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SMART GRIDS CONFERENCE 2013 CAMBRIDGE – Grid of Things

Opening Session – Connected Intelligence

10:00 Dr Justin Hayward, Director & Consultant, CIR Strategy, **Introduction**

10:05 Gavin Jones, Electralink, **Chairman's Opening Remarks**

10:10 Keith Clarke, VP Embedded, ARM Holdings plc Lead Sponsor

Smart Energy ecosystem – Partnership Models

10:25 Richard Smith, Head of Energy Strategy, National Grid

Connected, secure, two-way grid assets

10:40 Mark Askew, Senior Manager, Policy Analysis, Ofgem

Incentivising network companies to adopt Smart Grids

10:55 Jane Burston, Head, CCM, National Physical Laboratory

Real-time monitoring of power quality in smart grids

11:10 Panel with Gavin Jones followed by **coffee break**

Session 2 – Grids for Industries

11:45 Steve Kaye, Head of Innovation, Anglian Water, Gold Sponsors

Innovation in water for grids, energy and in customer experience

12:00 Mike Halley, VP EMEA, Trilliant

Trilliant Smart Grid Maturity Model (™)

12:13 Sam Bose, Founder Director, IntelliSense.io

Unlocking Intelligence in the Grid of Things; Drivers for the 3rd industrial Revolution

12:25 Martin Ansell Fault Current Ltd

Extending the capacity of the Power Grid

12:40 Panel with Gavin Jones

13:00 CIR Strategy & TTPV **Rapid Innovation Pitches**

13:10 Lunch and joint networking with Cleanpower Stream

Session 3 – Connected Design & Consumer Appliances

14:00 Douglas Cheung, Technology Director, Hitachi Europe, Gold Sponsors

Enabling Smart Cities and Smart Communities

14:20 Sean Cochrane, Head Smart Metering, Cyan Technology

Meeting the challenges of smart metering in emerging regions

14:40 Russell Haggart, VP, Product Management, Xsilon Ltd

Hanadu: In-Home M2M connectivity for Smart Meters and Appliances

15:00 Panel Dr Aidan Rhodes, UKERC & **Tea break**

Final Session – Connectivity, distribution, technology & policy – all confirmed

15:40 Ian Ellerington, Head of Innovation, DECC

DECC Innovation Programme – The story so far...

16:00 Phil Proctor, Programme Manager, Energy Storage & Distribution, ETI

The 2050 Challenge and Technology Solutions

16:20 Pilgrim Beart, Founder Director, AlertMe

Simplicity: The real challenge for 2020

16:40 Philip Sellwood, CEO, Energy Saving Trust

Consumer Convenience & Supplier Simplification through Connected Devices

17:00 Plenary panel with **Fiona Harvey, The Guardian**, then Chair Summary/ies

17:30 **Networking Drinks**

This 5th Annual Smart Grids & Cleanpower Conference by CIR Strategy brought in association with ARM, Anglian Water & Hitachi Europe is part of the Cleantech Conferences Series, which has run 20 times since 2007.

5 November, 2nd iWATER-iHEAT & HVM Graphene: www.cir-strategy.com/events/register 01223303500



Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





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Cambridge June 4 2014

SMART GRIDS & CLEANPOWER

Rigorous process

CIR Strategy

CLEANPOWER CONFERENCE 2013 CAMBRIDGE

Opening Session – Energy Issues in Highlight

- 10:05 Michael McCreary Senior HVM Consultant, CIR Strategy, **Introductory Remarks**
- 10:10 Alan South, Commercial Director, Solar Century plc, **Chair's Remarks**
- 10:15 Adam Cooper, Ofgem

Responsive regulation in a changing energy landscape

10:30 Dominic Emery, BP

BP Energy Outlook 2030

10:45 Professor Kevin Hesketh, NNL

An Alternative Nuclear Pathway

11:00 Professor Richard Davies, Durham University

Shale Gas and Oil: Risks and Rewards

11:15 Panel with Derek Pedley Oxford University & ESKTN

11:30 Coffee break

Session 2 – Innovations in Renewables

11:45 Adriana Laguna-Estopier, UK Power Networks

Flexible Plug and Play: enabling faster & cheaper renewable generation connections

12:00 Chris Wright, Founder, Moixa Energy

Distributed Energy storage at the edge of the grid

12:10 Alasdair Young, Director, Buro Happold

The role of heat networks in future energy scenarios

12:30 Martin Bloom, Chairman, Renesola & Emblem Ventures

Business Models for Renewables: the Need for Constant Renewal

12:45 Panel with Graham Ford, Mansion Partners

13:00 Lunch and joint networking with Smart Grids Stream

Session 3 – Larger Plants, Energy & Carbon Efficiency

14:00 Dr Philip Grunewald, Oxford University CE

Volatile wind and flexible demand: a balancing act?

14:15 Ali Lloyd, Principal Consultant, Pöyry

The outlook for biomass electricity in the UK: 2013 update

14:30 Philip Osborn, Head of Energy, Sainsbury's plc

Energy Efficiency & Store Generation Projects

14:45 Niall Mackenzie, Head of Industrial Energy Efficiency, DECC

UK Industrial Energy Efficiency – What can government do?

15:00 Panel with Richard Parker, Adapt Commercial, followed by tea break

Final Session – Connectivity, distribution, technology & policy – IN MAIN HALL

15:40 Ian Ellerington, Head of Innovation, DECC **DECC Innovation Programme – The story so far...**

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Notes – Maria Gradillas

Opening Session – Connected Intelligence - Moderated by GAVIN JONES, Electralink

1. Dr Justin Hayward – Introduction

Thanks team and sponsors and everyone for coming to this 5th edition of the event. Brief overview of CIR strategy. **Why our way?**

- Listen
- Solution-neutral methods
- Focus on understanding customer issues.
- Diverse set of customers.
- In-depth market research evidence and validation.
- Analytical and simple.
- Provide fresh minds.

Why us? Rigorous solutions that use evidence. **Why now?** Delays cost money – don't get caught in the upturn.

Offered to meet and give example of complete project program & client successes. Company **SliceMap** looking for funding – free to download from App Store on iPad/iPhones – contains all world's real technology companies in your pocket with Bayesian technology to choose & display selected as map. Rate companies like TripAdvisor.

Mega-productivity tool.

Introduces Gavin Jones from Electralink highly involved in smart grids and the energy industry. Chairman today.

2. Gavin Jones – Chairman's Opening Remarks

Highlights importance of smart grids area, President of Ghana has highlighted that the country's main problem is that of electricity shortage – main problem of the country is the lack of electricity – not car bombs or security. Argues that electricity and energy is the most important infrastructure in the developed world, vital for modern society. Health education, employment, all follows electricity – Links between GDP growth and availability of electricity.

In the UK we have a highly reliable energy source through investment that went in 50 years ago but that's more and more under stress – The Energy Minister recently spoke of a looming energy crisis around 2015-2017 so around the corner – He doesn't expect light to go out but he expects energy prices to increase – light on is crucial but affordable energy is also important. Companies can move all over the world look for cheap cost.

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





In US electricity costs are down because of Shale gas. Perhaps this enabled Obama to win election, companies are coming back to the UK after offshoring but intensive users of electricity industry companies going back to US. Political question in US – should they export shale gas or keep it for them - economic advantage – in this country smart grids necessary to drive cheap reliable energy to drive recovery. Electralink right at the heart of the industry of smart grids.

Smart Energy ecosystem – Partnership Models

3. Keith Clarke, VP Embedded, ARM Holdings plc (Lead Sponsor)

ARM - Technology licensing company – microprocessing company – we believe we can be part of the solution – SG engineering challenge around the world – solution will come in many forms collaboration in innovation will be needed. Those systems will require microprocessing technology – connecting intelligence.

Major themes of the scale of challenge:

1. increase use of energy use – we want to be able consuming as we do – in east they want to start using some if the things we've become adjusted to.
2. Energy mix of generation has to change – more renewables so grid will need to reconfigure.
3. Extremes the industry needs to serve – live in a cottage but have access to broadband, etc as well as more modern lifestyles in city apartment – solutions need to account for that.

We need to cater to the different type of consumers, from technology averse - need to make it easy to use – other people who want to get involved, control their usage and devices – solutions need to account for extremes.

Electricity consumption worldwide is increasing – different solutions needed for different industry or uses or areas – need variety of solutions depending how energy is used and how much is used. Technology is a factor – lighting or motors – various technology needed to control consumption

What is SG? Needs to be about saving energy, convenience, safe and secure.

Many challenges, lots of industry players, there have to be collaboration, standards, interoperability.

Currently vertical solutions are favoured to be able to control end-to-end systems – in the long term interoperability standards will be key to enable integration – so a more horizontal environment is more likely – Highlights importance of standards in the long term to enable innovation.

Key to these technologies - Reducing electricity consumption and enabling control.

Call to action – if you are thinking of an application – with a microprocessor and radio connection we can start trialing a technology very quickly – Example of a project with Vodafone- Example of how building a standard enables others to innovate around it.

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





Key final message - Solutions involve platforms, standards and collaboration to enable innovation

Connected, secure, two-way grid assets

4. RICHARD SMITH, Head of Energy Strategy, National Grid

This is the essence of what we want. We really value a secure energy system in this country.

How is National Grid (NG) navigating some of the real challenges now and over the next price control.

The grid is changing – connection of new renewable generation. Geographically, the source location is different.

Example: new wind coming from Scotland but most consumption in the south – flow from energy from Scotland to South – high stress area – B6 boundary example – if we look at the fully green scenario we have a gap in capability.

We need to invest in some assets – need investment to get capacity level up - in RIIO framework huge incentive where can you not build, what can you do instead. RIIO - Where do you need the investment what else can you do, can you sweat assets harder. Invest in secondary assets that enable better use of existing assets. Another option is commercial solutions – flexible demand.

Flexible generation is the standard tool at the moment – managing the capability today is about thermal generation.

In 2030 the tool-kit will grow in other areas.

Interconnection and storage – by 2030 we expect to see more interconnection (export and import of electricity).

On the energy balancing side, storage will help balance, for network operators the value of storage is in balancing.

Demand management is the most challenging and interesting option (graph of demand profile), if we think about demand profiles and what they mean – this gets quite hard – demand forecasting is very difficult – consumer electronics and lighting is huge – there could be some huge differences in technology there, which might move that big chunk of consumption. In terms of behavior, what type of behavior can we move?

When you look at breakdown of consumption – what can you move and how? Today very little but looking forward EVs (electric vehicles) and heat pumps there is huge potential and they will dominate the entire curve – Demand curve will change, huge uncertainty. We need to think about the wider system not just electricity.

Heat – huge challenge – smart is about the entire system – optimize the entire system. Example of heat – switch between systems, interaction with other systems

KEY idea – NG needs to think about the energy system has a whole, how they interact and how to optimize them in a smarter way.

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





Incentivising network companies to adopt Smart Grids

6. *MARK ASKEW, Senior Manager, Policy Analysis, Ofgem*

Encourage companies to think innovatively – LCNF (Low Carbon Networks Fund) RIIO

In 2008 – we realize there were some issues connected to Low Carbon targets that would impact distribution networks – (two way flows, PV, EVs) at the same time we realized there were opportunities for companies – but companies had never done that before so companies needed to innovate.

So we introduced LCNF – trial what works and doesn't in this price control – try new network management systems and determine what role can the DNOs play in the supply chain.

Trials should generate learning and provide a range of solutions more efficient than putting assets on the ground.

Structure of the LCNF given in PPT.

IFI – R&D

LCNF – Tier I – allowance 1 million GBP per DNO per year – so as long as they satisfied criteria they had access to funding

Tier II for larger demo projects – annual competitions

Discretionary reward – if they meet milestones and success criteria – also for projects delivered outstandingly.

DNOs are rewarded for innovating in

Structure of price control.

RIIO building blocks.

If companies outperform their outputs – reward otherwise penalize – they also have the innovation stimulus.

Key aspects of what we hope to encourage – output led – upfront allowance to deliver (up to them how to do this) Efficiency incentive – companies can keep up to 70% ? –

Equalised incentives: in the past incentive was towards capex solutions, now “totex” so all expenditures can claim return (any solution not just a capital investment can be commercial or operational investment).

Next distribution price control – NG want companies to have a tension when delivering their business – they need to have outputs – need to invest in order to reach outputs, on the other hand the other incentives will make them think about the best solution to reach outputs at lower cost.

Remove barriers to deploy SG

In May 2011 – we set up SGForum (Smart Grids Forum) – group of industry experts and stakeholders to move SG forwards

6 work streams

WS3 – took work from WS 1 and 2 and build a model that all DNOs now use for their business plans (TRANSFORM)

WS5 – website will be launched June 2013

Work Stream 6

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





Assess solutions that are coming out of trials, what solutions can be deployed in the next price control and what barriers are there to those solutions. Discovered few barriers. Mainly few of the engineering technical recommendations need to change as well as the charging rules.

Also discovered that additional transparency is needed

WS6 is now focused on how the consumer can become involved in the SG and the different options and scenarios.

Ofgem is focused on understanding scenarios and anticipating the barriers so that we don't hold up the development of SG.

Real-time monitoring of power quality in smart grids

5. JANE BURSTON, Head, CCM, National Physical Laboratory (NPL)

Introduction to National Physical Laboratory and then talk about 3 main challenges to measurement in smart grids. At the end potential future projects

NPL – UK measurement institute – Obj. to provide the measurement infrastructure in the UK – we work closely with industry – we calibrate top level of energy meters used by suppliers – tradition for high accuracy - we have changed recently as a result of our metrology for 2020 study which found 4 factors in changes in measurement science: measurement at the frontiers (need for accuracy measure in the field out of the lab ex, offshore wind) embedded measurements (Need for huge amount of sensors operating in real times all over the system) smart and interconnected measurements (how do we manage all the data and turn it into info that people need)

Last year we launched the Centre for Carbon Measurement to tackle these climate change challenges – we collaborate with industry.

3 key challenges identified in collaboration with industry

1- **Planning for impact of renewables (RES)** – we have developed a technology used in 3 projects:

- (i) North Wales – neighbourhood retrofitted with solar panels – we found increase voltage around the panels (these increases are important when you need to comply with limits)
- (ii) HVDC link between Sweden and Poland – to facilitate power transfer btw the countries – we looked at voltage change in generation – found increases in voltage distortion – need to understand how these voltage fluctuations affect cities.
- (iii) Measuring wind turbine flicker – flicker changes with a change of voltage, flicker affects people psychologically - we worked with Vestas to measure their turbines we left the measure device for 6 months to allow for different wind speeds

2 – Instrumentation for networks – where do you put a sensor to manage network

Work with Uni of Strathclyde to determine best position of sensors – we are looking at which sensors are vital, important and optional (to reduce number of sensors and data)

3 – Determine carbon savings in SG –

Ofgem problem assessing proposals for LCNF because of difficulty of comparing proposals in terms of how carbon savings are measured – so we have a project where we are developing a model to assess carbon savings.

WE are assessing the validity of the model in real projects.

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





At the end of project we aim to produce a standard for calculating carbon savings from SG projects.

With Nestas we are launching a prize to tackle domestic scale DR – if interested in becoming involved come see me.

Panel Q & A: SESSION SPEAKERS + GAVIN JONES, Electralink

Q LCNF Tier II project identified key challenge to get customers to shift behavior or adapt to technology – how do we achieve consumer education to engage with this technology?

Answer

LCNF – show real challenge in behavioural thing (at age 19, energy habits are set) – BBC program unplug everything and only plug it again when you use it – made a real difference – so it can be done it relies on educated consumer and on consumers that can see a benefit for them.

SM roll out will enable customers to see their energy use for the first time – once consumers have that they can start to make changes.

Consumers 1st experience with the technology ideally is a positive one.

If we can find solutions that deliver the changes that the industry needs without impacting the lifestyles of consumers, change will happen.

A professor at Cardiff University is looking at how we communicate about things drive values and behaviours – research in the context of a car sharing schemes, two groups, one was given financial info on scheme and other group info on environmental benefits of the scheme – 80% of those with environmental info made effort to recycle the survey (even though recycle bin difficult to access) only 50% of those given financial info recycled– we need to communicate in a way that relates to the behaviour changes we want.

There are some trials on consumer behaviour, there are examples of behaviour change without price signals.

Q – LCNF and IFI great initiative – do you think RIIO will help move LCNF projects into business as usual – this is key to other companies entering the market.

Key test will be what gets rolled out into business as usual. Business plans for DNOS needed by july they are considering where they can deploy the learning from the trials. NIC is a funding incentive that continues in RIIO.

DNOs are already rolling out some solutions coming out of LCNF.

Q - Sentec – WE would like to some type of open innovation forum and panels for the smaller companies like us to get a more holistic approach of how they are going to innovate. Smaller companies can innovate but can't get to the right people.

Ofgem – in 2nd year we realized this so we change the criteria to encourage DNOs to look for different partners – now DNOs need to show that they have a process for selecting partners as opposed to just going with the partners they usually work with

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





In developing the SG via funding, we need to take advantage of big AND small companies. For a for doing so needed – open innovation, no closed clubs for large multinationals who are not always the best at innovating. This industry is v long term so there is a tendency to work with established firms because you trust them. If you allow this companies to experiment in a safe environment this should enable other companies to participate. Could be a model to trial that could be used for other areas.

Session 2 Grids for Industry. Moderated by GAVIN JONES, Electralink

Smart Grids Communications Systems

Talk Title:- Trilliant Smart Grid Maturity Model (™) - Free your company's future from the pull of the past and escape velocity.

1. MIKE HALLEY, VP EMEA, Trilliant

Actively deploying grids in the US – documented challenges – Have developed a SG Maturity Model happy to share.

Small set of suppliers in this space – innovation is strangled.

SG maturity model – applicable for when you truly have a SG but in the UK complex because no vertical integration.

Capabilities and characteristics and transformational scale of model.

Challenge – there are two sides, companies that will supply utilities and utilities themselves. Previous investments are strangling the way forward.

In AG when a board reviews a portfolio like this (see graph in the slide) it's a good thing how do you get to that growth area? Teams try to go to work towards high growth area – how do you set innovative companies free?

In Trilliant its easier to innovate – you are away from the corporation.

Suppliers and DNOs - low growth-high margin products or you do something different – utilities need to think about the smaller companies.

Challenge for smaller companies, they have boards as well – we brought boards of utilities and smaller companies together and they found that they have the same challenges.

We have found an exciting new area - Prepay – In UK traditionally prepay has been for those in fuel poverty – dominated by 2 suppliers (Aixtron-electricity and Siemens-gas) – In UK theft is a problem – people leave properties leaving unpaid bills.

We have been deploying **prepay** in the UK – now different demographic want pre-pay, consumers don't want direct debit, its like top up on phones – interesting space where we've gone in which was dominated by 2 players. WE work with Centrica.

Some exciting new companies:

Airwave – secure network – bidding in DECC company - an example where a board decided to do something different.

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AlertMe

TOA technology – work form management same mature product – completely reinvented the space – they offer 1 hour appointment window (working with EON).
 UKPN – DNO with vision – setting channels of where we will invest fund – LCNF and their own money invested.

We think it's a real shame - DCC will be created – but right now it's not obvious how DNOs will leverage from this – Tendril trying to leverage this.

Example of Japanese fish – live shark in tanks keeps fish active – a bit like the smaller companies – GE don't fear large companies fear the most start ups that are going to disrupt.

HydroOne – AMI converted to time of use

Key Message - Great stories about shark in tank and diverting some cash into less safe options – i.e. having a balanced risk portfolio that genuinely seeks innovation

3. Unlocking Intelligence in the Grid of Things; Drivers for the 3rd industrial Revolution

SAM BOSE, Founder Director, IntelliSense

Cambridge-based company with large industrial customers – not focused on utilities and consumers

Mentions book on how Internet technologies will change traditional industries

Objective is to make it real no big words – how do you generate value with these technologies

Background – 2.5 years back – idea putting sensors and connecting – customers interested in value of data from the sensors – all about RoE – time frames - 6 months

Technology choices and solutions in 6 month timeframes

3rd industrial revolution (3IR) – transform old industries through digital technologies and RES (renewables)

Drivers: rise in technology (including retrofit) and energy shortage and savings. This is the business case what we try to address

Basic principles of 3rd IR (slide) is the context in which we try to build our solutions

Impact of RES on grid is driver of onsite generation

Industry economy – processes are the highest consumers – if you increase efficiency of processes you can change the electricity load profile – this is our target

These industries are willing to consider our technologies because they want to improve their processes at a system level. It's all about optimizing capex its a no-no.

There is also focus on predicting through data (ex. when will maintenance be required). Increase observation and intelligence of processes.

We deliver wireless solutions – sensors and cloud based platform that picks up data and analyses it.

Case studies – Germany is one of the leading countries – super grid and connecting all industry to renewables. All big companies involved in this challenge.

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





We are involved with the largest semiconductor fabrication plant in Europe – they want to deploy our sensors across their system – *system modeling* is our unique differentiator (deploy sensors, wireless network and cloud to provide solutions). Traditional factories can change themselves and become intelligent.

3 layers in our platform – brains application, infrastructure and hardware (wireless sensors that are retrofit to traditional factories).

We have technological solutions as well as business solutions.

How do we unlock intelligence - We push retrofit rather than rip and replace, vertical solutions and service based models.

4. Extending the capacity of the Power Grid

MARTIN ANSELL, Fault Current Limited

One of the sharks!

Set the scene – power grids needs to change, end of their life, design very hierarchical. Renewable targets upset the balance.

Networks have regulatory constraints and standards they need to keep to and they need to seek smarter ways to manage the grids.

Current ways to manage networks are blocking the deployment of renewables or making it too costly.

Grid is a complex system.

DNOs need to enable vast numbers new types of generation on the networks.

FAULTS

Is an abnormal flow of current (ex. Lighting strike) – grid parameters allow for faults but within limits. Adding new generation to the network will put this limits under stress. Existing options are expensive and time consuming.

A fault current limiter (FCL) – limits the amount of current through a system so that it doesn't get damaged.- its like a shock absorber

Graph with how the fault current limiter operates. Prevents damage, which is very costly. Absorbs the shock of the fault and allows equipment to do its job properly.

There are various methods to limit the faults – many of which are counter productive – in the pink box we have some emerging concepts

There are some FCL technologies –superconductor industry led the way but found some challenges (proves the case but concepts all have important issues or downsides, ex, need for continuous power) the holy grail FCL using permanent magnets (minimum operational costs and no power required).

Applications and benefits –

Enabling RES connection, improving grid quality and reliability.

Market potential.

Mentions report: Technology Innovation Needs Assessment August 2012 – cites FCL as valuable technology – it's a global market, many trials around the world.

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





One of the LCNF projects – Flexigrid Tier II projects looks at managing fault levels in the city of Birmingham, has issues connecting CHP plants from Universities and hospitals, also extra demand because of large stores such as John Lewis opening.

The project identified that 11kV network need FCL.

FCL also have the potential to create a business and reduce carbon.

Stresses the importance of a fit and forget approach of FCL technologies.

We are a spin off from Cardiff University, we have a novel concept, company established over a year ago, recently awarded DECC grant to build a demonstration and work with UK manufacturers.

PANEL Q & A: SESSION SPEAKERS + GAVIN JONES, Electralink

Q – Both suffering from the nature of GB market – what needs to happen for new companies and ideas to come through.

A – Interest to look at the US – lots of successful startups supported by VC funding – not sure we've got this environment in the UK – I like idea of including smaller companies into the industry – when I look at SGF it's the old boys' club, big consultants and big players: *if there is a way to engage new players that would be helpful*. Lets make sure that in the 3rd Industrial Revolution, in previous IR UK was very successful and the UK government supported 1st IR providing protection – France wanted to determine what was successful innovation and didn't do so well – so lets ensure that great initiatives undertaken by Ofgem and DECC remember (bad) French case.

There should be more focus on industry. This is the case of Germany. Protecting industry from industry and asking them to invest in technology and supporting them, making more intelligent, I think this area is not exploited. Other markets talk about application and what happens in 6 months, how do they create value, not lets look at 2020 or 2050. *Actively delivering value, now, stop the delays.*

Q- All information available on networks – security issue and risk?

There is a risk but our strategy is how to use our network on their existing network – so we are a layer on top of the critical path.

Q – 2 small companies – what is the frustration?

Getting time with people to listen to what you're doing. I have connections that open door, but *difficult if you don't have these connections to get an audience*, to get DNOs to listen to you, *they are inundated with people that want to pitch to them*. There is the EIC (Energy innovation centre) represents DNOs and you get 10 minutes to pitch your idea, but *are you pitching to the right person?*

Understand what market to go into. We can't deploy something faster, this made us go to industry – *there is no framework to engage startups.*

I think *the SGF misses an opportunity by not engaging some of the small businesses* – the bigger businesses might have an agenda, smaller businesses are looking for an opportunity.

Traditional vendors – have their standards and newer business don't like those standards we are more interested in more open standards approaches.

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





In the US the grid is highly unreliable. This is also one of the reasons why the investment environment is different. In the UK, reliability is not an issue. This means that companies don't feel the urgency to invest in the grids, less demand to do something.

INNOVATION PITCHES – start up and entrepreneurs

8 pitches were made, each 1 minute long.

EXPO and LUNCH with Cleanpower stream

Session 3 – Connected Design and Consumer Appliances

Moderated by DR AIDAN RHODES, UKERC

1. Enabling Smart Cities and Smart Communities

DOUGLAS CHEUNG, Technology Director, Hitachi Europe, Gold Sponsors
 Overview of Hitachi, large global company – Smart City energy group – London – 3 main areas IT systems, power systems and infrastructure.

Social innovation is the main focus of work.

We provide solutions from supply to demand.

Concept: smart cities and smart communities – IT systems interact with all systems – we aim to provide systems that integrate all things together – They create new systems and retrofit. Systems need to be scalable (offices -energy management systems- to cities).

4 main things in the evolution of a smart community – start from the small concept – optimize and build a large system – scalability is a main theme.

Case Studies

10 major smart community activities in Japan and world wide I will focus on 3 projects in Japan, Maui and UK. Each activity looks at a different part of the smart grid:

1. Rokkasho Village

We wanted to test how to implement a 100 percent (carbon?) free village.

Collaborated with a number of Japanese companies. We have 6 houses powered, implemented IT system. We trialled load shift to flatten load curve – we were able to move the charging of the EVs. Technology for each house was supplied by a different company. 1st we wanted residents not to change their lifestyle. Then we start giving signals to change behaviour. Though direct load control we were able to change 50% of excess energy. Self-sustaining ratio 83%.

We demonstrated heat pump control.

2. Project in Maui – successor to Japan project

In Maui high oil prices they wanted to produce RES and export to mainland. Issues encountered: excess energy, RES which is disruptive to networks, frequency impact, resource planning –where to put Res and data protection.

Solutions – smart power air conditioning systems, battery systems, ..

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6 main areas to prove: efficiency (energy optimized – implemented ICT platform which optimizes use of generation within the island) balancing through load control, EV stations used as energy storage, CyberSecurity – not our core area, system must be autonomous and the community needs to get involved need to be educated. Project timeline – we are now installing everything results later this year.

3. In the UK – LCNF tier I with WPD (Western Power Distribution) – we test rural areas – very long feeders, at the end of feeders drop in voltage due to RES connected in the middle of the line. We connected a reactive power control device to minimize the fluctuation – we were able to mitigate the fluctuation.

Phase II of the project- implement a control system to manage voltage fluctuations in a wider area.

ETI – public private partnerships (Caterpillar, Shell, Rolls Royce, 6 corporate partners, forgot others) Hitachi Europe invested in smart systems and heat programs, we became program associate.

Aim is to build a smart energy system that can be rolled across UK and EU. Electrification of heat – manage this transition. ETI have released 4 projects. 1- cataloguing new technologies, 2-ICT requirements of such systems and WA5 – engaging the consumer. We partner with local companies and are actively looking for companies interested in similar projects.

Smart Community system – our idea

Power conditioning systems and batteries installed in clustered houses – this cluster could provide balancing services, or local energy trading between houses.

Finally, we are actively looking for partners to work with SME or large.

2. Meeting the challenges of smart metering in emerging regions

SEAN COCHRANE, Head Smart Metering, Cyan Technology

Work of Cyan technology in emerging regions. We are based in Cambridge, 30 people most working in R& D. 2 product areas, smart lighting (lighting control solutions) and smart metering (SM), I will focus on SM.

We are delivering benefits of SM in emerging regions – India (pilots)

Focusing on the issues of utilities in those areas and working with partners in those areas and developing technologies specific to that areas.(Interoperability, radio technology)

Smart homes and smart energy – but most people don't have access to that much technology, they have more basic conditions in emerging regions.

Infrastructure in places where we work – pictures in slide – chaotic, our consumers typically bill is about \$10 a month and that is a substantial part of their income. Electricity really improves peoples life. Supply cut regularly because of excessive demand. But things are improving although some way to go.

Problems of getting data from these areas – meters buried in accessible areas and difficult to read. Hard to even find the meters. Getting data from meters in a regular fashion is challenge. Also in UK easy to find people, in our areas difficult to find people,

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





meters and data from meter. Meters support different formats, often proprietary. In India tampering with meters is quite common.

India - scale of problem – a lot of generation is lost in various fashion approx. 49GW. Also there is excess demand.

How is Cyan tackling problem:

- 1- We don't do it alone, we bring technology to our partners (Larsen and Toubro – big player in Indian meters we integrate our technology in their meters). Work with system integrators
- 2- Technology: a lot of meters support various protocols – we take data from the meter into a server, we keep the cost of the meter to a minimum, take the problem out of the meter.
- 3- Cyan has radio expertise – meter can forward data on to another meter and then to a concentrator. Costs need to be kept low.

Protocols – we're trying to enhance protocols make them more efficient for radio. Very cost sensitive – try to keep costs out of the design.

We want to move to full automated AMI but won't happen in one step. In the meantime we start with a very robust walk by system, deliver benefits now and deployable in current conditions, then when utilities are ready we deploy AMI with meters in place now. **This is very important part of our strategy (Having a Migration Path).** We can use radio meshing technology to deliver full AMI with technology in meters now. Very important in our area is ability to disconnect in case of not payment.

This is fully backward compatible with meters deployed today.

We can provide web portals for displaying data and another for allowing management of the network,

Work with people like oracle, how to get back end systems ready to take all the data online.

Key

- Working with very strong partnerships
- Substantial traction
- Simultaneous AMR and AMI operation
- Have tackled interoperability successfully

3. “Hanadu: In-Home M2M connectivity for Smart Meters and Appliances”

RUSSELL HAGGAR, CEO, Xsilon Ltd

Hanadu – developing a solution for working inside the home – platform connecting all applications together.

First connectivity solution designed for in the home.

Can coexist with other networking technologies (wi-fi, bluetooth, zigbee..)

Needs to interwork with other technologies

Xsilon – around since 2008 – Hanadu created specific for M2M

The amount of connected devices in the planet is huge – mobile phones, laptops, appliances, large chunk of connectivity is in the home – need to be able to connect machines in the home – requirement is there,

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Current technologies are limited (wi-fi limited, 3G and 4G).

Cost point – is another paradigm shift.

Hanadu key areas: SM (HAN) and home energy management ecosystem.

Applications in need of in home M2M: smart homes, ehealth, building automation, assisted living, smart appliances in general.

IN Energy smart homes category 3 key areas: data from meter to server, monitoring of microgeneration and home energy management.

Connectivity requirement, all have common needs: low cost, low power, low maintenance, fit in with what we got.

Key question is that all the technologies (Zigbee, etc) were being developed before this requirement of connectivity, this is what distinguishes our technology, this focus on connectivity, technology developed specifically for that.

Powerline technology, complement to Zigbee, Only technology being designed at the outset with IPV6, doesn't use lots of power, its small,

Every technology is trying to squeeze a lot of data in a very narrow radio space, (eg broadband powerline- HomePlug) but we have a different approach.

Architecture designed to integrate with existing systems, hybrid roll out, especially of Zigbee and 6LowPAN.

We define a different layer.

We integrate existing systems and we also resolve what we call the internet of silos – We can integrate the washer machine with home energy management system, onsite generation – each machine has a network and we integrate all the networks through a single platform.

Launching Hanadu special interest group on July 1st for everyone not just our customers. DECC Zigbee can't connect SM to IHD in 30% of homes, zigbee is technology of choice in the UK – Hanadu plus zigbee resolves this issue.

In home energy management – hanadu has a further reach avoiding bandwidth crunch. Enables monitoring of microgeneration, which zigbee struggles with specially in external equipment.

Sumup – we have a technology that integrates other networks and solves the problems of zigbee

Power line based communications

PANEL Q & A: SESSION SPEAKERS + DR AIDAN RHODES, UKERC

q- How will you deal with multiple networks?

Same issue with wi-fi when you connect to wifi you have also your neighbours networks – you need an access point.

Q how much power is used by PL system?

More than a radio network

Q – a lot of the trials are in island settings – how could that be transported to mainstream setting and how is Hitachi engaging consumers?

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Our experience – most trials in island because is easier to find participation because they want to help overall community and also they know they have a weakness – with current LCNF see trend towards moving toward community schemes and consumer involvement – the way people understand energy is not the same as the industry thinks about it, language is the biggest barrier. Tend toward those projects we will see more of them that involve consumer participation.

Q – Standards – we integrate a lot of technologies (AlertMe) – is Cyan using proprietary technology in India? Stand on standards?

We took a very pragmatic approach – looking at what there was there to begin with. We will use standards if they are there but our first objective is to solve the problem. We have adapted our technology so that it can cope with multiple formats (interoperability without standards). In our area the idea of connectivity is still far, some houses don't have washing machines.

Standards come off successful products, but customers want standards to ensure a market.

Standards can take a long time to evolve.

TEA BREAK

Final Session – Connectivity, distribution, technology and policy

Innovation in water for grids, energy and in customer experience

1. STEVE KAYE, Head of Innovation, Anglian Water, (Gold Sponsors)

Last few years – drought and almost run out of water – this brought us closer to our customers - we are getting these extreme weather patterns – floods and droughts – how do we cope with this?

Central theme to our CSR (corporate social responsibility) strategy – love every drop – food energy water under pressure – how is Anglian water changing the way it does business as a result?

We are trying to break away from paradigms of regulated businesses

Background to Anglian water – flattest, largest, driest region – so lots of challenges in terms of energy – one of the biggest energy users in the region. Pumping water around is the main energy use. Treating waste water is another big part of our energy bill, about a quarter. Very inefficient process (treating waste water), so any opportunity to improve efficiency of waste water treatment something we are looking for.

We need high level goals in order to drive innovation – example reducing embodied carbon by 50% this has driven innovation and also reduced costs. We also have a target to reduce by 10% carbon?

Slide with long-term innovation – using the byproduct of sewage treatment and create energy – we have a target of 90GW a year for electricity from this.

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





We try to engage other companies in innovation – we present our goals and have a process for submitting ideas - water innovation network- streamlining innovation into Anglian Water.

Water meters – we have looked at smart meters but we've never been able to say that there is a business case so we look at meters with less ambition – gathering data. There is a big program for rolling out electricity and gas meters and I think this should be extended to water meters – we have started discussions in this sense – collaboration with other industries.

Examples of reducing cost of carbon and carbon footprint.

Wastewater opportunities – another opportunity is to bring external organic waste into our systems but there are regulation challenges around that. Nutrient recovery – there are things in waste water that can be used as fertilizers.

Martin Bloom

Business Models for RES

Key issue: *which part of the value chain should companies operate in?* How should business plans change?

In 2005-6 ; silicon shortages and rising demand – our solution was to take silicon wafers from semiconductors that had been thrown away – we did this on an industrial scale – we were also able to get prepayments from customers.

As industry changed we have changed with it – we are now vertically integrated. Now difficult time again.

Fuel cell companies often close to automotive industry – but industry with long lead times so we also looked at other areas for fuel cells such as battery extenders for phones or computers.

Question is where is the best value for that product – consumer market? WE have identified Africa – mobile market in Africa very attractive – also growing middle classes and energy infrastructure is inadequate. There we sell the telcos not the consumers. So we have identified an opportunity.

LED lighting – also changed in last few years – 2011 – problems with the technology but those problems were solved. Another issue is manufacturing - do you manufacture yourself, joint venture, outsource? But at the moment the biggest problem is deployments – 18 months payback time – lots of retailers changing to LED lighting – **so value chains change over time so best place to enter also changes over time.**

There are also different ways of developing your product, example biofuels – similar to biotechnology and platforms to develop drugs – in biofuels is the same question do you develop jointly and sell globally, question **how do you position yourself in the value chain.**

Many of these are global markets.

Lots of money globally for funding projects – often investors are funding projects in their home markets.

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Markets are global and funding is global so companies need to assess this carefully.
Many sectors are changing – opportunities open up but at a particular point in time – do you stay in that spot or do you evolve.

1. DECC Innovation Programme – The story so far...

IAN ELLERINGTON, Head of Innovation, DECC

Constant theme today – state of change of the energy industry.

DECC – support of innovation and entrepreneurs program.

Need for gov support where you have uncertain markets.

DECC exists to head off two risks – shortfall in energy supply and catastrophic climate change.

3 objectives for energy innovation – achieving 2050 targets, reducing risks and costs, and economic growth (last one increasingly important).

Criteria of what DECC supports in terms of innovation.

Valley of death – we are trying to reduce it, there is good support for RD but angel support and initial financial support is where the real struggle is.

This is what the government is focusing on – technology-push, indirect funding and removing barriers and reducing risks.

Grouping across government – to maximize the impact of funding for low technologies.

Agreeing priorities, making sure priorities are funded, understanding business and innovators.

This was pulled together in TINA (2010) - 11 documents were produced – look at things that wouldn't happen without government support.

Webpage: lowcarboninnovationuk.com

Docs available from our websites, include innovation gaps.

Outline of the program areas and budget over the next 4 years:

Offshore wind – focus is to bring the cost down and collaborating with other industries for this purpose - things that make step change in costs;

Marine energy – v difficult area needs big step improvements if it is to compete with other renewable energies. But big potential;

CCS - also projects ongoing;

Fuel cells – working with the carbon trust;

Biomass and waste conversion – includes EU collaborations;

Buildings and energy efficiency;

Electricity storage 12 feasibility projects with different technologies;

Hydrogen production – eco-island project in isle of Wight;

Nuclear.

Total budget is 160 million pound

Entrepreneurs fund

It's for getting technologies to market.

2 key areas Power generation and energy efficiency.

About 30 projects grants about 15 million pounds.

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Technical experts to assess application, we also have commercial panel and VC to assess those projects – idea of scheme is to get projects across “valley of death” into something that is investible.

Fantastic companies involved in that – about half the money invested and we will be re-launching the scheme.

We try to make admin simple – but still some way to go...

Small companies are hard work for us (ed: *touché*).

Often small companies have either a very cool technology or very good management team but rarely both.

Good application – write down your idea and what you want to do – no second guessing, we have a fair and transparent process – we are looking for things that will contribute to energy future in the UK.

For the future – identify innovation gaps, continue with the fund and use the model more widely.

To meet the targets and be where we want to be in energy we need innovation.

2. The 2050 Challenge and Technology Solutions

PHIL PROCTOR, Programme Manager, Energy Storage & Distribution, ETI Energy Technology institute

ETI is a private-public partnership.

Mission is to accelerate the deployment of technology in the UK to meet 2020 targets. How we do that is we have two arms – strategy arm, key tool is a model that we have developed looks at all different sectors.

Reason for acceleration of technology – with business as usual targets would not be met.

One of the great challenges in UK – gas (heat) peaks 5 times higher than electricity. We try to evaluate different opportunities and implications in the UK network – existing infrastructure and cost - impact between upstream and downstream – Graph shows that with CCS the capacity requirement is lower some years later on.

Another example of generation profile. He is explaining the model and different operating scenarios, depending on the generation – looks at alternative scenarios.

Upstream perspective – with or without CCS affects upstream but also downstream in terms of the need to decarbonize. Example – Implications of CCS for transport – the existence of CCS or not changes the outlook for EVs in terms of decarbonisation and that impacts the networks – so *upstream affects directly what happens downstream*.

Another example - implications of CCS development on heat. CCS changes the demand for heat technologies.

Focusing on storage – model favours hydrogen storage – in CCS scenario - hydrogen is key technology and development of hydrogen networks (hydrogen is produced from CCS).

Other side of business is what we do with this information and go back to our mission accelerate technology deployment.

Slides at <http://www.cir-strategy.com/events/cleanpower/speakers.htm>





We have 6 different programs.

We are investing in projects and in organizations developing the technologies.

We are developing tools and devices – investing in demonstration projects.

Example of projects – energy infrastructure outlook, wave and tidal array analysis (tool available to download), ccs tool-kit.

Also investing in technologies connected to offshore wind – super large-scale wind generation technology also looking at floating platforms, electricity storage technology.

3. Smart Homes & IoT: the Commonality question

PILGRIM BEART, Founder Director, AlertMe

A change of gear – I will focus on end use (not supply)

Alertme is a connected home energy platform – we can put info that matters related to you energy in your hands (mobile example)

IN UK – working with British Gas – bill and remote heating control.

Shows slides with numbers from analysts – when we started 7 years ago we didn't know what sector we belonged to and there are a variety of projections in terms of devices, revenues... - projections on the internet of things – (iot – a catch-all phrase in danger of being meaningless when used across all sectors).

Internet of things - map that technology crunch put together – there are a number of players - horizontal players that are providing platforms that vertical players can use – otherwise you need to build the entire platform yourself – **so these horizontal platforms make it easier for IoT to happen.**

Evolution of connected devices – 3 waves of development.

Gartner life cycle is an interesting way of looking at things – relevant are the internet of things which is still going up, big data and machine to machine (M2M).

65 million devices in the home and rising very fast – average home has 41 appliances today.

Amount of energy appliances use – 30 percent of energy is used in the home and within the home is split as in graph – consumer electronics and home computing has increased a lot in the last years.

Big data – SM are not big data – utilities today don't collect data so SM will offer more info but still not big data – data become big if you can provide for each customer you can compare with neighbours so you need lots of data to compare.

Journey towards simplicity – 10 years ago when we started with AlertMe this is what we tried not to do (slide with X-10 power house).

But in the home everything beeps (e.g. washing machine when finished...) as all appliances become smart things will need to sort themselves out without intervention (or become intolerably annoying).

We will have lots of info but no time or knowledge to do anything about it.

We acquired a company a few years ago (wattbox) and it does something really nice – by putting more intelligence in it makes it simpler for the consumer – instructions – ignore it.

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Charts mean nothing to most people – too detailed and complex – we took idea of display in the car to present people with a simple dashboard but still too complicated – we have ended up realising that the best is very simple things – and things that tell you what you can do to make things better in their own benefit.

From a grid perspective – the grid may be a driver of internet of things – from a consumer perspective, we already see lots of appliances interconnected – so by the time we have SG we will already have an IoT happening in the consumers home – so SM will be a peripheral but we won't build consumer experience around this SG services. Consumer access devices will be key – CAD they take data from meter, display it and do other things with it – put it on a cloud or .. so gateway to exciting stuff.

Journey we've gone on – data from the things is what interesting but you need to boil it down to nuggets of interesting info that make sense to people and boil it down to simple messages, because we are trying to engage with the consumer which is a real challenge.

4. Consumer Convenience & Supplier Simplification through Connected Devices

PHILIP SELLWOOD, CEO, Energy Saving Trust

We are a social group of *private* companies. Protecting consumer interests.

This presentation is more about consumers and less about tech.

Our focus has been on UK households and how they make changes around technologies – that is all going to change around SM. Consumer engagement will be key. Real need to engage households in smarter use of energy. People in the centre rather than periphery.

Engagement – smart energy future – consumers central – 75% of people positive about SM but consumers need to be informed how to use technology and get consumers to emotionally engage with the technology – getting them to change behaviour; Difficult to have a low carbon home without low carbon citizens (or systems?)

SG should be beneficial to individuals utilities, etc and more cost effective exercise for those involved in We already have sufficient data from trial data - we can see stresses on the grid – need to upgrade infrastructure – industry can plan into different scenarios. The penetration of technology in people's home today is incredible. Need to invest in supply and demand management.

Our surveys have shown that trust is crucial. This is the most important factor in any implementation of technology. Changing habits require evidence to underpin it. Over 65% say that they would be energy efficiency if they had clear information of benefits. Getting installation right is at heart of that trust.

New markets will open up – new service providers and new players have a role to play. Starting point will be to provide information and support – not fit and forget.

Request – European-wide project – over 70% trades people felt more confident offering technology if they could give advice on energy efficiency themselves – homeowners more receptive to technology.

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What we are doing – at forefront of consumer engagement and at the same time we are looking at role of communities for driving demand of technologies in this area. All this evidence-based insight can prepare UK and public for smart energy future. Excitement is not technology but about how it benefits households in UK – put consumer in control of their energy use – making sure consumers understand new technology and benefits is key.

New techs need more dialogue between utilities and consumer – regain consumer satisfaction and trust

Smart energy can provide many benefits across the UK.

CLEANPOWER Conference 2013

SUMMARY

NOTE - this summary should be read in conjunction with the relevant slide set.

The Cleanpower conference stream within the 5th Annual Smart Grids & Cleanpower Conference Expo opened with **Mike McCreary of CIR-Strategy** welcoming delegates and introducing the day as a conference in two streams with the CLEANPOWER stream looking at transition & new energy mix futures, innovations in renewables and larger plants, energy and carbon intensity before joining with the Smart Grids stream for a combined view of connected intelligence, innovation, technology and policy.

The proceedings commenced with the Conference Chair, **Alan South, Commercial Director of Solar Century**, outlining how he saw an industry in transition to maturity, as demonstrated by the diversity of this conference and connection to the customer. To illustrate this he reflected on the status of the Solar industry in the UK as 'the good, the bad and the ugly'.

The 'Good' news is that in the UK, costs are coming down and therefore solar energy is becoming increasingly economic. It is almost following a 'Moore's Law' curve as the manufacturing of 'panels' moves into a mass production mode in China. It also benefits from Solar now at 1.6 ROC compared with Wind at 2.0 ROC.

The 'Bad' news is that solar does not work at night so the industry needs to look more deeply at demand side management.

The 'Ugly' news is a proposal that Solar imports from China into the EU be charged at 47%. Nobody wants this and a vigorous protest has been mounted. Just yesterday, a provisional tariff of 11.8% has been set for the next 2 months to allow time for further negotiation. Putting this in perspective Alan quoted €21 billion of solar imports from China compared with €150 billion total UK exports to China. He finished with an impassioned plea to UK & European bureaucrats of "Please no trade wars"!

Alan then introduced the Session 1 Moderator, **Derek Pedley, Associate Director** at the Environmental Sustainability Knowledge Transfer Network (ESKTN) which supports the UK's

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drive to a low-carbon, resource and energy efficient economy with four key areas: land management and food production, resource efficiency and waste management, sustainable water management and sustainable energy.

SESSION1: ENERGY ISSUES IN HIGHLIGHT.

The first presentation of the day came from **Adam Cooper, Associate Partner** at Ofgem talking about the Regulations required in a fast changing environment having particular emphasis on the long term view of customer benefits. He started by saying that Ofgem saw itself as being *responsive* rather than *reactive* with a need to be involved at the early stages of development to ensure that regulation does not slow down the speed of change. Whilst recognising that their remit was to protect customers, both existing and future, Ofgem also has to promote competition though the use of incentives with a move from the traditional 'RPI-x' form to RIIO, i.e.:-

Revenue = Incentives (including environmental) + Innovation (including R&D) + Outputs.

He acknowledged that much of the R&D culture had been lost following the demise of the CEGB and that through RIIO this should now return (*ed. discussions later covered the important area of open innovation for a enabling smaller innovators to engage in the industry*). He closed by saying that "Achieving Sustainable development is analogous to achieving continued improvement".

This theme of sustainability was then picked up by **Dr Dominic Emery, Chief Development Officer for BP Alternative Energy** presenting a summary of their recent macroeconomic study, "BP's Energy Outlook" (available on www.BP.com). This represents a projection of future energy trends and the factors that could affect them, including economic and population growth, and developments in policy and technology. Three key messages have emerged from the Outlook: the rapid switch in supply patterns, driven by the unlocking of unconventional hydrocarbon resources; the importance of technology and innovation, which have brought costs down rapidly for both unconventional hydrocarbon and renewable energy resources; and the great strides seen in energy efficiency at industrial and consumer levels.

This is graphically illustrated when looking at Demand split by OECD vs non-OECD countries and considering the fact that population is predicted to rise to 7 billion people by 2030. Efficiency drives in OECD countries give a flat line demand going forward whilst non OECD are showing rapid growth, particularly in the BRIC nations with the rest of South America, South East Asia and Africa closely behind. With power generation itself being the main driver of energy usage, it is vital to pursue more efficient methods of generation in these areas.

Worldwide only 2.1% of energy comes from renewable with the UK standing at 12.5% through the use of wind, solar (increased by 80% last year) and biomass, and Germany

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at 25%, mainly due to the government subsidy on solar. A similar trajectory is taking off in Japan after Fukushima, strong in solar and with investigation into hydrogen). China is currently relying on more efficient methods of coal generation with a staggering 1 new plant opening per week! This places even more emphasis on the need for decarbonisation using CCS to be widely adopted as the argument continues on whether China will pursue absolute reductions in CO₂ levels or merely a reduction in CO₂ intensity.

BP acknowledges the concept of Peak Oil but expects greater use of shale oil. The US is moving rapidly on this and will become oil independent through shale gas and shale oil. The UK could also become self-sufficient in light oil from as-yet unexplored resources. Looking forward, the relationship between GDP growth and energy tails off, with the OECD countries predicting growth in renewables whereas the non-OECD growth is forecast mostly in nuclear and hydro. BP believe that energy innovation will continue with new supplies based on maritime sources, either tidal &/or wave. Dominic's concluding thoughts were:

- Economic growth does need energy
- Competition and innovation are key to:
 - Energy efficiency
 - New supplies
- Energy security and climate change remain challenges.

Professor Kevin Hesketh, National Nuclear Laboratory then gave a talk entitled: **“Thorium – an alternative nuclear path”**. The talk set out to explain the thorium fuel cycle as a potential alternative to the uranium/plutonium fuel cycle and the rationale that proponents put forward in terms of improved sustainability, economics, radiotoxicity and proliferation resistance. The talk considered the advantages and disadvantages of the thorium fuel cycle and briefly described the history of thorium and summarised current R&D activities and future R&D requirements. The talk finished by explaining the industry view of thorium.

Kevin introduced himself with a brief history of NNL and explained that it is still part of DECC with an advisory role to government on the safety, sustainability and economics of nuclear generation.

He then opened his talk by saying that thorium is not seen as safer than uranium, both materials rely on nuclear fission and to become useful thorium 232 has to be converted to thorium 233 by the addition of a neutron from uranium or plutonium. It is an alternative to uranium that is more readily available. Thorium can be processed in thermal reactors whereas uranium is processed in fast reactors.

Following a very ‘neutral’, understandable and pragmatic view of the process, he concluded that whilst thorium is a valuable strategic and sustainable alternative to uranium with the potential for the waste to be less toxic, the science is still indeterminate

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and much more research is needed with, in his view, another 50 years before thorium generation could reach its full potential. His closing words were that thorium should not be seen as a magic panacea!

Taking an equally pragmatic and using his own words 'agnostic' view, [Professor Richard Davies of Durham University](#), gave a talk on '**Shale Gas and Oil: Risks and Rewards**'. Richard opened with an overview of the fracturing 'fracking' process, concentrating initially on the difference in geological separation between water aquifers at <1km depth and shale gas reservoirs at >2-5kms. His view is that UK media have seized on the possible contamination of water and link to earthquakes and have clouded some of the real issues and benefits. Statistically there have only been 3 earthquakes of minor magnitude linked to 'fracking' in 100's of 1000's of fracking operations and a similar magnitude of water issues, not necessarily positively linked. His concerns were that amongst other issues the density and number of drilling platforms required to extract shale gas will have an impact on the visual landscape and that longer term, unless managed correctly, well leakage could be a bigger problem.

He then went on to say that in the UK mineral rights are not owned privately, they belong to the crown, therefore nobody will become billionaire with it, whereas in the US, the mineral rights are with the land owners and many have become exceedingly rich from it. There are, however, significant reserves of shale gas and cited yesterday's announcement by IGas that "... *Our estimates for our area alone could mean that the UK would not have to import gas for a period of 10 – 25 years*". Richard also went on to explain that there could be significant reserves of shale oil, particularly in South East England!

He concluded by saying that whether shale gas and oil resources make a significant impact on the energy mix in European nations is probably more dependent on the social acceptability of the technology than the geology or engineering, as thousands of wells would be required. The resource is likely to be significant, but understanding and communicating the environmental risks will be essential if companies are to gain the social licence to operate.

A lively ("cracking" according to one delegate survey) panel Q & A followed this session.

SESSION 2: INNOVATIONS IN RENEWABLES

Session 2 was opened by moderator [Graham Ford, Director, Mansion Ecopartners](#). A seasoned clean energy entrepreneur, Graham founded and was CTO of Heliodynamics, a CSP company, and has worked at a high end consultancy, as PA Consulting. Graham introduced the session by speaking briefly of how the pressures of climate change, resource constraints and affordability make the path to a green grid a difficult one. New concepts in storage and generation could solve these problems, even for the UK, providing an enhanced and optimistic vision for renewables to provide a truly green grid.

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The presentations opened with [Adriana Laguna, Carbon Programme Manager of UK Power Networks](#), talking about the **Flexible Plug-and-Play Project** which runs until December 2014 and has a budget of £10mn. The project is about enabling faster and cheaper connections of distributed generation to the network by trialling new technologies and new commercial solutions and is part of the future network group driving innovation through multidiscipline projects. UKPN covers approximately 1/3 of the UK and is centred primarily on East Anglia.

Simply put, the connection of a large number of renewable sources places a strain on the existing system as the older plant, and transformers in particular, were designed for one way flow, i.e. from a central generation out to the point of consumption. Having reverse power flow is creating constraints which are driving high interconnection costs and placing the distribution system in tension with the concept of FITs. The Plug-and-Play system is being trialed in a small area around March in Cambridgeshire and is a software monitoring solution which at times of peak generation coupled with low demand will turn down the generation capacity. This causes uncertainty with the renewable generators which are inherently small and rely on low connection costs. The problem presented then becomes that when using smart technology to limit the generation in real time how do you generate fair deals to different customers, i.e. who do you cut off first!

The current rules for access to the grid being investigated are 'LIFO' – 'Last on First off', and some form of access granted on a *pro rata* basis set against a formula including the actual voltage being generated, distance to the point of connection and total capacity offered. Whilst the technical issues have reasonably clear resolution, the real issues facing the team are social, i.e. making customers accept that interruptible connections are 'business as usual' and then working with those customers to understand the cost and financial implications.

Following on from the issues concerning small scale generators, [Chris Wright, CTO & Founder of Moixa Energy](#), moved on to the user community and gave a presentation on **"Distributed Energy storage at the edge of the grid"**. In this, Chris outlined the value points on adding storage at the edge of the grid by installing local energy storage units in customers' homes for shifting peak load demand, and making storage available for network needs. He also discussed the advantages of edge of grid over centralised storage and the additional layers of value enabled.

Moixa offer their customers a DC conversion and storage system which can receive input from micro renewables or via micro inversion from the grid to power the plethora of low power DC systems now used in our houses such as PC's, TV's LED lighting etc. They estimate that at present 8% of home appliances are DC-based and this is forecast to rise

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to 45%. Aimed at providing 1 – 2 kWh of storage close to the Fuse unit, the system is based around their 'MASLOW' unit which contains lithium and phosphate batteries selected for their long life cycle. Using this type of storage system means that relatively low scale generation systems such as urban balcony solar generators can be used and can also allow time shift delay based around displacement of generation and use as well as catering for time of day tariffs. Interestingly, they adopted the Maslow trade name as they see a 'hierarchy of needs' within the energy market and their system is aimed at solving many of those needs.

Going forward Moixa are looking at reduction of the capital cost of the battery system (currently around £2K) by using recycled batteries that have been used in Electric Vehicles.

Chris closed by summarising that Maslow gives:

- Energy storage at the edge of the grid
- Energy resilience for customers
- Time shift energy use
- Affordable and scalable technology

Continuing on with the theme of storage, [Alasdair Young, Energy Sector Director for Buro Happold](#)

gave a presentation on **“The role of heat networks in future energy scenarios”**. Heat networks are often associated with small-scale gas-fired combined heat and power (CHP) or energy from waste (EfW) plants. However, they could play a more strategic role in a future low carbon, resilient energy system. Heat networks have the ability to supply significant areas of our dense urban areas economically. Other opportunities include energy sharing, seasonal storage, diurnal storage, balancing intermittents, and utilising waste low grade heat.

Alasdair outlined the storage demands for diurnal storage and seasonal storage linked to both generation and demand, illustrating this with the fact that London has a peak heat demand swing of 200%. He then spoke of countries that have similar swings such as Denmark and how they have used heat networks to balance them. Interestingly he noted Denmark has achieved this as it is more monopoly based, while the UK is more market based.

Looking briefly at the requirements for system balancing, energy sharing and waste heat capture he went on to look at the evolution of heat networks as they move from steam to hot water at 120 Centigrade, then to warm water at 50C, and into homes at 45C.

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Alasdair closed by illustrating the 4 types of heat networks in use and concluded by saying that:

- There are significant opportunities for heat networks in dense urban areas
- The technical potential is high
- There is economic potential function of heat demand, network cost and heat cost.
- Heat networks can provide multiple wider energy system services
- The value of energy system services needs to be considered
- That integrated energy system planning required
- The transition to zero carbon is supply constrained

SESSION 3: LARGER PLANTS, ENERGY AND CARBON EFFICIENCY

Session 3 was opened by moderator **Richard Parker of Adapt Commercial**, which is the commercial and consulting wing of the University of East Anglia concerned with renewable energy.

The first speaker was **Philipp Grunewald, of The Environmental Institute and Oxford University**.

Over recent years Phil has studied the possible role of electricity storage in future low carbon energy systems. This work has resulted in a realisation that a) the value of storage could increase significantly over coming years and that b) demand side flexibility could become a major competitor for physical storage in certain areas. In his talk Phil presented some recent findings brought together from work with Imperial College, University of Reading, University of Oxford and the UK demand aggregator Kiwi Power. Analysis of extensive trial data suggests that some service sectors are in a position to make a meaningful contribution towards system balancing and that the scope of their provision could be enhanced through appropriate policy measures.

Philip commenced by talking of the 'Flexibility gap' and how fluctuation in demand, particularly associated with the volatility of wind and solar, causes a need for large assets to run small amounts of time if all eventualities are to be covered. This illustrates the tension between Storage and Demand. One has either to store, or dynamically reduce demand which is often difficult without adequate notice, e.g. a cold store can change its' operating temperature but needs prior notice to do so. Equally, some load balancing can be achieved where users have access to standby generators which, by prior consultation, can be brought on line to reduce demand.

His view is that we have 4 options:

- 1: Build flexible generation and curtail excess supply
- 2: Build expansive networks and enable spatial arbitrage
- 3: Build physical electricity storage capacity

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4: Enable demand-side flexibility to respond to supply

He then went on to illustrate the political dimension with conflicting messages coming from government as to whether they advocate storage or generation increases. Phil's team have been looking at the data to support both cases and have concluded that there is an untapped potential in demand control and response in that:

- Presently demand response plays a minor role in response provision.
- Although policy makers desire a "level playing field" for all options, generation based solutions have shaped the existing framework.
- Could the demand response contribution be improved through regulatory changes?

Philip closed his presentation with an amusing reference to Aristotle's 'Allegory of the Cave' likening the cave shadows to images of machines that we have to see through in order to understand their true power demands.

He closed with the following conclusions:

- There is significant technical and commercial potential for various flexibility options
- That current regulatory structures favour generation-based solutions
- A better understanding of demand response potential could be gained through a combination of empirical studies and detailed analysis.

Moving on from the volatilities of wind, [Ali Lloyd, Principal Consultant, Poyry](#), gave a talk entitled "**The outlook for biomass electricity in the UK: 2013 update**". The talk updated last year's overview of the outlook for biomass electricity, taking account of recent policy and industry developments. In particular it focused on the government's shift in ambition towards a greater emphasis on biomass conversion of existing coal-fired power stations.

Ali opened by showing the Government projections for biomass to contribute around 1/3rd of renewable electricity by 2020. Most of this growth is predicted to come from either dedicated units or co-fired with coal. He showed how biomass requires various levels of financial support dependent on scale and fuel source and the variation in ROC's over time. The recent change in the ROC bandings has led to a greater emphasis on the conversion of existing coal plants to biomass capability so as to extend their useful life. However, there are limitations due to a decline in government appetite for new build and the availability of sustainable biomass in Europe; currently most comes from North America. The development of a sustainable supply chain is intrinsic to the achievement of targets. Ali closed by looking at the regulatory risks, supply chain demands and Sustainability compliance for ROC support.

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Moving on from the supply issues of biomass, [Phil Osborn, Head of Energy, Sainsbury's PLC](#) presented “**Sainsbury's 20x20 plan**” to achieve energy efficiency and store generation technologies.

As Head of Energy for Sainsbury's, Phil is responsible for the ongoing reduction in energy used by Sainsbury's, with a drive to reduce usage in absolute terms. Sainsbury's has successfully reduced its energy usage on an absolute basis despite an ever increasing estate.

Phil opened with the Sainsbury statistics of stores, staff and customers and how they have adopted their 20x20 plan as part of their Corporate Social Responsibility plan targets. The target is to reduce operational carbon emissions by 30% absolute and 65% relative compared with 2005 by 2020 and they are currently on track to achieve this. Typically they have already achieved a 9% reduction in electricity usage whilst increasing floor space by 25%!

The approach is to stick with the tried and basic methods with a mix of approaches between supermarkets and convenience stores and new build versus retrofit. Wind power ... “has not worked for them”... but they have had great success from solar PV in 189 stores (40% of the commercial installations in the UK), Ground source heat pumps, pellet and wood burners, and LED lighting. Other initiatives have focused on re-use of cold air from chillers and cold stores and switching to natural refrigerants to save CO₂ emissions. The later initiative has also been linked to a more robust to refrigerant leakages which have contributes to 1/3rd of their carbon footprint.

The 20x20 plan is also aimed at reduction in water usage with a success from 2005/6 to 2012/13 whereby they have achieved their target of reducing usage by 50% per m² of sales area by 2012. Again they have concentrated on basics such as fixing leaks and sharing supplies.

Phil closed by repeating his introduction that concentration on the *basics* can achieve huge results.

The session closed with **NIALL MACKENZIE, Head of Industrial Energy Efficiency, DECC**, talking on “**Industrial Efficiency – the role of Government**”. Niall gave a general introduction to the UK strategy and looked at case studies of how government can usefully and non-distortively offer and create market incentives for improving industrial and business energy efficiency.

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Niall initially reminded everyone of the carbon budget target of reducing greenhouse gas emissions by at least 34% by 2020. He stressed however that this was not the only target, decarbonisation will only come with energy efficiency and this is the current major government objective. In a manner similar to that adopted by Sainsbury, the government is wishing to concentrate on 'easy wins' prior to looking at decarbonisation of the 'hard to reach' sectors such as agriculture and heavy industry. Later concentration will be on 'hard to treat' sectors such as industry, aviation, shipping and agriculture while buildings make use of decarbonised electricity supplies. In this context, CCS in coal fired power stations is seen as a key technology.

Niall offered his opinion that some of the movement towards achieving the objectives has been achieved by the recession and not investment which poses a risk as the economy emerges from the recession.

He spoke of the various international schemes in operation such as the EU Emissions Trading Scheme, The Climate Change Agreements and CRC Energy Efficiency Scheme and the impact on these of the cost of Carbon at €3.

In real terms however, *heat is the single biggest consumer of energy in the UK with most of it coming from fossil fuel*, hence the drive towards CCS and Industrial CHP the Green Deal, which aims to address many of the barriers preventing energy efficiency improvements in UK buildings. The key elements of the government strategy framework states that:

- Our carbon plan and almost all modelling work says that we will **need to have near zero carbon heating for buildings by 2050. Industrial heat will need to cut its emissions down to around one third of current levels.**
- For **buildings**, this should be achieved by 1) **energy efficiency** measures like Green Deal and smart meters; 2) **Renewable heat** (mostly heat pumps) starting with most cost effective ie **off the gas grid**; 3) **heat networks** (district heating) in cities, with mix of different heat sources and heat customers.
- For **industry**, this requires 1) **efficiency improvements**, but limits to what more can be done in some sectors; 2) **fuel switching** to bio or electricity (as the grid decarbonises); 3) **industrial carbon capture and storage**

He went on to give a sector by sector view of possible approaches to achieving some of these goals.

The **CLEANPOWER** conference then adjourned to meet with the **SMARTGRIDS** stream for a final session on Connectivity, distribution, technology and policy, followed by the Chair closing remarks.

PLENARY PANEL Q & A: SPEAKERS + CLEANPOWER panel

Q- Energy institute model – a lot of technologies that had been discounted are included in the model.

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Model is up to date – all techs we refer to, are all relevant in terms of potential deployment - we are technology agnostic. We've just shown a particular run of the model.

The choices we make become a self-fulfilling prophecy – technologies chosen become cheaper

More complex than that.

Q- DECC – There is no involvement in agriculture in your activities – how does this sector fit into your thinking?

To the extent that they are dig into any of the schemes we run – agriculture is there. We have a program that looks at supply chain area in biofuels.

Transport program – on road efficiencies – will benefit agriculture.

Q – Water - I welcome “joined-up thinking” with gas and electricity (this is happening in Australia) – I think business case for SM in water is there – need to think about future and adding functionality – you don't want to deploy smart meters then in 5 years find them obsolete.

A – Fair point – making a point that from infrastructure point of view makes sense to combine resources – if more joined up at government level – there would be more progress as well.

Strong case for water SM around time of use tariffs. Challenge is that we have a regulated water industry so owners respond to signals they get from the *regulator*. Cost of water is lower of electricity at the moment.

Energy companies have incentives to deliver on energy efficiency – there is no such framework in water – Ofgem and Ofwat should “join up thinking”.

Q – Is DECC looking at other sources of GHG than CO2? – Yes.

Q – Energy Saving Trust Presentation - *No low-carbon home without a low-carbon citizen* – how do the consumers as producers fit in?

Some of our work looks at the impact of CHP clusters (work is on the way).

Part of taking control of energy use is to produce your own.

Q – Changes from top down, but also some of changes can come from the bottom up. In consumer world all big shifts is because consumers get excited about things – but I think it takes a bit of the two, example of recycling – need *infrastructure* as well as *enthusiasts* and *early adopters* – need top-down stuff that then presents consumers with a choice.

Government there is also focus on what local authorities are doing and how they can help their constituents - some scenarios have huge implications locally and that has to be understood as well.

It needs to be a mix – we have benefit from having a grid – but we have to bring the consumer as well as doing things nationally

We are missing one thing that we see elsewhere – getting communities to buy into their electricity generation – way to begin “winning hearts and minds”.

Q – What are you looking for in the next 12 months?

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AlertMe: Completion of Government's last bit of government standardization on SM delayed.

More collaboration and "shared learning" and understanding.

See some new businesses coming to the market.

A debate between utilities and government about energy future, a more "honest debate".

Utilities have historically been an invisible service, so we want to see ourselves making an emotional connection with customer, being more communicative.

SMARTGRIDS and CLEANPOWER Close and Networking Reception

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Speakers SGCP 13 Cambridge University by CiR Strategy Ltd (www.cir-strategy.com) – Synopses and Biographies provided

[Philip Sellwood, CEO, Energy Saving Trust](#)

The presentation will look at how smart meters and smart grids can help to shape the UK's energy future, with a particular focus on how this will help consumers be more energy efficient in the home. It will also recommend how organisations and government can effectively communicate the smart meter roll-out and new energy technology to UK households to make this smart energy future a reality. Philip Sellwood has been the Chief Executive of Energy Saving Trust since 2003. Prior to working at Energy Saving Trust, Philip had an extensive commercial career in the Retail sector, which included 20 years with Marks & Spencer. Alongside his work with Energy Saving Trust, Philip is a trustee for the Ellen MacArthur Foundation which has sustainability and education as its core charitable purpose.

[Ian Ellerington, Head of Innovation, DECC](#)

This talk will explore the efforts of government to support particular companies in cleantech, specifically innovating in energy & grids. An expert in energy, Ian was involved in change and project management in a career that includes stretches at Meggitt in defence projects, QinetiQ, KBC consulting, after a Cambridge education, and before joining DECC to lead innovation delivery.

[Dr Jane Burston, Head of Carbon Measurement, NPL](#)

Jane will deliver a talk about the NPL's approach to measurement and how this facilitates carbon reduction in grids and power sectors. Jane is Head of the Centre for Carbon Measurement based at the UK's National Physical Laboratory (NPL). The Centre helps develop, test and verify the performance of low carbon technologies including smart grids and renewable technologies, and is the Verification Body in the UK for the Energy stream of the European Commission Environmental Technologies Verification Scheme (ETV). Previously Jane was Founder and CEO of Carbon Retirement, a social enterprise reforming emissions trading and carbon offsetting. In 2011 she was named in Management Today's '35 high-flying women under 35' list and as Square Mile magazine's 'Social Entrepreneur of the Year'. Jane has recently been selected as a World Economic Forum Young Global Leader, alongside numerous Professors, Ministers and business leaders from around the world.

[Adriana Laguna, Carbon Programme Manager, UK Power Networks](#)

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Adriana's talk will cover the Flexible Plug and Play Project which runs until December 2014 and has a budget of £10mn. The project is about enabling faster and cheaper connections of distributed generation to the network by trialling new technologies and new commercial solutions. Adriana Laguna-Estopier is the Low Carbon Project Manager for UK Power Networks' Future Networks Team. Before joining UK Power Networks, Adriana was Business Development Manager for Acciona Energía, in charge of developing 300MW of wind energy in Mexico. She also worked in the Ministry of Energy in Mexico as Adviser to the Undersecretary of Energy Planning and Technological Development, helping design the country's first Renewable Energy Programme. Adriana holds a First-Honours Degree in Industrial Engineering from ITAM and an MPA in Environmental Science and Policy from Columbia.

Gavin Jones, Business Development Director, Electralink

Gavin was until recently Chairman of SmartGridsGB, and has been a VP at IBM. He is an experienced chairman for energy events. Gavin Jones is responsible for growing the commercial business of ElectraLink in support of the UK Energy industry. Gavin is involved in the UK Smart Energy arena at both customer and policy level, speaking, writing papers and meeting with policy makers across Europe. In the UK he is a member of the DECC and Ofgem's Smart Grid Forum which is shaping the future UK policy in this area. He has been influential in setting up Smart Grid Great Britain and was its first chair. Gavin also chairs Intellect's (the UK technology industry association) Utilities and Smart Metering and Smart Grids Working Groups. Prior to moving to ElectraLink, Gavin was IBM's Future Energy Leader for UK, Ireland and Nordics and had specific responsibility for leading the team selling Smart Grid solutions in the geography.

Justin Hayward, CIR Strategy

Justin formed CIR Strategy in 2001, an independent strategy consultancy offering diligence, market research, and the renowned 'Routes to Value' methodology. Justin worked at Deutsche Bank from 1996–2000 as a financial relative value analyst, looking at LIBOR trading strategies, global bond portfolios, volatility smiles, and Euroland bond spline models. He took an MBA from Cambridge Judge Business School in 2000/1 focusing on strategic management of technology. Through the 2002 HVM Report he wrote for EEDA, and the successful conference series founded that year, Justin is connected (distantly) to the foundation of the TSB HVM department, and new HVM TIC spread across the UK, and other academic departments using this title. Justin founded YouMuse, a transformational series of experiences for high-level execs to take back control of their learning and career programme, away in inspirational venues. He has also founded SliceMap. This is a global cluster map of all high tech companies that uses Bayesian analysis to solve the problem of noise on personalised google searches for technology-interested execs, and is both on web and as an iPhone app – a great

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productivity tool. Justin trained as a physicist, taking advanced degrees MAST, and PhD from Cambridge University. He was the PhD student of Professor Stephen Hawking beginning in 1991.

Graham Ford, Director, Mansion Ecopartners

The pressures of climate change, resource constraints and affordability make the path to a green grid a difficult one. New concepts in storage and generation could solve these problems, even for the UK, providing an enhanced and optimistic vision for renewables to provide a truly green grid. A seasoned clean energy entrepreneur, Graham founded and was CTO of Heliodynamics, a CSP company, and has worked at top tier consultancy, as PA Consulting, and an MA from Cambridge in Engineering.

Alan South, Commercial Director, Solarcentury

Alan South is responsible for driving growth at Solarcentury through proprietary products and services. His role is to lead the team, to manage innovation as a portfolio, and to maintain a five-year vision and strategic roadmap. He joined the firm in the relatively early days of solar and has witnessed its growth into a mainstream asset. In 2011 Solarcentury won the Queen's Award for Innovation. He has over 25 years technical and leadership experience in innovation. Prior to Solarcentury Alan was European head of IDEO, a company that features regularly in top ten lists of innovative companies. He is respected thinker and spokesperson, and has delivered executive learning programmes on behalf of Harvard and Said.

Dominic Emery, Chief Development Officer, BP Alternative Energy

BP's Energy Outlook represents our projections of future energy trends and the factors that could affect them, including economic and population growth, and developments in policy and technology. Three key messages have emerged from the Outlook: the rapid switch in supply patterns, driven by the unlocking of unconventional hydrocarbon resources; the importance of technology and innovation, which have brought costs down rapidly for both unconventional hydrocarbon and renewable energy resources; and the great strides seen in energy efficiency at industrial and consumer levels. Dr Dominic Emery is Chief Development Officer for BP Alternative Energy. BP Alternative Energy comprises Biofuels, Wind and Corporate Ventures. Dominic's current responsibilities include corporate venture investment, new business development and strategy for Alternative Energy. Dominic is a graduate of Oxford and Cambridge Universities and has worked for BP since 1986. He joined Alternative Energy in 2007 having previously worked in Exploration, and BP's Downstream and Trading businesses.

Keith Clarke, VP, Embedded Segment, ARM Ltd

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Talk Synopsis: Global energy consumption is expected to grow by about 70% in the coming 25 years driven mainly by developing countries. The smart meter is a big step in the right direction towards managing this growth, however in this talk we will look at the key technical issues of communication, security, and processing capability that face designers whose products must interface with the Smart Grid. We define the Smart Grid as a combination of three key elements: the grid itself that load balances and supports the energy demand, the smart meters and the connected appliances that consume the electricity. We will review more efficient processing technologies that can be included in every element that can help make many systems smarter in terms of measurement, communication and control. Keith is the vice president of embedded processors with responsibility for the Cortex®-R, Cortex-M and SecurCore® processors. Keith joined ARM in 1993 and held various positions from engineer to VP Engineering. Keith has a B.Eng from the University of Southampton and is a chartered member of the IET.

[Pilgrim Beart, Founder Director, AlertMe Ltd](#)

Pilgrim Beart [pron. BEERT] is a serial entrepreneur whose previous companies have delivered hundreds of millions of devices into the mass consumer market. Now his current venture AlertMe seeks to empower consumers with its Smart Home platform. Pilgrim will explain what this is, and how the evolution of the Smart Home is led by the needs of consumers. Synopsis: Title – 'Simplicity: The real challenge for 2020'. What's happening on the Internet of Things? How is that relevant to the Smart Grid? What are the challenges to engaging with consumers in the home?

[Martin Ansell, Chairman, Fault Current Ltd](#)

Title: Fault Current Limiters – Extending the capacity of the Power Grid
The synopsis: The need for fault current limiters is driven by a dramatic increase in electrical power system fault current levels as energy demand increases and more clean energy sources, such as wind and solar, are added to an ageing and already overburdened electrical infrastructure. A Fault Current Limiter is a Smart Grid system component that can help protect the grid by absorbing the destructive nature of excessive faults, extending the life of existing network equipment and allowing utilities to defer or eliminate costly equipment replacements or upgrades. Estimates suggest that investing in Smart Grid technologies, such as fault current limiters, can save billions of pounds in asset replacement cost, increase safety, reliability and power quality. Martin is a seasoned international executive who has worked in both the Telco and Energy industries for over 35 years. His experience spans from start-ups to Fortune 500 companies. In ALSTOM T&D, Martin helped guide the business development of its T&D Automation business and then went on to lead its UK activities in Power Electronics, EHV Switchgear and Substation Projects. In GE, he served as a member of its newly formed global T&D executive driving growth in the EMEA region and then, as a member of GE's Smart Grid

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leadership team, was responsible for its Asset Management & Optimisation software business (GE Smallworld). He left GE in April 2011 to found LIG Consulting, providing strategic advice to companies wishing to grow in the global energy sector. In 2012, he also joined the board of Fault Current Limited, a smart grid spin-off from the collaboration between the University of Cardiff and Fusion IP. Martin has a bachelor's degree in Electrical Engineering and has professional membership of the IET, IEEE and CIGRE.

[Richard Smith, Head of Energy Strategy, National Grid](#)

Richard has worked in the energy industry for over ten years and is currently Head of Energy Strategy & Policy at National Grid. He is responsible for leading the development of future energy supply/demand scenarios that take an holistic view of UK energy, and analysing strategic options for the optimisation of the energy system taking in to account political, economic, social, technological and environmental drivers. Previously in his career, Richard has worked in the space industry and the manufacturing sector. He holds a Doctorate in Engineering, an MBA, a MSc in Astronautics and Space Engineering, and a BEng in Civil Engineering.

[Phil Proctor, Programme Manager, Energy Technologies Institute](#)

Talk synopsis: The presentation will provide an overview of the ETI role in accelerating the development and deployment of technologies to enable the UK to meet the challenge of hitting the 2050 targets for greenhouse gas emissions. The presentation will provide insight into some of the ETI's strategic analysis on how energy infrastructure can be developed to support achieving the targets and where, as a result, the ETI is investing in the development of key technologies and tools. Phil Proctor is Programme Manager of the ETI's Energy Storage and Distribution Programme which focuses on the development of energy storage and infrastructure. A Chartered Electrical Engineer with the IET, previously Phil worked for ALSTOM Grid, project managing a large HVDC transmission project in South America.

[Professor Richard Davies, Durham University](#)

Talk Title: 'Shale Gas and Oil: Risks and Rewards' Whether shale gas and oil resources make a significant impact on the energy mix in European nations is probably more dependent on the social acceptability of the technology than the geology or engineering as thousands of wells would be required. The resource is likely to be significant, but understanding and communicating the environmental risks will be essential if companies are to gain the social licence to operate. Professor Richard Davies is professor of energy at Durham University and Dean of Knowledge Exchange and Impact. He has led research on the environmental risks associated with shale gas and oil and

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presented findings across Europe. He is agnostic about fracking technology, but determined to pursue independent research to ensure the evidence base for decision makers is available.

Professor Kevin Hesketh, NNL

Talk Title: Thorium – an alternative nuclear path The talk will set out to explain the thorium fuel cycle as a potential alternative to the uranium/plutonium fuel cycle and the rationale that proponents put forward in terms of improved sustainability, economics, radiotoxicity and proliferation resistance. The talk will consider the advantages and disadvantages of the thorium fuel cycle and will briefly describe the history of thorium and summarise current R&D activities and future R&D requirements. The talk will finish by explaining the industry view of thorium. Kevin is Senior Research Fellow with National Nuclear Laboratory. His areas of expertise are reactor physics and fuel cycle technology. His career in the nuclear industry started in 1975, when he joined the Theory Division of UKAEA at Culham, working on magnetic confinement fusion. In 1980 he left to join BNFL where he remained until the formation of National Nuclear Laboratory. During his career with BNFL and now NNL he worked on various reactor systems, including LWRs, HTRs and fast reactors and also spent time overseas with Westinghouse doing nuclear design work for US PWRs. Involved with many international organisations, especially IAEA and OECD Nuclear Energy Agency (NEA) he is presently the UK representative on the OECD/NEA Nuclear Science Committee (NSC) and chairman of the NSC Working Group on Reactor Systems. He is a Chartered Physicist, a Fellow of the Institute of Physics and was recently appointed a visiting professorship at the School of Physics and Astronomy at Birmingham University.

Mark Askew, Senior Manager, Policy Analysis, Ofgem

Mark will speak about: Networks regulation driving innovation and consumer benefits, Incentivising network companies to adopt Smart Grids; and Smart grid development in Britain Mark has worked on a variety of distribution issues at Ofgem including charging and regulatory framework for IDNOs. More recently, he was part of the team that developed the Low Carbon Network Fund and ran the funding competition. He now leads the smart grid policy work at Ofgem.

Clennell Collingwood, Investment Manager, TTP ventures Since joining TTP Ventures, Clennell has invested in electronics and telecommunications related businesses. He is now setting up an Accelerator to help emerging companies by validating ideas, proving technology, developing products, securing customers and attracting investment. The Accelerator draws on the resources of TTP and is funded by corporates.

Steve Kaye, Head of Innovation, Anglian Water

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Steve Kaye will talk about Anglian's constant quest for innovation and how it can link into the new Smart Cities movement at the Smart Grids & Clean Power Conference in Cambridge on June 5. Looking long-term in its 25-year strategy, the company intends to explore the possibilities for collaboration with power companies to deliver a smarter infrastructure. Ten implementations in new technology have recently been adopted, including water leakage monitoring and energy saving technology.

[Adam Cooper, Head of Sustainable Energy Policy](#)

Adam leads Ofgem's Sustainable Energy Policy team. Previously, he led a team responsible for the analysis of the business plans as part of the RIIO-T1 price controls. He qualified as a Chartered Accountant with Ernst & Young and has worked in a number of consulting and corporate strategy roles. Before joining Ofgem, he was Deputy Director of Financial Analysis at the Competition Commission. In a talk titled: Responsive regulation in a changing energy landscape, Adam will outline some of the ways in which Ofgem's work is meeting the challenges of Britain's changing energy systems. This will include the RIIO-ED1 price control, innovation funding, the move to smart meters and smarter markets, and the role of demand response.

[Douglas Cheung, Future Cities Group, Hitachi Europe](#)

Title: Enabling Smart Cities and Smart Communities Douglas' presentation will provide an overview of case studies from several smart grid and smart cities projects led by Hitachi globally, including an insight into the technologies used in these projects, for example voltage stabilisation equipment, ICT platforms and energy storage, as well as a brief point of view relating to emerging smart cities and smart communities concepts in the UK. Douglas is an experienced project manager and electrical engineer with a background in the implementation of smart and innovative automation and control technologies. As a Smart Grid Design Engineer-Project Manager at Hitachi, he is managing the design and delivery of LCNF projects for Hitachi in the UK, including a Tier 1 project in partnership with WPD in Cornwall, with a focus on voltage control and energy storage on MV and LV networks.

[Chris Wright, Founder, Moixa Energy](#)

Distributed Energy storage at the edge of the grid Chris will outline the value points on adding storage at the edge of the grid, installing Maslow energy storage units in customers homes for shifting peak load demand, and making storage available for network needs. He will discussing the advantages of edge of grid over centralised and the additional layers of value enabled. Moixa has also won a DECC Phase 1 contract to plan and bid for a largescale demonstration at MWh+ scale, into 750 homes in 2013/14.

[Alasdair Young, Buro Happold](#)

Synopsis: Heat networks are often associated with small scale gas fired combined heat and power or energy from waste plants. However, they could play a more strategic role

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in a future low carbon, resilient energy system. Heat networks have the ability to economically supply significant areas of our dense urban areas. Other opportunities including energy sharing, seasonal storage, diurnal storage, balancing intermittents, and utilising waste low grade heat. Alasdair works for Buro Happold, an international engineering design consultancy, where he leads the energy sector. He holds a mechanical engineering degree from Cambridge University and previously worked in the pulp and paper industry. Recent work has focused on delivery of new sustainable utility systems on large redevelopment schemes along with commercial research work in decentralised energy. Projects include the Olympic Park energy strategy, London Decentralised Energy Capacity Study, London's Zero Carbon Heat Resource study and a research project into geological heat storage with the ETI. Alasdair has evidence to the Examination in Public of the London Plan on decentralised energy and was a member of the UK Green Building Council Task Force on sustainable community infrastructure.

Dr Aidan Rhodes

Aidan is currently part of the Research Councils UK Energy Strategy Fellowship team, which is currently preparing a prospectus of the UK's energy research, skills and training needs. Prior to joining the Fellowship team, Aidan was a key member of the Knowledge Exchange team at UKERC from January 2010. He was responsible for helping to manage the National Energy Research Network and to deliver UKERC's role in the Energy Generation and Supply Knowledge Transfer Network (EG&S KTN). Aidan has authored several influential reports in the area of smart energy and smart grids and has facilitated exchange missions of UK smart grid experts with China, South Korea and Japan in conjunction with the FCO's Science and Innovation Network and UKTI. Previously, after completing a PhD in analytical electrochemistry at the University of Durham in 2008, Aidan worked at Imperial College as a Research Associate managing the Centre for Sustainable Electricity and Distributed Generation and participating in several large national and international research projects in the technical and policy aspects of electricity networks. Aidan has also completed a fellowship at the Parliamentary Office of Science and Technology, where he researched and wrote a parliamentary briefing paper on energy storage.

Sean Cochrane, Strategic Marketing and Applications Manager, Cyan Technology Ltd

Talk Title: Meeting the challenges of smart metering in emerging regions
 Synopsis: With rapidly growing populations, many emerging regions are finding it difficult to successfully deploy smart grid infrastructure. The challenges include collecting data from meters located behind physical barriers created by unplanned urban development. Cyan addresses these issues by working with local meter vendors to create an effective path from basic Automated Meter Reading (AMI) to fully integrated Advanced Metering Infrastructure (AMI). This presentation describes Cyan's approach and its robust CyLec range of wireless communication products for the metering industry. Biography: Sean Cochrane has worked in semiconductor and embedded systems development for the last 25 years, in a variety of software engineering, applications and marketing roles. Over the last 5 years Sean has focussed on metering systems development in India with

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Cyan Technology. Sean gained a BSc (first class) and MSc in Electronic and Electrical Engineering from Manchester University, an MBA from the Open University and PhD from Loughborough University for research into knowledge base verification methodologies.

Mike Halley, Trilliant Inc

Mike Halley (pron. Halle) has benefitted from 20 years of bringing Silicon Valley innovation to Europe. For a decade with Hewlett Packard & Microsoft building twice divisions that exceed \$1bn in annual revenue. Since 2007 via Venture Capital funded companies who disrupted the existing status quo to become market leaders like TOA Technologies for time based , cloud enabled mobile workforce management and currently using the portfolio investment from GE, ABB, Vantage Point , Zouk and UMC in Trilliant Inc from California. Synopsis : Title – Trilliant Smart Grid Maturity Model (™) – Free your company’s future from the pull of the past and escape velocity. Utilities and technology companies need to collaborate to build new value chains to enable the smart grid and scale the maturity model , ironically both are trapped by the pull of past revenues, mature products with high margins and last years operating plan. How we partner to share our innovations and collaborate are mutually inclusive.

Philipp Grunewald, Oxford University

Over recent years Phil has studied the possible role of electricity storage in future low carbon energy systems. This work has resulted in a realisation that a) the value of storage could increase significantly over coming years and that b) demand side flexibility could become a major competitor for physical storage in certain areas. In this talk Phil will present some recent findings brought together from work with Imperial College, University of Reading, University of Oxford and the UK demand aggregator Kiwi Power. Analysis of extensive trial data suggests that some service sectors are in a position to make a meaningful contribution towards system balancing and that the scope of their provision could be enhanced through appropriate policy measures. Prior to these theoretical musings, Phil was a proper engineer building laser processing tools for the semiconductor and photovoltaic industry.

Martin Bloom, CEO Emblem Ventures Martin is a seasoned and successful entrepreneur. Title: Business Models for Renewables: the Need for Constant Renewal Seeking Value in Business Models: Martin Bloom considers how value moves along different parts of the renewable energy value chain over time.

Phil Osborn, Head of Energy, Sainsbury’s

Phil has extensive experience in the procurement and management of energy, engineering and facilities services within the public and private sectors. Throughout his career, Phil has been motivated to improve service and financial performance and has always maintained an active involvement in energy management. As Head of Energy for Sainsbury’s, Phil is responsible for the ongoing reduction in energy used by Sainsbury’s, with a drive to reduce usage in absolute terms. Sainsbury’s has successfully reduced its energy usage on an absolute basis despite an ever increasing estate.

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[Sam Bose, Intellisense.io](#)

Synopsis: Sam will speak on three themes that you might have come across a lot recently: Internet of things, big data and the 3rd industrial revolution. Over the past decade Sam has been involved in the domain of Smart Grids, Machine 2 Machine, Energy and Enterprise Software through engagements with various leading companies. His experience includes working with Deloitte, Motorola, consulting with ARM and founding an enterprise carbon management company which he led through two investment rounds and early customer adoption.

[Russell Haggar, VP Product Management, Xsilon Ltd](#)

Russell will give a talk entitled – Hanadu: In-Home M2M connectivity for Smart Meters and Appliances Xsilon's "Hanadu" technology for In-Home M2M is targeted directly connecting up home energy management devices, smartplugs, smart appliances and smart meters. It is to the smart home what WiFi is to the laptop, and structured ethernet cabling is to the typical corporate network – only much, much simpler to deploy. The Hanadu SIG is available for likeminded industry partners and supporters to join us in promoting this solution to its wide audience. Russell Haggar is VP, Product Management and a co-founder at Xsilon. He has spent 25 years in the comms technology industry, acting variously as an engineer, marketeer, investor, NED and consultant with companies such as Marconi, Madge Networks, Sagentia, Element 14 (the Broadcom one, not Farnell), Prelude Ventures, DFJ Esprit (founding partner), XMOS, 3Way Networks, SiConnect and Enlightened Technology. As well as his role at Xsilon, Russell also works directly with a range of early-stage startups as they formulate their routes to market and worldwide domination.

[Ali Lloyd, Principal Consultant, Poyry](#)

Title of Talk: The outlook for biomass electricity in the UK: 2013 update This talk updates last year's overview of the outlook for biomass electricity, taking account of recent policy and industry developments. In particular it will focus on the Government's shift in ambition towards a greater emphasis on biomass conversion of existing coal-fired power stations. Ali Lloyd joined Pöyry Management Consulting in 2010 and has around 20 years of commercial experience in UK energy markets. He has a detailed knowledge of the UK electricity market including support schemes for renewable and CHP generators. Ali is part of Pöyry's renewables team, providing advice primarily to renewable and energy-from-waste developers on project valuation and off-take contracting strategy.

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