved in the submission of a Mod App.

3 CURRENT ACTIONS ON QUEUE MANAGEMENT

NGESO and the DNOs are of course aware of the issues surrounding queue times for connection, and have begun multiple actions aimed at addressing these.[7] This section outlines recent and current initiatives aimed at ameliorating these issues.

3.1 5 POINT PLAN (2021)

NGESO in 2021 outlined a 5 Point Plan to manage and address constraints on the GB electricity network.[8] The five themes of this plan were:

1. Clearer forecasts on BSUoS costs
2. Developing inter-tripping capability through our pathfinder
3. Working with regional networks on a whole-system approach
4. Exploiting storage potential in a heavily constrained network
5. Continuing to improve our existing network.

Of these, the third point is the most relevant to queue management. This point specifically relates to the development of Regional Development Plans (RDPs) to provide locally bespoke solutions to network issues; these are discussed further in Section 3.1.1.

3.1.1 REGIONAL DEVELOPMENT PLANS

Per NGESO, Regional Development Programmes (RDPs) are implemented to provide detailed analysis of areas of the network which have large amounts of DER and known network issues (at either transmission or distribution level) accommodating those DER.

RDPs are an implementation of a ‘learning by doing’ approach that can consider a wider range of solutions than would normally be investigated, including conventional, operational, flexibility, and market based solutions. The local specificity of these projects is intended to allow for bespoke solutions in certain areas, in advance of potentially slow industry-wide adaptation. The most developed of these solutions are explored in the following subsections. It is noted that this could lead to a lack of standardisation across the network and the adoption of solutions that may only be appropriate in a small subset of areas or instances. While RDPs aim to use standardised approaches wherever possible, a single approach using DFQM to offset network issues may be preferable to a full nationwide rollout of RDPs.

[7] https://www.nationalgrideso.com/industry-information/connections/connections-challenges-what-are-we-doing-now
[8] https://www.nationalgrideso.com/news/our-5-point-plan-manage-constraints-system

3.1.2 MW DISPATCH SERVICE

The MW Dispatch Service (MWDS) is an operational solution that can be applied to DERs connecting at the GSP level, rather than requiring conventional network reinforcements for any connection exceeding tolerance. MWDS operations are coordinated between the ESO and the relevant DNOs, as an example of a whole network approach. The arrangements are specified by NGESO, described below:[9]

'…In MW Dispatch areas, existing ESO Bilateral Connection Agreements (BCA's… have been used to apply specific technical conditions at both a GSP and individual DER connection level. We have introduced concepts such as visibility and control, and the use of DNO owned Active Network Management (ANM) schemes to manage levels of DER. The service, regardless of technology, requires Active Response Capability from DER Service Providers to reduce real power export output to zero ('turn to zero') when instructed by ESO. Energy storage that can act as either generation or demand are presently only required to reduce export to zero. Under certain network conditions and when it is economic to do so, ESO will instruct Service Providers (via the DNO ANM / DERMS system) to 'turn to zero'. If instructed, and providing they comply with the instruction, Service Providers will be paid for the volume of energy they have curtailed. The minimum unit size is 1MW.'

MWDS operates in a similar space to the proposed DFQM that is, it concerns assets providing flexibility services once connected to the network. However, it likely to be a complementary solution rather than rendering DFQM redundant, as the contractual arrangements concern the operation of DERs once connected to the network, which could in fact assist in the operation of DFQM in connection DERs under flexibility contracts.

3.1.3 BATTERY ENERGY STORAGE, WPD WEST MIDLANDS

In response to high interest from battery prospects in the West Midlands area of WPD's licence, this RDP has aimed to change how battery projects are assessed. Rather than consider demand as a single quantity, it considers two components: commercial demand, the usual consideration of demand that must always be met; and flexible demand, which can be flexed in accordance with network needs.

In this RDP, all storage is considered as flexible demand, and other demand connections can self-nominate to be considered flexible. Flexible demand or BES will then need to give visibility and control of their output to NGESO and/or the DNO.

'The existing RDP… Appendix G process can be amended to ensure economic and efficient flexible connections for BES are consistently administered across the Transmission / Distribution boundary. Where the developer agrees, the process can also be applied to other demand side flexibility providers.'

This RDP again operates along a similar axis to DFQM, considering as it does different components of demand for battery assets. It also touches on the connections process (specifically the Connect and Manage process discussed in Section 2.5). Specifically, it aims to 'develop the changes required

[9] MW Dispatch service details including visibility and control requirements, https://www.nationalgrideso.com/document/278151/download

in the connections process… including contractual arrangements to provide improved outcomes on the basis of demand side flexibility.'[10]

3.2 5 POINT PLAN (2023)

According to an article on the NGESO website dated February 2023,[11] NGESO are now implementing a 5 point plan for short term action on speeding connections to the network. This takes the form of the five points below:

- 'Operating a Transmission Entry Capacity Amnesty until April 2023, allowing developers to terminate their connection contracts without incurring liabilities, freeing up capacity in the queue.
- Updating our modelling assumptions to reflect current connection rates and reducing the assumption that most projects in the queue will connect.
- Changing the treatment of storage, including batteries on the network to allow them to connect faster and free up capacity for other projects.
- We are developing new contractual terms for connection contracts to manage the queue more efficiently so that those projects that are progressing can connect and those that are not can leave the queue.
- And finally, we will soon offer an interim option for storage projects to connect to the network sooner, but with the caveat that they may be required to turn off more frequently when the system is under stress without initially being paid to do so.'

These points are covered in the sections below.

3.3 TRANSMISSION ENTRY CAPACITY AMNESTY

The Transmission Entry Capacity (TEC) Amnesty was held by the ESO, in collaboration with Ofgem and the three TOs, to enable transmission queue members to leave the queue or reduce their TEC without significant costs before the implementation of milestone-based queue management, as defined in CMP376 (note that in general, the CUSC imposes cancellation charges for these TEC changes).

Launched in September 2022, the window for expression of interest in this TEC amnesty round ran till April 2023 following requests for extension. Submissions are subject to review in May – June 2023, with next steps to be confirmed by NGESO in July. The aim is to allow stalled projects to leave the queue and free up space, hopefully allowing other projects to connect more quickly. This does not interfere with DFQM and may increase its effectiveness, as capacity requests will be more accurately forecast.

3.4 UPDATED MODELLING ASSUMPTIONS

Using more recent data on progression of projects through the connections queue, NGESO have refined their methodology used to calculate project connection dates, the Construction Planning

[10] Regional Development Programme - Battery Energy Storage, WPD West Midlands, Design Phase Final Report v1.0, 2020
[11] https://www.nationalgrideso.com/news/eso-leads-way-major-initiative-accelerate-connections-electricity-transmission-grid

Assumptions (CPAs). These new CPAs will be used to evaluate connections henceforth, and existing contracts are being reassessed in light of the new assumptions.

Furthermore, NGESO have proposed a full scale Transmission Reinforcement Works (TRW) review for all offers contracted with a connection date starting in 2026, in order to reassess the forecasts of projects that will connect to the network using more up to date assumptions and data. While this does not interfere with the proposed timescale for DFQM, the implementation of DFQM has the potential to move the contracted connection dates of projects within the queue and thus could impact the scope of the TRW.

3.5 NON-FIRM CONNECTIONS FOR BESS

NGESO aim to offer an interim, non-firm connection option specifically for BESS. These offers would allow BESS projects to connect to the transmission network sooner than they otherwise would, but with their agreement that they may be required to turn off at times of high network strain without being financially compensated. NGESO assert that this could speed the connection up of up to 95GW of storage to the network, with their output being curtailed 'only on very rare occasions.'[12] Non-firm connection offers however will not affect the implementation of DFQM.

On 2nd June 2023, NGESO published a short report on the 'Accelerating Energy Storage Connections policy update.'[13] This confirms that NGESO are 'removing the requirement for non-critical enabling works to be complete before they connect under a non-firm connection arrangement. This means that the only transmission works storage customers will need to wait for are those that are essential to enable a physical connection to the network… those needed to mitigate fault level issues or those needed to meet safety-based requirements.' Further information on the details of these non-firm connection offers are to follow in the next steps of the ESO's policy review.

3.6 TWO-STEP OFFERS

NGESO has recently implemented an interim, two-step process for new applications with the aim of reducing uncertainty and streamlining the connections process. The first of these steps is an initial, scoping offer – specifically, not including 'the detailed works, programme or indicative costs and charges that would usually populate the appendices. No transmission works will be identified in or undertaken for the purposes of the connection at this stage. Securities will be set at £0. Clauses will be inserted in the bilateral and construction agreement to reflect that this is an initial offer and that it, if accepted, it will be updated to identify the transmission works, programme, charges, connection site/point, and any updated terms as per step two.'[14] Step two is then a follow-up offer issued within nine months, following review of the specific details that were generalised in step one. The goal of this process is to improve connection dates and reduced reinforcement requirements, seemingly reflecting an expectation that less time and resources will be wasted evaluating projects that would not have accepted the first step offer. This interim offer approach has applied from 1st March 2023, and is supported by Ofgem.

[12] https://www.nationalgrideso.com/industry-information/connections/connections-challenges-what-are-we-doing-now
[13] https://www.nationalgrideso.com/document/281171/download
[14] https://www.nationalgrideso.com/industry-information/connections/two-step-offer-process

According to the letter of support from Ofgem, NGESO and NGET will use the time freed up by this measure to 'update their assumptions around what will connect (the CPAs) and apply an updated, and more realistic, level of attrition that they assume for projects in the current queue. It will also enable a new approach to the modelling of batteries to be applied to all connection agreements, providing a more accurate assessment of the impact of batteries on the wider system.' The expectation from Ofgem is that these impacts will combine to reduce the overall projected need for transmission reinforcement, and thus bring forward the expected connection dates for queue members.

It is not expected that this approach will present any threats to the adoption of DFQM. In fact, the scope for offer details to change between the first and second steps may benefit the rollout of DFQM.

3.7 LOCAL CONSTRAINT MARKETS

NGESO are trialling the application of Local Constraint Markets (LCMs) at a constrained transmission boundary in Scotland (the B6 boundary), aiming to 'develop a market that facilitates access to new providers of flexibility and provide competition to the Balancing Mechanism – [the] existing market for the majority of transmission constraint management.' The ultimate aim of the LCM is to improve competition with new assets and reduce the B6 boundary constraint costs. This does not however interact with system constraints and as such does not directly help assets who remain in the connection queue.

3.8 THREE STEP PLAN

The Energy Networks Association (ENA) has in early 2023 published its vision for improving connection times under a three step plan, identifying three priority areas for change and improvement.[15] These are:

1. 'Reforming the distribution network connections queue, promoting mature projects that are closer to delivery above those that may be "blocking" the queue.

2. Changing how transmission and distribution networks coordinate connections, improving their interactivity.

3. Greater flexibility for storage customers through new contractual options.'

The first of these points, giving priority to projects that are 'shovel ready,' is expected for phased implementation beginning at time of writing (May/June 2023). This may help reduce queue times overall, but does not represent a shift to the current modelling of headroom as in DFQM. The second point, improved coordination between the network levels, is aimed at helping smaller projects connect earlier by setting clear delegation limits between transmission and distribution networks. This is due for phased implementation starting July 2023 and is likely to help with the implementation of DFQM. Finally, the third point includes the immediate shift to non-firm offers to battery projects in a ;connect and manage' approach, but also includes scope to change regulatory and technical frameworks for

[15] https://www.energynetworks.org/newsroom/energy-networks-launch-action-plan-to-accelerate-grid-connections

storage projects in the medium- to long term, changes that could assist with the implementation of DFQM.

3.9 ACCESS & FORWARD-LOOKING CHARGES SIGNIFICANT CODE REVIEW

The Access and Forward-Looking Charges Significant Code Review (Access SCR) was launched by Ofgem in December 2018, with their final decision published in May 2022.[16] The intention of the review was to ensure connections to the GB networks have up to date definitions of access rights and fair assessment of connection charges, all with the goal of delivering network decarbonisation while minimising the upwards pressure on consumer bills.

The impacts of the decision will be far-reaching, but the most relevant decisions made are:

- Ofgem has determined it is necessary to reduce overall charges for those projects connecting to the distribution network.

The impact of this may be to increase the number of applicants to connect to the network, and as such this may exacerbate the strain on the connections queue and increase the need for solutions such as DFQM.

- A standardised non-firm access option is to be available for larger network users.

Any applicant who wishes to opt for a non-firm connection, where this will provide a network benefit such as delaying the need for reinforcement, should be offered such an arrangement.

- Curtailment limits and end dates are to be put in place for those with non-firm access arrangements.

Non-firm offers must now include limits on the amount of curtailment the applicant can expect, and where a customer wishes to eventually transition to a firm connection, an end date for the curtailment must also be agreed. In tandem with the directive to allow non-firm connection offers to more applicants, this may affect the connections queue by allowing more projects to connect sooner, but may also result in a backlog of required reinforcements that will negatively affect the connection dates of later projects.

The changes requested in Access SCR have since been reflected in DCPs 404 through 407 and DCP-418, with the changes to the DCUSA being implemented to align with the intent of the Access SCR decision.

[16] Access and Forward-Looking Charges Significant Code Review: Final Decision, Ofgem, 2023, https://www.ofgem.gov.uk/sites/default/files/2022-05/Access%20SCR%20-%20Final%20Decision.pdf

3.10 OPEN LETTER ON FUTURE REFORM TO THE ELECTRICITY CONNECTIONS PROCESS

During the delivery of Workstream 2 of this project, Ofgem published an open letter on connections reform.[17] This letter is a statement of intent on how Ofgem intent to work to reform the connections process, with the next deliverable being a joint action plan to be published with the UK government in summer 2023.

In particular, this letter specifically calls out the current issues with the first-come first-served connections queue causing delays in connection to constrained systems. Annex A discusses the set of reforms that Ofgem consider most important to deliver better value, shorter delay connections. It specifically calls out the potential of developing new contractual terms for the queue management process and improving modelling for how storage is considered on the network. While improving the consideration of demand diversity is not specifically mentioned, it integrates well with the proposed objectives, outcomes, and principles.

Notably, Annex D states, 'Ofgem also supports the principle of DNOs optimising the capacity headroom in distribution connection queues by actively accelerating projects that are ready to connect, ahead of projects that have failed to achieve their progression milestones and/or that are unable to connect currently due to the amount of capacity available.' This would appear to support movement within the queue for projects that could connect on the network with the currently available capacity by offering flexibility services. It goes on to state that, 'any such advancement should occur only where the distribution network can connect a project that is being advanced without undue delay to other connecting parties and where the project can be connected without the need for reinforcement works... Any advancement of projects under this queue optimisation process shall be in accordance with the terms of existing connection agreements and should not be to the detriment of any party that has met the terms of their connection agreement, including achieving their progression milestones.'

3.11 ESO CONNECTIONS REFORM

NGESO is currently consulting on a holistic reform of the connections process.[18] The first phase of this process consisted of information gathering from the various potential stakeholders on the challenges surrounding queue management, while the second phase (currently in progress at time of writing) aims to 'co-create the solutions to the challenges we identified in phase 1, and we are now working with industry-wide stakeholder groups to create and test a series of options for implementation.' Consultation on this phase is ongoing throughout June 2023.

The consultation document on connections reform discusses a number of 'target model options.'[19] Foundational Design Option 1 represents the status quo, i.e. no change from the existing queue

[17] Open letter on future reform to the electricity connections process, Ofgem, 16th May 2023, https://www.ofgem.gov.uk/publications/open-letter-future-reform-electricity-connections-process
[18] https://www.nationalgrideso.com/industry-information/connections/connections-reform
[19] https://www.nationalgrideso.com/document/281561/download

management baseline. Two further foundational design options were considered along with five potential variations.

Foundational Design Option 2 would introduce one or more additional formal gates to the application process, with the aim of better evaluating projects that will be able to meet the criteria for connection. While this could reduce the congestion in applications to the transmission queue, it does not appear to interfere with DFQM. Foundational Design Option 3 would be a larger change to the application process, moving away from the current system of market-led applications and instead established a centralised planning process, operated by an entity such as the Future System Operator (FSO). While this option could present a risk to the adoption of DFQM at the distribution level, the ESO's report clarifies that it is not mandated to make such decisions, and as such this option has not been assumed in any of the target models proposed.

4 CONCLUSIONS AND RECOMMENDATIONS

This report has summarised the current state of queue management regulation in Great Britain and how it might affect the development or adoption of DFQM. In general, it does not identify any critical threats to the operation of DFQM as proposed in work package 1 of this project. The details of potential risks and recommendations are discussed further below.

4.1 RISKS OF DIVERSIFIED FLEXIBLE QUEUE MANAGEMENT

In general, the existing process of queue management does not preclude the adoption of DFQM. Furthermore, the systems that exist currently allow for the modification of the existing regulations via processes like CMPs. However, there are still threats inherent in making this change to the system. In particular, some examples are:

- Saturation of network requirements: It is variously mentioned that the current volume of applications in the queue may exceed actual network requirements, i.e. there may be a large number of projects in the queue that, due to saturation, will not ultimately be connected. Thus there is a potential risk that moving projects forward in the queue via DFQM will lead to other applicants feeling that they are effectively having their projects cancelled. This could lead to pushback and potential challenges.

- Reaction of non-flexible applicants: In the context of preferential treatment or connection offers for those applicants that agree to provide flexibility services and are suitable for DFQM, there will inevitably be applicants who feel that they are being side-lined. This could result in reduced engagement from these parties, potentially included missed milestones or slowed progress, and could even lead to legal challenges. This could be best mitigated by clarity of communication and engagement with these parties, particularly around the benefits offered by DFQM in freeing up additional network capacity.

- Potential centralisation of the national connections queue: While this is not presented as an option by the ESO's consultation on connections reform, the far reaching scope of this kind of measure could significantly interfere with the DNOs' operation of DFQM. However, any re-organisation on this scale would be preceded by lengthy reviews and consultation processes, and so engagement from the DNOs could reduce the likelihood of this risk occurring.

These threats however can be managed during development of the DFQM process, and do not invalidate the potential benefits to the networks and consumers.