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9 June 2016

Dear Anthony,

## **Revised Submission of Funding Request for Costs incurred Delivering Enhanced System Operator Outputs**

Please find attached below a revised narrative and supporting spreadsheet associated with delivering the “Enhanced System Operator” activities which are unfunded under RIIO-T1.

As discussed between us this submission seeks to address the issues raised by you in the various telephone conference calls that we have held over recent weeks. Also as agreed a DAG assessment will follow.

I would like to draw your attention to some changes between the original submission and this revised submission. The overall claim has reduced to by some £1.7m to £21.96m. Our original submission on 29<sup>th</sup> February 2016 included forecast numbers for the agency and relocation costs in 2015/16 and 16/17 associated with recruiting staff. These numbers were based on our experience of having to recruit a significant number of staff from outside the UK to obtain the right skills and experience. Such recruitment incurs significant relocation and agency costs. Given the timing of this revised submission we are now in a position to revise these numbers providing actual figures for 2015/16 and revised forecasts for 16/17 reflecting our recent experience in successfully recruiting a greater proportion of staff from the UK (without the significant relocation and agency costs previously anticipated). This accounts for c.£1m of the reduction.

In addition we have been able to provide more accurate forecasts of the Pan European Market Model (PEMM) costs based on tendered prices (not available in the February submission) and a reallocation of some of the PEMM operational costs that had been included in “Other Costs”. Finally the reduction in staff costs referred to above has resulted in a commensurate reduction in business support costs. We will be happy to take you through the detail on these changes in due course.

We look forward to your consideration of our submission for funding of our costs associated with delivering the outputs required by the enhanced SO role. In the meantime if you have any questions please do not hesitate to contact me.

Yours sincerely,

[by email]

Andy Balkwill  
RIIO Performance Manager – Electricity Transmission  
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## Appendix

### Delivering the Enhanced SO Roles – Enduring Resource Requirements

The new transmission licence obligations that came into effect on November 2<sup>nd</sup> 2015 require additional resource to carry out the functions and activities required to discharge these obligations.

This paper sets out and provides the justification for the additional resources required to deliver the new outputs that meet the obligations as defined in the licence. In summary the activities we need to undertake are:

- Assessing the TO options for investment and identifying a preferred option based on single year least worst regrets cost benefit analysis, this is already performed for England and Wales through the NDP process, the new obligation requires this to be undertaken for all of GB
- Providing independent cost benefit analysis for TO needs case approvals for Strategic Wider works projects
- Utilising a Pan European Market Model that allows for GB welfare benefit assessments of interconnectors and looks to the future to advise when, where and what capacity future interconnectors should be. Also this process will support the interconnector cap and floor regime
- Power Quality assessments – taking on an additional role to coordinate the TO and DNO power quality issues
- Developing models and data that support these new processes and obligations
- Analysing markets and their developments across Europe to support the running of the Pan European Market Model
- Using the Pan European Market Model to assess the security and capacity requirements for the EMR process in the Y+1 and Y+4 EMR auction timescales, at Ofgem's request, the funding for this activity was deferred from the EMR implementation and was to be included in the ITPR submission.

In total there is a requirement for 33 additional staff to deliver these activities, these staff are being recruited in phases as the work to deliver the obligations ramps up. The first 12 staff were recruited in early 2015, and the first joined in September 2015, with the last recruit arriving late March 2016. As part of the recruitment process there was the opportunity to incorporate 2 graduates into the ITPR process, this took place in September 2015 and took the overall recruitment to 14 during 2015. However one of the resources that was recruited to develop our modelling capability in Scotland was not needed and was redeployed onto other activities and has been removed from the ITPR numbers in this submission for 2015/16. However it has now been agreed with Ofgem in the NOA2 Methodology that we do need to build a full Scotland modelling capability and as such the total

modelling resources remains the same. As the activities are developed and enhanced to deliver year two of the outputs a further 21 resources are required. The additional outputs to be delivered in this coming year are:

- a full interconnector analysis and GB welfare benefit assessment;
- an enhanced Scotland network model;
- perform the Scottish network capability analysis; and to
- implement the SO role for Power Quality

It is recognised that in the first year we are still developing the processes and building experience and capability of managing the Scottish network in this way and therefore there will be efficiencies that will be able to be leveraged after the first full delivery year in 2017. It is expected that there will be a technical staff efficiency saving of approximately 10% per year from end of March 2017 to the end of the RIIO period for the teams involved in the NOA process. This will be a function of increased knowledge and experience of the Scottish Transmission Network and an ongoing improvement of our processes. The Power Quality resource of 2 people remains constant throughout the period as it is going to take time to develop this capability and the network is becoming ever more complex to manage due to the move to distributed generation and therefore we are not expecting any reduction in FTE numbers. The resources required to support the models and modelling capability have already included significant efficiency savings by economies of scale and by removing duplication of effort now that one GB model is required, therefore there are not expected to be further efficiencies to be gained. It is expected that as the Scottish model is developed there will be more data and process enhancements required.

It should be noted that the resource justification made in this document is against the current processes we use or propose to use to discharge the licence obligations. There are discussions underway with Ofgem at present which are looking to further enhance our investment recommendation process by analysing different scenarios and different times of the day/ year to fully capture the full range of investments required to efficiently manage the GB electricity transmission network. Dependant on the outcome of this analysis and the increase in scope of works then the resource requirement could be significantly increased. We completed the work to analyse the impact on network capability through the different scenarios by end of March 2016, following this, discussions with Ofgem will be undertaken to agree a way forward.

In March 2016 we delivered the first Network Optioneering Assessment report with limited new resources. This has meant that during 2015/16 existing resources overtime has been accrued and other activities have had to be scaled back or not undertaken. These activities include some of the regional operational strategies and the year round analysis that we would have historically performed. This is not a sustainable position as there is a risk that we are not able to identify the detailed upcoming operability issues early enough in order to efficiently implement operational strategies, this may lead to higher operational costs in real time. The developments and resourcing for NOA2 assuming broadly current processes, our current view of what NOA2 will involve and the additional interconnector activities that must be in place to deliver for January 2017 and beyond are therefore vital.

The below table summarises the resource requirements over the remainder of the RIIO period:

|                                    | 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 | 2020/21 | Total |
|------------------------------------|---------|---------|---------|---------|---------|---------|---------|-------|
|                                    | FTE     | Total |
| Network Options Assessment         | 6       | 8.9     | 12.4    | 12.4    | 11.4    | 10.4    | 9.4     | 71.9  |
| Strategic Wider Works              |         | 2       | 2       | 2       | 2       | 2       | 2       | 21    |
| Welfare Benefit of Interconnectors |         | 0       | 10      | 10      | 9       | 8       | 7       | 34    |
| Power Quality                      |         | 0.5     | 2       | 2       | 2       | 2       | 2       | 10.5  |
| Power Factory Modelling            |         | 1       | 4       | 4       | 4       | 4       | 4       | 21    |
| EMR ESP                            |         | 0       | 3       | 3       | 3       | 3       | 3       | 15    |
| <b>Total FTE Numbers</b>           | 6       | 12.4    | 33.4    | 33.4    | 31.4    | 29.4    | 27.4    | 173.4 |

In delivering the new objectives under the licence the resources required will flex and move onto other ITPR activities to meet the peaks in workload across the year. There are cross overs between the NOA economic assessment and the SWW needs case assessments. Also those staff that have produced ETYS are redeployed onto the NOA reinforcement capability assessments at other times. Therefore the FTEs quoted in the table in some cases is a measure of the effort required over the year, rather than a specific individual dedicated 100% to that activity continuously for a full 12 months. Therefore the numbers in the above table should not indicate that, for example, if there isn't a cap and floor process being undertaken that the individual is idle? As when the cap and floor process is undertaken it will consume many resources but for only part of the year and the FTE number in the table above and narrative below reflects this.

The justification for these resources to deliver the new licence objectives is as follows:

- **Assessing the TO options for investment and identifying a preferred option based on single year least worst regrets cost benefit analysis**

In order to perform this function there are two main activities that need to take place. The first is to assess the current and future network capability requirements and the second is to perform the single year least worst regret analysis.

Assessing network capability is something that was undertaken for England and Wales, under the new obligations we need to perform this activity for all of Scotland and manage the interfaces with each of the three Transmission Owners. To perform this assessment in England & Wales we perform detailed assessment on 20 boundaries and this involves 10 staff. To perform this same function for Scotland adds a further 6 boundary assessments which are more integrated and interactive with each other, so the expectation is that this activity can be performed with an additional five resources. This activity is a full year round activity to define and assess the network capability requirements.

To perform the detailed cost benefit and the single year least worst regrets analysis for England and Wales involves around 750 studies and requires one FTE to develop the models and inputs and a further ten to perform the analysis and make a recommendation for investment. To include Scotland in the analysis requires a further 250 studies to be run and

the economic model is much more complex, thus requiring an additional two FTE resources to develop and support the economic model and a further five FTE to perform the cost benefit analysis. These two activities are year round in developing the models and assessing TO options and alternatives along with developing non/ low build options for the SO to manage.

This brings the total new FTE to discharge these obligations to 12.

- **Providing independent cost benefit analysis for TO needs case approvals for Strategic Wider works projects**

Before the revised licence conditions much of the cost benefit analysis was performed by the TO and the SO was asked to comment, or the Scottish TOs paid for the SO to complete this analysis under contract. Now that this is an obligation for the SO to deliver the SWW needs case cost benefit assessment, we need to perform this analysis in full for all of the TOs for all of the SWW. These projects tend to take upwards of 9 months to complete, this time includes agreeing the scope of the works, collating data and building the models and then performing the analysis. It is expected that two to three SWW submissions will be required to be supported each year. A resource allocation of two FTE is required to fulfil this obligation. Each of these SWW submissions will be at different stages, but the expectation is that there will always be two to three submissions that we are actively supporting at any one time.

The total FTE to discharge the SWW obligations is 2.

- **Developing a Pan European Economic Model that allows for GB welfare benefit assessments of interconnectors and looks to the future to advise when, where and what capacity future interconnectors should be. Also this process will support the interconnector cap and floor regime.**

This area of work is completely new to the System Operator and requires the development and maintenance of a bespoke pan European economic model. There are many elements needed to deliver this capability/output which we detail here: -

- This model relies on sourcing and managing many data sources, pan European market pricing and trends, historic weather conditions across Europe and maintaining pan European boundary transfers. This will require two resources to source, maintain and manage the data.
- The analysis to support the identification of the GB welfare benefit of interconnectors and the analysis to determine the right level of interconnection and the locations in GB and countries to connect to is a complex set of challenges and analysis. A resource requirement of 6 FTE is required to support this activity on an annual basis.
- The other new role the SO is undertaking is to support the Ofgem process of the Cap and Floor regime. This is required to be undertaken following a Cap and Floor window determined by Ofgem to assess the benefit and costs of the proposed interconnector solutions. The process in 2015, which was to assess just one element, required 1 FTE of

resource to complete it, to perform the broader assessment resource requirement of 2FTE is required.

The total FTE to discharge this obligation is 10.

- **Power Quality assessments – taking on an additional role to coordinate the TO and DNO power quality issues**

Power Quality is the responsibility of the TOs to assess the impact of their connections and to ensure that the network is safe and secure. Under the new obligations the SO has a more active role to coordinate and define the power quality issues and work with each of the TOs, OFTOs, DNOs and the connecting customers (including generators) and interconnectors to ensure a fully coordinated and more efficient whole system solution to manage power quality issues. The activities will involve collating data, creating models and performing assessments to support the TOs and Customers. To perform this coordination function two FTEs are required.

The total FTE to discharge this obligation is 2.

- **Developing models and data that support these new processes and obligations**

To support all of the above activities more models which include detailed Scotland representation are needed to be developed and supported and the models will need to be developed to ensure fit for purpose to be utilised under a range of scenarios across a number of years.

The current model support is undertaken by 8 FTE, and includes 298 transmission substations, with the inclusion of the Scottish model this increases the transmission substations to 622 and hence a further 4 FTE are required.

Although the workload has more than doubled from 298 substations to 622 substations National Grid has managed to keep the additional FTE requirement down to an additional 50%.

In general, the substation and associated transmission modelling in Scotland is less complicated than E&W, also the current team have built up their capabilities and have the right processes and Standard Operating Procedures in place through the Performance Excellence<sup>1</sup> roll out to manage the additional work load more efficiently.

The total FTE required to discharge this obligation is 4.

- **Developing and run the Pan European Market Model**

An integral part of future EMR modelling activities is the development of a pan-European model that can stochastically model interconnector flows across European countries to support security of supply in Europe. This work will be required to support the recommendation to DECC for both the T-4 and T-1 auctions, de-rating factors to be applied to interconnectors for the Capacity Market auctions and any future strike price modelling for

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<sup>1</sup> "Performance Excellence" is the name we use for describing a methodology we use for driving efficiency in our ways of working and will be used to drive the ongoing efficiencies referred to in this document.

low carbon technologies. This analysis will need to be run every year and will involve modelling not just GB and its connected countries but the whole of Europe as flows from Germany, for example, will affect flows in France etc. National Grid doesn't currently own or operate such a model so will not only need to develop such a model but will also need to populate it and run it every year to support its EMR licence obligations. To undertake this work National Grid identified a requirement for 3 FTE resources to analyse the demand and generation backgrounds across Europe, generation technology costs in each country, interconnection capacities and the different reliability standards across Europe. Part of this work for the last two EMR capacity market auctions has been bought in using external suppliers, these resources bring this function in house so that we can build the knowledge and capability so that we can make better decisions. This requirement is also driven by the independent expert panel review of the auction process that stated National Grid needs to enhance its European modelling capability in order to better assess the interconnectors and the role they play in the capacity market. This will also require significant liaison with European SOs and TOs to ensure common approaches where possible and that the latest information is being utilised. This analysis is new to National Grid and due to its far reaching role can't be integrated within existing teams and therefore new resources are required to undertake the work and also answer the numerous questions from DECC's Panel of Technical Experts, DECC and Ofgem officials as part of their roles in scrutinising the work.

Total FTE requirement to discharge this obligation is 3.

### **What has been delivered during 2015/16?**

The additional 14 resources that were recruited during 2015 allowed the teams to deliver the required activities and data modelling that allowed for the production of the first NOA report, a power quality scoping assessment and further analysis to provide justification of the assumptions used in the NOA and fulfilled a procurement exercise to appoint a provider for the pan European economic model.

These deliverables required the existing teams to also reprioritise their work and to stop doing some activities that would have normally occurred in the year. To deliver the outputs above required a large team effort with the sharing of resources across teams and the appointment of agency staff to ensure the right resources were available.

Main Outputs delivered in 2015/16:

**NOA1 Methodology** – From April to September the first NOA methodology statement was developed and produced. The approach taken was to develop the methodology in close collaboration with the TOs (Scottish TOs and NGET) and Ofgem. This involved a series of workshops to explain and develop how the System Operator was going to perform the NOA analysis, the assumptions made and the data required from the TOs. Through the year the NOA methodology was expanded to include the processes and approach taken to assess the SWW needs cases.

The result was a NOA Methodology Statement and the form of NOA report was submitted to Ofgem in September 2015 for Ofgem's approval. Ultimately, Ofgem did not approve the

methodology but requested that we undertook the NOA process and delivered the NOA report in March 2016.

This process was a full time role for 1 FTE and was 1/3<sup>rd</sup> of an FTE for two other people.

**Scottish Boundary Assessment** – work was completed to enhance our Scottish network modelling capability as there was a requirement to be able to spot check and mirror some of the boundary calculations undertaken by the Scottish TOs as detailed in the NOA1 methodology. This spot checking was undertaken and highlighted some inconsistencies in approach and principles of boundary calculation. Further work has been undertaken to understand these differences and to further develop our understanding and modelling of the Scottish network.

Although originally we anticipated that two FTE would be required to develop the Scottish model only one was required, as per the original submission, as the level of detail and scope of the Scottish assessment was reduced through the NOA methodology statement development.

**Scenarios and Seasonal Variations** – Ofgem requested that we perform analysis to justify the assumptions we expressed in the NAO methodology regarding our use of a Gone Green study to stress test the network to find the capabilities required and the impact of seasonal variations on network capability. Following the completion of the analysis for NOA1 the resources were redeployed into recreating the models and processes in order to repeat some of the NOA analysis on different models that utilised different scenarios as a starting point and allowed for the assessment of seasonal variation and how these impact on network capability. The outcome of this work resulted in presentations to Ofgem and an agreement that the assumptions we had made regarding the use of the gone green data to perform the initial stress test on the network to find the capability and the scaling factors we use to replicate the seasonal variations were all valid assumptions and processes. These approaches are now continued into the NOA 2 methodology.

These assessments occupied the whole NOA delivery team (10 FTE) for a period of three months, January to March.

**NOA1 Report** – the first NOA report was delivered on March 17<sup>th</sup> 2016, ahead of the required deadline of 31<sup>st</sup> March. This NOA report was developed using the NOA1 methodology and required all of the NOA delivery team and the economics team to undertake the analysis of TO options and the cost benefit and single year least worst regrets analysis. This work took place from October 2015 (after the completion of the ETYS analysis) and concluded at the end of February 2016. Over 70 TO reinforcement options were analysed and assessed for their capability and criticality of if a decision needed to be made. This requires power system studies to be performed to assess the capability a particular reinforcement delivers and then economic CBA assessment to identify the optimum timing of the reinforcement in each scenario and then a single year least worst regrets analysis to identify the recommendation to be made to each TO. Over 1000 economic assessments had to be undertaken during the period of December to February.

These activities required the full time focus of the NOA delivery team (10 people) from October to December, and the economics team (5 people) from December to March.

**Pan European Economic Model** – Through the year 2015/ 16 significant activity was undertaken, in conjunction with Ofgem, to define the scope required to perform the new licence objectives with regards to interconnectors. The ability to assess the Cap and Floor submission for interconnectors and to perform the analysis to identify GB welfare benefit and hence the future interconnector volumes and timings are significant enhancements to the SOs deliverables. The scope of the modelling capability was delivered and agreed with Ofgem and from this a successful procurement process was undertaken to identify the successful supplier. This concluded in February 2016 with the appointment of Poyry to develop and supply a model.

This work required the full time commitment of 2 FTE with significant input from subject matter experts and procurement.

**Power Quality** – As part of the implementation of licence condition 2O, the System Operator was requested to provide a scope and definition of the role that the SO should undertake with reference to the coordination and assurance regarding Power Quality. This report was produced and delivered to Ofgem in December 2015, work has since continued in developing this set of requirements into processes and activities that the SO can perform.

This specialist area of work has been undertaken by an external contractor who has worked on this full time since August 2015.

**SWW** – The support of the TOs cost benefit analysis took place across the whole year, the assessments for the Scottish TOs before November were undertaken under contract with the TOs and since November we have performed the analysis as part of the SO role in accordance with licence condition 2O.

Since November we have supported the SWW needs case assessments for Hinkley – Seabank and the North West Coast Connection and in Scotland we have been developing the needs case for Dumfries and Galloway and the Scottish Island connections. This work is ongoing in Scotland with a significant amount of stakeholder engagement and assessment still being undertaken.

This SWW assessment and support has required the full time focus of 2 to 3 FTE since November 2015.

**STC Modifications** – as a result of the implementation of the requirements in licence condition 2O and the interface with the Scottish TOs many of the STCs have had to be amended and agreed with the Scottish TOs, Ofgem and the STC panel. A schedule of amendments was developed and this has been worked upon since December with the aim of meeting the obligation to have all of the relevant STCs updated and signed off before August 2016.

**Pan European Economic Model Procurement Strategy**

In identifying and selecting the preferred supplier of the economic model we have created a strategy of purchasing the model, performing the model developments and then entered into a three year licencing and support contract with Poyry. Therefore the costs for the next 3 years are known. However it is prudent to make a budget provision to allow for a renegotiation with Poyry and the potential that a new supplier may need to be found and there is a budget provision for the replacement of the IT hardware if required. This leads to the additional capex requirement in 2019.

### Supporting Spreadsheet



ITPR Business Plan  
Allocations submitted