

The Power Potential Project  
Webinar for interested parties – Summary Document  
29 January 2018

### **Purpose of this document**

This document is intended to support the webinar material published on the Power Potential website, summarising the content of the webinar and the Q&A session.

### **Webinar overview**

The purpose of the webinar was to provide interested parties with an overview of the latest developments from the Power Potential project as we prepare for the 2019 trial – where Distributed Energy Resources (DER) within the South East coast study area will be able to compete and be compensated for providing reactive and active power services to the power system – and provide an opportunity to raise questions and seek feedback on the service proposition.

The webinar began with a general introduction and overview of the project. This was followed with an update on project progress, the proposed position on the commercial framework and the potential market value. The webinar was then opened up for Q&A.

### **Overview of the project**

The Power Potential project is a new initiative with National Grid, as System Operator, and UK Power Networks funded through Ofgem's Network Innovation Competition (NIC) mechanism – receiving £8 million of funding. The project began in January 2017 and will complete at the end of December 2019, following a 12 month trial.

The purpose of the project is to develop technical and commercial solutions to maximise the use of DER to resolve transmission voltage and thermal constraints and explore a Distribution System Operator (DSO) route to market.

The South East region has been selected for the project because:

- this area has a high penetration of distributed energy resources (DER) with connection volumes growing rapidly in recent years
- the transmission network has high interconnection with continental Europe, with High-Voltage Direct Current (HVDC) links of 2 GW at present, increasing to 5 GW with future projects
- the network provides electricity to London via the east and west of the demand centre
- the voltage and thermal constraints at transmission network has made it complex for the SO to balance the system for varying network scenarios and conditions.

We see the Power Potential project as an innovative solution which will provide voltage support from DER to the transmission network via the Distribution Network Operator (DNO) to meet these challenges.

It is anticipated that the Power Potential project will deliver the following benefits to customers and stakeholders:

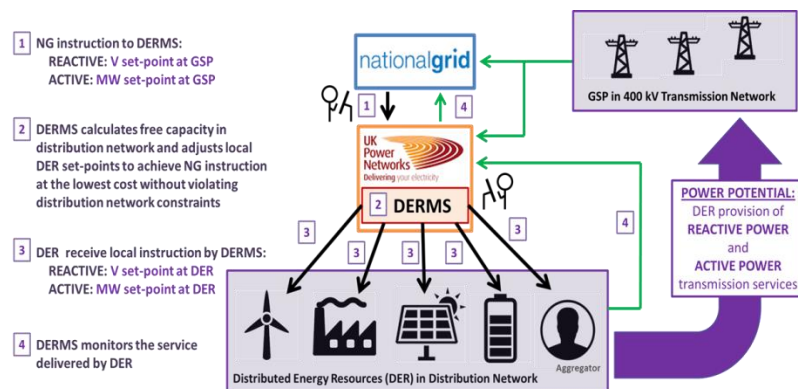
- deferring the need for network reinforcement
- enabling DER to participate to deliver market services
- 3720 MW of additional generation in the area by 2050
- savings of £412m for UK consumers by 2050.

## Project progress

### Technical update

Power Potential offers opportunities for DER to provide new reactive and active power services to the electricity transmission system. A novel management platform known as a DERMS (Distributed Energy Resources Management System) is being developed to enable this. The DERMS will facilitate the communication between the DER connected to UK Power Networks and National Grid.

The diagram below outlines the processes that will take place via the DERMS.



The DERMS process will work as follows:

1. National Grid will send an instruction to the DERMS. It can be a reactive power instruction to achieve a voltage set-point at the 400 kV Grid Supply Point (GSP) or an active power instruction to achieve a change in the active power flows at the 400 kV GSP. The GSP is the point in the network in which National Grid interfaces with UK Power Networks.
2. The UK Power Networks control room, where the DERMS will be located, will receive the instruction. It then calculates free capacity in the distribution network and adjusts local DER set-points to achieve National Grid instruction at the lowest cost and without violating distribution network constraints.
3. Instructions are issued by the DERMS to the individual DER to adjust their set-points and start delivering services. For the reactive power service, this will be a change in the DER local voltage set-point and for the active power service, this will be a change in the DER local MW set-point.
4. The DERMS will monitor the service delivered by DER, both at distribution and transmission level to check that the response is produced as required.

### Requirements for participation

We have prepared a *Technical Characteristics Submission Spreadsheet* and a *DER Technical Guidance document*. Both are available to download in the document section on the [project website](#).

To indicate your interest in providing one/both services, we ask that you fill in the *Technical Characteristics Submission Spreadsheet*. The deadline for returning this document is the **26 February 2018**. Please send your completed form to [box.powerpotential1@nationalgrid.com](mailto:box.powerpotential1@nationalgrid.com).

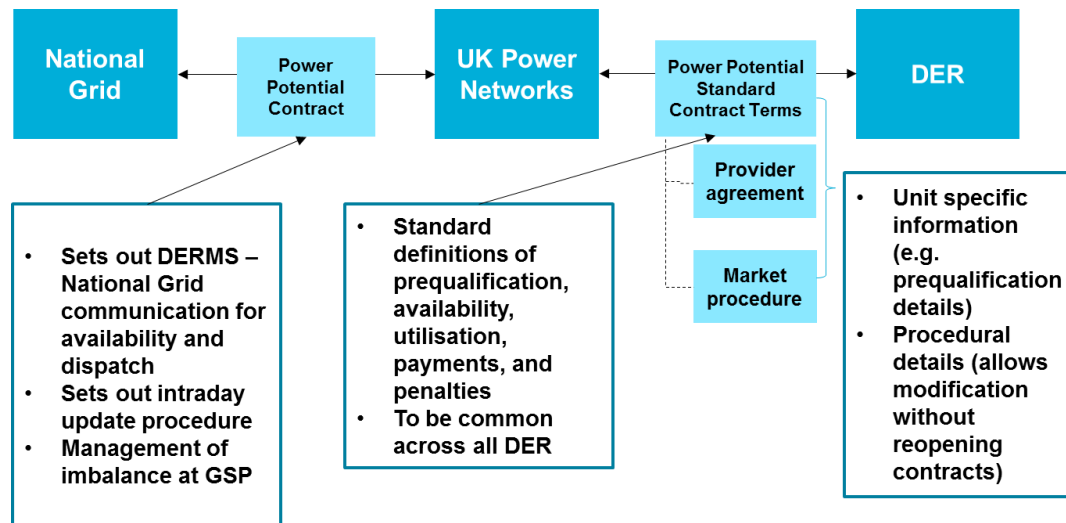
## Commercial Framework

In developing our commercial framework we are working to the following key principles:

- **be simple, transparent, and consistent** with the design of other flexibility products
- **encourage recruitment of existing and new entrant DER** into Power Potential
- provide the means to **deliver operational efficiency to network operators** over the longer term.

The *Heads of Terms (HoT) document* contains the details of the proposed commercial framework. We welcome your feedback on the proposed arrangements to enable us to maximise participation in the trial. The deadline for returning this document is the **26 February 2018**. Please send your comments to [box.powerpotential1@nationalgrid.com](mailto:box.powerpotential1@nationalgrid.com).

The diagram below shows the contract between National Grid and UK Power Networks. This will govern how National Grid and UK Power Networks use the DERMS for despatch and availability. It also includes how imbalances at the GSP are managed within the project.



Interested parties wishing to deliver the service will contract directly with UK Power Networks where they will sign on to a provider agreement and a market procedure agreement.

The market procedure agreement will provide the details on the process of bidding into the market. This will include the following information:

- detailed market timings
- the pro-forma for submitting bids and making changes to provider agreements
- the principles that UK Power Networks would use for assessing bids within the DERMS
- the information that UK Power Networks (the DERMS) would make available to the market
- instructions for using the web interface.

Given that the Power Potential project is an unproven technical solution, reactive power volumes procured during the trial will not be used to secure the system.

Participants will receive an availability payment for making the reactive service available, which will be paid on a £/Mvar/h basis. There is no availability payment for the active power service. Offering an availability payment for the reactive service provides some certainty of income for participants who may

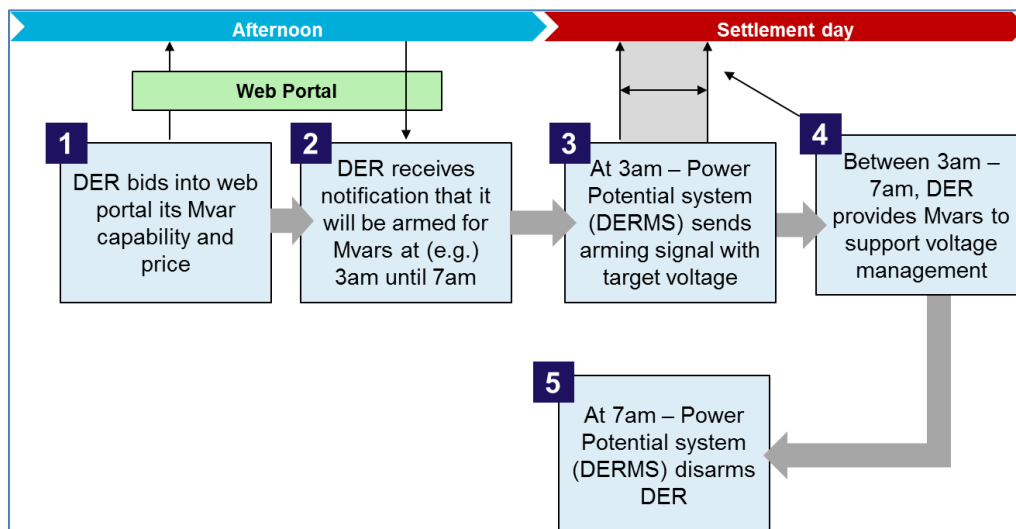
be required to invest in their assets to offer the service. We intend to articulate the requirements around prequalification and testing details in our next webinar in March.

For service delivery failures / penalties during the trial, we propose to pay for the level of service metered at the point of connection. If the service delivered is less than 80% of what was instructed, we propose to reduce availability payments proportionally to the percentage that was undelivered.

The diagram below highlights a few key points from the HoT document. As aforementioned, we welcome your feedback on this document by **26 February 2018**.

Contract aspect	Reactive Power (Mvars)	Active Power (MWs)
<b>Availability payments</b>	Where a service is procured from DER, availability payments will start from the beginning of the contracted period, i.e. £/Mvar/h	No availability payment for the active power service.
<b>Utilisation payment</b>	Payments to be based on £/Mvarh instructed and delivered	Payments to be based on £/MWh instructed and delivered
<b>Prequalification &amp; testing</b>	<p>Interested parties must complete and submit the Technical Characteristics Submission Spreadsheet</p> <p>UK Power Networks will outline any testing and monitoring requirements as a condition of participation in the trial</p> <p>Reactive service providers should be able to automatically deliver changes in reactive power capability in response to system voltage changes</p> <p>Active power service providers must be able to provide the service for a minimum of 30 minutes</p>	
<b>Penalties</b>	During the trial, availability payments will be scaled back in any given month if delivery is less than 80% against the service instructed. The availability payment will be scaled back by the proportional percentage of service undelivered	

This diagram below shows what the process will look like in practice for the reactive power service.



Procurement of Power Potential reactive power will take place at the day-ahead stage, likely to be the afternoon before the delivery day. For active power, we will procure reactive service in a day-ahead

auction. At the same time DER's can submit their volumes and prices for the active power service, which will be instructed in real time. Using reactive power service as an example:

- DER will notify National Grid, via web portal, of its Mvar capability and corresponding price for each settlement or a block of settlement period i.e. the requirement window. This submission will need to be done by 16:00 at the day ahead stage
- by 17:00 the DER will receive notification that it will be armed for Mvars and the period for which it is required to do so
- on the settlement day the DERMS will then send an arming instruction for the reactive power service at the start of the instruction period which in this example is 03:00
- during the instruction period the DER provides dynamic voltage support.

### Provision of multiple services

A common query from potential participants is whether Power Potential products can be co-provided with other services at the same time. We have provided the following table to explain the interactions between the services.

Other service	Reactive Power (Mvars)	Active Power (MWs)
<b>National Grid's Balancing Services (MWs)</b>	Provision of both Balancing Service and a reactive power service is possible, provided the performance of the existing Balancing Service is not compromised, e.g. by curtailing MW availability to provide Mvars	Provision of both services simultaneously is not possible as the services would counteract each other e.g. increasing MW output to deliver STOR/FFR, whilst curtailing MW output for constraint management

Where possible, we encourage participants to deliver both the reactive and active Power Potential services. However, we recognise that due to potential nullifying actions, it may be necessary to restrict the provision of active power constraint management for Power Potential if a participant is already available to deliver an existing balancing service.

The table (above) shows that reactive power provision under Power Potential can be provided in conjunction with a balancing service, as long as the existing balancing service is not compromised. This is not the case for active power provision under Power Potential in conjunction with another balancing service. This is because the provision of a service such as Short Term Operating Reserve (STOR) or Firm Frequency Response (FFR) would negate the curtailment action needs of Power Potential.

## Market Value

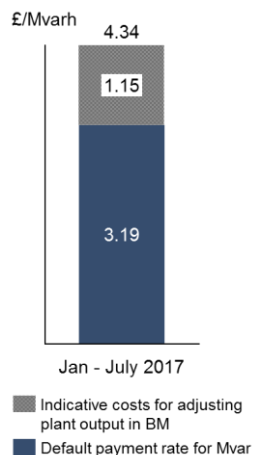
To enable participants to understand the potential volumes and utilisation that will be procured during the trials, we have developed three scenarios:

<b>Scenario 1</b>	Reactive power service to manage transmission High Voltage.	<ul style="list-style-type: none"> <li>• utilisation of 100 Mvar absorbing at Bolney 4 and 50 Mvar absorbing at Ninfield 4</li> <li>• service instructed 80% of nights all year round, and 75% of weekends between 11:00 and 15:00 when embedded generation suppresses system demand</li> <li>• <b>frequency of instruction: frequent.</b></li> </ul>
<b>Scenario 2</b>	Reactive service to manage a transmission voltage export constraint.	<ul style="list-style-type: none"> <li>• utilisation of 10 Mvar producing at Bolney 4, 10 Mvar producing at Ninfield 4 and service armed to inject producing Mvars following a voltage deviation</li> <li>• service driven by outages on the transmission system and by interconnector flows on the south coast</li> <li>• it is anticipated that the service would be instructed during times of peak system demand when interconnectors are flowing full into the Great Britain system</li> <li>• <b>frequency of instruction: infrequent.</b></li> </ul>
<b>Scenario 3</b>	Active power service to manage a transmission thermal constraint.	<ul style="list-style-type: none"> <li>• instruction to curtail active power to manage flows on the transmission system so they remain within acceptable asset short term ratings</li> <li>• requirement for the service is driven by planned and unplanned transmission outages and existing and future interconnector flows and exports from the DNO network</li> <li>• One example of an instruction could be to curtail 100 MW from Bolney 4 GSP when export levels on the south coast exceed transmission asset short term ratings</li> <li>• <b>frequency of instruction: infrequent.</b></li> </ul>

The table above illustrates potential service utilisation across a year using current system needs. These scenarios can be found in our [Guide to Participating](#) document on our website.

Currently, reactive power requirements are met by transmission connected generators through the mandatory reactive power market, with little to no participation in the commercial reactive power market. The cost of procuring reactive power through this route comprises of the default payment which is standard across all generators and possibly a positioning cost, if a generator's output needs to be adjusted in order for them to deliver the service.

The average price paid for this service between January and July 2017 is shown in the chart below, as an indication of the historic price of reactive power in the project area.





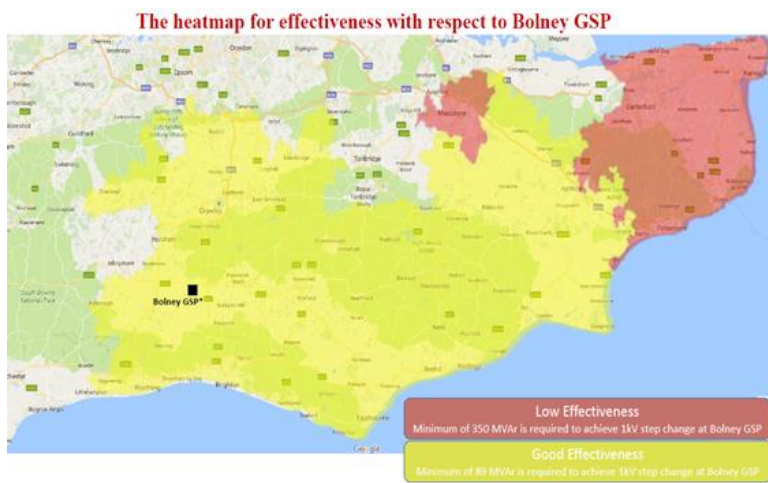
These figures should **not** be interpreted as guaranteed prices for the Power Potential trial or possible maximum or minimum payments. They are presented as an illustration of historic value and are to be used as a starting point for cost-benefit analysis.

We have prepared individual reactive power [heatmaps](#), for each GSP. These show how effective a DER could be in providing support to the wider network. The heatmaps were produced by measuring the change in voltage at the 400 kV bars for simulated reactive support from strategic points on the distribution network.

The effectiveness is shown through the use of the colours. Green indicates an effective area and red indicates a less effective area. This should give you an idea of how attractive the DER might be in comparison to other locations and therefore you may like to consider this information when preparing a bid price.

We would still encourage DER in the red areas to consider participating, especially if they are a larger sized asset. The value function used to create these heatmaps will be used by DERMS in the assessment of each bid.

Example of a heatmap.



The table below shows the project timeline.

	Jan	Feb	Mar	Apr
<b>Power Potential Project Team</b>	Draft Heads of Terms & Tech Characteristics	Host 1:1s with potential participants		
<b>Market Advisory Panel</b>		22 <sup>nd</sup> Feb Panel meeting to provide views on initial commercial proposition		
<b>Interested Project Participants</b>	29 <sup>th</sup> Jan: webinar to share draft HoTs & technical characteristics	Review HoTs & technical characteristics	26 <sup>th</sup> Feb: submit Technical Characteristics & feedback on HoTs	March Webinar to share initial trial design & impact on commercial proposition Provide feedback on trial design via 1:1s April webinar to share final trial designs and terms of framework agreement

We will be hosting one to one sessions at participant's request. Until the spring, we are arranging surgeries with interested parties to discuss technical capability, commercial details etc. Please contact the team to arrange a meeting with us: [box.powerpotential1@nationalgrid.com](mailto:box.powerpotential1@nationalgrid.com).

We will host our next webinar in March. This will provide further details on the initial trial design and we will be asking for your feedback on this. April's webinar will include final trial design details.

## **Q&A**

Q: How would bidding work given the overlap between different GSPs? Would we place bids per GSP?

*A: In the design stages of the control platform for Power Potential, we are working with the principle of assigning each DER to the GSP they are most effective at. Therefore, bids are assigned per GSP.*

Q: If we bid per GSP, do we end up getting discount for another GSP? If we bid on one GSP, such as Ninfield, there might not be a need that day, but actually there is a need on another GSP that our asset could service. Would we still get dispatched or how would this work? If I have an asset that can service two GSPs, and I bid on both, my bid might only get accepted in one. Does that mean that I'm automatically excluded from providing a service for the other if there is an activation requirement?

A: This won't prevent you from participating issuing your bid to provide service to resolve issues on other of the GSPs in the trial area. The principle of the control design we are considering is one that each DER connected is assigned to a single GSP in which the DER effectiveness is maximum. It is not expected that DER are effective in providing reactive services to GSP that are electrically far away. For the trials in Power Potential, even if your bid is assigned to one GSP, if there is a problem in another GSP in the area of the trial, it is likely to be reflected on both sites (as they are electrically close) and so your bid for a service called upon.

Q: Could you clarify on the possibility to provide both reactive power response and FFR? Does National Grid see a loss of value of the FFR tender?

A: No we will not devalue your FFR tender if you' are participating in the reactive service of the Power Potential trial. We expect you to submit your DER reactive power capability curve in line with its active capability. We would expect the DER to deliver on the FFR service if called upon and then to maximise or optimise your reactive service for the Power Potential service.

Q: What do you mean when you indicated that DER on the fringe of the areas shown on map would be of interest especially for larger assets, what do you mean by larger?

A: We are not limiting the size of assets to participate in Power Potential. We expect that any DER who is above 1 MWV should be able to participate in the trial. We don't have any major restrictions on the size of potential participants. The bigger the DER is, the more it can deliver. That is what we mean by larger.

Q: Will you be rolling this out to other network areas in the near future?

*A: It depends on the success of the trial in this area. We will definitely explore if this is a possibility after the trials have concluded.*

Q: What is your opinion on the flow battery as an alternative to lithium-ion?

*A: All technologies are welcome and expected to provide services within their capability range. There is no preference over any technology type.*



Q: Where can I find a detailed map of the project area?

*You can find these in our [Guide to Participating](#) document available in the document section on the Power Potential website.*

Q: For those who are involved in the process and given technical details to the Power Potential team, are you still expecting us to complete the latest forms?

*A: Yes we are. Please complete the form before the 26 February 2018.*

Q: What would be the procurement method for day-ahead auction, pay as bid or pay as clear?

*A: Pay as bid is our current minded position.*

Q: The size of the bid is dependent on the asset. 32% of our reactive power capability is needed. Can you comment on the bid size for wind farms?

*A: This capability range is a firm requirement for new connections. For existing plants, we are looking forward to receiving your technical capability information and try to accommodate you in the trials. Please specify this data in the Technical Characteristics Submission Spreadsheet together with your interest to provide one or both services.*

**Please send any further questions to the team at [box.powerpotential1@nationalgrid.com](mailto:box.powerpotential1@nationalgrid.com)**