Response to Ofgem's Question on the KASM ISP Proposal (Dated 11 April 2014)

Introduction

The network serving east Kent is characterised by complex power flows, caused in part by the connection of approximately 510 MW of renewable generation. Over 100 MW of further solar Photo Voltaics (PV) and wind generation hold connection agreements for the near term. In order to better manage constraints on the network and maximise the availability of short term capacity, the Kent Area System Management (KASM) project is being proposed. This is intended to explore the contribution that two novel solution technologies can make to improving constraints and maximising network capacity: a Contingency Analysis (CA) software platform and Distributed Series Reactance (DSR).

This note is in response to Ofgem's question (dated 11 April 2014) on the Kent Area System Management (KASM) Initial Submitted Proposal It quantifies the financial benefit of the project using the methodology set out in section 2, paragraph 2.13 of the LCN Fund Governance Document.

The method and anticipated benefit areas

The CA software platform automatically calculates shortfalls in response to changing network conditions, such as weather, generation connection patterns and interconnection power flows. It allows engineers to develop pre-emptive actions and hence avoid undesirable conditions, such as the overload of a network asset. The CA software is an 'enabling' technology providing greater visibility of the network performance, and whose information can contribute to decisions to defer or bring forward investment to support generation. It is deployed once per DNO group, with some ongoing configuration and maintenance costs.

DSR is a novel solution to re-balance power flows on lines using devices that are mounted on the phase conductors. This has the effect of maximising the capacity of the lines by ensuring that power is optimally distributed. The devices are also used to report on power quality and line running temperature and can contribute to managing dynamic line ratings. DSR is a 'smart' technology capable in and of itself of deferring conventional network reinforcement. It is deployed each time an appropriate network constraint is identified.

We currently estimate that the combined solution has a break-even point, using Ofgem's cost-benefit analysis model mandated for the RIIO-ED1 submission, once it has assisted in deferring twelve 132kV circuit and/or substation reinforcements similar to the one that we are currently studying across our two licenced networks SPN and EPN. For the purposes of this exercise, we assume that the cost and benefit structure of the schemes are similar.

The economics for other DNO licence groups would be similar: that the enabling technology and the per-scheme installation of DSR would break even after twelve deferrals, whether these were achieved in a single licence area or across multiple licence areas under the DNO group's ownership.

Availability and capacity provided by the most efficient "traditional" solution

UK Power Networks are in the process of studying the network in the east Kent area. Within the scope of our analysis lie the drivers behind the complex power flows that currently exist on the network and sources of potential future capacity constraints. We discussed in the ISP the tee-off arrangements that exist on this 132kV network, and our RIIO-ED1 business plan includes investment commencing in the latter part of RIIO-ED1 and completing in RIIO-ED2 which amount to £6.8m.

Whilst we are only using this an example, and cannot guarantee that the increased visibility would lead to deferral of this particular scheme, deferring a scheme such as this by 2 years would reduce Capital Expenditure during the RIIO-ED1 period by £1.82m. This is the cost that would be avoided if the method is successful. For the purposes of this LCN Fund submission we intend to complete a wider ranging and deeper network analysis. This will reduce the uncertainty on the cost of providing the most efficient alternative traditional solution and inform a robust business case to be developed during the preparation of the final submission proposal.

Mitigation of complexity and future network constraints provided by the method

Of the total LCNF Tier 2 project costs of £3.9m, £1.7m is the one-off project and contingency cost. This results in £2.2m as the 'first use cost' for the first deployment of the solution as applied to east Kent. A formal procurement exercise has not yet commenced, and so the total cost of the CA software platform and the DSR is based on budget estimates provided by a selection of vendors and cost information that is provided in the trade press. This situation can be expected to be improved during the preparation of the final submission proposal.

Of the £2.2m, approximately £0.7m is the anticipated cost of procuring the DSR. We anticipate that a commercial procurement of these modules in higher volumes would attract a reduction in the unit price of approximately 15%. Consequently, the cost of applying the DSR proven method at the scale of the project would be approximately £0.6m.

The remaining £1.5m of cost is incurred through the deployment of the CA platform. We have assumed that there are also additional one-off costs of system integration and of populating the package with a network topology for the first time and is likely to make up around 25% of the costs. Consequently, the application of the successful method in the scale of the project, if proven successful could be expected to be £1.7m, as shown below.

Cost of successful method applied at the scale of the Project

Project cost elements	Cost, £m
Anticipated cost of Distributed Series Reactance (DSR)	0.6
Anticipated cost of Contingency Analysis (CA) platform	1.1
Total costs of successful method applied at the scale of the Project	**1.7**

Quantified benefit of the KASM project

The financial benefit of the project is the base case cost less the cost of replicating the method at the scale shown in the project, summarised here:

Determining the financial benefit		**Cost, £m**
Base case cost		6.8
Method cost, comprising:		8.5
Cost of replicating method at scale in project	*1.7*	
Cost of reinforcement, deferred by 2 years	*6.8*	
Total anticipated benefit during RIIO-ED1		**0.12**
*NOTE: **Reduced** Capital expenditure **during the RIIO-ED1 period** £1.82m* *Less **Cost of replicating method at scale in project** £1.7m*		
Total anticipated benefit (capitalised and discounted view, 16yrs)		**-0.76**

It is not unexpected that the costs of the enabling technology (Contingency Analysis software) do not break even for the single scheme used in this example. However, once a total of twelve schemes each requiring this same level of capital expenditure are deferred, and assuming that a deferral of 2 years can be achieved in each case, a net positive benefit of £0.05m (which is the capitalised and discounted view (16 yrs), derived from the Ofgem cost benefit analysis model) is achieved.

Please note that:

- these calculations have ensured that the Method cost includes not only the software and hardware required as part of the Solution, but also the conventional reinforcement which is deferred and must still eventually be carried out, albeit later;
- these calculations have not monetised any carbon benefits of allowing low carbon generation to join the network sooner than would otherwise take place with conventional reinforcement;
- these calculations do not include any benefits from improved reliability for customers, if post-fault running arrangements can be identified which are better or more optimal than those which are currently being proposed by control engineers manually;
- these calculations have not included any benefits from the study of power quality (principally harmonics) which will also be studied during the project. It is unlikely that these will be able to be quantified during the bid phase, and will form part of the work of the project itself, but have a clear qualitative benefit.

Conclusion

The project is demonstrating a combination of enabling technology and a smart alternative to conventional reinforcement, and which show a clear break-even once they are deployed at the level of DNO groups in areas of considerable renewable generation. By implication, the project shows a clear break-even point at the GB level. The break-even point assumes modest deferral periods (2 years) and modest numbers of instances in which investment decisions can be revised and schemes deferred.