Innovation Competitions - Full Submission

Supplementary Answer Form

Tick if this answer has been provided verbally: ☐

Project code	SSEEN02	Question Number	1
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Section 1.4		
Topic	Cost		
Question	It is noted that there has been a considerable reduction in the project cost in the full submission as compared with the screening submission i.e. total project costs from £51.5 million to £3.38 million, with NIC funding requested reducing from £8.75 million to £2.938 million. Please explain the reasons for this reduction.		
Notes on question			
Answer	The MASC project is seeking funding for the additional cost of deploying a modular solution for the first time. During the interval between screening submission and full submission further engagement with internal stakeholders, equipment manufacturers and other stakeholders occurred to develop the MASC solution in greater detail. This has allowed the requirements of the MASC project and the budget requirements to be further refined to ensure successful delivery. This research has included a review of the number of potential substation builds in GB in the future; this has allowed the MASC proposal to be focussed on a typical renewable connection of 60MVA at 132kV. The costs of the project were then based on a solution of this nature. Further details are included in Section 3 of the Full Submission. These factors take into consideration that the NIC funding has been specifically directed towards ensuring the MASC solution is adopted into 'Business as Usual', hence the realignment and reduction in the funding request.		
Attachments	no		

Project code	SSEEN02	Question Number	2
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Section 2.1a		
Topic	Scalability		
Question	What problems do you foresee in the application of the modular approach to transmission voltages in England and Wales, i.e. 275 kV and 400 kV, as compared to the 132 kV substation proposed to be installed in this project.		
Notes on question			
Answer	When introducing a progressive substation solution which challenges the norm, it is necessary to select a trial project that proves and provides industry confidence. This has lead to the selection of a single 132kV connection bay substation supporting a new generator, which requires a single transformer. This is typical of a new generation connection especially in renewables rich locations, which will allow many of the potential benefits from MASC to be fully demonstrated. This will provide the confidence in a MASC solution and will provide the necessary detailed learning to progress such a solution at 275kV and 400kV. It is anticipated that many of the elements of the project will be directly replicable at the higher voltages. When discussing 275kV and 400kV solutions it is recognised that; • the transformers are larger and will present additional challenges especially around logistics etc; • from discussions with manufacturers it is know that there is some international experience in providing modular solutions at higher voltages ; • some additional design / evaluation will be required to apply the MASC modular containerised equipment to 275kV and 400kV equipment. The MASC project will provide much needed confidence in progressive substation build techniques and also develop maintenance and operational philosophies. It is recognised that 275kV and 400kV solutions will not directly be evaluated. However this is not foreseen as a draw back, as the manufactures have solutions which are used for mobile substation solutions.		
Attachments			

Project code	SSEEN02	Question Number	3
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Section 3.6 and 4c		
Topic	Partners		
Question	What discussions have been held with other TOs about this project? What have been the results of such discussions?		
Notes on question			
Answer	During the project development phase to identify potential projects there were collaborative workshops undertaken with the other TOs. The modular approach was identified during these sessions and SHE Transmission confirmed that it intended to progress with this approach. In developing the MASC approach, the feedback and comments on previous substation equipment related bids were considered. The MASC proposal is associated with permanent substation installations and will be largely manufactured and commissioned off site to reduce time and cost of construction, these will be a direct substitute for conventional substation designs. Discussions with other TOs indicate a common understanding of the benefits and potential attraction of such an approach. During the development and implementation of the project, the learning capture and dissemination strategy will ensure that the other TOs are fully informed on the progress of the project.		
Attachments			

Project code	SSEEN02	Question Number	4
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Section 3.6 and 4c		
Topic	Partners		
Question	What discussions have been held with DNOs about this project (as 132 kV is a distribution voltage in England and Wales)? What have been the results of such discussions?		
Notes on question			
Answer	The MASC concept has been shared in detail with SEPD – who are responsible for the operation of the 132kV network in southern England, opportunities for applications by DNOs are clear from this engagement. During the development and implementation of the project, the learning capture and dissemination strategy will ensure that the DNOs are fully informed of any knowledge gained from the project. The learning capture and dissemination strategy will also be structured in such a way that the benefits can be realised by TOs and DNOs.		
Attachments			

Project code	SSEEN02	Question Number	5
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Section 2.1a		
Topic	Business		
Question	The calculation of the claimed financial benefits of the MASC methodology is based on the assumption that it could be deployed to 30% to 50% of substations in the GB transmission network. Please explain how these proportions have been derived and indicate the criteria which define whether a substation could utilise the approach or not.		
Notes on question			
Answer	The extent to which the MASC solution could be applied will be dependent upon a number of factors, these include; • The network conditions and requirements for the project ie number of circuits, transformers, rating etc; • The location of the project, is it rural, city centre etc; and • Planning and consenting issues. Based on the above and a review of the information available from a number of sources including the NGET TEC register, DNOs LTDS etc it has been estimated that the MASC solution could be applied to between 30% and 50% of potential future projects. The early learning from MASC will help to validate this assumption. It is recognised that the MASC solution will not be suitable for every substation location therefore it is proposed as part of the knowledge dissemination plan to develop a methodology which will help identify which substation projects could benefit from this solution. This will help TOs, DNOs etc to be able to readily identify which projects may be appropriate for a MASC solution.		
Attachments			

Project code	SSEEN02	Question Number	6
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Appendix 7a		
Topic	Business		
Question	Please provide the underlying figures that Figure 4 "Cost Comparison of conventional AIS substation versus MASC" is based on.		
Notes on question			
Answer	Typical figures are shown below. This is based on a typical substation cost of £[redacted] for an AIS substation. Obviously each individual substation will be slightly different depending upon the network, Site conditions, location etc.		

Cost Elements	Based upon information in Figure 2 – AIS Substation	Based upon information in Figure 3 – MASC
Civil		
Building	[redacted]	[redacted]
Transformer	[redacted]	[redacted]
Electrical HV	[redacted]	[redacted]
Project Management	[redacted]	[redacted]
33kV Equipment	[redacted]	[redacted]
Miscellaneous	[redacted]	[redacted]
Modular Equipment (inc Transformer)	[redacted]	[redacted]
Total	[redacted]	[redacted]

Attachments	

Project code	SSEEN02	Question Number	7
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Sections 3.8.2 and 4b		
Topic	Business		
Question	Please indicate what evidence there is that the MASC approach will result in an up to 20% reduction in costs.		
Notes on question			
Answer	The assumption of 20% has been derived from initial engagement with several manufactures and an internal review of how the new approach could be applied. As stated within the main document the MASC approach and the move to off-site construction will reduce the cost of substation construction in a number of areas, including: • Standard Components: Current design practises for new substation construction and operation generally result in a near "bespoke" design based around the use of a standard set of components, the ability to "stock" standard substation units creates efficiency and continuity in the manufacturing environment. • Increased flexibility: Traditional substations are very "fixed" in nature; there are only limited options for increasing or decreasing capacity without significant works, options for expansion and contraction drive additional cost savings. • Transport and access costs: The modular equipment being proposed is designed to be transported and installed easily on site; therefore, reducing the requirement for weather dependent and expensive civil works etc. • Footprint and civil works: The use of a more modular design will facilitate a reduced overall footprint and less complex civil requirements and simplified planning consents. • Off-site manufacture: The use of a modular approach will maximise the use of off-site manufacture and commissioning. This should significantly		

	reduce the time required to install and commission the equipment on site, this is particularly beneficial for projects located in remote areas. Bringing production line efficiencies to a much larger proportion of the substation construction and commissioning process. • Reduced construction duration: As identified above a modular approach will look to optimise the use of off site manufacture and commissioning, this combined with the reduced civil works requirement will result in shorter time being required on site. Based on the above , it is envisaged that savings of up to 20% could be realised, however, the exact saving for each individual application will depend upon the specific nature of that location and the network conditions. The validation of the realisation this saving will be one of the outputs of the project. If the MASC solution is widely adopted then there is potential to derive further benefits from achieving economies of scale as volumes increase.
Attachments	

Project code	SSEEN02	Question Number	8
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Appendix 8		
Topic	Equipment Suppliers		
Question	Other than the letters of support shown in the submission please describe the nature and the results of the contacts that there have been between SHE and these major manufacturers in regard to this project. What confidence do you have that these manufacturers are ready to supply modular solutions to the UK market with appropriate manufacturing facilities in place and why?		
Notes on question			
Answer	SHE Transmission have long standing relationships with [redacted] for the supply of substation equipment. [redacted] SHE Transmission works closely with its supply chain partners including regular meetings with key suppliers at director level to ensure delivery of this programme of works. The modular approach has been identified at these sessions and there is a strong willingness to support its development and adoption into business as usual. All [redacted] of the manufacturers have supplied modular type equipment to various projects across a range of countries and already have the manufacturing facilities in place. The MASC project is looking to deploy the technology in GB for the first time and develop the necessary design / operational tools and standards to allow its widespread adoption. All of the manufacturers identified have provided technical information, previous examples etc to allow SHE Transmission to further develop the proposal.		
Attachments			

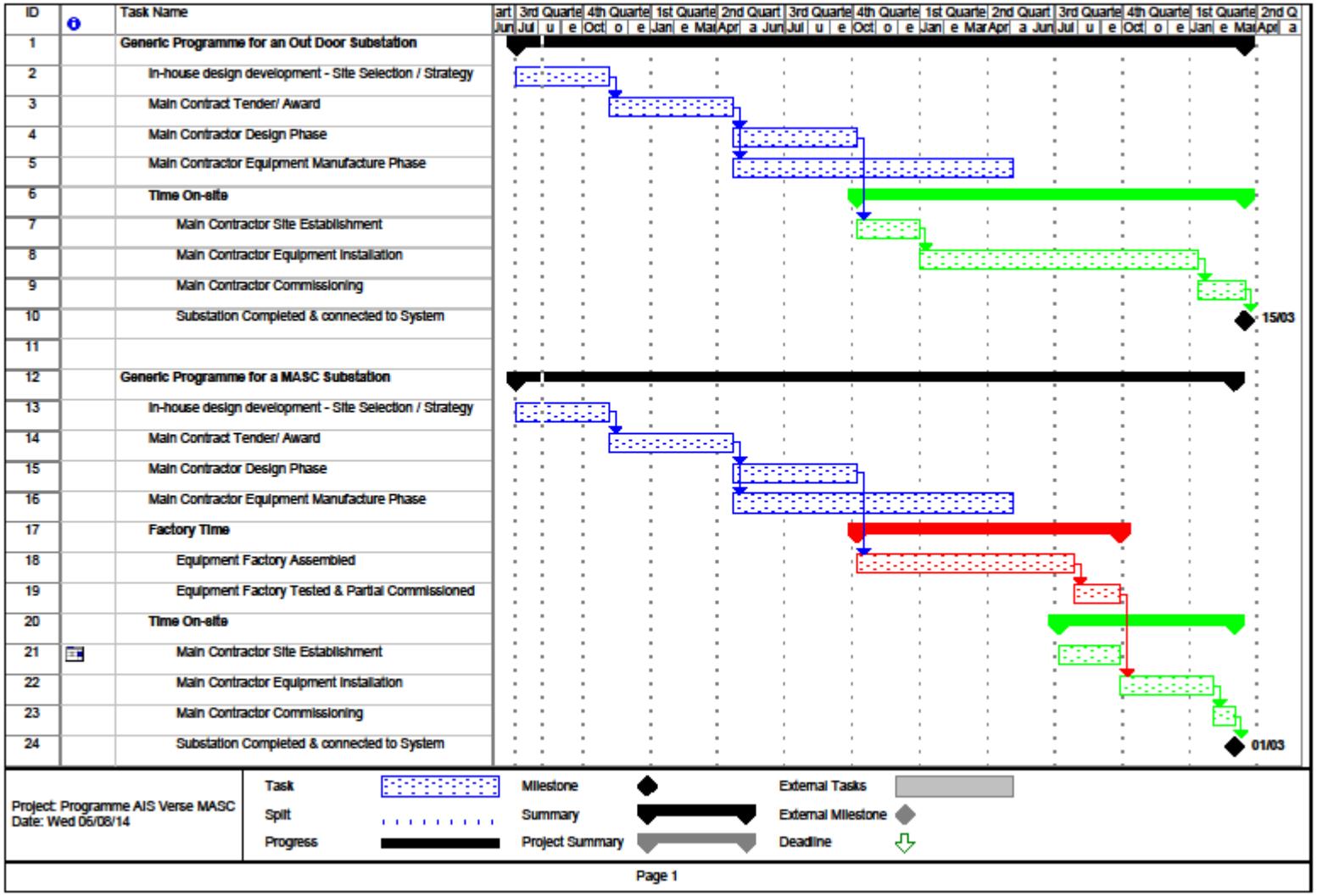
Project code	SSEEN02	Question Number	9
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Section 6		
Topic	Equipment Suppliers		
Question	What other manufacturers are being considered as possible providers of modular solutions?		
Notes on question			
Answer	As stated in Q9, SHE Transmission has an existing framework of suppliers for substation infrastructure. This framework includes some of the global leaders in this area with significant expertise in the development and deployment of substation infrastructure. This provided an ideal basis for collecting the necessary information to develop the MASC proposal. Other providers have been identified and some initial discussions have taken place. Phase 1 of the project will see the development of the final functional specification for the MASC equipment and the specific site for the first deployment. The MASC approach will not be adopted on a widespread basis without the availability and support of a robust and reliable supply chain. One of the key learning from the MASC project will be to develop a functional specification which results in robust competitive supply chain.		
Attachments			

Project code	SSEEN02	Question Number	10
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Section 6		
Topic	Generators		
Question	What discussions have been held with generators about this project? What have been the results of such discussions?		
Notes on question			
Answer	The first stage of the project involves the identification of a suitable trial location. This will be determined by a number of factors including the programme, the location and the network conditions. There are a number of potential connection projects planned within the SHE area which have been identified as being appropriate for the MASC approach within the project timescales. If funding for the project is confirmed then the functional specification etc can be further developed to allow SHE Transmission to engage more fully with any of the potential developers.		
Attachments			

Project code	SSEEN02	Question Number	11
Question date	31st July 2014	Answer date	4th Aug 14
Submission section question relates to	Section 6		
Topic	Generators		
Question	Please explain how the commercial arrangements with the generator that it is planned to connect in this project will operate. Is it expected that the costs of connection will be higher or lower than the conventional approach? If higher how will these additional costs be met?		
Notes on question			
Answer	The final site selection will be undertaken during the first phase of the project. This will include engaging with the renewable developer. However, the MASC project is based on the **additional** cost of deploying the solution for the first time being met by NIC. As far as possible it is intended that the connection will be delivered using the established industry arrangements is the generator will received a standard Bilateral Connection Agreement and a Construction Agreement from National Grid, based upon the CUSC. SHE Transmission will be the named Party that will build the necessary transmission connection assets. The costs etc used to establish this contract will be based upon the conventional method of delivering the connection capacity the customer requires. Whilst, there are undoubtedly benefits to be derived from the MASC approach in the long term, there are additional costs associated with this first time deployment. The MASC project is based around these additional costs being met from NIC. Therefore, the developer is only expected to bear the cost of the traditional connection arrangement.		
Attachments			

Project code	SSEEN02	Question Number	12
Question date	5th August 2014	Answer date	7th Aug 2014
Submission section question relates to	Section 2		
Topic	Benefits		
Question	The SHE Transmission submission suggests that, for a number of reasons, there could be a reduction in the time necessary to undertake planning and consent processes when a modularised substation is utilised. In addition it is mentioned that the time for on-site construction may also be reduced as a result of prior factory activity. However the total project time (from inception to commissioning) will also need to include the factory build time. What is SHE Transmission's view of the difference in the average overall time required (again, from inception to commissioning) between the conventional approach and the modularised one. If there is any expected difference please indicate the extent of the expected average difference, the reasons for it and the evidence that supports that view?		
Notes on question			
Answer	Please refer to the attached high level programme which illustrates the timeframe from start to finish for an AIS and a MASC substation. Presently the AIS and MASC programmes completes more or less at the same time. It is anticipated in the future that the MASC solution will have the potential to reduce the overall programme for the following reasons; § Design: once the basic "generic" solution is better understood and established, there will be a reduced design requirement for subsequent projects. § Manufacture: given the modular nature of the substation and future aspiration for serial production, factory production will be optimised and continuous. Therefore programme efficiencies are perceived as the modules will be purchased from a "production line "as opposed to 'built to order'; and § On-site time: As knowledge and confidence grows in the MASC solution the additional construction and commissioning contingencies will no longer be required. Basically, as this Modular approach becomes more familiar and accepted there is the potential to reduce overall timescales. The actual programme for each project will be determined by its specific requirements.		

Attachments	Q12_Programme AIS verse MASC.pdf


ID
Task Name
1 Generic Programme for an Out Door Substation
2 In-house design development - Site Selection / Strategy
3 Main Contract Tender/ Award
4 Main Contractor Design Phase
5 Main Contractor Equipment Manufacture Phase
6 Time On-site
7 Main Contractor Site Establishment
8 Main Contractor Equipment Installation
9 Main Contractor Commissioning
10 Substation Completed & connected to System
11
12 Generic Programme for a MASC Substation
13 In-house design development - Site Selection / Strategy
14 Main Contract Tender/ Award
15 Main Contractor Design Phase
16 Main Contractor Equipment Manufacture Phase
17 Factory Time
18 Equipment Factory Assembled
19 Equipment Factory Tested & Partial Commissioned
20 Time On-site
21 Main Contractor Site Establishment
22 Main Contractor Equipment Installation
23 Main Contractor Commissioning
24 Substation Completed & connected to System
3rd Quarte
4th Quarte
1st Quarte
2nd Quart
15/03
01/03
Project: Programme AIS Verse MASC
Date: Wed 06/08/14
Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External Milestone
Deadline
Page 1

Project code	SSEEN02	Question Number	13
Question date	5th August 2014	Answer date	7th Aug 2014
Submission section question relates to	Section 2.2 and 2.3		
Topic	Trials		
Question	There are a number of references to “monitoring” within the submission. Please outline what it is intended to monitor in excess of normal monitoring arrangements and indicate what the benefits of such monitoring is expected to be.		
Notes on question			
Answer	The MASC trial offers a platform to incorporate other emerging engineering approaches and techniques such as screw pile foundations through to ‘plug and play’ electrical connections. To introduce more modern and innovative solutions it will be necessary to engage with a range of stakeholders to understand their concerns and identify methods of evaluation, monitoring and result analysis to demonstrate if the approach or technique is ‘fit for purpose’ and can be adopted into ‘Business as Usual’. Monitoring, assessment and evaluation will also be required over and above the norm as the MASC trial will be the first time this modular approach to substation build will be used in this environment. Therefore within the factory environment for instance a additional resources etc will be required to witness testing and commissioning, it is anticipated that independent verification may also be called upon to further minimise and quantify associated business risks. As components are being placed together in larger systems within the factory, additional monitoring will be required during the transportation and installation phases to evaluate and monitor the associated impact of the journey. On-site commissioning of the first MASC solution is anticipated to be over and above the manufactures normal recommendations. This will help ensure the validity of the testing etc undertaken in the factory environment. The additional operational monitoring will include the continued surveillance of the sensors and equipment installed prior to transportation and		

	installation. There will also be an increased requirement for more frequent visits to the MASC site for inspection and reporting purposes. The benefit of the sensor monitoring specifically will be to: • Provide a degree of risk mitigation against failures associated with new designs and new environments • Provide Objective data on which to base learning outcomes, e.g. losses measurement, temperature operating ranges, partial discharge, noise levels etc. • Through monitoring of previously unseen parameters generate the opportunity for new useful data correlations to be identified for subsequent use in other environments and installations. The full range of monitoring etc required will be identified and confirmed during Phase 1 of the project. This will emerge with the selection of a manufacture, the product and innovations they are prepared to offer and internally the processes identified to understand and evaluate the new approaches and techniques to enable adoption into 'Business as Usual'.
Attachments	

Project code	SSEEN02	Question Number	14
Question date	5th August 2014	Answer date	7th Aug 2014
Submission section question relates to	Section 2.1f and 2.2		
Topic	Trials		
Question	Please provide further details of the learning that is expected from the NIA project, NIA_SHET_0013 and explains specifically how this will support the MASC project.		
Notes on question			
Answer	The NIA project involves interaction with the manufactures to explore the solutions they are able to offer and the opportunity to learn about their existing field solutions and also those under development. There is also a process of engagement with other stakeholders to consider their requirements. This will lead to the development of a functional specification for Modular Substations and inform the selection criteria applied to the solution deployed as part of the NIC project; the NIC project will fund the additional cost of the first time deployment of this solution. The learning and evaluation criteria will fall into a number of categories (this list is not exhaustive and will be expanded or contracted as new considerations are identified or eliminated as part of the project learning process): • Electrical plant Design options • Civil works design options • Protection and control design options • Mobility and transportation options • Visual, noise and environmental options • Substation communication options (on-site and backhaul) • Substation security • Support infrastructure options		

	• Electrical safety and Asset monitoring options • Asset life cycle option, including maintenance, inspection and asset life considerations. Presently the NIA project is funding the development of technical and functional specification for a modular substation. The documentation once completed will be used to provide the manufacturers and their partners with SHE Transmission functional requirements, which will then lead to a formal return of their MASC solutions. The MASC project will then use this functional specification and deploy it on a planned substation project. This will ensure that all opportunities to implement improvements are identified and that project takes full cognisance of the views of relevant stakeholders.
Attachments	

Project code	SSEEN02	Question Number	15
Question date	5th August 2014	Answer date	7th Aug 2014
Submission section question relates to	Appendix 6		
Topic	Market Assessment		
Question	Please provide a spreadsheet which shows the detailed calculations that led to the figures shown in Table1 (Average number of projects per annum) and Table 2 (Cumulative number of projects) of Appendix 6.		
Notes on question			
Answer	The data stated on the ‘slow progression’ and ‘gone green’ is based upon National Grid’s ‘Electricity Ten Year Statement’ further details and a link are provided in Appendix 12 Reference Note 1.		
Attachments	Q15_Background to Appendix 6		

Project code	SSEEN02	Question Number	16
Question date	5th August 2014	Answer date	7th Aug 2014
Submission section question relates to	Section 2.1f		
Topic	Trials and Benefits		
Question	In the submission it states that “The MASC project aims to take the best of ……. Modular approaches and seek additional benefits through the adoption of new construction techniques, protection systems, communications and auxiliary services”. Please provide some specific examples of the modular approaches, construction techniques, protection systems, communications and auxiliary services that it is aimed to utilise as part of the project.		
Notes on question			
Answer	A number of potential innovations have been identified during our engagement with the supply chain and other stakeholders. On the civil engineering innovation front there might be an opportunity to use screw pile foundations. Also the design of the structure enclosing the electrical equipment, temporary access roads, prefabricated bunding, methods to support income and outgoing connections may also be considered if appropriate. The ‘plug and play’ solution which may be used on the protection and control wiring is very much a transferable concept. A solution reducing the number of wires associated with the protection and control schemes may also be offered this could include solutions such as Bay controllers and process bus architectures. The application of wireless communications and fibre based communications media may be a feature of the final solution and are clearly applicable to a wider range of scenarios than those being evaluated in MASC. SCADA equipment and its subsequent commissioning are time consuming and normally installed towards the end of the onsite installation period. Supply of the necessary equipment to the factory will be explored, to enable inclusion within the factory installation stage and an element of pre-commissioning. When looking at auxiliary services it is normal to supply AC and DC voltages MASC may provide an opportunity to stream line auxiliary supplies, the time taken to evaluate, monitor and learn about alternatives shall be beneficial to		

	all subsequent projects. Above is a small selection of possible innovations which have far reaching potential benefits. But the key to realisation is in the opportunity and time to demonstrate in the field, collect supporting information, and provide analyses to support recommendations. The MASC project intends to apply a number of these new innovations together to provide a 'step change' in design and construction practise. The NIC funding will provide the necessary vehicle to ensure that the maximum benefit from the MASC trial is incorporated into 'business as usual'.
Attachments	

Project code	SSEEN02	Question Number	17
Question date	5th August 2014	Answer date	7th Aug 2014
Submission section question relates to	Section 2.1f		
Topic	Trials and Benefits		
Question	In the submission it is stated that “it also aims to challenge the historical standards which drive a traditional design”. Please clarify which historical standards are being referred to here and what the impacts of challenging them may be.		
Notes on question			
Answer	Substation design and operational practises have developed and evolved to ensure that safe and reliable operation of the Transmission Network. Many of the criteria which underpin these practises are developed in the context of the technology in use at the time of their creation and do not fully recognise many of the advances in technology and equipment. The use of pre assembled and part commissioned modules will require a fresh approach to the application of some of these to allow the benefits to be realised and prevent standards and historical practices remaining a barrier. During the project existing standards will be checked for compatibility with the selected solutions, where these create barriers to new innovative approaches the standards and guidance will be reassessed and redefined from first principles. We have provided a few examples below to demonstrate the breadth of this aspect of the project: • As the MASC solution is modular it provides opportunity for a major change in the way we operate, maintain and repair substation plant, it may for instance facilitate a faulty element being substituted and removed from site for repair, as opposed to the norm which would be on-site fault repair. Similarly established procedures for inspection, testing will in some cases be impossible within a modular environment. • A major constraint on design choices historically has been safety locking and interlocking arrangements; these will require challenging and creation of new approved practices, these changes could in turn have an impact on operational safety procedures.		

	• Standards pertaining to the clearances between assets, lightning protection, earthing arrangements and civil design will all likely be challenged in this process. • Some more fundamental standards driven by legislation such as the Electricity Safety, Quality and Continuity Regulations and the associated guidance documents on substation security, clearances etc. are another area requiring a rework. • On site substation commissioning guidance both of plant and protection systems would currently duplicate the work undertaken in the factory environment, these standards would require rationalisation to realise the full benefit of the solution. We have not created a definitive list of the procedures and standards that would be impacts as this will be a key output of phase 1 of the project and the solution assessment process. This will be developed further in the NIA project and refined in Phase 1 of the project.
Attachments	

Project code	SSEEN02	Question Number	18
Question date	7th August 2014	Answer date	11th Aug 14
Submission section question relates to	Section 2.1f		
Topic	Trials and Benefits		
Question	Have any feasibility studies on modular substations been undertaken **by** SHE Transmission (on either a site specific or generic basis) to help to validate the benefits of the proposed approach and to underpin the business and technical case? If so, please provide details and a copy of the resulting report.		
Notes on question			
Answer	Engagement with equipment manufacturers has resulted in a positive response, confirming that a modular solution can be sensibly adapted for the GB market. There is existing evidence to illustrate the MASC solution in other countries (please see Appendix 4). However, the feasibility of the solution's benefits is not yet proven in GB; for this reason, SHE Transmission proposes to prove the MASC concept under the support of NIC, to validate the benefits. Market assessment - Feasibility work carried out to support the potential opportunities for MASC deployment are detailed in Appendix 6. This appendix includes possibilities for new substation builds in addition to network reinforcement projects across National Grid's Slow Progression and Gone Green scenarios. Technical feasibility - The MASC substation will incorporate key technical components such as circuit breakers, earth switches and SCADA systems that are already proven and well-integrated into electricity networks across GB. A key difference between MASC and conventional substation builds is the focus on off-site construction in a modular way, with protection and control wiring completed in situ. This offers advantages to conventional substation construction projects, as testing and commissioning end-to-end of systems can be done before moving the substation to its location on the network. The NIA funded project registered by SHE Transmission in April 2014 allows us to engage with the supply chain and key stakeholder groups. The purpose of this engagement is to identify an appropriate design which does not negatively affect the control and management of electricity transmission		

	and which provides tangible benefits when compared to conventional substation methodology.
Attachments	

Project code	SSEEN02	Question Number	19
Question date	7th August 2014	Answer date	11th Aug 14
Submission section question relates to	Appendix 2		
Topic	Equipment Suppliers		
Question	In response to Question 8 SHE Transmission indicated that [redacted] who have been supporting the project had provided technical information and previous examples (presumably on the modular approach). Please provide a list of the information that has been provided and some example documents.		
Notes on question			
Answer	Representatives from [redacted] have given presentations and answered questions on their present modular substation solutions. These manufacturers have also shared learning gained from their experience of a modular approach. Engagement with manufacturers to date has focussed on ensuring that the elements necessary for a MASC approach exist, and that they are feasible for the GB market. This has been established by gathering high-level evidence of the deployment of substations with modular elements in GB and overseas.		
Attachments	Information from vendors redacted for public version.		

Project code	SSEEN02	Question Number	20
Question date	7th August 2014	Answer date	11th Aug 14
Submission section question relates to	Appendix 10		
Topic	Project Costs		
Question	Appendix 10 states that "Refer to the Resource Plan for the assumed internal and external resource requirements for the project". Please provide a copy of this resource plan.		
Notes on question			
Answer	Please refer to Q20_MASC Internal and External Resource Plan.		
Attachments	Q20_MASC Internal and External Resource Plan		

Q20_MASC Internal and External Resource Plan

Internal Resource Estimate

Category of SEPD Staff						
People to be confirmed	**Days Required in Year 1 (to Mar 2015)**	**Days Required in Year 2 (to Mar 2016)**	**Days Required in Year 3 (to Mar 2017)**	**Days Required in Year 4 (to Mar 2018)**	**Days Required in Year 5 (to Dec 2019)**	**Total Days**
Construction Project Delivery Manager (Transmission)	6	45	45	45	30	**171**
MASC Project Manager (Project Engineer)	35	252	252	252	190	**981**
Communications/ Output Manager	2	24	24	24	24	**98**
Knowledge Manager	3	24	24	24	24	**99**
Stakeholder Manager	12	52	27	27	27	**145**
Structural & Civil Engineer	0	12	52	52	36	**152**
Operational Engineer	0	12	30	60	60	**162**
SCADA Engineer	0	12	60	32	60	**164**
Technical Engineer	0	12	60	32	60	**164**
Commissioning Engineer	0	12	12	104	0	**128**
Policy Engineer	0	24	24	24	32	**104**
TOTAL	**58**	**481**	**610**	**676**	**543**	**2368**

	Days costed at zero for resource					
Category of SEPD Staff						
People to be confirmed	**Days Required in Year 1 (to Mar 2015)**	**Days Required in Year 2 (to Mar 2016)**	**Days Required in Year 3 (to Mar 2017)**	**Days Required in Year 4 (to Mar 2018)**	**Days Required in Year 5 (to Dec 2019)**	**Total Days**
Planning Support	6	24	30	24	12	**96**
Commercial Support	2	24	18	18	18	**80**
PMO Admin Support	12	52	52	52	75	**243**
Legal Support	0	12	9	9	6	**36**
Regulation Support	3	12	24	18	24	**81**
Finance Support	3	24	24	24	18	**93**
Consent Resource	0	24	24	12	0	**60**
Procurement Support	0	52	24	12	12	**100**
TOTAL	**26**	**224**	**205**	**169**	**165**	**789**

External Resource Plan:

People to be confirmed	**Days Required in Year 1 (to Mar 2015)**	**Days Required in Year 2 (to Mar 2016)**	**Days Required in Year 3 (to Mar 2017)**	**Days Required in Year 4 (to Mar 2018)**	**Days Required in Year 5 (to Dec 2019)**	**Total Days**
External Support Technical (Substation)	15	192	230	182	26	**645**
External Support Technical (Non-Substation)	5	20	50	50	20	**145**
TOTAL	**20**	**212**	**280**	**232**	**46**	**790**

Project code	SSEEN02	Question Number	21
Question date	7th August 2014	Answer date	11th Aug 14
Submission section question relates to	Full Submission Spread Sheet		
Topic	Project Costs		
Question	Please confirm that no contingency allowance has been included within the expected costs for this project.		
Notes on question			
Answer	There are no contingency allowances made within the expected costs of this project.		
Attachments			

Project code	SSEEN02	Question Number	22
Question date	7th August 2014	Answer date	11th Aug 14
Submission section question relates to	Full Submission Spread Sheet		
Topic	Project Costs		
Question	[redacted] which seems to suggest that these costs will be saved as a result of this project. However it is indicated elsewhere that the MASC project is intended to cover the additional costs of the first deployment of the MASC methodology and that the remaining costs of the demonstration substation will be covered by normal commercial connection arrangements. Please clarify what the figures in this tab are intended to be.		
Notes on question			
Answer	The definition of "Direct Benefits" appears to have been misinterpreted as a result of the unusual nature of the funding arrangements and a desire for openness and transparency around costs relating to the "do nothing" option The project has been structured to deliberately exclude the substation construction costs from the NIC funding request and to include only the additional costs of implementing a MASC approach for the first time. Had we chosen to include these costs in the request then it would have been correct to populate the Direct Benefits table with the cost of a conventional substation build project. For clarity, the delivery of this project will not result in any direct savings related to SHE Transmission's RIIO Business Plan submission. Instead, the financial benefits from the project will accrue when MASC methodology is proven and is applied to other projects across the network.		
Attachments			

Project code	SSEEN02	Question Number	23
Question date	12th August 2014	Answer date	14th Aug 14
Submission section question relates to	Appendix 7a		
Topic	Business Case		
Question	The answer to question 6 includes a table of substation cost elements. For each line item in the table please explain (1) the reasons for the cost changes between the AIS and MASC substations (2) how the MASC cost estimate for that item has been derived, showing the detailed calculation, the assumptions made, and the sources of those assumptions,. Also include the reasons why you have confidence that such assumptions and calculations are reasonable.		
Notes on question			
Answer	1. SHE Transmission asserts that MASC will save costs when compared to a conventional substation build. Most of the cost savings come from site infrastructure and establishment, civil and equipment costs, and project management. Some examples are listed below - these figures are based on the pie charts shown in Figure 2 and Figure 3 of Appendix 6a:		

Cost Elements	Based upon information in Figure 2 – AIS Substation	Based upon information in Figure 3 – MASC
Civil	[redacted]	[redacted]
Building	[redacted]	[redacted]
Transformer	[redacted]	[redacted]
Electrical HV	[redacted]	[redacted]
Project Management	[redacted]	[redacted]
33kV Equipment	[redacted]	[redacted]
Miscellaneous	[redacted]	[redacted]
Modular Equipment (inc Transformer)	[redacted]	[redacted]

Total	[redacted]	[redacted]

2.

Civil works – Refers to the substation ground area/footprint and the activities necessary to prepare land prior to the equipment installation. The table indicates [redacted] savings in costs between an AIS and MASC substation solution, which are comprised of the following elements:

- The reduced geographical footprint MASC offers means that less groundwork preparation and materials are required;
- The decreased footprint also signifies less need for costly works corresponding to drainage, water management, land management (such as excavation and plant clearance), security fencing and lighting;
- As the civil work requirements are reduced, so is the need for labour and transport costs; and
- The focus on off-site construction means that on-site labour and construction is reduced; this can be costly if skilled resource needs to be located at the site for extended periods of time.

Building – Traditionally, a one-storey, brick building will accompany an AIS substation solution to house control and protection systems, communications and SCADA equipment, and ancillary equipment such as batteries. It is anticipated that this equipment will be placed within the module during the off-site construction stage and transported directly to site.

Electrical Equipment –

Electrical Equipment – In order to compare the cost of the electrical equipment for the two options, a number of individual cost items are combined as shown below;

	AIS	MASC
Transformer	[redacted]	[redacted]
Electrical HV	[redacted]	[redacted]
33kV Equipment	[redacted]	[redacted]
Modular Equipment (inc Transformer)	[redacted]	[redacted]
Total	[redacted]	[redacted]

While the electrical equipment costs for MASC are more expensive than conventional design approaches, these costs are off-set by savings made in other aspects of the substation project and therefore MASC remains the lower cost option overall. The increase in price for MASC electrical equipment is comprised of:

§ Material costs for the container or modules;

The MASC solution will require increased off-site commissioning and testing of entire systems (as opposed to individual components). However, this reduces requirements and costs of on-site testing and offers better value.

	The MASC solution requires electrical equipment which uses a gas as an insulation medium as opposed to air. This is more expensive but needs less room, therefore savings can be made on land and land preparation costs, as indicated above. Project Management – This incorporates internal and external labour resource which is necessary to deliver a substation. The savings are achieved in the MASC solutions as follows: § The MASC solution will be a standardised specification, which requires a reduced level of initial design resource support and subsequent external stakeholder engagement § The on-site labour resource for MASC is significantly reduced as the majority of fabrication and commissioning will occur off-site at the factory location The MASC solution is largely constructed and commissioned off-site which reduces the overall construction and commissioning schedule. This will result in a corresponding reduction in costs associated with site establishment. Miscellaneous – this covers costs such as environmental surveys, consents, metering and batteries. Factory testing and commissioning means that savings can be made on transport, subsistence and salary for the technicians who would generally carry out testing on-site. The MASC solution offers the opportunity to streamline electrical auxiliary equipment by installing and commissioning in a factory environment. 2. Cost savings data is based on several sources. These include historic cost information from SHE Transmission's previous substation construction projects to calculate conventional costs, and information provided by the supply chain. To provide details of assumed cost savings, SHE Transmission viewed historical substation construction project data – for example, based on this information, it is safe to assume [redacted] of conventional substation construction costs fall under civil works elements. From these, information provided by suppliers was benchmarked against conventional costs and savings calculated from there. In the same way, a comparison was made on project management of MASC and AIS solutions – this showed that an air-insulated substation solution is estimated to require [redacted] of project management support, where as a MASC solution requires [redacted] (creating savings [redacted]) 3. SHE Transmission have engaged with several suppliers to ascertain likely average costs although final costs will be determined and evaluated before progressing to purchasing activities. SHE Transmission's procurement team have conducted several knowledge gathering exercises with equipment manufacturers to establish whether the project offers value for money and savings and benefits can be realised. This gives us sufficient confidence that costings and savings are reasonable. Note that the project will be subject to SHE Transmission governance to ensure compliance with the Project Direction parameters and therefore will

	need to provide evidence of value for money before the project is progress through the various “gates”. Note that part of the project’s aim is to prove that MASC offers a more cost-effective solution; therefore costs will be evaluated throughout the project life-cycle. Phase 1 of the project will further develop the requirements for the MASC solution and will validate these assumptions prior to committing to procuring Modular substation.
Attachments	

Project code	SSEEN02	Question Number	24
Question date	12th August 2014	Answer date	14th Aug 14
Submission section question relates to	Section 6		
Topic	Equipment Suppliers		
Question	In the response to question 9 it is stated that, as well as [redacted] who are named as supporters to the MASC project, other providers have been identified and some initial discussions have taken place. Please provide a list of these other providers, specifying those where such discussions have already been undertaken. In each case outline the response of the provider and summarise the information that has been provided that indicates that they would be a potential source of the required equipment.		
Notes on question			
Answer	A robust and diverse supply chain with the necessary capacity is essential for the widespread adoption of the MASC approach. Therefore SHE Transmission has undertaken widespread engagement with the supply chain to gain insight in to the range of technologies which are available. SHE Transmission holds an existing Framework Agreement for Substation Equipment. While the Agreement offers the opportunity to engage with specific suppliers, it does not prohibit the company from interaction with other organisations. [redacted] [redacted] [redacted] A well developed and robust supply chain is vital to ensure the successful adoption of the MASC philosophy. During Phase 1 of the NIC project we will continue to engage fully with the supply chain as we further develop the competitive procurement strategy for the project. This will include activities to identify other potential suppliers that have the relevant skills, expertise and capacity to support the widespread adoption of the MASC approach in GB.		
Attachments			

Project code	SSEEN02	Question Number	25
Question date	12th August 2014	Answer date	14th Aug 14
Submission section question relates to	Appendix 6		
Topic	Market Assessment		
Question	The estimated number of transmission reinforcement substations in England and Wales has been assessed by pro-rating the expected number of such upgrades in Scotland in line with the relationship between expected transmission reinforcement investment in Scotland and in England and Wales. What steps have been taken to validate that the relationship between investment levels and substation numbers is the same in both Scotland and in England and Wales?		
Notes on question	MASC will be suitable for deployment against all TOs' range of projects including reinforcement and investment of the additional network, as well as the connection of new, renewable generation. In addition to using National Grid's Transmission Entry Capacity data to understand substation requirements for new projects in the future, supplementary assessment took place to ascertain the potential extent for reinforcement and investment for existing networks. The following link will provide supporting evidence for Appendix 6a. This links to National Grid's 'Non-load Related Detailed Plan', which was submitted as part of their RIIO-T1 return to Ofgem (March 2012). The document details the transmission reinforcement plans to replace aging or problematic assets. http://www.nationalgrid.com/NR/rdonlyres/C2DC94F5-9555-46AB-842D-E887ED5D35C3/52216/2012_NGET_Detailed_plan_Non_Load_Related_v1redacted_2_.pdf		

Answer

In Appendix 6a, Table 5 identifies that up to 42 reinforcement projects planned by the two Scottish TOs during the RIIO T1 period. This figure was then extrapolated to include the rest of GB based on the anticipated total investment value identified by Ofgem i.e. £7bn for Scotland and £15.5bn for England and Wales in the same period. Based on this analysis a further 93 projects were anticipated during the RIIO T1 period. These figures were then extrapolated beyond 2020 using the based on the FES Slow Progression and Gone Green scenarios. The results are shown in Table 6 of Appendix 6a.

In order to validate this assumption the Non-Load Related Detail Plan from NGET RIIO-T1 business plan from March 2012 was used. The RIIO-T1 document lists the assets, which need replaced prior to 2020, and anticipated future project spend which will enable the delivery of new assets. For example, an extract from the circuit breaker replacement plan for the summer of 2014 is shown below.

This identifies that 24 substation bays require replacement over five locations in 2013/14 alone. This is comparable with the assumptions made in Table 6 of Appendix 6a.

Substation Name	Planned Replacement Year	No of Substation Bays	Reason for inclusion in RIIO-T1
Littlebrook	2013/14	5	Bundled with the substation replacement due to subsidence
Nechells East 132kV	2013/14	4	DNO replacement works (new substation)
Ninfield 400kV	2013/14	2	Static Compensator Replacement
Tilbury 275kV	2013/14	9	Site demolished to make way for a new 400kV substation
Walpole	2013/14	4	Link to replacement DNO works (new substation)

Total	**24**

Similar information is available for other work streams including ;

- Overhead line refurbishment;
- New transformers with increased loading requirements; and
- New or replacement reactive compensation equipment which is vital to control the flow of energy round the network.

All of these types of project require elements of substation construction which may be suitable for, and which may benefit from, the MASC solution.

Therefore, there is confidence that the number of projects identified in Appendix 6a for England and Wales is a reasonable based on the information available.

Attachments	

Project code	SSEEN02	Question Number	26
Question date	21st August 2014	Answer date	26th Aug 14
Submission section question relates to	Section 2.1a		
Topic	Aims and Objectives		
Question	It is suggested in the submission that the smaller size and certain of the characteristics of modular substations may aid and accelerate the planning and consenting process for their construction. Has this suggestion been validated in any way?		
Notes on question			
Answer	Both the containerised nature of the MASC solution and the reduced environmental impact of the MASC solution will help to reduce timescales associated with the planning and consenting process. It is believed that these factors will help to make any planning or consent application less contentious and enable a more timely decision to be reached. <u>Containerised Nature of the MASC Solution</u> Containerisation will facilitate significantly reduced land requirements, with corresponding reductions in civil works, excavations, drainage and foundations. Off-site construction will reduce the number of vehicle movements to transport components and human resources to site. Co-ordination of heavy lifting equipment will be reduced. There will also be decreases to time required on-site during the installation and commissioning phases, which reduces waste management and noise, etc. The containerisation of the MASC solution will help to lessen the impact on the local area, as there will be less traffic disruption and nuisance during the construction phase. There is also the potential that the permanent structure could be more aesthetically pleasing, and could be visually 'blended' into the surrounding area. Phase one of the project involves extensive stakeholder engagement with a range of groups including other licensed network operators and with organisations associated with planning and consent. We have already engaged with SHE Transmission's Environmental Management team to understand key concerns in substation construction		

	amongst external stakeholders. These include (i) time spent on site (ii) visual appearance and (iii) transport arrangements (especially those concerned with air-insulated substations). The MASC solution tangibly reduces these areas of concern and may avoid potential objections and challenges. For example, the Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009, considers there to be three separate planning categories (national, major and local). The legislation advises that developments of under two hectares would fall into the local, rather than major category. If a MASC substation can occupy an area of less than two hectares, the consent and planning processes are likely to be less onerous than would be the case with a large, conventional substation. <u>Environmental Impact</u> SHE Transmission invests significant resources to evaluate and minimise the environmental impact of our planned infrastructure developments. This includes the provision of reports detailing impact on the environment for any construction projects, which form part of our documents in the planning and consent stages. When a MASC solution is identified for a particular location, an environmental impact assessment is carried out in accordance with SHE Transmission established practice. The MASC solution requires significantly reduced land, fewer vehicle movements and shorter construction time on site. A MASC substation should also result in less concerns regarding hydrology (ground water, surface water, drainage, etc). The benefits provided by MASC should then, positively influence the environmental risk assessment, and allow any residual risks to be mitigated against. <u>Conclusion</u> Overall, MASC resolves or reduces many of the concerns historically raised by stakeholders. However, we have planned extensive stakeholder engagement within Phase One of the project and will deliver a set of recommendation papers following input from key environmental and other stakeholders.
Attachments	

Project code	SSEEN02	Question Number	27
Question date	21st August 2014	Answer date	26th Aug 14
Submission section question relates to	Spread Sheet – Whole Project Costs		
Topic	Costs		
Question	The table below shows the equipment cost that it is planned to incur under this project. In each case please provides details of equipment that it is planned to purchase.		
Notes on question			
Answer	The information outlined below is an initial indication of where the additional costs are anticipated to be incurred. These costs assumptions will be developed and validated during Phase 1 of the project. The information outlined below is an initial indication of where the additional costs are anticipated to be incurred. These costs assumptions will be developed and validated during Phase 1 of the project. <u>Modular Substation Costs</u> [redacted]: This includes the anticipated cost of ; § Additional design time associated with the production of the MASC solution for the first time. This is in addition to the production of the traditional design; § Costs associated with modifications and/or redesign of electrical equipment to suit GB technical, functional and operational requirements;		

[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]
[redacted]	[redacted]

§ Purchase of new components as required to ensure compliance with GB technical and site specific requirements;

§ Additional costs associated with the realignment of the manufacturing facility for first time construction of the GB MASC equipment. This will include inclusion of GB specific requirements and any free issue equipment supplied by SHE Transmission;

§ Development of transportation solutions for GB deployment;

§ Costs associated with the development of testing, commissioning and any potential certification requirements for the MASC solution in GB;

§ Attendance at meetings, or delivery of presentations to multiple parties within SHE Transmission and external stakeholders to detail the design solution; and

§ Delivery of actions from workshops which identify potential hazards or risks.

Reliability Mitigation [redacted]

These costs have been allocated for the following purposes;

§ Costs associated with delivering the additional civil works e.g. lease/purchase of an area of ground beside the MASC solution which would be suitable to hold a replacement transformer;

§ Cost associated with the purchase of 'spares' which have long lead times or are critical to the overall operation of the MASC solution (which would normally be procured based upon population numbers);

§ Studies of the MASC solution to identify single points of failure; and

§ Testing to destruction, if necessary, items within the MASC solution to gain a better understanding of their likely failure modes as well as resilience to the SHE Transmission network and environment. These tests will help determine any mitigation measures and will assist in identifying the causes of any failure which may occur in the early years of operation.

Additional Monitoring [redacted]

Costs have been allocated to:

- Cover the purchase of additional measurement equipment to validate the operation of the MASC equipment e.g. vibration monitoring to measure stress applied during transportation, installation, and operation. The cost also allows for the inclusion of additional fibre cables, routers and communication auxiliaries to support monitoring equipment.
- Purchase of power and real time monitoring solutions to support the operation of the equipment; this may include additional batteries, communication equipment or data storage devices.

Materials / Stakeholder Engagement [redacted]

	This cost is associated with materials through including venue hire and event management which will enable information to be shared with and gathered from, the key stakeholders, as well as dissemination of learning to the industry. Costs will also cover printed and web materials as appropriate to assist knowledge sharing with interested parties.
Attachments	

Project code	SSEEN02	Question Number	28
Question date	21st August 2014	Answer date	26th Aug 14
Submission section question relates to	Spread Sheet – Whole Project Costs		
Topic	Costs		
Question	In the table shown in question 27 it indicates the modular substation costs. Please confirm that these are the additional costs of the first use of the modular substation and describe what these costs are expected to be in respect of and how they have been estimated.		
Notes on question			
Answer	The equipment costs are associated with the additional costs for deploying the MASC solution for the first time. A more detailed explanation of how these costs have been estimated has been included in question 27. These costs have been estimated based on a combination of internal SHE Transmission cost information and early engagement with the supply chain. These have been supplemented with experience in delivering previous LCNF and NIC funded projects. As indicated in the submission the anticipated costs of the MASC solution was established using typical information provided by [redacted] and combining it with internal SHE Transmission information to establish the overall cost of a modular substation. Considering that the project is still at an early stage in its development, there was a reasonable degree of consistency in the information provided from the equipment manufacturers. This has given SHE Transmission further confidence that these cost estimates are appropriately robust.		
Attachments			

Project code	SSEEN02	Question Number	29
Question date	21st August 2014	Answer date	25th Aug 14
Submission section question relates to	Section 3.5		
Topic	Operating Costs		
Question	The submission states that the MASC approach should result in reductions in operating costs. What is the anticipated estimated level of such reductions compared to current operating costs?		
Notes on question			
Answer	Due to the majority of the MASC equipment being fabricated and commissioned in a controlled environment, there is an anticipated reduction in operating costs. There will be further savings anticipated from the reduction in overall footprint; <u>Planned General Site Maintenance</u> As the footprint of the MASC solution is smaller then an AIS equivalent there will be less associated housekeeping costs i.e. weed killing, land maintenance, etc. As the majority of equipment is containerised this avoids related environmental wear and tear or cleaning requirements. <u>Planned Equipment Maintenance</u> The use of largely GIS equipment should see a reduction on the overall maintenance costs for the project. <u>Unplanned Maintenance</u> The MASC solution will be fabricated in a controlled environment. This should reduce the potential of equipment failure due to contamination, and improve the reliability of the assets while helping to minimise faults. Another benefit of the MASC solution is that substation components which have experienced a fault are foreseen as being easier to exchange out, with spares and the repair potentially being completed off-site. Off-site fault repair will enable the MASC solution to be returned to service more quickly than a conventional substation. The MASC project aims to develop these ideas and gain a greater understanding of the potential cost		

	reductions available. Security If the overall footprint for MASC is reduced compared to that of a traditional substation, savings can be made on security costs related to fencing and lighting.
Attachments	

Project code	SSEEN02	Question Number	30
Question date	18th September	Answer date	26th September 2014
Submission section question relates to	Business Case		
Topic	Substation Cost		
Question	Please could you provide clarification on how some of the costs of a substation are socialised? And therefore how the savings would flow back to customers?		
Notes on question			
Answer	As identified in the original submission the MASC approach can be applied to the full range of substation projects. This includes • Refurbishment and Reinforcement of the Transmission Systems operated by the three TOS, and also equivalent projects carried out by DNOs in England and Wales; and • New Connection projects on the Transmission System – these are generally to facilitate the connection of new renewable generation developments. **Benefits from Refurbishment and Infrastructure Projects** When the Substation Assets are being installed for reinforcement or refurbishment, the assets are classed as Infrastructure, and therefore **all** of the benefits will flow directly to back to Transmission customers. Similarly, benefits will flow to Distribution Customers if the MASC solution is applied by a DNO. **Benefits from New Connection projects** For new connection projects the costs are split between Connection Charges and Infrastructure Charges. Connection Charges relate to the costs of assets installed solely for the use of an individual user – these costs are borne solely by the developer. Whereas Infrastructure Charges relate to the recovery of costs related to the wider transmission network (where assets may be used by a number of different users) and are socialised amongst all users of the transmission network. The cost split between Sole User charges and Infrastructure Charges are determined in accordance with the CUSC (Connection and Use of System Code). The requirements of the CUSC are applied via the Charging Statements of National Grid, SHE Transmission and SP Transmission Connection Charging Statements. The Connection/Use of System boundary		

	definition can be found in the CUSC – it is this boundary which informs the cost split between Infrastructure and Sole User charges. There are a wide range of factors which will influence this cost split including, network configuration, rating, voltage, location etc. The specific requirements of the CUSC will inform cost split for each individual project.
Attachments	

Project code	SSEEN02	Question Number	31
Question date	18th September	Answer date	26th September 2014
Submission section question relates to	Section 2		
Topic	GB Safety Rules		
Question	Please send us a list of the GB safety rules/standards that you expect will need to be changed in order for the MASC design to be deployed in GB. Where these changes require the support of other parties please explain who would need to agree and how this will be achieved. It would also be helpful to explain why these changes could not be achieved through business as usual.		
Notes on question			
Answer	The Energy Network Association published the Model Distribution Safety Rules; 2010 edition (MDSRs), which are used by all electricity network licensees. Each network licensee has the right to adapt these rules within allowed boundaries in response to individual issues on their own network. SHE Transmission therefore works within the 2010MDSRs, adding Explanatory Notes and Special Instructions (ENSIs) where appropriate. It is the intention to tender for a MASC type solution clearly stating the requirement to comply with the SHE Transmission Safety Operating Rules 2012. The tenders will be required to identify any of their equipment that does not meet, or that operates outside of, the present SHE Transmission standards; they must however, also provide supporting evidence that safe operation and maintenance can still be maintained. As part of the tender return the vendors will be asked to detail any elements where innovation, operational stream lining and cost efficiencies can be achieved, whilst highlighting challenges associated with realising the full potential of their product(s). It will be mandatory for vendors to identify potential challenges and demonstrate a workable and safe solution, along with evidence that they can maintain the current standards of safe operation. Specific resource will be channelled into assessing the different tender returns and analysing the impact on the SHE Transmission Operational Safety Rules 2010. This will form an essential element in the selection of the vendor for the initial deployment. Any changes to the SHE Transmission Operational Safety Rules 2010		

through the introduction of the MASC solution would be openly shared with the other network licensees. If the MASC solution requires additional guidance notes for operational integrity, the information will be added into the appropriate sections via the use of ENSIs.

In brief, the sections of the 2010 MDSRs which SHE Transmission may issue an ENSI to maintain the high level of operational safety are as follows;

Section	Title	ENSI may cover
3	General Safety Precautions	Instructions on how to access and egress the MASC structure safety and carry out key tasks safely.
5	Procedures For Work on Particular Items of Plant, Apparatus or Conductors	Definition of 'Zone of Work' for a MASC solution or the enhancement of earthing checks prior to entering the MASC structure.
8	Safety Precautions and Procedures Applicable to Low Voltage systems	Heighten the awareness of LV systems within the vicinity of MASC equipment.

Funding MASC through NIC offers the correct platform and resource to ensure that the industry shares learning and creates the correct procedures to successfully deploy modular solutions safely across GB. Trying to undertake MASC through BaU is not desirable or appropriate for this reason. BaU funding will not allow the proper collaboration between network licensees to share knowledge and understand which of their own safety rules may need to be challenged.

In order to make the necessary changes in safety rules and operational procedures requires one of the TOs to provide the "leadership" and momentum to allow the MASC solution to be adopted. No single project (whether a connection project or a refurbishment project) can justify the additional expense or risk associated with deploying the MASC solution in isolation. NIC is required in order to allow these new practises to be developed and implemented across the GB. This will provide the volume of projects required to ensure participation from a range of vendors and achieve economies of scale. A single TO operating in isolation may not be able to achieve this and risks being left with a bespoke "modular substation" which may prove to be more expensive in the longer term. Without the support and protection of NIC, it is unlikely that a single TO would take this risk. Without NIC funding there is a missed opportunity to investigate the full potential of MASC safety benefits, and NIC funding is therefore essential if the trial is to go ahead.

Attachments	

Project code	SSEEN02	Question Number	32
Question date	18th September	Answer date	26th September 2014
Submission section question relates to	Project Readiness		
Topic	Safety Issues		
Question	Please confirm the view you expressed at the meeting that you see no safety issues that could prevent the deployment of the MASC method.		
Notes on question			
Answer	SHE Transmission does not view any fundamental issues in relation to safety that would prevent the deployment of the MASC method. Safety is the single most important aspect of SHE Transmission's work. The company is renowned for its non-compromising viewpoint and comprehensive processes to safeguard the wellbeing of the public, staff members, the environment, network integrity and SHE Transmission's asset portfolio. SHE Transmission recognises that MASC may challenge some of the established safety rules (see question 31). Rather than these challenges being "safety issues that could prevent the deployment of MASC", these should be regarded as new opportunities to ensure that modular solutions can be safely deployed with clear and compliant rules available to all network licensees. This is another reason in support of NIC funding for the MASC project; learning will be shared with the industry to the advantage of all licensees and customers. An NIC funded MASC project would bring the industry several benefits, not least a new focus on off-site construction, creating clear and tangible safety benefits for substation equipment and construction workers.		
Attachments			

Project code	SSEEN02	Question Number	33
Question date	14 October 2014	Answer date	16 October 2014
Submission section question relates to	Evaluation Criteria 4.a		
Topic	Use of SF6		
Question	How have you considered the increased use of SF6 in substations post project (and its displacement of the use of air insulated switch gear) in your environmental assessment? Is there still a positive environmental case?		
Notes on question			
Answer	SHE Transmission takes its environmental commitments very seriously and is committed to the safe management of SF6-containing assets. We use the example of an SF6-insulated substation to demonstrate the potential reduction in geographical footprint that a MASC substation could have. As per the bilateral meeting discussion, we are considering the potential for SF6 alternatives for the generic specification. For example, a supplier has recently launched g3, a clean gas which reportedly has 98% less impact on global warming than SF6. It is important however that the specification created during the NIA project, which will be used as a starting point for the NIC project, doesn't produce another 'niche' or bespoke substation. At procurement stages of the NIA/NIC MASC, vendors will be encouraged to propose new, cleaner alternatives to SF6. A conventional GIS substation using SF6 as the insulation medium would require 106kg of the gas per bay. This volume of SF6 has decreased since the initial concept design, as manufacturers have developed their technologies to reduce the potential for leaks. Today, manufacturers are experimenting with SF6 mixed with other electrically inert gasses to further reduce SF6 volume. The use of innovative and progressive approaches associated with gas insulation signifies that a typical MASC solution will typically contain less then 60kg of SF6 (based on 90MW at 30% load factor). In comparison to a conventional GIS substation the MASC solution will contain 43% less SF6. Within the NIC submission, figures have been provided for the anticipated annual installation of new substations, which may be air or gas-insulated, depending on requirements. In developing a MASC solution, based upon the		

	information provided above, three single bay MASC substations could be deployed for a GIS double bay equivalent based upon the volume of SF6 and anticipated environmental impact. The MASC solution is then more environmentally sound than conventional GIS, and we assert that MASC offers a positive environmental case in comparison to AIS and conventional GIS solutions.
Attachments	

Project code	SSEEN02	Question Number	34
Question date	28th October 2014	Answer date	30th October 2014
Submission section question relates to	SDRC		
Topic	Stakeholder Engagement		
Question	As part of second bilateral meeting, in response to the “big questions”, you explained that the stakeholder engagement for the project, in particular to refine the functional specification of the substation, would involve consultation with all other relevant network licensees (including DNOs). The SDRC 9.1 in you re-submission is less specific. Please confirm what stakeholder engagement would be undertaken to inform the substation specification and how this relates to the revised SDRC.		
Notes on question			
Answer	We can confirm that Stakeholder engagement will occur in various forms from individual face to face meetings through to multi-stakeholder organised events. During the second bilateral meeting we presented the following diagram:  Figure 1. A selection of External Stakeholders we seek to engage This illustrates the spectrum of External Stakeholders we intend to engage to improve and develop the generic modular substation functional and technical specification. The aim of engaging with these stakeholders is to listen and learn about the positive aspects the Modular Substation will bring, as well as any concerns of foreseen challenges they envisage. The feedback obtained will be aligned and analysed against the generic Modular Substation specification and improvements recorded. Below is an indication of how the specification may be influenced: • Logistics: survey requirements to assess the overhanging obstacles such as foliage from tree, due to the size of the modular substation and transportation means;		

	• Planning and Consent: preferences for the finish of the modular substation; • Network Licensees: confirmation that the modular substation specification could be adopted to fit their needs also; and • Supply Chain: areas of the specification which limit initiative solutions or incur additional costs to comply with. Furthermore, when the location and Customer for the Substation have been finalised, the Customer's requirements will define the Modular Substation's key parameters; such as the capacity of the substation and the connection timescales. The identification of the location will also enable discussions to be held with the local community groups, Government and landowners; which will influence site specific requirements. Internally discussion will also be undertaken with Stakeholders within the business on specific aspects of the Modular Substation solution and the impact on technical and functional specifications. These engagements with both external and internal stakeholders will provide the opportunity to share our progress and gauge where improvements on the specification could be made. The deliverable will be a report detailing the outputs from stakeholder engagement activities and their impact on MASC's functional specification.
Attachments	