

SMART GRIDS 2014 BUSINESS CONFERENCE DAY JUNE 4

Session 1: Plenary Smart Grids & Cleanpower: Introduction

10:00 Dr Justin Hayward, Director, Cambridge Investment Research, [Introduction](#)

10:05 Gavin Jones, Business Development Director, ElectraLink, Grids Chairman's Opener

10:15 Jeremy Nicholson, Senior Advisor, EEF, Energy Intensive Users Group, Cleanpower Chairman's Opener

10:25 Stephen Cunningham, CEO, UK, Ireland & Nordic, Landis & Gyr, [Keynote: Managing Energy Better - The landscape for smart grid](#)

10:40 Peter Sharratt, Director - Sustainability Services, SBP (spin out Deloitte), [Energy Trilemma](#)

10:55 Dr Bernard J Bulkin, NED, Ludgate Investments (former Chief Scientist BP) & Cambridge Univ., [Keynote: An Energy Trilemma is Abhorrent](#)

Plenary panel with speakers and chair

Morning coffee & showcase of products and services

Session 2: Grids stream Connected Intelligence: networks, meters & fast data analytics

11:45 Marieke Beckmann, CCM National Physical Laboratory [Smart grid measurement](#)

12:00 Dr Sean Cochrane, Director Cyan Technology [A connected energy network through metering and lighting](#)

12:15 John Di Stasio, CEO Sacramento Municipal Utility Department (SMUD) [Jt Keynote: Smart grid intelligence and risk](#)

12:35 Martin Dunlea, Global Industries Lead, Utilities, Oracle, [Jt Keynote: Fast Data, Actionable Data](#)

Panel with Peter Drake, Managing Director, Intelligent Networks

13:10 - 14:00 Lunch networking & exhibition of products & services

Session 3: Grids stream Smart Cities: real systems solutions at scale | the industrial internet

14:00 Michael Clark, Programme Director - Low Carbon London UK Power Networks, [A Smart Grid for London](#)

14:15 Rich Hampshire, Principal Consultant CGI, [End-to-end smart grid & consumer engagement](#)

14:30 Philip Burr, Director of Product Marketing Arkessa, [Case study: an M2M platform for IoT Solutions](#)

14:45 Chris Wright, CTO, Moixa Technology, [Enabling localised energy systems through smart storage in homes](#)

15:00 Dr Andy Stanford Clark, CTO Smart Energy, IBM, [Keynote: Island Energy- fast, friendly, fuel](#)

Panel with Tony Rooke, Sustainable Strategy Director; Smart Cities & Innovation, Infosys

Coffee networking & expo of products & services

Session 4: Plenary Policy debate grids and energy: innovators | funding | regulation & reforms

16:15 Dora Guzeleva, Head of Network Policy Ofgem, [How regulation can be a win-win for stakeholders](#)

16:30 Ian Ellerington, Head of Innovation, DECC, [The key role of innovators in changing the energy industry](#)

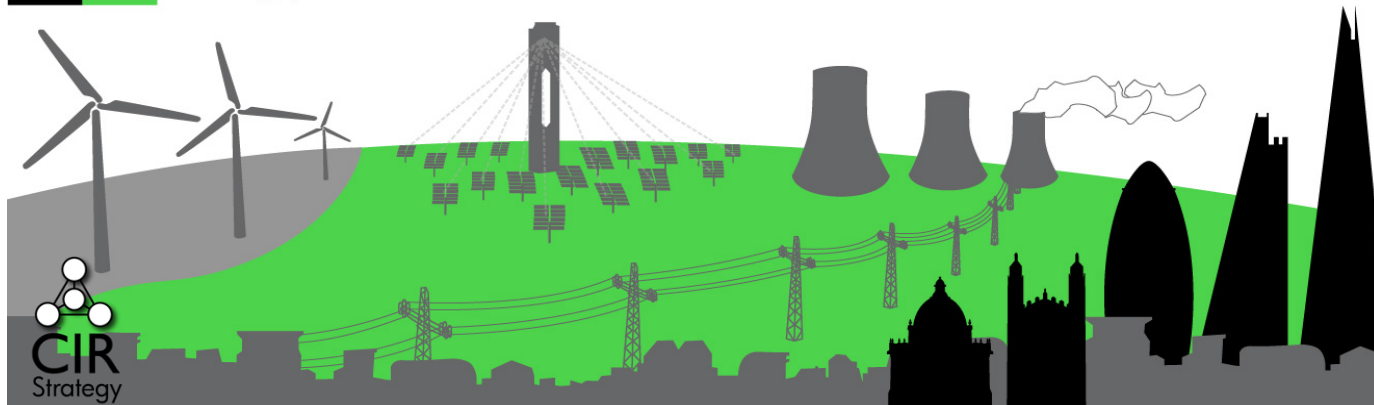
16:45 Dr Mark England, EVP Smart Grid, Sentec, [Routes to market for energy innovators](#)

17:00 Pilgrim Beart, Founder, AlertMe, [Keynote: UK energy management innovation in global markets](#)

Panel with Chairman - followed by Chairmen's summaries

17:30 Drinks networking & Close of Conference This 6th Smart Grids & Cleanpower Conference is organised by CIR Strategy in association with AlertMe. The CIR Conferences Series, which has run since 2007. The next Smart Systems Summit 2014 takes place on 1-2 October 2014 London at the Institute of Directors: www.cir-strategy.com/events/register or 01223 303500





CLEANPOWER 2014 BUSINESS CONFERENCE DAY JUNE 4

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10:25 Stephen Cunningham, CEO, UK, Ireland & Nordic, Landis & Gyr, [Keynote: Managing Energy Better - The landscape for smart grid](#)

10:40 Peter Sharratt, Director - Sustainability Services, SBP (spin out Deloitte), Guiding future investments for infrastructure & sustainability needs

10:55 Dr Bernard J Bulkin, NED, Ludgate Investments (former Chief Scientist BP) & Cambridge Univ., [Keynote: Is there an Energy Trilemma?](#)

Plenary panel with speakers and chair

Morning coffee & showcase of products and services

Session 2: Cleanpower stream Fracking in Focus

11:45 Professor Andy Woods, Lead Scientist, CU BPI, [Science & the Risks and rewards of fracturing for shale gas](#) 12:00 Dr

Tony Smith, Technical Director SLR Consulting [Separating Myth from reality - Fracking and the social licence](#)

12:15 Joel Price, COO San Leon Energy, [Experiences of shale development in the EU](#)

12:30 Marieke Beckmann, Research Lead National Physical Laboratory, CCM, [Emissions measurement in fracking](#)

12:45 Michael Bradshaw - Professor of Global Energy Warwick University [Keynote: The impact of the US shale gas revolution on UK gas security](#)

Panel with Chairman

13:15 - 14:00 Lunch networking & exhibition of products & services

Session 3 Energy markets: competition & pricing

14:00 Mike Wilks, Director Smart Energy Poyry, [Energy market structure: could do better?](#)

14:15 Emilia Melville Buro Happold, [Community Electricity Aggregator: peer pressure and participation](#)

14:30 Doug Stewart, CEO Green Energy UK, [The role of alternative suppliers of energy](#)

14:50 - 15:40 Panel with Chairman

Coffee networking & expo of products & services

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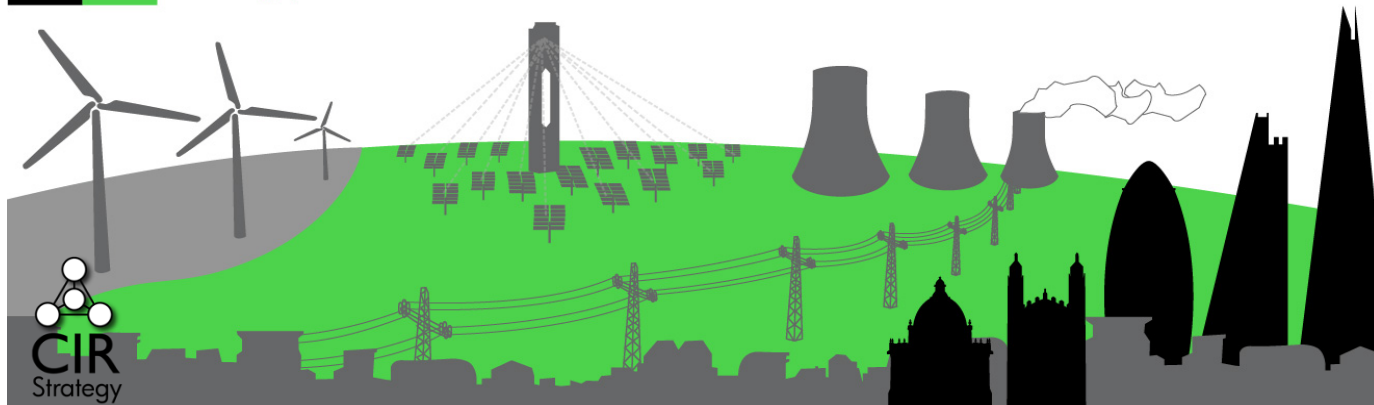
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Notes by Mark Nelson, CU edited by CIR

(Cleanpower Stream (& plenary) Session 1 Notes:

Gavin Jones, chairman:

Energy infrastructure is the most important infrastructure for the country, and we have to get it right. The challenge of matching supply and demand, which is what Smart Grids are all about, is critical. We're a great country for innovation, the leaders in Europe for investment in demonstration projects.

Jeremy Nicholson:

25% of Europe's power plants need replacement soon, and there will be problems if it is not done in a timely fashion. An interesting question in this problem is whether demand response can be a part of the solution. The question is, how easy is it to take advantage of any demand response that may be available?

Demand response may make the difference between dangerous shortages or the usage of expensive backup generation capacity.

Demand response alone cannot take care of the problem of 30GW of intermittent power, but will still be important.

Aluminium smelters used to provide a major demand response, but they're unfortunately gone. However, there will be opportunities for other industries, such as gas compression and cement production.

Technology is the key, though that is not to say that there are important political and economic aspects to the solution. Normally, when someone says 'Win-win' solution for the consumers, it should be viewed with a bit of suspicion. Likewise, energy efficiency cannot be the only solution - in the words of a former energy minister, you have to have a supply to be efficient about!

Steve Cunningham, Landis Gyr (Toshiba Group)

"The Landscape for Smart Grids"

We stand right at a crossroads for Smart Grids - big business players like Google and Apple are stepping in to investigate commercialization of smart grids.

What technologies will make the Smart Grid? It's already happening with phone networks and home automation and Wi-Fi and smart meters. That's why the big players are stepping in - things are starting to link up already.

Data privacy - if we already share so much about our shopping and personal tastes and finances with companies, what difference is it to supply much less rich information about our gas and electricity usage for the purpose of energy monitoring and demand shaping? That's why Google paid billions for Nest - not for the nice thermostats - but for the data.

Where is the Smart Grid in 2014? In 2011, Smart Grid tech was lumpy and inconvenient, and was only tolerated on cost grounds. Now, massively distributed systems are happening in the UK today. It will be in everybody's interest to opt in.

It is reasonable to expect that in the future new businesses will start to fit the profile of energy supply for a given country.

If the Smart Grid doesn't open itself up to the Internet of Things, it will shrivel and shrink away.

Peter Sharratt

"A personal view of tackling the energy trilemma"

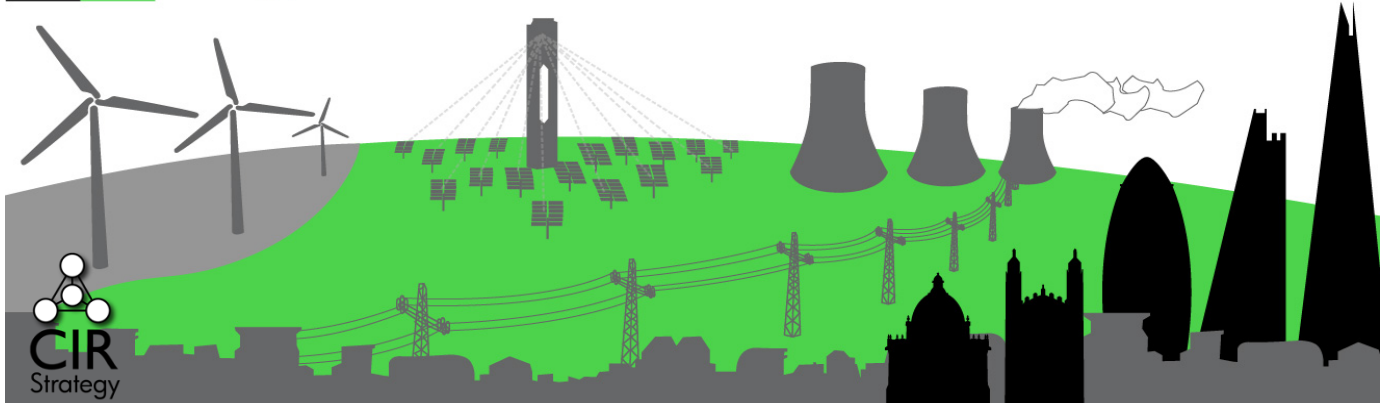
If there is \$40 trillion in investment needed, the question is what exactly do we spend it on?

It is the growth of the middle class that will drive energy needs, and it will be in the context of cities.

The case of Dubai - a new type of development problem: how to use modeling to design policy to maximise sustainability objectives? As an example, minimizing power plant expansion was set as driving objective, and as a result, building a carpark spot was linked to building solar panels to reduce centralized power demand.

The answer for addressing the Trilemma was through obtaining evidence to establish integrated policies for sustainability.





Masdar City is probably the largest experiment yet in trying to deal with the energy trilemma. Policy and design were integrated - but why didn't it succeed? Part of it was funding, but a big part was focusing too much on outputs without constructing the governmental and policy framework for its sustainability and success.

Bernard Bulkin

An abhorrent concept - that solutions to energy problems necessarily requires tradeoffs. Someone has named this the Energy Trilemma - and it's just plain wrong.

The solution isn't new, but it isn't being applied, and isn't being thought-through properly: Sustainable Development. It's not just about climate change, and not just about the environment.

Sustainable Development means living within environmental limits. It's so simple to say, so easy to ignore. A major lesson of the 20th Century is that it's always cheaper to deal with the costs of environmental damage before it happens rather than afterwards.

Sustainable development requires creating social cohesion and a strong, healthy, and just society. We achieve this by creating a Sustainable Economy, in which environmental and social costs are imposed on the parties that create them. Good governance is essential - active participation at all levels brings in creativity.

All of these aspects are required - we must not make tradeoffs between them.

Instead of honest examination about Sustainable Development, the conversation is dominated by biased parties.

We find that when the principles of consultative and participatory government are practiced, that wind is a consistent favorite with the population. But how do we deal with variability? The answer is one that meets all the points about sustainability.

Interconnection will work when the interconnection is with other sources of low-carbon electricity in France, Denmark, Norway, and other countries. A strong resilient society across the broader European community will be the result.

Flow batteries are getting set to make a big impact with storage.

Costs are important - subsidies must come down. Cost reductions can happen, but needs to happen through specific engineering design and planning decisions, not through faith in reductions in moving down learning curves.

QUESTIONS:

- Couldn't greater interconnectedness be problematic in addition to helpful?

QUOTE: Interconnection with French nuclear critical for balancing.

[SPEAKER NEXT TO QUOTE]: Weather conditions do not respect national boundaries; there are also physical limits to interconnection.

- We can't make progress on Tidal Barrages because of bad governance.

QUOTE: Severn barrage people are asking for a very large subsidy, so this isn't a reasonable solution. It's unfair to say government is the problem, because there's been a huge effort to examine it as a solution.

[MODERATOR]: We need to have the barrage as part of the structure of our energy plan for it to be feasible.

- Follow-up from previous question - from living in Netherlands, such large-scale water control structures already exist.

QUOTE: What we need, and don't have in our society, is to weigh up a concentrated harm against a distributed good.

[MODERATOR] We do have such calculations with infrastructure such as roads.

- How do we rectify the two views we've heard here - bottom-up consumer-led change, and top-down large-scale planning for sustainable development?





[CENTER SPEAKER]: If sustainable infrastructure like sustainable power sources meet specific economic benchmarks, then the changes will happen. If they remain the preserve of government funding and investment substitution, you'll never see massive adoption.

[Quote2]: Increasingly, sustainability problems are being translated into accounting terms that make sense for large corporations, who then are able to grasp the scale of their own possible costs and efforts in sustainability and can take decisions to engage in solutions.

FRACKING IN FOCUS - Session 2 (Cleanpower Stream)

Prof. Andy Woods:

Energy supply is dominated by hydrocarbons, so finding and developing new sources of hydrocarbons is essential. Examining the reserves-vs-production ratios, coal is plentiful, but gas and oil are much less so.

With a shale gas well, an initial high flowrate is expected, followed by a rapid decline. Therefore, multiple wells are necessary.

To increase gas recovery, hydraulic fracking is used. The well is pressurized with fluid (water, chemicals, and small particles called proppants). The fluid forces open cracks in the shale, which are then held open by the proppant particles. Sonic detectors on the surface are used to detect the location of the fracture front as it moves through the formation.

Wells using hydraulic fracking are typically 1-3 kilometers long, and require about 4 million gallons of water per fracture effort. Flows decline in roughly 1-2 years.

Fracking is quite a controlled process, and imaging can demonstrate where the fractures are occurring.

We still don't understand at a fundamental level how the gas is flowing through the shale. It is an open question whether other formations around the world will match the depletion curves noted in American gas production.

There are questions about the availability of water for fracking, as quite a lot is required.

Marieke Beckmann

Total fugitive emissions from some refineries in Canada may be 10 times as high as calculated - so it is important to get away from pure calculations and transition to measurement-based approaches.

Calls for methane leakage monitoring have from DECC and the EU, among other groups.

National Physical Laboratory has initiated FuME project to quantify fugitive methane emissions.

Officially, the project is targeting all sources of methane but the primary concern is the quantification of emissions from shale gas fracking operations.

LIDAR-equipped trucks can be used to construct three-dimensional spot-measurement models of methane leaks at sites.

Any people or groups interested on participating in such efforts are very welcome to contact the National Physical Laboratory.

Dr Tony Smith

Dozens of wells have been fracked in the UK in the last four years.

Fracking was traditionally written 'fracing', though admittedly the battle has been all but lost.

There is no doubt that the industry has been very poor about communicating with the public about fracking.

There are currently no lateral wells in the UK.

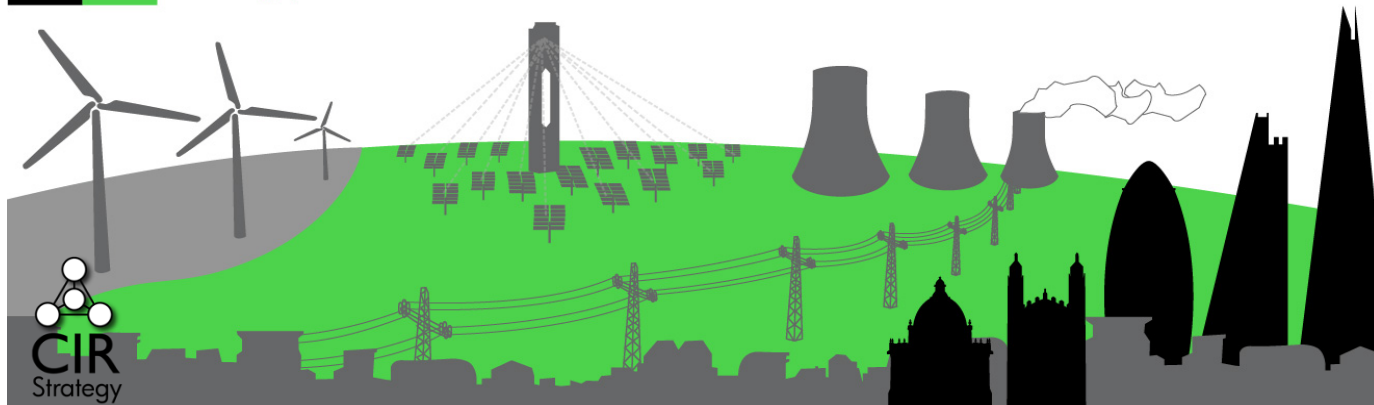
Sensible energy policy in the UK? That's a laugh - look back over the past four governments, and there isn't one.

Comparing anti-fracking diagrams illustrating ground water contamination with drawn-to-scale diagrams illustrates the large gap between facts and myths in information about fracking.

The chance of seismicity linked to fracking creating noticeable tremors is practically nil.

Technology and science and data are driving the effort to reduce the water required in fracking efforts.





Statements from the Royal Academy on radiation exposure from fracking indicate that in any normal situation the public is not at risk.

Currently, 85% of home heating is provided by natural gas. The question is not 'whether gas' but rather 'which gas'. UK gas would be taxed at a rate of at least 62%, which could then fund tidal barrages and wind and other projects.

Going to a town hall and giving out a glossy brochure and a cup of coffee and a piece of cake is utter tokenism - it's not going to work.

Just meeting legal requirements for safety doesn't do anything for local communities - you have to go above and beyond.

Joel Price:

Despite having the most advanced fracking industry in the EU, Poland has nothing near the density or extent of efforts as in the United States.

Shale varies from country to country and formation to formation, with different depths and hydrocarbons in each.

While it is highly misleading that a finished gas well is only the size of a postbox, it is similarly untrue to assume that each individual finished tree requires its own acre or two after remediation. The truth is in the middle, with the likely outcome of multiple finished wellheads on a single 1-2 acre site.

Fracking and water contamination are not directly related - rather, the issue is the relation between poor drilling practices and water contamination. Getting away with poor drilling practices such as those that lead to contamination in the USA would be nearly unthinkable.

Support for shale development in Poland is around 80%, depending on which questions you ask. Polish shale development is now moving extremely quickly due to political will.

'Shale development' and 'fracking' are interrelated, but are not the same thing.

San Leon company outreach efforts in Poland include having local school groups visit the well sites, where they observe and write reports for their class.

Prof. Michael Bradshaw

The shale gas revolution in the USA did not happen overnight - but after decades of buildup, the expansion of production was extremely rapid.

As recently as 2006, US governmental organizations were not even collecting separate statistics on shale gas production. Yet by the end of the current decade, the USA is expected to become a net exporter of gas.

Investment around the world in either regasification or liquefaction facilities was remarkably disrupted by the US shale gas revolution, which led among other things to strong growth in the LNG spot market and reduced utilization of natural gas import/export terminals.

Currently, there is essentially a self-contained North American market for natural gas. The debate rages in the USA on whether to allow and/or encourage development of LNG export capacity. However, US gas would not necessarily liberate Western Europe from Russian gas, as for example Russia could dump gas on the market to outcompete expensive US imports of LNG.

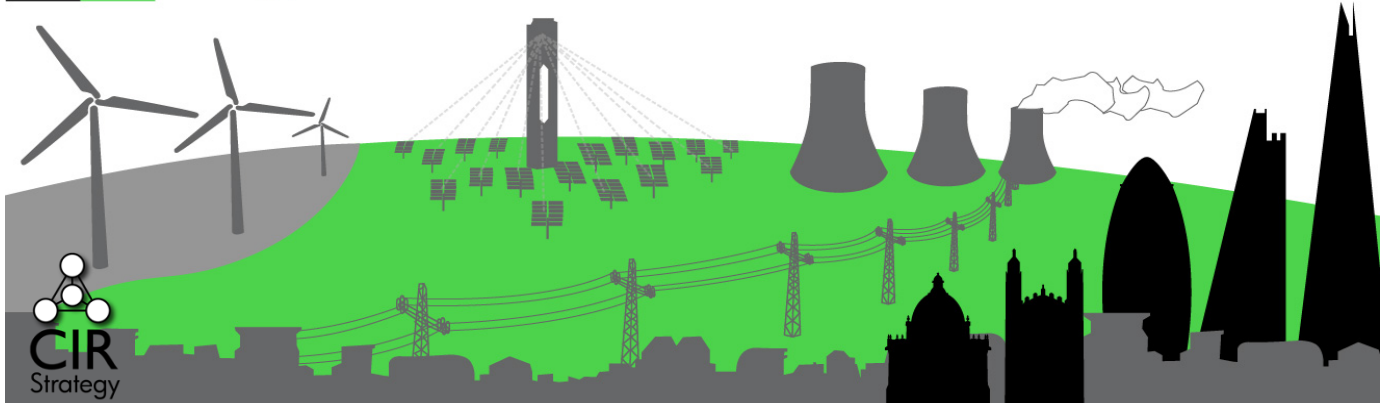
Emergency gas supplied to Japan to compensate for loss of nuclear generation has come with emergency prices - at significant cost to Japan's balance of payments.

Fuel switching in the American market from coal to gas led partly to the decrease in American emissions, though with significant sensitivity to economic conditions and gas prices.

No one in the UK seems to want to invest in gas-fired generation capacity, even though it will be required to deal with increasing penetration of renewable generation.

The Dash for Gas was nearly as impressive for its recent rapidity of collapse in supply as for its rapidity of increase in the 70s. 98% of gas in the UK in 2012 came from Qatar.





Without a molecule of unconventional gas developed in the UK, there has already been a significant impact of shale gas on the UK, including unforeseen consequences such as the return of coal to Europe.

Session 3: Energy Markets

Mike Quote3

The behavior of the European energy sector is set to become much more volatile and will have an impact on existing structures - not just networks, but also producers.

Demand Side Response is much more effective when it's rarely used rather than constantly relied upon.

We need to get away from the desire to bash the Big 6 and other political games.

There are important changes currently taking place at the Pan-European level through network codes that bind countries to standard energy market models in order to better link national and regional energy networks.

If there was ever a true test of the European experiment, it's the establishment of a common European energy market.

Emilia Melville

Electric vehicle adoption is likely to be quite clustered as people copy their neighbors.

Installation of smart meters will allow homes to participate in demand response mechanisms that are inaccessible today.

Community Energy has the potential to be a disruptive force in UK energy in the future.

A recent trial in Australia based only on information rather than monetary incentives for participants achieved over 10% reduction in energy usage for a community.

For most people, having a conversation with a neighbor or a member of a family is a much more effective communication strategy than from government or industry representatives.

It's difficult to know how big the knock-on benefits of Community Owned Aggregate would be without specific social research, but the potential is large.

It's currently not possible for households to get together and purchase energy as a group entity.

One current project involves offering a 5000gbp prize to a community if it can keep its peak below a certain level and achieve overall reductions in usage.

Buro Happold is actively looking for partners for community-level energy projects.

Doug Stewart

Green Energy has started providing gas as of the beginning of June, after asking their customers whether they should or not.

Green Energy had an ethical dilemma about whether to supply gas; their customers didn't.

The UK energy business is risky at the supply level, risky at the retail level, and is bloody risky at the trading level.

Retailers like Green Energy feel as if Ofgem is currently stifling innovation.

You can't bundle community energy economically with the current market system.

Green Energy enjoys a high level of trust with its customers and therefore can move quickly in new market conditions.

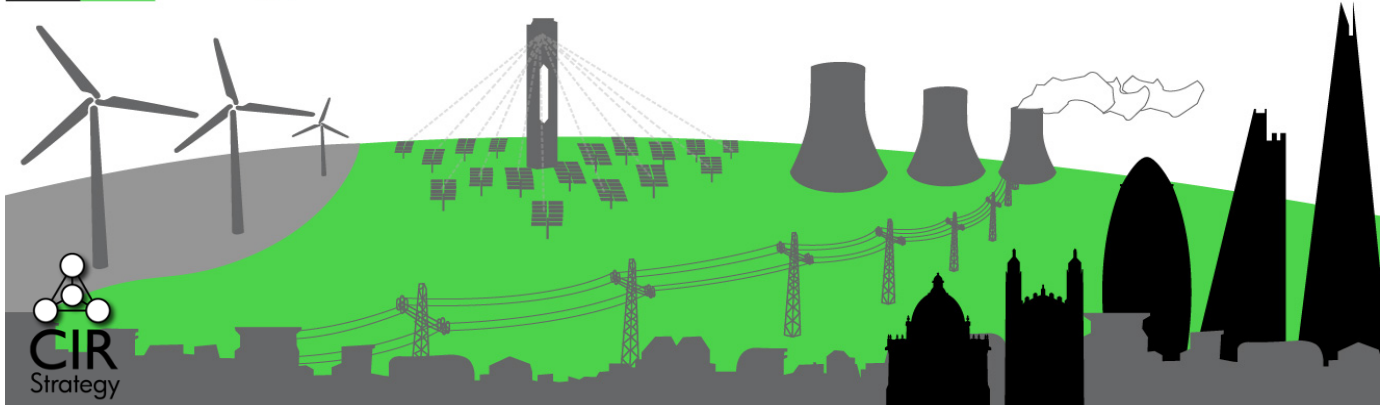
Demand side factors are much cheaper to improve than the cost to build new power plants.

"Too cheap to meter" was never about fission - it was about fusion.

-We have heard over and over again that in order to make progress we have to go against the government, against the regulators, and getting this sort of thinking into the energy industry is difficult because the suppliers seem to be almost in awe of the regulators.

Quote: It's a simple business made difficult and expensive by regulation.





-How long did it take Green Energy to get a license?

Quote: We decided to operate at first as a White Label company, acting as a marketing arm for a company with a license, and then took customer service under our own roof, which was very difficult and involved many steps. The price was about half-a-million pounds.

-If I was a solar farm, could I sell it to a factory down the road?

Quote and Quote2: Private wires are prohibitively expensive. You can sell your electricity, but not sell it exclusively to certain customers.

Quote3: Some of the complexity comes from the requirement to separate all parts of the value chain, from generation to distribution.

-The example mentioned about the church with a large roof and the school across the road with the daytime energy needs [disallowed by regulation and prohibitive cost to lay distribution cables] demonstrates a massive failure of capital allocation. Where is the solution?

Quote3:

-The taxpayer paid for the establishment of the grid, so it really belongs to us. There appears to be a case to make that we've let large companies have monopoly access to the system for long enough. Shouldn't we be able to make a strong political argument that the public should have access to the grid (as long as it doesn't break the grid) for the uses of community generation?

Quote3: You can change the role of networks, but whether you still use them or not depends on whether you're willing to build a wall around your project and become independent from the grid.

-Can decarbonisation occur through markets?

QUOTE3: Markets seem to be fantastic at driving out the very cheapest option given the rules of the game. There will always be a role for regulation to help reduce this problem.

Quote2: The market is currently set up that the distribution companies don't know what happens past the substation. The network operator will not get the data from smart meters, just the supplier (and consumer), and can't get it by law without permission from the customer.

QUOTE3: Networks need this information to avoid damage and service outages.

-The regulators are there to protect the businesses from the consumers. Without it you go to jail, with it you keep your job.

Quote2: Consumer trust can be low because in the end the lights turn on whenever they want it. So dissatisfaction can remain high without the big companies losing their customers.

-The Big 6 did themselves a massive disservice by bringing up operating margins. The public doesn't care about that, and there's nothing in economics that says that operating margins must be comparable with other fields.

Session 4

Dora Guzeleva

Ofgem has given up on universal love; that won't happen.

Ian Ellerington

We're basically snipers hunting the irrational, and when we find it we flag it down. (Re public funding grants filters)





The Energy Trilemma is not a trilemma, but rather three independent objectives that much all be met. Security is more important than anyone wants to admit.
There seem to be a lot of people that seem to think that subsidies are there to give them an easy life. That's not the case. DECC is trying to find the best value activities that it can to support innovation.
Wind must drop in cost by as much as 60% to become competitive with other energy sources.
DECC's aim is to issue if politically possible more 'convertible' grants that can be converted into equity should the company be successful.
The UK absolutely cannot achieve its low-carbon aims by itself. International cooperation is required.

Dr Mark England

As nice as it would be to imagine that we're innovating in the energy sector for purely business principles, it's not true: energy innovation is about lowering carbon emissions.

I appreciate that Ofgem has worked hard to give industry a long time to bring innovations to market, but eight years is still quite short for the business cycle in energy.

It is important to find routes to market that avoid the need to sell only to large companies, who are typically buying from other large companies.

Ultimately, the use of a patent is as a lever to get money out of a manufacturer when they produce the new product.

If patents are your route to market, it needs to be a big enough deal to make up for fixed costs in the patent process and to convince the manufacturer to take on all the risk up front.

Ofgem's LCNF does help with innovation in some cases.

The winner in innovation is not the 'best' product but the one that has the best route to market.

Pilgrim Beart

David Mackay's 'Sustainable Energy without the Hot Air' was like a bible to me.

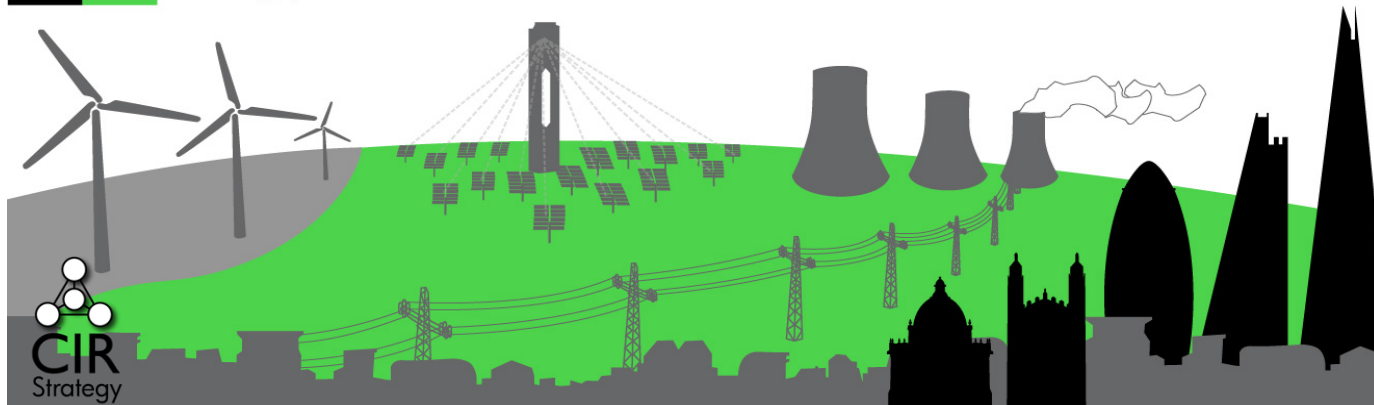
Once you start getting a large stream of data from your platform, it becomes another way to discover how to provide value for your customers.

Co-creation is the idea that customers can help you make the product through feedback.

The biggest investment you make is your life, and you don't get it back - so invest wisely.

Some West coast companies spend fortunes trying to brute-force markets into existence, and they fail. One of the most important things is to be able to survive until markets create themselves.





Notes by Maria Gradillas, IC, edited by CIR

Session 1: Plenary Smart Grids and Cleanpower

Dr Justin Hayward, Director, Cambridge Investment Research, Introduction

Opening welcome from Justin. Highlights success of previous day. Explains how the day will work out and logistics. Two plenary sessions at the beginning and end of the day and break up into two streams of smart grids and clean power for two sessions. Thanks sponsors for their support.

Introduces CIR Management Consultancy, established in 2002, works with tech companies in Cambridge tech cluster - slide with their key clients.

Highlights that their work is highly hands on and explains their method: Routes to value - about finding goal system and carry out market research to find how companies can achieve value faster.

Goes through slide on how CIR works and what services can offer.

Their method offers clear benefits (see slide) and has many application for different type of companies.

CIR also organises workshops

We get our hands dirty - which is rare in Cambridge -

We also organise conferences - presents two upcoming conferences and networking opportunities:

Smart Systems summit in London 2014

Business model of Graphene and carbon-based & other functional materials right for particular applications such as touchscreens and flexible electronics and sensors and other industrial sectors such as aerospace, defence, automotive, healthcare.

Hands over to Gavin Jones Chairman of this session today - highly involved in Smart Grids GB and Smart Grids Forum

Gavin Jones, Business Development Director, ElectraLink, Grids Chairman's Opener:

Welcome everyone - just a few words to introduce the SG stream - very interesting sessions throughout the day - I hope you get involved as well with questions and thoughts - fascinating area - importance of this area - energy infrastructure is most important infrastructure of a country - reliable power infrastructure key for companies but it must be affordable - price and reliability key or we'll lose out. Changing the way demand and supply work is key - we are a great country for innovation - we are leaders in EU in demonstration projects great country to try and find the solutions - importance of getting it right. Hope you enjoy, we have fascinating speakers.

Jeremy Nicholson, Senior Advisor, EEF, Energy Intensive Users Group, Cleanpower Chairman's Opener

Advisors to EEF - represent industrial energy users and part of value chain of energy system - we are very interested in security of supply but also in doing SG in an economic way - important for manufacturers.

Looking at our generating capacity in UK and EU - needs replacing is it a challenge or opportunity?

Need to do it in a responsible and affordable way and without locking ourselves into tech solutions - problem of intermittency - can we solve it in an efficient way - demand response is a way to deal with this

Nuclear baseload also very inflexible - demand side services should be at a premium - issue is how easy is it to take advantage of that flexibility? - depends on elasticity of demand - some industries more flexible than others.

Opportunity - ability to link up appliances distributed throughout the system and if that can be coordinated

Industrial sector always very involved in demand side response - steel making sometimes made more money from demand response than from steel making!

Opportunity to offer backup power - expensive and tends to be carbon intensive as well - we don't want to rely on this to manage intermittency - High levels of intermittent offshore wind planned in UK - cannot rely entirely on demand response alone - doesn't mean DSR has a role to play





Industry involved in providing STOR - very fast response - big one is aluminium smelters - but no longer located in UK - lost them in last few years, one factor in those closures was electricity prices - fear of increase - point is that manufacturers need a competitive environment in which to operate.

Some process can be operated flexibly, important to understand which processes can do this.

Threat of shortage of supply - coal plants very carbon intensive - long term energy security still needs to be clear, nuclear is it financially viable? Where will funding come from? We will see what happens with nuclear and at what price? £92 per megawatt hour guaranteed for 35 years from government.

Affordability issue is high up the political agenda, much more than before, for consumers and for competitiveness of industry - balanced approach - environmental but also economic sustainability is the only way to engage rest of the world in this agenda. So low carbon direction is here to stay but value for money in doing that - so doing it without harming consumers very important - technology is the key to this - economic advantage is important in decarbonisation - example switch to natural gas in the past. Other technologies will be needed to meet decarbonisation goal - developing economic technologies is the key - Markets are very good at delivering win win solution no need for great policy intervention - but we will see (I know Ofgem speaker later will have something to say about this!) Technology needs to be part of the solution - Words of last energy minister - Malcolm Wicks - very balanced about this, he knew about affordability, he said yes energy efficiency hugely important, demand side response very important but let's not forget about supply! Need something to be efficient about!

Stephen Cunningham, CEO, UK, Ireland & Nordic, Landis & Gyr, Keynote: Managing Energy Better - The landscape for smart grid

Landis-Gyr now part of Toshiba

I am going to talk about the direction for SG what we've seen last year and where that sends us.

Introduction was very interesting - we stand at a crossroad for smart - traditionally energy has been in realms of gov - last years commercial interest - mainly at consumer end - while policy debates are taking place (fracking Ukraine) we have people looking at energy from a different end (Apple Google) - from a consumers perspective - what do consumers want and like to interact with - this firms start to be interested in energy for the first time in forever.

The internet of things - we will drive this - It is happening already at the metering end - infrastructure is already being rolled out. At other end of the picture - smart devices at homes - at my home we have over 15 devices communicating with internet all the time - 4 years ago we would have looked at smart as different from things we like interacting with (tablets etc) Cisco are moving back into the space because its starting to link -

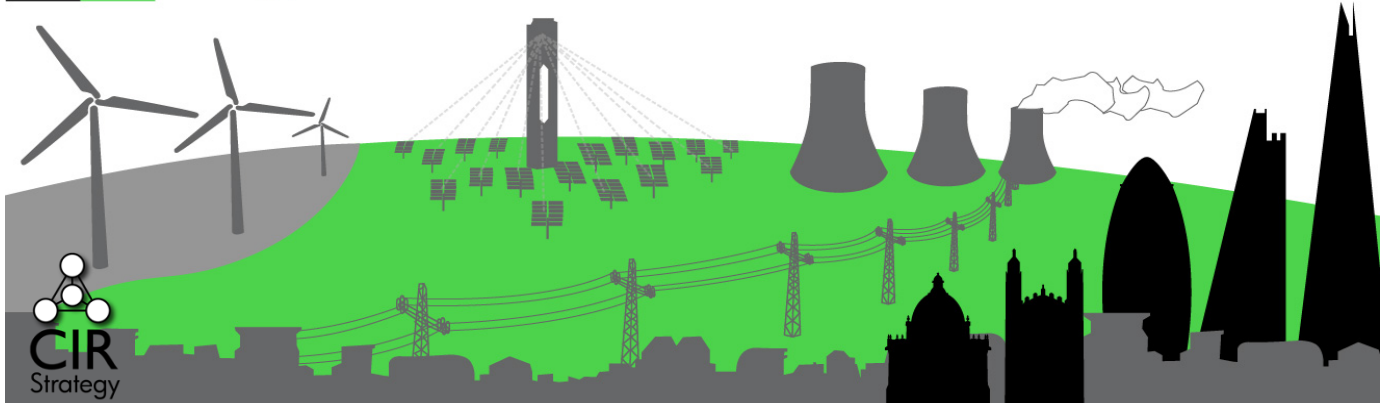
IN the homes sensors are starting to be deployed and interact with other devices - we are in a really interesting cross-roads point.

Data privacy is a really big issue - but as long as I've been at Landis - I've never been able to understand where that debate stands - we give out so much information already - tesco can tell more from your clubcard than energy companies will from your meter - issue is that people don't see a value in giving info to electricity companies - that's the real difference - when consumers see a value change will be radical.

DSR will be key - in order to make value out of DS you will need millions of data points - data can be averaged lets you do smthg very powerful - Need meta data - Google can become the aggregator - they trust me not the utilities - or Apple - join me

Where are we today with smart grids in contrast w 2011 - we are in a very dif place - 2011 traditional energy companies - see slide - intangible for consumers - more about the inconvenience about being switched off - people hated smart meters, attitude to control forced on you was negative - this will only be accepted on trust - Now completely tech independent - interoperable - will allow anything to talk to it - massively distributed (UK will have the first infrastructure) - Network into





watch home with many sensors will talk to anything in the home - It's also all about the data - SG is not about controlling a device it's about the data and figuring out what it can offer commercially to all other in the value chain including consumers. It will be in everybody's interest to opt in - contribute data in and get benefits out - will be societal - even for business - I'll build a business to fit with the energy profile of a given country and will be chosen for value - people will do it on the basis of what's in it for me.

Pace of evolution is very fast but its changing direction, part of a wider internet of things -

Solutions available on 2011 are already outdated - we're facing a new world - if SG doesn't become part of it, it will shrivel and die.

Which companies will control how we consume energy? - short window - 24 months for leadership to emerge in this space - Key for those interested in this space - move out of the world you're in - control will come from a place where it doesn't come today - so embrace that change.

Peter Sharratt, Director - Sustainability Services, SBP (spin out Deloitte), Guiding future investments for infrastructure & sustainability needs

Morning everybody - I will talk about my experiences in addressing some of the challenges in the energy trilemma - I will talk about rethinking growth and about value drivers in the UK beginning to drive change.

Rising global population, ageing infrastructure, carbon - urbanisation and the issue of equity

40 trillion needed in investments globally - what do you spend it on?

Key thing - urbanisation - trends on slide - heading towards 75% urbanisation in 2050 (9bn people)

This is a difficult challenge -

Will talk a bit about Dubai - rapid urbanisation - city 1.7mn headed to 2.6 million - How could you rethink the growth model?

Power infrastructure system was very inefficient - 3% - model was predict and provide (2008) - design challenge was how you could do DSM to minimise expansion of supply infrastructure - key was to understand role of regulation. In this particular case, challenge was car ownership in a congestion space - condition to having second car was to put a PV panel up.

Issue around Saudi Arabia - hugely urban population - high electricity usage - understanding power supply and development of Saudi - Saudi uses its oil to generate power internally - how to address trilemma - framework for decision making - policy issue around competitiveness, job creation - integrated approach to dealing with development.

It's very difficult to implement change - example of Masdar city - vision of integrated model

Why did it not work? Part was the funding - but what did we learn - we were missing the policy framework and supply chain.

Focused too much on outputs and less on how it could be achieved.

We have technology solutions, issue is, is there a market?

Key of understanding risk and value model - example of Beaulieu - gap - organisations developing wider value model so that they can assess the impact - Social Value Act 2012 - requires authorities to track value for wider society -

We've been looking at value created missed this?

I want to finish on this idea of partnerships, technology rights are important. Diagnostic analysis - how can technology help deliver public services.

Dr Bernard J Bulkin, NED, Ludgate Investments (former Chief Scientist BP) & Cambridge Univ., Keynote: Is there an Energy Trilemma?

I wrote an article in guardian sustainable business last month on what a smart grid is

http://timeli.info/item/1574654/The_Guardian_Business/South_Koreans_are_leading_the_way_in_their_vision_for_smart_grid_Guardian_Sustainable_Business...

I have no slides, I will just talk





One of the most horrid concepts to me is that if we want sustainable solutions for energy- we need to make tradeoffs - replacing cheap coal with expensive wind it will cost us - someone had the idea of calling this the energy trilemma - we can get rid of coal, replace with shale gas and deliver it costless thanks to fracking failure - not way to approach energy issues - I want to discuss how to make energy decisions - I will offer alternative to energy trilemma, I will replace it with sustainable development.

Principles of sustainable development (SD)

SD not just about climate change or the environment - it means living within environmental limits - respecting limits so that resources are not impaired for future - great lessons of XXth century - cheaper to deal with problems earlier than to deal with aftermaths.

SD is about ensuring a strong healthy and just society - meeting diverse needs of all people existing and future communities, promoting social inclusion and promoting equal opportunities.

For energy this goes through the supply chain - highlights issue of coal miners.

So ensuring healthy and just society:

We do this two things by providing a sustainable economy. Environmental costs fall on those that create them - polluter pays - and efficient use of resources is incentivised.

Good governance is essential - active participating systems in all level of society

Finally SD is about using sound science responsibly - ensuring that policy is developed (precautionary principle should be used)

As we make difficult energy decisions we must follow these 5 points.

ALL 5 points are required we do not trade off between them - we can use all five of them and still make good decisions but we rarely do - because it's too much trouble -

It's too hard to do all baseline measurements (as we should be doing) before extracting shale gas - too difficult

Instead of good governance, energy debate is around a gov that wants to make decisions without letting the public have its say
Coal fails every test of SD

CCS - if it is ever implemented partially fixes one aspect of it but does nothing for the rest

Wind Power in UK - wind changes recent landscape - since we had wind turbines 200 years ago

Nuclear plant changes landscape as well, so does coal mine - when we consult public when good participative power is applied - wind is favoured, even in communities where wind farms are built

Is it sustainable economically?- yes, offshore wind as well will reduce the cost and play bigger part in energy mix

Issue of wind, how do we deal with variability - we must move towards greater interconnection between UK and other

countries. Interconnections alleviate need for fossil fuel back up because all of this interconnection is to low carbon electricity: French nuclear, Icelandic geothermal, Norwegian hydro - we are doing it already - we are interconnected to France but could build more.

This would make good economic sense - for us and for connected countries as well - Strong resilient society across a broader EU community

Storage can also alleviate variability - flow batteries will make big impact.

Biomass can also be used for other transitions.

I want to come back to costs because poverty and fuel poverty is a big issue - cost are coming down for wind - Chinese announced that by 2016 they will be able to do large scale PV at cost parity to coal. This is a transition that is required for all parts of industries - instead of campaigning for subsidies - cost reductions can happen but they need to be substantive - cost reduction can happen

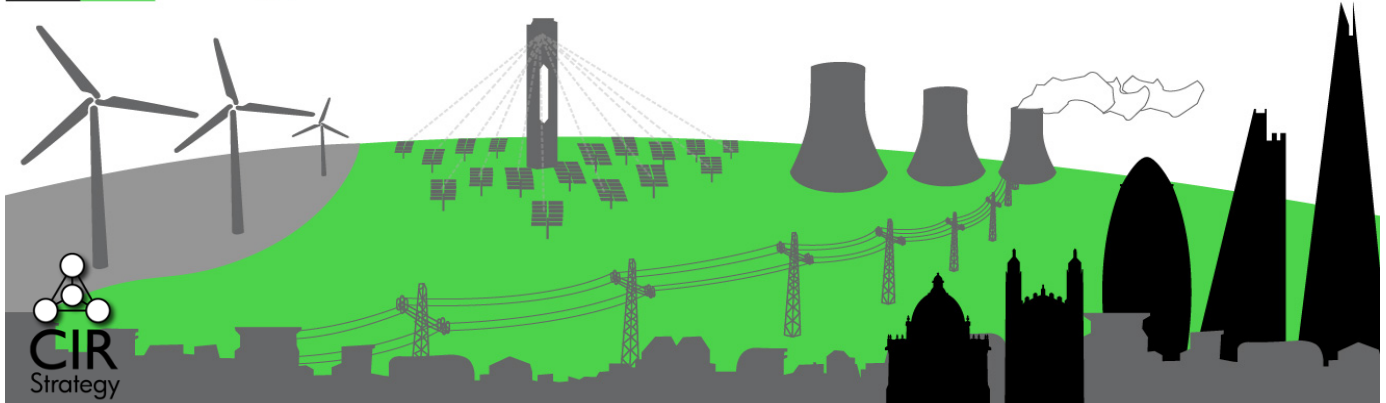
Nuclear is a separate subject - has managed to lock down subsidy into future, however, healthy business should need no subsidies.

Plenary panel with speakers and chair

Chair: we had fascinating range of views on all areas - Questions

Q: Interconnection: will it make it easier only for first movers to increase the renewable?





Answer

I am careful with this to include France - its not renewable its low carbon - we see it already in Nordic countries, they use nuclear to stabilise - without nuclear part of your premise would be true (Bernard).

Greater interconnection makes it easier to deal with less flexible supply - it is a good thing - Balancing Denmark by spilling electricity into Germany wouldn't work - so yes interconnection will help - but one problem that interconnection won't help is that meteorologic conditions cross the boundaries of EU - so seasonal imbalances wont be solved by interconnections - storage will also be needed.

Countries with mountains and Hydro - very powerful voices - Austria very much against nuclear but they buy energy from France ().

Also interconnectors relatively expensive and limited capacity - part of the solution will be interesting to see how they play out - interesting balances that need to happen - modelling v interesting

Q: Good governance is an oxymoron - govern is about maintaining the status quo - but this is not what we want to maintain - example tidal barrier - biggest battery in the planet but I cant even get to talk to a Minister because political will is it will upset someone (person from Wash tidal barrier)

Issue is how do you redesign decision taking?

The specific is different than the general - At the moment, big tidal solutions are very expensive, unfair to say gov hasn't considered this - Wash and Severn are being considered, when we have done participative processes people are very much in favour (instead of nuclear) but there is a cost of question (Bernard).

Quote - Tidal solutions have been in parliamentary discussions - its not a dead issue but there are some challenges - I like tidal solutions, but structure need to be set up.

Q - Follow up to that question on tidal solutions - I lived in the Netherlands they have this barrier already there.

A -If we were to build a Thames barrier today we would build power generation into it - for other barriers there are environmental issues related to protected habitats. Severn stuary - if you build barrier there will be changes to the habitat - any change is harm - we don't have a way at the moment to weigh or to make decision between concentrated harm and distributed good.

Q from Sentec- Interested in the intersection of two visions we heard from Cunningham and Bulkin - Apple led consumer approach, will it lead to sustainable development?

Quote2 - I agree with Bernie - if the commercial environment for energy management is there - it will happen - if people can buy it and value it appropriately it will happen - good to have sustainable objectives - but commercial viability also important - I think we will get both - the more that enabling technology is there at right price it will happen.

In orgs like Google - there has been a shift to understanding energy - more strategic not just about assets. People like Google have the resources and power to influence supply chain.

Morning coffee & showcase of products and services

Session 2: Grids stream Connected Intelligence: servers, networks, meters, fast data analytics

Introduction from the chair: Intelligent networks - connected intelligence is what networks are about

What has happened in the last 40 years in ICT

Marieke Beckmann, CCM National Physical Laboratory Smart grid measurement

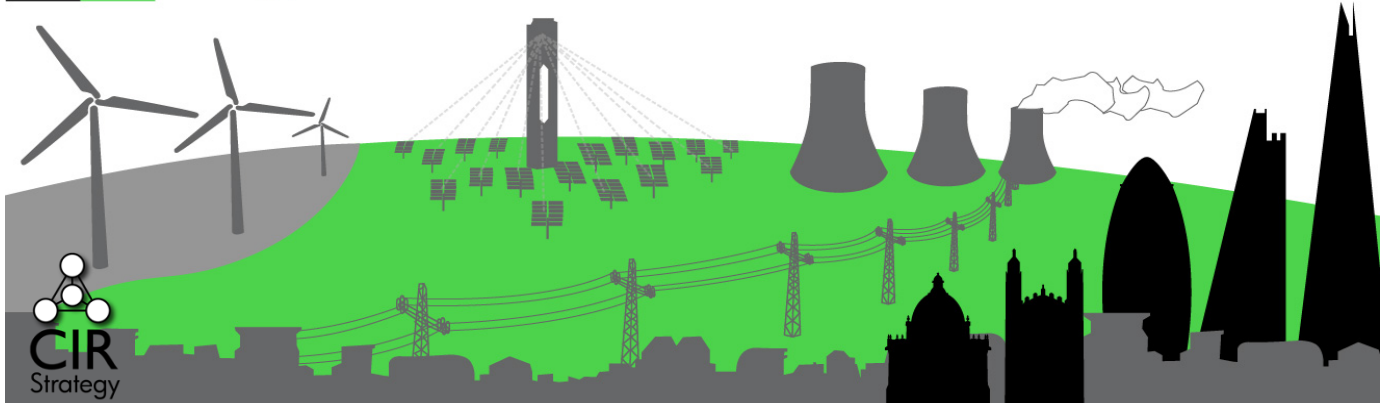
Why measurements are important and how metrology can pave some of the way to SG and how you can get involved

What is NPL - owned by BIS - largest science asset of UK gov - aim is to produce science with impact to benefit society

Level of accuracy is increasing enormously - its important because we need high level of accuracy to be able to have a national standard.

In SG we address 3 areas - renewables impact on the network, instrumentation for networks, and carbon savings of smart intervention - very complicated to calculate.





Slide with example of HVDC networks and installations - provide measurements of power quality. Example HVDC link between Holland and Poland - measure voltage changes.

Example of wind turbines and how they affect cities

2nd issue - instrumentation - have been doing work with dynamic rating of cables: if we put too much power into the line - fireworks - DNOs need to know how much power can be put into cables and how to manage it - we integrate weather predictions in our ratings.

European metrology program - work with University of Strathclyde - optimising algorithms to find which data is vital, necessary or optional (issue of data overload)

PMUs - warning of system stability - ERMP project around this to create tools to measure and locale power quality disturbances

Optimise harmonic mitigation

Some of the measurements are around fault location, how to measure power flow through networks - why does this matter? Because it costs money to have a blackout - its not just inconvenience - even limited outages are hugely costly to industry.

Final area is on carbon savings model - Ofgem trying to assess carbon saving potential of some LCNF projects- we developed a model to assess this. Ex project in Ireland to measure behaviour changes in consumption as a result of smart meters -

Just for fun - we took the UK national energy generation and developed a carbon factor

We are currently running a challenge price with Nesta - dynamic demand - innovations allowing households to reduce their demand at peak time - 70 applicants - 5 finalists - we've been working with them for the last months to develop their ideas further.

Will announce winner later this june in science museum.

I wanted to give you an oversight into what NPL is doing and activity we provide and how measurement can provide progression towards SG.

Question - in carbon measurement - do you include embodied carbon?

We have researchers that work on embodied carbon - we do some attempts to do but it is very difficult but at the moment the model is just operational data.

Person that made the question highlights need of life cycle approach to carbon measurement

Dr Sean Cochrane, Director Cyan Technology A connected energy network through metering and lighting

Will talk about our work in smart metering and SG

Based in Cambridge

Mainly involved in smart meters (SM) and smart lighting

Main operations in China - smart lighting and smart metering

Work going on in India and lately setting up projects in Brazil

We are focusing in world emerging regions - in the emerging world emerging challenging and differences in how utilities and grids operate in some instances there is no infrastructure.

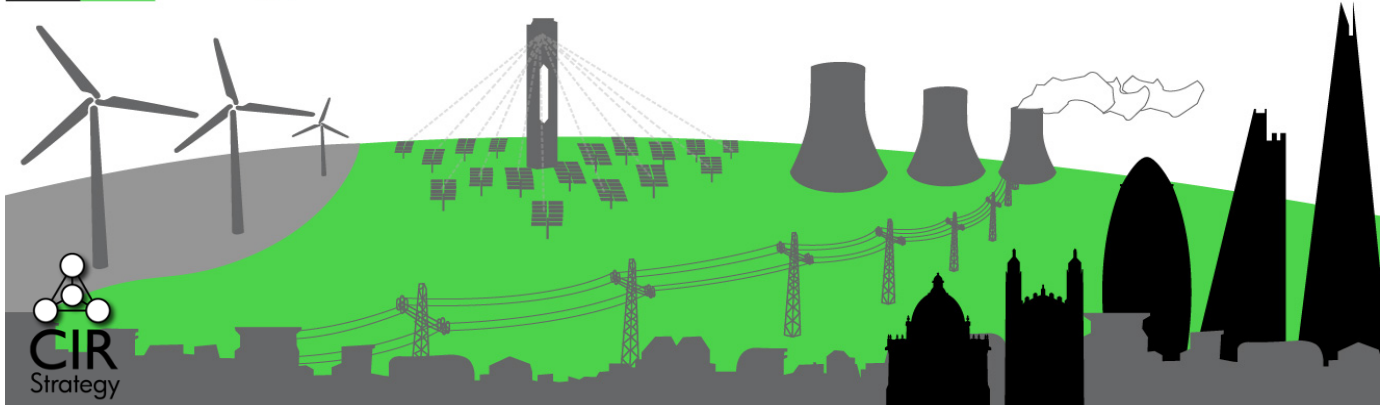
Project in gas in China - gas meters - battery life management is the key thing in this - we managed to get a 10 year battery life.

We have found that cost is very critical - In this instance the utility didn't want to spend money on the battery.

Electricity metering - we find in territories like India that the collection of meter data through automated reading won't happen in one go - it will be a staged process - putting radio technology for walk by reading solves a lot of the initial problem of accessing and finding the meter - in India sometimes difficult to find dwellings, no google maps - radio is first stage of automation.

Second stage - is allowing utility to migrate to (??)





We use good solid low frequency radio technology - sometimes you try to get data from places like an alley - difficult access. We provide interfaces into billing systems and data management systems.

First things that utilities want to do - getting readings in - see if there have been attempt to tamper with the meter. India there is not enough generation capacity to meet demand - at peak large chunks of cities get switched off - what they want to do with SG is to manage that - avoidance of load shedding is something we get involved with.

India - there is the issue of losses

Huge amounts of electricity from illegal taps - automating meter readings has advantage of avoiding having guy who reads meter on your side. Political aspect is important because of social aspect of electricity.

In India huge need for investment

Projects we have ongoing - (slide with map with projects in India)

We are agnostic to meter technology itself - good to separate meter from comms infrastructure - we work with different meter partners - we achieve interoperability between dif vendors

Big project in Trichy - 2000 meters

Retrofit - very important - massive base of installed meters in the world - a lot of utilities don't want to just rip off the meters - big issue in India - in the UK as well. Being able to work with existing meter and bring in on to a smart platform is key.

Project in Brazil - successful retrofit

Lighting - we can manage demand on lamps and bring energy usage down.

Projects in China

We are working on bringing this technology into the internet of things - Smart metering as a platform to incremental solutions.

John Di Stasio, CEO Sacramento Municipal Utility Department (SMUD) Jt Keynote: Smart grid intelligence and risk

Recently retired from SMUD so my discussion is more philosophical today

In US regulatory environment is not homogeneous among different states

SMUD - municipal utility - California 25% renewables - we are vertically integrated

Space-time: partner in our smart grid project - provide tech that presents data visually

External drivers for changes in US - key dif with UK - energy deregulation is not coming through policy but through technology - organic - heavy emphasis on consumerism and tech - that's driving the policy agenda more than regulatory considerations.

Some utilities still focused on interactions with regulator we were more focused on things coming from consumers.

Drivers

We have climate change policy in California for reducing emissions

The focus is on physical and cyber security

Renewable integration is a big challenge - electricity demand follows a duck curve - we need renewables on our systems - but supply sometimes creates negative pricing - integration issues because we have a base - In California we have so much solar during the day that it takes care of all demand and in the evening there is a huge ramp of demand for traditional generation to step in - huge challenge - SG help solve this

New Customer expectations - challenge of integration

SMUD started to use demand side management to get rid of duck curve and create a more flat curve - look at consumer side to deal with ramps in the curve

The utility of the Future in the US -

Where do they stand in the Future as we transition to a more distributed model

SG Investment Grant

State of California got largest grant - thanks to it now part of our system is smart enabled.

Smart sacramento vision - infrastructure delivery pipe historically - now intelligent structure and interoperable

Slide describing how the grant was spent





DRS - customer driven and industrial consumer - we did a consumer study - dynamic tariffs important

We installed 615,000 smart meters

Distribution automation - no intelligence below substation level - historically a dumb system not much investment historically
We used automation to reduce our outage minutes - data from smart meter was used to reduce outage time and customers affected

Electronic switching - graphically seeing the system was useful to dynamically switch - data from smart meters was key

Outage communication - was v big - with SM we could tell a customer was out before they know - embedded outages - power up but some consumers still out - we could now see that and give them estimated restoration time and confirm they were restored - that info made consumer satisfaction go up enormously before they had to call us for us to know they were out of electricity.

Enhanced outage management - data helps predict weaknesses in the system -

Other part of it is Big Data - all data from SM - having an understanding of what info do I want to use what can we enable - utilities not good at that, others see value proposition of that data mentioned before - allowing people to use energy in a different way. We adopted idea of providing analytics with the data so that consumers would make energy decisions.

Situational awareness and visual intelligence - Space-time technology very useful

Examples of what was done with that technology:

Help operate the system much more efficiently.

Tech also used for asset health - predictive maintenance

We also looked at conservation voltage reduction - granularity gives you the ability to be more efficient - energy savings through optimising our own system - consumers get benefit as well.

As a result of SG project also operational centre went from paper to computers.

Martin Dunlea, Global Industries Lead, Utilities, Oracle, Jt Keynote: Fast Data, Actionable Data

key message - how utilities are adjusting their business practices in face of data coming into their organisations

We work with utilities around the world

Utilities' understanding of big data - they typically talk about the increasing volume of data - But utilities are also realising that the speed at which data comes in is increasing, also the variety of that data (more unstructured) has changed, finally how to drive value. These characteristics are very challenging for utilities.

We know that the very best companies have taken on the challenge to manage the data and have seen a positive impact in their business.

Bad news - utilities only very low percentage are implementing changes to manage the data (17-20%)

Utilities at the moment are collecting data predominantly through smart meters (SM) - but now starting to look at other sources of data - sensors, distribution management systems...

Finally, utilities want to optimise their operations through data. (results of survey - all of the above)

Shift in focus - but utilities still using data

Utilities are also realising that data can be used for more than increasing operational efficiency - demand forecasting - energy retail,

Why would utilities care about this data and value to their operation:

New data sources - offer possibilities for utilities to use data to make better decisions (see table)

Utilities need to move into a more complex environment - new challenges that utilities face - at Oracle we have been trying to understand that if you decide to build a platform to manage big data and get value out of it - need to think about a number of things - bring it in and integrate it into traditional applications and how are you going to analyse that data.

Different stages - acquire, organise, analyse decide.

Oracle has developed a platform for utilities globally (see slide)

Yellow box in the middle - utilities: we would like to develop standards into data management- OUDM - we have built a model to help utilities with their data management.





Natural progression in moving from data to big data

Fast data is a complementary approach

If data is managed properly - decision making is improved

Fuelling this demand are increased volumes of data, complexity and speed

Amount of data has no signs of slowing down. -Organisations need tools to capture and analyse data

Data management platform enables this

For utilities - significant move from structured data management now unstructured data that needs to be managed and integrated into the org.

Panel with Peter Drake, Managing Director, Intelligent Networks

Q - How do you justify investment in SM and whether benefits were worth it (q for john)

A - We did a Business case - we were going to do AMR deployment - roll out mandated

We have achieved more operational benefits that we thought - some hard to monetise - ex.consumer satisfaction - we have also had operational benefits - the investment has been worthwhile - makes a difference if you can improve the relationship with the consumers.

Dynamic pricing was the most beneficial tool

Q -Any reduction in consumer usage?

We provided people more granular and frequent information to make decisions - this flattened consumption

Q - two questions - one on bypass to Cyan -

Two also - In this country issue around consumers not understanding tariffs - how did you get past that (to John)

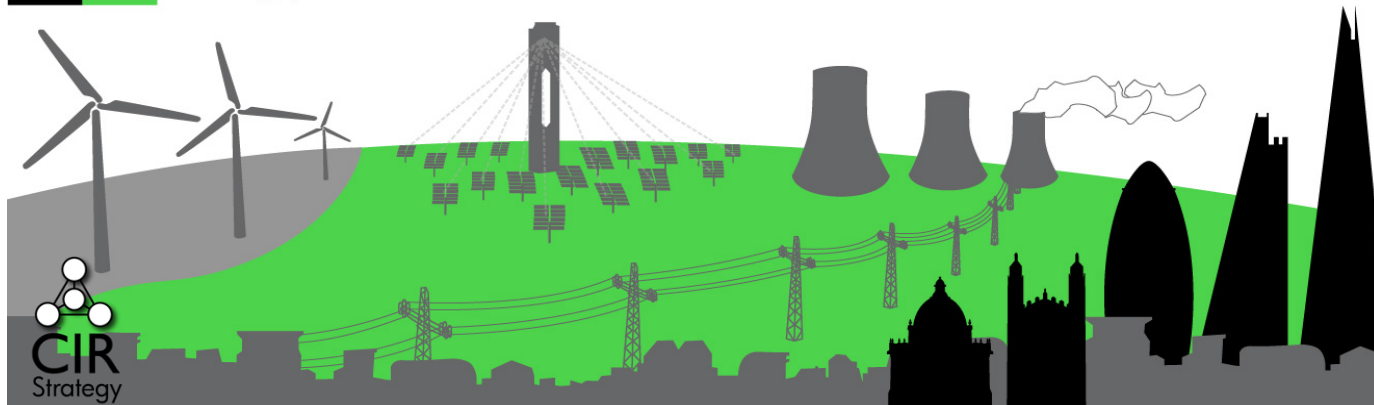
Cyan - value from data from meter - used to catch people tampering with meters - system was put in place for people suspected of tampering to try and catch people at it.

Analytics - enable to see irregularities you can zero in

John: Tariffs - we are regulated locally - we are municipal - so we were able to get the approval - we did 50k customers - we provided customers with different technologies to see what made a difference - we took a subset of customers and put them on the tariff without getting them to opt in - level of satisfaction was the same even though they didn't have the technology. There is something about behavioural change, I think and we are just starting to scratch the surface.

Lunch networking & exhibition of products & services





Session 3 Grids stream Smart Cities: real systems solutions at scale - the industrial internet

Panel with Tony Rooke, Sustainable Strategy Director, Smart Cities & Innovation, Infosys

TR: OK, now in this session we've got a range of speakers who will each give us an understanding of real life situations, developments at scale, and the IoT (internet of things)

14:00 Michael Clark Programme Director - Low Carbon London UK Power Networks, A Smart Grid for London

Hello, I'm Michael Clark, I have the pleasure of running LCL day to day, we're nearing completion by the end of this year, will be publishing everything we've found out, exciting time, busy time, there are lots of reports to write about what we've found out... we're doing these with Imperial College London.

Quick recap for those not so familiar: UKPN serves 25% of UK, mixed network fairly unique, varied component network, London one of the densest energy networks in the world; unique situation to test genuinely smart grid that is LCL

As we move forward into new regulation period we are going to see moving from very dumb local network into a semi smart that means autonomy, an awful lot more data and measurement points, programmes like this really serve up the challenges and seek to find solutions, level of complexity and automation that will come through

We'll also see the national smart meter roll out, but to realise the 12 billion cost for installation we've got to know what do with them how to use to genuine advantage for DNO and our customers; there's a shift, all seeing huge volumes of DG, including response markets, not what the grid was originally designed for, can be done but not trivial e.g. turning off generators at local level not trivial especially when lots of faults on network big issue for us in London

Probably the biggest impact will be from electrification of heat and transport... huge lift in demand from today and we need to be ready

The new regulations we're entering into, and with LCNF, there's a definite steer towards smart, not being pushed, I think we agree with that, also daily emphasis internally of value to customer, second only to safety; LCL geog nature and variance across our customers ideal location to test

I'm looking forward to share insights

[Reads out slides about 2020 predictions]

The networks will not stand with this as they are, traditionally we do reinforcement but now we need to discover where the value is in not carrying on with the old, behaviour change, better value for customers, key aspect of what we're doing daily LCL really set out to be *the* holistic smart meter project, we've included smart meters, ToU (Time of Use), EV and HPs, customer adoption issues... also the distribution networks need to use DSM for different cost and tech drivers, but there are different conflicts and synergies of doing so

Volumes of DG (distributed generation) on the system are really not trivial

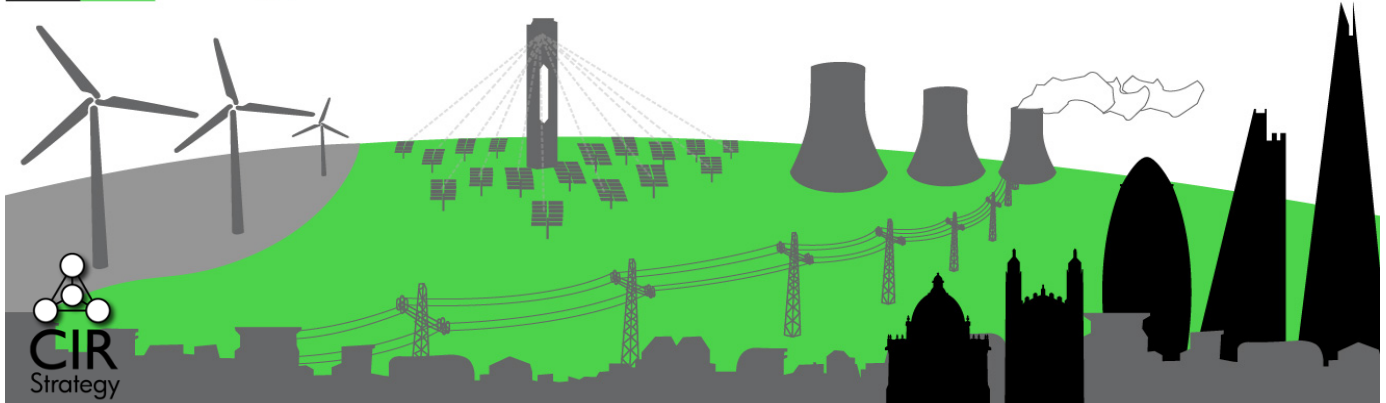
When we set out, the volume of wind was huge, and this could have a huge impact on balancing ... DNOs will need to know how to do the balancing attendant on this (wind)

We have limited time so let me just give some insights into what we've been doing

Smart metering is really the jewel in our crown; 6000 customers with half hourly profiles for a year; graph shows the variance between customers in how they use their energy; the way customers currently billed and profiled not the best, but for DNOs to have this once in a generation insight, locations, demographics, volumes of people in households, help us design networks better, extend the life of some assets and plan ahead

One of things I'm most proud of, the dynamic ToU, with EDF over 1100 customers on this tariff, real insight into people *can* sustain DSR when the system needs it, we've taken data from last 10 years, data sweepings, simulate people's use of that out of peak times, also tested dynamically i.e. Day to day with different price bands, simulating network faults that may take one or two days to fix, low prices less 4p kwh, high price 67p, people not just respond for first couple of months, but consistently, many saving more than £100 a year, some people are fairly indifferent, and a smaller proportion that loose a little bit, mechanisms to compensate because it's a trial the more in lower orange segments of graph the more are responding to price. Therefore people can understand more complex tariffs, provided texts on their phones; vulnerable customers can they get the same benefits? So it's all fantastic news





Slide 7 figure looks like Elexon Part 1

EV and the electrification of heat - first time understanding diversity factors of EV, diversity a big deal for DNOs, people use on average less than 2kwh per household, but that changes significantly with EVs, we've got a big enough sample to say people using another 1 kwh, on average 0.3 per household, with EVs. But people do plug in in the evening just after the evening peak, big challenge we need to understand how to manage it

DSR we're really targeting specific assets, we're committing £44 mill of future plan to this

We can look at power flows right across the network are, see with real power and clarity

How do we calculate net present value on our network in order to return that value to our customers? I'll take questions at the end.

TR: OK, now we have Rich Hampshire, this guy knows more about smart than any guy I know - apart from a few people in this room...

14:15 Rich Hampshire, Principal Consultant CGI, End-to-end smart grid & consumer engagement

Smart grids definition = incredibly broad

3 significant terms

Intelligence - lots of data but data is only data what are we going to do with it? How deliver value for utilities and consumers?

Behaviour - consumer end

How do we keep our energy system *both economic and long term sustainable*?

Intelligence - greater instrumentation including LV and secondary networks, not just transmission grid, impacts on design, build, operation and maintenance of networks over the long time. Will also challenge their operating models and core capabilities some orgs v good at that, some orgs with skills at collaboration and partnership already owning more part of SM domain

We are going to EV transport, and heat, that's going to increase demand on networks, micro generation and embedded generation in networks, wind solar wave whatever comes next, therefore more complex and dynamic infrastructure system, and we will need more intelligence to manage that

Consumer end, want to draw on experience in Sweden engaging consumers, key elements in getting people engaged, need to get committed people to BUY in, not just understand what to do but commit to taking actions, feel part of something, was one of Green Euro 4 exemplar cities, putting people in control, I've not heard about consumer delivery body, perhaps challenges for more negative message in press, but was about broad group and the tools with a web based platform for info, but that web based platform was about making it easy and relevant to engage with, e.g. I live relatively modern housing estate, e.g. me and my three kids opposite single guy but we have the same energy consumption, making info important, engaging people to changing their behaviours, and reinforcing actions so that they are positive

One side make it simple to understand, are you average, worse, best practice? If you're some way off best practice you can start to take actions of low hanging fruit; on the right hand is gamification, getting people engaged, putting prizes up, giving people challenges to reduce their energy consumption

Slide 6 only apartments with centralised heating

Where people are actively engaging = over a 5 times saving on normal energy usage

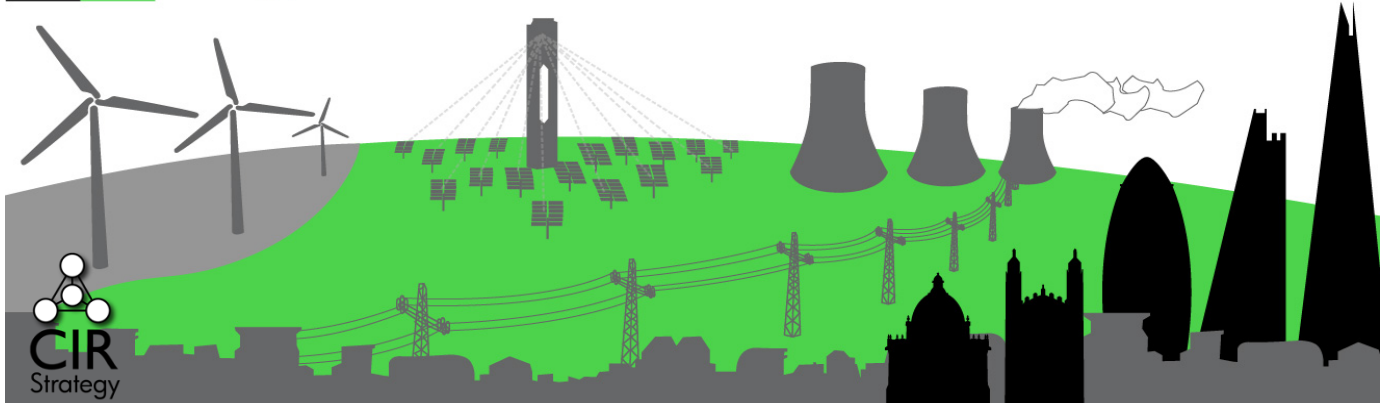
Slide 9 - 2008/9 improvement falls back in 2010 when the website wasn't used; need continuous reinforcement and engagement, improvement picks up in 2011 when re-starts

Good news in UK: more than half of people think renewables will be part of mix; 7 / 8 people not aware of a smart grid; even though 16% heard of smart grid, but 33% think smart meter will help with energy usage

But not that 1 in 6 said they wouldn't use low carbon technology connected to a smart grid, especially in the older generations I'm worried about 1/3 people say they would opt out of access to the use of their data - worrying for an intelligent system with data

We're on first steps of journey with smart grids, but 2020s economics of next regulatory period will help smart grids





Demand side - google buying nest, apple moving towards a smart home system, I'm not convinced it will happen in 2 years, but automation and closing that control loop, but more and more consumers will begin to benefit as this happens
Smart grids in themselves - we need them to help us move towards a low carbon econ, low carbon energy consumption, implications on design and commercial arrangements on our networks; consumers can reduce their exposure to rising energy costs by choice, but by ability to manage the technologies, without affecting their lifestyle in tandem with ToU
This is not just a new piece of technology, long period, consumer attitudes will change, business models will change, less consumer fear of the new,
Finally we do a series of dummies' guides; one on water market due out later this month

TR: OK, now we're going to have a case study of an M2M platform for IoT

14:30 Philip Burr, Director of Product Marketing Arkessa, Case study: an M2M platform for IoT Solutions

I'm going to talk about enabling the smart grid. The energy trilemma, emissions, security of supply, and cost
Part of solution is moving to renewables, levelling of supply and of course the different solutions can be deployed to help with that, smart meters, community energy schemes or microgeneration, or DSM.

UK lots of stakeholders involved, so lots of challenges

One of key issues is about intelligence, managing supply and demand as effectively as possible

Is the community microgeneration actually working? What is happening with the storage? All this is driven by data, consumers need to reduce cost and businesses need to reduce energy and longer term view when to modulate energy usage

One of the key problems for data is connectivity - how get from those devices and assets that are deployed? Different sensors, smart meters, production side, distribution, community microgeneration, lots are situated in remote areas where costs of getting connections there is challenging

Therefore connections need to be easy to install and reliable and cost effective, in order to provide energy as cheaply as possible, as well as secure so it can't be tampered with

Good news is that Arkessa are highly experienced at providing connectivity, biggest for commercial and industrial smart meters (? In UK?) , we have specialists and specialist team in energy utilities, and tailored offerings for that

Key requirements for this connectivity, because 1000s of connections managing that a key challenge, need strong tools and systems to manage those connections, if you're paying for those connections you need to have the knowledge of what's going on in there. Often done via GPRS or 3G, so if you've got multiple communications providers the problems multiply. Typically you have got to use multiple comms providers, so typically customers come to Arkessa because we can offer connectivity across multiple coms systems, so no-one needs to visit smart meters, or sensors, to actually get it to work

One of our customers has measured this reliability, single network with a single operator in the UK, but with Arkessa improvement in efficiency from 85% to 98%. Huge difference

We will start seeing a move towards different, or M2M options, connecting to these devices, so being able to have a level of separation from these technologies is desirable. Providing that one service to our customers is very important.

The other challenge is around data integration, how get all disparate devices and data communication methods, you can apply data analytics, information management systems, you need to bring that together in an intelligent integrated way

We have an IoT integration platform, connecting devices to enterprise, the platform does that, takes care of the security and provides a unified data set into that data system

Large no of customers across energy utilities I'm sure you'll recognise many of those names

We provide the tools to aggregate and manage on the smart grid, independently of any particular operator or technology, and we do that privately. Within that system we provide tools to do useful things with that data and feed big data analysis.

TR: OK, now we have the CTO and founder of Moixa, who's focused on more of a local level: energy storage in the home

14:45 Chris Wright, CTO, Moixa Technology, Enabling localised energy systems through smart storage in homes

Distribution storage systems and how this could benefit the smart grid, also the atomisation of the grid itself





We're a start-up based in London, we've been developing the Maslow distribution energy system for the last 2-3 years, small object that fits in your home or near meter, storing 2kwh of electricity, hosting a DC network in that home, for the lighting in your home, we're very interested in the transition from traditional DC to AC devices, around 40% of energy bill is DC devices so as these become AC (e.g. LED driven TVs), integrating small amounts of renewables, e.g. 2 PV panels for off-grid lighting, and enable people who not own their own renewables to manage it e.g. on a window, balcony;

Here's where we think it's really interesting; lots of work across the world how energy storage across grid can alleviate problems from intermittency of grid; duck curve can be flattened by storage so less need for peak hour plant

So we connect via various comms systems to our devices, via the cloud but to analyse system performance across arbitrary groups of systems e.g. all Camden, all London, or all of a particular type of household, analyse overlap across groups, where are they all pulling and pushing power

I'm sure Pilgrim will talk about how IT is moving from silos to horizontal silos

So we're integrating with Good Energy and substation data, to provide services via the grid; Kiwi power, integrating services across the grid

We think storage on the grid can alleviate and make sense of make more of that resource available, provide resilience in the home, we think by pushing it into the home rather than to large things it becomes a lot more scalable, and a lot easier than Dinorwic, because we're run out of mountains with lakes at the top at $n = one$

So this is an example of us looking at an aggregate, shifting load in the home at peak times, we're currently rolling out to 300 homes via a contract with DECC, enabling us to demonstrate that we can provide services and utilities from that aggregate of lots of systems (home)

Take from the level of the desk, to the building, to the city level; USBs will go from 5 W to 100W devices, enables us to know what's happening in a building in a quite a granular way

We're also now kicking off some projects with SSPD as a DNO, and British Gas as a utility; what does it mean if you try to integrate within a localised system, and look at energy flows within that community we can optimise for it, how the community as an aggregate can consume, adding storage to household with 2kwh PV, can push to greater scale within a whole community; Mrs Smith who's gone on holiday can lend her energy to Mrs Brown who hasn't. We're really exploring that...

[Question from audience - is that still DC energy? No, it's a billing problem rather than a technical problem, the wires are there but the ability to create a virtualised private energy network, question of how you create the enabling technology for that)

Support for that, at the level of the locality e.g. For DNOs infrastructure, or pulling power when wind success, or pushing power when need for support; we see a need for services to lots of layers to the energy stack, consumers arbitrage their microgeneration production, to DNOs, but pushing storage at the edge of the grid i.e. in homes, you can provide services / market for that storage in lots of different ways rather than putting next to a large station with less attraction

15:00 Dr Andy Stanford Clark, CTO Smart Energy, IBM, Keynote: Smarter planet works

This is a project funded by TSB, based on IoW, the basic idea is that you take electricity put it into an electrolyser, capture the hydrogen, put it into tanks and use it for various things. Several research projects. Add oxygen to make water plus electricity; or decarbonise the gas supply, e.g. 10% hydrogen into natural gas and no explosion, Germany trying 15% we'll wait to see the results

3rd use is to power vehicles, what we're doing on this project

Several universities working with us, also NPL, also SSE because these things use a ton of electricity, we're also doing really cool things will fuel cells and workshops in schools, raise awareness what's TSB really wants

2 40foot shipping containers; refuelling station, storing hydrogen at 300bar in tanks, at 70bar in cars, not like EV charging for 6 hours at a stretch; we do whenever there's a much renewables as possible because it is energy intensive

The electrolyser itself, a desk side one, you can also get a desktop one, you compress the hydrogen, store in high pressure tanks, at least 500bar pressure, then computer controlled dispenser

University of Nottingham model, when's the best time to run the system, there are ideal sweet spots,





Storage racks are ludicrously thick metal

Fuelling station, smart card to identify yourself and which vehicle it is, so the billing system knows who you are, and the storage system knows which vehicle

Q - Are people prepared to pay enough for the hydrogen conversion and storage?

We started 18 months ago, we don't know the answer yet, we will be commissioning the equipment in the island in July, then one years' trial Sept14-Sept15,

Different types of vehicle, an hydrogen internal combustion engine, quite easy to change petrol engine to hydrogen if you know what you're doing; 6 hybrid transit vans short haul haulage both petrol and hydrogen; the range is the same as petrol The coolest vehicle, hydrogen at the back, sucks in oxygen, makes water that turns engine round, Hyundai are manufacturers, and we're negotiating to lease these

Some tiny taxis made at the University of Warwick, I hope to use to drive to the ferry every day, but not as comfy as Hyundai Also hydrogen boat at Ventnor, modified outboard motors, will run one engine on petrol one on hydrogen within this single boat, hydrogen tanks are really heavy; quarter of a ton, cheetah marine are one of the partners doing that

This is all part of the smart grid in my mind... fits in really nicer with IBM's smarter planet, integrated and intelligent systems thinking

Q - (Christopher ?) Lithium batteries - how recyclable are they? How long before they need to be replaced?

Around 2000 cycles, quoted guy, they're pretty recyclable metals like lithium, we're agnostic about what the technology is, doing some work with other firms, and other batter types, diverting batteries from being recycled and reusing them. So long as battery is reasonably energy dense we can manage any of those

Q - I'm particularly interested in this hydrogen story, what are the practicalities e.g. LPG cars loose boot with gas storage? Safety issues e.g. fire?

Yes, lose boot because of 50 bar tank. But in terms of safety, hydrogen is safety, if you pull nozzle out of petrol pump, petrol fire goes down and across c.f. hydrogen fire goes straight up, in terms of taking hydrogen vehicle interesting; carrying hydrogen in container is ok, but not if is part of fuel tank, we had to negotiate with the ferry companies about that. Certainly having a sign on back of your car about hydrogen tank on board stops people tail gating you! (joke)

Q - (Daniela of building intellect) - environmental design and architecture, algae powered house, you can produce hydrogen from algae, so have you considered that?

We have looked at it but we were based on electrolyser technology. Unfortunately, hydrogen buses in London are based on fracking from methane - it's the wrong way round, just use the methane as a fuel first...

Q - You mentioned DG as one of the important parts of LCL?

Yes, in London some fairly hefty targets for energy from DG, also CHP; for us it's very important to understand the fault level issue, the fault contribution onto our existing network really pushes the limits so becomes quite expensive to connect; also can we start to understand who's contributing to the fault level, and if so can we start using some control to shift this, we've got a good idea of who generates often, but we will need to know in more details at all the nodes for 2025 onwards; also 2020; we need to know what we should invest in to deal with this

Q - Which technologies are you looking at?

We're looking at micro generation at the level of LV networks, the other is CHP which has traditionally been for heat according to a summer heat load

Session 4: Plenary Policy debate grids and energy: Innovators, funding, regulation & reforms

Dora Guzuleva, Head of Network Policy Ofgem, How regulation can be a win-win for stakeholders

Ofgem - everybody blames us for everything all the time

We try to create a win win situation with stakeholders - however, we mostly try to protect interest of consumers -priority I am going to talk about Regulatory mechanisms - we have introduced a new regulatory mechanism





Current mechanism is ok has worked for a long time - reduced energy costs and increased efficiency but unclear whether it was right in a new world - was not taking into account the consumer too focused on regulation also needed to change companies culture so that they innovate and look after consumers.

So we introduced RIIO

We need to provide companies with revenues - otherwise we all lose - revenues are now set every 8 years rather than 5 - we are now going through the 1st price review ED1 - just finished for gas.

This price controls focuses on outputs, incentives and innovation.

Outputs - environment now very much the focus, it's also an output - we set target and incentives - they are asymmetrical and there are also reputational incentives.

Innovation - DNOs have not been good at it because as regulated monopolies they don't take risks.

Why did we move to incentivise innovation? I'm not going to repeat what all have said before - new low carbon technologies, policy targets, etc.

There are uncertainties around low carbon scenarios - but it is clear that if we are to meet especially the high scenarios with traditional means, it will mean lots of money and lot of disruption - we can't afford it - people have been speaking about SG for a long time - DNOs built models - we get better results in all scenarios if we invest in SG than with traditional copper and wires.

Also SG are good for consumers

So what did we do - we created the LCNF and RIIO - there are a lot of projects some of those finish this years CLNR, LCNF - delivering results - a lot of money invested - £200million have been spent already - up to £500mm available.

This will transit into the innovation stimulus over the next regulatory period.

LCNF - there are 2 parts - we give some money at the beginning of each period if projects meet criteria and then there is a competitive part - we give money to the best projects.

The great thing is that we have seen some results - in DNOs business plans - some companies are already applying in their business as usual smart fuses, RTTR, ANM, network monitoring, templates are being applied, all have come from LCNF projects.

So this is a temporary fixture of the price control (innovation trials) - enables increasing tool kit of DNO and also it informs policy development - we can look at the results of these trials and change the policy and regulatory framework to enable SG to develop.

In the price control there is a very strong incentive for efficiency.

Learning - ENA have developed a portal with all the projects trialled including all the initial one sof the IFI - data, close down reports that projects need to produce - there is also a collaboration portal. DNOs have also engaged with partners - equipment suppliers, universities, local government, service providers, aggregators - range of companies engaged - part of the incentive is to change DNO behaviour but also to develop a market for services/

We also have a conference - LCNF this year is in Aberdeen - very good event.

Ian Ellerington, Head of Innovation, DECC, The key role of innovators in changing the energy industry

Introductory joke on queens new carriage

DECCs head of engineering and innovation - 2yrs and 5months at DECC

Background in consulting - I set up an innovation program from scratch

Major Programs:

Innovation Policy and Innovation Delivery - 160 contracts and grant -

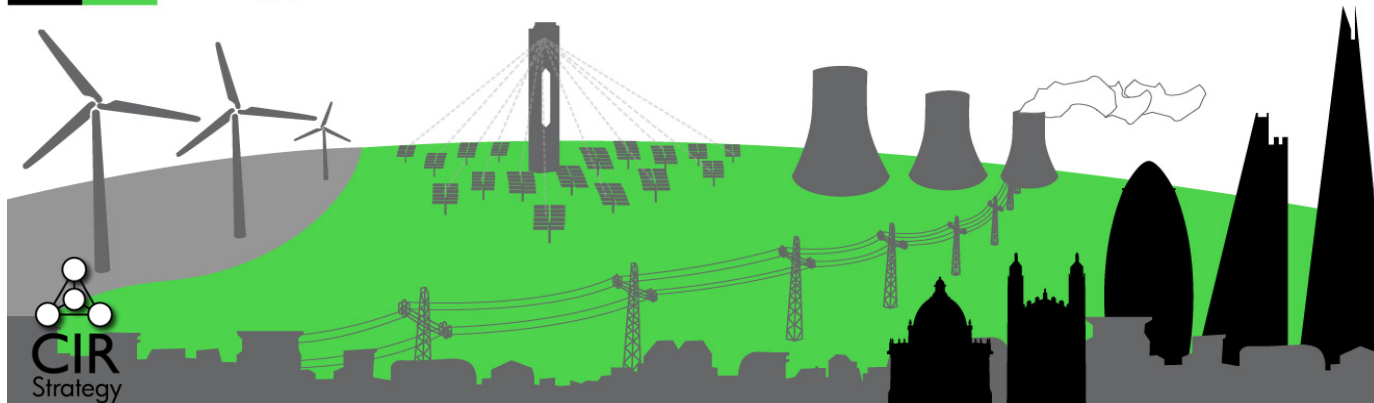
I also have two teams of engineers and technical people - it's a technical resource available to policy teams

We are here to address energy trilemma - they are 3 independent objectives that we are trying to meet - I am looking to achieve all three.

The three things in there:

Sustainability or low carbon although they are not the same thing - sustainability is about a matter of timescale





Affordability - also interesting one - elasticity of demand for energy is shockingly low - I was camping with the family last week - gas is 25 pounds a bottle - I was trying to convince wife to use electricity which is cheaper but she called me stingy basically

Other one is Security of supply

What is innovation - in gov often confused with research and invention - but innovation is about solving problems in a creative way

Gov is spending £2 million in research and innovation - also lot of money is spent on subsidies for companies that are pre-commercial - subsidies are supposed to support a transition into competitive technology.

Diagram into how innovation work - of course its nonsense - starting with R&D is the wrong place (commercial need should be start) - also not a linear process.

So why innovation - talked about the trilemma - clear that current technologies wont give us 3 objectives combined - some are close - ex, PV in west Texas.

So the program we run is to contribute to economic growth and towards the trilemma and reduce risks and costs of future energy policy.

Encourage innovation in areas that we think are required - mixture of procurement, grant schemes, and direct resources in private area

To get 2050 targets we need quite a big step forward in technologies both in supply and demand -

Electricity only 35% of energy usage - heating is highest so insulation would be a key way to reduce domestic energy usage

Across public sector series of bodies involved in innovation - DECC provide guidance to them.

Low Carbon Innovation Coordination Groups (LCICG) - identify important areas for innovation

I have a budget of £200million - I try to find the best value - on DECCs scheme is mostly late stage support - they work in the lab and unsure about the commercial - crawl steep side of valley of death

I don't have to ask for a return - we work with 60+ SMEs -

WE spend a lot of the budget in building energy savings, very important - also in offshore tech because costs need to come down - see slide

Example scheme that we are running - energy entrepreneurs fund and energy catalyst

Convertible grants - can be converted into equity

It's a very broad innovation program, I have a team of professional investors to help assess commerciality - we treat it as an investment pitch

Also Technology Strategy Board - Energy catalyst - open for any application for people that have innovative technologies that meet the requirements - lots of different projects - ex. novel double glazing technology.

Halcyon- wireless lighting system - product will be commercial next month - LED high efficiency light bulb - wifi controllable

Low carbon innovation is key to achieving energy objectives - all need to be working collectively

Also working internationally - UK can't do this by themselves

Next thing we will be doing is prioritising technology options - 2020 is not that far away

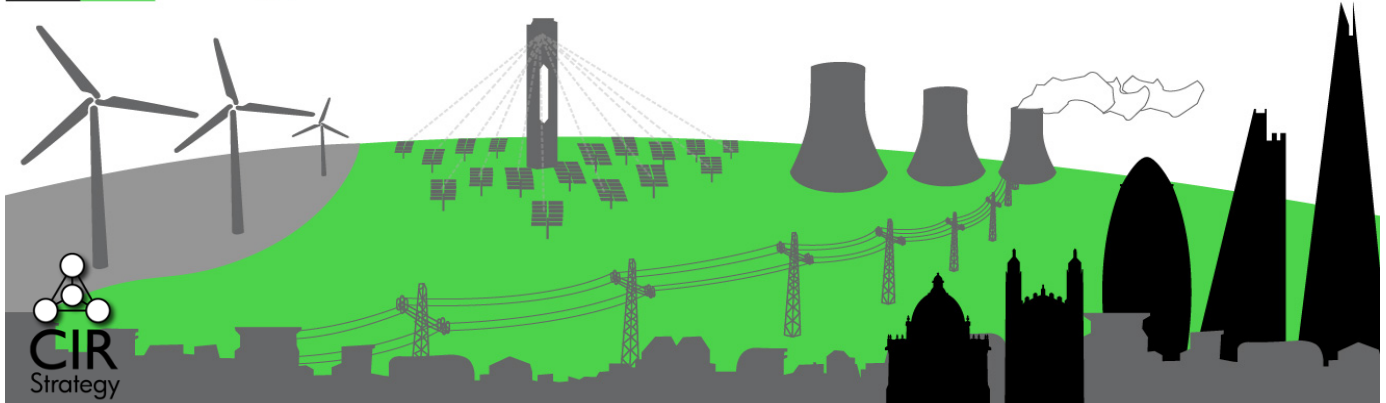
16:45 Dr Mark England, EVP Smart Grd, Sentec, Routes to market for energy innovators

Sentec we are a smart energy innovator

We have covered already, what is driving our energy innovation - ultimately it comes down to CO2 emissions reduction - renewable generation, improvement in efficiency, electric transport - CO2 emission reduction is driven by policy not business decisions, this affects ability of innovation to get to market - not down to speed of technical innovation - limiting factor is typically commercial or financial constraint - particularly because we are dealing with regulated companies - next regulatory period is 8 years - in a way that locks-in certain techs.

Second thing is quite poor linkage between investment in tech and financial return - in electricity innovation is spread along the network but only one party pays for it.





Small business typically better at innovating - but we are trying to sell to big business and they are used to buying from big business as well.

What alternative ways are there for getting to market:

3 examples -

Licensing an enabling technology to someone established in the market- this is the one we've had most experience with - IP licensing - need to make sure your innovation can be well encapsulated to be protected by the patent system - patent is lever to making money - Typical license structure - manufacturer uses your product and you get paid royalties. - Example sensor- we licenced it to Invensis (sensus now) 4 generations of meters - we also made good money out of it. Good and bad for us - for us relatively low risk - and can get long term revenue stream - but difficult to sell because manufacturers take risk, need to pay upfront.

Selling components - using a component to encapsulate your innovation - you can do this if you can't use patents. Example where we've done that - component MicroMonitor - energy measurement - cost is so small that you can put it on anything - we provide a very small chip - we sell those part directly to manufacturers of dif measuring devices

Advantages - commercial model is very simple - you can build dif components - lots of possible manufacturers.

Disadvantages - life cycle is very short, final share of product margin will be very small

Final example- JV- partner with large organisation - partner has the marketing and sale capability - example - JV with Selex ES - we are selling grid monitoring systems to the grid operators - results for the 6 DNOS 5 are now customers - this has been greatly helped by LCNF, most of this sales have been from LCNF projects - challenge is turning that into business as usual.

Advantages - as a small business you struggle to sale to WPD -

Disadvantages - culture class, have to share the margin

Finally - who are the innovation winners and loser -

Winners - solution that generates enough benefit

Key message - Important to think about route to market right at the start.

Pilgrim Beart, Founder, AlertMe, Keynote: UK energy management innovation in global markets

I will continue the theme of innovation - Alert Me - company that I co-founded some years ago

Background: computer engineer - 1998 decided to start my own company - have been involved in a variety of start ups - they are all around connected products.

AlertMe: Co-founded in 2006 - based on simple observation - consumers increasingly connected - through smartphones - homes increasingly connected thanks to broadband - but these two things were disconnected - so seemed to be a gap in the market.

Now we are in the space of connected homes but in 2006 there were questions on why this

3 propositions we think were killer apps for home: Energy management, security and telecare (care of the elderly in the home).

We wanted to develop things for the normal people - mass market (not for geeks or very rich)

We seed funded and angel round

Our early customers gave me valuable insights into the direction we should take

Dave MaKay's book Renewable Energy without the Hot Air became the Bible for me

We had BG as strategic investor and customer

Why is home energy management important - it's where 30 of country's energy goes - consumer pull

Homes today - increasing number of gadgets but not connected - contrast with cars - all connected and coordinated without you realising

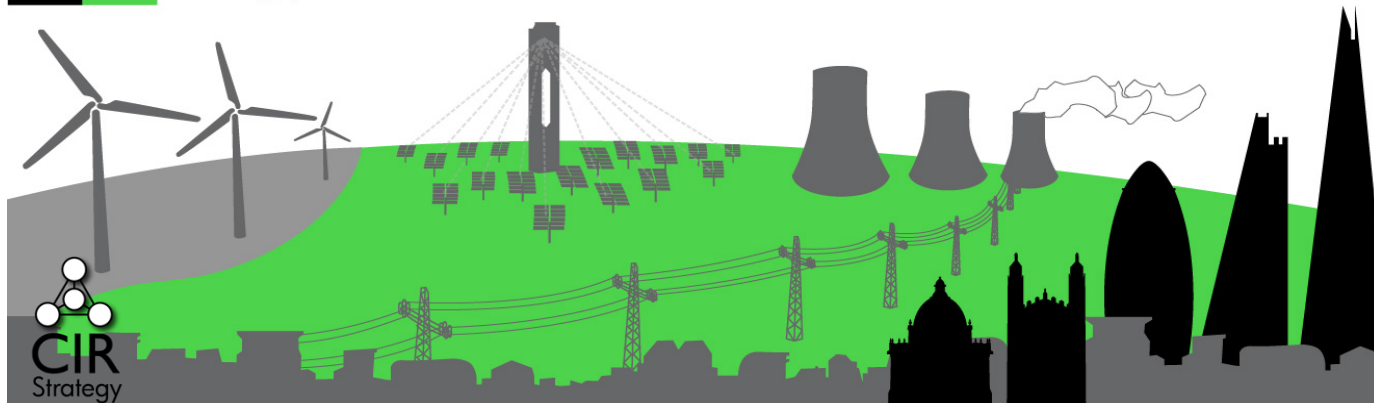
Where AlertMe has gottent to - we have 350,000 gadgets connected today

7.5bn data points going through our platform every month this is very important because it becomes an important source of info

In UK big customer is BG - Hives

In the US its Lowes





In terms of start-up challenges - small companies can be more agile in addressing opportunities - a word of caution VC funded path, also can lead you to making mistake of not making revenue early on - but revenue is important information from the market - tells you what people will pay for.

Success takes time - 10 years at least

If you are an innovator - you will be too early for the market - so increasingly I see the challenge of startup is to survive until market happens.

In terms of path to market - we weren't sure we could build a customer base by B2C or channel partners - so we tried both - growth came through channel partners but we learnt a lot from our customers from B2C.

Horizontal or vertical is another option - Nest is an example of very focused company - but sooner or later you probably need to broaden out, create ecosystem

Government initiatives - you don't want to build a business based on subsidies - the key is about stability of government initiatives- example of PV as a disastrous intervention.

30bn pound a year spent by consumers on home energy

How innovation takes hold - Interesting analogy with Telcos -

3 legged stool - see slide

Significant element of Gov push is needed to create infrastructure to make innovation feasible

Interesting for VC funded - markets take time to emerge very little anyone can do about that - you need to be careful you are not too early.

Value chains are an interesting model of how to make markets happen

Finally - good analogies: broadband, Digital TV, Recycling - astonishing transformation that required a lot of behaviour change from consumers - lot of push from government and embracement from consumers with industry filling gap in the middle.

Summary of the Day from Gavin Jones (Chair of the Smart Grids Stream)

We've heard about a whole host of interesting ideas and innovation - a lot is happening and progression, very exciting times.

Summary from Chair of Cleanpower Stream, Jeremy Nicholson

Debate on fracking - what has happened in Poland, what could happen here - good to get evidence

Roles of independent players, community energy - facing significant barriers - we also heard from an independent supplier outside the big 6 which was interesting

Overview of market from Poyry

Finally, there are regulatory barriers that need to be overcome, no lack of innovation to be done.

Gavin Jones thanks all the speaker and everyone for coming.

Justin also thank you to Gavin and Jeremy for chairing the streams.

Drinks networking ensued til 645pm

