Appendix XIV

Stakeholders concerns addressed

This appendix details many of the concerns shown by stakeholders during the engagement process. Each query has been addressed, and where applicable, some form of mitigating action has been identified.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
Does off site construction require additional factories to be built? Does one environmental saving offset another in terms of carbon impact? It is important to consider all factors involved"	A. Discussions with Manufacturers and other Parties have provided confidence that existing factories would be used for the fit out of the modules, as there is a local skilled work force.
Regarding enhancing the potential for reduced environmental impact "well...don't know about that...need to see proposals regarding drainage...need to see drainage plans...and happy to contribute to the design of the drainage plans"	M. It will be necessary to keep the Environmental and Community Stakeholders up-dated as the design develops to ensure that the MASC solution is reducing the environmental impacts.
"Conceal components wherever possible, including undergrounding wires etc."	M. Warrants further investigation at the design phase to identify the best solution for the electrical cabling on-site.
"Depends on where it is situated… if not in view, don't waste money hiding components… but if in view, hide components"	M. Statement needs to be incorporated within the Functional Specification and MASC selection tool.
"Would need clarification on which components will be concealed"	M. It will be necessary to keep the Environmental and Community Stakeholders up-dated as the design develops to ensure that the MASC solution is reducing the environmental impacts.
"...is the footprint two dimensional...could reduce the two dimensional impact but build it higher and increase the three dimensional impact...would say smaller footprint is an advantage but a caveat that it should refer to all dimensions including height and structure ...and preferably be lower"	M. It will be necessary to keep the Environmental and Community Stakeholders up-dated as the design develops to ensure that the MASC solution is reducing the environmental impacts.
We have a vested interest in trees and sites selected are usually forested...trees have to be cleared so reducing the area is an advantage...trees are seen as a carbon store and felling them is against government policy"	M. It will be necessary to keep the Environmental and Community Stakeholders up-dated as the design develops to ensure that the MASC solution is reducing the environmental impacts.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
"All forests are planned...land management plans...planning many years in advance and then subsequently faced with a proposal for a substation. The number one priority is how does the substation sit in the landscape? Will this have knock on effects for other areas? Felling trees sooner possible? Impacts on the landscape plan and how we operationalise it...major challenges for Forestry Commission as well as impact on the land"	M. It will be necessary to keep the Environmental and Community Stakeholders up-dated as the design develops to ensure that the MASC solution is reducing the environmental impacts.
"The ranking really depends on site sensitivities; the reduction in acoustical impact is obvious in terms of the construction period but not clear in terms of operational noise impact. Will these be reduced as result of MASC? Can these units be insulated to minimise operational noise levels?"	A. The noisiest piece of electrical plant is the transformer and the associated fans to keep it cool. Noise enclosures or housing indoors defeats the efficiency of the cooling system. However, the noise mitigation strategy will be based on the location and the MASC equipment to be installed.
"Conceal where possible...may contribute towards resilience...unusual to have mature standing timber close to substations... extreme weather and trees fall over... could protect the substation"	M. Warrants consideration once the location has been finalised.
"To what extent the MASC Approach can (or does) respond to the locale?"	A. Following discussion with the manufacturers it was discovered that there are options available to clad the outside of the modules to aid their aesthetic look and allow them to blend in as much as possible.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
"Will the MASC approach be used (i.e. to extend) existing sub-stations? And thereby increase the existing foot print? Or will the MASC approach only be used for new sub-stations?"	A. MASC is not foreseen as being suitable for every future substation modification or new build. MASC is an alternative solution which will provide a larger range of options to be examined at the design phase as the electrical systems needs evolve. One of the benefits of MASC is its reduced footprint requirements. This may in the future allow an up-grade substation to be planted on the original site without requiring additional land take.
"Because they can have major impact on the view in open areas so a smaller footprint could be very beneficial if a modular substation is not any higher than a standard substation design"	M. It will be necessary to keep the Environmental and Community Stakeholders up-dated as the design develops to ensure that the MASC solution is reducing the environmental impacts.
One respondent noted that '...the way the information is presented is confusing as you are mixing up actual impact with the effect of the impact, which makes it hard to rank'	M. It will be necessary to keep the Environmental and Community Stakeholders up-dated as the design develops to ensure that the MASC solution is reducing the environmental impacts. Being able to present more detail against a new location will enable a more meaningful conversation about environmental impact and effect to occur.
"Fewer vehicle movements? Less re-work [since factory made]?"	A. Yes there should be significantly less vehicle movements.
There are both positives and negatives for local communities; positives in terms of less disruption during site build, but negatives in terms of the amount of money spent in local shops and businesses if staff on site for a much shorter duration.	A. There will potentially be a reduced 'short-term' spend to the local community, as one of the key benefits of the MASC solution is a reduction of site time. Ultimately the MASC solution will bring long term benefits to the whole community via contributing towards ensuring electricity is affordable to all.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
If substation is fabricated off-site then individual components or modules could be potentially larger...at the moment smaller pieces... may require upgrading of roads and access routes which would have some environmental impact"	A. At the design stage the route into the location would be a key factor in determining the road selection and the upgrades necessary. The MASC solution parameters have been set today at UK transport requirements. The solutions returned have suggested the need for several containers for transportation purposes to mitigate the environmental impact associated with road up-grades.
Maybe increased costs associated with unforeseen circumstances (e.g. such as having to widen bridges / rebuild bridges etc. to get modules transported to site).	A. Each project has a detailed risk register which based upon the known facts assess the impact of the plausible unknowns. Based on the risk register mitigations measures are put in place, as well as contingency funds. The risk register is a 'living' document and reviewed regularly, early identification minimises the increase in costs.
Problems can centre on higher voltage end to end protection	M. As the design progresses and the location determined the protection necessary will be investigated and action taken where necessary to ensure correct coverage is maintained.
All the modules need to be connected together and tested as a whole before leaving the factory rather than leaving this to be done on-site.	M. Agree that aim is to complete testing in the factory. Once the manufacturer is selected it will be possible to investigate how much of the system can be placed together in the factory and the measures necessary to prove the testing to minimise the necessary re-testing on site. This is a key driver and must be included in design phase discussions.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
Protection will always need to be signed off on-site.	M. Agree there must be on-site protection sign off. The MASC solution may present opportunities to test in the factory with a reduced number of tests repeated on-site.
"The failure analysis will need to drive the functional spec" i.e. an understanding of what can and cannot withstand being transported etc.	M. Agree. Firstly, the elements that make up the MASC solution must be identified including their test to destruction results if applicable, this will in the first instance help shape the functional specification. Secondly, further shaping of the functional specification will occur from failure analysis of a MASC solution, if and when failure occurs. With regards transportation sensor equipment will monitor the stress and strains experienced during this period. Analysis of the data should bring about improvements.
UK is still a small player in global switch gear. Switch gear providers will pander to the needs of USA and China due to purchasing much larger volumes. It means the standards for the UK usually conform to international standards rather than our own.	M. It is recognised that non-UK equipment is designed to meet different standards. Mindful of the challenges this introduces to will be prudent to evaluate the system safety culture in Europe to help identify the difference. This fact finding may shed light on how the UK could move towards purchasing equipment that is cheaper as it is produced in higher volumes.
A key question is "What is modular?" And what is not? What does one include in a module and what does one leave out? "Where is the 'sweet spot'" in the context of modular design?	M. Modular presently aligns with equipment that fitted together into a larger system and transported to site. Going forwards this might need to become a bolder statement, with the input and output capacities and parameters declared only, allow the MASC solution to be a black-box and the manufacturer optimising the solution.
How far can you standardise the design in a competitive market?	A. Having a standard product will help manufacturers optimise designs and equipment costs as they will be able to take advantage, of ordering in volume for instance, to bring about efficiencies.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
Establishing a framework for manufacturers to meet that is agreed by the largest players in the UK market could prove very cost effective albeit very hard to do. A quality, assured way could pave the way for standardisation and durability.	A/M. Agreed, a prescriptive framework is a timely and challenging process which will not capture all the industry players' wishes. The MASC solution in principle delivers a foot print and onsite time savings, thus identifying how this is achieved and the process in place to manage delivery of the end product are more likely to appeal to all industry players.
There needs to be some agreement amongst the industry in UK even internationally about what modular means and what "bits" will be modular and which bits will be left flexible for bespoke needs.	M. Agreed, follow up discussion are necessary to help shape the MASC functional specification as more details become available.
Need to be mindful of procurement frameworks with manufacturers when standardising designs (could create exclusivity which would be anti-competitive)	M. Agreed, as the MASC Functional Specification is developed it should not be overly perceptive but more performance based to ensure competition.
Could 'modules' be something that perform a specific function e.g. a control module; transformation module?	A/M. Yes within the enclose frame of the MASC solution there will be cabinets which preform specific roles. There will be benefit in investigating to what level these can be simplified to allow future change overs, which are time efficient.
The design needs to consider to what extent the various "modules" are transportable. Need to consider not just the size and weight of the various modules but also their resilience (or not) in relation to being transported (i.e. vibrational damage etc.).	A/M. The parameters of the modules will be based on road transport requirements. Sensors will monitor the effect of transportation and learning feedback to ensure improvements.
Ask for digital imprint of the products so that it is easier to make bespoke parts if a product is not produced anymore, for example using a digital printer.	M. To be included in the MASC risk register and as the design progresses products must at risk of being bespoke shall be identified, with mitigation measures identified.
A need to quality assure the factory build process with key experts / functions contributing to this process (i.e. consider investing in the supervision of this process including stringent factory acceptance tests).	M. To be included within the MASC risk register. At the design phase work will also be required with the manufacturer to build a suitable quality assurance plan to match the technology readiness level.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
Need to have a mechanism in place so that it can take account of the latest developments in technology (i.e. ensure that the specification is kept fresh/evolving).	M. Creating a performance MASC Functional Specification will allow the latest developments in technology to be included.
Potential to integrate the control technology in factory (e.g. MMAC) to allow partial commissioning off site.	M. As the MASC enters the design phase, this is one of the goals the manufacturer will be asked to realise.
Given the multiple challenges with the design aspects it was suggested that a working group be established to draft the specification (for MASC) and then to offer this for consideration/deliberation to a wide range of industry peers. There was concern about how long such a process would take. However, it was acknowledged that it was important to bring parties impacted by the MASC approach up to a common level of understanding of the technology, its capabilities and limitations	M. Agreed, there are multiple challenges associated with MASC and as such it is important to involve the industry. Moving forwards it is easier to comment on a circulated document and seek input. This is a very positive response and the suggestion will be investigated going forwards.
The question was raised on how small to make individual modules i.e. in terms of convenience for dismantling or repairing them?	A/M. Ideally a module must be road transportable.
Maintenance and replacement of parts on a modular design will be challenging as “parts” might not be as readily available.	A. The aspiration is to change the module, or swap it out with a working unit to allow the fault repair to occur off-site. An aspiration behind the MASC is to reduce down time due to repairs and on-site replacement of parts.
Traditionally we put cables at the bottom of the substation, where there is increased risk of water ingress. Could factory built modules help us to do things differently, for example, could we put them on the side, as this would mean we could remove the space need for a void at the bottom of the substation?	A. A port-a-cabin type container can be designed on legs to allow cable entre from ground without the need for cable basements. Alternatively bus-bars may be used instead of cables. Looking at more options for the cable layout will be possible at the desk-top design phase.
Embedded sensor technology could be utilised more widely to support failure reports and maintenance, but can have higher a failure rate and generate “false positives”.	A/M. Agreed, this is a good future development.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
If one wants to minimise full commissioning on-site then individual modules (or parts of modules) need to be checked for aspects such as vibration resistance, sensitivity to mechanical damage. Potentially sensitive parts could be removed from a module and commissioned on site. Failure analysis would be needed to elucidate this. Failure analysis results will drive the design of the factory.	M. Agreed, measure will be put in place to monitor the transportation of the equipment. Failures will also be assessed as and when they occur.
Consider ways of integrating MIDEL into MASC (traditional approaches to substation construction may have only used one insulation material but if introducing other materials then consideration needs to be given to cross contamination).	M. Agreed, the design phase will identify the insulation medium for the transformer. It may be that MIDEL is a next generation MASC development.
Switch-gear can't have a 40-year lifespan if factory-built	M. Discussion with the manufacturer will occur at design phase to identify the lifespan of the equipment.
Many variables means standardisation could be partial in practice and risks will/might be heightened.	M. Generally the aspiration is to take todays equipment and build it off-site, the associated risk are will know and understood. MASC first time round will make one or two minor alterations thus controlling the variables.
Fears exist that modularisation might compromise quality as well as system security levels	M. All equipment placed on the system must confirm as a minimum to system security levels, MASC will be subjected to the identical requirements. On the quality front MASC will use todays equipment, with a few progressive elements. The progressive elements will go through systemic verification to ensure their quality and suitability.
Could be a problem with inter-changeable modules	A/M. As the design progress inter-changeability at a modular level will be investigated.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
Modularity makes it very difficult to transfer to competitive tender, making it hard to argue that contracts are non-contestable and posing problems for after sales across multiple manufacturers.	M. As the design progresses inter-changeability between manufacturers needs to be investigated.
"Give residents more confidence in what finished site will look like"	M. With the location identified and the manufacturer appointed then it will be possible to explore the MASC finish options with the local community
Challenging planners particularly in relation to standards around brick builds and a need to promote the benefits of other approaches such as putting modular substations on stilts to remove risk of flooding, avoiding moving existing cabling etc.	M. Once the location is identified and the manufacturer on-board then options of the MASC substation can be fully addressed.
"Communities should get some benefit for the disruption for e.g. SSE needed to put in lay-bys on a minor road so they could gain access to a site but when the works were completed they blocked off the lay-bys by putting in boulders so the locals could not use the lay-by anymore which does not seem fair, there should be some ongoing benefit"	M. Once the location has been identified the opportunities can be investigated to bring additional benefit to the local community.
Opportunities to involve end users in the design stage (avoid 'silo design').	M. Agree the end user needs to be involved in the design phase, may investing in 3-D modelling on a physical level will help make informed design choices.
Transportation of large modules, and optimising the siting, are genuine obstacles.	M. Once location is identified then transportation options can be assessed.
Connecting the modules on site once they've arrived on site will prove one of the hardest tasks. A large crane with a very, very large truck will be needed to move the modules.	M. Agreed, feedback has highlighted this as a potential challenge. Connection and installation options need to be well thought though and developed at the design stage.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
'Flexibility in design to allow for integration in a range of locations'	M. Standardising the size of the transportable units will help to ensure that the MASC solution is suitable for other locations. Likewise if the port-a-cabin type containers appearance can be easily altered this will as help make them aesthetically pleasing where ever they are located.
"[not sure]...would replacements be faster because [under MASC] it would be a standardised approach? … Would this be better [more resilient] in a crisis [outage]?"	A. Yes replacement should be faster.
We cannot "shrink wrap" the module, we need to ensure that we leave space for sites to develop over time	A. An aspiration of the MASC solution is to remove the initial module and replaces it will a more suitable module if expansion is required. Today we can only add to the substation, tomorrows approach an up-grade. Almost in a similar fashion to replacing a car, you can purchase a new car that has a higher specification but still fits into your garage.
There may be protection issues with plug and play modules.	A. M. Based upon the manufacturer's proposals the protection and control connection systems will be assessed and challenges identified.
"If there is a rigid approach to the design of modules, it might not always suit / fit the local environment"	A. It is anticipated that there will be a suitable level of flexibility to the external appearance of the modules.
"Height of sub-station – needs to be non excessive"	A/M. It will be necessary as the design develops to keep the Environmental and Community Stakeholders up-dated to ensure that the MASC solution is reducing the environmental impacts.
Could reduce the frustration experienced by 'connectees' by joining protection schemes together.	M. As the location is identified and the design developed it will be possible to review the protection schemes in the aspiration of optimising the solution.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
"The most important visual issue is to ensure the siting and design is appropriate to the location. Materials such as slate and stone may still be required for very sensitive locations to mimic historic buildings"	M. It will be necessary as the design develops to keep the Environmental and Community Stakeholders up-dated to ensure that the MASC solution is reducing the environmental impacts.
Design should take account of the need to replace protection or design protection to last the length of the switchgear.	M. As the manufacturer is selected and the design developed optimising protection costs will be assessed.
Because of the physical limitation of some sites then difficult choices will need to be made on which elements are modularised and which are not. Suggested that MASC may be more suitable to new build projects (e.g. wind farms, housing estates, new factories etc).	M. Agreed that MASC presently aligns with new build projects, however it's suitability for replacements and extensions will also be evaluated.
"[Perceived that] if there is a leak, it will be sorted quickly"	A/M. This question relates to the SF_6 gas and yes if an issue is detected with SF_6 switch gear, investigation and necessary action are taken immediately.
Reducing the complexity of protection/simplification will make it easy to pre commission, thus saving on-site time and could make it last as long as the switch-gear.	A/M. As the location is identified and the design developed it will be possible to review the protection schemes in the aspiration of optimising the solution.
Making it work for specific sites and locations where there may be specific site conditions or access restrictions.	M. True all sites are not the same and in standardising the MASC design then the specific site access requirements will be known and a design adapted to suit.
Consider the challenges associated with planning '…not always possible to drop things off the back of a lorry…into a housing estate…people don't want a big container in their back garden'	A/M. The MASC solution when the location is known needs to be as sympathetic to the surrounding landscape as possible.
Need to demonstrate reduced impact / evidence of civil engineering innovations to SEPA to support better outcomes in relation to planning consent.	M. It will be necessary as the design develops to keep the Environmental and Community Stakeholders up-dated to ensure that the MASC solution is reducing the environmental impacts.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
There was a view that the core specification would be high level and "very slim"… There will always be someone saying we don't need that".	A. The intention would be a document that could be used as a base which will allow other Parties to add in their own specific requirements. Correct it will be challenging to produce a MASC Functional Specification which pleases everyone.
"It seems to me that the whole issue of electricity generation and distribution needs serious thought in terms of future need. Many products in use domestically and by local authorities (I mean lighting) use low voltage dc. Perhaps continued distribution of high voltage ac should be looked at in the light of this"	A. Low voltage DC has a market, there is merit in the suggestion that research should be under taken into the wide application of low voltage DC. Mindful of this Scottish Power have proposed a low voltage DC project in Wales and are presently seeking funding. We are supportive of their bid.
"But don't know how safe SF_6 is, or the extent of leaks annually, or the impact of relative to CO2 emissions. Difficult to put SF_6 in context or benchmark it"	A. If an issue is detected with SF_6 switch gear, investigation and necessary action are taken immediately. There is a requirement to report the volume of SF_6 used annually. To maintain the equipment which uses SF_6 as an insulation medium it is necessary to drain the SF_6 undertake the maintenance and refill with new SF_6. This accounts for the bulk of new SF_6 purchased annually, the old SF_6 is removed from site and reprocessed.
"Your survey response questionnaire assumes a 'one design fits all' approach in relation to Landscape and Visual Impact replies. What may be appropriate visually in the centre of Chester may not fit a hillside in rural Wales - and each may be more visually in appropriate due to appearing out of context. Colour, height and access are equally as important and here a range of options may be better."	A. The MASC solutions aim is to develop a standardised electrical solution regarding system architecture, protection and control philosophies. The external finish aims to be flexible to meet the needs of the location.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
It was suggested that SHE Transmission secure DNO cooperation (towards MASC) at the highest level i.e. CEO. It was recognised that there would be a cost to each DNO becoming involved in discussions/deliberations around this. However, it was also considered important that all parties hear, understand and appreciate each other's views, however different they may be.	A/M. There is merit in progress further support for the MASC project.
Standardisation needs to balance cost savings from standardising the design against a potential loss of innovation from suppliers.	A. Innovation is wider then products alone, it may be working more efficiently and timely. Standardising will hopefully bring about improved efficiencies in time.
Costs could potentially be higher and associated higher risk for the first time deployment, though these should diminish over time.	A. Correct there is a cost associated with first time endeavours. In essence MASC is taking the electrical equipment that would be placed together on-site and preforming this element in the factory, therefore the associated risks should be identical if not reduced. MASC does introduce a new set of risks the majority will be mitigated through the normal project process. The NIC funding is specifically aimed at validating the elements which have not been used by SHE Transmission, therefore lowering the associated risks.
Commercial acumen of commissioners will need to be improved if they make the switch to factory-assembly	A/M. Agreed that commissioners need to be investigated to identify the optimum solution.
We'd need to more pro-actively build on relationships with existing suppliers. Perhaps we could also be more engaged about safety and could implement greater visibility and risk management; a programme of continuous feedback would give us this.	M. Sharing the learning especial safety is a high priority.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
"Increased traffic bringing in modules – including the use of wide loaders. Less local jobs."	A. At the time the MASC substation is installed there may be less local job creation then the alternative substation solutions. However developing MASC in the long run aims to be beneficial to the whole community via costs efficiencies in electricity prices.
"The Survey only looks at the MASC from the benefits points of view and does not take into account any negatives. We have been using packaged substations in distribution for some years now and to try and adopt this principle to a transmission substation is unrealistic. If those behind this concept had any understanding or knowledge of how substations are built they would know that much of what you are trying to eliminate that being the civil /groundwork for a new substation would still need to be completed for MASC project. It is the civil/groundwork that causes the most disruption to local community and environment not the actual substation equipment. Finally if we continue to build substations in the most difficult areas to access where we cause upheaval to locals and struggle to transport supergrid transformers along 20 miles of single track roads then what chance have you of transporting a whole substation"	A. There will always be negatives with projects, which need to be weighed up against the positives. An element of civil work will be required and the beauty of the MASC solution is the electrical fit-out can occur within the factory as the civil works are occurring on-site, saving time when the equipment arrives on-site.
Non UK manufacturers resisting UK standards requirements (as well as a need for UK clients to embrace international standards).	A/M. Agreed investigation is necessary to understand how other countries operate their equipment.
Careful risk management and responsible sourcing of parts would give us some reassurance. Little items could affect the module as much as the larger parts.	M. As the design progresses the different parts to the solution will be evaluated.
In relation to commissioning, the question was raised, "Do you need to commission twice (i.e. in the factory and on-site)? The primary concern was for safety however there was an awareness of the potentially additional cost and time of commissioning in both locations	M. The aim is to investigate further the commissioning requirements and discuss the options to identify if there is a solution that negates the need for future duplication in commissioning.

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"More economical use of materials and resources"	M. Agreed and to progress this to the next level culture and process need to also be reviewed to improve the use of materials and resources.
Write operational procedures on back of standards	M. Sound advice which needs to be investigated to bring about maximum efficiencies from the MASC solution.
Pre-commissioning training and seminars will have to be highly effective for buyers to really understand what they are purchasing by way of modularisation. It will be essential to agree and establish a robust commercial framework.	M. This needs to be included as part of the knowledge dissemination plan.
Greater transparency over contracting and quality expectations	M. Included in the knowledge dissemination plan.
A need to be cognisant of trends in relation to the growth in renewables	A. Agreed that renewable growth as well as decline may affect MASC. Hence one of the MASC aspirations to align the useable equipment life with that of a renewable generation plant.
Need to consider the compatibility (or potential compatibility) of any proposed designs or MASC construction proposals with Ofgem incentives.	A. Agreed that Ofgem incentives drive ideas but also SHE Transmission are very customer focused and were possible will meet the preferences of the community.
A modular pilot is being undertaken by Northern Power Grid maintaining this link would increase learning and share knowledge to meet regulatory requirements for greater collaboration on modular approaches.	A. Agreed this is an important link to maintain.
Different voltage levels may actually be more challenging and you may need to include space for spares, especially things that need to be replaced more often such as breakers. This may need to be considered in terms of space saving/operating in constrained spaces.	A/M. Important to look into high voltage levels and the potential MASC can offer.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
There is the significant challenge of changing existing culture around standards to one which will embrace MASC. Identify those issues which need to be challenged (e.g. do we need to have the same onsite commissioning as before etc).	M. Agreed, understanding todays culture will play a significant role in identifying how best to accommodate MASC.
Who will be responsible for maintaining it?	A. SHE Transmission maintains the substations they own today. However based on the MASC solution and options the manufacturer is prepared to offer maintenance may be bought as a service.
May call for a culture change in terms of the use of new equipment, safety standards and procedures	A. Correct there will be a change required in today's culture to maximise on the efficiencies MASC has to offer. Equipment may be used for the first time on the UK system but it will have a significant record of use in other countries. Looking at those countries safe systems of work and procedures will help with the identification of the changes that need to be evaluated and risk assessed against today processes.
Before certain key items of equipment are opened for investigation, operations staff currently "walk around it" to check that there are no hazards/impediments to proceeding. The question was raised, with this practice of 'walking around' still be operated in our modular context?	M. Yes the equipment will be centralized in the container and 360 degree access will be possible.

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Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
Opportunity to promote awareness that MASC will have challenges but will be safety compliant. An opportunity to challenge existing policies (e.g. distance between circuit breakers and disconnectors if hybrid switch gear is used). Not changing culture from 'safe to unsafe' but from one process to another process. Significant challenge for MASC will be to challenge safety standards and policies with a clear vision for the whole of the UK required.	A/M. Agree that MASC will be a challenge to safety standards. Discussion and information will be shared with key safety and operational personnel to develop a solution and mitigate the challenges.
Challenge will be to change 'hearts and minds' to realise the benefits of offsite construction	M. Agree, information needs to be shared about the progress of the MASC transit through the factory build and the efficiencies highlighted.
Trust in suppliers takes a long-time to build.	M. Agree. The positive step is engaging with the suppliers on the MASC solution to gain more confidence in the solution they are offering.
There are considerations around contracting third parties and a belief that these relationships will be made more difficult to generate and/or manage if more risks are passed onto them via more transparent contracting.	M. Initially the MASC solution will be contracted to a single manufacturer. However with a more in-depth understanding of the product then it will be possible to consider how best to procure subsequent MASC solutions. It is possible that contracting with third parties is an options, information to support this should also identify improvements in the contracting process which would enable this to happen.
"There are clear implications for increased risk when it comes to ownership of staff and ownership/accountability of subcontractors. Third parties are usually a black hole due to the loss of control on good practice. Big risk".	M. If third parties are identified as an option to procure a subsequent MASC solution, then it will be necessary to identify how good practice will be promoted.

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Stakeholders concerns addressed

Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
It was accepted that there was an inherent risk to safety with the use of any new equipment. In this respect, the modular equipment, compared with traditional build equipment, was "new", it was unfamiliar. However, it was considered that appropriate training would be given and any such risk could be minimal.	A. The MASC solution does not intend to introduce new equipment that has no record of use on an electrical system. At present the electrical kit is sent to site in a number of boxes and requires skilled labour at the location to build the equipment into usable units. With MASC the build of the equipment will happen in a factory location and then the unit will be transported to site. The associated risks with the MASC solution are believed to be much less than the conventional approach.
The most serious accidents are potentially linked to moving large bits of units around so risks are mainly eliminated for this in terms of safety.	A/M. The transportation and installation methods need to be assessed and mitigation measure put in place to correctly manage this phase of the MASC project.
Acknowledged that safety clearances may require two sets of rules: (i) standards rules for traditional substations; and, (ii) new rules for modular (i.e. if modular these rules as well). Acknowledged that anyone can learn the rules but '…when to use and apply each set will be difficult'.	M. Training will be given if there are changes in the safety rules. In addition where safety rules are changed they will be risk assessed and the recommend mitigation measure implemented.
Regarding increased choice in visual design options "...need for them [SHE Transmission] to make the effort to engage with planners"	M. Agreed the options should be discussed with the planners.
There needs to be improved coordination between the transmission and distribution functions ('all crazy…don't know what's happening 5 miles away from them') and acknowledgement that this will be very challenging but there needs to be 'a thought process' nevertheless	M. Accepted that coordination between transmission and distribution organisations appears to be limited; there are significant challenges as to the openness allowed. As we know the MASC solution is also very applicable to the distribution organisations. Proactive engagement will occur to disseminate the knowledge learnt and share the experiences.

Appendix XIV

Stakeholders concerns addressed

Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
An obstacle might be that investments in future replacements might increase if one small part needs replacing - does it mean that substantive/larger components may need replacing alongside it?	M. Presently it is envisaged that like for like components will be swapped out. But in the future it may be likely that the whole port-a-cabin will be removed. This will minimise the associated down-time but the fault will be fixed and the whole port-a-cabin ready for placement elsewhere on the system. This seeks the most economic solution and optimises assets.
"The manufacturer needs to have the right credentials [and experience] to manufacture these modules to ensure [our, the customer] confidence levels". What additional quality standards / monitoring may be needed?	A. Agreed that the module itself is a new addition, but not part of the electrical operation system. The modules ability to withstand the environment and last the operational lifetime of the MASC solution is important. The manufacturers producing the modules are experts and have many forms of the modules in other industries. It will be necessary to seek out information on the condition after 10, 20 years, as well as reviewing the challenges and identified mitigation levels.
Change management will be critical and will need to involve different training and awareness at different levels to get buy in to the concept.	A/M Agree. Ensure change management is added into the risk assessment table and mitigation identified
Potential to explore the commercial opportunities of making modular substations available to other parties (e.g. developers)	A. Agree. The MASC functional specification will be accessible to developers
Consider the significant limitations associated with a maximum transportation width of 2.5 meters (e.g. this may mean that choice of switch gear is limited).	A/M. The trial location for the MASC and the product the manufacturer is able to provide will determine the transport options. Detailed work will follow to ensure that the module is road transportable.

Appendix XIV

Stakeholders concerns addressed

Challenge Identified by Stakeholder	Answer (A) or Mitigating (M) Action Proposed
It will be important to secure early buy-in from the health and safety community and HSE in relation to the MASC approach	A. Agree. The MASC solution primarily takes well known equipment and builds it up in a factory which is a very controllable environment, the health and safety benefits will be recorded and where necessary specific elements will be discussed with the correct authorities.
"How safe are modular substations. what happens if there is a fire"	A. The electrical equipment will be monitored and at the first signs of the deviation from normal operation the equipment will be isolated. The fire and safety risks are not foreseen as being greater then a standard substation today.
Potential to save money. However, cost saving needs to be proven, not simply anticipated, "there has to be a clear capital connection benefit".	A/M. Proving cost efficiencies will be included in the final stages of the project evaluation. It will be important to undertake some initial estimates based on the manufacturers information and then evaluate once the MASC solution is planted to verify the savings.
Those involved in on-site build also need to understand the factory build process so that they can fully understand the onsite build requirements and potential savings.	A. Agree. It is the intention to have the site people in the factory so they can understand the product that will arrive and the necessary requirements.
Need to look at "whole life costs". Have experienced situations before where reductions in whole life costs were anticipated, but not delivered - indeed, solutions ended up being more expensive.	A/ M. Agree. Assess the whole life cost is essential and planned as part of the later stages of the MASC validation process.
Concern that some people may end up paying too much acquiring more features than they needed	M. It will be essential to look into ways of stimulating future ways of innovation but on a level which is suitable for the MASC solution and delivers the right benefits.
An opportunity to encourage dialogue between different stakeholders (e.g. civil and electrical engineers etc) to explore barriers / hurdles as well as how these can be overcome.	M. As the design progresses there will be opportunities to evaluate the options and identify alternative solutions.