

Britain's First Smart Grid: Knowledge Sharing Event  
IET, Savoy Place, London  
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Event Report

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## 1 Context

SSEPD organised this event to share learning from our experience of developing, deploying and operating Britain's first smart grid on Orkney. The central focus was on Orkney's Active Network Management (ANM) scheme, developed in collaboration with the University of Strathclyde to overcome grid capacity constraints which were preventing new renewable generators from connecting to the existing grid network. The ANM scheme has enabled new generators to connect to the Orkney grid without the need to create additional capacity by reinforcing the network, providing substantial cost savings.

As the first of its kind, the process of creating the ANM scheme has resulted in a wealth of learning for SSEPD and our project partners, the University of Strathclyde and Smarter Grid Solutions (SGS), the spin out company founded to deliver the ANM as a result of the initial research.

Our aims in holding this event were to:

- provide stakeholders, particularly other network operators, with practical learning about the design and operation of ANM schemes which they could apply in their own roles
- give stakeholders an opportunity to share and discuss their own experience/opinions/learning regarding ANM with peers
- build a foundation for further learning exchange by raising participants' awareness of the type of knowledge held by SSEPD and partners

This report provides a summary of key learning points from each work stream and delegate feedback, including the closing remarks from Ofgem.

## 2 Attendance

Over 60 delegates attended, including representatives from Ofgem, DECC, the five other UK Distribution Network Operators (DNOs) and a wide range of consultancies, developers, academic institutions and community/industry bodies. A full list of delegates is provided in Appendix I.

## 3 Structure of the day

The event was designed to be interactive and participatory. Prior to the event delegates had been provided with relevant background information via email, including a strategic review report on the Orkney Smart Grid and a white paper on SSEPD's approach to business and systems analysis, as applied to the Orkney scheme. On the day itself, the event began with an opening session to set the scene and put the Orkney Smart Grid project in context. Delegates then split into two work streams for a series of tutorials. The work streams ran in parallel: tutorials in Work Stream 1 focussed on the technical aspects of ANM while tutorials in Work Stream 2 focussed on the commercial aspects.

- Technical tutorials
  - Accessing capacity in a constrained network
  - Exploring the deployment of ANM
  - Owning and operating an ANM system
- Commercial tutorials
  - Stakeholders and the commercial drivers for ANM
  - The contractual interface
  - Facilitating ANM

Tutorials were run by staff from SSEPD and SGS, all included small group activities. Each set of tutorials was followed by an open forum discussion to review learning from the sessions.

Delegates then regrouped for a closing session – a facilitator from each work stream provided a short summary of the key learning points from their session. This was followed by a presentation from Stewart Reid, Future Networks and Policy Manager, on SSEPD's current and future work building on the experience of developing and operating the Orkney Smart Grid.

All presentations and videos of the opening and closing sessions are available on SSEPD's website, together with a range of other learning resources: <http://www.ssepd.co.uk/OrkneySmartGrid/>.

## 4 Summary of learning points

### 4.1 Technical Work stream

**Suitability and applicability:** network management schemes, such as demonstrated on Orkney, are likely to be most attractive where the network is well delineated (a geographic island or perhaps a network in a valley), where the next traditional reinforcement is expensive or likely to be of long duration to deploy, and where there is a community identity and energy awareness.

**Applicability:** this technique is not just about islands, nor is it just about controlling generation; there are clear parallels for controlling demand (both increments and decrements), and for controlling storage. It is also evident that the system architecture is subtler than simply "local intelligence". The Orkney scheme is decentralised in the sense of having a hub in Kirkwall power station but there is also intelligence embedded with each generator being controlled (for example, for loss of communications, a local decision had to be taken to ramp the generator down to ensure network safe operation); the Orkney scheme is therefore a mix of centralised and distributed intelligence even within the islands.

**Complexity:** it is evident from the Orkney scheme that there is much subtlety in the detail; complexity will be compounded by the commercial decision model; the scheme must not only track the variability of generator outputs but also variability of network demands and the changing constraints on the networks,

which may move their location as demand and generation patterns alter; furthermore the generation curtailment pattern may have to satisfy multiple nested constraints. In the future, it may be economically attractive to combine intelligent network control with protection or voltage control arrangements.

**Assurance to stakeholders:** it is clearly helpful to have evidence from a working project, evidence of modelling that has been validated, and a performance track record. However, standardisation will be needed to demonstrate effective quality control and the transfer of good design from one location to another. Standardisation is also helpful for developing the cost effectiveness of such schemes (for example improved procurement, better spares management, effectiveness of training and learning); the question was asked whether it would be helpful to form a "Developer Forum" to both share knowledge and to standardise best practices.

**Project approaches:** the work stream was interested to be shown the approach to Systems Analysis adopted by SSE. Their approach uses two main mechanisms (i) use cases and (ii) business process analysis. Use cases describe the goals and scenarios and capture the vision, business process analysis describes how the project will be owned and operated in the organisation. The approach uses diagrammatic techniques with standardised symbols, and this can provide a helpful common language for information sharing between companies and a platform that acts as the starting point for the next project.

## 4.2 Commercial Work Stream

**Relationship management:** the range of stakeholders with interests in ANM is very broad, and the required information flows between different parties complex and extensive. Pro-active stakeholder engagement was essential to set up the Orkney scheme, particularly with developers, to ensure understanding of ANM principles. Determining the most appropriate contractual relationships to deliver an ANM scheme presented a challenge at the Orkney project design stage – while Orkney now provides a successful blueprint, there may be potential for adaptation to different circumstances or alternative solutions. The volume of information to be shared between stakeholder groups is also a challenging feature of ANM schemes.

**ANM is a 'living beast':** unlike conventional network reinforcement, an ANM scheme is not a 'fit and forget' solution. Stakeholder engagement is an ongoing, rather than one off activity, which must continue indefinitely once the scheme is operational because generators should be informed of the reasons for constraints, changes to the scheme etc. and be able to provide feedback on its ongoing performance. Appropriate communication channels are required. Setting up a forum/user group has proved valuable on Orkney.

**Resource requirements:** discussion of the range and nature of stakeholder relationships led to consideration of the current capability of DNOs to develop ANM systems as a standard solution to network capacity constraints. It was agreed DNOs need new business models to support the long term

engagement and information exchange requirements for ANM systems. In addition, DNOs have a wide range of internal ANM stakeholders dispersed through different teams – methods to coordinate exchange between these groups and the ANM provider are required. Dedicated 'ANM support teams' could become standard for 'business as usual' deployment.

**Bankability and sustainability:** bankability was agreed to be the cornerstone of a successful ANM scheme. Generators will not be able to access finance to take up ANM connections unless the DNO can offer commercial arrangements with a high degree of certainty on predicted constraint levels in the long term. Finance providers require 'absolute clarity' on constraint levels, hence commercial arrangements must ensure that a generator's capacity will not be eroded over time i.e. must be sustainable. The 'Last In First Off' (LIFO) principle of access used on Orkney provides this certainty in theory and is understood within the financial sector as a result of the project. Its other advantage is relative simplicity - this has aided communication of the concept, contract design and development of the technical solution (in terms of coding). However some erosion of capacity by sub 50 kW generators shows that potential threats need to be anticipated.

**Evolution:** it was recognised that ANM schemes must evolve over time - external factors such as changes in demand (e.g. caused by an energy efficiency initiative) may affect constraints and therefore ANM requirements. ANM may be a temporary solution pending reinforcement in some areas, or a sustainable permanent solution to capacity constraints in others. In addition, ANM technology will evolve. Hence no ANM solution will remain 'optimal' – monitoring of local and technical developments, learning and flexibility will be required to adapt.

## 5 Conclusions

This section provides an overview of feedback received from delegates, the closing remarks from Gareth Evans of Ofgem and our views on next steps.

### 5.1 Delegate feedback

Structured feedback was collected via an online survey after the event. We also provided opportunities for delegates to give informal feedback on the day via 'graffiti boards'. One board was set up in each work stream and delegates were encouraged to use post it notes to record things they liked about each session, suggested improvements, or additional questions. The questions, together with answers from tutors, are available on SSEPD's website: [www.ssepd.co.uk/OrkneySmartGrid](http://www.ssepd.co.uk/OrkneySmartGrid)

Overall, both sources of feedback indicated a very positive response to the event programme and delivery format. The tutorial format and emphasis on participation was particularly welcomed – 'likes' recorded on graffiti boards included *"interactivity as opposed to death by Powerpoint"*, *"strong focus on participation"* and the *"in-depth perspective"* provided by tutors.

### 5.1.1 Survey results

Table 1 summarises key survey results, showing that both the quality and relevance of the event exceeded expectations for over 75% of respondents.

**Table 1. Delegate survey responses (based on responses received from 31-35% of external delegates)**

How would you rate the following?	Answer Options (% response)				
	Well above expectations	Above expectations	Met expectations	Below expectations	Well below expectations
Overall quality of event	35	53	12	0	0
Relevance of event to your role	24	47	29	0	0
Registration process	29	29	41	0	0
Pre-event reading material	12	35	53	0	0
Venue location	38	25	31	6	0
Venue facilities	19	44	38	0	0
Catering	24	47	29	0	0

Qualitative responses to the open questions below provide more insight to support these ratings:

#### What was the most beneficial aspect of the event?

Three main themes dominated the 16 responses received; these are listed with number of times the theme was recorded and illustrative quotes:

- Interaction and small group discussion (7)  
*“the discussions created an interesting work environment with free expert participation”*
- Networking with peers and specifically interacting with SSEPD project staff (7)  
*“chatting informally to the personnel involved in the project”*
- Improved understanding relating to SSEPD’s work on the Orkney Smart Grid and/or ANM (6)  
*“really well run – better than events run by professional events organisers and educational – actually made the concept quite simple”*

#### What could we have done to improve the event?

The 14 responses received included the following themes, listed with the number of times the theme was recorded:

- Suggestions for additional content (6)
- Nothing (4)
- Enable participation in both work streams (3)

- Recommendations for specific changes to individual tutorial exercises (2)
- Reduce time spent on feedback/discussion (1)
- Hold outside London (1)

Suggestions for additional content included more introductory/background information on smart grids, more technical detail about ANM and examples of other similar smart grid projects. As an alternative to enabling participation in both work streams, a stand or display for each stream, manned by tutors during breaks, was suggested as a means to provide information. Implementing this suggestion would also reduce the need for a whole group learning review, which would address the comment that too much time was spent on feedback.

### **What key messages will you take away from the event?**

The main themes to emerge are listed below with the number of times the theme was recorded and illustrative quotes:

- Smart grids are becoming a reality – that the Orkney system works in practice  
*“ANM smart grid deployments work and offer financial as well as green benefits”*  
  
*“That things are now in action”*
- Learning about processes/technical aspects of ANM and the Orkney Smart Grid scheme (4)  
*“the technical solution from the project to use in other areas”*  
  
*“the technical and commercial decision processes”*
- That ANM is not problem-free – the practical issues which need to be resolved (3)  
*“interesting that solution erodes as small micro-generation is introduced”*
- The importance of stakeholder engagement (3)  
*“the value of maintaining constructive relationships”*
- Knowledge sharing is a valuable exercise (2)  
*“small group working with..informed and able facilitators is a great way to draw out feeling/discussion/consensus”*
- The problems addressed by the Orkney Smart Grid are also faced by many other European countries (1)
- Deployment of smart grid technology has real potential but needs to be quicker (1)

- Too many to list (1)

## 5.2 Ofgem response

Gareth Evans of Ofgem ended the event with a short closing remarks session, providing some feedback on his impressions of the day.

Gareth thanked the organisers and also the delegates for their participation to make the day a success. He explained that Ofgem's primary aim in providing incentives for research and demonstration is to stimulate learning and that it is up to DNOs to ensure learning is effectively captured from these projects. He noted that many LCNF projects are already generating a wealth of useful lessons and information, but that there is a need beyond this "to convert learning to knowledge". One of the key challenges Ofgem has identified for LCNF projects is ensuring that learning gained by those directly involved in projects is passed on to others across the DNO community.

Gareth singled out the Orkney ANM system as a success from the Registered Power Zone incentive and commended the event as a 'high quality' response to Ofgem's call to disseminate learning from innovation projects, stating that future similar events would be beneficial.

He also highlighted conversion from innovation to business as usual as the next step. With this in mind, the closing remarks ended with a call for delegates to get involved in RIIO by participating in working groups and through the Smart Grid Forum.

## 5.3 Next steps

This event has provided clear proof of concept for the effectiveness of a workshop-based approach to disseminating learning. Based on lessons learned from delegate feedback and our own experience of trialling this approach, future knowledge sharing activities will be developed to share findings from our portfolio of innovation projects.

One of the strongest themes of the day was the need to progress business as usual roll out of ANM – this was a topic of key interest with extensive discussion of the opportunities and associated challenges. As noted in above (4.1) suggestions were made on the day that an ANM developers' forum or user group would be one way to continue the type of knowledge exchange initiated at the event, and also promote standardisation. Both will be necessary to underpin successful wider deployment. SSEPD would strongly support development of a forum or user group and we would welcome feedback from other groups on this proposition.

## Appendix I: Delegate list

Organisation	Name
Aston University	Danielle Strickland
Cable & Wireless Worldwide	Paul Brodrick
Chiltern Power	John Scott
Community Energy Scotland	Mo Cloonan
Cooperative Bank	Mark Draper
Cooperative Bank	John Puddephatt
Coriolis Energy	David Morris
DECC	John Christie
DNV KEMA	Colin MacKenzie
EA Technology	David Roberts
Electricity North West	Darren Jones
Electricity North West	Kate Quigley
ELIA	Kenny De Kerf
Energy Networks Association	Paul Fidler
Energy UK	Alastair Manson
Highlands and Islands Enterprise	Graeme Harrison
Imperial College	Dimitrios Papadaskalopoulos
Imperial College	Sara Nanchian
Northern Power Grid	Mark Nicholson
Northern Power Grid	Alan Creighton
Northern Power Grid	Peter Turner
Northern Power Grid	Preston Foster
Ofgem	Dora Guzeleva
Ofgem	Gareth Evans
Hammars Hill Energy Ltd.	Richard Jenkins
Hammars Hill Energy Ltd.	Alistair Gray
Oxford University	Beaudry Kock
PA Consulting	Marc Tritschler
PB Power	David Hawkins
RenewableUK	Zoltan Zavody
RenewableUK	James Hubbard
Scottish Equity Partners	Tony Robison
Scottish Power Energy Networks	Martin Hill
Scottish Power Energy Networks	David Carson
Smarter Grid Solutions	Colin Foote
Smarter Grid Solutions	Alan Gooding

**Organisation**

Smarter Grid Solutions

Smarter Grid Solutions

Smarter Grid Solutions

Scottish and Southern Energy Power Distribution

Sgurr Energy

SmartGrid GB

Technology Strategy Board

TNEI

UK Power Networks

UK Power Networks

UK Power Networks

University College Dublin

University of Strathclyde

University of Strathclyde

University of Strathclyde

Western Power Distribution

Western Power Distribution

**Name**

Robert Currie

Neil McNeill

Robert Armour

Stewart Reid

Jennifer McGregor

David MacLeman

Jenny Rogers

Andy Comrie

Ian Freeman

Andrew Urquhart

Alec Morrison

Gary Bartlett

Brian Shewan

Martin Lee

Gavin Montgomery

Rob McNamara

Christian Inglis

Charlotte Higgins

Gilbert Manhangwe

John Hayling

Nick Heyward

Andrew Keane

Simon Gill

Michael Dolan

Laura Kane

Roger Hey

Simon Yeo