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Scottish Hydro Electric Transmission Limited

Summer consultation



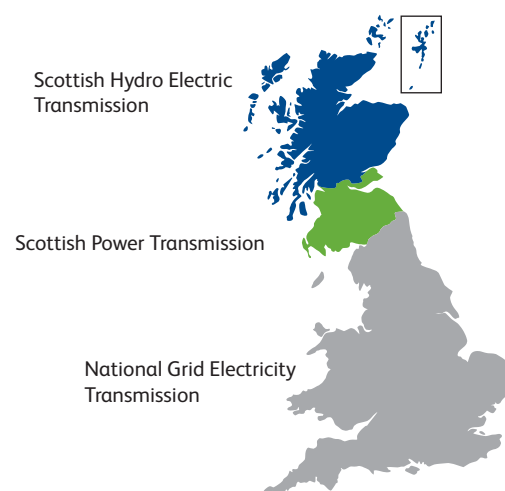
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1.

About this document

Figure 1.1: GB Transmission Licensees



Scottish Hydro Electric Transmission Limited (SHE TL) is the owner of the high voltage electricity transmission system in the north of Scotland (Figure 1.1). As the regional monopoly for this activity, SHE TL is regulated by the Office of Gas and Electricity Markets (Ofgem) through a 'price control'. Amongst other things, this determines the amount of revenue SHE TL is able to earn from users of the network to cover the efficient cost of maintaining and developing the transmission system.

The next price control period will run from 1 April 2013 to 31 March 2021. In July 2011 we published our proposed Business Plan for that period, with an update published in January 2012. Both of these can be found at:

www.ssepd.co.uk/Transmission/TransmissionPriceControlReview/

Throughout this document, references to Our Business Plan refer to our July 2011 Business Plan, as amended by the January 2012 Update.

In February 2012, Ofgem indicated in its Initial Proposals document that it intended to accept and fast-track Our Business Plan. This was confirmed in its Final Proposals published in April. Ofgem's decisions and supporting information on the price control are available at:

www.ofgem.gov.uk/Networks/Trans/PriceControls/RIIO-T1/ConRes/Pages/ConRes.aspx

This September 2012 publication is intended to provide an update for interested parties on the ongoing work by SHE TL to ensure we are able to deliver on our commitments in Our Business Plan.

Topics covered include:

- Keeping the lights on and supporting growth in the low carbon economy. **This is covered in sections 3 and 5.**
- Our ongoing commitments to our customers and stakeholders. **This is covered in section 4.**
- Minimising our environmental impact. **This is covered in section 6.**
- Update on our innovation activities. **This is covered in sections 3 and 5.**
- Performance during the last price control review, April 2007 to March 2012 (TPCR4). **This is covered in section 7.**

There are some areas where we are particularly keen to hear your views. We have summarised these as questions within each section and then collated these in Appendix 1. We continue to welcome comments and discussion on any aspect of Our Business Plan.

2.

What you have told us

Any investment in our network or change to the way in which it is operated is designed to ensure that we meet the changing needs of our current and future customers. To be able to do this, we rely on customers informing us of their plans and requirements and telling us where we have got things right or wrong in the past and how things might change in the future.

Our Business Plan

SHETL is the only provider of transmission services in the north of Scotland. In Our Business Plan, we set out how important it is to us that we understand the service our customers and stakeholders expect from us.

In developing Our Business Plan, we adopted our most wide-ranging engagement exercise to date. Going beyond the project-specific consultation and engagement that we have undertaken on our large transmission projects, we sought to help stakeholders understand how they could engage in the development of Our Business Plan and to incorporate their views wherever possible. In those instances where we were unable to incorporate their feedback (such as when views conflicted), we provided an explanation of the approach we were adopting and the reasons for it.

We found this engagement with customers and stakeholders to be an essential input to the Business Plan's development. Given the value of this discussion, it was important to us that Our Business Plan was underpinned by a commitment to ongoing engagement. In our documentation, we highlighted those areas where we expect to seek further views and/or believe it is right that we report on our performance.

Key proposals in Our Business Plan

- Commitment to ongoing customer and stakeholder engagement
- Funding of future engagement based on historic performance – ineffective engagement = no funding
- Regular customer-orientated performance reporting

Update since January

Since January, we've continued to receive feedback from our customers and stakeholders through a variety of channels. We continue to incorporate these comments as we seek to implement the necessary processes and procedures to deliver Our Business Plan. Channels through which we have received feedback include:

- Stakeholders' feedback to Ofgem's Initial Proposals;
- Industry Working Groups; and
- The development of collaboration opportunities.

Feedback to Ofgem's Initial Proposals

In February, Ofgem published Initial Proposals for Scottish Power Transmission (SPT) and SHETL, consulting on a package for each organisation based on the Business Plans submitted. This document can be found at:

www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=153&refer=Networks/Trans/PriceControls/RIIO-T1/ConRes

A significant number of our customers and stakeholders responded to Ofgem in relation to Our Business Plan and the associated package. Unless marked confidential, Ofgem published all of the responses received on the website and we have reviewed all of these. A number of these raised suggestions as to things we may wish to consider in delivering Our Business Plan and we are reviewing how we can incorporate these comments into our processes.

Having reviewed the feedback provided, Ofgem followed up on the Initial Proposals document by publishing Final Proposals for SPT and SHETL in April. This document is available at:

www.ofgem.gov.uk/Pages/MoreInformation.aspx?docid=190&refer=Networks/Trans/PriceControls/RIIO-T1/ConRes

Working Groups

In its Initial Proposals document, Ofgem identified a small number of areas where the decision to fast-track SHETL and SPT was contingent on ongoing participation in Working Groups, particularly in relation to the development of a Network Access Policy (NAP) and customer satisfaction.

The subsequent Final Proposals document noted the progress made in these areas, whilst setting out our obligation (and commitment) to complete these ahead of the commencement of the RIIO-T1 period in April 2013. Both documents can be found at:

www.ofgem.gov.uk/NETWORKS/TRANS/PRICECONTROLS/RIIO-T1/CONRES/Pages/ConRes.aspx

Since January, we have maintained our active participation in these Working Groups, seeking to reflect the views of our customers and stakeholders in the discussions, to ensure that the outcomes developed deliver real value to affected parties. Updates on these areas are provided in [section 4](#) (Incentive Mechanism) and [section 5](#) (Optimising Network Access).

In addition, we have also participated in other industry working groups, both to provide further information on our progress and also to seek to understand customers' and stakeholders' views further.

Working groups that we have participated in include:

- Ofgem's Innovation Working Group and Environmental Discretionary Reward workshop;
- SO Incentives workshops;
- Renewables UK Grid Strategy Group;
- Electricity Networks Strategy Group (ENSG);
- National Skills Academy for Power's Workforce Renewal work (looking at issues for TOs and the supply chain); and
- DECC's Project Reporting workshops.

Collaboration Opportunities

Wherever possible, we are keen to seek to collaborate with our customers and stakeholders to develop solutions to issues of mutual concern. One proposal that we have been developing over the last few months is our Highlands Apprentice Initiative, in conjunction with Balfour Beatty, Babcock and NorPower, which we see as a model for tackling workforce renewal issues, building closer relationships with our supply chain and offering opportunities to young people within our area.

This initiative will provide 28 young people in the Highlands with a guarantee of one year's work experience and is part of our commitment to the Highlands and Islands. As part of the programme, the trainees will spend 12 weeks at Inverness College and a period of 20 weeks in training at our Training Centre in Perth and Balfour Beatty's training facility in Derby. At the end of the process, the trainees will gain SVQ / NVQ qualifications and it is hoped that this will lead to longer-term and/or permanent job opportunities with us and/or one of the partner organisations.

This scheme will bring benefits to all of the parties involved and is part of our commitment to the Highlands and Islands.

We welcome other ideas that can lead to constructive solutions that deliver multiple benefits from our customers and stakeholders.

Next Steps

Over the coming months, we will continue to engage actively with our customers and stakeholders as we develop our plans further. The subsequent sections of this document set out the work that we undertaken over recent months to develop our internal processes to deliver our commitments to you. We want to hear your thoughts on these developments to ensure we stay on the right track.

As we further our work, we will continue to actively participate in various Working Groups to complete the work on new arrangements, as well as providing updates on our progress and testing our thinking with our stakeholders and customers.

Throughout this document, we have posed questions to test our thinking and seek your thoughts. We would appreciate feedback in response to these questions and to any of the other points raised in the document. All comments received will be reviewed and incorporated, wherever possible. Where we cannot act on your feedback or wish to confirm our understanding of your comments, we will contact you to discuss this further. [Appendix 1](#) provides further details on how you can respond to this consultation.

If you'd prefer to discuss your thoughts on a face-to-face basis, please let us know and we will look to arrange a mutually convenient time. Our contact details can be found in [Appendix 1](#).

3.

Maintaining a safe, reliable supply of electricity

We have an excellent record in providing a safe, reliable supply of electricity to the north of Scotland, and we aim to maintain that record over the coming decade. While we consider this to be ‘business as usual’, we continually strive to improve the way we work.

Our Business Plan

As set out in Our Business Plan, we are committed to doing everything we possibly can to avoid interrupting customers' electricity supplies but, when it does happen, we will restore supplies as quickly as we can. We continue to aim to do this safely, effectively and at the lowest cost to our customers.

We also set out our asset management policy which seeks to balance three main factors: cost; risk; and performance. Our aim is to achieve satisfactory network performance at an acceptable risk and within the constraints of efficient cost. Across all of our activities, safety issues are given priority.

Key proposals in Our Business Plan

- Continued business focus on staff, contractor and public safety to achieve our target of zero incidents
- At least maintain current levels of system reliability and continue to contribute to National Grid's annual system performance report
- Financial rewards / penalties for good / poor reliability performance
- Introduction of customer Guaranteed Standards scheme for transmission interruptions
- Increase investment in workforce skills
- Regular customer-orientated reporting of performance

Further work since January

Over recent months, we have been working to ensure that we are able to deliver on our commitments. Areas that we have focussed on include:

- Safety;
- Reliability;
- Encouraging innovation; and
- Performance reporting

Safety

For SHETL, as part of the SSE family, safety is our number one value. We want all of our colleagues and supply chain partners to return home each evening in the same condition that they left in the morning.

Over the last few months, we have been working as a team to review our approach to safety. The focus of our programme has been behavioural safety, looking at why accidents happen and how we can all take steps to prevent them.

Across the whole of SSE, we are rolling out an initiative called, the Safety Family, and we have recently had a number of workshops so all of the SHETL team could be involved. This approach goes beyond looking at safety rules, to look at the way we do things; how we communicate about safety; and how everyone is involved and has a role to play. We are committed to transforming our safety culture and this initiative is challenging us all to consider how our actions can be part of this.

This isn't something that we limit to our employees and, over the last few months, we've met with a number of our suppliers. We know our supply chain shares our views on the importance of working more safely so these discussions have focussed on how we can share best practice in our wider sub-contracting community to keep all those who work as part of our wider team safe.

We've made a lot of progress in relation to safety but we recognise there is always more that can be done. Unfortunately, three individuals have been fatally injured working on or near our network this year. Full investigations are being conducted into all these incidents and we will review the outcomes in due course.

Reliability

Thankfully, transmission system problems on our network that affect our customers in the north of Scotland are a relatively rare occurrence. However, we recognise that when they do occur, they result in inconvenience and disruption to those affected.

Our Business Plan therefore proposed a mechanism to incentivise reliability based on two components, namely:

- A payment to customers if a fault on the transmission system results in a loss of supply of more than six hours duration, and
- An automatic adjustment to our revenue reflecting our annual energy not supplied (ENS) performance relative to an agreed baseline.

Further information can be found in our autumn 2011 consultation paper at:

www.ssepd.co.uk/Transmission/TransmissionPriceControlReview/TransmissionConsultations

Since January 2012, we have been working to develop the internal process to facilitate this mechanism. Whilst the mechanism itself is straightforward, it has taken a little more work than originally envisaged to ensure the payments process is suitably robust.

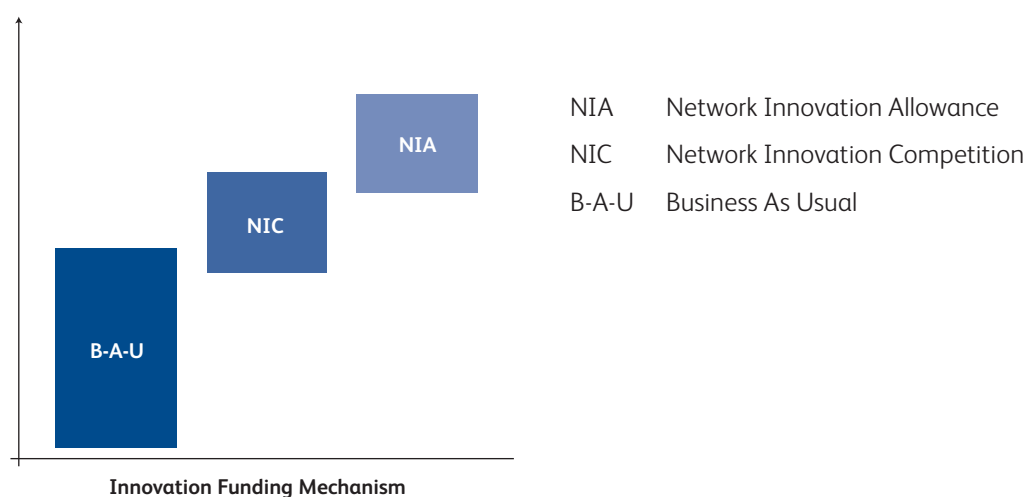
We expect to finalise the development of the process over the coming months and will publish a customer information leaflet in the winter, ahead of it coming into force from 1 April 2013.

Encouraging Innovation

SHETL, along with its sister distribution licensees Scottish Hydro Electric Power Distribution (SHEPD) and Southern Electric Power Distribution (SEPD), actively encourages all of our team to 'Work Smarter', looking for opportunities to develop how we operate so we can improve our service and increase the efficiency and/or the effectiveness of our activities.

Our approach to innovation is risk-based as we believe this is the best way to encourage and promote innovative developments in our activities, without jeopardising these obligations. Those projects that we assess as being low to moderate risk are incorporated into our business-as-usual (B-A-U) activities, whilst those with a higher level of risk require additional controls and safeguards to ensure that they have no detrimental impact on our duties. Projects of this nature are likely to be considered for funding via a dedicated innovation mechanism as shown in [Figure 3.1](#).

Figure 3.1: A risk-based approach to innovation



We encourage our team to seek such incremental developments and adopt them into B-A-U activities where it is appropriate to do so. Many of these developments can easily be overlooked, seen as being ‘too small to be proper innovation’, but can have a significant impact to our performance. Other developments that we commonly treat as B-A-U are the introduction of a proven technology or technique to a new application where the transfer presents limited and known risks to the business.

Those projects that we assess as having a higher level of risk associated with them are ring-fenced and assessed against the criteria for the eligibility to be funded under the Network Innovation Allowance (NIA) or considered as part of the development of a proposal for the Network Innovation Competition (NIC). Our Innovation Strategy documents, published alongside Our Business Plan, provide more information on how we envisage developing these projects. These can be found at:

www.ssepd.co.uk/Transmission/TransmissionPriceControlReview/LatestDocuments

An update of some of the projects that we’ve developed under the Innovation Funding Incentive (IFI) can be found in [Appendix 5](#).

Regular Reporting

Our Business Plan sets out our commitment to regular reporting of our performance against Our Business Plan to our customers and stakeholders. We believe it is right that we report on our performance to you, as well as our licence obligations to report to Ofgem. We want to ensure that such reporting is meaningful and of value.

[Section 4](#) sets out our proposals for regular engagement with you, our customers and stakeholders, and how we propose to conduct this in light of the feedback you have provided to date. In [section 7](#) of this document, we have summarised our performance for the Transmission Price Control Review Period that ended on 31 March 2012 (TPCR4).

Your views on these two sections will inform our ongoing approach to reporting so we welcome any feedback you can provide in this respect.

Next Steps

Over the coming months, we will be continuing to roll out our approach to safety and to seek to build a better understanding of best practice with our wider sub-contracting community. We will also continue to promote innovative thinking and seek opportunities to continue to improve our performance by acting more efficiently and/or effectively.

As highlighted above, the payments process for our reliability incentive requires some further work to ensure that we are able to make any eligible payments under the mechanism as seamlessly as possible. Once we have finalised the details, we will seek further views to ensure the approach adopted also works for our customers and stakeholders.

As set out above and in [section 4](#), we will be reviewing your feedback to this document, alongside the comments provided during the development of Our Business Plan, to ensure that the approach we adopt to regular reporting is useful and meaningful to you.

Consultation Questions:

- Are there any areas of our activities where you think we could do more to ensure the safety of any affected parties? If so, please provide details.
- Do you have any comments on our approach to incorporating innovative developments into our business-as-usual activity?
- Do you have any comments on our approach to regular reporting?

4.

Someone to talk to

We are committed to offering you the very best standards of service. You can be sure that whenever you get in touch with us, you will be greeted in a friendly manner.

Our Business Plan

Although we only have a small number of electricity generators and users directly connected to our network, a wide range of energy customers and stakeholders can be affected by our activities. In Our Business Plan, we committed to treat everyone who is, or could be, affected by our activities as our customer.

Our objective is to ensure that everyone who is affected by our activities is aware of what we are doing and we have explained why we are doing it as clearly and concisely as possible. We aim to do this in a timely way that best meets the needs of those concerned.

Key proposals in Our Business Plan

- To publish a Customer Charter that clearly sets out the standards our customers should expect from us
- To maintain our Grantors Charter from landowners
- To publish a Connections Guide that clearly explains the process for transmission connections and the service you can expect to receive from SHETL during this process
- Ongoing customer and stakeholder engagement

Further work since January

We recognise that this area is one of the most important for our customers and stakeholders and, since January 2012, we have devoted a lot of time to working on establishing how we will deliver on the commitments contained within Our Business Plan.

Key areas of activity have included:

- Reviewing our communications strategy and lessons learnt;
- Ongoing work with Ofgem and the other Transmission Owners (TOs) to develop a method to measure our performance and associated reward / penalty incentive; and
- Developing initial drafts of our Customer Charter and Connections Guide.

Our Communications Strategy

In developing Our Business Plan, we adopted a six-stage approach to engaging with our customers and stakeholders. The primary aim of our approach was to help customers and stakeholders understand how to engage in the development of Our Business Plan in a way that best suited their interests and to provide opportunities for those interested in our plans to contribute to their development.

We found this engagement process to be an essential input to Our Business Plan and, from the feedback received, we believe that this approach also proved valuable to those affected by how we plan, operate and develop our transmission network.

As we move from developing our Plan to delivering on our promises, we believe it is essential that we continue to provide relevant and accessible information on our plans and to seek your views on both an issue/project-specific basis and on a 'whole business' approach.

We want you to feel involved and informed by us but recognise that life gets pretty busy at times and some aspects of our activity are of greater interest to different parties.

In reviewing the lessons learned from developing Our Business Plan, we believe our communications have fallen into two categories:

- Those that relate to a specific area of our network, usually in relation to one of our large transmission projects; and
- Those that provide updates across our business as a whole, such as Our Business Plan and performance reporting.

We therefore propose dividing our communications into two groups; namely those publications that are 'whole-business' in their message and those that are related to a given project. Whole-business communications will be provided directly to all parties that have expressed an interest in being kept informed about our activities, whereas publications relating to a given project or issue will be targeted to those parties that are directly affected or have expressed an interest in the area covered. Additionally, all of these documents will be available via our website:

www.ssepd.co.uk

We believe communication is a two-way process and are keen to hear your views. In our documents and on our website, we will provide you with appropriate contact details for you to be able to get in touch with us.

We will also set up meetings to discuss your thoughts, either on a one-to-one basis or in small interest groups, as required. Where there are questions on which we are particularly keen to seek feedback, we will ensure that these are clearly identified in the document.

Where you take the time to share your views with us, we will always review your comments and look to incorporate them into our activities where we can. Unfortunately, there may be times where we are unable to act on your feedback. If this happens, we will contact you and explain why this is the case.

If, at any time, you no longer wish to receive information (in whole or part) from us or your circumstances change, please let us know and we will update our records accordingly.

We will provide 'whole-business' updates at least three times a year. These updates will provide information on our performance, updates on high-profile projects, and major developments within SHETL. We believe that this frequency is appropriate to keep you informed without becoming excessive.

The frequency of project-specific communications will vary depending on the work being progressed. In these documents, we will explain the next steps in the process and when you can expect to receive updates or further information.

Incentive Mechanism

We initially proposed a customer satisfaction survey based on the milestones associated with the connections process. Subsequent discussions with Ofgem and the other TOs indicated a preference for a broader Satisfaction Incentive that would reflect the quality of service we provide across our activities and the results of which would automatically adjust revenue.

Since January, we have been working with Ofgem and the other TOs to develop a mechanism that will drive long-term behaviours, focussed on the needs of our customers and stakeholders, whilst recognising the different roles of transmission owners (like SHETL) and the System Operator (SO).

As the price control is not intended to alter existing industry arrangements, we have recognised the importance of designing the mechanism so it complements the arrangements set out in existing industry governance, such as the British Electricity Trading and Transmission Arrangements (BETTA) and the System Operator – Transmission Owner Code (STC).

We have thereby agreed, in principle, a three-part mechanism that will adjust our base revenue by $\pm 1\%$. The three components are:

- Annual Satisfaction Survey;
- Performance against agreed Service Standards; and
- Third Party Assurance that we have actively engaged with our customers and stakeholders.

The breakdown of the incentive by component is being developed in conjunction with Ofgem and the other TOs. We envisage the components working as follows:

(i) Annual Satisfaction Survey

From this summer, we will be launching an annual satisfaction survey via a third-party independent provider. We hope that this will provide a snapshot of how well we have met your expectations over the last year and provide us with additional insight into how we can continue to evolve our approach to deliver effective and efficient services.

The third-party provider will contact a random sample of our customers and stakeholders each year to ensure that the responses are as representative as possible. The process should be brief, with scope for you to provide additional comments if you wish to, but please let us know if you do not want to participate.

We will write to you each year before the survey work commences to provide the details of the provider, an overview of the process and relevant contact details if you have any queries.

This summer's survey is intended to set a baseline of how satisfied you are at present with our service. A small sample group has been asked to provide more detailed feedback. This detailed feedback will be used in part to ensure the research organisation is asking the right questions but we will also review what we learn from this to improve our performance.

We will keep you informed on the outcomes of each year's survey. If you are invited to participate by the survey company, you will have the option as to whether your comments are disclosed to us or anonymised. Where you are comfortable for your views to be shared directly with us, we will provide tailored feedback in response to your comments.

(ii) Performance Against Agreed Service Standards

It is important to us that we have objective standards of service that measure the quality of service we provide to ensure we meet your needs and can demonstrate where we have improved or where further work is required.

We know that there will be some elements of how we do things that will be more popular with some parties than others. We understand that our suppliers, for example, are never going to like us keeping a close eye on costs but we believe this is the right thing to do for energy consumers who ultimately fund our activities.

We are keen to ensure that any service standards that we put in place are meaningful, sustainable and a fair reflection of the service you receive. We are therefore reviewing our processes to identify the areas that can be measured and the appropriate measures to implement. We will also feed the outcomes from this summer's Satisfaction Survey into this to ensure that these standards align with your priorities.

These standards will build on our commitments as set out in our Customer Charter. The initial draft of this Charter is provided in [Appendix 2](#).

As with the survey, we will report each year on our performance so you can review our progress.

(iii) Third Party Assurance

The final component of the incentive is intended to ensure we stand by our promises, especially in those areas that are more difficult to measure or perhaps a bit more subjective.

We set out above that we are keen to receive your views and we want you to know that we have taken your feedback on board, especially in those areas that take time to change or where the views received conflict.

In developing Our Business Plan, we asked a third party to validate that we delivered on our engagement strategy, ensuring that meetings were appropriately documented; actions completed on time; and feedback given where we were unable to meet an individual's expectations. This approach was recognised by Ofgem as a "particularly positive aspect" in the Initial Assessment of Our Business Plan:

www.ofgem.gov.uk/Networks/Trans/PriceControls/RIIO-T1/ConRes/Documents1/busplanannex.pdf

We also found this valuable and believe its continued use will allow you to be confident of the importance we place on your views.

We are in the process of developing the terms of reference for this work and, once finalised, we will publish these on our website. As part of our annual reporting, we will also make available the opinion of the appointed assurance body.

Draft Publications

The other area that we have been working on since January is development of our Customer Charter and our Connections Guide. Our initial drafts of these documents are provided in [appendices 2 and 3](#).

We recognise that these need further work and also need to reflect the outputs of the development of our service standards and this summer's Satisfaction Survey. However, we are interested to know your thoughts on these drafts and how we might be able to improve them to better meet your needs.

Next Steps

We hope that this approach will ensure that you feel informed and involved in our ongoing activities. We are committed to increasing transparency around our activities and to improving our service to you.

Any investment in our network, change to the way it is operated or development of our processes or procedures is designed to ensure that we meet the changing needs of our current and future customers and stakeholders.

To help us get this right, we rely on you informing us of your plans and requirements, telling us where we have got things right or wrong in the past and letting us know how things might change in the future. In exchange, we will:

- Treat you in a friendly and respectful manner in all of our communications;
- Listen to your views, including meeting face-to-face to discuss your concerns wherever possible;
- Explain when we can't meet your requirements;

- Deliver on Our Commitments; and
- Update you in a timely manner when things change.

We will continue to review our approach in light of your feedback and evolving best practice. We hope you will continue to engage with us and share your thoughts.

Consultation Questions:

- Do you support our proposed approach to ongoing communication? Will this approach meet your needs? If not, what would you like to see?
- Do you believe an Annual Satisfaction Survey, as described, will provide a fair reflection of our performance?
- What areas do you think we should capture in our service standards and how might these be measured?
- Do you have any other comments on the proposed incentive mechanism?
- Do you have any thoughts of our draft Customer Charter and / or Connections Guide? How can we improve these to better meet your needs?
- What is your preferred format to receive updates from SHETL?
 - Hard copy, by mail
 - Email with attachment
 - Email notifying new documents uploaded to website, with links to page
 - Other

5.

Supporting the growth of the low carbon economy

Over the coming decade we expect to significantly expand our network to facilitate the growth of renewable generation in the north of Scotland in order to meet national renewable energy targets. The potential scale and timing of this investment is not fixed as it depends on new generation projects proceeding. Nevertheless, our forecasts indicate that we could invest some £3-5 billion in our network, compared to the value of the existing business of around £450 million.

Our Business Plan

In developing Our Business Plan and subsequent discussions, our plans to reinforce the transmission network to accommodate new renewable generation have consistently generated the most interest. We recognise the importance of these projects to our customers and stakeholders and are committed to greater engagement around our plans as we progress them.

Our Business Plan set out our proposals for managing the uncertainty associated with our large transmission projects and our local generation connections infrastructure. We believe it is essential to balance the need to invest in these projects in a timely manner to meet the need of generation developers while avoiding consumers funding assets ahead of a clearly identified need. We believe our investment plans fairly balance these concerns.

Key proposals in Our Business Plan

- Uncertainty mechanisms for large transmission projects and local connections infrastructure
- Pre-construction expenditure included as 'business-as-usual' to facilitate the timely development of these projects
- Ongoing engagement, consultation and reporting on our large transmission projects

Further Work Since January

Over the last few months, we have continued to develop our thinking in terms of the large transmission projects that will be required and also the processes, both internal and industry wide, that will be required to deliver our commitments. Notable areas of work include:

- Strategic Wider Works;
- Procurement Strategy;
- Integrating Innovation;
- Optimising Network Access; and
- Project Transmit

Further information on each of these areas is provided below.

Strategic Wider Works

Strategic Wider Works (SWW) is the term that Ofgem has adopted for the uncertainty mechanism that will be used to assess and fund, on a case-by-case basis, those projects identified as likely to require funding during the RIIO-T1 period (April 2013 – March 2021) once a needs case can be demonstrated. We have worked closely with Ofgem to develop this mechanism and it largely aligns with our proposal submitted in January 2012.

Since January 2012, we have been reviewing our internal process to develop a uniform approach to presenting the needs case for these projects to Ofgem. We believe that this process will ensure we present Ofgem with all of the detail they need to assess these projects, as well as supporting our internal governance process for our large transmission projects.

We also hope that the SWW process will benefit our supply chain, through increased transparency around the funding for these projects and the consequential decisions that we have to make on some of our large transmission projects. We recognise that there is more that we can do to integrate our regulated framework with the commercial supply chain and will continue to work to improve this for all.

We are already working with Ofgem to start using the SWW mechanism to assess projects for funding and currently have four projects going through the process, namely:

- Western Isles;
- Caithness-Moray;
- Shetland Link; and
- Kintyre Hunterston.

(i) Western Isles

In April 2012, we submitted our Needs Case to Ofgem for our Western Isles project. In our submission, we have proposed that this project establishes a 450MW HVDC link to the Isle of Lewis from Beaulay, near Inverness, and the associated reinforcement work on the Isle of Lewis.

A summary of our submission is available at:

www.sse.com/uploadedFiles/Z_Microsites/Western_Isles/Controls/Lists/Resources/WesternIslesNeedsCaseStakeholderSummary.pdf

While Ofgem review this submission, we are continuing to develop our technical needs case and expect to submit this to Ofgem in late summer 2012. Discussions to date indicate that we should receive a determination on funding for this project in early 2013, with a scheduled completion date of October 2015.

(ii) Caithness-Moray

At the end of May 2012, we submitted our needs case for our Caithness-Moray project to Ofgem. The project scope includes a 1200MW HVDC link between the Caithness coast and Blackhillock substation, along with upgrading existing infrastructure on Caithness.

The technical needs case for this project will be submitted in November. As a consequence of project phasing, we expect to complete the operational reinforcement in September 2017, with further reinstatement works being completed by March 2018.

Further information on the submission will be available in due course at:

www.ssepd.co.uk/Transmission/ProjectUpdates/

(iii) Shetland Link

In line with the SWW process, we notified Ofgem in May 2012 that we anticipate submitting the needs case for a link to Shetland this summer. We are currently developing this and expect to submit in late summer 2012. Further information on the submission will be available in due course at:

www.sse.com/Shetland/ProjectInformation/

(iv) Kintyre Hunterston

In July, we notified Ofgem of our intention to submit the needs case for our contribution of a joint project, with Scottish Power Transmission, that will reinforce the network in south west Scotland by connecting Crossaig, on the Kintyre peninsula, and Hunterston. We are currently developing the needs case and expect to submit in autumn 2012. Further information on the submission will be available in due course at:

www.sse.com/kintyrehunterston/

Our ongoing large transmission projects

Alongside this document, we have also published an update on our large transmission projects. This can be found on our website as well as more information on any specific project in our project updates section:

www.ssepd.co.uk/Transmission/ProjectUpdates/

Procurement Strategy

In developing Our Business Plan, we were acutely aware that our approach to procurement is essential to our ability to deliver our commitments. Over recent months, we have reviewed our approach and challenged ourselves to be more innovative in our commercial arrangements, as well as our technical solutions.

Some of the highlights from this work include:

- A sharpened focus;
- Introduction of strategic contracts; and
- Launching our Open4Business Highlands and Islands portal.

(i) Sharpened Focus

In reviewing our procurement functions, we identified three key areas of activity that our Commercial and Procurement team typically looks at, namely commercial strategy; reinforcement works and our large transmission projects. Across these areas, the focus and drivers differ slightly to reflect the funding arrangements and the needs of the projects.

To support this, we have divided the responsibilities within our team so that each area is supported by dedicated personnel. These specialists are then supported by a team of suitably qualified and experienced staff who provide broader support up to and beyond the contract award, ensuring that contracts are managed efficiently and effectively.

(ii) Introduction of Strategic Contracts

To facilitate delivery of our growth programme, we are introducing the use of strategic contracts for certain aspects of our anticipated procurement needs. We believe that this approach will allow us to move from the transactional procurement methods to longer term strategic relationships. In reviewing best practice, we have identified that long term relationships of this nature can, when used appropriately, lead to benefits for all parties through a reduction in tendering and surety of business.

The first of these areas is currently out for tender and we shall closely review the outcomes of that process to ensure that this approach allows us to continue to deliver the best possible value for our customers and stakeholders.

(iii). Our Open4Business Highlands and Islands portal

Across SSE, we recognise the significant role we play in contributing to the economic well-being and sustainable development of the communities we operate within. At SHETL, we are keen to work with local suppliers and service providers, where possible, to ensure that our projects deliver multiple benefits for the north of Scotland.

We have therefore been actively involved in the development of our Open4Business Highlands and Islands portal. This provides a platform to promote opportunities originating in the region and will allow local suppliers to view opportunities across our projects; register as a supplier; and respond to notices free of charge. Users can also advertise their own opportunities such as sub-contracting work.

Further information and access to the portal can be found at:

www.sseopen4business-highlands.com

Integrating Innovation

In taking our large transmission and connections projects forward, it is important to us to smoothly integrate the outputs from our innovation activities. As discussed in [section 3](#), some of these take the form of incremental innovations or gradual step-changes as members of our team identify ways in which we can do things more efficiently or effectively.

Equally important is the smooth transition of the outputs from our activities funded via the Innovation Mechanisms. These have historically been funded via the Innovation Funding Incentive (IFI) and, forward looking, and will be funded under the Network Innovation Allowance (NIA) and/or the Network Innovation Competition (NIC).

We recognise the value of collaboration in our innovation work and appreciate the contributions received from our customers and stakeholders in shaping our innovation plans.

Examples of projects that we're currently working on (or expect to develop early in the new price control) and will be looking to incorporate into our large transmission projects include:

- alternative fault management techniques to manage faults on HVDC cables;
- new technology associated with AC/DC convertor designs;
- review of current network modelling techniques to correctly reflect the impacts of wind generation on HVDC links;
- insulated cross-arms to allow up-rating of existing assets;
- investigations into chain trencher technology; and
- development of bay controllers to reduce amount of multicore cabling within substations.

We believe it is essential that we make the most of the opportunities presented by our investment plans to ensure we are appropriately equipped to facilitate the transition to a low carbon economy, whilst maintaining a focus on the challenges that tomorrow may present.

Optimising Network Access

As the Transmission Owner (TO), SHETL has a duty to make its network available to the System Operator (SO) and this is an obligation that we take very seriously. We recognise that any instance of part of our network not being available has consequences for those who rely on our network to transport the power they generate or use and we endeavour to minimise such instances.

However, in order for us to carry out essential maintenance activities on our network and to deliver some of our large transmission projects, there are instances where we have to request that one or more circuit is temporarily made unavailable. The successful delivery of these projects will relieve some of the constraints that are currently observed in the north of Scotland. This can only be achieved if we can secure short-term access to our network to carry out key activities.

With a significant increase in the work planned for our network over the coming years, we have been actively working with the SO and the other TOs to review the current arrangements and, where appropriate, propose additional frameworks to minimise the disruption of this work to network users as far as possible.

This is an ongoing area of work that builds on the thinking contained in our Network Access Policy (NAP), available in the supporting documentation for Our Business Plan:

[www.ssepd.co.uk/uploadedFiles/Controls/Lists/Resources/Transmission_price_control_review_business_plan\(1\)/Doc5.pdf](http://www.ssepd.co.uk/uploadedFiles/Controls/Lists/Resources/Transmission_price_control_review_business_plan(1)/Doc5.pdf)

We have agreed, in principle, a revised approach to short-term and long-term planning of outages that would require us to provide information to the SO across a longer window than is currently considered. This approach will also identify the outages that are more strategic in nature, with the intention of confirming when these fall at an earlier stage in the process, to ensure we are able to deliver the commitments associated with our large transmission projects.

Whilst the final placement of outages will remain at the discretion of the SO, we hope that this revised planning framework will provide greater certainty to all affected parties and minimise the inconvenience associated with planned network outages.

In order for the NAP to be meaningful, it will need to balance the drivers and incentives on both the TOs and the SO, via our respective price controls and incentive mechanisms, as well as giving due consideration to the implications for our customers and stakeholders. The outcomes of the work on SO incentives will therefore be important to allow the finalisation of the NAP.

Project Transmit

In May 2012, Ofgem issued Directions to National Grid (NGET) as System Operator, following the completion of Project Transmit, Ofgem's Significant Code Review looking at transmission charging arrangements. This can be found at:

www.ofgem.gov.uk/Networks/Trans/PT/Pages/ProjectTransmit.aspx

The Directions require NGET to raise an amendment to Connection and Use of System Code (CUSC) Modifications Process to address the issues identified by Ofgem. SHETL is not a party to the CUSC and its role in this process is therefore limited. However, we will support the industry in considering NGET's proposal and providing evidence as requested.

Further information on the CUSC and the modifications process, including the members of the Modifications Panel, can be found at:

www.nationalgrid.com/uk/Electricity/Codes/systemcode

Next Steps

We will continue to develop our proposals for our large transmission projects and, where required, will submit these to Ofgem for funding approval in line with the Strategic Wider Works process. As part of this process, we will continue to seek customer and stakeholder views on our proposals and will be in touch directly with interested parties as set out in [section 4](#). Updates will also continue to be available from our website at:

www.ssepd.co.uk/Transmission/ProjectUpdates/

Over the summer, we will continue our work with the other TOs and the SO to develop an integrated NAP that balances the needs of all affected parties. We anticipate publishing a document, in conjunction with the other TOs and SO, in autumn 2012.

Consultation Questions

- Do you understand the process that projects need to go through to be funded under the Strategic Wider Works process and how you can contribute to this process? If not, what areas would you like further information on?
- Do you have any comments on our procurement strategy?
- We are keen to involve our customers and stakeholders in our innovation activities. Do you have any further suggestions on how we do this better?
- Do you have comments on the work being undertaken to optimise network access?

6.

Doing our best to look after the environment

As an organisation, one of our core values is to operate responsibly, taking the long-term view to achieve growth while safeguarding the environment. Our plans for the next decade are underpinned by our objective to apply best practice in environmental stewardship in all our activities.

Our Business Plan

As a business that operates in an environmentally sensitive landscape, we are particularly conscious of the need to ensure that our working practices are environmentally friendly. In Our Business Plan, we set out how we intend to minimise the environmental impact of our activities.

We recognise that there are difficult trade-offs to be made. On one hand, our activities are essential to growth of renewable electricity generation which many see as an environmental benefit. On the other hand, our activities involve installing new assets and there is an associated environmental impact. We believe that many of the environmental considerations of growing our network are best determined on a project-by-project basis and will continue to seek your views as we consider such trade-offs.

In Our Business Plan, we also recognised the environmental impact when we operate our assets, particularly in terms of electrical losses, leakage of oil and leakage of the greenhouse gas sulphur hexafluoride (SF₆); and the impact from our day-to-day activities in terms of our Business Carbon Footprint (BCF).

We endeavour to embed consideration of our environmental impact as a central part of our how we work and to make it clear that this is everybody's responsibility.

In Our Business Plan, we committed to increasing the transparency of our environmental impact by publishing an annual performance report. We believe that this will raise awareness, both externally and internally, of the steps we currently take and how we can further improve in this area.

Key proposals in Our Business Plan

- Through timely and effective engagement prior to construction, to minimise the environmental impact of our projects to maintain or upgrade our network
- To publish an annual environmental performance report
- To publish a statement setting out our approach to the consideration of visual amenity in our planning process

We published our Visual Amenity Statement in January 2012 and it is available at:

www.ssepd.co.uk/uploadedFiles/Controls/Lists/Resources/Transmission_price_control_review/Current_documents/Transmission_price_control_review_business_plan_supporting_information/RIIO_SHETL_January2012UpdateEnvironmentalMeasures.pdf

Further Work Since January

Since January 2012, we have been looking at how we will deliver the commitments in Our Business Plan. In particular, we have focussed on:

- Reporting our environmental performance;
- Reviewing our procedures;
- Project mitigation; and
- Flood defence.

Reporting our Environmental Performance

Our Business Plan set out our commitment to report on our environmental performance on an annual basis. Since January, we've been looking at this, considering the information that we currently report on and areas where we think we could capture further information.

Our current BCF report is included in [Appendix 4](#). This sets out our performance for the year 2011-12, based on the current reporting requirements set out by Ofgem.

We recognise that there is more that we can do to improve this document and would be interested to know your thoughts as to what would make it more meaningful. Areas that we are looking to incorporate include:

- Year-on-year performance;
- Environmental innovations (new approaches, developments and protection);
- Highlights from collaborative work with our stakeholders and/or regulatory authorities; and
- Waste management (further information provided below).

We believe it is right to provide year-on-year performance to allow interested parties to review the trends associated with our environmental performance across financial years. In so doing, we recognise the scale of our proposed growth will make it more difficult to compare outcomes across years.

We are therefore looking at ways in which we can report trends in a meaningful way. Some of the options that we could use would be to include measures that relate performance to measures that capture the growth in our network. Possible examples could include the size of our network, the Regulated Asset Value (RAV) of our business or the number of employees. It may be appropriate to use a combination of these to reflect the different drivers that influence our environmental performance.

As this work is in development, we have not included year-on-year performance in this report but we will look to do so when we publish our performance for 2012/13. Your feedback will help us to develop this report.

Reviewing our Procedures

We have been considering how we need to adapt our existing approach to managing and mitigating our environmental impact to ensure we promote best practice and enable our employees to contribute to this.

We've been looking at how we can learn from complying with some of the requirements on our large transmission projects and implement this more widely. Two innovative areas that we've been developing are:

- Species Protection Plans
- Recycling and reuse

(i) Species Protection Plans

As part of work on the Beaulieu-Denny 400kV Upgrade, we have worked with Scottish Natural Heritage (SNH) to undertake a full review of the requirements associated with the protection of birds (schedule 1 and others) and European Protected Species.

This work has led to the formulation of a number of species-specific protection plans, setting out the requirements to be incorporated in project planning and guidance for colleagues working within close proximity to setts, holts, nests, places of shelter etc. These plans are intended to ensure we safeguard protected species and comply with our legal and regulatory obligations, whilst allowing construction work to proceed with minimal impact.

We are now in the process of rolling these protection plans out across the business to advise our environmental professionals of the options available to them when projects are in the planning stage and to ensure we operate in line with best practice during the construction and operation of our assets. We believe that the adoption of these plans will ensure we continue to provide important levels of protection and deliver a consistent approach across our activities.

(ii) Waste Management

We have been looking at how we can further minimise our environmental impact through our approach to waste management, particularly as we upgrade our network. We are keen to implement a high recycling and reuse rate for waste materials.

Materials Management Plans are being integrated into our systems of work to promote the sustainable use of materials across our activities. In planning work and evaluating construction techniques, we consider a number of options as a matter of course and opportunities to use recycled materials or to reuse/ replace existing materials are actively sought to limit the impacts of our construction projects.

We also look at the end-of-life options for both new and existing equipment and infrastructure during the design and dismantling phases of our projects to ensure that we implement a sustainable approach, wherever possible. Recycling of redundant plant and overhead lines is a constantly evolving option as recycling markets evolve and present us with new options to pursue.

We believe that waste management is an important component of our environmental performance. We are looking at how we can measure and record this aspect, with an expectation that this will be incorporated into future annual Environmental Performance Reports.

Project Mitigation

We believe that it is essential that our large transmission projects are sensitive to the habitats, wildlife and topography of the areas they are in. For all of our projects, we are assisted and regulated to minimise and mitigate our impact by a number of organisations, including the relevant local authority, Scottish Natural Heritage, the Scottish Environmental Protection Agency (SEPA), Historic Scotland and the Scottish Government.

Some of the steps that we are currently working on to mitigate the impacts of our projects include:

- Adoption of **Construction Environment Plans** to protect watercourses, soil, peatlands, wetlands, blanket bog and heathland and promote land reinstatement;
- **Rollout of Species Protection Plans** (as described above);
- Steps to **reduce adverse residual groundworks effects**, particularly on soil, local hydrology, forests and local badger populations;
- **Development of access tracks**, bringing benefits to forests and remote communities;
- **Use of Materials Management Plans** and consideration of appropriate strategies to manage/mitigate waste;
- **Site identification** to minimise the impact on works and new assets on ecology and the landscape;
- Post-construction **planting of native shrubs and trees** to screen assets, where appropriate to do so;
- **Reuse of existing towers** where possible; and
- **Removal of existing overhead lines** that are no longer required.

Flood Defence

As part of developing Our Business Plan, we assessed the areas of potential flood risk on our network, the probability of any significant event occurring, and what preventative measures could be deployed to prevent the impact of loss of supplies in the area.

More information can be found at:

[www.ssepd.co.uk/uploadedFiles/Controls/Lists/Resources/Transmission_price_control_review_business_plan\(1\)/Doc6.pdf](http://www.ssepd.co.uk/uploadedFiles/Controls/Lists/Resources/Transmission_price_control_review_business_plan(1)/Doc6.pdf)

As part of this assessment, we identified twenty transmission sites potentially at significant risk. This was based upon the Scottish Environment Protection Agency's (SEPA) data, where there is a 1-in-200-year flood risk from fluvial or costal conditions.

Since January, we have continued to progress the work on the three sites identified as being of greatest priority and are continuing to develop our plans for the next phase of this work.

Next Steps

Over the coming months, we will continue to review our reporting approach to ensure we are capturing and measuring the most appropriate areas of our activity to understand and mitigate our environmental impact. As stated, we intend to be open and accessible in reporting this so you can assess our performance and understand the actions we take.

To assist this process, we would appreciate your thoughts on the contents of this section and our Business Carbon Footprint report for 2011/12 in [Appendix 4](#).

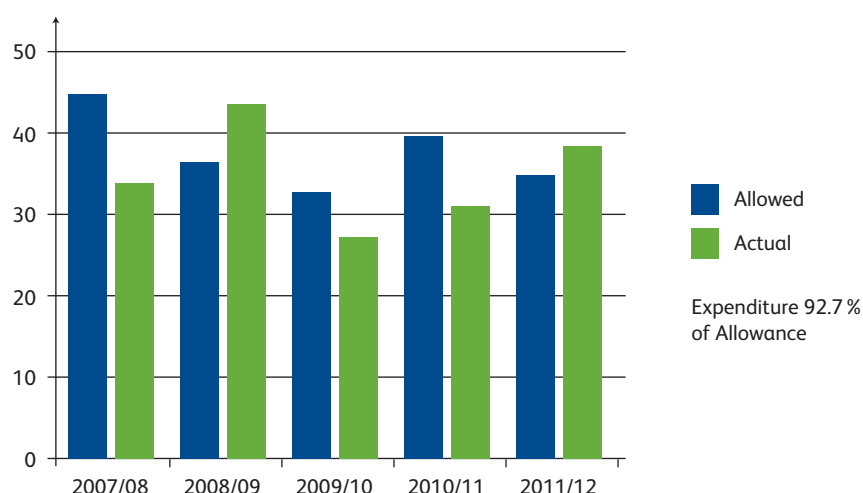
Consultation Questions

- Do you support our proposed approach to reporting our environmental performance?
- Are there other factors that you think we should incorporate into annual report?
If so, please provide detail on how you suggest we report on these.
- We have set out in this section a couple of areas where we have particularly sought to improve our environmental performance.
 - Do you have any comments on these sections?
 - Is a more detailed overview of particular areas of work of interest to you and something that would be beneficial to incorporate into our annual report?
- We have set out some of the mitigation activities that form part of our large transmission projects.
 - Are you aware that we are involved in this type of work?
 - Would further updates similar to this be of interest?

7.

Our Performance (April 2007 – March 2012)

Figure 7.1: TPCR4 Base Capital Expenditure, £m nominal



Introduction

Our Business Plan and the majority of this document are forward looking in nature, setting out what we intend to deliver during the next price control period. In order for you to understand our plans fully, we believe it is important that you can also review our historical performance.

This section summarises our outcomes for the last price control review (TPCR4), which ran from April 2007 to March 2012. We have broken our performance down into the following categories:

- Base capital expenditure;
- Operating expenditure;
- Regulatory asset value;
- Large transmission projects;
- Output measures; and
- Innovation.

TPCR4 was conducted under the traditional 'RPI-X' approach to network regulation and, as such, we did not publish a Business Plan but instead submitted information directly to Ofgem. Further information on TPCR4 can be found on Ofgem's website at:

www.ofgem.gov.uk/Networks/Trans/Archive/TPCR4/ConsultationDecisionsResponses/Pages/ConsultationDecisionsResponses.aspx

All price controls are developed in a pre-determined price basis and then scaled by the relevant inflation rate for each year of the price control. TPCR4 was determined using 2004/05 as the price basis. To ease comparison with actual expenditure, we have compiled this section in nominal prices, adjusting our allowance for each year by using the Retail Price Index (RPI).

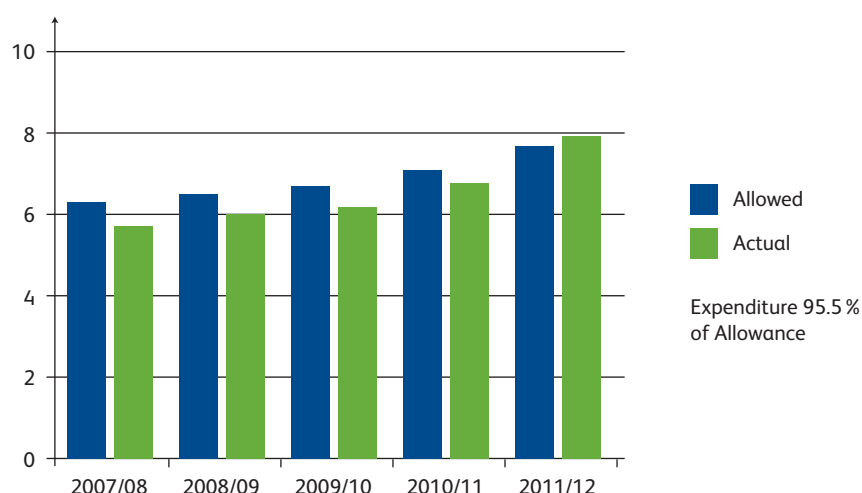
Base Capital Expenditure

Our base capital allowance for the TPCR4 period was set at £189 million in nominal prices. This allowance was to cover the majority of SHETL's capital requirements, across both maintenance and growth expenditure, except the large transmission projects funded separately (discussed further below).

Additionally, an uncertainty mechanism was included to fund local connections infrastructure if additional generation was brought forward beyond the forecast at the time of the settlement, in the form of a revenue driver. The threshold for this mechanism was not triggered during the TPCR4 period.

Our total base capital expenditure across the period was £175.1 million (in nominal prices), equal to 92.7% of our allowance. The annual breakdown of our allowance to actual expenditure is shown in Figure 7.1.

Figure 7.2 TPCR4 Controllable Operating Costs, £m nominal



Operating Expenditure

In setting the price control, operating expenditure was separated into two categories; those under our control (controllable operating costs) and those that we don't control (predominantly business rates and licence fees). Ofgem then set an allowance for our controllable operating costs, whilst the non-controllable components were subject to a pass-through mechanism.

Our allowance for controllable operating costs for the TPCR4 period was set at £34 million (in nominal prices). Our total controllable operating costs expenditure across the period was £32.5 million; 95.5% of our allowance. The year-by-year breakdown is shown above in Figure 7.2.

Large Transmission Projects

In addition to the base capital allowance within the price control, Ofgem used two mechanisms for funding large transmission projects during TPCR4; Transmission Investment for Renewable Generation (TIRG) and Transmission Investment Incentives (TII).

Further information on these mechanisms can be found at:

www.ofgem.gov.uk/Networks/Trans/ElecTransPolicy/CriticalInvestments/TIRG/Pages/TIRG.aspx (for TIRG);

and

www.ofgem.gov.uk/Networks/Trans/ElecTransPolicy/CriticalInvestments/InvestmentIncentives/Pages/InvestmentIncentives.aspx (for TII).

(i) Transmission Investment for Renewable Generation

SHETL has two projects funded under the TIRG mechanism; Sloy Inverarnan and the works on the Beauldy-Denny 400kV Upgrade that are within our network area. (Works on the section of this project within Scottish Power Transmission (SPT)'s area are SPT's responsibility and funded accordingly).

Construction at Sloy Inverarnan was completed in 2009/10 as per our funding agreement with Ofgem and, due to damage to the transformers during delivery, was fully operational from 2011/12. Our revenue associated with this project will be adjusted in accordance with Ofgem's determination, available at

www.ofgem.gov.uk/Networks/Trans/ElecTransPolicy/CriticalInvestments/TIRG/Documents1/TIRG%20Sloy%20Determination.pdf

Work on our part of the Beauldy-Denny 400kV Upgrade commenced in 2010/11 and is due to complete in 2015/16. Enabling works and the substation build are progressing well and the first of the new towers was completed at the end of February 2012. More information on project progress is available at:

www.sse.com/BeauldyDenny

(ii) Transmission Investment Incentives

We also have four projects funded under TII; namely Knocknagael, Beaulay-Dounreay, Beaulay-Blackhillock-Kintore and Beaulay-Mossford (substation).

Of these, construction at Knocknagael was completed in 2011/12 and the substation energised with additional capacity available in the NW region from November 2011.

Completion was achieved four months ahead of schedule and £2.62 million under our allowance.

Of the remainder, Beaulay-Dounreay is due to complete in the rollover year (2012/13) and Beaulay-Mossford (substation) and Beaulay-Blackhillock-Kintore are due to complete during the T1 price control. Further information on all of these projects can be found at:

www.ssepd.co.uk/Transmission/ProjectUpdates/

An update on all of our large transmission projects has been published alongside this document with further information on the current status of our large transmission projects that have either received or are in the process of being assessed to receive funding. This document can also be found in our projects update section via the link above.

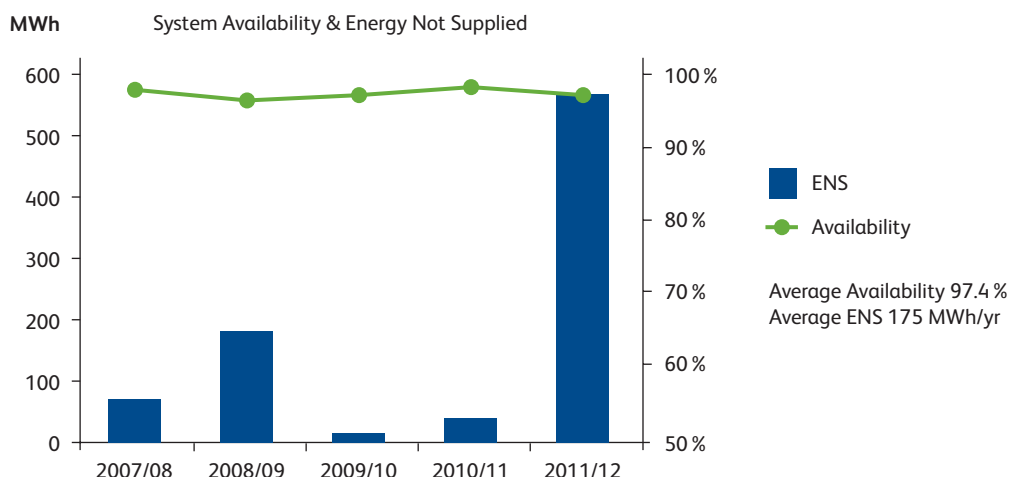
Regulated Asset Value

Our Regulated Asset Value (RAV) is a regulatory tool; used to reflect the value of network companies' assets based on their historical investment. It is calculated from an estimate of asset values at privatisation plus allowed additions and minus depreciation. The revenue we earn includes an assumed return on the value of these assets.

As a consequence of the investment in our networks during the TPCR4 period, we have seen our RAV increase from £330 million at the end of March 2008 to £770 million at the end of March 2012. This is equivalent to growth of 230% in the value of our regulatory asset base over the TPCR4 period.

This growth incorporates both base projects and our large transmission projects and includes Shadow RAV associated with TIRG projects, where applicable.

Figure 7.3 SHETL Output Measures



Output Measures

Output measures were in the relatively early stages of development when Ofgem published its Final Proposals for TPCR4. Two key outputs were identified for all of the Transmission Owners; System Availability and Energy Not Supplied (ENS).

We delivered an average system availability of 97.4% and average ENS of 175 MWh per year. The annual breakdown of our performance is shown in Figure 7.3.

The purpose of these output measures was to “enable greater visibility as to the performance of the transmission systems in response to the capital expenditure and operating expenditure [allowed]” (Ofgem, Transmission Price Control Final Proposals, December 2006).

As such, an annual performance report has been published by National Grid, as part of its System Operator role, compiling performance figures for all of the Transmission Owners. These reports can be found at

www.nationalgrid.com/uk/Electricity/Info/performance/

Innovation

As part of the price control, SHETL was granted an allowance to fund innovation projects, through the Innovation Funding Incentive (IFI), up to a value of £500,000 per year. Our actual expenditure across the period was £2.4 million, 95.9% of our available allowance.

Projects funded include:

- Insulated cross-arms;
- Flow battery trial;
- Dynamic line rating studies;
- Alternative design work for wood poles and conductors;
- DC technologies;
- Mobile condition monitoring systems; and
- Tower construction techniques.

An update on some of our innovation projects is included in Appendix 5. Additionally, our latest IFI report, as submitted to Ofgem, can be found at:

www.ssepd.co.uk/Library/IFIsRPZs

Appendices

Appendix 1.

Responding to this Update

As set out in Our Business Plan, we are keen to incorporate your views into our plans and therefore welcome feedback on any aspect of this update.

In each section, we have identified consultation questions where we would particularly appreciate comments and these are summarised in the following pages.

To allow us to incorporate your comments as we continue to develop our internal processes and participate in working groups with Ofgem and the other TOs, we would appreciate it if responses could be submitted by **16 November 2012**.

Responses will be acknowledged on an individual basis and we may contact you to discuss your comments further.

As far as possible, we are happy to meet and discuss your thoughts on this update. Please contact us via the contact details provided below if this would be useful.

We may wish to share your response with Ofgem and the other TOs as part of our ongoing work. If you would prefer us to keep your comments confidential, please indicate this in your response.

We recognise the pressures on your time and would like to thank you for contributing to helping us continually improve our performance.

Please direct responses to:

Landel Johnston

Scottish Hydro Electric Transmission Limited
Inveralmond House
200 Dunkeld Road
Perth PH1 3AQ

Or email:

transmission.review@sse.com

Section 3: Maintaining a safe, reliable supply of electricity

- Are there any areas of our activities where you think we could do more to ensure the safety of any affected parties? If so, please provide details.
- Do you have any comments on our approach to incorporating innovative developments into our Business-as-Usual activity?
- Do you have any comments on our approach to regular reporting?

Section 4: Someone to talk to

- Do you support our proposed approach to ongoing communication? Will this approach meet your needs? If not, what would you like to see?
- Do you believe an Annual Satisfaction Survey, as described, will provide a fair reflection of our performance?
- What areas do you think we should capture in our service standards and how should these be measured?
- Do you have any other comments on the proposed incentive mechanism?
- Do you have any thoughts of our draft Customer Charter and / or Connections Guide? How can we improve these to better meet your needs?
- What is your preferred format to receive updates from SHETL?
 - Hard copy, by mail
 - Email with attachment
 - Email notifying new documents uploaded to website, with links to page
 - Other

Section 5: Supporting the growth of the low carbon economy

- Do you understand the process that projects need to go through to be funded under the Strategic Wider Works process and how you can contribute to this process? If not, what areas would you like further information on?
- Do you have any comments on our procurement strategy?
- We are keen to involve our customers and stakeholders in our innovation activities. Do you have any further suggestions on how we do this better?
- Do you have comments on the work being undertaken to optimise network access?

Section 6: Doing our best to look after the environment

- Do you support our proposed approach to reporting our environmental performance?
- Are there other factors that you think we should incorporate into our annual report? If so, please provide detail on how you suggest we report on these.
- We have set out in this section a couple of areas where we have particularly sought to improve our environmental performance.
 - Do you have any comments on these sections?
 - Is a more detailed overview of particular areas of work of interest to you and something that would be beneficial to incorporate into our annual report?
- We have set out some of the mitigation activities that form part of our large transmission projects.
 - Are you aware that we are involved in this type of work?
 - Would further updates similar to this be of interest?

Appendix 2.

Our Commitments to You

(Our Draft Customer Charter)

Introduction

Scottish Hydro Electric Transmission Limited (SHTL) is the owner of the high voltage electricity transmission system in the north of Scotland and is regulated by the Office of Gas and Electricity Markets (Ofgem).

This is our initial draft of our proposed Customer Charter and we welcome feedback from interested parties. We are issuing it as part of our Summer 2012 Consultation and will revise in light of responses received before formally publishing later in the year.

In Our Business Plan for the RII0-T1 price control period (April 2013 – March 2021), we committed to maintaining the safe and reliable transportation of electricity through our network area and ensuring that our network is able to facilitate the development of the low carbon economy.

This document builds on Our Business Plan by setting out our commitments to you, our customers and stakeholders, as we carry out our business. In addition, we are developing service standards that will help you monitor how we are performing.

Section 4 sets out the work we are doing on these and, later in the year, we will issue a consultation on our proposed service standards once they are further defined. We will then annually report against these so you can monitor how we're doing in improving our performance against our service standards.

Our Commitments

(1) We will develop, maintain and operate our networks safely at all times.

We will continue to take all reasonable steps to ensure that members of the public, contractors and staff are not harmed as a consequence of our activities. We will seek to learn from best practice around the world and challenge each other to improve our performance. This remains our highest priority at all times.

(2) We will seek to provide our customers and stakeholders with the best possible service.

In particular, we will continue to review how we communicate more effectively and our responses when you get in touch with us.

(3) We will maintain our commitment to delivering value for money across our activities.

We are funded by bill payers (both domestic and commercial energy users) and we recognise the impact our costs have on everyone's budgets. We commit to ensuring that our expenditure is efficient and effective; keeping the impact on bill payers as low as possible; and delivering fair outcomes to our customers and suppliers.

(4) We will operate in a sustainable manner, with consideration to the long-term impact of our activities.

We are committed to the communities and environments that make up our network area. The nature of our business and the longevity of our assets means that our investments will have a long-term impact and we will do what we can to ensure that we deliver positive benefits to the north of Scotland.

(5) We will build and maintain lasting, mutually beneficial relationships with those affected by our activities.

We will seek to work with you, developing multi-disciplinary and multi-organisation teams, where appropriate, to deliver effective solutions that benefit the wider industry and community.

(6) We will work smarter, deploying innovative solutions where these can assist us in developing, maintaining and operating our networks.

We will work with the innovation community to identify, develop and deploy new technologies and techniques that bring benefits to those impacted by our networks.

(7) We will report regularly on our performance so you can assess how we are delivering on these commitments and our wider obligations.

We will publish an annual performance report, covering our performance across our key outputs and obligations, with additional updates on important areas of our work.

Appendix 3.

Connecting to the National Electricity Transmission System (Our Draft Connections Guide)

Introduction

Scottish Hydro Electric Transmission Limited (SHETL) is the owner of the high voltage electricity transmission system in the north of Scotland and is regulated by the Office of Gas and Electricity Markets (Ofgem).

This is our initial draft of our proposed guide to the connections process and we welcome feedback from interested parties. We are issuing it as part of our Summer 2012 Consultation and will revise in light of responses received before formally publishing later in the year.

Who's Who?

As illustrated in [Figure A3.1](#), SHETL is the Transmission Owner (TO) in the north of Scotland. Scottish Power Transmission and National Grid Electricity Transmission are the TOs for the south of Scotland and for England and Wales respectively.

National Grid Electricity Transmission (NGET) is also the System Operator (SO) across all of Great Britain and, as SO, is responsible for agreeing all new connections to the National Electricity Transmission System, including in SHETL's transmission area. We work with NGET to assess applications for connection and to deliver the necessary works to facilitate the physical connection.

The arrangements that govern the relationship between the SO and all of the TOs, including the connections process, are set out in the System Operator – Transmission Owner Code (STC) and a number of supporting procedures.

Further information on the STC can be found at:

www.nationalgrid.com/uk/Electricity/Codes/sotocode/

Someone to Talk to

We recognise that generation projects of the scale that require a transmission connection are not a small undertaking and are subject to many factors. If you are in the early stage of project development, our Contract Management Team can provide information, support and guidance in relation to obtaining a connection to the grid.

Once a project enters the connections process (set out on the next page), we are obliged to follow a formal process and communication about your project will largely be with or via NGET. However, we will endeavour to play our part to ensure your project progresses smoothly and in a timely manner.

If you wish to contact us, we will deal with your query in a professional, courteous manner, in line with our Commitments to You (draft provided in [Appendix 2](#)). Your feedback will help us to continue to improve our service.

You can contact us by:

email: mcc@sse.com

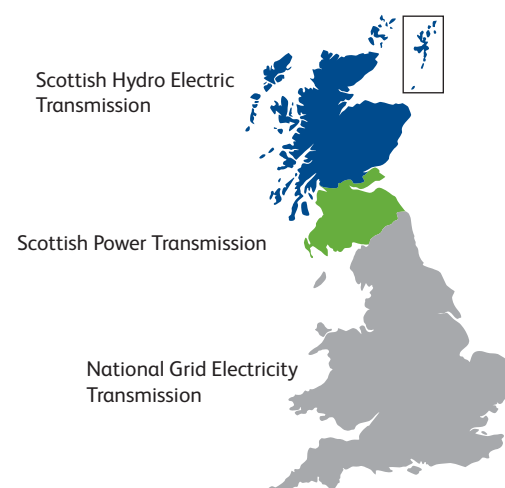
or

telephone: 0845 072 4319

Alternatively further information can be obtained at:

www.ssepd.co.uk/Library/ChargingStatements/SHETL

Figure A3.1: GB Transmission Licensees



The Process

With multiple parties involved, the process for making a transmission connection is formalised to ensure all parties understand the steps to be followed and timescales for completion.

Once you decide to formally apply for a connection, your application will follow a formal process, as set out in the STC. You will notice that formal communications are predominantly with NGET, as the System Operator. However, if you are applying for a connection within our licence area, we will work with NGET to develop your connection offer and, if you choose to accept, will work with you and NGET to deliver your physical connection.

The transmission connections application process can be summarised as five steps:

Step 1:

The applicant sends the relevant completed application form along with supporting data to the National Grid Electricity Transmission (NGET) team.

Step 2:

NGET checks the application form to ensure that all the information has been correctly completed. Upon payment of the appropriate fee, NGET then has a maximum of 90 days in which to develop the connection agreement offer for the applicant, in conjunction with SHETL.

Step 3:

Once the offer is prepared, NGET sends the offer to the applicant who has a further 90 day period to review it.

Step 4:

NGET will contact the applicant to discuss the offer and arrange a post-offer meeting to clarify any aspects of the offer as required.

Step 5:

The applicant will normally be expected to sign the agreement within the 90 day period otherwise the offer will lapse.

Further information on the process can be obtained via the following links:

www.nationalgrid.com/uk/Electricity/GettingConnected/NewConnections

www.nationalgrid.com/uk/Electricity/GettingConnected/NewConnections/ConnectionApplicationProcess

www.nationalgrid.com/uk/Electricity/GettingConnected/NewConnections/TransmissionConnections/docs.htm

Appendix 4.

Our Business Carbon Footprint

(2011/12)

Introduction

Scottish Hydro Electric Transmission Limited (SHETL) is the owner of the high voltage electricity transmission system in the north of Scotland and is regulated by the Office of Gas and Electricity Markets (Ofgem). This is our Business Carbon Footprint for the year April 2011 to March 2012.

We are committed to increasing the reporting available to our customers and stakeholders on our environmental performance. This Business Carbon Footprint captures a limited element of our impact so we are developing the necessary processes to be able to publish an annual environmental performance report from next summer.

Publishing this Business Carbon Footprint report is part of our development process and we are interested to know how you think we can provide greater visibility of the environmental impacts of our activities.

The components captured within this report are those that we are currently required to report to Ofgem, namely:

- Buildings’ energy usage;
- Substations’ energy usage;
- Operational transport (road);
- Business transport (road, rail and air); and
- Use of sulphur hexafluoride (SF6).

Our impact has been calculated in the relevant unit for each of these components and then converted into tonnes of Carbon Dioxide (CO₂) equivalent to provide a means of aggregating the components together.

The assumptions that we have used to collate this report are provided in each of the subsequent sections.

Our Business Carbon Footprint (2011/12)

For the year April 2011 to March 2012, our Business Carbon Footprint was equivalent to 6,040 tonnes of CO₂ equivalent emissions. This compares to 6,359 tonnes of CO₂ equivalent emissions for the previous year. The breakdown of this footprint by component is shown in [Figure A4.1](#) on adjacent page.

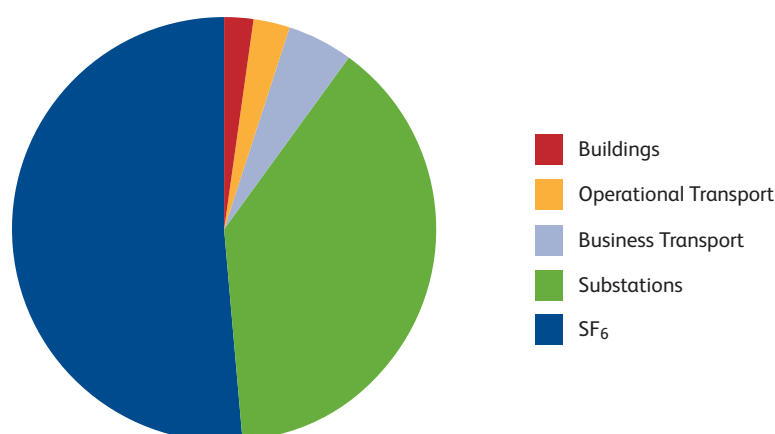
Buildings’ Energy Usage

In collating this report, all relevant buildings have been identified using the same office/depot/store log that we provide to Ofgem.

Where we share buildings with sister licensees, such as Scottish Hydro Electric Power Distribution (SHEPD), we have implemented systems to allocate energy usage on the basis of staff head count. The ‘Grid Rolling Average’ conversion factor has then been used to calculate the equivalent tonnes of CO₂ associated with the electricity consumed. At present, none of the buildings used by SHETL use gas.

Electricity Consumption (kWh)	Gas Consumption (kWh)	tCO ₂ equivalent
269,315	0	140

Figure A4.1: Our Business Carbon Footprint (2011/12)



Substations' Energy Usage

All of our substations are registered as unmetered supplies and therefore the energy used is not metered. To calculate the usage associated with our substations, we have separated our assets into voltage categories and a best estimate framework for the energy consumption at these sites has been used.

Principles and assumptions used in this estimation are as follows:

(i) Substation numbers – The number of substations in each category is taken from our plant database.

(ii) Estimating principles – Electrical load in a substation is a combination of the following factors:

- **Space heating:** Based on multiples of 3kW off-peak heating ON for 6 hours per day, for 6 months a year (only 10% of HV sites are heated);
- **Panel heaters:** Based on multiples of 0.07kW (only 10% of HV sites with separate LV panels);
- **Lighting:** Based on multiples of 0.2kW and assumed it is ON for 10 days during the year;
- **Battery chargers and tele-control equipment:** Based on multiples of 0.5kW, assuming a continuous supply to DC standing loads;
- **Mains powered equipment:** Based on 0.5kW of continuous supply; and
- **Transformer coolers:** Based on the cooler ratings of individual transformers. Substations are assumed to have 2 transformers on average, with coolers in operation for 10 days of the year.

Electrical load has been calculated for each substation, using the principles detailed above. These figures have then been multiplied by the 'Grid Rolling Average' to calculate their equivalent CO₂ emissions.

	Number of Substations	Units (kWh)	Total Units (kWh)	tCO ₂
132kV	92	40,625	3,737,500	2,334
275kV	14	52,879	740,306	
Total			4,477,806	

Operational Transport (Road)

The volume of fuel (litres) consumed by operational vehicles is captured using fuel cards. We do not report freight separately from passenger operational transport, so all operational road travel is included in the following table. The appropriate conversion factor has been used to convert the volume of fuel into tonnes of CO₂.

Operational Transport (Road)	Petrol (litres)	Diesel (litres)	tCO ₂
	134	63,611	163

Operational Transport (Other)

The majority of our operational transport is conducted by road. Consideration of other transport modes has been given as follows:

- Operational rail journeys, where relevant, have been included in the business travel section;
- The use of sea travel is minimal and, for the purposes of this report, is considered negligible due to the scale of the emissions;
- Operational air travel incurred by SHETL is currently reported by Scottish Hydro Electric Power Distribution (SHEPD). These figures are not material in terms of emissions.

We will continue to monitor these other forms of operational transport and include them in future reports in the event that usage makes these modes material in terms of assessing our emissions.

Business Travel

Business travel is typically by road, rail or air. The use of sea travel is minimal and, for the purposes of this report, considered negligible due to the scale of the emissions. Travel is captured through our internal travel and expenses systems and mileage calculated from these. The appropriate conversion factor is then used to convert to tonnes of CO₂ equivalent.

Business Travel	Road (miles)	Rail (km)	Air (km)	tCO ₂
	849,958	140,795	205,216	305

Sulphur Hexafluoride (SF6)

Emissions of SF6 are calculated by combining the volume of SF6 used in routine maintenance and the volume used during fault repair. These figures are extracted from our Asset Management System, which are recorded in accordance with the Energy Networks Association (ENA) Engineering Recommendation S38. In addition, natural leakage is calculated using the aforementioned Engineering Recommendation and a model produced by the ENA.

The appropriate conversion factor is used to transform this combined figure of SF6 lost to the equivalent tonnes of Carbon Dioxide.

SF6 Emissions	tCO ₂
	3,098

Appendix 5.

Innovation, Research and Development Projects Update

Introduction

Scottish Hydro Electric Transmission Limited (SHETL) is the owner of the high voltage electricity transmission system in the north of Scotland and is regulated by the Office of Gas and Electricity Markets (Ofgem).

In January 2012, we set out our updated Innovation Strategy explaining how our transmission business is anticipating the new opportunities to bring innovation and technology into our network. This is available at:

www.ssepd.co.uk/Transmission/TransmissionPriceControlReview/LatestDocuments/

In that document, we explained the engagement undertaken with our stakeholders to make sure those new capabilities are relevant and important to them, as well as setting out our intention to become the most innovative electricity network company in Europe by 2016.

This update is a sample of just ten live or recent research projects. They highlight how technology will play a vital role in keeping our future assets more capable, more efficient and yet more sustainable than those found anywhere today.

You can also view our recent report to Ofgem for projects funded under the Innovation Funding Incentive on our website, at:

www.ssepd.co.uk/Library/IFIsRPZs/

The projects covered in this update are:

- Flow Battery Trial;
- Dynamic Line Rating;
- Alternative Tower Construction;
- Mobile Condition Monitoring;
- Aluminium Carbon Core Conductor;
- Collapse Prediction Relay;
- Wide Area Monitoring, Protection and Control;
- Optical Current Transformer;
- Nano Composite High Voltage Direct Current Insulation; and
- Insulated Crossarms.

For each project, we have provided a technical overview of the project and a project progress update, as at June 2012.

Figure A5.1 – Flow Battery Trial, Nairn substation



(i) Flow Battery Trial

Technical Overview of Project

The project is to install the first flow battery on the UK network. The battery is sized at 100kW / 150kWh and is connected to the DC auxiliary supplies of Nairn transmission substation and is illustrated in Figure A5.1.

The primary aim of the project is to gain understanding of flow battery technology and to disseminate this learning to the benefit of the UK industry.

The provision of DC supplies at transmission substation sites have almost exclusively been provided by lead acid batteries. New technologies are now emerging which may offer superior performance with reduced maintenance costs but, to date, there has been no operational experience within the UK.

Through this project, we have gained hands-on experience of this innovative technology and captured significant learning.

There are five main objectives of the study:

1. Establish the suitability of a flow battery for providing substation DC supplies as an alternative to conventional lead acid batteries;
2. Gain operational experience in the operation and maintenance of an established flow battery technology;
3. Test the viability of monitoring conventional and new battery technologies remotely using proprietary software and a data link;

4. Validate the round trip efficiency claims for this type of energy storage device; and
5. Determine the economic and operational benefits of using flow battery technology in existing substation asset replacement programmes.

Project Progress

Unfortunately, the original unit installed on site in 2009 had to be shut down due to a number of issues. We have worked extensively with the manufacturer, Premium Power, to address the issues identified and considerable design alterations have been made to ensure that the unit is suitable for use in an operational UK transmission site.

The revised unit was planned to be on site and commissioned by autumn 2011, but manufacturer issues have delayed this. The new management is focused on ensuring the unit is operating correctly by thoroughly addressing issues such as getting consistency across all the stacks.

We have invested significant time over the last year, in conjunction with EA Technology, to analyse the results to ensure a robust product. We consider that this development time is necessary to ensure that the issues previously discovered are resolved. The deployment of the revised unit is now planned for 2012/13.

SHETL has also used the experience gained on this project to inform the purchase and deployment of further electrical energy storage projects.

Figure A5.2 – Dynamic Line Rating technology



(ii) Dynamic Line Rating Monitoring System

Technical Overview of Project

The purpose of the project is to establish the effectiveness of a dynamic line rating system on one of our 132kV transmission lines, illustrated in Figure A5.2. At present, the maximum level of allowable generation is almost at its peak due to the static line rating of the 132kV circuit in question. We intend to gain accurate information of the line's rating during summer and winter conditions, and utilise this information for optimum transmission performance.

The CAT-1 Transmission Line Monitoring System allows accurate real-time rating of transmission lines, by monitoring the mechanical tension of both ruling span sections at a dead end structure. Sags, clearances, and average conductor temperature are all directly related to CAT-1 measurements. With line ampere data from a SCADA system, an actual line rating is calculated.

If successful, there is potential to roll out this system on other transmission circuits that have limited capacity. This will allow SHETL and the System Operator (SO), National Grid Electricity Transmission (NGET), to accommodate increased generation on the transmission system in the north of Scotland.

The adoption of dynamic line rating is expected to:

- Increase generation output and allow further generation connections to the 132kV circuit;
- Raise transmission capacity;
- Monitor sag in order to provide advance warning of impending clearance violations; and
- Match line ratings to load and weather conditions.

Project Progress

The monitoring units have been received and a review carried out to identify suitable circuits for the trial installation. A 132kV line in the north of our area has been identified as a possible location and plans are in place to install the equipment, although some issues with communications and power supplies remain to be resolved prior to installation.

Figure A5.3 Testing of SBB and ERS technique



(iii) Alternative Tower Construction

Technical Overview of Project

This project intends to investigate the use of the SBB Emergency Restoration System (ERS) technology in the construction and deconstruction of transmission tower lines.

It is proposed to investigate using ERS technology, illustrated in Figure A5.3, during the construction of towers to which access is difficult, impractical, or where the access route is environmentally sensitive. By employing this technique and using all-terrain vehicles, the requirement for temporary roads will be significantly reduced or removed, and we anticipate a reduction in the impact of some of our construction works.

Successful implementation of this method will also provide a safer working environment and reduce certain project costs.

Project Progress

Given the original purpose of the equipment and its successful use internationally, we are confident that the new methodology is sound and will deliver the benefits envisaged.

Initial testing of the prototype was carried out in January 2012 in collaboration with the developer, SBB, and an experienced line contractor, Norpower. A number of modifications have been identified which will improve the operating potential of the tower crane.

While these are being developed, we have arranged for the tower to be used for its original purpose as a bypass tower on a current project. This will enable our staff and contractors to become familiar with its function and operation in practise.

(iv) Mobile Condition Monitoring System

Technical Overview of Project

This project focuses on the development of a new, non-contact, non-invasive condition monitoring system suitable for the condition assessment of Open Busbar Transmission Substations.

As we move further towards asset replacement based on condition rather than age, this technology can gather condition information while maintaining a high level of safety.

This type of equipment can also be used to constantly monitor items of plant that have operational restrictions placed against them, thus allowing operational personnel to work in greater safety in the vicinity of any affected plant.

The integrity of transmission plant is maintained as it is non-invasive and we can reduce the need to take affected plant out of service to carry out invasive testing. This technology offers the potential to play an important role as part of our more proactive approach to network and asset management.

Project Progress

The base system had previously been used within SHETL, with a good level of success and confidence developed in this technology. The latest modified system is substantially based on existing technologies but benefits from additional development work to increase the amount of information able to be gained from using the device.

The mobile system was delivered and trialled for a number of months at one of our substations. The unit was subsequently returned to the manufacturer to have a number of modifications and upgrades carried out.

The system has been returned to us again for a further period of trialling prior to being handed over to our maintenance teams for field assessment.

(v) Aluminium Carbon Core Conductor

Technical Overview of Project

Due to an increase in demand, a reinforcement of the transmission infrastructure between Peterhead substation and St Fergus switching station was required. This involved a new 3rd 275/132kV transformer and associated equipment, along with the construction of a 3rd circuit of approx 14km.

Of this circuit, 11km of overhead line has been constructed using Aluminium Carbon Core Conductor (ACCC). This is the first installation of this type of conductor within the UK.

The project brings the benefit of being able to use a conductor that has an increased capacity. This allows the up-rating of existing lines, with reduced strengthening of towers and foundations, and may preclude the need for rebuild.

As the conductor can run at higher temperatures with a lower sag and a greater capacity, the benefits would be suitable to use on both distribution and transmission projects. This conductor can also be used to re-conductor existing circuits that require a higher capacity by using the existing wood pole and tower network.

Project Progress

The conductor installation was completed by May 2011. The circuit was then successfully commissioned and this innovative conductor is presently in service. The project has been closed, although we continue to look for other appropriate opportunities to deploy the technology across our network.

(vi) Collapse Prediction Relay

Technical Overview of Project

The project evaluated a new type of protection relay claimed by the manufacturers to be able to predict a possible transmission power system collapse at an early opportunity. The CPR-D relay was assessed in a laboratory at the University of Manchester and also while installed on the GB electricity transmission system.

Using only local voltage inputs, the relay is intended to use a number of techniques to assess the stability of the transmission system. If proven to operate successfully, the device would have the potential to predict a blackout at an early stage and enable corrective action to be taken.

Project Progress

Following extensive testing, it is our opinion that, whilst the relay can detect system abnormalities, it is not able to differentiate between normal disturbances and potential system collapse situations.

Results from the installation on the transmission system show that the relay was triggered by local switching events. They also show that the device was unable to detect oscillations that were able to be detected by other devices installed on site.

This project concluded that the device does not have the ability to predict system collapses and illustrates the importance of field testing of new technologies, prior to investing in new equipment.

(vii) Wide Area Protection, Monitoring and Control

Technical Overview of Project

Power-grid congestion issues and disturbances worldwide have emphasized the need to enhance power grids with Wide Area Monitoring, Protection and Control (WAMPAC) systems as a cost-effective solution to improve grid planning, operation, maintenance and energy trading.

WAMPAC systems take advantage of the latest advances in sensing, communication, computing, visualization, and algorithmic techniques. Synchronized Measurement Technology (SMT), including Phasor Measurement Units (PMUs) and its applications are an important element and enabler of WAMPAC.

For building a WAMPAC system, the issues related to a) infrastructure, b) applications and c) policies and procedures must be very thoroughly considered. In this sense, the specific features and needs of the power system in question are critical. They determine the system architecture and the prioritisation of applications of the future WAMPAC system.

In designing a WAMPAC system, the application of a suitable simulation environment for development and testing of WAMPAC functionality is the optimal approach. A number of simulation tools for this purpose exist today. The aim of this project is to check the suitability of DIgSILENT software packages for these challenges.

A better understanding of system conditions and margins will enable better use of available network capacity and constraints and ensure that plant operates safely within its capability and design limits.

This project has the potential to create a cost effective method of predicting and identifying a very high impact, low probability event and contributes to better informed asset management.

Project Progress

This project commenced in 2008 and ran through to 2011. The key deliverable elements of the project included:

- A review of existing WAMPAC solutions, including an evaluation of systems installed elsewhere (Denmark, Sweden. USA);
- Identification of technology suitable for installation on the GB transmission network;
- Evaluation of system architecture requirements;
- Evaluation of the current state of technology used for WAMPAC systems;
- Review of future physical connection requirements and challenges with the maintenance of the hardware;
- Development of a simulation tool based on DIGSILENT for investigating WAMPAC systems;
- Evaluation of WAMPAC algorithms on a simulator modelling the GB network;
- Design and evaluation of new algorithms for improved network monitoring and control;
- Evaluation of WAMPAC algorithms; and
- Benchmarking, validation and fine-tuning of models used.

The research was concluded successfully and further wide area monitoring protection and control projects are likely to follow.

(viii) Optical Current Transformer

Technical Overview of Project

This project is investigating the development of an optical Current Transformer (CT) prototype, in conjunction with Manchester University. The product is an innovative new CT designed for use on the high voltage network.

The device would be a replacement for traditional iron cored Current Transformers (CTs). There are devices on the market that are similar to this at present: however, they have not gained acceptance within the industry as they have severe restrictions on operation. This project will aim to remove these issues and create a device that will provide enhanced flexibility to the transmission system.

Currently, standard protection CTs do not provide for power quality monitoring as the design of the devices is such that they are unable to measure high frequency harmonics. This new system will utilise Rogowski Coils and as a result will be able to measure these harmonics. This is an invaluable addition to the capability of the CT as it will allow greater monitoring of the transmission system at a lower cost than at present.

The new device will also fit with the new IEC 61850 standard for substation protection and control and will be fully compatible with the digital requirements of future substations.

Project Progress

We have held a project start up meeting with the University of Manchester. The University is currently in the process of recruiting research students and work on the design is expected to commence over the summer.

Figure A5.4 Installation of insulated Crossarms



(ix) Nano-Composite HVDC Insulation

Technical Overview of Project

This project involves the production of nano-composite electrical insulation materials and components. It will establish property and process design rules for reliable production and processing that are scalable and demonstrate this by the manufacture and realistic testing of a high voltage resin bushing.

This applied research project addresses the need to achieve systematic processing and production of nano-composite electrical insulation materials for the reliable manufacture of high performance, next generation high voltage direct current (HVDC) power transmission equipment. Major enhancements in performance and properties of key components in new HVDC electrical insulation systems are essential for long-term growth of on-shore and off-shore HVDC systems, which rely on point-to-point and multi-terminal schemes.

The availability of higher performance electrical insulation materials will meet advanced HVDC needs and provide opportunities to trade off size and cost. Innovative, nano-composite based electrical insulation materials appear to provide the performance required. This project focuses on developing and testing demonstrator components under arduous conditions, thus driving rapid exploitation.

Project Progress

This project will prove the likelihood of a commercial project and is based on a shared collaborative funding proposition. The project team contains all of the necessary elements of the supply chain to make the project work. An initial meeting has been held and agreements have been prepared which are now under review by all parties.

(x) Insulated Composite Crossarm

Technical Overview of Project

Since 2010, SHETL has been assisting with the development of an insulated crossarm for steel lattice transmission towers. This product, being developed by a spin out company of the University of Manchester, is designed to allow existing towers to be uprated in voltage and current by increasing the height and distance of the conductor from earth and is illustrated in Figure A5.4.

The aim of the insulated crossarm work is to maximise the capacity of existing infrastructure, without building new lines or rebuilding existing lines. Studies using the crossarm along with novel conductor types (such as the ACCC discussed above) have shown that, on L3 towers (the design used on a number of routes in SHETL's area), the crossarm could result in 150% increase in power throughput, without the requirement for tower reconstruction.

Figure A5.5 Installation at St Fergus Switching Station



Project Progress

We have been assisting with the environmental testing of the crossarms and are trialling four crossarms on one of our most exposed transmission lines at the Lecht. This test is primarily aimed at understanding how the arms cope with extreme weather conditions. At 2300 feet above sea level, the area is subjected to high wind speeds and very high levels of snow fall for approximately five months of the year. This test will conclude in 2012.

The next stage in testing is also under way involving the live testing of two arms at St Fergus switching station and is shown in [Figure A5.5](#). These are energised through a test transformer and isolated from the main system.

This test is being carried out at 400kV and is intended to investigate how the crossarms handle polluted environments. In this instance, salt is the primary pollutant in this coastal environment. This installation is now in place and is progressing well.

Following on from the original 400kV project and its success to date, the use of these crossarms to up-rate 132kV lines is now being investigated, in collaboration with National Grid.

We intend to install these crossarms on two live 132kV circuits out of Beaully substation this year. This will be a trial but it also solves a specific operational need at these sites and it is considered that the crossarms are well suited to provide an appropriate solution.

It is hoped that if these crossarms prove to be a success, they can be more widely used as part of the transmission reinforcement work due to take place over the coming years. The potential benefit could be a considerable reduction in the number of towers we need to rebuild.

Contacts

To request further information please write to:

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