Making a positive difference
for energy consumers

To: Transmission licensees, generators, suppliers, consumer groups and other interested parties

Direct dial: 020 7901 7223
Email: kersti.berge@ofgem.gov.uk

Date: 2 April 2014

Dear colleague,

Consultation on Scottish Hydro Electric Transmission's proposed transmission project between Caithness and Moray in northern Scotland

This letter sets out our initial views on the Needs Case for Scottish Hydro Electric Transmission's (SHE Transmission) proposed transmission project in northern Scotland. The project involves a subsea High Voltage Direct Current (HVDC) cable link between Caithness and Moray to be built by 2018/19 and is estimated to cost £1.3 billion.

We are considering the proposal under the Strategic Wider Works arrangements put in place for the RIIO-T1 price control. We are consulting now on our initial views and welcome your views. Please send these to SWW@ofgem.gov.uk by 28 May 2014. We believe consulting now broadly aligns with SHE Transmission's implementation programme for the project.

Our initial view is that there is a need for a reinforcement of the transmission system in northern Scotland in future. The analysis shows existing transmission capacity is highly likely to be exceeded, with the timing depending on the generation scenario.

However, the case for the proposed subsea cable solution is finely balanced. SHE Transmission has proposed this project on a standalone basis, but its own analysis suggests that consumers would benefit more if it is combined with a further onshore reinforcement to resolve wider system limitations. If viewed in the context of wider system requirements, SHE Transmission's analysis also shows that an alternative combination of onshore reinforcements (one that doesn't involve a subsea cable) could provide even greater benefits to consumers than the proposed solution.

However, the cost-benefit analysis doesn't provide a complete picture. The onshore option, while cheaper, probably could not be completed until eight years after the subsea cable proposal. This might have an impact on meeting 2020 renewable targets and on generator investor confidence, given the amount of new generation planning to connect in the area.

In addition, the timing and cost of the potential onshore options are also more uncertain than the subsea cable proposal. This is because there could be planning consent issues and the design and routing of these options are not worked up in as much detail. As a result

there is a larger degree of uncertainty with the estimated net benefits of the onshore options in SHE Transmission's analysis.

Because of SHE Transmission's procurement timetable, we have decided that now is the right time for us to be consulting on these issues so that all options can be kept on the table. However, SHE Transmission needs to provide us with more evidence in response to this consultation to demonstrate its proposal is in the interests of consumers compared to the other options. This is critical given the finely balanced nature of the assessment.

The remainder of this letter is structured as follows:

- Consultation questions.
- SWW arrangements and our approach to assessing proposals.
- Summary of SHE Transmission's proposed Caithness Moray transmission project and cost-benefit analysis.
- Our consultants' reviews.
- Our initial views on Needs Case for SHE Transmission's proposed transmission project.
- Next steps.

Consultation questions

We are seeking your views on SHE Transmission's proposed Caithness Moray transmission project, our consultants' analysis and our initial views. In particular, we would welcome feedback on these areas:

- Do you consider SHE Transmission's proposed standalone subsea cable project to reinforce the transmission system in northern Scotland is an appropriate option for consumers at this stage? Please explain the reasons behind your views.
- What are your views on the timing and scale of SHE Transmission's proposed subsea link to reinforce the transmission system in the Caithness Moray area?
- What are your views on the future costs of generation constraints in northern Scotland?
- What are your views on the potential wider benefits of SHE Transmission's proposed subsea link? How should wider benefits be measured and evaluated in the Needs Case assessment for a proposed transmission project?
- Do you consider we (and our consultants) have identified the relevant issues to the Needs Case assessment for SHE Transmission's proposal? Are there any other factors you think we should examine in order to inform our views on the proposed reinforcement?
- Do you have any other comments on our intial views set out in this letter?

SWW arrangements and our approach to assessing proposals

Our approach to assessing transmission projects under the SWW arrangements involves an assessment of the Needs Case, followed by a Project Assessment.[1] Our views are also informed by public consultation on each assessment stage.

Our assessment of the Needs Case for a specific proposal focuses on the strategic aspects of the reinforcement and considers whether:

[1] Additional information on the Strategic Wider Works arrangements is available at: https://www.ofgem.gov.uk/publications-and-updates/guidance-strategic-wider-works-arrangements-electricity-transmission-price-control-riio-t1-0

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- there is a demonstrable need and robust case for investment given a credible range of uncertainties, including the potential development of future generation;
- the technical scope of the proposal is appropriate and represents an economical proposal relative to the alternative reinforcement options and the status quo;
- the timing of the investment is appropriate given that there is a satisfactory case for need and that the scope of investment is appropriate; and
- the proposed reinforcement is in the interests of existing and future consumers.

The next stage in our process, the Project Assessment, focuses on the proposed project in greater detail and considers whether:

- the detailed technical design of the proposed reinforcement is fit for purpose;
- the transmission owner has developed a sufficiently robust development plan and risk sharing arrangements to deliver the proposed output efficiently; and
- the costs are efficient.

If we find fundamental issues with the cost efficiency of a project in our detailed Project Assessment the transmission owner may need to redesign or retender its proposal.

When the issues highlighted in a SWW assessment are resolved, we will determine a new SWW output[2] and an adjustment to the transmission owner's allowed expenditure in the RIIO-T1 transmission price control.

Summary of SHE Transmission's proposed Caithness Moray transmission project and cost-benefit analysis

In 2013 SHE Transmission submitted a Needs Case to us for a proposed transmission project to increase the capacity of the transmission system in northern Scotland (specifically to provide additional capacity across transmission system boundaries B0 and B1). The proposed project is estimated to cost £1.3 billion and to be completed in 2018. It comprises:

- A new 275/132kV substation at Spittal, approximately 4km north of Mybster.
- Redevelopment of the Blackhillock substation, including a new 400kV busbar.
- A HVDC cable between Spittal and Blackhillock (160km) comprising a 800MW cable from Spittal to the Caithness coast, then a 1,200MW subsea cable to Blackhillock.
- A new 275kV/132kV substation at Loch Buidhe, at the crossing of the Beauly to Dounreay 275kV and Shin to Brora/Mybster 132kV overhead lines.
- A new 275/132kV substation at Fyrish near the existing Alness 132kV Tee point and moving the existing Alness Grid Supply Point (GSP) to the new substation.
- Replacing the existing conductors on the 275kV circuit between Beauly and the proposed new substation at Loch Buidhe (62km).
- Rebuilding the existing Dounreay–Thurso–Spittal 132kV circuits at 275kV (32km) and a new 275/132kV substation at Thurso South close to the existing Thurso GSP.
- A new 132kV double circuit overhead line between the new substation at Spittal to Mybster (4km).
- A new 132/33kV collector for new wind generation around Mybster.

The proposed subsea link includes anticipatory investment to accommodate a future cable link from Shetland. The main anticipatory element included in the proposal is additional

[2] SWW outputs are defined as increases in transmission system boundary capability or equivalent additional capacity where no boundary exists.

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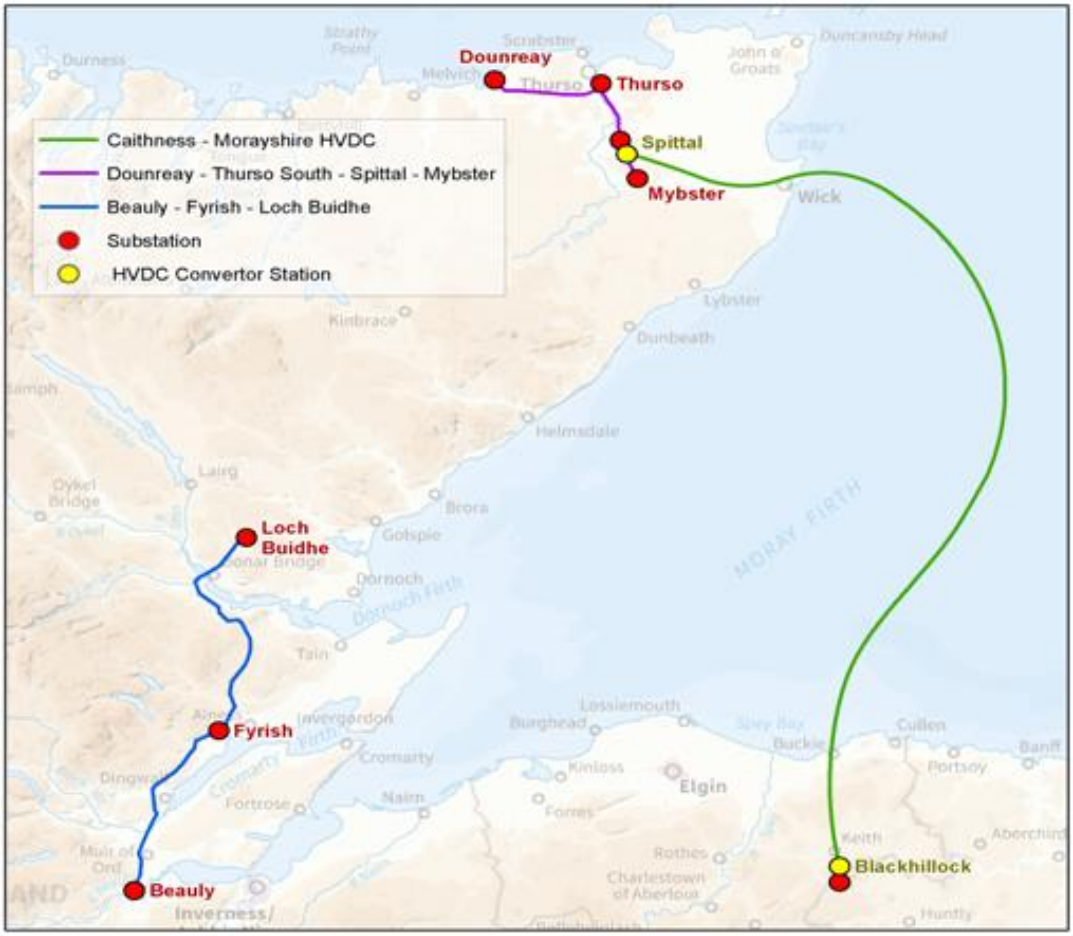
capacity (400MW) in the cable from the Caithness coast to the Blackhillock substation in Morayshire. The proposal does not include the cable link to Shetland.

The proposed project, Option 1a, is depicted in figure 1.

Figure 1: Caithness Moray HVDC link and associated onshore works (Option 1a)



Approach to justifying a proposal is economic and efficient

To inform our assessment we require SHE Transmission to provide supporting evidence that its proposal is an economic, efficient, and coordinated option to meet the future transmission requirements in northern Scotland. This is usually done is by comparing the expected net present values of the proposal and the other feasible reinforcement strategies. The net present value of an option is calculated as difference between the costs (capital and operating) and the benefits of the option (which in this case predominantly accrue from avoiding the costs of constraining generation) discounted to current values.[3]

Table 1 summarises the four reinforcement options examined in SHE Transmission's cost-benefit analysis. Figure 2 depicts the routing and combination of possible reinforcement options.

[3] The net present values are discounted using the Spackman approach which was recommended by the Joint Regulators Group for cost-benefit analysis of public infrastructure projects. The firm's financing costs are taken into account by converting the firm's investment cost into annual payments using the firm's weighted average cost of capital (WACC). The resulting costs and benefit flows are discounted at the Treasury's Social Time Preference Rate (STPR) of 3.5%.

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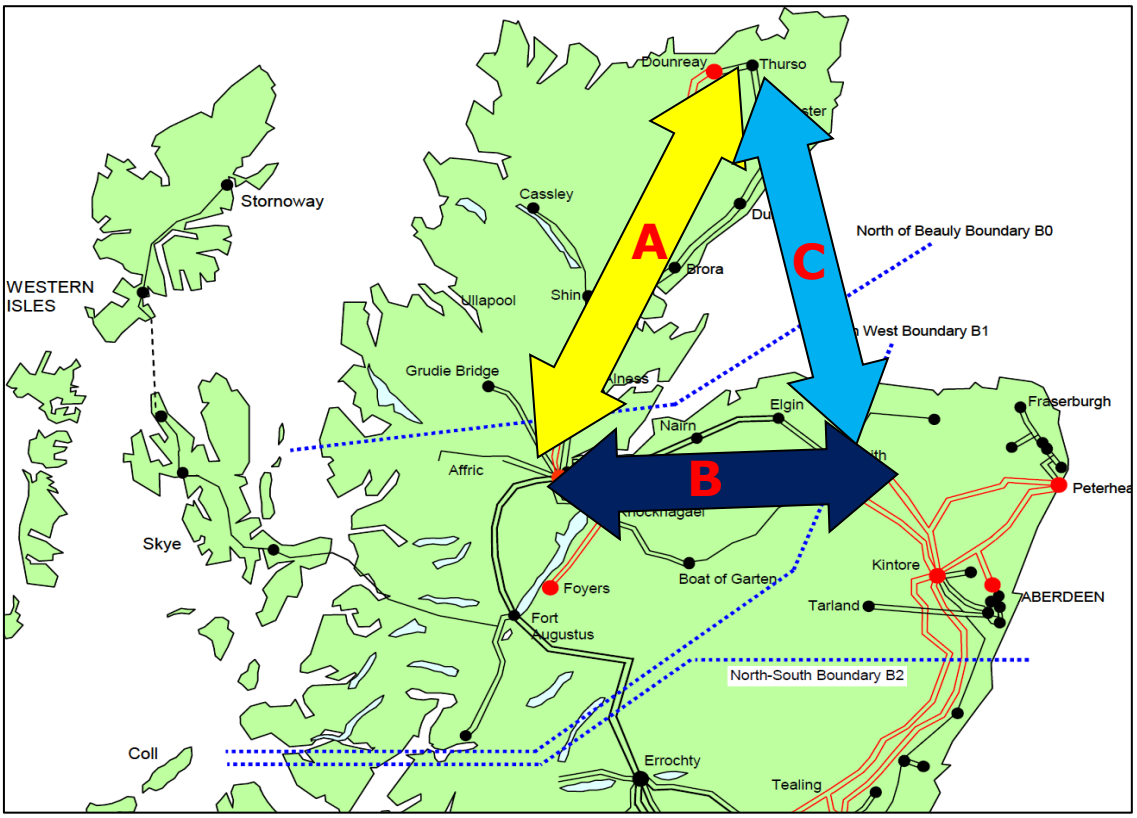
Table 1 – Proposed reinforcement and other possible options

Option	Technology	Capital cost (£m, 2013)	Timing	Additional boundary capability	Composition (shown in figure 2)
1a	HVDC subsea cable link between Caithness and Morayshire + onshore works **(SHE Transmission's proposed option)**	1,268	2018	B0: 800MW B1: 850MW	C (see figure 1 also)
1b	1a + AC onshore rebuild of existing double circuit line between Beauly and Blackhillock substation to 400kV (BB400)	1,716	2018 and 2024	B0: 800MW B1: 1,720MW	C + B
2a	AC onshore rebuild of 132kV existing double circuit line between Dounreay to Beauly to 275kV	1,100[4]	2026	B0: 1,100MW	A
2b	2a + BB400	1,548	2026 and 2024	B0: 1,095MW B1: 1,480MW	A + B

Figure 2 – Possible reinforcement options in northern Scotland



[4] The cost estimates of Option 2a used by SHE Transmission in its analysis incorrectly include costs for equipment that is not associated with this particular option. Consequently the net present values of Option 2a in all the scenarios and sensitivities underestimate the net benefits of the option. Despite this error the ranking of Option 2a is not affected relative to the other options. This error has no impact on the analysis of the other three options.

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Summary of SHE Transmission's cost-benefit analysis

The net present values of all the options are sensitive to a number of assumptions, notably how much generation gets built (the generation scenarios) and the constraint costs. Table 2 below compares the net present values of the four options using SHE Transmission's central constraint cost assumption of £130/MWh. Table 3 shows the net present values of the options when constraint costs are £100/MWh. Table 4 shows the impact of an increase in capital costs on the net present values of the four reinforcement options.

The generation scenarios in SHE Transmission's cost-benefit analysis include the Slow Progression, (SP) and Gone Green (GG) scenarios National Grid developed with industry for its 2012 GB Future Energy Scenarios.[5] SHE Transmission also included two other generation scenarios:

- Slower Slow Progression (SSP): a variant developed by SHE Transmission with a slower rate of deployment, nonetheless renewable generation more than doubles by 2030.
- A fourth generation scenario, called "Reduced renewable deployment", that was developed at our request. The rate of generation deployment is slower in the period leading up to 2020 than in SSP. However, the level of generation converges with the amount of generation in the SSP scenario by 2025 (this is because the rate of deployment between 2020 and 2025 is slightly faster than in SSP).[6]

Table 2: Net present value of reinforcement options (with central case assumptions[7])

£m, 2013	Generation scenario			
	Slow Progression	**Gone Green**	**Reduced Deployment**	**Slower Slow Progression**
Option 1a	1,122	2,174	211	264
Option 1b	1,854	3,316	307	360
Option 2a	395	1,082	-119	-138
Option 2b	**2,094**	**3,467**	**735**	**717**

Table 3: Net present value of reinforcement options if constraint costs £100/MWh

£m, 2013	Generation scenario			
	Slow Progression	**Gone Green**	**Reduced Deployment**	**Slower Slow Progression**
Option 1a	441	1251	-259	-219
Option 1b	881	2005	-310	-269
Option 2a	4	525	-399	-414
Option 2b	**1180**	**2237**	**135**	**121**

[5] More information is available at: http://www2.nationalgrid.com/UK/Industry-information/Future-of-Energy/FES/Documents-archive/

[6] The Reduced Renewable Deployment scenario does not represent Ofgem's central view on the deployment of new generation in northern Scotland. It is an alternative scenario we think appropriate to include in the analysis to cover the risk that generation deployment turns out to be slower at the end of this decade than is captured by the other scenarios. SHE Transmission has labelled this scenario as "Ofgem" in its analysis.

[7] The central case assumptions used in the cost-benefit analysis are: the Slow Progression generation scenario, base capital expenditure, the Spackman approach to discounting, a £130/MWh constraint cost, and the option timings in table 1.

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Table 4: Net present value of reinforcement options for an increase in capital costs: 10% for HVDC cable and equipment, 20% for all AC components of options

£m, 2013	Generation scenario			
	Slow Progression	**Gone Green**	**Reduced Deployment**	**Slower Slow Progression**
Option 1a	946	1998	36	88
Option 1b	1573	3035	26	79
Option 2a	131	819	-383	-402
Option 2b	**1725**	**3098**	**366**	**348**

SHE Transmission believes Option 1a is the optimal reinforcement proposal because it would allow it to reinforce the transmission system in two distinct stages with two major benefits:

- The first stage (Option 1a) provides an early boundary capacity increase and constraint relief, and positive net benefits under the generation scenarios considered with the central case assumptions. In addition, Option 1a would allow the earlier connection of renewable generation and contribute to the UK's renewable energy and decarbonisation targets. SHE Transmission consider this could provide additional potential welfare benefits between £800 and £1,350 million.

- SHE Transmission believes the second stage, (b in figure 2), is less urgent, and that an investment decision is not required at this time. SHE Transmission think progressing Option 1a now would allow it to 'wait and see' whether the next stage turns out to be needed depending on the development of generation in the post-2020 period.

Our consultants' reviews

We appointed DNV KEMA (KEMA) to independently review the technical and cost-benefit submissions provided by SHE Transmission in support of its proposed Caithness Moray HVDC subsea link (Option 1a). We requested KEMA to provide an expert view in the following areas:

1. The consistency of SHE Transmission's proposal with the fundamental guiding principles for wider reinforcements of the national transmission system.
2. Whether an appropriate range of uncertainties has been considered in testing the requirement for, and the scope and timing of, the required reinforcement.
3. Whether SHE Transmission has adequately evaluated its preferred proposal as well as other possible reinforcement options and / or operational measures.
4. The comprehensiveness and reasonableness of the estimated lifetime costs for each of the options set out in SHE Transmission's proposal at this stage and whether these are sufficient to allow a fair comparison of the options.
5. A review of the methodology used in the cost-benefit analysis and Least Worst Regret analysis[8] against best practice.
6. The validity of the core input assumptions used in the supporting analysis.

[8] In Least Worst Regret analysis, regret is defined as the difference between the net present value of an reinforcement option and the best possible option in a given generation scenario, ie foregone benefit. The option that provides the least worst regret minimises the potential foregone benefit of implementing that option under all scenarios.

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Overall, KEMA thinks a subsea cable option could be broadly similar to the onshore reinforcement, Option 2b, but only when wider benefits are included and the subsea cable is combined with a further reinforcement south of Beauly (forming Option 1b). However, based on the technical evidence and cost-benefit analysis provided by SHE Transmission, KEMA thinks Option 1a, the standalone subsea cable, does not appear to be optimal in the context of the wider system development. KEMA highlighted in its review that the positive investment case for a reinforcement in northern Scotland was sensitive to the cost of generation constraints given the high costs of all the options. As a result KEMA recommended further work to substantiate the generation constraints used in the cost-benefit analysis.

For this detailed assessment of generation constraints, we appointed a second group of consultants, Pöyry, to model generation constraints and costs under the different reinforcement options in northern Scotland.

Pöyry's analysis suggests that constraint volumes in the area north of the B1 transmission system boundary are overestimated from 10% to 15% depending on the generation scenario. Pöyry says the main explanation for this difference is due to modelling the dispatchable hydro and pumped storage north of the B1 boundary with optimised dispatch rather than a fixed hourly profile adopted in SHE Transmission's analysis.

Pöyry also estimates that annual costs for generation constraints in northern Scotland could average between £40/MWh and £90/MWh over the period. On average this is around 50% lower that the central case assumption of £130/MWh used in SHE Transmission's analysis. Pöyry attributes the difference in forecast constraint costs to a number of differences in its modelling approach and assumptions compared to SHE Transmission's analysis. This includes differences in the expected costs of replacement energy and lower margins in the offers and bids made by balancing generators and curtailed generators respectively.

We are publishing the respective reports prepared by our consultants KEMA and Pöyry alongside this letter. Our consultants' work has informed our initial views on the Needs Case for the proposed Caithness Moray project and should be read in conjunction with this letter.

Our initial views on Needs Case for SHE Transmission's proposed transmission project

This section sets out our initial views of SHE Transmission's proposal, taking into account the reviews undertaken by DNV KEMA and Pöyry of SHE Transmission's analysis. Our assessment and position on the Needs Case will also be informed by responses to this consultation.

We have considered a number of issues as part of our Needs Case assessment. Some are linked to the results of the cost-benefit analysis that SHE Transmission has carried out, and others are related to issues not captured by the cost-benefit analysis. The issues related to the cost-benefit analysis include:

- Consistency of the proposal with wider network development requirements.
- Assessment of the least worst regret strategy.
- Sensitivity of the Needs Case to different assumptions.
- The cost of the proposed solution.

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Taken together, the issues above suggest to us that the possible onshore option, Option 2b, appears to be more beneficial for consumers than the proposed Option 1a or Option 1b given the analysis presented by SHE Transmission and our consultants.

However, we think the cost-benefit analysis does not capture all the relevant issues. We believe there are additional factors that also need to be considered which mean the case for the proposed solution is more finely balanced. These issues are:

- Uncertainty over the possible onshore options.
- Risks around the different options.
- Potential wider benefits from the proposed solution.

We discuss our views on each of the issues below.

Consistency of the proposal with wider network developments

SHE Transmission has shown in its technical analysis that the amount of new generation expected to connect in northern Scotland will exceed the existing capacity of the transmission system. Although the timing depends on the generation scenario it appears that a relatively large scale reinforcement will be needed in future to accommodate the expected increase in power flows.

Large scale transmission projects typically involve long lead times, are costly and have significant interactions with other parts of the transmission system. Given these issues it is important a proposed solution is sufficiently forward looking and strategic to ensure it is optimal in context of the overall system development and requirements.

As it stands, SHE Transmission's subsea proposal (Option 1a) doesn't include a second stage reinforcement of the transmission system between Beauly and Morayshire. We acknowledge SHE Transmission's proposal keeps open the option of a further reinforcement between Beauly and Morayshire at a later date (to eventually complete Option 1b). However, we are concerned that the current proposal doesn't include a more developed plan at this stage for coordinating with a further onshore reinforcement.

SHE Transmission's analysis in Table 2 shows that it is likely to be in consumers' interests to combine reinforcements north and south of Beauly in the scenarios considered (the net benefits of Option 1b and 2b exceed those of the standalone proposal, Option 1a by between £450m and £1,300m). Additional sensitivity analysis of the timing also suggests that combining this second reinforcement with the subsea cable earlier than 2024 would give greater benefit to consumers. It is not clear from SHE Transmission's analysis the circumstances under which it would be more beneficial to complete only Option 1a rather than 1b. We believe SHE Transmission needs to provide further evidence on a scenario under which the a 'wait and see' approach has a positive value. It should also examine the implications of this different scenario on the case for Option 1a.

Assessment of least worst regret reinforcement strategy

Typically, there are a number of inherent uncertainties involved in large scale transmission reinforcement projects. This includes not knowing the exact timing and/or the size of the reinforcement that is needed as this will depend on developments in the generation market in future. One way to inform a decision on a potential range of reinforcement options is through least worst reqrets analysis. Under this approach, the aim is to minimise the possible foregone benefit or regret of a particular reinforcement strategy, where regret is

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equal to the difference between the net present values of an reinforcement option and the best possible option in a given generation scenario. In other words, the option that minimises the potential foregone benefit of implementing that option under all the scenarios considered is the least worst regret option.

KEMA has highlighted the proposed subsea link proposal, Option 1a, (and the possible combined offshore/onshore Option 1b) is not the least worst regret option in SHE Transmission's cost-benefit analysis. This means it is possible to select another option that would provide greater benefits to consumers in all of the other scenarios considered. On the basis of SHE Transmission's analysis, the onshore reinforcement, Option 2b, would give greater measured benefits to consumers than either Option 1a or 1b under all the scenarios and sensitivities examined by SHE Transmission (the additional net benefits ranges between £170 million and £1,400 million depending on the generation scenario and sensitivity).

Sensitivity of the Needs Case to different modelling assumptions

Sensitivity analysis is an important part of cost-benefit analysis as it tests the impact that different assumptions could have on the results. If different assumptions are found to cause major changes in the results these should be the focus of attention to ensure the central case assumptions are credible.

SHE Transmission's sensitivity analysis shows the net benefits of proposed Option 1a and Option 1b are generally more senitive than the possible onshore Option 2b to different generation scenarios, cost overruns and lower constraint costs in northern Scotland. In particular, we note that SHE Transmission's sensitivity analysis show that the net present values of Option 1a and 1b could turn negative in the weaker generation scenarios if constraint costs are £100/MWh instead of £130/MWh.

Pöyry's analysis and modelling of constraints in northern Scotland suggests that the cost of generation constraints could be as much as 50% lower on average than the £130/MWh assumed in the central case in SHE Transmission's analysis. Pöyry's estimates are also considerably lower than forecasts of generation constraint costs used previously in cost-benefit analysis for other transmission projects such as the Western HVDC bootstrap.

Here we note the shift in government policy to provide wind generation subsidies in future through a feed in tariff under the new Contract for Difference regime rather than from the Renewable Obligation mechanism. As a result, the deadweight effect of the Renewable Obligation included in constraint costs previously will reduce and eventually be removed from the cost of future generation constraints.[9] This means the expected future costs to consumers of generation constraints are likely to be lower than estimates used in previous cost-benefit analysis. We don't think the subsidy issue is a cause of the difference in generation constraints costs used in SHE Transmission's analysis and modelled by Pöyry. However, Pöyry's analysis shows that the underlying assumptions around the bid and offer

[9] Under the new Contracts for Difference (CFD) mechanism, there will be a smaller overall cost paid by consumers for system constraints on renewable generation compared to the effect under the Renewable Obligation (RO). This is because the total subsidy paid by consumers to renewable generators under the CFD will vary for the amount of renewable generation that is actually generated. As a result, in the event a wind generator is constrained off by the System Operator consumers would pay the system costs of curtailing the generator (made up of the curtailed generator's bid-off price (equal to foregone wind generation income plus a potential mark up) and the replacement energy offer plus a potential mark up. In contrast, under the RO, consumers would pay the curtailed generators bid off price, the balancing generators replacement energy offer (plus any mark ups on the bid and offers) and as well the total RO subsidy that is fixed each year regardless of the amount of renewable generation that is produced.

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prices used to determine constraint costs can vary widely and are affected by market developments both within year and over longer periods. Accordingly, we have some concerns about the central case assumption for generation constraint costs used in SHE Transmission's analysis. We don't think it is credible that these are constant for the lifetime of the proposed reinforcement.

The implication of a lower average constraint cost is that the net benefit to consumers from all the reinforcement options will be smaller. This has major implications for the optimal timing, and the overall need of any reinforcement. We believe SHE Transmission need to review Pöyry's modelling on the cost of generation constraints and consider the implications this might have for its project.

The cost of the proposed solution

Generally large scale transmission reinforcements are costly and small percentage increases in costs can impact on the net present value of a proposal. We are concerned about the high cost estimates for the subsea link proposal, Option 1a. This initial view on the estimated costs reflects KEMA's high level benchmark comparison and will be subject to further consideration in our Project Assessment. Our concern is compounded now that SHE Transmission is at preferred bidder stage with a supplier for the cable and converter equipment. This means that there might not be as much competitive pressure on any issues arising.

We note that SHE Transmission's analysis shows that an increase in costs of only 10% could erode much of the positive benefits of Option 1a. A larger increase would most likely turn the project's net present value negative.

We have commenced our Project Assessment of Option 1a to review the proposed design and costs in more detail. A crucial part of this work will look at the routing and specification of the offshore cable. This information will give us a better understanding of factors that drive the costs and the efficiency of these. It will also further inform our assessment of the Needs Case for the proposed reinforcement.

Uncertainty over the possible onshore options

SHE Transmission's cost-benefit analysis of the different options is informed by estimated costs. The basis on which these costs are estimated is not the same because the options are at different stages of development. We are concerned about the relatively low level of project definition on the possible onshore options. This is because it affects the degree of certainty/accuracy on the scope, risks and costs of these options. As a result there is a higher degree of uncertainty around the estimated benefits of the options (SHE Transmission's accuracy range for the costs of the possible onshore options ranges between -50% to +100%).

We think there is a large risk the scope of the other possible options could change as a result of planning consent issues. This could have a big effect on the project costs and possibly further impacts on timelines.

We think this is important because a comparison of the proposed transmission project against other possible options is a more robust test than a comparison to the case of no reinforcement. For a project of this scale and complexity, we think it is vital that the other options are refined to a reasonable level of detail to allow an informed consideration and comparison. We recognise that costs and time are involved in developing and refining a

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range of options. However, we think this gives greater assurance that the proposed reinforcement has been subject to a fair and reasonable test against the next best alternatives.

As a result we are asking SHE Transmission to identify the potential sensitivities and likely objections that might arise if it applied for planning consent and to use this information to refine the scope and costs of the options.

Risks around the different options

A reinforcement involving a HVDC subsea cable and/or a possible onshore reinforcement have different risk profiles and uncertainties, given differences in location and technologies. The table below sets out the key risks and uncertainties for each and the potential impacts of these.

Options with HVDC subsea cable	Options with AC onshore circuit
Supply chain – constraints in cable manufacturing availability, vessel availability and the limited market for convertor technology. **Potential significant impact on costs and timing.** Could lead to a delay and add to cost.	**Planning consent** – could increase the scope of the option to meet conditions and reduce effects on the local environment, eg by including costly underground cabling,. **Potential significant impact on costs and timing.** Costs on some onshore projects have increased significantly to meet conditions of planning consent.[10]
HVDC technology – issues around adoption of new technology, including lack of international standards and system integration. **Potential significant impact on costs.**	**Unknown environmental considerations** – could increase or change scope of option to address unknown issues along route, eg unsuitable ground conditions. **Potential significant impact on costs.**
Offshore build – risks of access constraints around inshore waters, cable landing arrangements, subsea cable routing and installation. **Potential significant impact on costs and timing.**	**Uncertainty on timing of future grid availability** – could undermine developer generator confidence. **Potential moderate impact on investment in renewables in northern Scotland.**

Given the cost, scale and complexity of the proposal we think it is important that there is sufficient consideration and transparency about the potential impact of the uncertainties on the scope of the different options and the project costs. We will be doing some further work in this area to better understand the likelihood of these risks and uncertainties and the potential range of impacts. For the HVDC subsea proposal we expect to get more clarification on this through the Project Assessment that we are progressing alongside this consultation on the Needs Case. We will also be seeking further information from SHE Transmission on the sensitivity of the onshore reinforcement options to different potential planning conditions and the possible impacts on costs and timing. To some extent this has been partly captured in the cost-benefit analysis by the 2026 base timing assumption for the onshore Option 2b. However, there could be additional timing or cost implications.

[10] SHE Transmission applied for planning consent for the Beauly Denny 400kV upgrade in 2005. The Scottish Government granted consent in 2010 with conditions to mitigate environmental and visual amenity impacts. As a result the construction costs for Beauly Denny have increased from £245 million forecast in 2004 to £457 million (2004/05 prices).

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Potential wider benefits from the proposed solution

There are wider issues that are also relevant for the consideration of a transmission reinforcement strategy. In the context of the UK Government's energy policies such as 2020 renewables targets there are potential wider benefits from transmission infrastructure projects. For example, a subsea link in 2018 would most likely ensure new generation in the area is not restricted due to limited transmission availability (approximately 1,600MW of contracted generation north of Beauly is reliant on a reinforcement to connect to the transmission system). At the same time, many of these projects are also likely to be contingent on a range of other factors, eg obtaining planning consent, securing finance. Accordingly, in the absence of further information, it is difficult to estimate the direct impact the proposed subsea link in 2018 might have on the renewable energy targets and other objectives to decarbonise the power sector.

The subsea link proposal would also have a lower impact on local visual amenity. We note however, the possible onshore options that make up Option 2b are not expected to be new lines but upgrades to existing lines. Therefore, the visual impact of an onshore option is likely to be lower in net terms compared to a new line in a new location.

SHE Transmission think the subsea link proposal could provide an opportunity for efficient anticipatory investment in cable capacity between Caithness and Moray to accommodate generation from Shetland and Orkney in the future. Its analysis shows there could be a positive benefit from investing in additional capacity as part of its proposal if it is used within 30 years. Based on SHE Transmission's analysis we agree that the proposal appears to offer a relatively low-regret opportunity for anticipatory investment in a future link to other generation in northern Scotland. We will be seeking further clarification on the respective cost estimates of the standalone and incremental investment as part of the Project Assessment.

We think there are some wider benefits associated with the proposal. However, the value and extent of these are uncertain. We think some of the wider benefits of Option 1a/1b that SHE Transmission has claimed, such as facilitating renewable generation and reducing dependence on imported fossil fuels, appear to double count benefits already included in the main cost-benefit analysis, ie through avoiding the costs of the replacement energy. For some of the benefits it is not clear exactly how we would value the economic benefit, ie the contribution to the 2020 renewable targets. We also think some benefits could be be overstated or could be better incorporated into the main cost-benefit analysis through better specification of the expected impact on costs and timing of the other options, ie refining scope for expected visual amenity concerns.

To inform our thinking in this area we welcome the views of interested parties on the wider benefits of the proposal and large, strategic transmission projects more generally.

Summary of our initial views

Based on SHE Transmission's analysis, the views of our consultants' and the consideration of the issues summarised above, we think there is a need for a reinforcement of the transmission system in northern Scotland in the future. However, the case for the proposed subsea cable solution is finely balanced. On the one hand, the cost-benefit analysis suggests an alternative combination of onshore reinforcements could provide even greater net benefits to consumers than a reinforcement involving a subsea cable when considered in the context of wider system requirements. On the other hand, issues such as uncertainty over the scope, costs and timing of the onshore options and potential wider benefits of a

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earlier reinforcement suggest the proposal's strategic value might be greater than is currently captured in the cost-benefit analysis.

We consider that now is the right time for us to be consulting given SHE Transmission's proposed procurement plan as this allows all options to be kept on the table. However, we recognise that we need further information in order to be able to make an appropriately informed decision. It is incumbent on SHE Transmission to provide the further information detailed in this letter and any other information it considers relevant to allow us to do this.

Next steps

We will continue our assessment of the Needs Case for SHE Transmission's proposed Caithness Moray transmission project. The focus will be on the areas highlighted in this letter. To assist our consideration of these issues we require SHE Transmission to provide further information on:

- Sensitivity analysis on the cost and timing of the onshore reinforcement options that could arise from different planning consent conditions. We would expect this analysis to be incorporated in the cost-benefit analysis.

- Implications of Poyry's dynamic approach to constraint modelling for SHE Transmission's central case assumption on the future cost of generation constraints. Further analysis of the uncertainty over the future cost of generation constraints and the impact of this on the cost-benefit analsyis.

- Evidence to support optionality benefits of a 'wait and see' approach to the onshore reinforcement south of Beauly, and the implications for its proposed reinforcement. None of the generation scenarios and analysis presented to date demonstrates these benefits.

Along with our Needs case assessment, we are commencing our Project Assessment on the proposed Option 1a. In this next stage of our assessment we will further examine the design, route and efficient costs of the proposed solution. Information from our Project Assessment will also inform our position on the Needs Case. This approach is consistent with the guidance on the SWW process we published in October 2013.

After considering the responses to this consultation, and any further information relevant to the Needs Case of the proposed Caithness Moray reinforcement, we will come to a position on SHE Transmission's proposal (Option 1a). If we come to a view that the proposed project, Option 1a, is well-justified ie the right thing to do for existing and future consumers, we will consult on our Project Assessment and our views of the efficient costs.

Alternatively, we may come to the view that a compelling Needs Case for the proposed transmission project has not be made at this time. In such a situation, SHE Transmission would be responsible for leading on the next steps including further consideration of how best to develop its transmission network to meet the requirements of existing and future network users.

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Please send your responses to the questions highlighted at the start of this letter by 28 May 2014 to SWW@ofgem.gov.uk. If you have questions about this letter or the consultation you can contact Anna Kulhavy, telephone 0207 9017390 or Adam Lacey, telephone 0203 2632701.

Unless marked confidential, we will publish all responses on our website (www.ofgem.gov.uk). If you wish your response to remain confidential please clearly mark your response to that effect and give your reasons for seeking confidentiality.[11]

Yours faithfully

Kersti Berge
Partner, Electricity Transmission

[11] Ofgem shall respect such requests subject to any obligations to disclose information, for example, under the Freedom of Information Act 2000 or the Environmental Information Regulations 2004.

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