

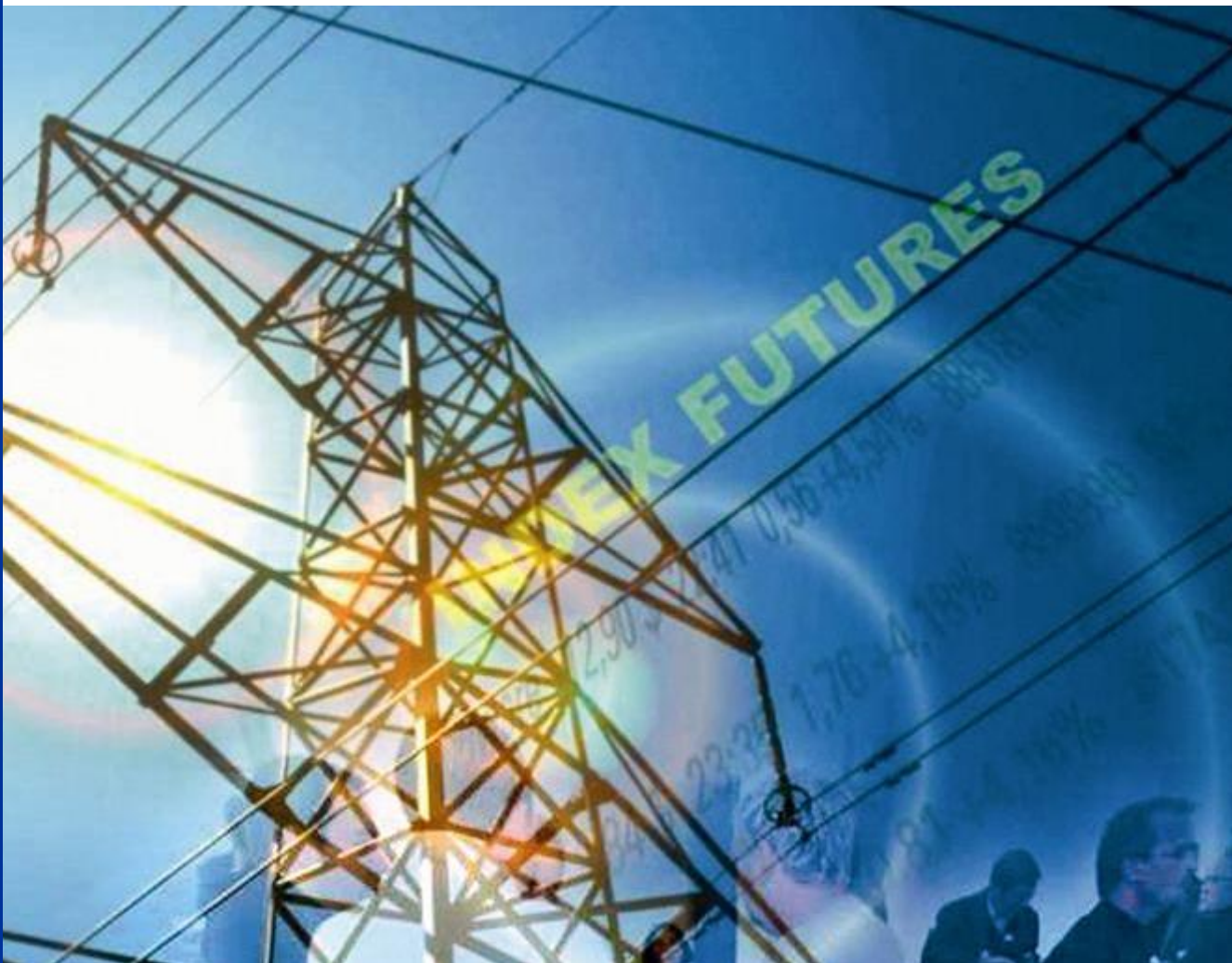


KINTYRE-HUNTERSTON STRATEGIC WIDER WORKS NEEDS CASE ASSESSMENT

A report to Ofgem

March 2013

KINTYRE-HUNTERSTON SWW NEEDS CASE ASSESSMENT



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TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
SHE Transmission’s proposal	5
Pöyry’s assessment of the Needs Case	5
Conclusions	6
Recommendations for SHE Transmission’s future Needs Case submissions	7
1. INTRODUCTION	9
1.1 Background	9
1.2 Structure of this report	9
2. DESCRIPTION OF THE STRATEGIC WIDER WORKS ASSESSMENT PROCESS	11
2.1 Overview of Strategic Wider Works process under RIIO-T1	11
2.2 Assessment of the Needs Case under the SWW process	12
3. OVERVIEW OF THE PROPOSED KINTYRE-HUNTERSTON REINFORCEMENT	15
4. PÖYRY’S ASSESSMENT OF NEEDS CASE	17
4.1 SHE Transmission’s guiding principles	17
4.2 SHE Transmission’s determination of capacity needs	23
4.3 SHE Transmission’s consideration of uncertainties	27
4.4 SHE Transmission’s consideration of alternative options	28
4.5 Summary of assessment findings	30
5. IMPLICATIONS FOR TECHNICAL CASE ASSESSMENT	33
ANNEX A - INCREMENTAL REINFORCEMENT OF SOUTH WEST TRANSMISSION NETWORK	35
ANNEX B – DETERMINATION OF NET BENEFITS AFTER REINFORCEMENT (£M)	37

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EXECUTIVE SUMMARY

SHE Transmission's proposal

Scottish Hydro Electric Transmission plc (SHE Transmission) has put forward the proposed Kintyre-Hunterston reinforcement for assessment by Ofgem under the SWW process implemented as part of the RIIO-T1 price control framework for 2013-2021.

The proposed reinforcement is estimated to be completed by October 2016 at a cost of £266.6m, and comprises:

- a 2 x 220kV 240MVA AC (40km) subsea cable from the Kintyre peninsula to South West Scotland with development of a new 132/220kV substation, including quad boosters, at Crossaig where the cable lands on the Kintyre peninsula;
- a double circuit 132kV (13km) overhead line upgrade to Carradale; and
- a 220kV onshore land cable connection and associated 220kV/132kV works at Hunterston substation.

The onshore Hunterston cable and substation works has been allowed for in the Scottish Power Transmission RIIO-T1 baseline, and therefore will not be subject to the SWW process.

Pöyry's assessment of the Needs Case

The proposed scale of reinforcement has a robust Needs Case based on:

- the renewables developments that already exist, are under construction, or are at an advanced stage of development (e.g. consented) – comprising 454MW of capacity in total; and
- the alleviation of a SQSS derogation for the Kintyre peninsula via creation of a second route to the Main Interconnected Transmission System (MITS), with the Hunterston-Kintyre link up to Crossaig forming part of the MITS.

Moreover, with one exception which is being progressed by Scottish Power Transmission (SPT), all the relevant planning and environmental consents are in place to enable the proposed Kintyre-Hunterston reinforcement to proceed in a timely fashion from summer 2013. We believe that there are limited delay risks posed by manufacture and installation of the two 40km 220kV 240MVA subsea cables, and the supply chain relating to the new substation and overhead line upgrade.

However, given the scale of renewables development activity on the Kintyre peninsula – comprising a total of 1248MW; a key question is:

- Should the proposed reinforcement be bigger – to most cost efficiently accommodate future renewables development on the Kintyre peninsula?

This was assessed by determining whether:

- the proposed reinforcement represents an appropriate scale of investment at this time; or
- it presents inefficiencies via the cost of this reinforcement plus any incremental reinforcements, or an alternative one-off larger scale reinforcement.

In this context, we raised a number of questions regarding the Kintyre-Hunterston Needs Case submission to which SHE Transmission provided responses. The responses

received also include additional cost-benefit analysis (CBA) for incremental levels of additional renewables above SHE Transmission’s Central Case.

All of the SHE Transmission CBA were performed with reference to the proposed reinforcement only. These assessments demonstrate net benefits of the proposed reinforcement that also increase with incremental generation in the Kintyre region. However, the CBA work does not inform about comparative net benefits relative to any alternative design such as consideration of third HVAC cable optionality or a larger single reinforcement.

We believe that a more thorough assessment in the context of higher renewable growth would have investigated higher renewable growth scenarios with alternative reinforcement options of varying capacity. This would have allowed SHE Transmission to robustly justify that the identified Kintyre-Hunterston reinforcement option along with its incremental reinforcement plans is fully appropriate, most efficient and the least regret reinforcement plan to suitably meet potential future renewable development on the Kintyre peninsula.









Nonetheless, based on further information received from our Q&A process with SHE Transmission, Kintyre-Hunterston as part of an incremental pathway is demonstrated to be appropriate. Specifically, the incremental reinforcement options indicated by SHE Transmission to the proposed Kintyre-Hunterston link appear to be suitable and economically efficient to integrate higher renewable generation in the future considering the uncertainty around the actual volume of renewables.

Of these incremental upgrades, it may be appropriate in the context of the current level of renewable development activity on the Kintyre peninsula to consider modifying the proposed Kintyre-Hunterston reinforcement to include optionality for a third HVAC cable in the overall SWW funding. This could either be as part of the current scheme or as a future addition given suitable initial technical scheme design to accommodate this. We suggest investigating this optionality in the Technical Case assessment.

Conclusions

Our assessment of the four key aspects of the Needs Case can be summarised as follows:

Table 1 – Overview of Pöyry assessment

Factor	Guiding Principles	Capacity Need	Uncertainties	Options
Initial assessment				
After Q&A assessment				

In summary, our assessment of the Needs Case of Kintyre-Hunterston reinforcement is described below.

- Guiding principles – we believe that the guiding principles that SHE Transmission has applied are broadly appropriate although there is scope for further refinement. For example, the CBA could have been performed for alternative reinforcement options.
- Capacity Need – based on our Q&A and assessment, Kintyre-Hunterston as part of an incremental pathway is found to be an appropriate first step which, along with incremental reinforcements, would be able to meet the capacity requirement of higher renewable growth in the Kintyre region.
- Uncertainties – SHE Transmission has appropriately examined the merits of their proposed reinforcement option for Hunterston-Kintyre to different uncertainties. However, the CBA has only been applied to their preferred reinforcement option, with no check of sensitivity of the CBA to material changes in capacity need assumptions, especially regarding likelihood of early phase renewables projects to proceed. Given our view on the appropriateness of the link as the first step in an incremental reinforcement pathway identified by SHE Transmission, we are satisfied that consideration of uncertainties is acceptable but not comprehensive.
- Options – SHE Transmission have demonstrated a suitable assessment of potential alternative reinforcement options for the determined capacity need and have considered options delivering greater capacity versus incremental development pathways of which their proposed reinforcement would be Step 1.

Recommendations for SHE Transmission’s future Needs Case submissions

Based on our Needs Case assessment for Kintyre-Hunterston, and its outcome as characterised in Table 1, we believe it is helpful to identify the following three aspects:

- to consult and confirm the capacity needs and the uncertainties involved in the expected generation volumes with key relevant stakeholder(s) at the time of Need Case formulation and submission;
- to consider and evaluate reinforcement options for providing capacity materially higher than the Central scenario e.g. to assess merits of higher capacity anticipatory investment options; and
- to expand CBA assessment beyond the preferred option and include CBA of different reinforcement options against different generation scenarios – and to test the sensitivity of results to changes in assumptions.

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1. INTRODUCTION

1.1 Background

As part of the RIIO-T1 price control, to take effect from 1 April 2013, Ofgem is including a provision for within-control period determinations on revenue adjustments (during the price control period) to enable delivery of Strategic Wider Works (SWW) outputs.

The SWW mechanism will include provisions within the licence to make future adjustments to revenues to reflect any decisions taken by the Authority to allow cost recovery for eligible projects which meet certain criteria and do not form part of the RIIO-T1 baseline.

To put forward a project for consideration under the SWW mechanism, the relevant Transmission Owner (TO) must provide a Needs Case submission followed by a technical case submission. The TO decides when to submit the proposals on the basis of when they believe they are able to justify the economic and technical case for delivering a project on a given timescale.

SHE Transmission has put forward the proposed Kintyre-Hunterston reinforcement for assessment by Ofgem under the SWW process – consisting of both a Needs Case submission and a Technical Case submission.

Ofgem has commissioned Pöyry to undertake an independent expert assessment of both the Needs Case and Technical case for the proposed Kintyre-Hunterston project. This is to inform its determination of the requirement, timing and level of funding for the project.

This concise report provides Pöyry's assessment of the Needs Case only for SHE Transmission's proposed Kintyre-Hunterston reinforcement project under the SWW process.

1.2 Structure of this report

This concise report assessing the Needs Case for the proposed Kintyre-Hunterston reinforcement is structured as follows:

- Section 2: Overview of the Strategic Wider Works process;
- Section 3: Overview of the proposed Kintyre-Hunterston reinforcement;
- Section 4: Pöyry's assessment of the Needs Case; and
- Section 5: Implications for the Technical Case assessment.

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2. DESCRIPTION OF THE STRATEGIC WIDER WORKS ASSESSMENT PROCESS

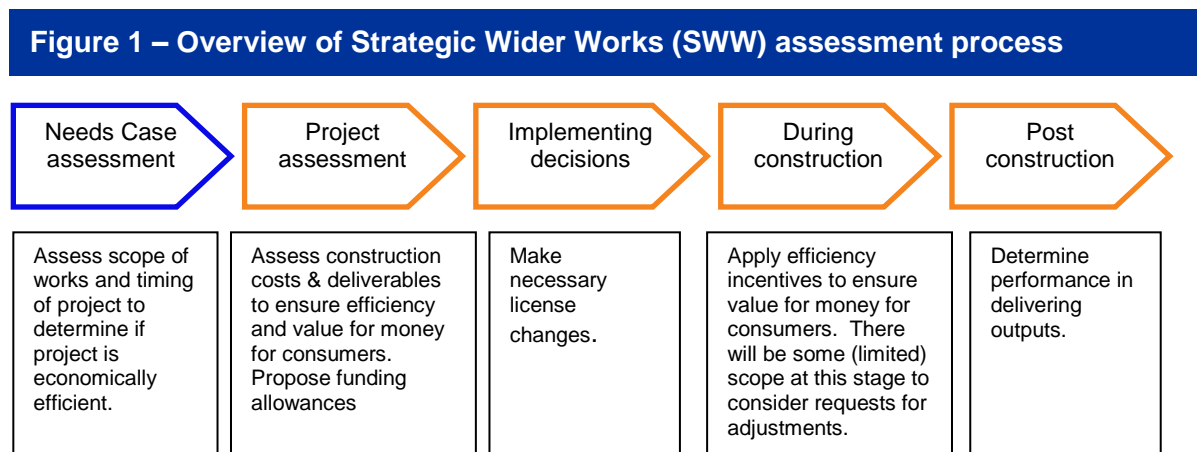
2.1 Overview of Strategic Wider Works process under RIIO-T1

The Strategic Wider Works process for RIIO-T1 has been adopted to enable the onshore TOs to put forward major wider reinforcement schemes (in cost and/or scale terms):

- linked to anticipatory investment for typically meeting renewable generation developments; and
- subject to uncertainty of need, timing and scale – at the time of the RIIO-T1 settlement at least.

Details of the Strategic Wider Works (SWW) arrangements, as they will apply to SHE Transmission, are set out in Appendix 2, “Guidance on Strategic Wider Works Arrangements”¹.

The stages in the overall SWW process are outlined in Figure 1 and discussed below.



The assessment leading to a decision on cost recovery is in two stages:

- the first stage is a Needs Case assessment, commencing following receipt of the Needs Case submission; and
- the second stage is a project assessment, commencing following receipt of the Technical Case submission.

The above assessment stages are interactive and are likely to overlap:

- the review of the Technical Case submission may be an input to the conclusion of the Needs Case assessment (e.g. by providing input assumptions, based on latest cost estimates, for updating or testing quantitative analysis, and further information on delivery strategy and practical factors driving the proposed timing); and

¹ Ofgem, RIIO-T1: Final Proposals for SP Transmission Ltd and Scottish Hydro Electric Transmission Ltd – Supporting Document, 23rd April 2012.

- completion of the full project assessment is subject to a positive conclusion from the Needs Case assessment.

Where, following the above assessment, the Authority reaches a decision to allow cost recovery, Ofgem will take forward the necessary licence changes to reflect that decision. This will include specification of ex-ante total expenditure (totex) funding allowances (with annual profile), secondary deliverables, and completion date for the SWW project.

During construction, Ofgem will monitor progress towards outputs, and expenditure against profiled allowances. The risk of differences between allowances and expenditure will be shared between the TO and consumers through the efficiency incentive mechanism, with a sharing factor (50% in SHE Transmission's case) determining the proportion of this difference which is borne by the TO. In addition, the Cost and Outputs Adjusting Event (COAE) mechanism will provide scope for ex-post adjustments in certain circumstances. The COAE mechanism will only apply to material changes attributable to a single prescribed event. Further details of the material changes and prescribed events relevant in SHE Transmission's case are set out in the guidance document referred to above.

Finally, post construction, Ofgem will determine performance in delivery of outputs. This will include establishing whether and when the agreed increase in boundary capability had been delivered and where applicable, understand the reasons for any failure to deliver in line with agreed outputs, and the extent to which the TO could be held responsible for this. Ofgem may address late delivery through the imposition of a financial penalty, which would be set taking into account the level of consumer detriment and any aggravating or mitigating actions taken by the TO.

2.2 Assessment of the Needs Case under the SWW process

The assessment in this report provides an input to Ofgem's Needs Case assessment under the SWW process (the first stage shown in Figure 1). The key objectives are to determine whether there is a demonstrable need for the reinforcement in the timescale proposed by the TO, and whether the proposed scope of works is appropriate. Namely:

- Fundamental guiding principles of SHE Transmission's strategy for Argyll & Kintyre, e.g. in relation to the role of:
 - deterministic planning criteria of the Security and Quality of Supply Standard (SQSS) with the consideration of cost-benefit analysis;
 - optimisation against a range of scenarios versus keeping options open for an uncertain future (e.g. through anticipatory investment); and
 - relevant factors (e.g. supply chain considerations and planning issues) not captured in the quantitative analysis.
- Assumptions underlying the determination of the need for transmission capacity; including current levels of generation, user commitment for future connections and access to the transmission network, current and future levels of demand, and constraints volumes and costs.
- Range of uncertainties taken into account when evaluating the long term need for transmission capacity, and when optimising the scope of the planned reinforcement works (including any anticipatory investment) and the timing of delivery. This includes assessment of whether the input assumptions used in quantitative analysis capture an appropriate range of assumptions for the purpose of testing the needs case and optimising timing.

- Adequacy of considering alternative investment options and/or operational measures to accommodate the same need.

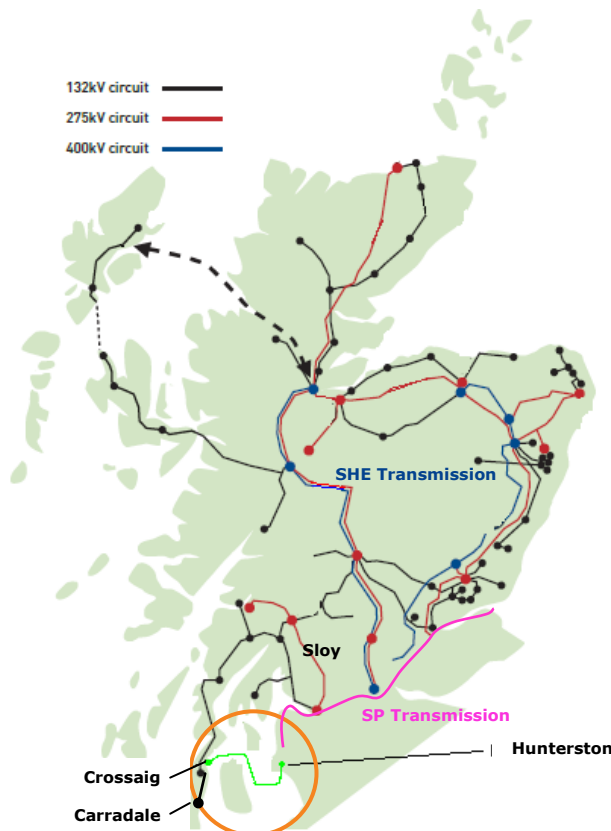
Under the principles of the RIIO framework, the depth of Ofgem's and Pöyry's supporting review of the above assessment areas is undertaken proportionate to the perceived quality of the Needs Case submission and the level of justification provided by SHE Transmission, including relevant supporting evidence.

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3. OVERVIEW OF THE PROPOSED KINTYRE-HUNTERSTON REINFORCEMENT

SHE Transmission states that the project to reinforce the transmission system in Kintyre is driven, primarily, by the need to relieve the growing pressure on the local network, and to support the growth of renewable generation in the region. The proposed reinforcement is illustrated and described in Figure 2 below:

Figure 2 – Overview of Kintyre-Hunterston link



The proposed reinforcement comprises:

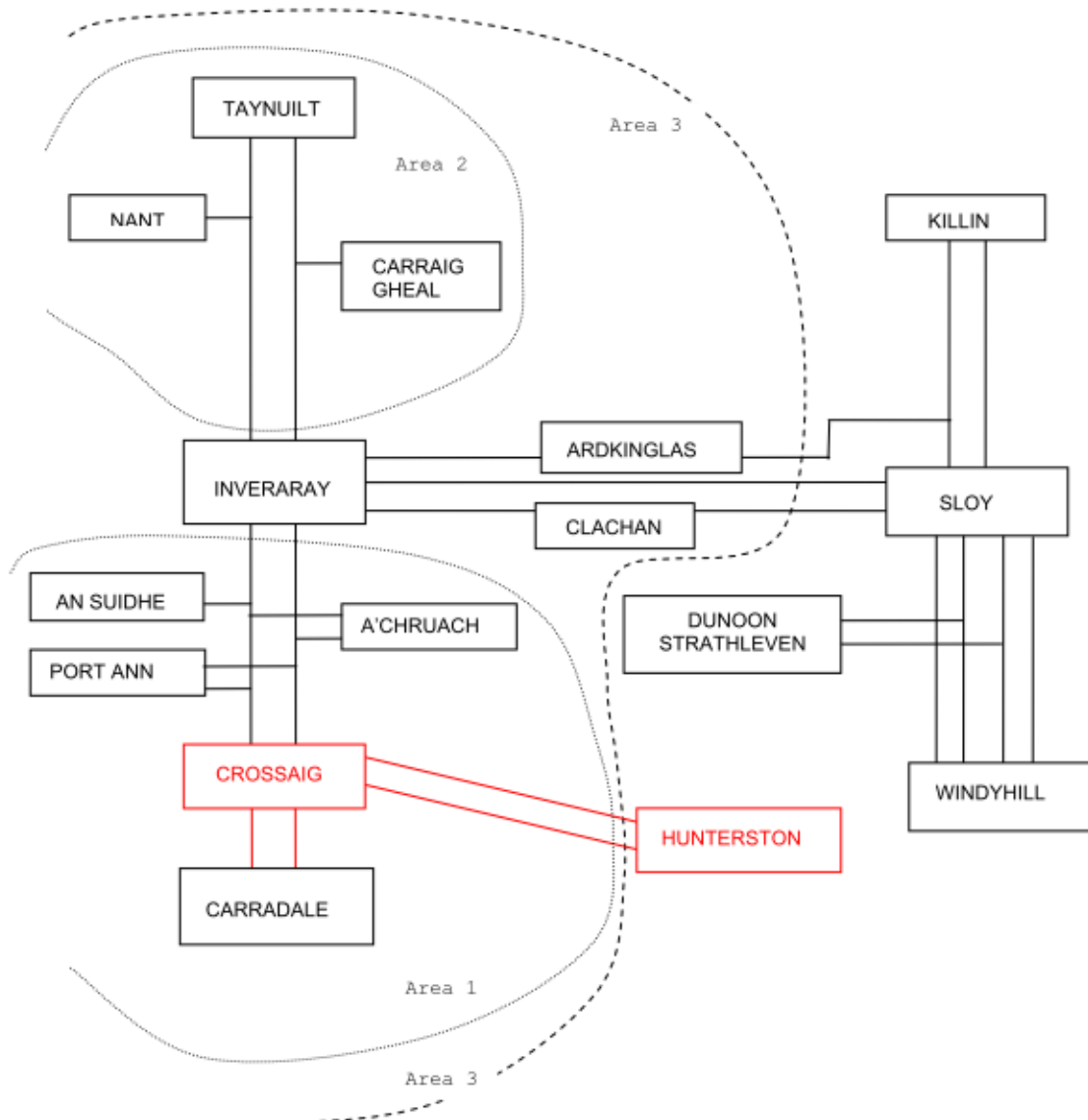
- 2 x 220kV 240MVA AC (40km) subsea cables from Crossaig to SP Transmission’s existing substation at Hunterston;
- a new 132/220kV substation, including Quad Boosters, at Crossaig;
- construction of 13km of new 132kV double circuit overhead line between Crossaig and Carradale;
- the dismantling of the existing 132kV overhead line between Crossaig and Carradale; and
- incurs a Present Value (PV) capex of £266.6m with a project completion date of October 2016.

Source: Kintyre-Hunterston reinforcement, stakeholder’s summary.

The project is largely located in SHE Transmission’s licensed area, but 3.5km of land cable and associated substation works (132/220kV transformer and associated switchgear) are located in SPT’s licensed area at Hunterston. SPT will be completing the required works in their licensed area. The SPT share of the works has been allowed in their RIIO-T1 baseline, and therefore will not be subject to the SWW process. It is not specifically included within the scope of the SWW assessment by Pöyry. The PV given in Figure 2 includes costs for SPT’s works at Hunterston.

An electrical circuit diagram of the Argyll & Kintyre region of the Scottish transmission network and the proposed Kintyre-Hunterston reinforcement scheme is provided in Figure 3 below:

Figure 3 – Electrical diagram of the transmission network in the Kintyre region and the proposed reinforcement



Notes:

- (i) The diagram also shows local network boundaries against which network capacity to export from Kintyre to the wider transmission network would apply
- (ii) Both Windyhill and Hunterston lie within the SPTnetwork region. This is the network within the SHE transmission area.

Source: SHE Transmission Needs Case Report, Kintyre to Hunterston Transmission Reinforcement, 8th January 2013.

It is worth highlighting that even after commissioning of the proposed Kintyre-Hunterston reinforcement, a minor boundary constraint exists for transfer of power across the Area 1 boundary in Figure 3. The geographic location of future renewables development on the Kintyre peninsula influences the increase in export capacity that can be provided by the proposed Kintyre-Hunterston reinforcement. The boundary constraint could potentially reduce network capacity increase by as much as 50MW from a maximum potential of c.600MW.

4. PÖYRY'S ASSESSMENT OF NEEDS CASE

Our assessment of the Needs Case for SHE Transmission's proposed Kintyre-Hunterston reinforcement addresses the following assessment areas:

- Fundamental guiding principles of SHE Transmission's strategy for Argyll & Kintyre.
- Assumptions underlying the determination of the need for transmission capacity.
- Range of uncertainties taken into account when evaluating the long term need for transmission capacity, and when optimising the scope of the planned reinforcement works (including any anticipatory investment) and the timing of delivery.
- Adequacy of considering alternative investment options and/or operational measures to accommodate the same need.

These are described in further detail in Section 2.2. We address each of these in the following sections before presenting a summary of our assessment of the Needs Case for SHE Transmission's proposed Kintyre-Hunterston reinforcement.

4.1 SHE Transmission's guiding principles

Ofgem asked us to assess the guiding principles that SHE Transmission has applied in compiling their Needs Case for the proposed Kintyre-Hunterston reinforcement covering three aspects:

- Use of the deterministic Security and Quality of Supply Standards (SQSS) with the consideration of a CBA.
- Optimisation of the proposed reinforcement against future scenarios.
- Other relevant factors i.e. consenting and supply chain considerations.

Each of these is addressed in the following sections.

4.1.1 SHE Transmission's use of SQSS with CBA

In the Needs Case submission SHE Transmission describe the methodology for determination of the required capability of the transmission system. This should secure demand and allow generation to access the energy market by applying the criteria within the National Electricity Transmission System (NETS) SQSS. SHE Transmission demonstrated that they have considered the potential reinforcement options for facilitating the development of renewable generation on the Kintyre peninsula under the standard deterministic SQSS technical assessment. Specific SQSS criteria applied was:

- SQSS Section 2 Criteria for local transmission system;
- SQSS Section 3 Criteria for demand; and
- SQSS Section 4 Economic and Security Criteria for the MITS.

The above criteria were adequately covered in the technical assessment of the required capability of the transmission network. This was followed by an economic assessment (CBA based) of the balance between operational costs and investment in the transmission infrastructure.

Capital cost, consenting and environmental issues, and delivery timing of each of the alternative options were compared, and a preferred reinforcement option, linking Kintyre to Hunterston, was identified.

SHE Transmission has demonstrated the merits of this preferred reinforcement option with the CBA. However, the applied CBA did not include other options which would meet a higher capacity need.

It is our view that a comparative CBA assessment of alternative options would have further assured the right selection of the preferred option. However, based on the further information provided by SHE Transmission regarding; the cost of alternative options (including those meeting higher capacity needs overtime) and the delivery timings of these options, our view is that the proposed Kintyre-Hunterston reinforcement is the more economically suitable of the options considered. Details of alternative options as provided by SHE Transmission are reproduced in Annex A. Section 4.4 gives further details of our assessment of alternative reinforcement options.

4.1.1.1 A minor non-compliance of NETS SQSS

SHE Transmission highlight in the Kintyre-Hunterston transmission reinforcement Needs Case submission that even after the proposed reinforcement has been completed there is a minor non-compliance with the NETS SQSS. This is in relation to the Section 2 criteria under a pre-fault outage of one transmission circuit followed by a fault on another transmission circuit.

Under this scenario with a pre-fault outage of one subsea cable followed by a fault on the other subsea cable there will be insufficient capacity on the remaining existing 132kV transmission lines to accommodate all the generation connected south of Inveraray. However, SHE Transmission's view is that this is a low probability event and would not be expected to give rise to any significant operational constraints on the network. Therefore SHE Transmission propose that an intertrip would be installed to protect the infrastructure in the unlikely event of this situation occurring. They also indicate that the investment option required to remove this minor non-compliance would be to rebuild the 132kV overhead lines between Crossaig and Inveraray. This could not be economically justified to remove such a minor non-compliance.

Our view is that this is a reasonable approach given the positive aspects of the proposed scheme and the unreasonably high cost that would be required to remove the residual minor, low probability non-compliance.

4.1.2 SHE Transmission's optimisation against future scenarios

SHE Transmission has demonstrated that given a capacity need of 624MW, and taking into account the assumed likelihood of potentially lower or higher capacity requirements, the proposed Kintyre-Hunterston reinforcement option is the optimal reinforcement option.

Whilst SHE Transmission initially indicated that "Several scenarios were carried out on the generation background to examine the impact on the cost benefit case and therefore to test the robustness of the project", they also indicated that "The technical assessment against the NETS SQSS used the connected and contracted generation only."

The second tranche of SHE Transmission's responses we received also included additional CBA for incremental levels of additional renewables ranging from 150MW to 600MW over and above 624MW. However, technical assessment against the NETS SQSS for these incremental levels was not provided.

The CBA were performed with reference to the proposed reinforcement only and demonstrate net benefits, which increases with incremental generation in the Kintyre region. Annex B summarises CBA results provided by SHE Transmission. However, the

CBA does not inform about comparative net benefits in relation to any alternative design e.g. consideration of a third HVAC cable optionality as a part of the current design, or as an additional project at a later stage.

Pöyry requested that SHE Transmission identify the development paths of potential further reinforcements should the generation exceed contracted levels (several potential generation scenarios were defined), addressing the pathway of (i) capacity delivered, (ii) cost per increment, (iii) delivery period, (iv) delivery date, and (v) challenges for delivery and could include a single incremental development pathway or different options depending on the pace of renewables development beyond contracted levels. In response, SHE Transmission has provided information (shown in Annex A) on reinforcement development paths to accommodate substantially higher generation in the future. The two alternative single projects to accommodate higher capacity are not attractive due to their late delivery time (post 2022) and consenting risks. One of these options – a twin HVDC link between Crossaig and Hunterston 2x480MW - is also significantly more expensive.

In their overall response SHE Transmission has provided information that suggests on costs and deliverability grounds there may only be one viable alternative to the currently proposed reinforcement options. This would be to add a third HVAC cable link between Crossaig and Hunterston; either as part of the current scheme, or as a future addition given suitable initial technical scheme design to accommodate this. As shown in their incremental pathways (option 2, Annex A) in addition to this third HVAC subsea cable, rebuilding of existing OHL between Inveraray and Crossaig with new double circuit heavy duty 132kV would enable integration of 200MW of additional renewable generation in the Kintyre area. However, the technical merits as well as CBA assessment of such a scheme has not been provided.

It is our opinion that the assumed generation volumes used by SHE Transmission are slightly conservative and it is possible that higher levels of generation will be realised. This is dependent on the developing Argyll & Bute Council view on the location of proposed wind farms (i.e. clustering and visual impact concerns), and the impact of cessation of government subsidies after 2020.

However, based on our overall assessment, Kintyre-Hunterston as part of an incremental pathway is found to be an appropriate first step, which with future incremental reinforcements would be able to meet the capacity requirement of higher renewable growth in the Kintyre region.

4.1.3 SHE Transmission's consideration of other relevant factors

There are two other relevant factors we have looked for in SHE Transmission's Needs Case submission, specifically; consenting status and, supply chain considerations. Our assessment of each of these factors is briefly discussed below:

4.1.3.1 Transmissionplant consenting status

SHE Transmission has indicated that consent has been obtained for the subsea cabling route, the new substation at Crossaig and overhead line rebuild. The following planning and consenting documentation has been provided by SHE Transmission to evidence this;

- Substation Town and Country Planning consent (Ref 10/01792/PP) for Crossaig substation.
- Marine Licence consent Licence Number (Ref 04291/12/0) for marine cable installation works.

- Section 37 Overhead Line Consent (Ref 123/10-11) for 132kV OHL from Carradale to Crossaig.

The planning consent for the Crossaig substation states that work must have commenced by 3 years from the date of consent, which is 11th January 2014. This appears to be consistent with the programme provided and sign-off of planning conditions.

SHE Transmission has provided recent correspondence with SPT regarding obtaining planning consent for the transition joint and cabling to Hunterston. SPT has agreed in principle to the proposed boundary change at the transition joint bay, and are managing the associated consenting process.

SHE Transmission and SPT have discussed the importance of alignment and agreement of the Horizontal Direct Drilling (HDD) approach before presentation to Marine Scotland. This should help to minimise consenting timescales.

SHE Transmission has stated that the extent of the works i.e. the horizontal directional drilling for the cable installation and the 220 kV cable jointing, are not deemed as problematic. [REDACTED]

There also appears to be a close engagement between the SHE Transmission and SPT project teams to progress consenting and connection design. Thus, our view is that obtaining planning consent for the transition joint and cabling to Hunterston does not represent a significant risk.

4.1.3.2 Generation consenting status

Generation consents in the region are directly linked to SHE Transmission's proposed network reinforcement, which provides 100-150MW above currently contracted generation. SHE Transmission has applied the following probabilities to non-contracted generation to assess the potential generation volumes likely to connect in the region;

- 50% of submitted generation applications;
- 20% of generation in pre-application or scoping; and
- 10% of generation in pre-scoping stages.

SHE Transmission state that these probabilities are based on an internal subjective assessment. The assessment considers factors such as developers progressing more than one project through the scoping stage, developers then selecting favourable schemes to progress to development, failure to gain planning consent, material delays to consents and wind turbine attrition for individual schemes due to planning conditions.

Based on our experience of planning and consenting of onshore wind in Scotland, we feel that the probabilities used by SHE Transmission are broadly reasonable. Argyll & Bute Council are considered to be generally supportive of wind energy development both from a consenting and political point of view. [REDACTED]

[REDACTED] They have advised SHE Transmission that the "Assumed Probability of Connecting" should be reduced from 50% to 40% (i.e. from 78.7MW to 63.0MW) for the "Not Contracted: Consent Submitted but not yet Determined" category of generation. The net benefits for the Central Case of the CBA would be expected to reduce slightly given this alteration to the probability of connecting, but not materially.

In the Kintyre Hunterston CBA, uniform generation growth has been assumed for non-contracted generation with the total of 623.9MW (reduced to 608.2MW if above mentioned lower probability of connecting is considered) connected by 2020 for the Central Case. Following 2020, no further generation is assumed to connect.

Based on our independent analysis of submitted generation applications and generation in pre-application or scoping to the present date, we have identified a further 207MW that was not present in the SHE Transmission assessment at the end of December 2012. This is likely to be partly due to generation moving through the planning process but also indicates that there is some continuing developer interest in the region. This results in a further 50MW of generation volume based on application of the SHE Transmission probabilities (including reduction of the "Not Contracted: Consent Submitted but not yet Determined" probability to 40%).

The additional generation identified includes a proposed 129MW onshore wind farm in the region which is at the scoping stage. This was not previously identified by SHE Transmission, possibly as it is proceeding through as a Section 36 application and only entered the public domain when it progressed to the formal scoping stage. It should be noted that Section 36 applications benefit from higher planning approval rates than planning applications, and this should be taken into account when projecting future generation levels.

In our experience from initial site identification, it is normal for larger wind energy developments to take between 3 and 5 years (sometimes longer) to progress from inception to construction. As such, it is reasonable to assume that any projects emerging through the planning system now will progress uniformly over the next 7 years.

Whilst it has been widely reported in the media that government subsidies may cease after 2020, this will not necessarily mean no further projects coming forward after this date. Even without subsidy, further schemes (including replacement and extension) are likely to emerge and need connection. There may be a slight acceleration of projects experienced prior to 2020 as developers may feel that they will have more justification and political support before then (in contributing towards National energy targets). However, we would not expect the growth profile to necessarily flatten after 2020 although there will be less certainty. Our view is that the assumption that no further generation connects post-2020 is conservative.

It is our opinion that the assumed generation volumes used by SHE Transmission are slightly conservative and it is possible that higher levels of generation will be realised similar to the sensitivity case of Scenario 3 (central scenario of 624MW + 50MW) in the CBA. However, this will depend on the developing Argyll & Bute Council view on visual impact and proposed wind farm locations.

As mentioned earlier, Kintyre-Hunterston as part of an incremental pathway is an appropriate first step which along with incremental reinforcements would be able to meet the capacity requirement of higher renewable growth in the Kintyre region.

4.1.3.3 Supply chain considerations

A key supply chain risk is obtaining manufacturing slots for High Voltage (HV) subsea cables, which is known to be a major industry bottleneck. SHE Transmission has indicated that the preferred contractor has confirmed that they can meet the required supply delivery date. This should minimise the risk of ability to procure the subsea cable in line with planned construction, installation and commissioning plan.

SHE Transmission and their preferred cable contractor are currently closing out technical and commercial issues. This is due for completion end of May 2013, and the contract will be awarded on the basis of SHE Transmission Board approval and Ofgem minded-to decision. The earliest contract award would be 1st June 2013.

[REDACTED]

[REDACTED]

SHE Transmission has indicated that the Substation contract will be procured under a full turn-key basis with the Framework Contractor responsible for the procurement of key plant items including transformers, quad boosters and reactors. Discussions to close out technical issues and ensure procurement in programme timescales between SHE Transmission and the contractor are ongoing.

Our assessment of supply chain considerations indicates that SHE Transmission has taken reasonable steps to de-risk the supply of subsea cables, other balance of plant and civil works. The approach is consistent with the needs case and proposed works programme.

4.1.4 Summary of our view of SHE Transmission’s guiding principles for assessment

SHE Transmission has applied appropriate guiding principles in relation to determination of the need for the Kintyre-Hunterston reinforcement, although there is a scope for refinement in detailed application. In particular a comparative CBA assessment of alternative options would have further assured the right selection of the preferred option.

Considering potential future growth in renewables there may only be one viable option on costs and deliverability grounds to augment the currently proposed reinforcement option i.e. to add a third HVAC cable either as part of the proposed scheme or as an optional addition. There is a need to perform a net benefit analysis inclusive of such a scheme taking into account the uncertainty surrounding the generation growth.

SHE Transmission has indicated that consent has been obtained for the subsea cabling route, the new substation at Crossaig and overhead line rebuild. Consenting documentation has been provided by SHE Transmission to sufficiently evidence this. Obtaining planning consent for the transition joint and cabling to Hunterston is not identified as a significant risk. SPT is responsible for this element and there appears to be close engagement on this between the respective SHE Transmission and SPT project teams.

Our assessment of supply chain considerations indicates that SHE Transmission has taken reasonable steps to de-risk the supply of subsea cables, other balance of plant and civil works. The approach is consistent with the needs case and proposed works programme.

[REDACTED]

As part of our Needs Case assessment we have further explored the:

- determination of capacity needs;
- consideration of uncertainties; and
- consideration of alternative options.

The details of these assessments are provided in the following sections.

4.2 SHE Transmission’s determination of capacity needs

4.2.1 SHE Transmission’s case for capacity needs

SHE Transmission has justified the proposed Kintyre-Hunterston reinforcement on the basis of 454MW contracted renewable capacity on the Kintyre peninsula, shown below in Table 2.

Table 2 – Operational and other contracted renewables on Kintyre peninsula

Generation Status	MW
Connected and Operational	277.5
Contracted: under Construction or Consented	152.9
Contracted: In Consent Process	24.1
Total	454.5

Source: SHE Transmission Needs Case Report, Kintyre-Hunterston Transmission Reinforcement, 8th January 2013.

SHE transmission indicated in response to an Ofgem written question that “Since April 2012, one large marine development has signed up for 30MW at Carradale” and that otherwise “The status of the contracted generation is up to date as of December last year.” This would change the total operational and other contracted renewables on Kintyre peninsula given in Table 2 to 484.5MW.

It is our view that the proposed Kintyre-Hunterston reinforcement option submitted:

- provides the necessary increase in network capacity to connect the 454MW of contracted generation in the area;
- is the most economic option for meeting the network capacity needs presented by the 454MW of contracted renewables; and
- presents a positive cost benefit case for enabling access of these renewables to the wider interconnected transmission network in Scotland.

However, in their Needs Case submission, SHE Transmission highlights that there is substantial additional renewables activity on the Kintyre peninsula as indicated from discussions with Argyll & Bute Council. In total this would lead to a maximum of 1248MW of renewable generation on the Kintyre peninsula based on current interest. In reality a proportion of those in the earlier stages of discussion/development will fall away and thus a key assumption which is required is what proportion of such developments will do so.

The status of all renewable development activity on the Kintyre peninsula and its treatment by SHETransmission in its CBA of proposed options for the Kintyre-Hunterston reinforcement are shown below in Table 3.

Table 3 – Total current renewable development activity on the Kintyre peninsula and SHE Transmission’s view of likelihood of commissioning

Category	Generation (MW)	Assumed Probability of Connecting (%)	Resulting Generation (MW)
Connected and Operational	277.5	100	277.5
Contracted: under Construction or Consented	152.9	100	152.9
Contracted: In Consent Process	24.1	100	24.1
Not Contracted: Consent submitted but not yet determined	157.4	50	78.7
Not Contracted: Consent in Pre-Application or Scoping with the Argyll and Bute Council	271.3	20	54.3
Not Contracted: Consent in Pre-Scoping with the Argyll and Bute Council	364.7	10	36.5
Total	1248		624

Source: SHE Transmission Needs Case Report, Kintyre to Hunterston Transmission Reinforcement, 8th January 2013

Furthermore, in response to our request for assessment of CBA scenarios with materially greater generation than previously assessed, SHE Transmission performed further CBA assuming progressively increasing generation being connected over the period from 2016 to 2025. These results are summarised in Annex B.

Since all these studies are related to the proposed Kintyre-Hunterston reinforcement only, the benefits would increase as more renewable growth takes place in the Kintyre region. Unfortunately this does not provide guidance on whether a higher capacity reinforcement would have been more beneficial. Hence this introduces an uncertainty to the proposed reinforcement capacity based on economic grounds.

4.2.2 Our view of SHE Transmission’s determination of capacity needs

Table 3 shows SHE Transmission’s cost benefit assessment of the required capacity from the Kintyre-Hunterston reinforcement. This assessment of the most economic options considered that network reinforcement is needed to accommodate up to 624MW of renewables development. This is 50% of total possible renewables development, with 430MW already operational or under construction. This suggests that only 25% (i.e. circa 200MW) of additional proposed renewable generation capacity will proceed.

As mentioned previously, our view is that the assumed generation volumes used by SHE Transmission (as given in Table 3 above) are slightly conservative and it is possible that higher levels of generation will be realised. This would undermine SHE Transmission’s assessment of capacity need in post reinforcement period. However the Kintyre-Hunterston reinforcement, as part of an incremental pathway, is an appropriate first step that along with incremental reinforcements will be able to meet the capacity requirement of higher renewable growth in the Kintyre region.

4.2.2.1 Scale of reinforcement

If SHE Transmission’s assessment of the likelihood of early phase projects is an underestimate then a substantial additional amount of renewable generation would arise. This would exceed the capacity headroom provided by the proposed Kintyre-Hunterston reinforcement.

Furthermore, SHE Transmission also note in their Needs Case submission that “Significant numbers of very small generation developments are being pursued within the South West area. However, the MW volumes are assumed to be small and they have been excluded” from their assessment of capacity needs.

Whilst it is our view that there is a robust needs case for the scale of reinforcement proposed for the Kintyre-Hunterston reinforcement based on the currently contracted generation and level of renewable development activity – the issue is that its capacity would be limited to provide for the potential additional renewables development on the Kintyre peninsula above 624MW.

Indeed, in response to a Pöyry query on this matter, SHE Transmission indicated that “The proposed reinforcement provides additional network capacity over and above that required for current contracted generation. This equates to around an additional 100MW to 150MW of installed wind generation depending on its location”. SHE Transmission also indicated that “Location is important because generation to the north of Crossaig will be restricted by existing OHL (Overhead Line) capability and impact on the balance of flows.”

Thus, the key question is whether the proposed Kintyre-Hunterston reinforcement is large enough and represents an appropriate first step in a cost efficient sequence of incremental investments needed to meet potential future renewable development on the Kintyre peninsula; or is under-sized and presents inefficient investment against an alternative higher capacity reinforcement option.

4.2.2.2 Options to integrate greater than expected renewable generation

Regarding the assessment of optimal capacity of the reinforcement based on our assessment of SHE Transmission’s Needs Case submission, a small number of specific questions were raised by us to SHE Transmission to seek more information on their determination of capacity need and its economic delivery. In their response, SHE Transmission indicates that if generation is greater than expected, incremental reinforcements to the proposed Kintyre-Hunterston reinforcement of South West Transmission Network can be initiated, which include:

- Capacity for non-firm (constrained) generation connection in the first instance.
- A third 220kV, 240MVA subsea cable link between Crossaig and Hunterston. Rebuild existing OHL between Inveraray and Crossaig with new double circuit heavy duty 132kV OHL. This can accommodate an incremental generation of 200MW at an additional estimated cost of £200m with earliest delivery by 2020.
- A new 275kV double circuit OHL on route Inveraray-Windyhill, (bypassing Sloy) with a rating of around 850MVA per circuit, split 132kV network at Crossaig. This can accommodate an incremental generation of 450MW at an additional estimated cost of £180m with earliest delivery by 2023.

Alternatively, single incremental projects would include:

- A new 275kV double circuit OHL on route Crossaig-Windyhill, (bypassing Sloy) with rating around 1450MVA per circuit, with twin Auracaria 700mm² conductor on L12 towers. This can accommodate an incremental generation of 820MW at an additional estimated cost of £450m with earliest delivery by 2024.
- A twin HVDC link between Crossaig and Hunterston 2 x 480MW which would require rebuild of existing OHL between Inveraray and Crossaig with new double circuit heavy duty 132kV OHL. This can accommodate an incremental generation of 350MW at an additional estimated cost of £750m with earliest delivery by 2022.

A number of challenges for each of the above options were indicated by SHE Transmission as given in Annex A. These include; delivery timings, generation disposition, routes through national parks for OHL, consenting issues and costs. The challenges identified were reviewed and are felt to be reasonable given the specific details of each option.

4.2.2.3 Suggested option to integrate greater than expected renewable generation

After review and assessment of the potential alternatives, our view is that SHE Transmission could seek to build a higher capacity reinforcement of a very different design, such as a HVDC link upfront as an alternative to the current proposed Kintyre-Hunterston reinforcement. However, this would probably take significantly longer to deliver thus resulting in higher short-term constraint costs. Thus, the current proposed Kintyre-Hunterston reinforcement supplemented by the incremental network capacity upgrades in the region indicated by SHE Transmission as more generation requires connection, seems to be most appropriate.

Further reinforcements should also be based on a robust CBA. However, based on the level of renewable development activity in the region and reduced constraints costs due to additional transmission transfer capacity, we would expect this to be positive.

Of these incremental upgrades a third HVAC cable would currently be the preferred incremental techno-economic option if more generation arrives. The alternative of upgrading the existing overhead line route to 275kV presents a number of delivery challenges. It seems sensible for the proposed reinforcement design to at least enable a future efficient addition of a third HVAC cable to the currently proposed two cables.

It may be appropriate in the context of the current level of renewable development activity on the Kintyre peninsula to consider expanding the proposed Kintyre-Hunterston reinforcement to include this third HVAC cable in the overall scheme for SWW funding. This is an aspect we suggest to explore further in our subsequent Technical Case assessment for the proposed Kintyre-Hunterston reinforcement.

4.2.2.4 Other capacity needs considerations

In our assessment, we considered SHE Transmission's treatment of a number of other reinforcement capacity needs considerations including;

- demand;
- constraint energy volumes; and
- constraint costs.

SHE Transmission provided evidence to show that in the area of interest, demand is relatively small compared to levels of generation. Demand considerations were not felt by Pöyry to be material as a driver of reinforcement capacity (regardless of any sensitivity on assumed demand levels).

The methodology and results for constraint energy volumes calculated through power system analysis as part of the CBA are reasonable. Also, in our view, the assumptions for constraint costs used in the CBA were reasonable, and, in contrast to generation levels, have undergone a sensitivity test with materially higher values to test the CBA outcome.

Overall, it is in our opinion that these aspects have been appropriately addressed.

Fundamentally thought is our view that determination of the reinforcement capacity needs based on generation assumptions is the key factor regarding selection of the appropriate solution and assessment of its merits.

4.3 SHE Transmission’s consideration of uncertainties

SHE Transmission commissioned SKM to undertake a cost benefit assessment of the proposed transmission reinforcement for Kintyre-Hunterston reinforcement. The CBA considered the balance between the capital expenditure associated with the proposed Kintyre-Hunterston infrastructure works, and the potential savings due to reduced energy constraint costs. Reduced constraints costs resulted from reinforcing the network and creating additional transmission system transfer capacity.

A capacity need of 624MW was used as the central case for the CBA with a sensitivity analysis of alternative levels of generation development to assess the merit of the proposed Kintyre-Hunterston reinforcement.

The CBA clearly shows that the proposed Kintyre-Hunterston reinforcement has a robust CBA case. For example, it highlights that for the central case capacity need of 624MW, capitalised constraint costs prior to reinforcement would amount to £795.3m under base case assumptions. This would reduce to £611.9m under a more conservative view of constraint cost assumptions. This derives a substantial positive cost benefit case as shown in Table 4 below:

Table 4 – SKM CBA for Kintyre-Hunterston reinforcement against central case capacity need

PV Capex (£m)	Base Case		Reinforcement option		Net Benefits (£m)	
	£130/MWh	£100/MWh	£130/MWh	£100/MWh	£130/MWh	£100/MWh
-266.6	795.3	611.8	2.5	1.9	526.2	343.2

Source: SKM, Kintyre-Hunterston 132kV Transmission Network Reinforcement Cost Benefit Analysis, January 2013, provided by SHE Transmission in support of Needs Case submission

SKM examined the sensitivity of these results to:

- different levels of capex cost for delivery of the Kintyre-Hunterston reinforcement;
- different assumed levels for cost of capital; and
- two additional generation scenarios – one lower, one higher than the Central Case.

However, the higher additional generation scenario – Scenario 3 - was very limited in testing robustness to higher levels of generation development. SKM states that it was derived by applying “a marginal increase in probability of the non-contracted generation projects progressing to final connection”, and that this only increased assumed generation development from 623.9MW to 673.8MW. This was in the context of 1247.8MW of overall potential generation excluding very small projects.

Considering the limited range of the sensitivity analysed in Scenario 3 regarding higher renewable generation, we asked SHE Transmission to confirm the impact on the CBA for the proposed Kintyre-Hunterston scheme with higher generation levels than Scenario 3. In response, they provided additional CBA for progressively increasing generation (in increments of 100MW, up to a total of 1274MW) being connected over the period from 2016 to 2025. This assessment (summarised in Annex B) based on the proposed

reinforcement suggests that there are additional net positive benefits with renewable growth higher than the Scenario 3 generation levels.

The CBA assessments did not consider alternative reinforcement options with larger reinforcement capacity capability to meet future materially higher renewables development on the Kintyre peninsula than assumed for SHE Transmission’s central case. Thus, there is no ability to assess the relative merits from a least regret perspective of different reinforcement options for Kintyre-Hunterston. This would have enabled the comparison of delivery of higher upfront network capacity capability vs. alternative incremental development pathways.

The impact of project delays on net benefits due to supply chain constraints or weather issues has not been explored in the CBA, although this is not expected to be significant.

To summarise, the CBA methodology applied to consideration of uncertainties was appropriate apart from the limited range of generation scenarios considered, particularly higher generation scenarios and the lack of consideration for different scheme options (of varying capacity). Other assumptions and sensitivities examined such as for cost of capital and constraint prices were reasonable.

4.3.1 Our view of SHE Transmission’s consideration of uncertainties

Whilst SHE Transmission has appropriately examined the merits of their proposed reinforcement option for Kintyre-Hunterston to different uncertainties, SHE Transmission may have underestimated the likelihood of future generation levels above 624MW. The additional CBA corresponding to higher levels of renewable generation does not explore the comparative merits of any other larger capacity reinforcements versus the proposed reinforcement option, on a least regret cost basis for example. The likely impact of other uncertainties such as constraint price and cost of capital is relatively modest.

4.4 SHE Transmission’s consideration of alternative options

In its Needs Case submission, SHE Transmission identify a number of possible reinforcement options for the South West in relation to the Kintyre peninsula which were considered during the development phase of the Kintyre-Hunterston reinforcement project. These options and their estimated costs² are provided in Table 5 below:

² SHE Transmission indicate that the cost estimates provided in their Needs Case submission as presented in Table 5 above were determined during their internal project design refinement stage (known as Gate 2 to 3), hence they may not match exactly with the accompanying technical funding submission issued to Ofgem as these were prepared at a later stage including project tender prices.

Table 5 – Kintyre-Hunterston reinforcement options considered by SHE Transmission

Option	Description	Cost estimate (£m)	Total cost (£m)
1	Rebuild of existing 132kV line to 275kV construction, from Carradale to Sloy and also the rebuild at 275kV of one of the two existing 132kV circuits between Sloy and Windyhill - a total distance of some 176km. The required construction would be double circuit steel towers with twin 400mm ² ACSR conductor, and substation connection works as necessary to accommodate the higher transmission voltage.	389	389
2a	Construction of a new 132kV substation on Kintyre (suitable site identified at Crossaig) with two separate 132kV, 180MVA subsea cable circuits to the existing Hunterston 132kV substation. Rebuild of the existing 132kV double circuit OHL between Crossaig and Carradale.	207	224
2b	SPT works associated with option 2a	17	
3a	Construction of a new 132kV substation on Kintyre (suitable site identified at Crossaig) with three separate 132kV, 120MVA subsea cable circuits to the existing Hunterston 132kV substation. Rebuild of the existing 132kV double circuit OHL between Crossaig and Carradale.	282	283
3b	SPT works associated with option 3a	21	
4a	Construction of a new 132kV substation on Kintyre (suitable site identified at Crossaig) with two separate 220kV, 240MVA subsea cable circuits to the existing Hunterston 132kV substation. Cable operation at 220kV achieved with step up/step down transformers at both ends. Rebuild of the existing 132kV double circuit OHL between Crossaig and Carradale.	205	227
4b	SPT works associated with option 4a	22	
5a	Construction of a new HVDC converter station at Crossaig on Kintyre, and installation of a twin circuit HVDC link (2 x 240MVA) to a new HVDC converter station established at Hunterston substation. Includes SPT costs of £9M.	572	572
5b	Construction of a new HVDC converter station at Crossaig on Kintyre, and installation of a single circuit HVDC link (480MVA) to a new HVDC converter station established at Hunterston substation. Includes SPT costs of £5M	330	330

Source: SHE Transmission Needs Case Report, Kintyre to Hunterston Transmission Reinforcement, 8th January 2013

Based on their assessment of required capacity – as discussed in Section 4.2 above – SHE Transmission determined that their preferred reinforcement option from Table 5 is Option 4, namely the twin 220kV, 240MVA AC subsea cable design. The rationale for Option 4 was that:

- it provided the required 240MVA capacity per circuit with fewer installation risks;
- the capital was about the same as the smaller capacity 132kV cable options; and
- the other options would have longer delivery times and consenting issues in addition to higher capital.

SHE Transmission indicated that even after the proposed reinforcement has been completed, there is a minor non-compliance with NETS SQSS. This is in relation to the Section 2 criteria under a pre-fault outage of one transmission circuit followed by a fault on another transmission circuit. Complete removal of this non-compliance would be an expensive investment and SHE Transmission has proposed that an intertrip would be installed to protect the infrastructure in the unlikely event such an occurring. This can be further investigated during the technical case assessment.

4.4.1 Our view of SHE Transmission’s consideration of alternative options

Our view is that whilst SHE Transmission has appropriately assessed different reinforcement options and its rationale for its preferred option is sound – this does not

consider capacity need uncertainty. As discussed in Section 4.2, our view is that SHE Transmission may have been overly cautious in their determination of capacity need. They have not suitably considered higher capacity reinforcement(s) for materially higher levels of renewable development suggested by current overall activity.

All Kintyre-Hunterston reinforcement options considered by SHE Transmission as shown in Table 5 relate to a capacity need of 624MW only. Our view is that reinforcements providing a capacity greater than 624MW should also have been investigated with CBA performed as appropriate.

In response to Pöyry’s queries regarding reinforcement options to accommodate higher levels of generation, SHE Transmission provided information regarding two incremental reinforcement pathways. As mentioned earlier in Section 4.2.2.2, these include:

- Third 220kV, 240MVA subsea cable link between Crossaig and Hunterston. Rebuild existing OHL between Inveraray and Crossaig with new double circuit heavy duty 132kV OHL. This can accommodate an incremental generation of 200MW at an additional cost of £200m by 2020.
- A new 275kV double circuit OHL on route Inveraray-Windyhill, (bypassing Sloy) with rating around 850MVA per circuit, split 132kV network at Crossaig. This can accommodate an incremental generation of 450MW at an additional cost of £180m after 2023.







The incremental reinforcement options indicated by SHE Transmission to the proposed Kintyre-Hunterston link appear to be adequate and economically efficient to integrate higher renewable generation in the future. This is appropriate given uncertainty regarding the actual volume of renewables that would need to get connected during post reinforcement period. Challenges and timescales for delivery of alternative options as identified by SHE Transmission are reasonable and align with our experience of supply chain and consenting issues for similar projects.

However, we think that a more thorough assessment in the context of higher renewable growth would have investigated alternative renewable growth scenarios with alternative reinforcement options. This would have ascertained that the identified i.e. proposed option along with its incremental reinforcement plans is fully appropriate, most efficient and least regret reinforcement plan to suitably meet potential future renewable development on the Kintyre peninsula.

4.5 Summary of assessment findings

Our assessment of the four key aspects of the Needs Case can be summarised as follows:

Table 6 – Overview of Pöyry assessment

Factor	Guiding Principles	Capacity Need	Uncertainties	Options
Initial assessment				
After Q&A assessment				

In summary, our assessment of the Needs Case of Kintyre-Hunterston reinforcement is described below.

- Guiding principles – we believe SHE Transmission has applied them appropriately at a high level, although there is scope for refinement in detailed application such as CBA could also have been performed for alternative reinforcement options.
- Capacity Need – based on our Q&A and assessment, Kintyre-Hunterston as part of an incremental pathway is found to be an appropriate first step which along with incremental reinforcements would be able to meet the capacity requirement of higher renewable growth in the Kintyre region.
- Uncertainties – SHE Transmission adopted a suitable approach but only applied it to their preferred reinforcement option with no sensitivity testing of the CBA to material changes in capacity need assumptions; especially regarding likelihood of early phase renewables projects to proceed. Given our view on the appropriateness of the link as the first step in an incremental reinforcement pathway identified by SHE Transmission, we are however satisfied that consideration of uncertainties is acceptable but not comprehensive.
- Options – SHE Transmission have demonstrated a suitable assessment of potential alternative reinforcement options for the determined capacity need and have considered options delivering greater capacity versus incremental development pathways of which their proposed reinforcement would be Step 1.

We believe that a more thorough assessment in the context of higher renewable growth would have investigated alternative renewable growth scenarios with alternative reinforcement options of varying capacity. This would have allowed SHE Transmission to robustly justify that the Kintyre-Hunterston reinforcement option along with its incremental reinforcement plans is fully appropriate, most efficient and the least regret reinforcement plan to suitably meet potential future renewable development on the Kintyre peninsula.

However, Kintyre-Hunterston as part of an incremental pathway is demonstrated to be appropriate. The incremental reinforcement options indicated by SHE Transmission to the proposed Kintyre-Hunterston link appear to be suitable and economically efficient to integrate higher renewable generation in the future.

It may be appropriate in the context of the current level of renewable development activity on the Kintyre peninsula to consider modifying the proposed Kintyre-Hunterston reinforcement to include optionality for a third HVAC cable in the overall SWW funding either as part of the current scheme or as a future addition given suitable initial technical scheme design to accommodate this. We would suggest investigating the assessment of this optionality in the Technical Case assessment.

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5. IMPLICATIONS FOR TECHNICAL CASE ASSESSMENT

The key activities for the Pöyry Technical Case assessment will include;

- review and assessment of the robustness of SHE Transmission's procurement process and likely efficient outcome;
- examination of the appropriateness of the proposed costs;
- review and assessment of the robustness/appropriateness of SHE Transmission's evaluation of and proposed approach to risk; and
- assessment of the appropriateness of the construction programme to meet proposed timescales.

Based on the Pöyry Needs Case assessment, this will also consider:

- optionality of a third HVAC cable to the existing proposed reinforcement configuration in terms of efficient procurement, cost, risk and programme; and
- and design and cost implications if a third HVAC cable is left as a standalone project post proposed reinforcement.

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ANNEX A - INCREMENTAL REINFORCEMENT OF SOUTH WEST TRANSMISSION NETWORK

No	Description	Delivery period (yrs)	Earliest Delivery Date	Incremental Generation accommodated (MW)	Total Generation accommodated (MW)	Estimated Cost (£M)	Comments and Challenges for Delivery
Proposal + Incremental reinforcements							
1	Proposed Kintyre-Hunterston reinforcement.	2	2015	100 to 150	550 to 600	250	Generation that can be accommodated is subject to Generation disposition. All consents secured for delivery in 2015.
2	Install third 220kV, 240MVA subsea cable link between Crossaig and Hunterston. Rebuild existing OHL between Inveraray and Crossaig with new double circuit heavy duty 132kV OHL.	6	2020	200	750 to 800	200	Replacing existing 132kV OHL should be achievable on basis that similar tower heights. A feasible third subsea route has been identified, although conditions less favourable than first two subsea routes.
3	Construct a new 275kV double circuit OHL on route Inveraray-Windyhill, (bypassing Sloy) with rating around 850MVA per circuit, split 132kV network at Crossaig	9+	2023+	450	1250	180	Consenting approx 78km of 275kV OHL very difficult, route passing through National Park. ██████████ SP works may be required at Windyhill. Generation disposition important.
Alternative single project							
1	Construct a new 275kV double circuit OHL on route Crossaig -Windyhill, (bypassing Sloy) with rating around 1450MVA per circuit, with twin Auracaria 700mm ² conductor on L12 towers	10+	2024+	820	1270MW	450	Consenting 176km of 275kV OHL very difficult, very long route passing through Kintyre and National Park. ██████████ SP works may be required at Windyhill.
Alternative single project							
2	Install a twin HVDC link between Crossaig and Hunterston 2*480MW. Would require rebuild of existing OHL between Inveraray and Crossaig with new double circuit heavy duty 132kV OHL to harvest generation.	8+	2022	350	800MW	750	Consenting risk much lower than 275kV alternative. Limited firm capacity but additional non-firm capacity available. Multiple HVDC converters at Hunterston end challenging.

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ANNEX B – DETERMINATION OF NET BENEFITS AFTER REINFORCEMENT (£M)

Generation Scenario	Total Connected Generation (MW)	Capex	Pre-reinforcement Constraint Cost	Post-reinforcement Constraint Cost	Net Benefit
Central Case	623.9	-266.6	795.3	2.5	526.2
Scenario 1 – Connected and Contracted	454	-266.6	266.6	2.1	-2.1
Scenario 2 - Connected/contracted plus 30MW	484	-266.6	326.4	2.1	57.7
Scenario 3 – Central Case Plus 50MW	673.8	-266.6	988.7	5.1	717.0
Scenario 3 + 100MW	773.8	-266.6	1351.1	28.8	1055.7
Scenario 3 + 200MW	873.8	-266.6	1742.4	92.6	1383.2
Scenario 3 + 300MW	973.8	-266.6	2156.7	203.7	1686.5
Scenario 3 + 400MW	1073.8	-266.6	2589.7	374.8	1948.3
Scenario 3 + 500MW	1173.8	-266.6	3037.0	600.6	2169.8
Scenario 3 + 600MW	1273.8	-266.6	3494.0	865.3	2362.2

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