Scottish & Southern Electricity Networks (SSEN)

Stakeholder Views on a New Suite of Transmission Structures (NeSTS), Glasgow, February 2017

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SMR
21 Lansdowne Crescent
Edinburgh
EH12 5EH

T: 0131 535 1056
F: 0131 535 1057
info@socialmarketresearch.co.uk
www.socialmarketresearch.co.uk

Executive Summary

In March 2016, Scottish & Southern Electricity Networks (SSEN) appointed Social Market Research (SMR) to develop and facilitate stakeholder engagement events on a New Suite of Transmission Structures or NeSTS. This report presents an overview of the findings from the second stakeholder engagement event held in Glasgow on 1 February 2017.

Overall Message: Strong Support for SSEN's Transparent and Detailed Assessment Approach

The research findings clearly indicate a strong level of support for the continuing development of the 510 Series Overhead Transmission Line Design Concept.

Stakeholder views are summarised under each heading, below, and in greater detail in the Key Findings section of the report. The top three takeaways from the event are:

- **Strong support for the chosen design and its continued development** i.e. the design is developing well, is now at the stage of refinement and continues to have the full support of stakeholders as an improvement over more traditional tower designs;

- **Agreement that there has been a major step forward since the last stakeholder engagement event** i.e. that the possible alternatives to the steel lattice design have successfully been narrowed down to the chosen 510 series and that the changes and refinements made to the 510 design have been in line with earlier stakeholder comments and views; and,

- **Stakeholders are support of the process of stakeholder engagement** i.e. it is clear that SSEN is listening to stakeholder views, is responsive to what stakeholders say, that the process of engagement is considered valuable and stakeholders want to continue to be engaged for as long as their views can have an influence on the design and its implementation.

Context and Purpose

Tim Sammon (SSEN's R&D Project Manager) opened the day with an overview and update of the NeSTS. Stakeholders welcomed the opportunity to be present and to air both their own views and those of their organisations. Questions at this point were largely about clarification on issues that were to be the subject of the rest of the event and stakeholders were content for these issues to be considered during the course of the day. One, more central, issue was raised concerning how the success of the eventual design was to be measured. In answer to this question, SSEN replied:

> *"That's a very good question. We have done the business case. We will take account of the costs of the new design and we will assess if we are delivering a reduced environmental impact. We will use both these things to decide success. It will still be a success if we find that the monopole is no better than the steel lattice, because we would have tested the possible alternatives to a lattice tower."*

SSEN also confirmed that the eventual design would be put out to public consultation.

Span, Power rating, Insulator Configuration and Access Provision

Following presentations on Span, Power Rating, Insulator Configuration and Access Provision, stakeholders were interested in discussing the relationship between height, span and other factors such as weight. The discussion topics raised by stakeholders centered on how those relationships varied in specific circumstances. There was strong support for higher, but fewer, towers and maximising span as much as possible.

> *"That's good to know (that taller, but fewer towers are possible) because it is the towers that are the most visible".*

Stakeholders welcomed the proposal to use a single earth wire and were keen to keep the number of conductors to two or less.

There were questions from stakeholders regarding the proposed prototype tower and the climbing and safety features that the prototype would test. It was confirmed by SSEN that the prototype will exist in several variants and will test 4 different types of access systems.

Exhibition and Evidence

During coffee, all stakeholders were invited to review the exhibition of the different design concepts on display in the event venue. The exhibition was made up of photo montages of the eight potential designs in differing natural landscapes with 1:25 scale model structures of the monopole and lattice tower on physical display.

Stakeholders found both the models and the photomontages to be of great benefit in assessing how the old and new designs compared and how they sat respectively in different landscapes.

> *"The montages are very helpful instead of just looking at the models and having to imagine them in a landscape."*

Discussion followed on the degree to which the photomontages were realistic. SSEN explained that the montages were produced according to Scottish Natural Heritage guidelines. However, it emerged that stakeholders would like to see additional variations in the landscapes used, for example wild land, and to have close up comparisons as well as distant views. There was also some discussion about how visible the towers were as they receded into the distance:

> *"The towers in the photomontages are almost transparent as they recede into the distance, which is quite optimistic. I think some of these are quite optimistic. Sometimes distant towers show up more clearly than they do in the photos. Maybe there could be variations where the distant towers could be enhanced to show up more clearly and then a comparison could be done."*

> *"You need to change the visibility of the structures for the photos taken on dull days."*

SSEN undertook to consider these views and to try out different variations of the photomontages.

Environmental Performance

Stakeholders were particularly interested in the design aspects of tension towers. It was clear that a monopole tension tower was favoured over a twin pole design:

> *"The double pole doesn't have the nice symmetry of the monopole. The double pole is less pleasant, it's asymmetric and less well balanced."*

There was a discussion on the relative impacts of temporary roads and whether the shorter build time of the monopole design would, in reality, yield an environmental benefit to the underlying terrain.

Q *"Looking at the impacts, the temporary roads and so on, there is impact on the ground in laying the road access. Whether the road is used for 6 days for a lattice tower or 1 day for a monopole is not the important thing, surely it's the laying of the road that causes the greatest environmental impact?"*

A *"It is much easier to reinstate the ground if you use the road for fewer days, it's easier and quicker."*

Q *"Can you use a floating road for these installations?*

A *Yes, you can, sometimes. It depends on the site and the conditions. The underlying vegetation suffers more and may die off if the floating track is left down for long periods, so the shorter the time that it is in place the less damage is done to the vegetation and the quicker and easier is the reinstatement."*

Q *"But the reinstatement probably wouldn't be done straightaway anyway so, for example, the floating track for a monopole tower may not actually be in place for a significantly shorter time, so the saving is quite hypothetical."*

A *"There will be some time saving for sure. And there will be less plant and machinery movement and a lower manpower impact. Also, if you are on site for a shorter time, there is less risk of an incident such as a fuel spill. There is also a positive impact on site safety if the site is in operation for a shorter time."*

Score Cards

Stakeholders were asked to view a series of photomontages showing the traditional lattice tower and monopole design in different landscape settings and to consider visual, landscape and aesthetic considerations.

In terms of visual perception, the monopole scored better against the lattice tower on foreground (two stakeholders rated the monopole 'good' compared with one stakeholder rating the lattice structure 'good'). Analysis of mean scores found that stakeholders scored the monopole higher on backclothed (3.6 vs. 3.4) and foreground (3.2 vs. 3.4), with no difference in mean scores for distance (3.2) or skylined (3.2).

In terms of the 'fit' of the structure within the Scottish landscape, a greater number of stakeholders rated the monopole 'good' in relation to three of the four landscape settings (agricultural lowland; upland moorland; forest / woodland edge), with the same number of stakeholders (n=1) rating strath as good. Note that stakeholders recorded higher mean scores for the monopole in all landscape settings.

Also in terms of aesthetics relating to the form / shape of the structures, all five stakeholders rated the monopole as either 'very good' or 'good' compared with only one stakeholder rating the lattice tower as 'good'.

In terms of a composite indicator of all nine factors combined (i.e. considering the perceptibility of the structure, 'fit' in the landscape and aesthetics relating to shape and form), stakeholders recorded a higher (more positive perception) overall mean score for the monopole (31.8) compared with the lattice tower structure (26.2).

Next Steps

Tim Sammon (SSEN's R&D Project Manager) gave a short presentation on the next stages of the project. Stakeholders welcomed the progression of the project to the prototyping of the chosen model. There was a discussion on wind testing of the prototype. One aspect of this was whether the monopole design would result in greater or lesser wind noise than steel lattice towers. SSEN responded by saying that such testing was limited primarily to design theory and to checking the theoretical dynamic resonance of the monopole.

The second area of discussion was on whether the models used for wind testing took into account changing climatic conditions and the potential for higher wind speeds in the future.

Q *When you test the new design for wind and climatic conditions will you take account of recent and potential adverse climate changes?*

A *Good question. The testing is defined by a standard but I'm not sure how much future climate change is in the model. The standard being used was last updated in 2015. In practice, it is difficult to predict and design for what might potentially be adverse changes in climate control, but we take account of most of that with safety factors.*

Round table stakeholder group discussion

Opinions on the scorecards

General opinions on the new, simplified, scorecards for visual impact were very positive. One stakeholder had previously completed the more complex scorecard presented at the last stakeholder event. He found the new scorecards much easier to complete. Another stakeholder commented on her preference for responding with a narrative answer rather than with a score:

> *"I find it easier if I am able to write in my answers as comments rather than scoring numbers. A number doesn't always express what you want to say."*

Opinions on the event in general

All the stakeholders thought that the event was well deigned, pitched at the right level and avoided unnecessary jargon and technicality. Some felt that it would be useful to have labels on the physical models so that stakeholders from a non-engineering background could quickly see which parts go where.

> *"I thought it was pitched perfectly at the level I need to be able to understand it in terms of our work."*

"I found it really good the way that the information was presented and the fact that we were able to ask questions as we went along, very little jargon, which was well explained."

"Yes, I agree, there wasn't too much jargon, but it would help if you were able to name things on the towers and say, this bit goes here and that bit goes there, this is called this and that is called that."

Pre-consultation material

Most stakeholders found the pre-consultation information useful in orientating them to the day. Stakeholders agreed that it would be useful if future pre-consultation material included a timeline or response schedule that showed how the consultation so far had influenced the project and the tower design.

"I would have found it useful, because there has been previous consultation and previous input, I would have found it helpful if maybe there was a list to say, well we heard that in a previous consultation and this is what we did about it, where you have succeeded and where you haven't. Like a list of previous consultation comments and the responses and priorities that you attach to them."

Things that were missing.

In general, stakeholders agreed that the event was thorough and presented them with the kind of information that they needed and expected. One stakeholder commented that the consultation would become much more meaningful once the potential sites and locations for building the new design become known. Another commented that she would have liked some emphasis on areas other than visual impact.

"It was a bit heavy on visual impact and it would have been useful to have more on wildlife impact, but I am hopeful that we will be able to have subsequent discussions on those issues with a bit more focus on our areas of interest."

Transparency

All the stakeholders had a high level of trust in the information that had been presented. One stakeholder remarked that it would be self-defeating to hold consultations and not be fully open about what is proposed. Another commented that there is a clear pathway between the previous stakeholder event that he had attended, the point at which the project had now arrived and the trajectory into the future. He felt that this journey had clearly taken account of stakeholder opinion thus far and that the questions being posed today were what he would expect of an open and transparent process.

The issue about the visual accuracy of some photomontages was raised again in this discussion. There was no suggestion at all that SSEN were trying to misrepresent the visual impact on the landscape, rather that the photomontages needed to be as close to reality as possible.

"Yes, I think it is fully transparent…after all you are trying to know what we think, so you need to be transparent about it. Still, some of the visuals…. I'm not sure that they represent the way things will really look like, that's not suggesting any dishonesty, no not at all, it's just natural skepticism on my part."

Balance between information giving and discussions/question time

The balance between information giving and the time set aside for questions and discussion was thought by all to be just right.

> *"It was interesting to know the background of it, why you have come up with the designs and so on, so you needed to give a lot of information to understand what was involved."*

Format of the next workshop

All the stakeholders thought that the workshop process worked very well and is their own preferred way of engaging.

> *"For me this (workshop format) is very useful and interesting to hear the views of other stakeholders in the group."*

> *"Yes, definitely, this format works very well for us, if there is another group event, then I would definitely want to be part of that."*

> *"What's useful about this is when you hear other people's views it helps you to think about it a bit more and you get more out of it than you would just one-to-one."*

However, it was agreed that other methods of engaging with stakeholders would be useful alongside stakeholder events. This was primarily to meet the needs of those who are unable to give up a full day to attend an event. Shorter, more condensed events were suggested, perhaps as a roadshow taken by SSEN to different venues. Bespoke events were also proposed for larger organisations where there are a range of interests across departments or individuals.

> *"The group session works well for me but at the same time I would really like one-to-ones with other people in [name of organization] to hear their views on their own specialties. There are 4 or 5 people that I would like to get in a room to discuss these issues, but it would be difficult to get them to give up a whole day. Coming into them with a tight agenda and a set of questions you might get more out of it than a workshop."*

> *"It would be useful to know in advance the next time about the issues that you have identified so far that need to be addressed, then we could make sure that either we talk to our relevant colleagues in SNH so that we can represent their views or that maybe that they can come along."*

> *"Yes, our bio diversity officer in the Council or environment officers, some of those might be interested in coming along."*

> *"Yes, in [name of organization] there are lots of other areas of expertise that would be interested in being involved."*

> *"Yes. My own role is fairly process driven in assessing planning but there are people in planning policy and environment who might be interested in being engaged."*

Buy-in to the project proceeding

All the stakeholders thought that the project should definitely go ahead to the next stage, given that there were obvious benefits in the new monopole design. Stakeholders could see the progression thus far and were interested to find out how the next stages progress.

"Yes, it feels somehow more real now and less of a concept since I was at the last stakeholder event. There is a definite progression in the engineering and the various inputs."

Stakeholders were unsure exactly when would be the best stage to engage with them again, but there was a clear preference for engagement to continue frequently enough for it to make a difference.

"I think it has got to be at a stage where we can still make a difference."

"I think it would be best, if it is possible, to have as much engagement as we can as you move from one stage to the next."

Digital voting during the event

The principal motivations for stakeholders to attend the event were to contribute to the design of overhead transmission lines and to ensure that environmental impact concerns are considered.

The key findings from the digital voting included:

- *4 out of 5 stakeholders were clear on the purpose and content of the day and one asked for further clarification;*
- *4 out of the 5 stakeholders thought that the presentation on span improved their understanding of the context in which the project is operating;*
- *All stakeholders agreed that the presentation improved their understanding of the prototype design.*
- *All stakeholders agreed that SSEN is sensitive to the issue of power rating within the context of the overall prototype design;*
- *All stakeholders agreed that the presentation on insulator configuration and access improved their understanding of the prototype design;*
- *All stakeholders agreed that the presentations on environmental considerations have improved their understanding of the prototype design; and*
- *All stakeholders agreed that SSEN is sensitive to environmental considerations within the context of the overall prototype design.*

Evaluation

- *All stakeholders found the presentations during the event helpful in informing their views;*
- *All stakeholders found the group discussions at the event helpful; and,*
- *All stakeholders found the event an effective approach for putting their comments and ideas forward to SHE Transmission.*

Contents

1. Introduction

1.1 Context

A key strategic objective of Scottish & Southern Electricity Networks (SSEN) is to develop and apply solutions to ensure that the electricity transmission infrastructure continues to develop in a way that minimises or reduces its impact on the environment while providing future capacity to meet customer needs in the North of Scotland.

As part of its strategic commitment to embrace innovation, SSEN secured £7.5 million from Ofgem's Network Innovation Competition[1] (NIC) to develop new transmission and overhead line structures. With this funding the challenge for SSEN is to develop a New Suit of Transmission Structures or NeSTS which produce a lower environmental impact than traditional designs. The project is targeting advances in the following aspects to achieve this;

- the structures are less perceptible;
- less material used;
- less construction; and
- less maintenance.

Funding for NeSTS was secured in 2015 with the project subject to the following timeline:

- 2016 - 2018 Design new structures & overhead line;
- Stage Gate – deployment decision (with Ofgem);
- 2019 - 2021 Construct overhead line; and,
- 2022 Publish e-tools and report.

1.2 Stakeholder Engagement

A requirement of all NIC funded projects is that funded organisations must commit to, and evidence, effective stakeholder engagement for the life of the funded project. SSEN, as part of its application, submitted a stakeholder engagement programme to run alongside the roll out of the project. The first element, addressed in the first stakeholder event held on 19 May 2016, focused on stakeholder views on a number of designs for different transmission structures which SHE Transmission is currently considering for construction.

1.3 Deliberative Event

This report presents the outcomes from a second stakeholder event, held on 1 February 2017 in Glasgow. SSEN invited a range of stakeholders pertinent to the Scottish marketplace. This event was designed to show stakeholders the progress achieved since the first stakeholder event, and to consider further the environmental impacts of the selected monopole design.

The event represents the second step in an extensive stakeholder engagement programme that is planned until 2022.

[1] https://www.ofgem.gov.uk/network-regulation-riio-model/network-innovation/electricity-network-innovation-competition

2 Deliberative Event on NeSTS

2.1 What we did

Scottish & Southern Electricity Networks (SSEN) and SMR worked collaboratively to design the format of the deliberative event, the presentation materials, and the points for deliberation / topics etc. Because of the extensiveness of the topic area within the proposed pilot, it was decided that a 'pre-read pack' would be prepared for background reading by participants.

Note that the full Agenda is included as Appendix A. The event agenda consisted:

- The context and purpose of NeSTS;
- An overview of the prototype design:
  - Span
  - Power rating
  - Insulator configuration and Access Provision
- Environmental performance;
  - Tension Support Form
  - Visual Impact Assessment
  - Reduction in Construction Activity
- Using a scorecard to evidence stakeholder perception of visual impact; and,
- Stakeholder discussion groups on the performance and value of the event and recommendations for future stakeholder engagement.

Following each presentation there was a short question and answer session.

To support the discussions and deliberations within the event itself, photo montages of the different design concepts were used as well as 1:25 scale models of different design options.

At appropriate points, SMR's electronic, interactive voting software was also integrated into the event. Primarily, this was done to generate quantitative metrics regarding stakeholder opinions about the effectiveness and/or knowledge exchange gained (or not) as a result of SHE Transmission's presentations.

The voting software was also used to generate stakeholder feedback on the event format to understand how improvements could be made during the future roll-out of the NeSTs stakeholder engagement programme.

Recruitment of participants to the event was undertaken directly by SSEN.

With the permission of stakeholders, the event was audio recorded, with stakeholders reassured that comments would be reported on a non-attributable basis.

2.2 Profile of Participants at the Deliberative Event

Five stakeholders representing four organisations attended the event. These external organisations were:

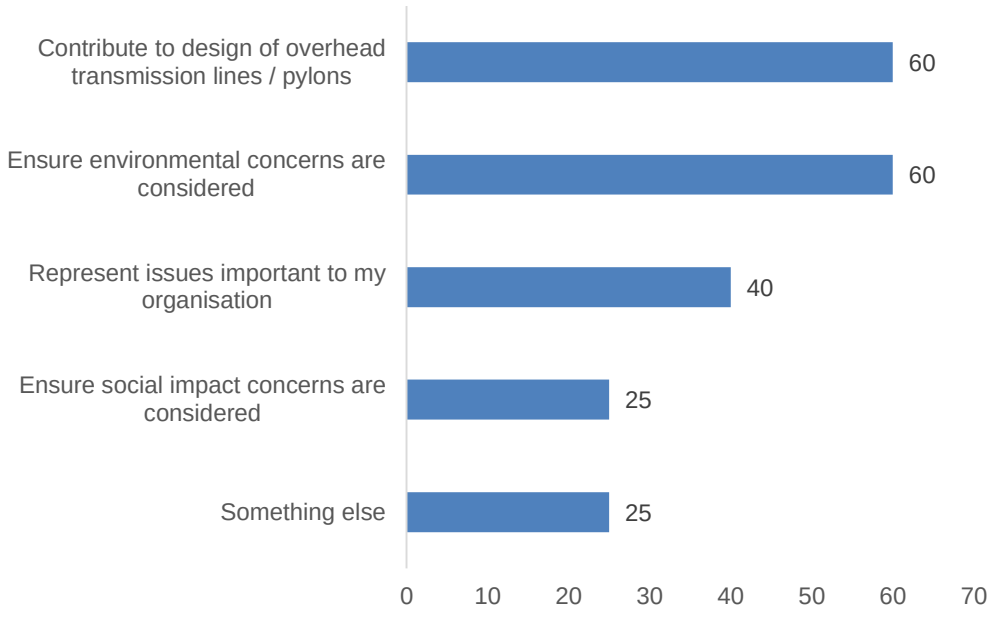
- The Scottish Government, Planning Consents Department;
- Scottish Natural Heritage;
- Royal Society for the Protection of Birds; and,
- Argyll and Bute Council.

2.3 Motivation for Attending the Event

Using SMR's digital voting facility, stakeholders were invited to choose the top two things that motivated them to attend the NeSTS stakeholder event.

Figure 1 shows three stakeholders attended the event to contribute to the design of overhead transmission lines, with three attending to ensure environmental concerns were considered. Two stakeholders attended to represent issues important to their organization with one stakeholder attending to ensure social impact concerns are considered.

Figure 1: Please list the top 2 things which best represent what motivated you to attend today? (n=5)



3 Key Findings

3.1 Context and Purpose

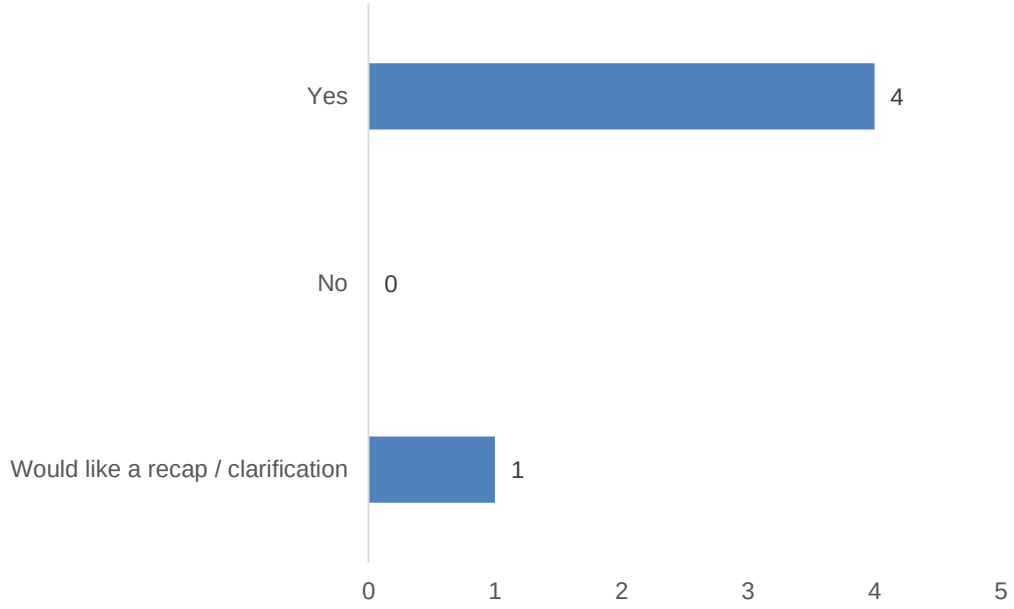
Tim Sammon (SSEN's R&D Project Manager) provided an overview and update of the NeSTS project to stakeholders covering:

- Purpose and constraints;
- Design selection and refinement;
- Concept comparison and assessment recap;
- Design selection and refinement;
- Buy-in from customer, supply chain, contractor operations and engineering team;
- Benchmarking;
- Design evolution; and,
- Prototype.

Following this presentation and, using SMR's digital voting technology, stakeholders were invited to say if they were clear on the purpose and context of the day.

Figure 2 shows that 4 out of 5 stakeholders were clear on the purpose and content of the day with one asking for further clarification.

Figure 2: Following the presentation are you clear on the purpose and context of today? (n=5)



A number of clarification questions followed from stakeholders:

Q *"Are the two models (the models physically present in the room) to the same scale?"*

A *"Yes, they are to the same scale, but the lattice tower is a 400kV tower."*

Q *"What about other environmental impacts of the designs, I mean other than the visual impacts. What about the impact on birds for example?"*

A *"This is quite complicated and we will get to it more fully in discussion. The monopole design provides fewer opportunities for nesting and some reduction in collision risk with the tower itself, though the overall collision risk may stay roughly the same when you take account of collision with the conductors. There is the same electrocution risk, though the monopole does provide a less attractive top to nest in."*

Q *"If you make the towers higher does that not increase collision risk?"*

A *"No, a higher tower doesn't really increase collision risk. The lines will remain similar to those used with a lattice tower, so collision risk with the wires, the main risk, does not change."*

Q *"You mentioned that you would define the success of the new design at the end. How will you measure success?"*

A *"That's a very good question. We have done the business case. We will take account of the costs of the new design and we will assess if we are delivering a reduced environmental impact. We will use both these things to decide success. It will still be a success if we find that the monopole is no better than steel lattice, because we would have tested the possible alternatives to a lattice tower."*

Q *"Will the new design go out for public consultation?"*

A *"Yes, we will go out to consultation if we decide to build it. We will use the photomontages and 3-D to show the design."*

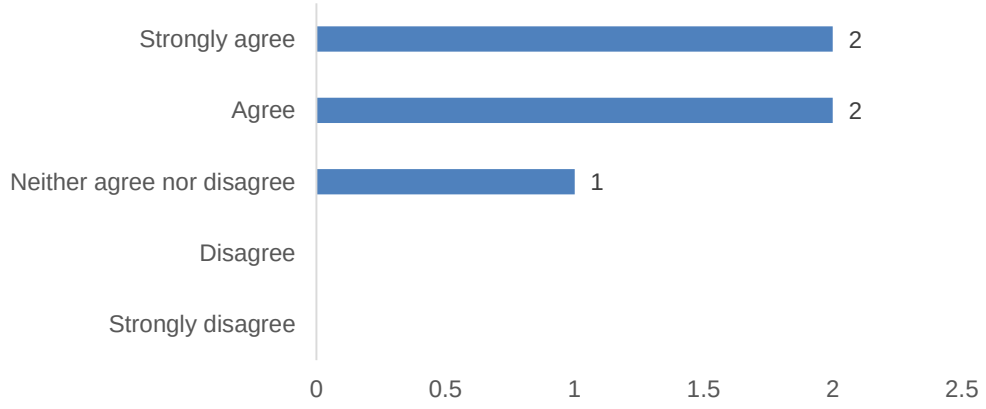
3.2 Span

Malcolm Lowe (Principal Structural and Civil Design Engineer, Energyline) presented an overview of the relationship between span and height in the context of OHLs. The presentation covered:

- Standard-span;
- Standard-span versus Maximum span;
- Relationship between standard-span and support height;
- Relationship between standard-span and weight; and,
- Comparison of standard-span NeSTS & other specifications

Figure 3 shows that 4 out of the 5 stakeholders thought that the presentation on span improved their understanding of the context in which the project is operating. One stakeholder neither agreed nor disagreed.

Figure 3: Please say if you agree or disagree that the presentation on span has improved your understanding of the context in which the project is operating in? (N=5)



Following this presentation, stakeholders made a number of comments and asked a number of questions:

Q *"Is it feasible to have different options for different conditions, say a shorter tower and a wider span in different settings?"*

A *"Yes, that is certainly possible as long as loading does not exceed strength."*

Malcolm Lowe provided the following clarification:

> *"You might have to increase span if you are crossing a river, for example. It is a trade-off between height and the number of structures".*

Comments from stakeholders included:

> *"That's good to know (that taller, but fewer towers are possible) because it is the towers that are most visible".*
>
> *"There does not seem to be much visual gain in having shorter towers so higher towers and fewer of them seems to be the best solution".*

3.3 Power Rating

Jonathan Sherwood (Project Engineer, Energyline) presented an overview of the design issues surrounding power rating. This included:

- Rating requirements;
- Rating and weight;
- Conductor systems and load capacities; and,
- Earth wires.

Figure 4 shows that all stakeholders either strongly agreed or agreed that the presentation improved their understanding of the prototype design.

All stakeholders also agreed that SSEN is sensitive to the issue of power rating within the context of the overall prototype design (Figure 5).

Figure 4: Please say if you agree or disagree that the presentation you just heard on power rating has improved your understanding of the prototype design (N=5)

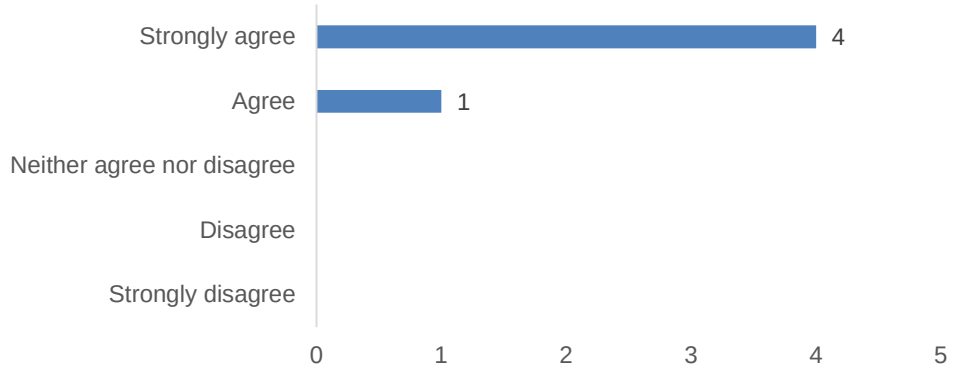
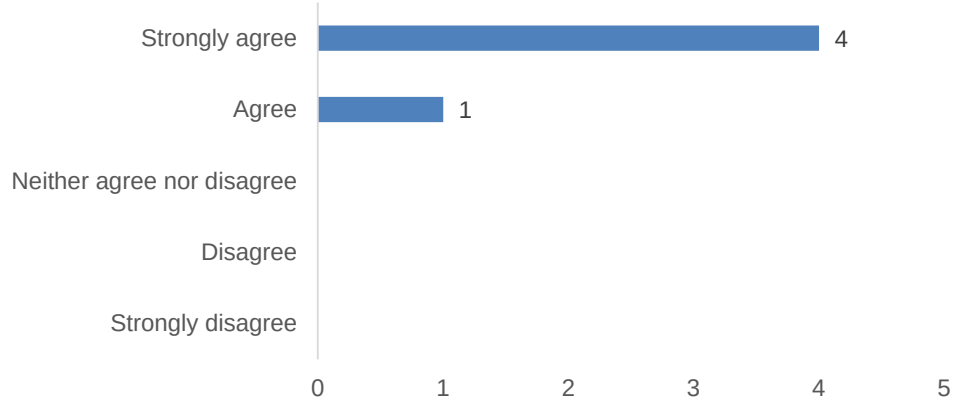


Figure 5: Given the presentation on power rating, please say if you agree or disagree that SSEN is sensitive to the issue of power rating within the context of the overall prototype design? (N=5)



The following questions were asked following the presentation on power rating.

Q *"What is MVA?"*

A *"Megavolt Amps."*

Q *"Having a single or twin earth wire, is this to allow you to switch off one circuit while you work on another?"*

A *"Yes. There is more space in the new design to lower a single earth wire. So, SSE operations are happy to have a single earth wire instead of a twin."*

Q *"I thought in moving from lattice to the monopole design we would always only have one conductor?"*

A *"In a lattice design you can have between 1 and 4 conductors. For this installation, you need two conductors whether you were using lattice or monopole tower."*

3.4 Insulator Configuration and Access Provision.

Steve Turner (Senior Construction Engineer, Energyline) gave a presentation on Insulator Configuration and Access Provision. This covered:

- Key design change in the insulator configuration;
- Pole body and access;
- Rescue considerations; an,
- Crossarm design.

Figure 6 shows that all stakeholders either strongly agree or agreed that the presentation improved their understanding of the prototype design. All stakeholders also strongly agreed or agreed that SSEN is sensitive to these issues within the context of the overall prototype design (Figure 7).

Figure 6: Please say if you agree or disagree that the presentation you just heard on insulator configuration has improved your understanding of the prototype design (N=5)

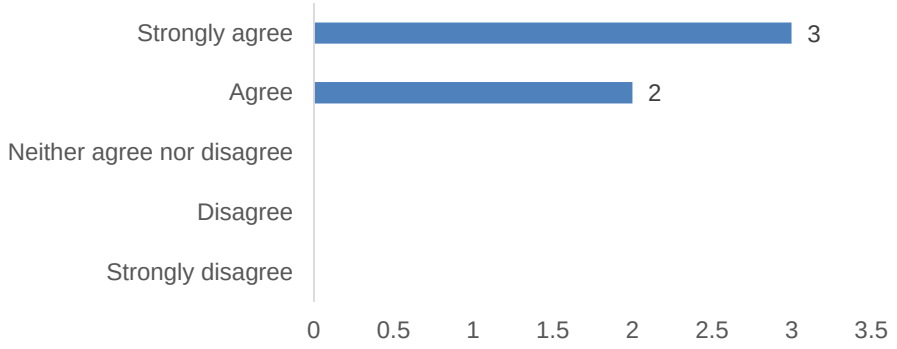
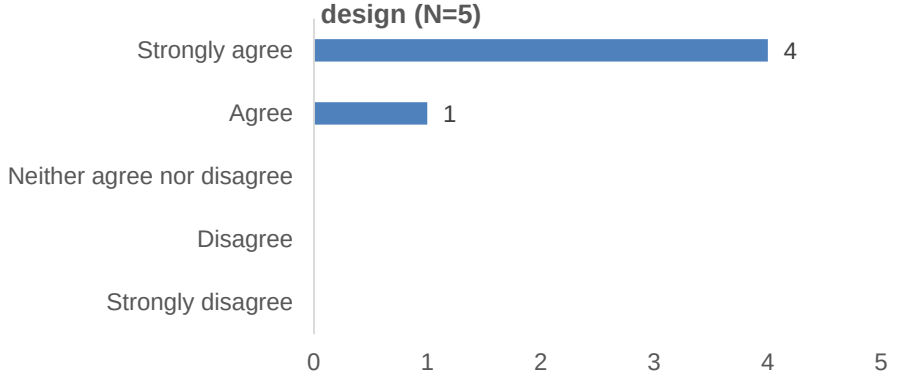


Figure 7: Given the presentation on insulator configuration and access provision, please say if you agree or disagree that SSEN is sensitive to these issues within the context of the overall prototype design (N=5)



he following question was posed on insulator configuration and access.

Q *"You talked about developing the prototype. Are you considering different designs or configurations on the prototype?"*

A *"Yes. On the prototype, we will put 4 different types of access systems. We are going to provide several variants."*

3.5 Exhibition and Evidence

During coffee, all stakeholders were invited to review the exhibition of the different design concepts on display in the event venue. The exhibition was made up of photo montages of the eight potential designs in differing natural landscapes with a 1:25 scale model structure of the monopole and lattice tower also on physical display.

After coffee, stakeholders were invited to make comments on the exhibition and models. Stakeholders welcomed the photomontages and the models.

> *"The montages are very helpful instead of just looking at the models and having to imagine them in a landscape."*
>
> *"Yes, they (the montages) are good, they give us a good starting point for discussion."*
>
> *"It is good to have the models (the physical scale models) as well as the photomontages."*

There was some discussion on the selection of landscapes for the montages and the level of realism that the photomontages represented.

> *"In Scotland, we have some very open, elevated, landscapes without artifacts or settlements which are not represented in the montages. These are not necessarily designated areas, but are wild land."*
>
> *"Some close-up comparisons would also be good as well as some where the towers and lines are at a distance. These are all with a pylon in the foreground and the line going away into the distance."*
>
> *"Yes, I agree (about the benefits of showing a line in the distance). It would also be good to see what they look like with intersecting lines. When more than one line runs across a landscape that is where the biggest visual impact comes."*
>
> *"The towers in the photomontages are almost transparent as they recede into the distance, which is quite optimistic. I think some of these are quite optimistic. Sometimes distant towers show up more clearly than they do in the photos. Maybe there could be variations where the distant towers could be enhanced to show up more clearly and then a comparison could be done."*
>
> *"Having the car alongside the model helps to give a sense of scale, but a person would be a better device to help with scale" (A later comment suggested that a model of a person placed on the tower itself would be the best way of providing scale).*

SSEN responded with the following comments to the views expressed by the stakeholders on the photomontages:

A *"Let us think about that and get back to you. We can try some different things. We try to show the landscape and lighting accurately , but let us try some different things and come back to you."*

A *"We have tried to show in all the landscapes, a tower on the skyline."*

3.6 Environmental Performance

Dr. Shona Mackie (Environmental Adviser, SSEN) gave a presentation on environmental performance. This covered:

- Environmental considerations;
- Tension support continuity;
- Designs in the landscape; and,
- Visual effects.

The following questions were posed after this presentation:

Q *"How often along the line do you have to have a tension tower?"*

A *"70% of a line is suspension towers."*

Q *"Have you considered the option of the double pole tensions tower – though the double poles don't look any thinner?"*

A *"Yes, we thought that maybe two slimmer poles might have a lower visual impact, but when it comes to it you don't get much of a visual saving or much thinner construction on the double pole design."*

Further stakeholder comments.

"There is a much stronger visual impact with the twin pole tower."

"The double pole doesn't have the nice symmetry of the monopole. The double pole is less pleasant, it's asymmetric and less well balanced."

This was followed by a presentation by Jennifer Skrynka (Chartered Member of the Landscape Institute, ASH design+assessment Ltd). This included

- Pictorial representation of structures within landscapes;
- Introduction to scorecards comparing lattice tower and monopole designs;
- Scorecard on Visual consideration;
- Scorecard on Landscape orientation; and,
- Scorecard on Aesthetic consideration.

Further stakeholder comments:

"You need to change the visibility of the structures for the photos taken on dull days."

This was followed by Steve Turner (Energyline) talking about the reduction in construction activity and the consequent benefits for the environment.

Steve Turner's presentation prompted the following questions.

Q *"Looking at the impacts, the temporary roads and so on, there is impact on the ground in laying the road access. Whether the road is used for 6 days for a lattice tower or 1*

day for a monopole is not the important thing, surely it's the laying of the road that causes the greatest environmental impact?"

A *"It is much easier to reinstate the ground if you use the road for fewer days. It's easier and quicker."*

Q *"Can you use a floating road for these installations?"*

A *"Yes, you can, sometimes. It depends on the site and the conditions. The underlying vegetation suffers more and may die off if the floating track is left down for long periods, so the shorter the time that it is in place the less damage is done to the vegetation and the quicker and easier is the reinstatement."*

Q *"But the reinstatement probably wouldn't be done straightaway anyway so, for example, the floating track for a monopole tower may not actually be in place for a significantly shorter time, so the saving is quite hypothetical."*

A *"There will be some time saving for sure. And there will be less plant and machinery movement and a lower manpower impact. Also, if you are on site for a shorter time, there is less risk of an incident such as a fuel spill. There is also a positive impact on site safety if the site is in operation for a shorter time."*

Following these three presentations, all stakeholders agreed that the presentations on environmental considerations had improved their understanding of the prototype design and agreed that SSEN is sensitive to environmental considerations within the context of the overall prototype design (Figures 8 and 9).

Figure 8: Please say if you agree or disagree that the presentations you just heard on environmental considerations have improved your understanding of the prototype design? (N=5)

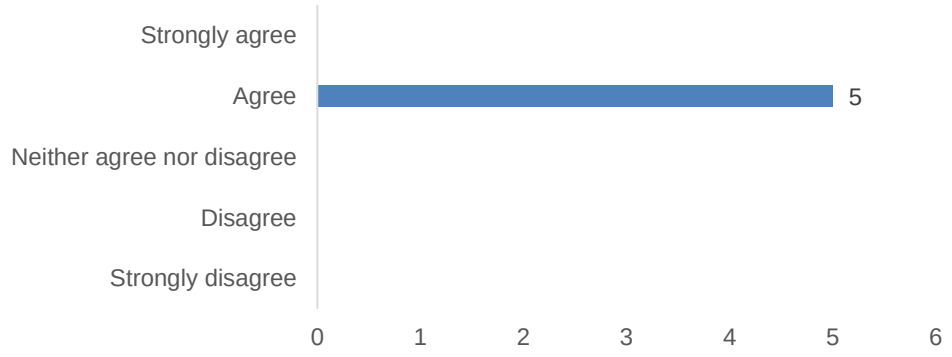
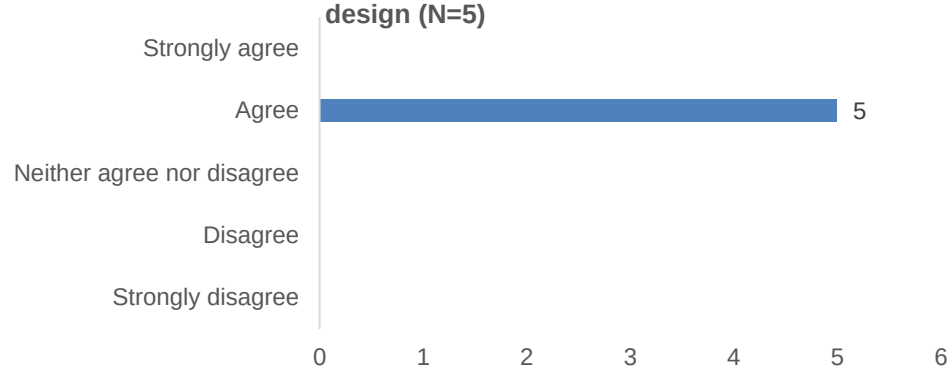


Figure 9: Given the presentations on environmental considerations, please say if you agree or disagree that SSEN is sensitive to environmental considerations within the context of the overall prototype design (N=5)



3.7 Score Cards

As noted at the event, the monopole structure was identified as the preferred design during the first round of stakeholder engagements conducted in 2016. This feedback allowed SSEN to progress the design of the new monopole structure as well as consider other factors such as technical buildability, maintenance, cost and environmental considerations.

To further support the design development process, stakeholders attending the event were invited to view a series of photomontages and to consider the visual, landscape and aesthetic considerations within an overall environmental context. The photomontages were prepared for both the new monopole design and the existing steel lattice towers (suspension structures only) for a range of Scottish landscape types where the structures might typically be seen.

Having viewed the different photomontages, stakeholders were in turn invited to answer three questions associated with the appearance of the structures and how well they address visual landscape and aesthetic considerations. Stakeholders were provided with explanatory notes to assist with scoring.

Question 1: Visual Consideration – the perceptibility of the structure

[note that stakeholders were advised that 'perceptibility of the structure' reflects on how prominent the structure is considered to be in terms of its visual bulk and visual transparency and that there is likely to be a preference for a structure that is less prominent].

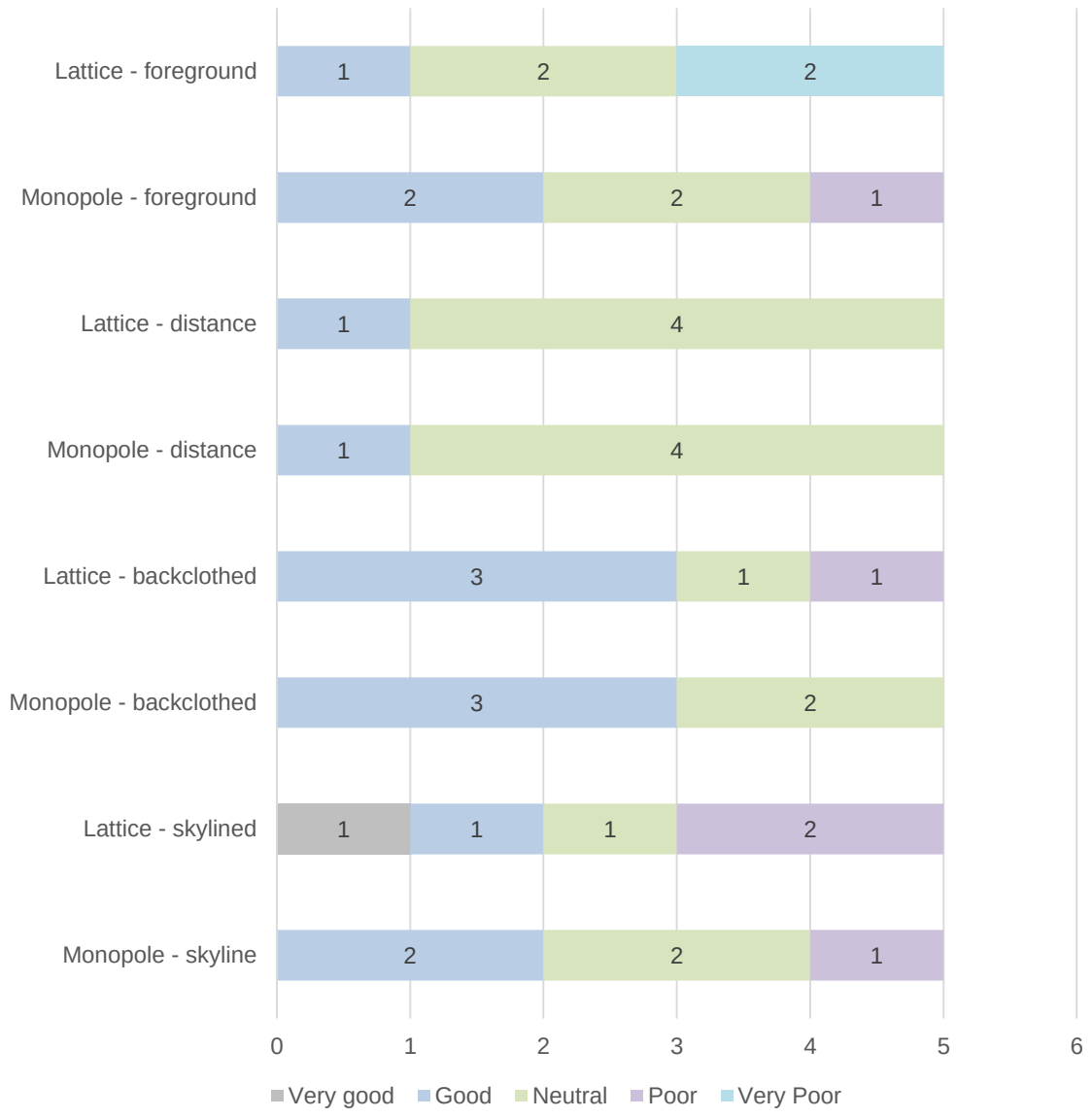
Given this information, stakeholders were then invited to rate the success of the steel lattice tower and the monopole in terms of four scenarios: foreground; distance; backclothed; and, skylined.

Stakeholders were asked to score the steel lattice tower and the monopole on each of the four scenarios. Scoring was on a continuum from 1 to 5 where 'very good' (5) is scored where a structure is considered to be least prominent in the landscape and very poor (1) is scored for a structure that is considered very prominent.

Figure 10 shows that:

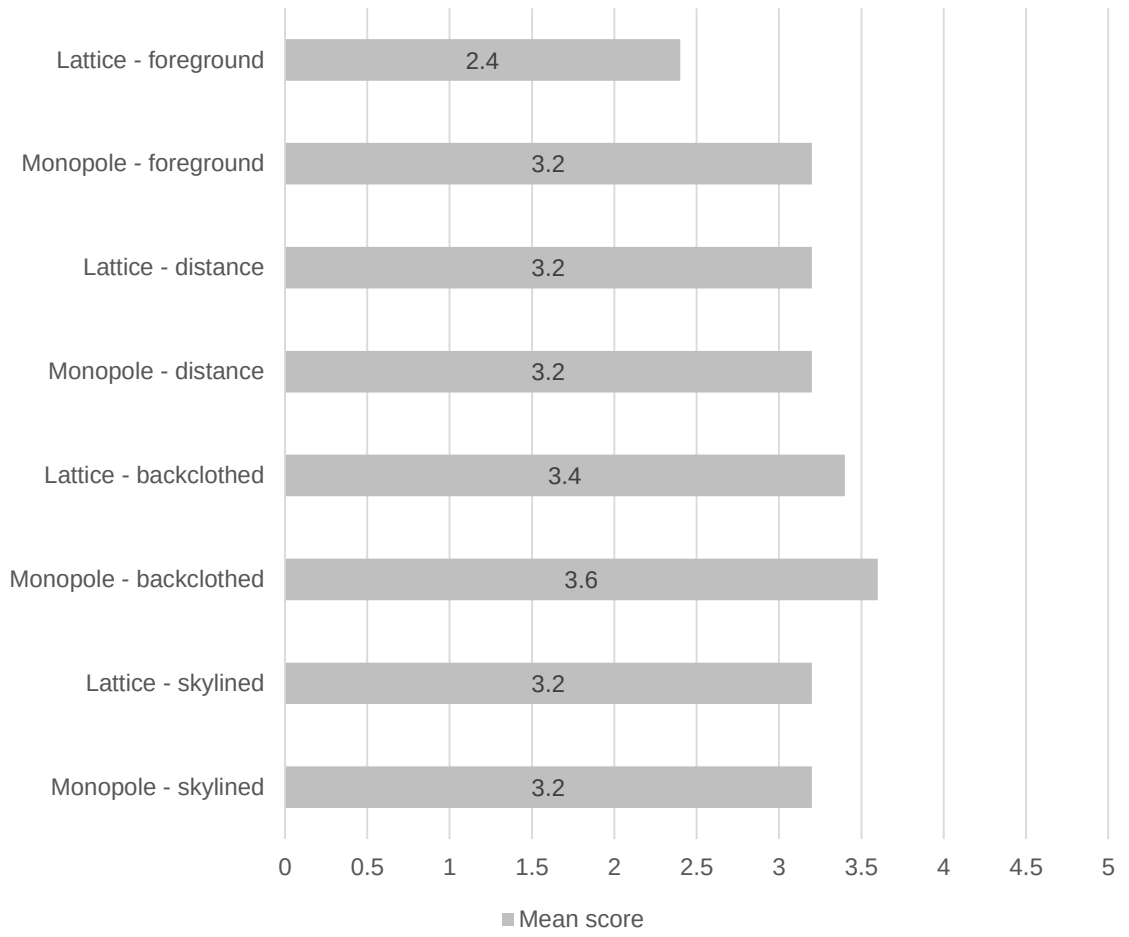
- **Foreground:** the lattice tower was rated 'good' by one stakeholder compared with two rating the monopole as 'good';
- **Distance:** both designs were rated the same (one stakeholder rated each design 'good' and four rated each design 'neutral')
- **Backclothed:** the lattice tower was rated 'good' by three stakeholders with the same number rating the monopole as 'good';
- **Skylined:** the lattice tower was rated either 'very good' or 'good' by two stakeholders compared with two rating the monopole as 'good';

Figure 10: Scores for visual consideration - the perceptibility of the structure (base=5)



In terms of mean scores (higher mean score is perceived to be better) the monopole scored better on foreground (3.2 vs. 2.4) and backclothed (3.6 vs. 3.4) whereas both designs scored the same on distance (3.2) and skylined (3.2).

Figure 11: Mean scores for visual consideration - the perceptibility of the structure (base=5)



Stakeholder Comments on Question 1:

- *'Bulk and transparency could be separated? E.g. lattice more bulky but more transparent, [mono]pole more bulky but less transparent…pole less bulky (more simple) but less transparent';*
- *'I would expect design of a line would strive to make the best of whichever tower type is selected – each has different strengths at different distances from the viewpoint. If tower type is not selected before final route is selected the impacts of the route may be sub-optimal'.*

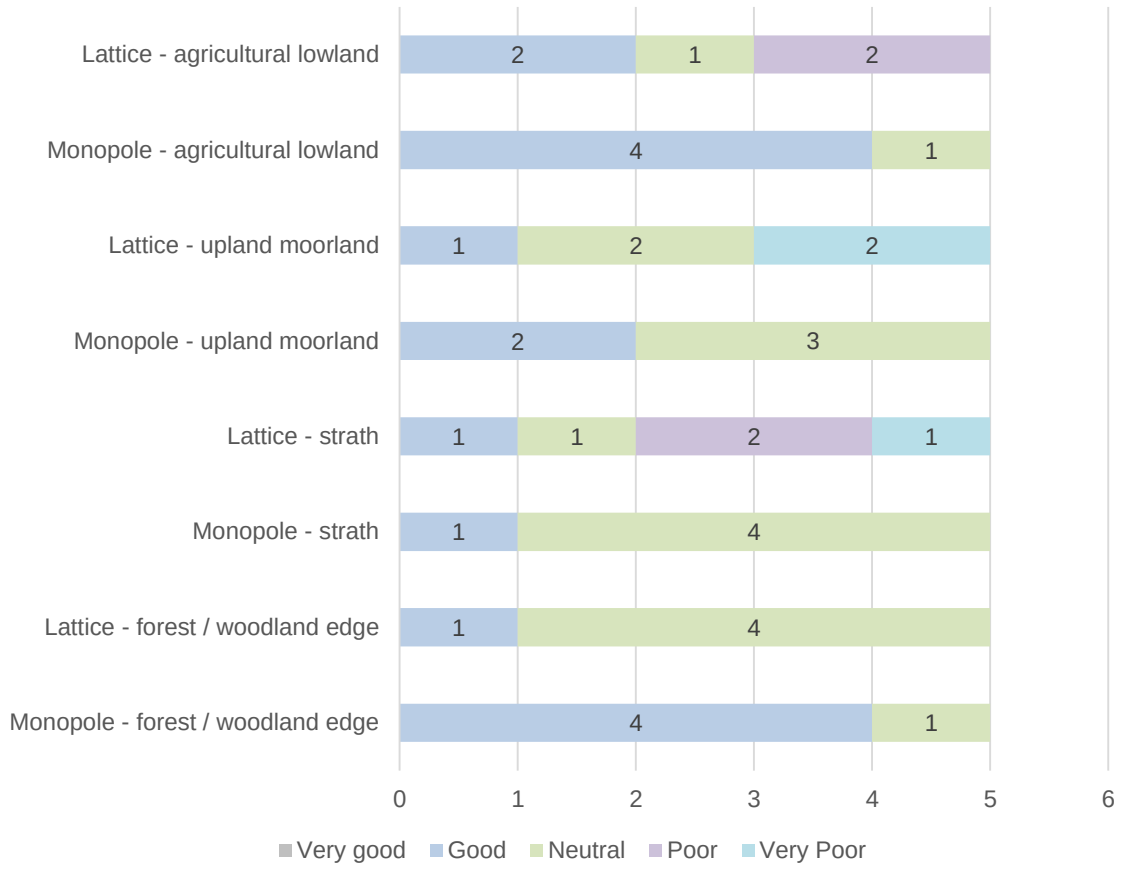
Question 2: Landscape consideration – the 'fit' of the structure in the Scottish landscape *[note that stakeholders were advised that considerations should include: the flexibility of the structure height and spans in the four different landscape types; and, the relative scale of the structure in the four different landscape types].*

Scoring was on a continuum from 1 to 5 where 'very good' (5) is scored where a structure is considered to have a good 'fit' in the landscape and where the scale of the structure is not at odds with the surrounding landscape, and 'very poor' (1) is scored for a structure that does not 'fit' well in the landscape and the scale of the structure is at odds with the surrounding landscape.

Figure 12 shows that:

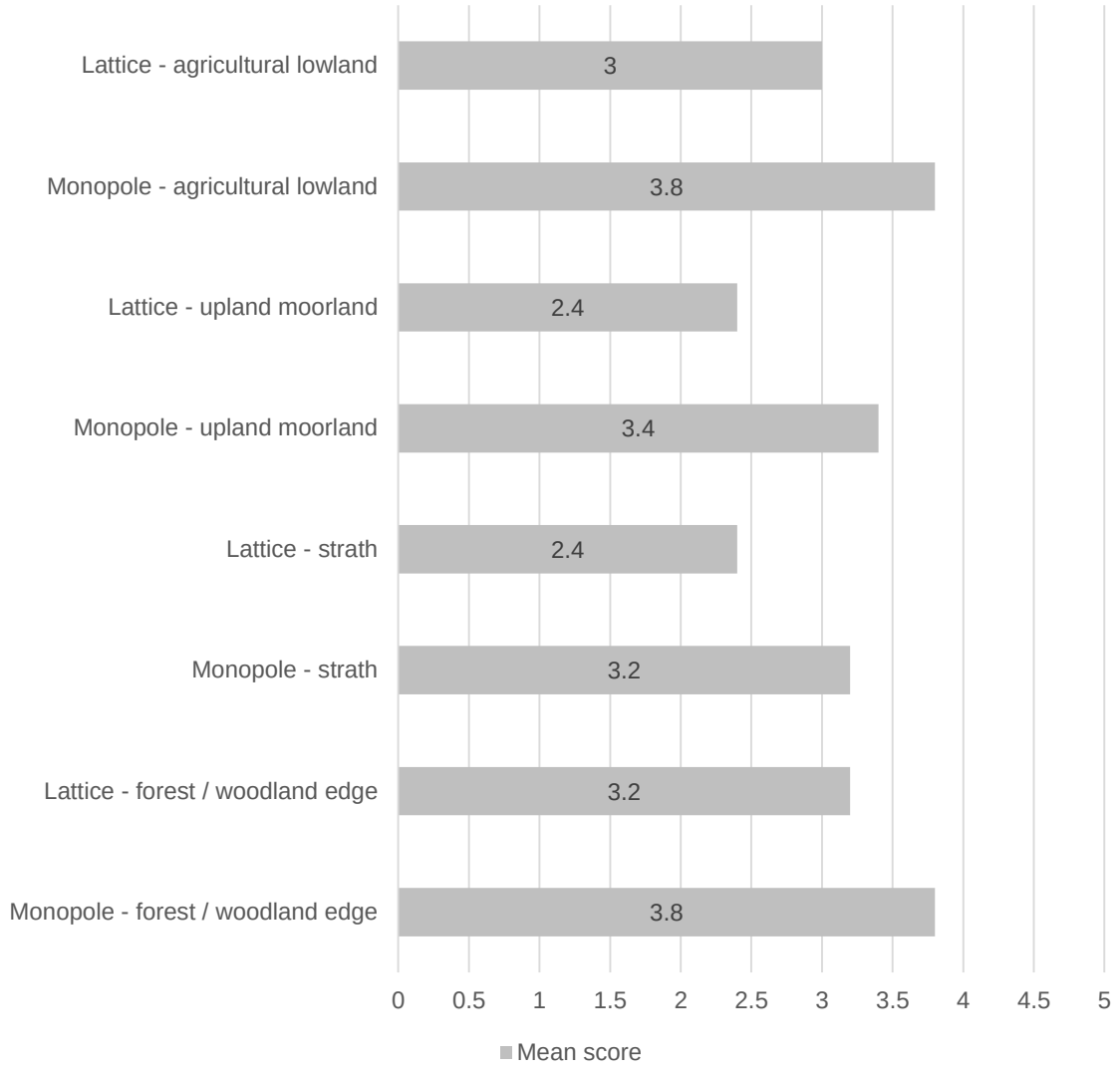
- **Agricultural lowland:** the lattice tower was rated 'good' by two stakeholders compared with four rating the monopole as 'good';
- **Upland moorland:** the lattice tower was rated 'good' by one stakeholder compared with two rating the monopole as 'good';
- **Strath:** the lattice tower was rated 'good' by one stakeholder with one rating the monopole as 'good';
- **Forest / woodland edge:** the lattice tower was rated 'good' by one stakeholder compared with four rating the monopole as either 'very good' or 'good';

Figure 12: Scores for landscape consideration - the 'fit' of the structure into the Scottish landscape (base=5)



In terms of mean scores (higher mean score is perceived to be better) the monopole scored better on each setting (Figure 13).

Figure 13: Mean scores for landscape consideration - the 'fit' of the structure into the Scottish landscape (base=5)



Stakeholder Comments on Question 2:

- *'The forestry visual is not a very sensitive example of landscape line through woodland on Southern slope of Loch Tunnel NSA seen from a distance would maybe be a better example to demonstrate a sensitive landscape context…in this clear-cut corridor it almost does not matter which pole!'*

Question 3: Aesthetic consideration of the form / shape of the structure

[note that stakeholders were advised that considerations should be given to: whether the shape of the structure is visually pleasing; and, the structure appears well proportioned].

Scoring was on a continuum from 1 to 5 where 'very good' (5) is scored for a structure that is considered to be visually pleasing in the landscape and 'very poor' (1) is scored for a structure that is not considered to be visually pleasing in the landscape.

Figure 14 shows that one stakeholder rated the lattice tower as 'good' for aesthetic consideration of the form / shape of the structure compared with all five stakeholders who rated the monopole as either 'very good' or 'good'.

Figure 14: Scores for aesthetic consideration of the form / shape of the structure (base=5)

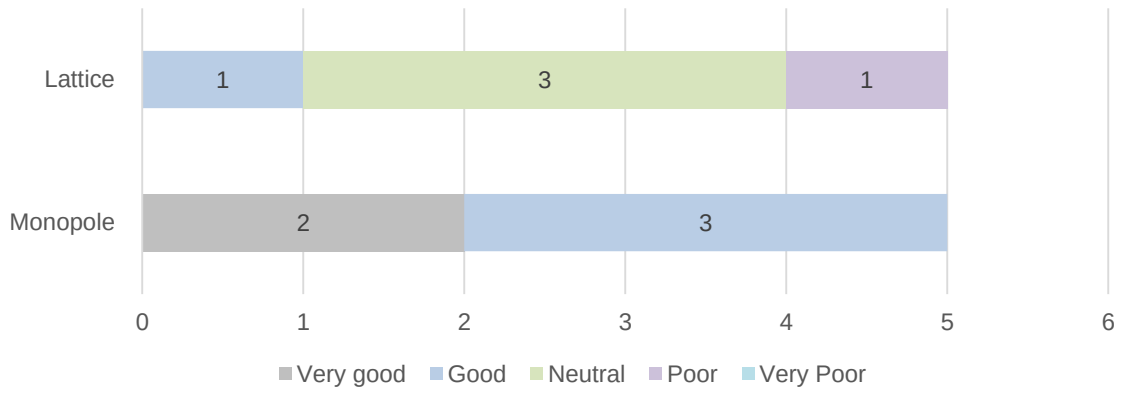
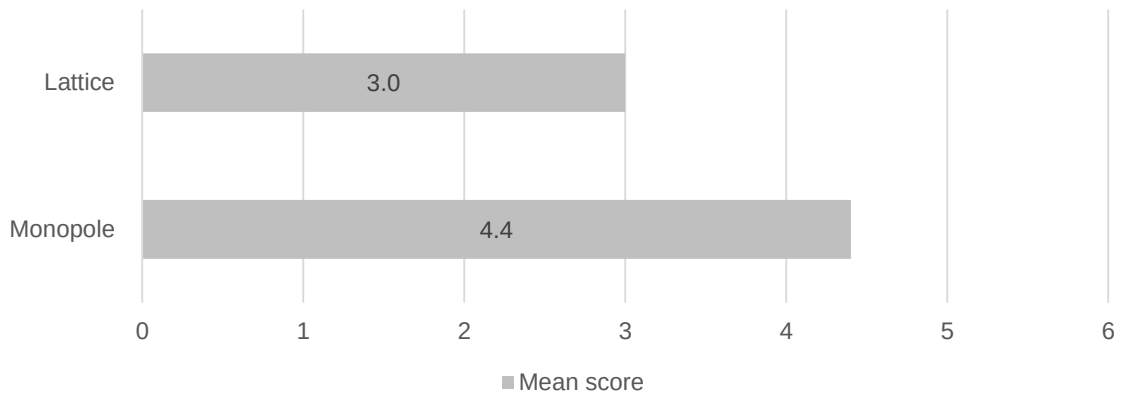


Figure 15 shows that the monopole deign recorded a higher mean score among stakeholders for aesthetic consideration of the form and shape of the structure (4.4 vs. 3.0).

Figure 15: Scores for aesthetic consideration of the form / shape of the structure (base=5)



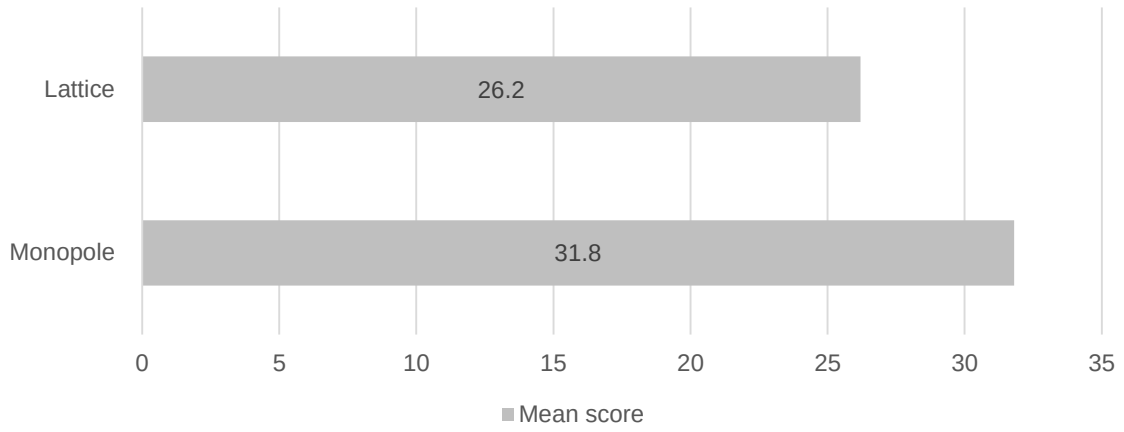
Stakeholder Comments on Question 3:

- *'Lattice has industrial appearance that can be intrusive in rural and especially remote landscapes. The simplicity of the monopole is positive and unintrusive but it is surprisingly visible / prominent on visuals compared with lattice';*

- *'The steel lattice is particularly poor when close up – the further away it is then it begins to look less dominant than monopole except when skylined or where separate lines converge. But on balance I would say monopole is better'.*

Finally, considering all nine factors for each design, the mean score for the monopole was 31.8 compared with a mean score of 26.2 for the lattice tower.

Figure 16: Mean score based on all 9 factors (base=5)



3.8 Next Steps

Following the lunch break, Tim Sammon (SSEN's R&D Project Manager) gave a short presentation on the next stages of the project. This included:

- A description of the steps and stages still to come;
- Prototyping;
- Testing;
- OHL design; and,
- Stage Gate.

Following the presentation, there were some general questions about the how climate change might affect the new design and how it would be tested for wind noise.

Q *"When you test the new design for wind and climatic conditions will you take account of recent and potential adverse climate changes?"*

A *"Good question. The testing is defined by a standard but I'm not sure how much future climate change is in the model. The standard being used was last updated in 2015. In practice, it is difficult to predict and design for what might potentially be adverse changes in climate control, but we take account of most of that with safety factors."*

Q *"Will you be checking to see if the new design makes any noise or anything in high winds?"*

A *"It is difficult to answer that. I don't know how meaningfully we can conduct such a test. We can check the dynamic responses of the design and from that information we may be able to determine if there is a certain resonance that would create noise. I think the expectation is that you would have less noise with a monopole design than you would with a steel lattice tower. We can check the design theory, but I'm not sure how you would actually test for it. I will try to get you an answer on that, to find out what factors are taken into account it would be good to know."*

3.9 Discussion session

There then followed a discussion session where the stakeholders, facilitated by a member of the SMR team, discussed the following issues:

- Opinions on the scorecards;
- Hits and misses;
- Format for the next workshop;
- Unaddressed issues; and,
- Future buy-in.

Opinions on the scorecards

General opinions on the scorecards were very positive. One stakeholder had previously completed the more complex SAM scorecard presented at the last stakeholder event. He found the new scorecards much easier to complete. One stakeholder found the tick-box approach limiting:

"I find it easier if I am able to write in my answers as comments rather than scoring numbers. A number doesn't always express what you want to say. For example, there are many different types of woodland and if I am able to comment on the impact on different types of woodland that is better than only being able to comment on woodland in general where a single score does not fully represent my view"

Hits and misses with the event: general comments.

"I thought it was pitched really well, I thought it was pitched at my level of understanding."

"I thought it was pitched perfectly at the level I need to be able to understand it in terms of our work."

"I had a look at the material before today and there was enough there to let me know that I would be able to participate fully in the day."

"I found it really good the way that the information was presented and the fact that we were able to ask questions as we went along, very little jargon, which was well explained."

Pre-consultation materials

"I wasn't really sure coming into today just what the issues would be that we would be discussing and perhaps if I had more information in advance I could have talked to some colleagues and got their views."

"Unfortunately, I didn't get the material in advance. I'm standing in for somebody who was at the last one, so I came along with limited knowledge, but even so, I am happy that I have got a feel for what it is all about and it was a valuable experience."

Would it be useful to have a clearer picture of the responses to consultation thus far?

"I would have found it useful, because there has been previous consultation and previous input, I would have found it helpful if maybe there was a list to say, well we heard that in a previous consultation and this is what we did about it, where you have succeeded and where you haven't. Like a list of previous consultation comments and the responses and priorities that you attach to them."

"Yes, that might be useful to have a breakdown of what has been done in response to consultation so far, both in the information pack and also in the presentation on the day."

Was anything missing from the day?

"It would be helpful, but I don't think anybody knows yet, to find out where these new lines are going to be built. That would make it all a bit more real."

"It was a bit heavy on visual impact and it would have been useful to have more on wildlife impact, but I am hopeful that we will be able to have subsequent discussions on those issues with a bit more focus on our areas of interest."

Was everything transparent and open?

"Yes, I think it fully transparent, after all you are trying to know what we think, so you need to be transparent about it. Still, some of the visuals. I'm not sure that they represent the way things will really look like, that's not suggesting any dishonesty, no not at all, it's just natural skepticism on my part."

"Yes, I think this is very open. At the last stage, we were talking about the difference between different designs and now you have narrowed it down to the preferred choice and we are talking about prototypes and details. And when you get further down the line to something actually being built it becomes more of a legal undertaking, so, yeah, everything seems to be transparent and honest."

What did you think of the balance between information giving and discussion/question time?

"All fine by me."

"It was interesting to know the background of it, why you have come up with the designs and so on, so you needed to give a lot of information to understand what was involved."

"It's all a new area for me so it was very interesting and also very well pitched."

Was there too much technical jargon?

"No, when you are talking about the different elements, for example the cross-arms or the conductors, it is all new, so it would be useful if you could have something that tells you what all the different bits are."

"Yes, I agree, there wasn't too much jargon, bit it would help if you were able to name things on the towers and say, this bit goes here and that bit goes there, this is called this and that is called that."

"Yes, it would be useful to know about the different towers a compression tower, tensions tower, a turning tower."

Should we continue with the same format for the next workshop?

"For me this (workshop format) is very useful and interesting to hear the views of other stakeholders in the group."

"Yes, definitely, this format works very well for us, if there is another group event, then I would definitely want to be part of that."

"What's useful about this is when you hear other people's views it helps you to think about it a bit more and you get more out of it than you would just one-to-one."

"These kinds of events are very useful bringing different agencies together."

"I have been to other events where the agencies and the public were both present, but that does not work well. You need to get the agency or professional view separately like you did here today and engage with the public and communities separately."

Are there other methods of engagement that we should be using?

"It's difficult, because we all lack resources and it is difficult to find an appropriate person who can afford to spend a whole day at something like this, so that's a reason why maybe some people can't or won't attend an event like this. Maybe it would be worthwhile coming to the Council to meet with others as well."

"The group session works well for me but at the same time I would really like one-to-ones with other people in [name of organization] to hear their views on their own specialties. There are 4 or 5 people that I would like to get in a room to discuss these issues, but it would be difficult to get them to give up a whole day. Coming into them with a tight agenda and a set of questions you might get more out of it than a workshop."

"You could maybe have an online questionnaire as well for people who can't travel who could give you some information and some views."

Should we engage with other representatives from your organisation?

"It would be useful to know in advance the next time about the issues that you have identified so far that need to be addressed, then we could make sure that either we talk to our relevant colleagues in [name of organization] so that we can represent their views or that maybe that they can come along."

"Yes, our bio diversity officer in the Council or environment officers some of those might be interested in coming along."

"Yes, in [name of organization] there are lots of other areas of expertise that would be interested in being involved."

"Yes. My own role is fairly process driven in assessing planning but there are people in planning policy and environment who might be interested in being engaged."

Were there any issues left unaddressed today?

"Not really any, I came here to get an update on what was happening and we got that presented to us very well."

Do you buy-in to the project going ahead?

"Yes, for sure."

"Yes, of course there definitely seem to be benefits, perhaps greater in some areas than in others, but definitely the project should go ahead to the next stage."

"There was an interesting comment at the beginning that these towers hadn't been re-designed since a long time, so yes, the project should definitely go ahead to see if they can be designed in a better way."

"Yes, it feels somehow more real now and less of a concept since I was at the last stakeholder event. There is a definite progression in the engineering and the various in-puts."

At what stage, would it be useful to engage with you again?

"I think it has got to be at a stage where we can still make a difference."

"I think it would be best, if it is possible, to have as much engagement as we can as you move from one stage to the next."

3.10 Closing Remarks

Tim Sammon (SSEN's R&D Project Manager) closed the event and outlined future things and next steps that would be undertaken to include those stakeholders in at-tendance.

Stakeholders were once again invited to ask any final questions and/or make any further comments. No questions were asked by attendees at this time.

3.11 Evaluation of the Event

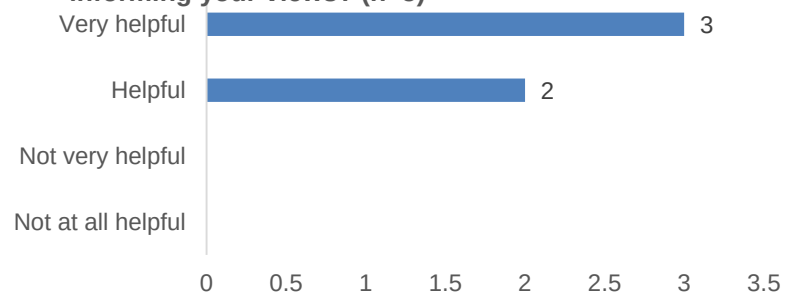
Voting software was used to gauge overall stakeholder views regarding the event, its format and approach. The voters anonymised responses and were used by participants to rate the approach and implementation of the NeSTs deliberative event across several different assessment areas. Respondent evaluation findings are described below.

Presentations

Stakeholders were invited to rate how helpful they found the NeSTs Event Presentations overall.

Figure 17 shows that all stakeholders found the presentations throughout the day either 'very helpful' or 'helpful' towards informing their views.

Figure 17: How helpful were today's presentations towards informing your views? (n=5)

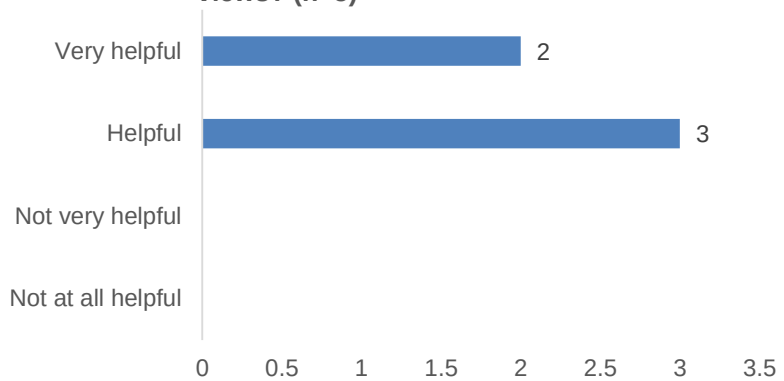


Group Discussions

Stakeholders were also invited to rate how helpful they found the NeSTs Event discussion.

Figure 18 shows that all stakeholders found the group discussion either 'very helpful' or 'helpful'.

Figure 18: How helpful was the group discussion for giving your views? (n=5)

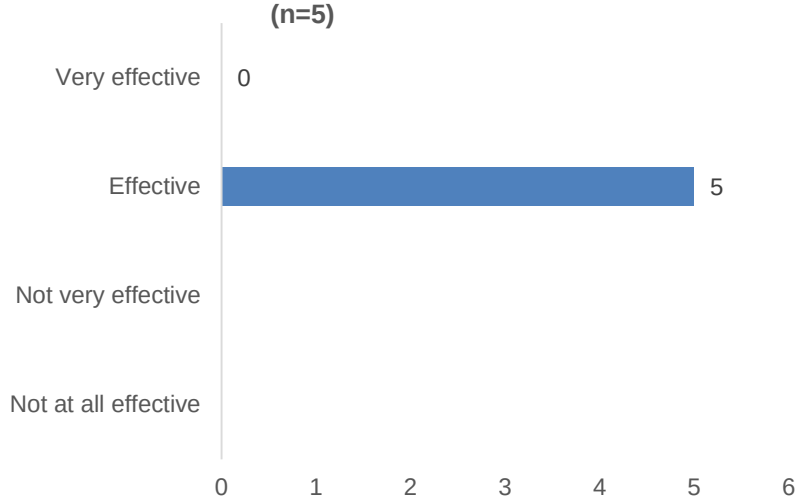


Effectiveness of the approach for inputting comment and ideas

Stakeholders were also invited to rate how helpful they found the NeSTs Event Presentations overall.

Figure 19 shows that all stakeholders found the approach used for the event an effective means of putting their comments and ideas forward.

Figure 19: Overall, how effective did you find today's approach in putting your comments and ideas forward to SHE Transmission? (n=5)



Appendix A: Event Agenda

Agenda

9.45	**Registration**
1000	**SESSION 1 - PRESENTATIONS AND VOTING** Context, Purpose, Introduction NeSTS Prototype Design - Span - Power Rating - Insulator Configuration and Access Provision
1130	**Coffee break, exhibition and networking**
1200	**SESSION 2 – ENVIRONMENTAL PERFORMANCE** - Tension Support Form - Visual Impact Assessment - Reduction in Construction Activity
1300	**Lunch**
1400	**SESSION 3** - What's Next?
1415	- Discussion Groups
1500	**Summary and closing remarks**

Appendix B: Event Content

NeSTS

External Stakeholder Engagement Event
1 February 2017

Scottish and Southern Energy
Power Distribution

NeSTS


Safety Moment


Agenda
Donal McDade
Social Market Research

Agenda

9.45	**Registration**
1000	**SESSION 1 - PRESENTATIONS AND VOTING** Context, Purpose, Introduction NeSTS Prototype Design - Span - Power Rating - Insulator Configuration and Access Provision
1130	**Coffee break, exhibition and networking**
1200	**SESSION 2 – ENVIRONMENTAL PERFORMANCE** - Tension Support Form - Visual Impact Assessment - Reduction in Construction Activity
1300	**Lunch**
1400	**SESSION 3** - What's Next?
1415	- Discussion Groups
1500	**Summary and closing remarks**

TODAY

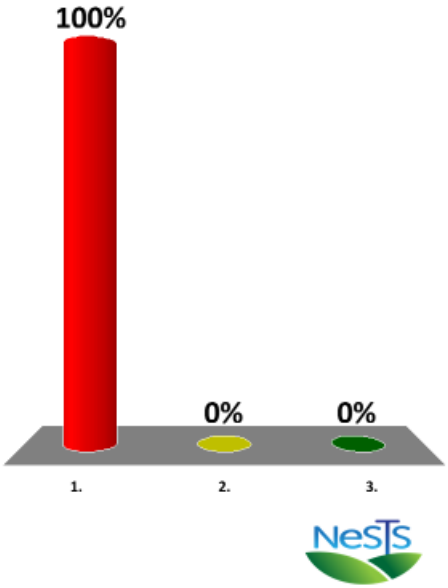

CONFIDENTIAL


Switch mobile phone off or to silent


Who's in the room today?

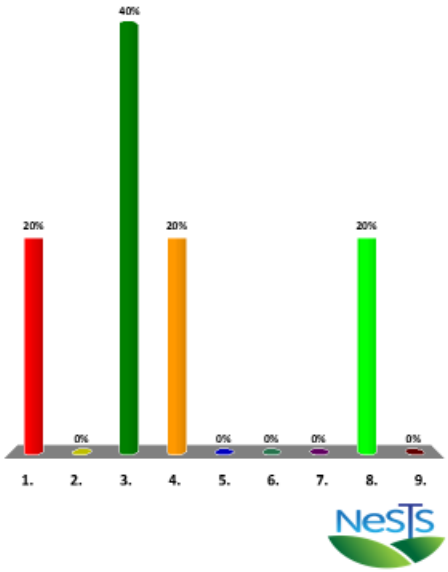
Q. Are you right or left handed?

1. Right
2. Left
3. Ambidextrous!



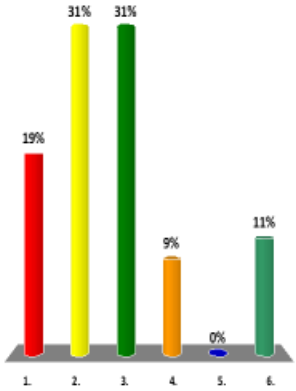
Q. Which organisation are you representing here today?

1. Scottish Natural Heritage
2. Highland Council
3. Scottish Government
4. RSPB
5. John Muir Trust
6. Aberdeenshire Council
7. Historic Environment Scotland
8. Argyle and Bute Council
9. SSEN

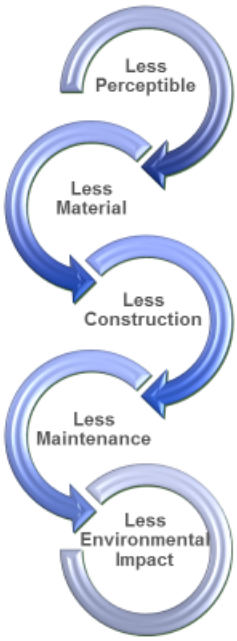


Q. Please list the **top 2 things** which best represent what motivated you to attend today?

1. Represent issues important to my organisation
2. Contribute to design of overhead transmission lines / pylons
3. Ensure environmental concerns are considered
4. Ensure social impact concerns are considered
5. Ensure land management concerns are considered
6. Something else



New Suite of Transmission Structures



£7.5m Network Innovation Competition 2015 funded project to develop new transmission over head line structures.

- 2016-2018 Design new structures & overhead line
- Stage Gate – deployment decision (with Ofgem)
- 2019-2021 Construct overhead line
- 2022 Publish e-tools and report

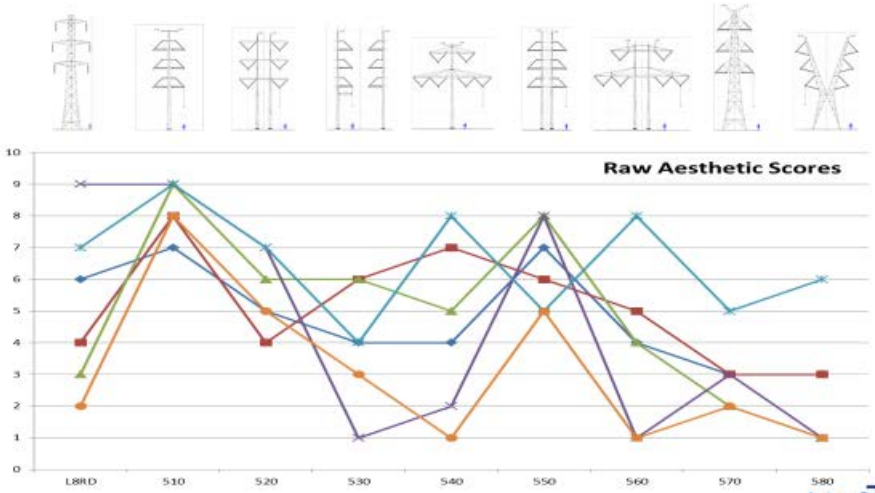
Based on Network Innovation Allowance project work in 2014.

Purpose and Constraints

- This engagement seeks your views on our prototype design before over head line design begins.
- This presentation outlines the design choices which we have made in response to your and other stakeholder engagements in 2016.
- Our work is subject to important constraints;
  => current safety
  <= current cost

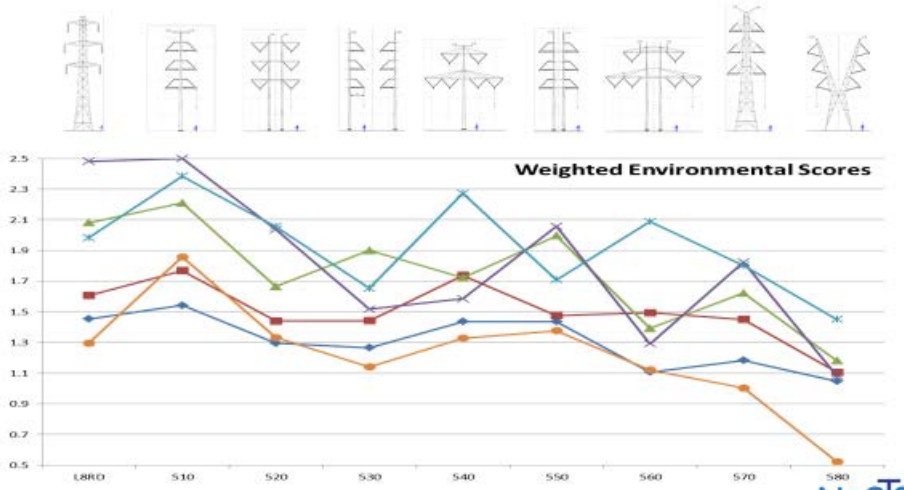
Concept Comparison and Assessment Recap

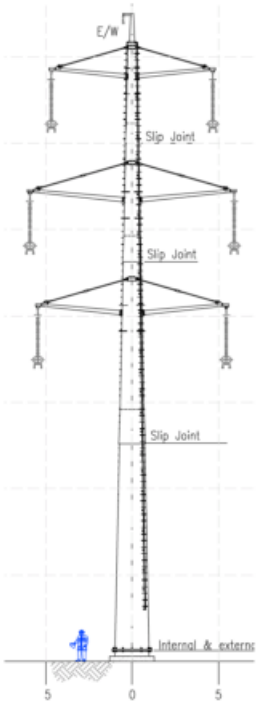
- 8 concepts were compared using visualisations and models



Concept Comparison and Assessment Recap

- And, using our Support Assessment Matrix tool.





Design Selection and Refinement

- The single monopole concept was favourite in all assessments.
- 81% of 2000+ customers surveyed pick monopole over steel lattice.
- So the monopole concept was selected and has been refined to produce the prototype designs we will review with you.
- Stakeholder input has driven this process
  - Consultees.
  - Main contractors and the supply chain.
  - Transmission operations teams.
  - GB Transmission Owners.

Customer Buy In

Supply Chain and Main Contractor Buy In

- All components available from proven supply chain.
- We have visited several suppliers and will commission them to optimise our design.
- Main contractors are being engaged to embody their ideas and prepare for design adoption work package.

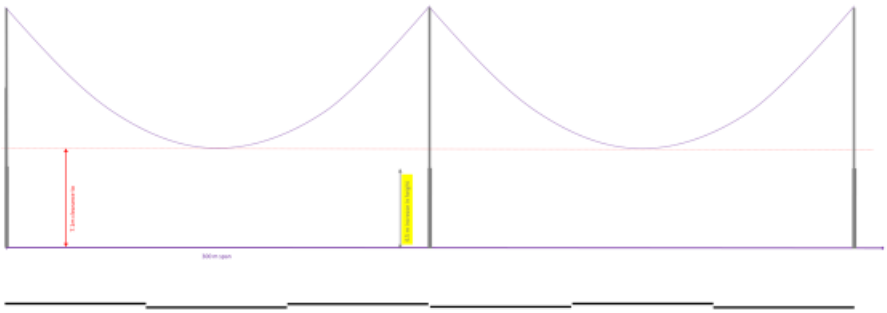
Outline

- Standard-span
- Standard-span vs Maximum span
- Relationship between standard-span and support height
- Relationship between standard-span and weight
- Comparison of standard-span NeSTS & other specifications

Standard Span

- The Standard Span is a notional distance.
- It is the distance between standard height supports that will just achieve in-span electrical clearances to ground.
- For the NeSTS supports, the standard span is 300 m, which accommodates a conductor sag of 10m and clearance to ground of 7.1m.

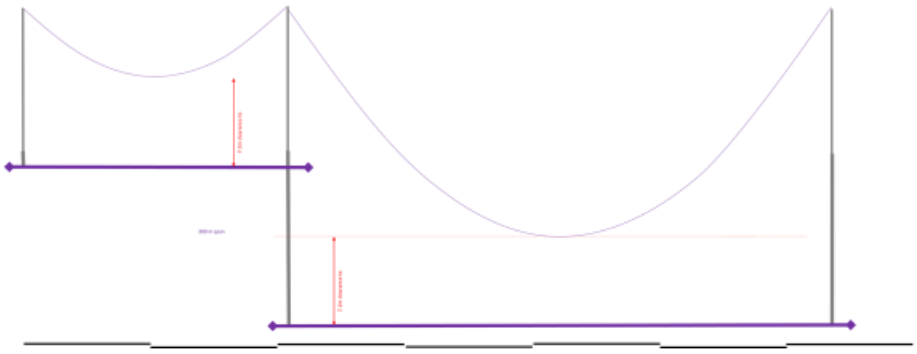
Standard Span



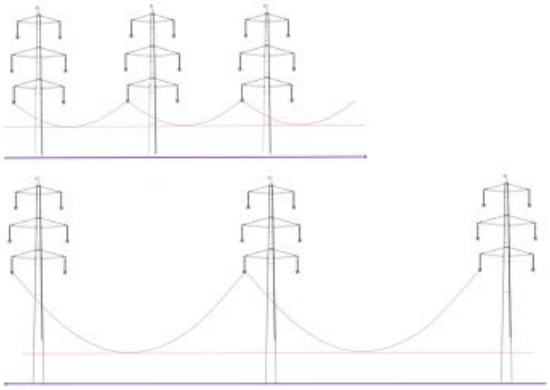
Maximum Span

- The standard span is not the maximum span
- The maximum is dependent on the strength of supports and the strengths of supported conductors and earth wires
- Typical maximum spans are 1.5 x standard span, depending on loading conditions

Maximum Span



- Actual spans can be increased or decreased from the standard span. Maximum and reduced spans are illustrated here.



Top – reduced height supports M
Bottom – Extended towers.

Height vs Span

Comparison of support heights

Support extension	Overall height	Sag limit	Span limit (flat ground)
M6	31.5	3.38	137
Standard ht	37.5	9.38	300
E9	46.5	18.38	454

Standard height highlighted

Height vs Span

Comparison of support heights

Support extension	Overall height	Sag limit	Span limit (flat ground)
M6	31.5	3.38	137
Standard ht	37.5	9.38	300
E9	46.5	18.38	454

Reduced height (M6) highlighted

Height vs Span

Comparison of support heights

Support extension	Overall height	Sag limit	Span limit (flat ground)
M6	31.5	3.38	137
Standard ht	37.5	9.38	300
E9	46.5	18.38	454

Extended height (E9) highlighted

Effects of span change

How would an increase in span-length affect an overhead line?

- Heights of supports increase
- Loadings on supports increase

But,

- Number of supports per km reduces

Height of support

But the increase in height is not proportional to the increase in span, it's a square relationship.

Sag = k x span ^{2}

(For example, a 10% increase in span results in a 20% increase)

Climatic loading

Critical climatic loading on supports arises from three scenarios:

- high wind,
- heavy ice (no wind), and
- combined wind and ice

An increase in span increases both wind and ice loading.

Design conductor tensions are also increased.

Standard span for NeSTS

- The standard span for the NeSTS was originally set at 200m, in order to stimulate debate.
- A cost-optimum standard span in the region of 250m was anticipated.
- Early stakeholder feedback indicated that taller but fewer supports would be preferred to a greater number of shorter supports.
- Reference made to other OHL support specifications in the selection of standard span for NeSTS, including:
  - SSE400
  - L8RD,
  - L3,
  - L7c
- Current standard-span for NeSTS – **300m**

Span comparisons

Support	Voltage	Standard Span	Max span	Max sum of adacent
L8RD (1)	275	305	500	800
L3 (2)	275	365	536	805
SSE400	400	370	700	820
NeSTS	275	300	450	660
L7(c) Norm (3)	132	290	450	700
L7(c) Severe (4)	132	229	355	600

Notes

(1) TPS-2.4.3. Low altitude, 25 m/s wind, capped ice at 60mm

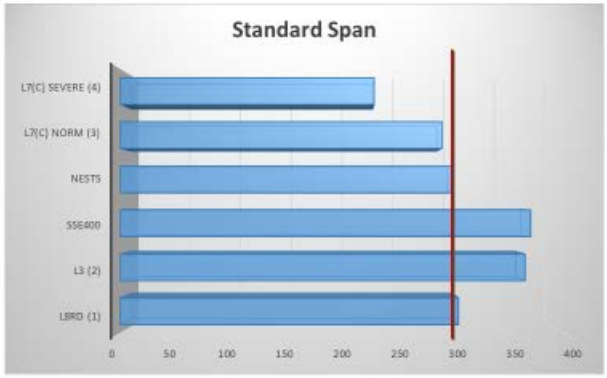
(2) ENA TS 43-2. Deterministic loading.

(3) ENA TS 43-9. Normal climatic loading. Wind 25, altitude 400m

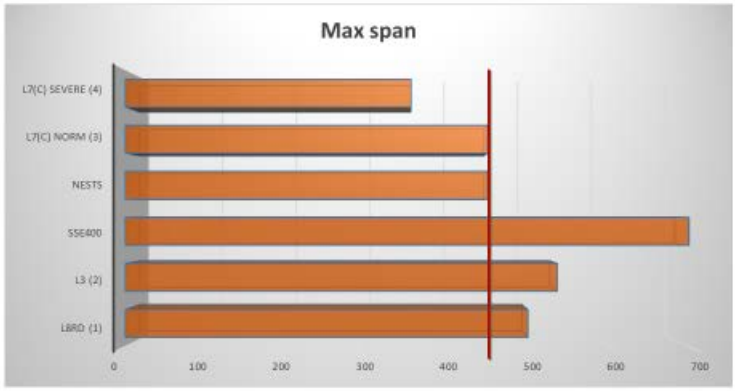
(3) ENA TS 43-9. Severe climatic loading. Wind 25, altitude 150m

The NeSTS standards span of 300m is a compromise,
it is not as great as that of the SSE400 and L3,
it is similar to that of the L8RD and L7 (normal); and
It is greater than the L7 (severe).

Span comparisons



Span comparisons (max span)



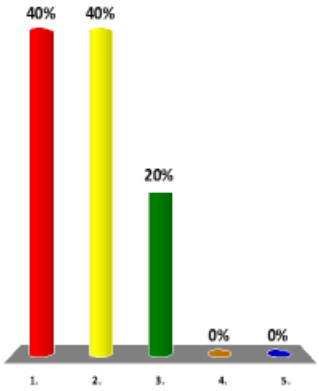
Height

NeSTS D2 Standard Height
(Spans shown at 300m)

NeSTS D2 Reduced height
M6
(Spans shown at nominally
150m)

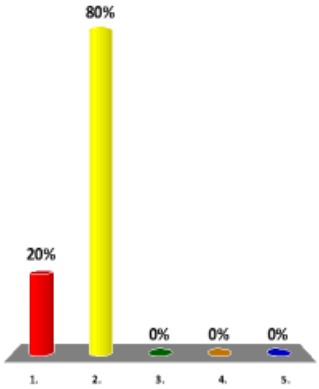
Q. Please say if you agree or disagree that the presentation on span has improved your understanding of **the context in which the project is operating in**?

1. **Strongly agree**
2. **Agree**
3. **Neither agree nor disagree**
4. **Disagree**
5. **Strongly disagree**



Q. Given the presentation on span, please say if you agree or disagree that Scottish and Southern Electricity Networks (SSEN) is giving due consideration to span **within the overall prototype design**?

1. **Strongly agree**
2. **Agree**
3. **Neither agree nor disagree**
4. **Disagree**
5. **Strongly disagree**



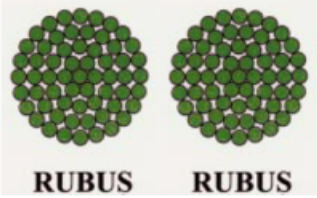
Power Rating

The electrical **rating** requirements for a conductor determine the **size** i.e. cross-sectional area and/or the number of conductors in a '**bundle**'

In essence the **higher the electrical rating the greater the cross-sectional area** needed to allow the efficient flow of current This relates to an **increase in weight** which **increases the loads** on the supports

To meet the differing demands of the network a range of support suites is being developed i.e. Light, Medium and Heavy Duty

From This ~800 MVA



To This ~1150 MVA

Power Rating

The NIC project will see the full development and trial of the Medium Duty suite which requires an increased rating and therefore increased bundle size when compared to the previous design revision

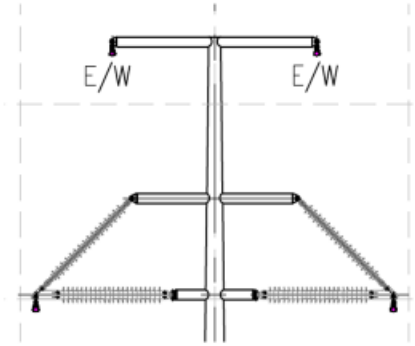
The other two suites being developed are presented in the table below (Light and Heavy Duty)

	Light Duty	Medium Duty	Heavy Duty
Conductor	1 x 700mm² Araucaria	2 x 500mm² Rubus	2 x 700mm² Araucaria
Sub-Conductor Diameter (mm)	37.26	31.5	37.26
Number of Sub Conductors	1	2	2
Relative Vertical Load	1.00	1.80	2.00

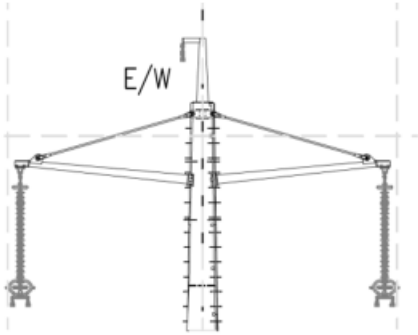
As a result of the heavier conductor system the **support and foundation load capacities increased** accordingly.

You will also note the additional conductors on the photomontages which affects the aesthetics of the wirescape

Earthwire



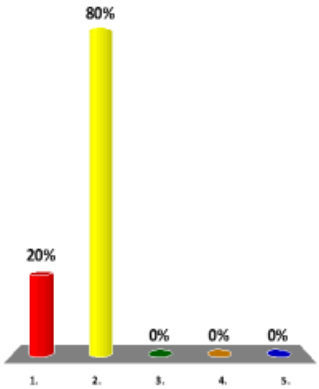
The double earthwire has now been replaced with a single earthwire and corresponding peak design



Initially there was a requirement to have two earthwires to provide safe clearance for work on the earthwire whilst maintaining 1 circuit live. This requirement has been dropped as clearances are sufficient.

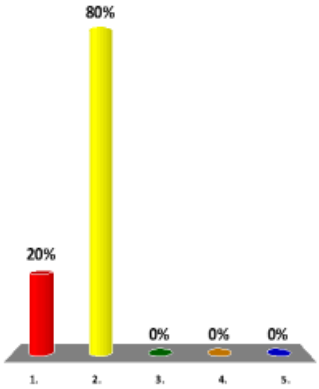
Q. Please say if you agree or disagree that the presentation you just heard on power rating has improved your understanding of **the prototype design**?

1. **Strongly agree**
2. **Agree**
3. **Neither agree nor disagree**
4. **Disagree**
5. **Strongly disagree**

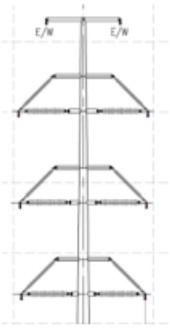


Q. Given the presentation on power rating, please say if you agree or disagree that **SSEN is sensitive to the issue of power rating within the context of the overall prototype design**?

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

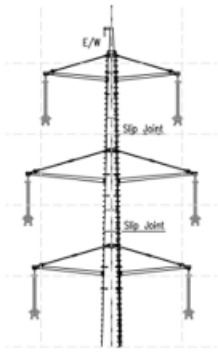


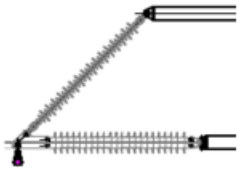
Insulator Configuration



Stakeholder feedback indicated a preference for traditional suspension strings

Key Design Change

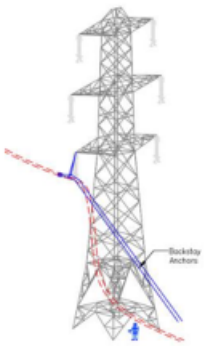


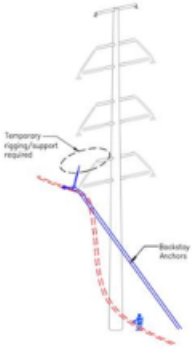


The design will still use composite insulation which may offer reduced visual impact.

Insulator Configuration

Another reason for the change from horizontal vees to suspension insulators was the difficulty in providing a method of working on the insulator and/ or conductor that is compatible with current procedures and equipment.





Backstaying is a procedure which requires an attachment point above the place of work. A suitable piece on equipment could not be envisaged which was practical and safe for this task.

Access Provision
Pole Body

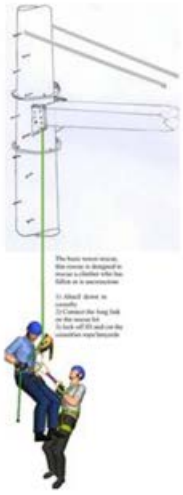
Climbing access is required to carry out construction and maintenance procedures

Multiple options are being appraised for functionality and safety

Sabre Industries Step Bolts | EuroPoles Ladder/ C Channel | EuroPoles Angle Step Bolts

Access tracks provision will be installed on opposing sides of the support to demarcate circuits and provide safe / physical separation of operatives and live circuits

Access Provision
Rescue



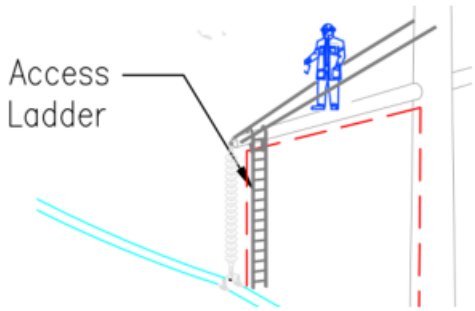
To be able to perform a rescue the rescuer must be able to get above the person being rescued this requires access facilities be carefully considered.

Access rings will be required in strategic working locations and for access around the support to allow rescue.

Access Provision
Crossarms

Safe access on the crossarm is required to work on the conductor system using the same procedures and equipment as conventional supports

A part of safe access is having a permanent attachment to the support to prevent falls

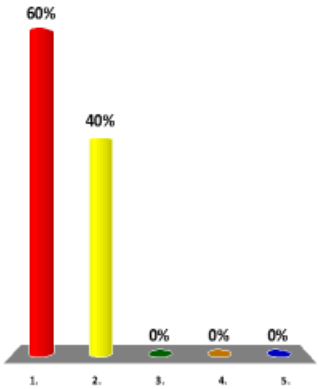


Many solutions were reviewed, the chosen solution is for two stays which provide permanent attachment and stability for linesmen

Other safe options considered were excluded due to their visual impact on the support i.e. hand rails.

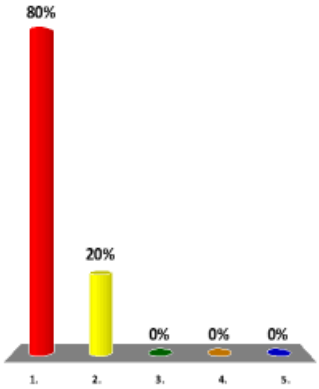
Q. Please say if you agree or disagree that the presentation you just heard on insulator configuration and access provision has improved your understanding of **the prototype design**?

1. **Strongly agree**
2. **Agree**
3. **Neither agree nor disagree**
4. **Disagree**
5. **Strongly disagree**



Q. Given the presentation on insulator configuration and access provision, please say if you agree or disagree that **SSEN is sensitive to these issues within the context of the overall prototype design**?

1. **Strongly agree**
2. **Agree**
3. **Neither agree nor disagree**
4. **Disagree**
5. **Strongly disagree**




Session 2
ENVIRONMENTAL PERFORMANCE
NeSTS


Landscape and aesthetic considerations
Shona Mackie
Environmental Adviser
Scottish & Southern Electricity Networks
NeSTS

Comments on the Exhibition

Environmental Considerations

Tension Support Continuity

Strath

Upland Moorland

Forest Edge

Agricultural Lowland

Visual Effects

ash

ash

Question 1 - Visual consideration.
How visually prominent do you consider both the steel lattice tower and the new monopole to be in the following four situations:

- Foreground
- Distance
- Backlothed
- Skylined

Scoring is on a continuum from 1 to 5, where Very Good (5) is scored where a structure is considered to be least prominent in the landscape, and Very Poor (1) is scored for a structure that is considered to be very prominent.

Steel Lattice Tower			**Monopole**		
Foreground	Very good		Foreground	Very good	
	Good			Good	
	Neutral			Neutral	
	Poor			Poor	
	Very Poor			Very Poor	
Distance	Very good		Distance	Very good	
	Good			Good	
	Neutral			Neutral	
	Poor			Poor	
	Very Poor			Very Poor	
Backclothed	Very good		Backclothed	Very good	
	Good			Good	
	Neutral			Neutral	
	Poor			Poor	
	Very Poor			Very Poor	
Skylined	Very good		Skylined	Very good	
	Good			Good	
	Neutral			Neutral	
	Poor			Poor	
	Very Poor			Very Poor	
Comments:					

Question 2 – Landscape consideration.
How well do you consider that the steel lattice tower and the monopole structures 'fit' into the four landscape types (as illustrated in the photomontages).

Scoring is on a continuum from 1 to 5, where Very Good (5) is scored where a structure is considered to have a good fit in the landscape, and Very Poor (1) is scored for a structure that does not fit well in the landscape.

Steel Lattice Tower			**Monopole**		
Agricultural Lowland	Very good		Agricultural Lowland	Very good	
	Good			Good	
	Neutral			Neutral	
	Poor			Poor	
	Very Poor			Very Poor	
Upland Moorland	Very good		Upland Moorland	Very good	
	Good			Good	
	Neutral			Neutral	
	Poor			Poor	
	Very Poor			Very Poor	
Strath	Very good		Strath	Very good	
	Good			Good	
	Neutral			Neutral	
	Poor			Poor	
	Very Poor			Very Poor	
Forest /woodland edge	Very good		Forest /woodland edge	Very good	
	Good			Good	
	Neutral			Neutral	
	Poor			Poor	
	Very Poor			Very Poor	
Comments:					

Question 3 - Aesthetic consideration.

How do you rate the overall appearance of both the steel lattice tower and the monopole.

Consideration is to be given as to whether you think:

- The shape and form of the structure is visually pleasing; and
- The structure appears well proportioned.

Scoring is on a continuum from 1 to 5 where Very Good (5) is scored for a structure that is considered to be relatively visually pleasing in the landscape, and Very Poor (1) is scored for a structure that is not considered to be visually pleasing in the landscape.

Steel Lattice Tower		**Monopole**	
Very good		Very good	
Good		Good	
Neutral		Neutral	
Poor		Poor	
Very Poor		Very Poor	
Comments:			

Reduction in Construction Activity

The benefits of the tubular supports is a reduction in construction periods. A typical lattice support would typically take between 4 days (D2) and 7-8 days (heavy angles and terminals) to assemble and erect. A single tubular support of any design could potentially be assembled and erected in one day, saving on man days and timescales for temporary access roads being in situ.

EuroPoles – Pole Erection

Example

- *5 men & 1 major plant* average 3 day savings per tower*
  - *60 man day / OHL km less labour*
  - *12 plant day / OHL km less plant*
- *Fewer journeys, less access duration, lower risk of weather delays.*

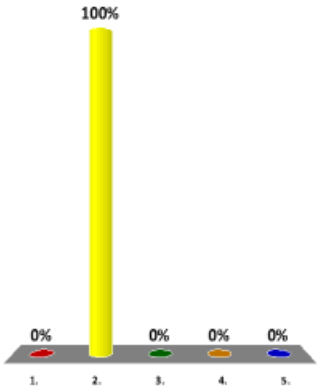
Less activity implies less risk, implies better safety performance

**Typically 100t crane.*

Access development will be similar to existing requirements, dependant on terrain, where stone roads will be required to accommodate all construction activities

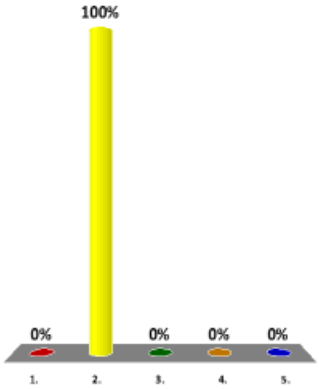
Q. Please say if you agree or disagree that the presentations you just heard on environmental considerations have improved your understanding of **the prototype design**?

1. **Strongly agree**
2. **Agree**
3. **Neither agree nor disagree**
4. **Disagree**
5. **Strongly disagree**



Q. Given the presentations on environmental considerations, please say if you agree or disagree that **SSEN is sensitive to environmental considerations within the context of the overall prototype design**?

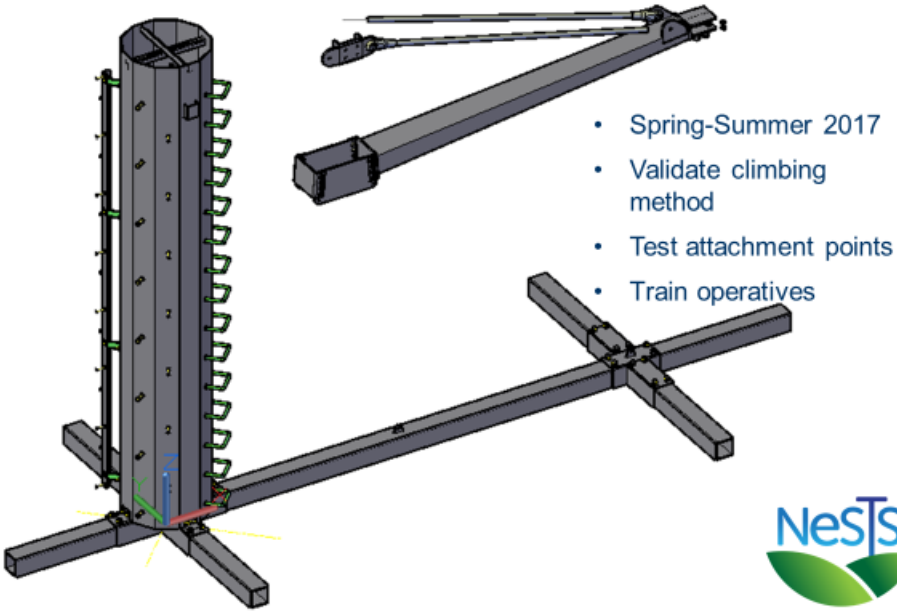
1. **Strongly agree**
2. **Agree**
3. **Neither agree nor disagree**
4. **Disagree**
5. **Strongly disagree**



Lunch, Networking and Exhibition

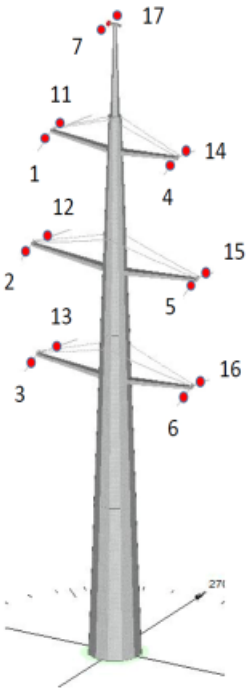
Phase	Stage	Activities
PHASE 1 – DESIGN DEVELOPMENT AND ENGAGEMENT	Stage 1.1 – Concept Proving	Internal review of NIA project outputs and confirm requirements
		Third Party technical review of work to date.
		Refine assessment & selection criteria
		Initial engagement with Statutory Authorities and other stakeholders
		Initial engagement with material suppliers and contractors
		Develop full suite of supports
		Prepare prototype scope and testing requirements
		Refine design and confirm preferred solutions
	Stage 1.2 – Prototypes and Initial Testing	Build scale prototypes - 'fit' and connection check
		Confirm requirements and design for ancillary equipment and facilities
		Prove elements and components
		Evaluate outputs
	Stage 1.3 – Parallel Design	Select potential trial routes
		Select contractor
		Evaluate against conventional options for route application
		Conventional application - planning and environmental appraisal
		Conventional application – main works
		Conventional application – associated works
		New design application - planning and environmental appraisal inc technical assurance
		New design application - main works
		New design application – associated works.
		Compare and review NeSTS with conventional supports
		Refine design further
	Stage 1.4 – Prep for Full Scale Testing	Finalise full scale and component testing requirement
		Develop testing - procurement and technical management
		Evaluate outputs and designs
		Prepare Phase 2 specification
		Evaluate Business Case.
STAGE GATE		Review Stage 1 outputs and NeSTS Business Case

Prototyping



- Spring-Summer 2017
- Validate climbing method
- Test attachment points
- Train operatives

Testing



- Design for Manufacturing - Spring 2017
- Cross arm testing at full scale - Summer 2017
- Full scale test structures ordered – Autumn 2017
- Full scale testing – Winter 2017/2018

Loadcase (3a) - Wind&Ice

Load point	V (kN)	T (kN)	L (kN)
1	49.4	127.0	317.8
2	49.4	127.0	317.8
3	49.4	127.0	317.8
4	49.4	127.0	317.8
5	49.4	127.0	317.8
6	49.4	127.0	317.8
7	18.5	49.0	112.6
11	49.4	127.0	-317.8
12	49.4	127.0	-317.8
13	49.4	127.0	-317.8
14	49.4	127.0	-317.8
15	49.4	127.0	-317.8
16	49.4	127.0	-317.8
17	18.5	49.0	-112.6

Transverse overturning moment 39558 kN.m

Loadcase (3a) - Wind&Ice

Load point	V (kN)	T (kN)	L (kN)
1	49.4	127.0	317.8
2	49.4	127.0	317.8
3	49.4	127.0	317.8
4	49.4	127.0	317.8
5	49.4	127.0	317.8
6	49.4	127.0	317.8
7	18.5	49.0	112.6
11	49.4	127.0	-317.8
12	49.4	127.0	-317.8
13	49.4	127.0	-317.8
14	49.4	127.0	-317.8
15	49.4	127.0	-317.8
16	49.4	127.0	-317.8
17	18.5	49.0	-112.6

OHL Design

- Scheme selection underway
  – communities will be first to know when complete.
- Landowner and community stakeholder engagements – throughout 2017
- 3D visualisation – Spring 2017
- Pilot project optioneering workshop – Spring 2017
- Environmental Impact Assessment – Summer 2017
- Pilot project verification workshop – Autumn 2017

Stage Gate

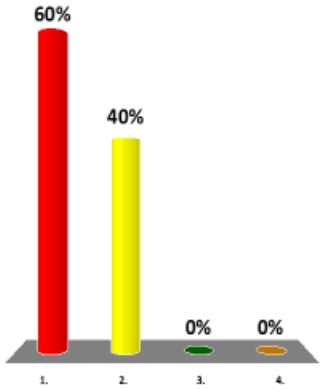
- Report stakeholder engagement and response – Summer 2017.
- Re – examine NIC bid business case – Autumn 2017.
- Commit to build OHL or to close project – Winter 2017/2018.

Discussion Groups

- Hits and misses from today?
- Format for next workshops?
- Unaddressed issues?
- Buy-in to the project?

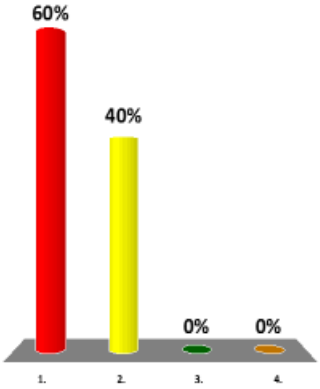
Q. Please rate your level of support for us continuing to explore the prototype design?

1. Very supportive
2. Supportive
3. Not very supportive
4. Not at all supportive



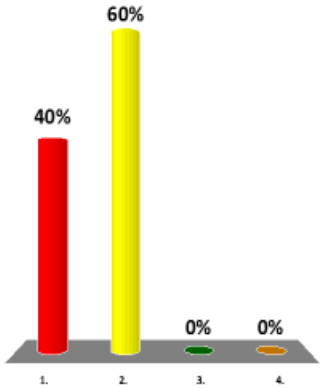
Q. How helpful were today's presentations towards informing your views?

1. **Very helpful**
2. **Helpful**
3. **Not very helpful**
4. **Not at all helpful**



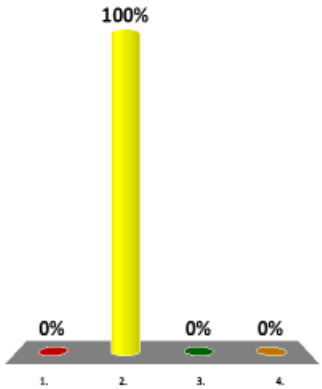
Q. How helpful were the various discussions for giving your views?

1. **Very helpful**
2. **Helpful**
3. **Not very helpful**
4. **Not at all helpful**



Q. Overall, how effective did you find today's approach in putting your comments and ideas forward to SSEN?

1. **Very effective**
2. **Effective**
3. **Not very effective**
4. **Not at all effective**



Thank You

futurenetworks@ssen.com

Scottish & Southern Electricity Networks (SSEN)

Appendix
Supplementary Stakeholder Interviews

15 June 2017

SMR
21 Lansdowne Crescent
Edinburgh
EH12 5EH

T: 0131 535 1056
F: 0131 535 1057
info@socialmarketresearch.co.uk
www.socialmarketresearch.co.uk

Contents

1. Supplementary Interviews with Key Stakeholders

Following the Glasgow event in February 2017, it was agreed that a number of supplementary information sessions would be conducted with several key stakeholders who were unable to attend the core event. A total of four information sessions were conducted which provided SSEN with an opportunity to bring these key stakeholders up to date on progress with NeSTS as well as providing these stakeholders with an opportunity to raise any concerns or seek points of clarification with the process to date. The four organisations taking part in these sessions were:

- Historic Environment Scotland (HES) [20 February 2017];
- Forestry Commission Scotland [20 March 2017];
- Scottish Environmental Protection Agency (SEPA) [27 February 2017];
- John Muir Trust [24 March 2017].

1.1 Historic Environment Scotland

Historic Environment Scotland (HES) overall were very supportive of the NeSTS project and expressed a keen interest in design solutions aimed at minimizing or reducing impact on the natural environment in Scotland. However, the HES representative did stress the following:

> *'With any OHL proposal it is always a question of individual sites and whatever design is used the key considerations will be the route of the OHL and siting, given that there will be a greater impact if the site is near a listed building, monument or other heritage asset'.*

> *'In terms of design solutions, or individual pylons, it is great you are looking at this and if you can find a solution that has a lower environmental impact in terms of what works on the ground but is also less visually prominent, this would be the essence of our advice'.*

There was discussion on the design moving towards greater span with fewer structures with this being supported by HES:

> *'We would support less interventions as you are going along…yes preferable'.*

> *'We would agree with that … better to have less structures in the landscape but in terms of specific sitings of monopole pylons we would still want to keep an overview on the micro-siting of these…project specific…depends on how the line is being routed and the specific heritage context…specific positioning may be an issue if, for example, there is a key view, sky lining etc., but broadly supportive of less structures in the landscape'.*

The HES representative enquired if the monopole design had been an outcome of the scoring (SAM) with the SSEN representatives confirming that this was the case. The HES representative further enquired if any sites had been selected for the design, with SSEN representatives confirming that location had yet to be decided.

Designation

There had been some discussion about the current Lattice design and designation as a protected structure, with the HES representative commenting as follows:

> *'Designation usually involves a 30-year timescale when you go back and look at things…with electricity infrastructure you never know…'.*

Support for the Monopole Design

The SSEN representatives provided an overview of progress from the initial seminar in 2016 and indicated there had been a convergence of opinion favoring the monopole design. In response, the representative from HES commented on the importance of qualitative analysis in addition to the more numerate analysis relating to the SAM:

> *'I guess all of this is quite subjective which is maybe why the monopole design is being favored…beauty is in the eye of the beholder and it would be interesting to build on the scoring (SAM) with qualitative analysis'.*

> *'In terms of the design evolution the thing for us is really the height and position in the landscape…the solution seems fine'.*

The SSEN representatives confirmed there had been a lot of feedback (including qualitative) on the assessment methodology.

Reduced Land Use

The SSEN representatives outlined the potential benefit of 75% less land use associated with the monopole design as well as the potential for less construction activity. This was welcomed by HES:

> *'I think that [less construction activity] is a key point for us in terms of archaeology and things on the ground and so if you can reduce physical impact and the amount of work on the ground…we don't want to increase the risk to these areas caused by disturbance with a lot of construction work going on in and around it…that is a good aim for us…we are pleased…important for us'.*

> *'The benefits of these structures being taller in the landscape is that these interventions [physical construction] are happening less often…that's the trade-off'.*

HES also commented on an increase in larger structures on the landscape most notably larger windfarms:

> *'We have noticed more recently bigger and more powerful windfarms in the landscape… a lot of applications where they are scaling up in height…more generational capacity'.*

Maintenance and Safety

HES enquired if components could be removed from the structure, with SSEN confirming that stays and holes and components above 2.5 meters would be permanent features whereas below 2.5 meters there would be hardware to stop people

climbing the structures. SSEN confirmed that it is their intention to avoid putting components on the structure, where possible.

Visualizations

HES agreed that the visualizations which had been forwarded had been useful although the size of the files made if problematic for the HES representative to circulate to colleagues:

> *'We have the visualizations... quite big...would like to get them scaled down to circulate to colleagues...issue is opening them... could you send them in a lower resolution?'.*

SSEN confirmed that they would forward revised visualizations in a lower resolution but that it may be difficult to see aspects of detail which can be seen in the higher resolution version.

Feedback from HES on the visualizations was positive:

> *'I think it was brilliant we got the visualizations in different landscape types. Very helpful for us when having different discussions around them...great to understand what the impact will be in visual terms depending on the type of landscape...we mainly think about the archaeological landscape and how things will look in relation to cairns and things like that'.*

> *'I think the visualizations captured the different landscapes and there were no glaring omissions'.*

In relation to forestry, the HES representative appreciated that visualizations can be cyclical:

> *'With forestry, we are always aware that it is a cyclical thing...they cut away trees and things become more visible...then patterns of regrowth...useful to see them [monopole] in that context but at the same time we like looking at the bare-earth landscape...understanding what permanent features will be there and changes in forestry etc.'*

SSEN asked if it would be helpful to have the visualizations at different times of the year with HES commenting:

> *'...it would be difficult...we are presented with a lot of visualizations and with windfarms we have flagged that there may be greater visual impact during the winter months...I wouldn't be so unreasonable to ask for a visualization for every season but a broad idea of whether they would be more apparent in the winter months rather than summer etc.'.*

In response, an SSEN representative confirmed that the NeSTS project was working on 3D visualizations which include the ability to change seasons.

HES raised a further point on visualizations based on experience from other projects (non SSEN) and suggested that visualizations can sometimes be used to distort views:

'You can see where particular visualizations have been used to camouflage things...recognize grey skies in winter months and on bright days there can be glare...atmospheric conditions change and it can be very difficult...an area we are considering doing some retrospective work involving comparing visualizations at the design stage with the actual landscape now and see what the impacts are'.

'Difficult to know how people respond to new things...other landscapes after a generation...we are used to lattice towers...it is not an easy science...in terms of visualizations just try to be as representative as possible...difficult to do but the most important thing'.

Comments on the Project Overview Presented

HES were invited to reflect on the project overview provided by the SSEN representatives and feedback was positive around the rationale for the changes in design. However, this was caveated with the need to have detailed discussions on siting of the new structure:

'The overview has been good...it is great to have the rationale behind some of the design changes explained and what the drivers are in terms of the technical constraints'.

'With the environmental impacts, we would look for reduced works on the ground...reduced visual impacts...and it seems from the information you've shown me that the monopole design is best for doing that in terms of reduced visual impact...taller span and reduced interventions...then we would support that...with any project with us it will be down to the detailed design stage and where you put it [i.e. monopole] basically...there will be all sorts of constraints re: heritage assets, landscape and then we will have some of the more meatier discussions about detailed sitings'.

Support for the Design

Based on the response to the project overview, HES were broadly supportive:

'Broadly supportive and happy with the aims of this and the environmental drivers which I think are brilliant and great to see you are taking that into account... but will come down to where it is being sited...but great to see you are considering environmental, visual impact, paint finishes etc... great to see that level of analysis going in there...evidence that you have done the work...all you can ask for'.

Engagement

HES valued the opportunity to be engaged on the design:

'It's great to be engaged on this...we don't really get engaged on design...it's wonderful to see what is happening and also to be able to feedback to my colleagues on the constraints and where the thinking is going...in reviewing energy policy it is good to have examples of projects...national strategy'.

'What people think about something aesthetically can vary enormously...we would look for a low impact solution and continuity in the landscape...some

may view the lattice as a classic…these groups exist and we do get listing requests from niche areas'.

HES Summary and Final Comments

Overall HES are very supportive of the monopole design but would need to consider specific sitings on a case by case basis. HES also valued working in descriptive terms but very much appreciated the need for numeracy in developing a major electricity infrastructure project:

'My preference is for a monopole then it is a question of continuity and then impact on the ground…monopole is a bit of no brainer and less invasive on the ground'.

'We work in very descriptive terms and I understand that a big energy infrastructure project demands numerate analysis but we look at things descriptively…getting a sense of something and having scope to go back to those terms would be helpful'.

'Happy to share the visualizations with other colleagues and stakeholders…we are good at giving quite descriptive feedback and happy to do this…and happy to feed into the stakeholder engagement process'

'Supportive of the process…good effort and good to see what comes of it and improvement'.

'Stakeholder event was very useful…with the engineers etc….great to be talked through the design changes today and not often engaged on thigs like this…happy to help…by in large really great and interesting'.

'Workshops and events are useful to hear what others think…a morning event would be preferable so that we can resource it…great to get different stakeholders together'.

1.2 Forestry Commission Scotland

Forestry Commission Scotland were positive and supportive of the design but sought some clarifications during the session. One of the queries related to the term *'delivering a lower land use'*, with the SSEN representatives explaining that they meant by a lower construction footprint as well as spending less time in the construction phase of the works. Queries also related to the height of the monopole as well as how deep the foundations would be. The Forestry Commission was satisfied with the explanations provided by SSEN. In responding, the representative of the Forestry Commission commented as follows:

'Grand…we don't have any concerns regards where the project is going and our concern is more to do with the application of the technology and impact assessment on the case by case basis…you haven't done anything wrong…engaging with stakeholders and considering the options…considering many aspects and you have put safety first…very well HES saying there shouldn't be any impact on the landscape but you still need to have a maintenance team…trade-off…but interesting…same height and same lines…double conductors'.

Public Perception

The Forestry Commission challenged anyone to be able to tell the difference in structures (twin pole versus monopole):

> *'There has been a load of research done on the customer perception or public perception…you wouldn't even notice it [the monopole] …so guys you are spending a lot of time and effort coming up with the best solution but probably 95% of the public would not notice it…great that you are doing it but when it is at 30 meters plus…one line or two…I challenge anyone to spot the difference…you have considered a lot of things'.*

Focus on Over Head Lines

During the session, the Forestry Commission did ask why the focus was solely on OHLs and not undergrounding, as well as what proportion of lines in Scotland are over ground and underground. The Commission also enquired about how Scotland compares with other countries.

SSEN responded to all queries and said that there will always be cases where SSEN will have to over ground and that cost will also be a factor. SSEN also pointed out the environmental impacts associated with maintenance, as well as the technical challenges associated with undergrounding higher voltage lines. The Forestry Commission were satisfied with all of the explanations provided.

Overview of Process

SSEN representatives provided an overview of the design journey to date and made the point that the design at present is generic and that the next stage will be applying the design within specific communities. SSEN also advised that they had produced a number of visualizations including asking the Forestry Commission for thoughts on the two options of a twin pole versus a single pole. In response, the Forestry Commission commented that there is no difference from a forestry perspective:

> *'From a Forestry Commission point of view there isn't much difference regarding the impact on forest but I like the double line…element of difference which is a bit of a contrast…everyone goes for single…double is something new'.*

> *'It goes back to the function of the structure…it is a man-made structure in a man-made environment…Scotland was never open views and bare land…people get hung up on openness and everything has to be neat and clear and fit in. At the end of the day you are delivering a service and this is a man-made tower and the structure has to be functional…if it is the best option and the safest option then good…there has to be trade-offs'.*

Visualizations

The representative of the Forestry Commission was shown the different visualizations with the Commission representative commenting as follows:

> *'Visualizations absolutely brilliant…like the switch between the two [single line to double line] …I was expecting major differences but actually less clutter…with*

double line it is simple and neat…I am a fan of traditional elements…man made structure and you can't cover it in leaves and flowers'.

'The new design is sleek and simple and you can't argue with that…tourists come to Scotland to enjoy the open views and in some areas, we don't have the variety of structures we enjoy in other countries'.

'Can't argue with a leaner structure…working within the parameters you guys have…but in a moorland situation you have to deal with a range of stakeholders…they have a voice and interests…good luck with that…game keeper, conversationalist, recreational… all have different interests…they all want no lines and to keep it the way it is and we argue that it's never been like that'.

'The only thing we would get hung up on is ancient woodlands where there is a very strong presumption against anything that could affect it…if it is a plantation then this is man-made against man-made as long as there is no net loss of woodland…a resource…moorland is not contentious'.

Impacts of Forestry Not Considered by SSEN

The Forestry Commission were generally satisfied that SSEN had considered all the possible impacts on forestry. In response to a direct question from SSEN on whether or not there had been any impacts not considered by SSEN, the Forestry Commission representative commented as follows:

'*No, I don't think so. You have shown everything else is similar to before and from a Forestry Commission perspective I wouldn't see anything to object to'.*

'Your plans would include an element of replanting in some areas and the sooner you do that the better…if construction time is reduced by even 6 months that could be a planting season for us…gaining a growing season would be beneficial for us'.

The Forestry Commission representative also highlighted the point that SSEN has flexibility in Scotland which may not be the case in other European countries:

'If you think about the forest in Europe, you have flexibility in Scotland to do a range of things…what to fell and when to fell. In Scotland, you have forest planted in the 80's which hasn't been touched…we can move things around and maybe we did not want to fell until 2025 but we can fell now if required…flexibility and easy for you to work with landowners and the Commission who have a big land ownership…if you fell earlier and construct quicker then gain a growing season…all positive'.

Forestry Management Plans and Meeting Basic Parameters

The Forestry Commission highlighted the value of the forestry management plans and working within these plans as well as adhering to the broad principle of no net loss of woodland

'We encourage you to work with the management plans and if there is no management plan in place then it is a good opportunity to put one in place…as well as no net loss of woodland… if you meet these two parameters then good. We get hung up on things like in order to minimize the visual impact

of the line then hide it in the forest...some still say that and it is a big no...not there to hide things...it is a valuable resource...man-made lines working in a man-made forest...some environmental architects say you hide the lines in the forest'.

Time Saving with Maintenance

The Forestry Commission representative enquired as to whether or not SSEN had considered or quantified the savings on maintenance, with SSEN confirming that exact costs had not been calculated but that they did envisage savings with the use of drones for inspections etc. The Forestry Commission representative was satisfied with this explanation.

Using the New Design for All New Pylons

In response to a question on whether SSEN planned to use the new design for all new pylons, SSEN confirmed that they will still be considering the traditional pylons but that a library of designs currently exist which could be used.

Feedback from the Scottish Government

During the session, the Forestry Commission representative enquired if there had been any feedback on the design from the Scottish Government and whether or not the area for siting the works had been disclosed. In response, and without revealing any detail, SSEN confirmed that the Scottish Government were broadly supportive of the new design. SSEN also advised that the location for the works has not been disclosed and that the community affected would be the first to advised.

Stakeholder Engagement

The Forestry Commission advised that SSEN may find a pool of stakeholder's resistant to change but that the overall policy environment is constantly changing (e.g. agricultural supplements changing, revisions to energy strategy and

'...an element of perpetuity with low yield windfarms decommissioned but if yielding then possibly repowered...Orkney where they are repowering with higher turbines to increase yield'.

'All good news and your engagement process has been great...the fact that you take the time and go out and speak with stakeholders'.

'Better when you have everyone around the table ...events where there is merit in having everyone around the table rather than having to deal with everyone's concerns which can be painful...a bit like having to go back to the dentist every week!'.

Forestry Commission Summary and Concluding Comments

SSEN asked the Forestry Commission representative if there was anything else that they would like to know about the design or the project itself. Again, the response from the Forestry Commission was positive in their overall assessment of the project:

'No, that was incredibly detailed and thank you so much for sparing the time...it's great...a lot of work behind this'.

'Even if you have a relatively smaller footprint on the land that is important…as well as some savings on time…relieved to hear that it is not any smaller because you could have a greater impact on the corridor and relieved to hear this not happening'.

'You spoke about communities most affected and you need a live case to go and test that…communities can be vociferous and loud'.

1.3 Scottish Environmental Protection Agency (SEPA)

The representative of the Scottish Environmental Protection Agency (SEPA) was presented with an overview of the project journey to date including the factors influencing the design changes and rationale for selecting the chosen monopole design.

Preference for Fewer Structures

In response, the overview presented by SSEN, the SEPA representative confirmed a preference for less structures but also highlighted the fact that the ancillary structures and works will have the greatest environmental impact:

'The less structures the better. Even though the footprint of these pylons isn't huge, simply reducing the number of them over an 80-kilometer line will have a substantial cumulative impact in terms of risk attached to excavations. However, this is not the biggest of environmental risks when it comes to these types of projects, it's the ancillary structure (access roads) which have the most impact. It's a bit frustrating as a planner that I cannot really comment on the design because I have my pure environmental hat on and it doesn't really matter as long as the number of structures is reduced and footprint for each pylon isn't ridiculous'.

The SEPA representative went on to set out the rationale for favoring fewer structures which essentially centered around lower land use:

'It basically comes down to the fact if small towers only require 15 square cubic meters of land being excavated but the taller tower requires 25 then it balances itself out in terms of SEPA's remit. The design above ground doesn't really concern us. It's more of concern for HES and Historic Environment Scotland who are focused on landscape and visual impact. We are more focused on what is happening under the ground in terms of that excavation. It's all relative but I have one point to raise in terms of the size of the foundations but I am sure we will come onto that anyway'.

The SSEN confirmed to SEPA that increases to span and loads would require bigger foundations but that there would be savings. In response, the SEPA representative commented:

'I see what you mean it mitigates itself out probably causes a neutral impact in terms of the difference. If you are reducing the number of towers from 4 per kilometer to 3 per kilometer it will probably the same amount of footprint that will be disturbed in terms of foundations…I think you are talking about very small quantities [savings] which is not a showstopper for us'.

Access Roads, Ancillary Works and Maintenance

There was some discussion around access roads with SSEN confirming that these roads don't get smaller as the plant used is basically the same. The SEPA representative accepted this but did enquire about how the new design compares with the traditional lattice structure:

> *'I guess you have to have the same size lorries, so it doesn't really make a difference in terms of the size of the access roads. The maintenance regimes may make a difference, how does it compare to a standard lattice structure?'.*

In response to this question, SSEN said the new design has the potential to deliver lower maintenance and will almost certainly deliver easier inspection. However, SSEN confirmed that neither of these factors had been quantified yet. SSEN also confirmed that vehicular access would not be required, and that the access roads would be removed which is not currently the case with the traditional structures.

Following a detailed overview of changes to the cross arms in term of both safety and visual appeal, as well as an overview of the potential for less land use, the SEPA representative was asked to confirm that they were comfortable with the summary:

> *'Yes, I am happy it will deliver lower maintenance, reduced construction activity, improved security and lower land use. That all seems to make to sense'.*

Span and Height

Based on stakeholder feedback to date, as well as detailed engineering analysis, SSEN confirmed that the direction of the travel for the design is for the structures to be higher with increased span, with the proviso that when there is a ridge line, or a particular artifact, then smaller pylons would be more appropriate, with SEPA commenting:

> *'So basically, in scenic areas, that makes sense'.*

Twin Pole versus the Monopole

SSEN presented a range of visualizations to show both the monopole and twin pole structures in different landscape settings. In response, the representative from SEPA favored the monopole:

> *[Upland Moorland] 'I didn't realise you had to do that, but it makes sense. You must be able to slightly deviate on the straight line to 2 degrees. I think from our perspective simply on the basis of using one less pole the top one because of less land impact. As a basic rule, I think we would prefer the top one' [i.e. the monopole].*
>
> *[Strath] 'Again we would prefer the top one, when you get into agricultural land the main thing is to avoid water courses/ground water supply etc. It doesn't really matter from our point of view as you don't really encounter peat in this landscape'.*
>
> *[Forest Edge] 'As a given I would select the one with the less footprint which would be the top one'.*

Reduction in Construction Activity and Land Use

SSEN provided an overview of the likely impact of the new design on the timescales for construction activity and highlighted the potential for the new design to reduce construction times (i.e. saving 60 man days and 12 plant days per kilometer of line). In response, the SEPA representative cited the link between less man and plant days and reduced environmental risk:

> *'I suppose the main thing is the less man days and plant days reduces the risk of environmental risk and if its quicker, you can schedule easier around breeding seasons and the weather etc. '*

SSEN presented the foundation drawings and made the point that on a lattice tower there are four excavations with this reduced to one for a monopole tower. SSEN also made the point that with the monopole design it is possible to bring the concrete right up to the pole which makes the land up to the pole still usable and that the finished concrete lump is smaller. The SEPA representative accepted this explanation but indicated that they would like to see the figures on depth as well as consider the type of ground:

> *'I suppose if there is just one of them rather than 4 lattice ones then yes but I would need to see more figures on the depth of the excavations. However, with one excavation it should even out. However, it really depends on the type of ground you are building on. You might have one project where the ground is OK and you make a good saving, but then you could have a project that you are working on a project where that is not the case'.*

> *'For some reason, I have got it in my head it takes 21 cubic meters for the current level of excavation on a lattice tower design. I think you will end up with less impact, but the value of the environmental impact will depend on the type of land you are working on'.*

SEPA Summary and Concluding Comments

SSEN outlined the next stages in the process as well as engaging with the community likely to be affected by the trial. SEPA found this useful and advised that they were happy to be contacted in the future about the project:

> *'Yes absolutely [future contact], it is the construction element that our teams will be particularly interested in. Less risk, in terms of less time on the ground. Even though it's not our remit, working around seasons either migrating birds, salmon spawning makes a lot of sense.*

In response to a direct question on whether SEPA believed the project to be of value the SEPA representative commented:

> ***'**When I first heard about this project it was at general steering group in Inverness and there wasn't as much background to it but we would definitely welcome any development that lessens construction time'.*

Stakeholder Engagement

The SEPA representative was asked if the information presented was transparent and clear with the following comment made:

> *'Yes definitely (transparent), yes very clear, yes more than a basic understanding and I am more than happy to continue to contribute to the consultation process'.*

Support for the Project

Overall, SEPA were supportive of the project:

> *'From what I have heard today, I think it is a good idea. From SEPA's remit, it is important to stress that the visual impact issues are not as significant to us as for HES etc.'.*

The SEPA representative further stated that as a stakeholder they had been provided with enough information/evidence to allow SSEN take the project to the next stage. The SEPA representative also confirmed that the project, as outlined, will reduce environmental impact:

> *'Yes, absolutely I think that was very clear. I think you have done a lot of work to date'.*

1.4 John Muir Trust

SSEN opened the session and proceeded to provide an overview of progress on the project to date, as well as the different stage gates in the design procedure. SSEN also highlighted the importance of stakeholder feedback on the overall design process. In response to the presentation, the representative from the John Muir Trust confirmed that they understood it.

SSEN then went on to explain:

- Height and span;
- Need to ensure functionality ahead of aesthetics;
- Learning from manufacturers;

The representative from the John Muir Trust enquired if the new design differs substantially from the current steel lattice design, with SSEN in turn explaining that it varies but it is smaller at this voltage level. SSEN commented further that they had thought about going smaller (as the T pylon) but that stakeholders said they would like the option of smaller towers, and smaller span to use in specific situations, but the overall preference is for fewer higher towers which is basically the tradeoff.

SSEN also confirmed that the insulator configurations had been changed for two reasons: safety considerations; and, visual appeal. The representative from the John Muir Trust confirmed they were satisfied with these explanations, particularly SSEN's explanation of the use of cross-arms to reduce the need for access roads.

Access Roads

The representative from the John Muir Trust asked:

> *'Would you vary the access design depending on the terrain. If it's inaccessible by machine, would you have a slightly different design?'.*

In response, SSEN indicated that the design should reflect a need for them to be climbable and that SSEN's preference is to have access without mobile platforms.

Stakeholder Engagement

The representative from the John Muir Trust was asked if they were satisfied that SSEN had spoken with a wide range of stakeholders including the general public, with the Trust satisfied that this was the case:

> *'Yes, from what I can gather you have spoken to an exceptionally wide range of people, absolutely'.*

> *'Yes, I think that is very important [taking the views of the general public]. From our point of view, we represent the general public view... well at least one segment of them, so we are quite happy that you have met that requirement'.*

The representative from the John Muir Trust was also invited to comment on stakeholder engagement activities with engineers and safety experts:

> *'From what I can see yes, I don't know a great deal about it. I do know that some of my former students including one girl who works for SSE at heights so we would be keen they are safe as well'.*

Understanding of the Safety Constraints

The representative from the John Muir Trust was asked if they felt the information presented was clear in terms of communicating the constraints in terms of safety and other considerations during the design process. In response, the Trust stated:

> *'Yes, I do, I am quite happy with all that'.*

Understanding of the Manufacturing and Cost Constraints

SSEN provided an overview of the manufacturing and cost constraints considered as part of the design process, with the Trust representative confirming they understood and were satisfied with the explanation given:

> *'It would seem a very sensible thing to do from a business point of view apart from anything else and also to learn from other people's experience. We are not fundamentalists about anything and anything that brings common sense in we are quite happy with'.*

Understanding of How the Design Process Evolved

The representative from the John Muir Trust also confirmed that they were clear on how the design process had evolved and the rationale for the design changes, with the John Muir Trust confirming that their key issue is aesthetics:

> *'Yes, I can clearly see the progression of where you have come from and where you have got to. Essentially from our point of view aesthetics are the most important issue but yes, I can see how it has evolved and how you have got there'.*

Concern that Temporary Tracks are Being Made Permanent

SSEN outlined its vision for the new design and stated that the design has the potential to deliver: lower visual impact; lower land use; improved safety; and, reduced construction activity. In response, the representative of the Trust was happy with the explanations given but did say that tracks are an issue for them, with landowners applying to have temporary tracks made permanent:

> *'Yes, I can see that. The tracks are an issue for us as you probably realise. It's not the reinstatement though reinstatement can take time. The Beauly Denny ones have been reinstated well and they will just take a bit of time to cover over. The big problem we have got is with landowners which are going for retrospective planning permission'.*

> *'They want to adopt them as permanent tracks. On the Beauly Denny line, I wasn't with the Trust at the time…we did object to aspects of it but one of the assurances was that all the tracks would be reinstated and what we have faced since then is a continuous stream of applications from land owners who want to retain them and a lot of them have been adopted and retained. That is a problem as far as we are concerned'.*

SSEN confirmed that applications from landowners to make tracks permanent is a recurring issue that SSEN has little or no influence over, although it was suggested that some local authorities are tightening up on this.

> *'I think you are probably right there was one up on the Corrie Alec pass which we objected to very strongly. There was actually a track in place but they wanted a bigger track. I suppose it's one of these things if you don't have it you don't miss it but once you have got it a lot of them want to keep it. So, we just need to deal with planners on that front'.*

Colour of Structures

The representative from the John Muir Trust did enquire about the colour of the structures in terms of integrating with the backdrop:

> *'Going back to the point you raised about spraying in the factory, maybe it's something we come to later but are we talking about different colours for these things to fit in with the backdrop?'.*

In response, SSEN confirmed that opinions vary and colours can vary depending on what light they are seen in. SSEN confirmed that there is a choice which is one of

the benefits of factory application. On the issue of different colours, the representative from the John Muir Trust commented further:

> *'We would certainly agree with you. Despite our reputation, we don't normally object to many wind farms but we objected to 3 last year. Two are coming forward which involve a public enquiry, one at Taplin (Muirhall Energy) because the backdrop on this occasion is not going to be a skyline, they are suggesting the colour should be a dark green. It depends on what angel you look at the structure and in what light but yes colour could be important'.*

SSEN confirmed that they are conscious that the proposal currently is based on a generic design in sample landscapes and that the design will continue to be influenced by stakeholder opinion before moving to a specific design in a specific location. In response, the representative from the John Muir Trust commented:

> *'There is a windfarm on the A9 where somebody has painted a windfarm in shades of grey where it starts of as dark grey and gets lighter as it gets higher'.*

SSEN confirmed that this example was built by Enercon and that there are a lot of these structures in Germany and along the East coast of England.

Still on the issue of colour, the representative from the John Muir Trust commented further by saying:

> *'It was just a general question. It's one we have often queried in terms of turbines are concerned but this is the first time we have come across an application where the suggested colour is green. You can't totally hide things but actually it does make sense if he backdrop is not pure skyline for example hills. I think colour is more important in non-agricultural areas as there are less manmade features to detract from it. It doesn't stand out as much in agricultural areas'.*
>
> *'I think the landscape changes and you can't change colour to reflect time of year. Well not yet anyway'.*

SSEN confirmed that they will implement a matt finish and if a single colour his chosen, the bias will be towards dark grey because of the changing seasons etc. Again, SSEN confirmed that stakeholders will be involved in this decision.

The representative of the John Muir Trust also enquired if the new design structure would be built with steel with SSEN saying that there is lots of work going on with materials for overhead line supports using composite materials, but given the load composites, SSEN is keen to avoid any risk first time around. SSEN also pointed out that there are concerns about the carbon footprint of composites.

Visualizations

The representative from the John Muir Trust was presented with a range of visualizations on the design and the initial reaction was that the new design was less busy on the landscape:

> *'The new version is a lot less busy in the landscape. It's a lot cleaner and actually it does help. There is so much going on in the steel lattice design it ends up been a distraction'.*

'If you have one pole it's an improvement, so the continuation is an improved as well. You are covering less area at the base therefore visually your impact is reduced'.

[Strath] 'The impact is far less when you compare it with the lattice design. A lot comes down to personal preference but I prefer the nice clean lines'.

[Forrest Edge] 'It's the same effect as far as I am concerned'.

[Agricultural Lowland] 'In that type of landscape I don't think the gain in terms of lessening visual impact is as substantial as in the other landscape images'.

John Muir Trust Summary and Concluding Comments

SSEN confirmed that they are working on 3D visualizations which will provide greater flexibility in terms of angles and viewpoints. SSEN confirmed that they will be identifying a site and engaging with the local community. SSEN also confirmed that they will continue to engage with stakeholders on the design.

The representative from the John Muir Trust indicated their satisfaction with the process as well as their interest in staying involved:

'If you can send me the link I will share this information with my colleague Helen McDade who could not be here today. From our general perspective if you can replace steel lattice with something that looks a bit cleaner and neater it's always going to be a gain. The bottom line is we know these things need to be built, they need to be there, we just need a design to minimise impact as much as we can and that does look very much along the right lines. I am quite happy'.

In term of risk to wildlife the representative from the John Muir Trust believed the risk to be minimal:

'I can't see how it would endanger wildlife any more than that the lattice design. From our point of view, the improvement in the design is that is that it is visually less impactful'.

Also in relation to construction activity, the Trust had concerns in relation to wildland areas:

'Our concern is the wildland areas, in particular peat. If you reduce the construction activity it will reduce the amount of damage to these habitats and the need for restoration. It's all positive'.

Support for the New Design

The representative from the John Muir Trust was generally supportive of the new design:

'It is doubt an improvement. Yes, I would be generally supportive.
Yvonne: What do you think of our general approach to stakeholder engagement on this specific project?

Stakeholder Engagement

Stakeholder engagement was welcomed by the Trust, with the Trust indicating that they would be happy to continue to be engaged but also made the point that participating in the engagement process is subject to time constraints:

> *'I think from the point of view of the Trust, we very much welcome people taking the time and effort to come and sit down and talk us through the process. We are quite happy with that. We are happy to continue to be engaged in this consultation when we can. Our problem is literally time constraints, so as far as we can we would like to continue to be involved in the engagement process'.*