MW Dispatch service details including visibility and control requirements

nationalgridESO

Foreword

The last decade has seen a rapid expansion of energy resource connecting to local distribution networks. At National Grid ESO (ESO) we have been working with the local Distribution Network Operators (DNOs) through Regional Development Programmes (RDPs) to get their customers connected more quickly and at lower cost to the consumer.

Our initial projects with National Grid Electricity Distribution (NGED) and UK Power Networks (UKPN) are now in delivery. In the south-west of England, the first MW Dispatch (MWD) constraint management service will shortly open for registration and will go live later in the Summer. This project has facilitated an earlier connection for over 1GW of Distributed Energy Resource (DER) and deferred the need for transmission investment.

The project provides a route for smaller parties to provide flexibility services to the ESO ensuring a new revenue stream for these providers. This is achieved through a world first co-ordinated DER turn-down service being used by our control centre in real time. Critical to the project's success is the requirement to provide both operational visibility and commercial controllability for DER down to 1MW capacity.

Whilst we recognise that larger distributed generation has the option to access the Balancing Mechanism (BM), we believe there is value in greater deployment of distribution connected capability to provide additional real time services across both transmission and distribution. We need a consistent and scalable approach to the deployment of this functionality, which we are already achieving through our MW Dispatch projects.

This paper provides an overview of the MW Dispatch functionality as developed with NGED and UKPN. These projects lay a pathway to consistent real time constraint management services from DER across GB. The paper covers both the requirements for DER, as well as the processes and interfaces needed for the relevant Distribution System Operation (DSO) activities to interface with the ESO. We have worked with both DNOs to ensure that the specifications for both projects are consistent and intend to make this the basis for non-BM real time transmission constraint management services from DER going forwards.

In 2022, we published our position paper on Operational Visibility of DER and described some of the benefits of greater operational visibility[1]. Co-ordinated real time visibility and control infrastructure is core functionality needed in the MW dispatch projects. We recognise with the increase in connection applications, there are real challenges in getting parties connected. We believe that such real time visibility and control of DER can help DNOs get customers connected more quickly, whilst also providing opportunities for DERs to provide transmission and distribution services in the future. One example of this is our proposal for interim restrictions on availability connections ahead of enabling works for energy storage. In this example real time visibility and control of DER could enable the ESO's control centre to access embedded energy storage ensuring that their early connection did not cause operability challenges to the transmission system[2].

Going forwards we believe that the use of standard visibility and control requirements via DNO Bilateral Connection Agreements (BCA) for new DER of capacity 1MW or larger will become more widespread. These conditions could form the basic technical requirements for parties wishing to connect across distribution networks.

Whilst this paper lays out the specification for the MW Dispatch Projects, we are interested in potential areas of enhancement and change. We would welcome your feedback and can be contacted at: box.WholeElectricitySystem@nationalgrideso.com

[1] https://www.nationalgrideso.com/document/250251/download

[2] In this case the technical requirements of the scheme would be consistent with MW Dispatch, however instructions would be a condition of the restricted availability connection rather than a commercially resolved constraint management service.

1. MW Dispatch overview

The increased growth of DER across specific areas of the transmission system has traditionally been facilitated by Transmission Owner (TO) build solutions. The MW Dispatch project is delivering a whole electricity system operational solution which enables a coordinated approach to managing transmission network constraints between ESO and each partner DNO. This is achieved through the dispatch of non-Balancing Mechanism (BM) DER in real time with an appropriate commercial arrangement to provide a 'turn to zero' service.

The MW Dispatch Service initially applies to DER connecting at 13 Grid Supply Points with NGED in the South-West and UKPN on the South Coast.

The MW Dispatch Service is possible due to the introduction of specific conditions on "visibility and commercial control" in the connection agreement between DNO and DER. Hence the necessary visibility and control equipment is installed and commissioned by the relevant DNO at the DER site.

Leveraging this technology, in MW Dispatch areas, existing ESO Bilateral Connection Agreements (BCA's) and associated Appendices with DNOs 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.

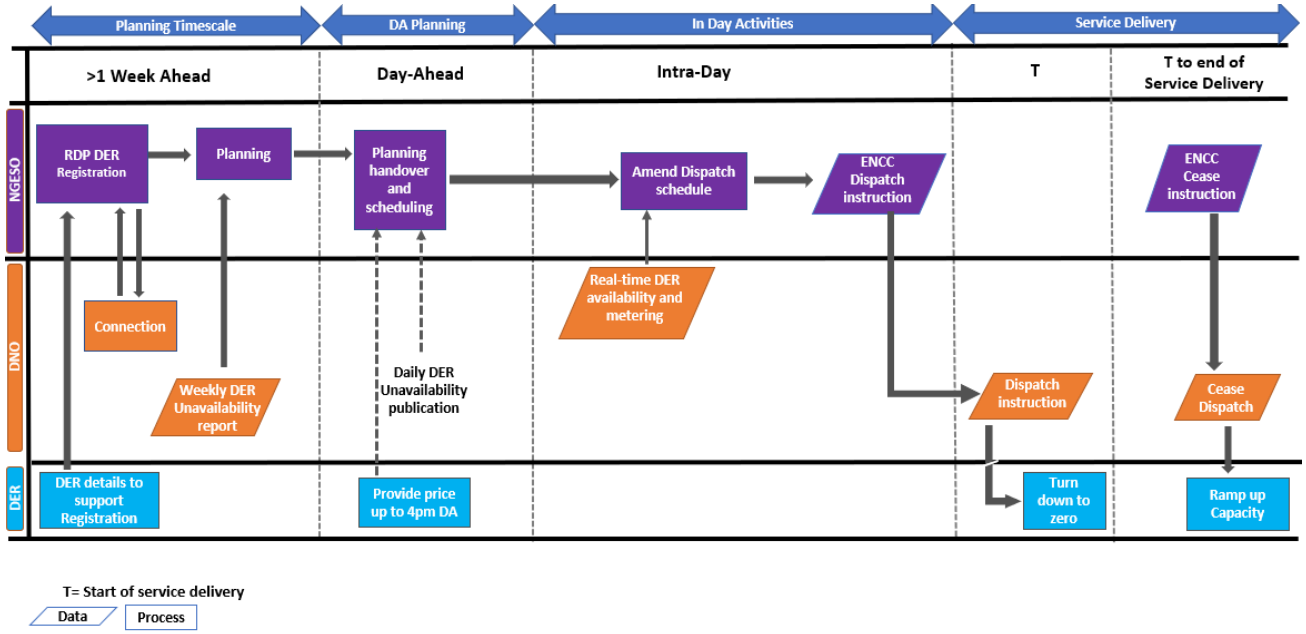
The contractual requirements for the MW Dispatch Service are described in full in the MW Dispatch Service Terms[3], and can be summarised as:

- Active Response Capability 'turn to zero'.
- Minimum 1MW installed capacity.
- Control Equipment - the Provider's interface equipment between the DERMS and the Contracted DER Unit controls which allows for the remote monitoring and dispatch of the Contracted DER Unit.
- Respond to instructions (via the Control Equipment) and reduce output to zero MW within a 2min Response Time.
- Providers will submit to the ESO any revision to its 'Utilisation Rate' each day for the following Trading Day.
- Each Trading Day will run from 05:00:00 hours to 04:59:59 the following day
- If instructed, generation output is maintained at zero until a cease instruction is issued.
- Payments will be made by ESO direct to the provider (based on Utilisation Rate), for each instruction.

The high-level overview of the MW Dispatch process is shown below and described in more detail in sections 2 and 3.

[3] https://www.nationalgrideso.com/document/270961/download

Diagram 1.1 High-level overview of MW dispatch process

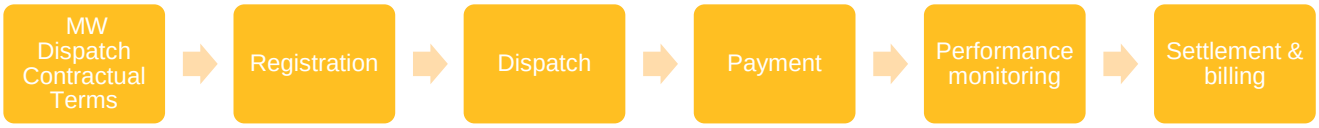


2. Relevant details for DER

DER with relevant terms and conditions in their DNO BCAs are required to provide a constraint management service to the ESO. This provides an additional revenue stream for these DER.

We have designed the MW Dispatch service (diagram 2.1) to be consistent with existing services and processes. Informed by stakeholder feedback throughout the design process, the new MW Dispatch service allows parties to fulfil their visibility and control requirements. The following section describes each of these process steps in further detail. Further guidance on the first MW Dispatch project with NGED including service terms can be found on our website[4].

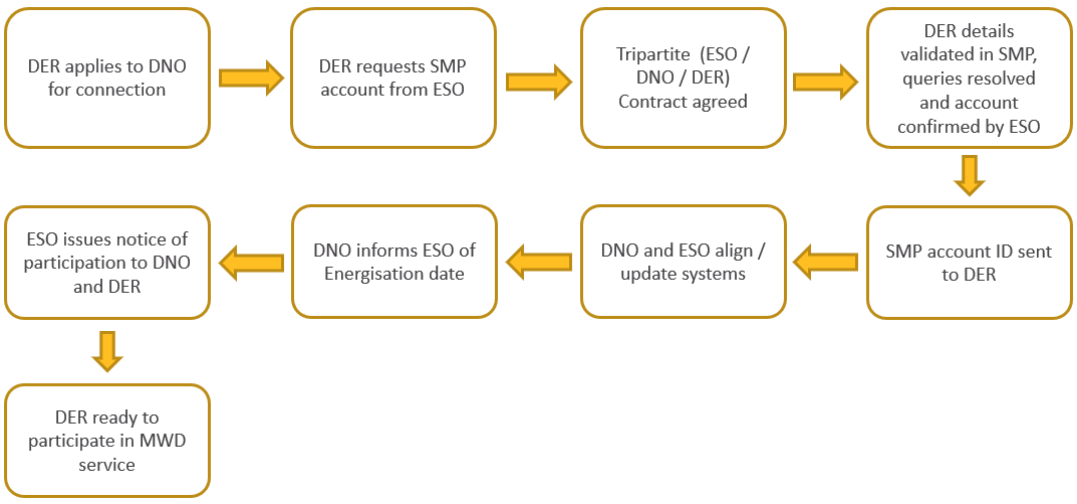
Diagram 2.1 Overall service provider process for MW Dispatch



MW Dispatch contractual terms[5] - As part of our MW Dispatch project, we have worked closely with NGED and DER to develop a new tri-partite contract structure to enable this coordinated service between DER, DNO and ESO. This is the first ESO contract developed in full collaboration with a DNO and incorporates many of the outputs from the ENA Open Networks Common Contracts work, which is common across the DNOs. The terms set out, including its schedules (the "Service Terms"), form a tripartite agreement ("MW Dispatch Contract") between the Provider (DER), the DNO and ESO.

Registration - For a DER to participate in the MW Dispatch Service, it must become a Registered Service Provider with ESO and become prequalified for the service by registering its asset/s and by agreeing to the MW Dispatch Service Terms as published by ESO. This registration process is managed via our Single Market Platform (SMP) as shown below in diagram 2.2.

Diagram 2.2 MWD registration process overview



Dispatch – The dispatch of the service provider is subject to a pre-instruction unavailability process as described in section 3 of this paper.

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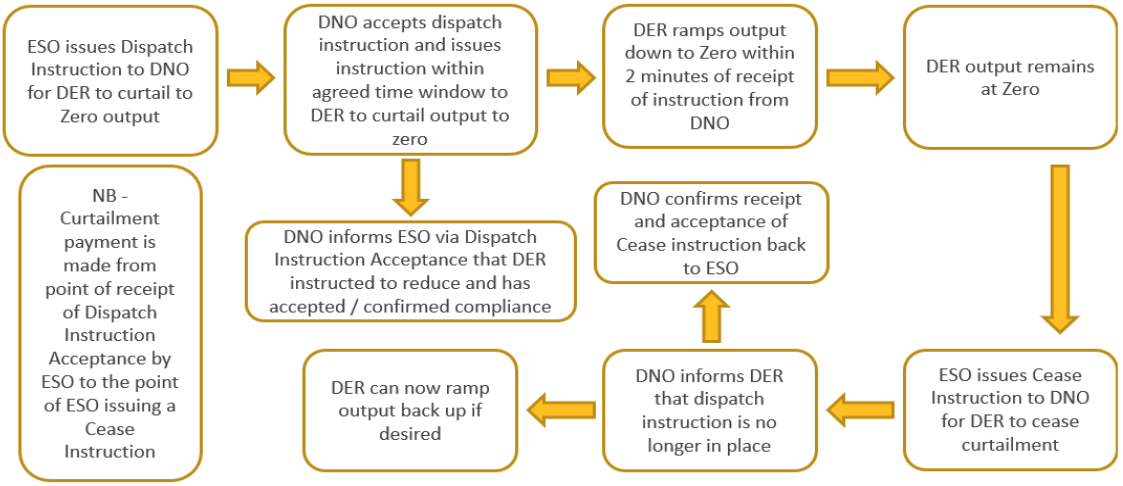
[4] https://www.nationalgrideso.com/industry-information/balancing-services/system-security-services/megawatt-dispatch-overview

[5] Contract terms refers to the tri-partite frameworks agreement needed for a provider to provide the MW Dispatch service to the ESO. This is separate to the DER's BCA with the DNO.

At any time, the ESO may issue an instruction to the DNO to request that the DER provider curtails their asset output to zero (0MW) as shown in diagram 2.3. The dispatch instruction is undertaken within the agreed time window and remains open ended until the ESO issues a further instruction to cease the dispatch activity.

Diagram 2.3 MWD instruction process overview



Visibility and Control requirements - Through the implementation of the 'Requirements for Generators' (RfG)[6] updates to the GB Grid Code, generation connecting to distribution networks has been required to install operational metering and certain control requirements to a standard specified by the local DNO since 2019. This formed part of the implementation of the European Network Code (which has been retained as GB Law post-Brexit). These are the current functional requirements that we are expanding upon for MW Dispatch.

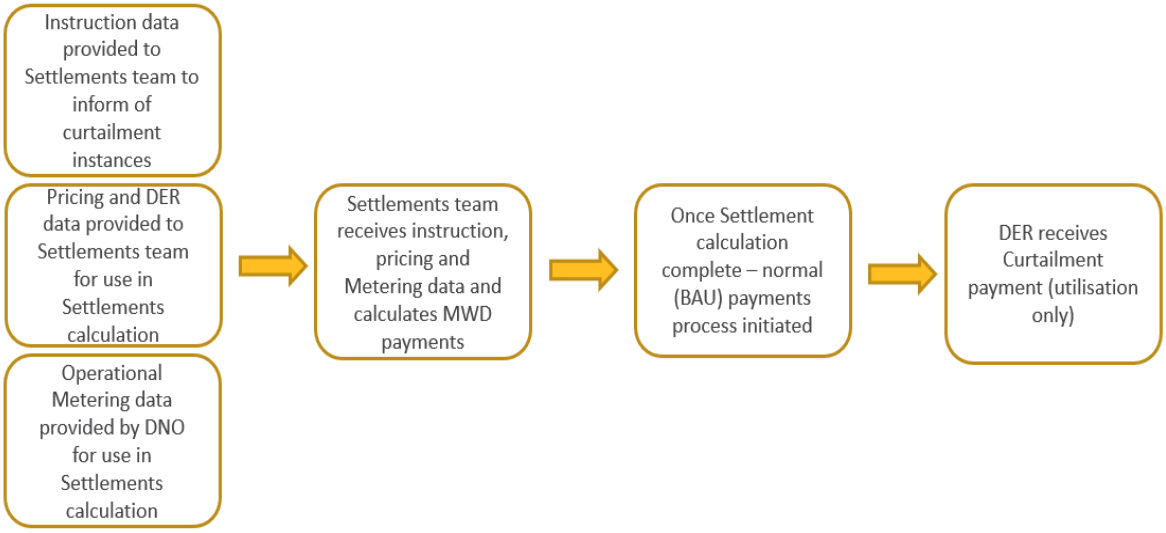
Payment - Each Provider has the opportunity to update its Utilisation Rate (for each DER Unit) each day (by 4pm) for the next following Trading Day and this is submitted via the ESO SMP. The ESO pays MW Dispatch Service Providers for the volume of curtailed energy in the form of a Utilisation Payment.

The payment is based on a 'Pay as Bid' price covering the full duration of the curtailment instruction (including ramping down) up to the Cease Instruction.

Settlement & billing - Settlement for the service is on a utilisation only basis and no availability payments are applicable. Settlement is based on the terms set out in the Service Terms agreement and the ESO applies MW Dispatch volumes within Applicable Balancing Services Volume Data (ABSVD) for MW Dispatch service providers.

[6] https://www.nationalgrid.com/sites/default/files/documents/RfG%20Factsheet%20June%202018.pdf

Diagram 2.4 MWD settlement process overview



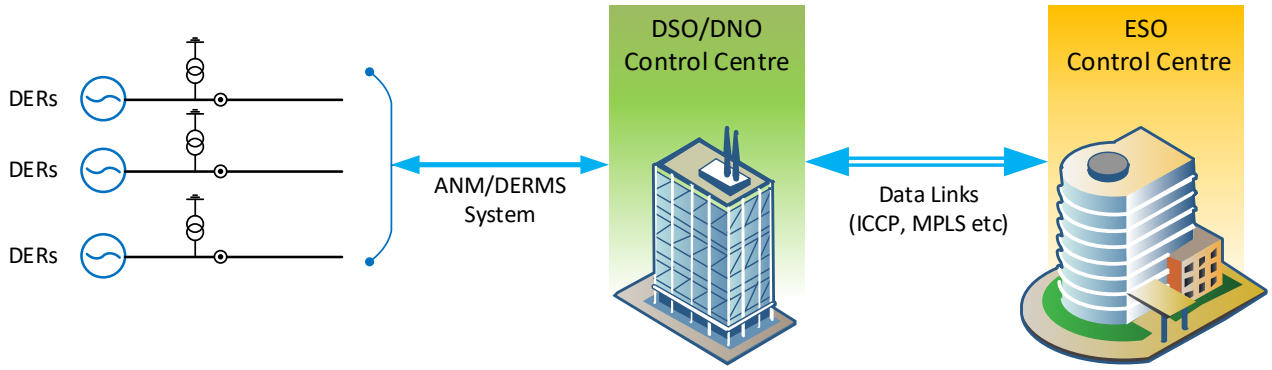
Performance monitoring – The ESO will monitor the performance of all dispatch instructions through the monthly settlement process against the following service failure criteria: response time, and service delivery. The ESO will continue to review the performance monitoring frequency to ascertain whether more frequent monitoring than monthly is necessary.

3. Relevant details for DNOs

DNOs are involved as project partners in the development and delivery of MW Dispatch projects. This ensure the functionality works for the DNO's operational systems and ensures that the MW Dispatch service is co-ordinated with activities on the local distribution networks.

On the basis of the work undertaken so far there are common requirements that are needed to facilitate MW Dispatch and other Visibility and Control Systems with DNOs. Figure 3.1 below provides a schematic overview of these requirements. Whilst we recognise that there may be specific requirements for different DNO control centres, these requirements are the basis for our future work and development with other DNOs. Further information on processes developed with DNOs for delivery of MW Dispatch are included in the annex.

Diagram 3.1 Overview of communications requirements needed for visibility and control



ANM/DERMS capability – partner DNOs need to have the ability to facilitate real time visibility and control data for their respective licence areas, with an ability for these systems to interface both with DER and the ESO. To date this is achieved through the deployment of ANM/DERMS technology. This technology, or equivalent, will be required for the delivery of similar systems.

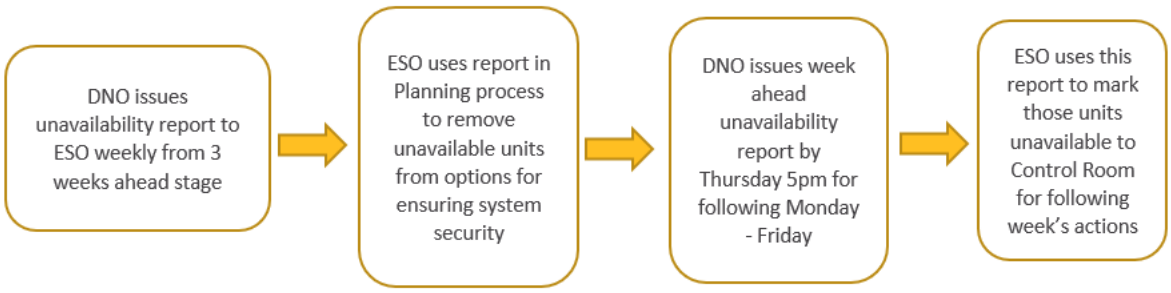
Data link provision and communication - establishing inter-control room communication protocol (ICCP) links is vital to RDPs as they allow an effective, consistent and established method of communicating between the various parties (DNO / TO / ESO). This supports the transfer of data and messaging / instructions necessary to enact many of our RDP services and products. In addition to using the industry standard ICCP links, the ESO is also building upon existing Application Programming Interfaces (APIs) to enable additional data types and functionality to be deployed. These interfaces will allow the sharing of registration data between DER / DNO / ESO to ensure a cross organisational view and facilitate effective registration of DERs for the MWD service. The specifics of the data types and the structure of the web services being utilised for the MW Dispatch project can be found in the ESO's latest published API information document[7].

Planning, modelling and scheduling coordination - Existing planning processes have been updated to take account of the basic MW dispatch service. This uses the data gathered at the registration stage to assess the pre-fault effectiveness of DER on regional constraints, which also allows the implementation of improvements to the planning and modelling of new DER. It is also the first ESO service to deliver a basic coordination process that ensures the service can be dispatched, taking account of DSO flexibility services, and forecast ANM operating periods.

[7] https://www.nationalgrideso.com/document/230366/download

To manage potential transmission-distribution network issues and conflicts, the DNO provides an 'ahead of time' view (the Unavailability Report) to ESO detailing any provider units that should be deemed as unavailable to ESO due to restrictions on the local distribution networks. The ESO will then remove these units from the MWD options available to Control Room teams, ensuring appropriate mitigation of any conflict risks as shown in diagram 3.2. This process supports the introduction of primacy rules required through the BEIS Smart Systems and Flexibility Plan[8].

Diagram 3.2 pre-instruction unavailability process overview



[8] Transitioning to a net zero energy system: Smart Systems and Flexibility Plan 2021 (publishing.service.gov.uk)

Annex

How we work with DNOs to deliver co-ordinated projects such as MW Dispatch

There are various processes and approaches which have been developed through the first MW Dispatch project which has established best practice to efficiently develop and deliver detailed solutions. These requirements form the basis for our future work and development with other DNOs, however we will continue to refine and improve based on learnings going forwards.

Project management approach – The project employs an Agile way of working (where possible) and involves defining, planning, and completing tasks within a short time window called a sprint. An end-to-end process for the service is defined providing a high-level view of the individual elements and constituent parts. These high-level elements are then further refined, developed, and validated with all stakeholders on a continuous basis throughout the project to ensure requirements are being met at each stage.

Consistent with the Agile approach a minimum viable product (MVP) is implemented. The MVP is a version of IT delivery with enough features to be usable as an initial phase to facilitate the operational requirements and allows for stakeholders to provide feedback for future product development. Future enhancements are considered in scope for the project, however the scope and delivery of enhancements will be defined and refined following agreement of the MVP requirements and design.

Governance requirements - The DNO and ESO hold regular bilateral meetings to monitor progress of the project, ensure risk mitigation and clear any progress blockers. These meetings also highlight any policy or stakeholder topics that may have an impact or need to be considered within the development stages of the project. Joint Project Management Board (PMB) meetings can also be considered during the project in order to engage senior DNO/ESO management for prompt key decision making. In addition, key outcomes from the bilateral meetings are shared with all DNOs that are currently not part of the specific RDP, during monthly Whole Electricity System Joint Forums. This provides visibility of technical and commercial developments and invites an open discussion on whether consistent technical approaches can be employed and agree the best way forward across the group.

Engagement with stakeholders -There is significant engagement with stakeholders during development and delivery of MW Dispatch. The ESO attends DNO customer forums to explain the service and invite feedback. During the detailed implementation there is regular engagement through webinars and consultations to agree service terms and advise of overall timeline.

Project roles – Delivery of MW Dispatch projects needs a joint delivery team of IT, ESO/DNO and Legal experts, to put in place the technical tools, data architecture, commercial contracts, and stakeholder communications to enable the end-to-end solution. Additionally, the team need to establish the necessary information exchange, information models and system adaptations to enable ESO/DNO commercial and network security analysis tools to successfully evaluate and utilise the service.