NATIONAL GRID
March 26, 2018

Coordinator: Welcome and thank you for standing by. At this time all participants are in a listen-only mode. After the presentation we will conduct the question and answer session.

To ask a question, please press star followed by the number 1. This call is being recorded. If you have any objections, simply disconnect at this point. Now I'll turn the meeting over to your host, Amy Boast from National Grid. You may begin.

Amy Boast: Welcome everyone and thank you for joining our Potential Webinar. My name is Amy Boast and I am the Commercial Lead for the National Grid Power Potential Project.

I'm here in National Grid Warwick today with my colleagues on the project, Clare Maguire, Biljana Stojkovska, Kameesh Philips and Inma Martinez from National Grid. From U.K. Power Networks, we have Tatiana Ustoniva and Kellie Dillon.

At this time you are currently in listening mode and I will go through the presentation and then we'll open the line for Q&A. If you do have any questions in the meantime, please hold them until the end or send an email to our dot box, which is box.powerpotentional1@nationalgrid.com.

If you're also struggling with any of the WebEx slides, the material is on our website and available to download now. We're also recording the call so you can follow up afterwards.

The purpose of today's webinar is to share an update on the project status, in particular the development of the commercial framework. Presenting with me today is Tatiana, a member of the Technical Delivery Team for U.K. Power Networks.

Our last webinar was at the end of January where we shared a draft version of our Head of Terms document for the services being procured along with an invitation for interested participants to submit their technical characteristics submission spreadsheet to in order to see the ability of distributed energy resources to participate.

Today we intend to address the feedback given on the draft Heads of Terms as well as to answer any queries that were raised throughout this exercise for both technical and commercial work streams. We will then share updates on next steps with time available for Q&A at the end of the call.

So just to recap, what is Power Potential? The project is a three year network innovation competition project with National Grid and U.K. Power Networks. The demonstration project is seeking to access reactive and active power services and distribute them to resources connected to the distribution network to support the role of system operator.

We're trialing the use of these services in the South East of England where the connection of distribution energy resources is growing rapidly. And due to the region's location, we have high levels of interconnection with continental Europe through correlating HDVC links of two gigawatts anticipated to rise to five gigawatts with each project.

A successful demonstration of Power Potential will enable more customers to connect in the South East region with the chance to provide services to National Grid through new revenue streams.

The services procured will also allow operation and distribution in transition networks within our operating standards. Most importantly services secured could also lead to reduced consumer costs and deferring network reinforcement work on both networks.

The trial will take place across four grid supply points. They are Sellindge, Bolney, Canterbury and Ninfield. And if you're within or on the edge of the trial area, we're keen to hear from you. Please get in touch by the dot box and we will confirm whether you're eligible to participate.

So to give you a quick update on where we are with the project, we shared this timeline in previous webinars. Since our last webinar we've completed the detail design of our platform known as DERMS or the Distributed Energy Resources Management System.

The project has now moved into the design phase. Testing of the platform will commence in the summer ahead of our go live demonstration trial in 2019. Tatiana will share more detail later in the webinar regarding testing.

At the same time we've also been working hard designing the details of the trials and have consulted our Regional Market Advisory Panel on these designs.

The panel is made up of a range of industry stakeholders whose objective is to provide their views as to how to ensure Power Potential is not only a success, but designed to be fit for the future. The panel has an independent chair and

they intend to publish the minutes from the meetings on our website in due course.

We have also been busy meeting with interested participants to discuss their involvement and continue to arrange discussions that all the - who submitted their technical capabilities to us in February.

Following today's webinar we intend to hold two surgeries on the 6th and 11th of April for interesting participants to discuss their specific project with us to share any feedback on the trial designs we share today.

If you cannot make these dates, we are still committed to hosting one-to-one meetings with any provider so that we can take onboard as much feedback as possible before publishing our final Heads of Terms document in May.

So just to share an update on the exercise we ran in February, we'd like to thank all participants who submitted their technical characteristics to us.

Thirteen submissions we received in representing 18 sites across the range of technologies. The feedback on the draft Heads of Terms document has also allowed us to shape the design of our trials.

Current volumes indicate approximately 80 MVar of lead capability and 70 MVar of lag capability. But this is just based on data currently available to us and we anticipate this to rise.

These volumes show the confidence of the project that's subject to contract. We have enough volume to demonstrate technical viability and power potential.

Most of their submissions expressed an interest for both services, reactive power and active power with approximately 270 megawatts of active power interest.

We continue to welcome the submission of technical characteristics in sites working within the trial region wishing to participate in Power Potential. And then continuing to follow up with all providers who have already submitted their information to clarify details and ask any follow up questions.

Regarding the feedback on the draft Heads of Terms, we received a range of comments including strong support for the day-ahead procurement. There were also a range of technical and commercial queries and the most common of which we'll discuss in the slides to follow (slide 10 onwards).

Namely on the technical aspects of the project, more information was sought around pre-qualification and testing requirements, metering requirements and frequency of an instruction.

And commercial feedback was largely in relation to

- the desire to understand the interaction with the provision of other balancing services and;
- specifically feedback regarding the need to recover costs related to participation so that participants could avoid incurring losses in the trial.

Thank you for being transparent and sharing these costs with us. This has allowed us to be more informed in shaping our trial design. Current indicative CAPEX costs for the communication or control upgrades participants range from £15,000 to £50,000 with average cost of upgrade in the order of £25,000.

The following slides (slide 11 - 19) aim to address current technical queries that we've received regarding participation for Power Potential. We'll start with a reminder as to how the process will actually work.

The procurement of Power Potential reactive and active power services will take place at the day- ahead , approximately 1700 hours before delivery day.

DER will be provided with access to a web portal bidding platform where they can input their availability for MVars and MWs and associated priorities for the following day.

(Slide 11) Using reactive power services as an example, Step 1 of the diagram shows that DER will notify National Grid via the Web portal of its megabar capability and corresponding price for the window the service is being procured for. This may be a settlement period or consecutive settlement periods. The submission will need to be done by 16:00 hours at the day-ahead stage.

Step 2. By 17:00 hours the DER will receive notification that it will be armed for MVars on a period for which is required to do so.

Step 3. One the settlement day, DERMS will then send an arming instruction for the reactive power service at the state of the instruction period which in this example is 3:00am.

Step 4 shows that during the instruction period the DER will then provide dynamic voltage support.

Step 5. At the end of the instruction period DERMS will disarm the DER.

One of the common discussion points DER participants is how payments for the services will work and how often instructions will be sent. So the next two slides aim to address this (slide 12 and 13).

Building on the example to show how payments for their active power service work let's assume that the DER has been contracted to deliver their reactive power service between 3:00 am and 7:00 am.

At this point the DER has secured an availability payment. At this point, the DER has secured and availability payment, considering the DER will be available (armed in voltage droop control) for the whole contracted period. In addition to this, a utilisation payment may happen or not, and it will depend if the service is at all utilised during the contracted window.

I'll expand on the idea of when utilisation happens in the next slide (slide 13). But before doing so, let's take steps through this example. Please bear in mind that the numbers used her are by no means indicative. They're just used here for the sake of clarity.

So in this example a DER was contracted from 3:00 am to 7:00 am; so for four hours for a total volume of 20 Mvar. Assuming a price of 1£/h, being available for 4h would result in an availability payment of £80.

As I mentioned before, this payment is secured after procurement when the DER was selected to provide the service. On top of this let's assume that the volume - (20) Mvars volume - only five Mvars were utilised for a period of 30 minutes during the contracted window for a price of 2£/Mvar.

This results in the utilisation payment of £5. We will measure the delivery of that utilisation instruction at the DER point of connection. In total during the

delivery day, this DER would then receive a total payment of £85 for participating in the reactive power service. Again these prices are arbitrary and simply used to illustrate how payments would be calculated.

If we now move on to the instructions that trigger these payments (slide 13). Firstly, DERMS instruction of availability will be issued for two minutes before the contracted period starts. This will arm the DER in voltage droop control mode for the whole window using a characteristic like the one shown in the figure to the bottom right of the slide.

The instruction is issued in this case to change the DER operating mode from power factor control mode to voltage droop control mode. And it will consist of droop slope value (likely to be fixed at 4%) and a voltage set point (which can then lead to be adjusted by DERMS).

Note that after this the DER will be kept operating at nominal level unless directly instructed otherwise. To do so DERMS by design principle would adjust the DER voltage set point every ten seconds as needed. In any case, these changes are expected to be in a very narrow range.

Let's now discuss the instructions that drive utilisation payments. These correspond to two different conditions. The first is a National Grid instruction by DERMS.

This instruction is issued from DERMS to change the DER voltage set point and to collectively achieve a National Grid request for a Mvar volume. This instruction will therefore trigger the utilisation.

The other utilisation scenario corresponds to the dynamic response to system events. In the case the DER would respond automatically to a severe voltage change because it would be on the voltage droop control mode.

Following this automatic response, DERMS will issue an instruction to change the DER voltage set point and maintain support. These are the two scenarios that anticipate utilisation taking place for reactive power. I will now hand over to Tatiana.

Tatiana Ustinova: Thank you very much Amy. My name is Tatiana Ustinova and I am part of the Technical Delivery to U.K. Power Networks.

U.K. Power Networks has developed the DER interface requirements specification document. It will be released to the Power Potential website in the near future. The document covers System architecture and parties' responsibilities, functional and non-functional requirements. The following two slides summarise the key information from the document.

So you can see that these diagram on slide 16 shows the default arrangement of the relevant equipment at the customer substation. U.K. Power Networks remote terminal units, RTU, and customer plan controller are installed within the same substation, as most of you know.

Remote Terminal Units are in constant communication with U.K. Power Networks control center. It transfers the megawatts, MVars and voltage measurements with the frequency of around one second.

Slide 17 summarises questions that have been asked during one-to-ones with the interested customers. The current thought is that U.K. Power Networks RTU measurements will be used to assist with the DER performance.

Different DERs have different resolution meters and some maybe have only MPAN half-hourly meters.

The use of RTUs will allow for the uniform resolution, which ranges from several hundred milliseconds to around one second. But we obviously welcome your thoughts on the requirements and procedure.

Power Potential will cover the cost of RTU upgrade to enable issuing control signals to DER or installation if it's necessary. For new DER the requirement will be to interface with U.K. Power Networks via DNP3 protocol over TCP/IP.

For existing DER we will try to accommodate existing communication solutions. So please get in touch with us to discuss. The bids will be entered via a web-interface as a web page or mobile app. It will be provided by the project and will be fully independent from the DER control system.

Slide 18 will give a high level overview of the testing. Testing will take place in the second half of the 2018 and is not a reason to take more than two, three working days.

Dates and procedures will be agreed between the U.K. Power Networks and the customer to avoid/minimise disruption.

The test will include for example:
- DER speed of response
- technical capability to provide this service and;
- communications.

And now I will hand it back to Amy to provide an update on the commercial queries.

Amy Boast: Thank you Tatiana. So I'll now run through some of our common commercial queries as well as provide an outline as to our current thinking on trials designed for 2019.

So a common query that we have received from potential participants is whether the Power Potential products can be co-provided with other services at the same time.

We have provided the table to explain the interactions between services (slide 20). Where possible we wish to encourage participants to deliver both the reactive and active Power Potential services.

In the table for reactive participation under Power Potential we can see that this can be provided in conjunction with balancing service as long as the existing balancing service is not compromised.

This is not the case for active participation under Power Potential in conjunction with another balancing service as the provision in such a service like FFR or store would negate the curtailment action needs as the Power Potential active power service. We do however see that outside of the existing balance in services contracted window,that they provide a quick delivery and active Power Potential service.

In relation to flexibility service to U.K. Power Networks, the services for reactive and active power can be provided as long as it is not compromised in which case curtailment of active power would not be compromised. However, optimisation will aim to maximise both services.

In relation to non-firm connections, we would like to encourage participants. This is due to the compatibility of the Power Potential project with the framework around non-firm connections.

And we recognise that this is a change in our position as to what has been previously communicated. We would like to take as much learning as possible from this opportunity given the nature of the innovation project.

The second most common piece of feedback we received on the draft Heads of Terms was the need for participants to avoid incurring losses in the trial. This was a key piece of feedback, which we took into consideration when designing the trials for 2019.

As a reminder, the purpose for the Power Potential trials are to demonstrate the proof of concept; i.e., to prove the ability of distributed assets to solve transmission constraints. And secondly, to demonstrate the proof of market; i.e., to establish the commercial viability for such an approach.

In achieving these things, we have designed our trials in line with the following principles, market efficiency, operational and continuous review of the possibility to implement as business as usual.

By market efficiency we mean to maximize participation and distribute energy resources while maintaining efficient allocation of our project budget. As an example, we want to ensure that we reward the DER that is most effective yet pay a fair price that reflects the need for investment to provide the service but does not place participants in a significantly beneficial position going forward.

From an operational perspective, we want to maintain system security by not utilizing trial volume secure systems as the service is still improving, particularly the reactive power service.

Trials will follow the operational profile full requirements. And finally it's important that we continuously review the flexibility of Power Potential to business as usual in order to inform projections for future use.

It is assumed that DER who participate in these trials will have completed pre-qualification in testing successfully in line with the project needs. Please note the following slides focus primarily on the reactive power service at the innovative element of the project.

So to demonstrate both the technical and commercial Power Potential solution, we've proposed splitting work in 2019 into three types of trial phase. Phase A, a fixed fee for a fixed number of hours; Phase B, price discovery; and Phase C, transition to business as usual.

Each phase has a different objective and corresponding commercial framework as a result. Phase A seeks to demonstrate the technical solution in Power Potential; i.e., that DER can provide support to both low and high voltage pre-fault scenarios while still so informing the effectiveness of their support of the Grid Supply Point (GSP).

We will do this by simulating and measuring voltage response following the rapid change / drop of the voltage on the transmission system and also by measuring the effectiveness of DER delivery at the GSP through controlled utilisation of the service.

DER will received a fixed fee for a fixed number of hours for this wave. This removes certainty to trial participants of guarantees a firm revenue whilst also securing technical data for the project.

Phase B of the trial aims to establish the financial viability of Power Potential through price discovery. We will do this by fixing the number of hours we run the daily auctions for while applying the learning from Phase A by assessing bids in line with DER effectiveness. DER will compete with one another in day ahead auctions during this phase.

The final phase of the trial is transition to business as usual. To prepare the DER for current market conditions whereby they will be exposed to competition, the transition connected asset participating in the managing market.

To do this we will fix the numbers of hours we run daily auctions for while supplying the cap to the bids that we accept in line with the managed price whilst also considering DER effectiveness.

Having consulted our Regional Market Advisory Panel on this design, we believe this approach will ensure that we deliver the objectives to the project in line with our principles.

We also believe that this will address the need for participants to avoid incurring losses in the trial to providing some fairness of revenue via Phase A fixed fee for a fixed number of hours.

We welcome your feedback on this approach and intend to finalize the details over the coming weeks with respect to exact value for fees and number of hours during Phase A of the trial year.

So that's hopefully a good overview as to the common queries that we received following our Webinar in January. To give you an overview of our next steps, there are several pieces of ongoing work that the project team are doing.

We'll finalise several details with you on these issues as soon as possible. This includes:

- power factor studies to investigate the potential of the greater service delivery and the impact that this may have on connection agreements.
- how to resolve any impact that delivering reactive power service may have on the DUoS charges.
- Specific details of trial designs (number of hours and fixed fees)

Following today's webinar we intend are holding two surgeries on 6th and 11th April for interested participants to discuss their specific project with us and to share their feedback on the trials design. We commit to hosting 1:1 meetings with any provider who cannot make these dates in order to take on board as much feedback as possible before publishing our final Heads of Terms in May.

In these one-to-ones we are keen to hear your feedback on our trial designs and continue to work to address any technical queries you may have. We intend to share our final trial designs and final (unintelligible) review in mid May allowing a few weeks for final feedback. And we invite DER to sign onto Power Potential framework agreements in June.

I'd now like to thank you all for listening. And hopefully I can line up questions while we support you by several members of the project team in answering your queries.

Coordinator: Thank you. We will now begin the question and answer session.

Amy Boast: Question: The practical limits on the usefulness of the reactive power that a generator can deliver ie. a 132kv distribution connected generator is much more able to influence system volts than another generator connected at say 33kv. Isn't this project a little bias towards larger connections?

Biljana Stojkovska: Thank you for the question. The generators that are closer to grid supply point are more efficient than generators that are connected in the lower level of distribution network, due to the reactive power losses. Further down on the network the generators are less effective from prospective of reactive power. However, in the Power Potential project we encourage all generators to participate regardless their effectiveness. We publish the reactive power heat maps where you can check effectiveness on the generators in the area.

Coordinator: Thank you. That concludes this conference. Thank you for participating. You may now disconnect.

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