nationalgrid

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To: Rhianne Ogilvie
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16th April 2014

Dear Rhianne,

Re: Enhanced Frequency Control Capability ISP Clarification Questions

National Grid Electricity Transmission (NGET) submitted the Initial Screening Pro-forma (ISP) as part of Network Innovation Competition (NIC) 2014 for development of Enhanced Frequency Control Capability (EFCC) project on the 4th April 2014. Further to this, we received a request to provide some clarifications as mentioned in your email on 14th April 2014. This response is on behalf of National Grid Electricity Transmission plc. in support of our NIC submission and is not confidential.

Given the high volumes of renewable generation connected to both the distribution and transmission system, there will be periods where there is very little conventional generation connected to the transmission system. Therefore, if we are not to restrict to the integration of renewable generation, it will be necessary to develop new solutions in operating the transmission network and it will be necessary to ensure that both renewable generation (transmission and distributed connected) and demand contributes to the secure operation of the grid.

A. Clarifications requested on the method(s):

The EFCC project will develop the future capability that the grid requires for frequency control through following steps:

- Task 1: Develop a reliable tool to measure the rate of change of frequency at a regional level (based on the use of available and additional Phasor Measurement Units across the system), and central control agent which enables initiation of very fast response in proportion to the rate of change of frequency. This is a specific piece of new equipment (novel control system) which is going to be demonstrated and meets the specific requirement in section 4.8 of the NIC governance document.

- Task 2: Demonstrate fast acting response delivered to the grid from new technologies and resources using the tool developed in task 1. The final selection of technologies and resources will be finalised in the final bid. We have identified the following potential candidates for the purpose of demonstration in this project:

    - Solar PV;
    - Demand Side Response (DSR);
    - Windfarms;
    - HVDC links; and
    - Storage.

  This demonstration will determine the capabilities of these technologies at transmission and distribution system to reliability meet the fast response needed. This is a specific novel application of existing transmission and distribution connected equipment and meets the specific requirement in section 4.8 of the NIC governance document.

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- Task 3: Through demonstration of such enhanced frequency control model, the EFCC aims to demonstrate how the use of such resources, in an optimised way, can reduce the overall response requirement for the grid. This activity will lead to development of new commercial balancing services which is a new specific commercial arrangement and meets specific requirement in section 4.8 of the NIC governance document.

B. Clarifications requested regarding the potential savings:

National Grid has identified and published the future reduction in the level of system inertia in the Electricity Ten Year Statement (ETYS: http://www2.nationalgrid.com/UK/Industry-information/Future-of-Energy/Electricity-ten-year-statement/Current-statement). At present, the system frequency is economically and optimally managed by providing the required level of response for the largest loss. When the system inertia is high, lower level of response is required. For example to control the frequency for a loss of a large generator the overall response less than 100MW/s is sufficient. By 2020, to control the frequency using the existing system capability the response as high as 600MW/s will be required.

The increase in response requirement is due to the reduction of system inertia which requires significantly more volume of response that and increase the cost of controlling the frequency to around £200-£250m per annum. This cost would include:

- Additional cost of holding extra response; and
- Additional cost of constraining the generation and demand (i.e. having to limit interconnectors' export level in real time to manage system frequency)

With developing the new capabilities proposed within EFCC, we aim to provide the additional measures to avoid holding larger volumes of response or having to constrain generation or demand. This demonstration will also increase the diversity of response providers and will bring the incremental cost of controlling the frequency down.

C. Clarifications requested regarding project partners and external resourcing/funding:

National Grid as a prudent transmission system operator continues being active in identifying future system challenges and opportunities to better and more economically operate the grid. In doing so, we have engaged extensively with our stakeholders (ranging from academic institutes to services providers, and network operators) via various channels such as, customer seminars, operational forum, stakeholder engagement on ETYS, and regular discussions etc. to develop a holistic view of future grid requirements, and evaluate solutions in terms of technology readiness and cost prospective to address the requirements.

As part of developing this proposal, we implemented a stakeholder engagement strategy in order to:

- Capture the ideas for a project of such nature, consolidate them and develop a project which addresses the requirement for future frequency control capability; and
- Invite industry partners to participate in this project via
    - Developing the necessary control systems required as part of this project
    - Provide the required resources (i.e. demand, windfarms, solar PV farm) so the demonstration to be carried out on these sites
    - Share knowledge and learning delivered as part of this project.

This was done via various channels; including engagement via our website, Commercial Operation, Energy Networks Association, and number of forums where we regularly hold discussions with our industry stakeholders.

We have already had discussions with the parties showed interest to participate in this project in order to understand what level of contribution they can make towards this project. We have confirmation from some of the interested parties to provide in-kind contribution, or to make the facilities required for the purpose of demonstration available to us. As mentioned in the proposals, we

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are still evaluating the potential partners (a selection criteria is developed to maximise the benefits and bringing the cost down) and this will be confirmed at the time of final submission in July.

I trust the above information provides more clarity areas highlighted in your email. If you require more information please contact myself vandad.hamidi@nationalgrid.com.

Yours sincerely

[By email]

Vandad Hamidi
SMARTer System Performance Manager

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