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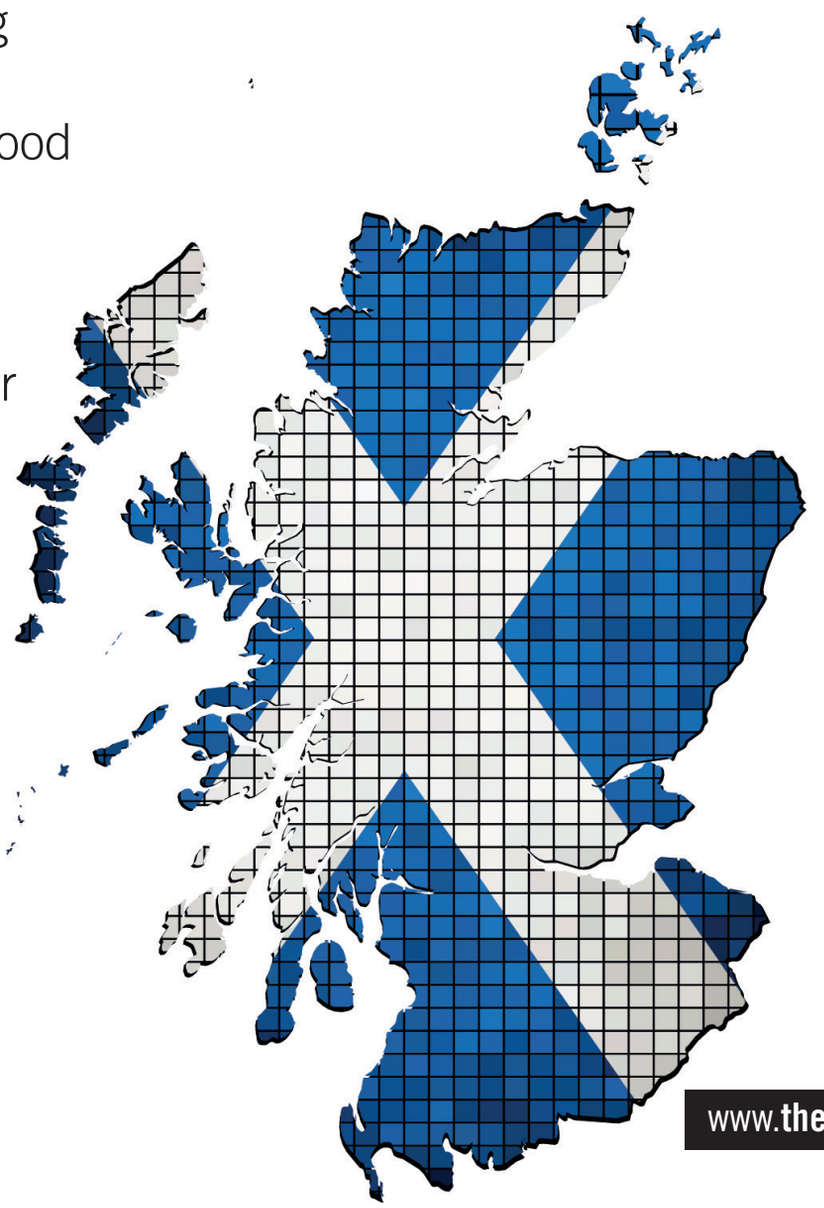
Changing the face of **Scotland's Power Generation**

An Engineering Policy Group Scotland Holyrood Briefing given at the Scottish Parliament on 16th November 2016



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The Engineering Policy Group Scotland

With a combined membership of 40,000 Scottish engineers and scientists, the Engineering Policy Group Scotland (EPGS) acts as a two way link between the professions and government in Scotland. It aims to provide feedback into government thinking and proactively raise matters of relevance with government.

The EPGS comprises senior members from across Scottish industry academia and professional organisations.

The leadership is provided by a core group of senior professional Engineers and Scientists from key professional bodies in Scotland

The information given in this document represents the outcome from an event organised by EPGS. It does not necessarily represent the definitive subject views of the participating organistations listed above.

As engineering and technology become increasingly interdisciplinary, global and inclusive, Professional Bodies reflect that progression and welcome involvement from, and communication between, all sectors of science, engineering and technology.

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- policy@theiet.org

Changing the face of Scotland's power generation

The Engineering Policy Group Scotland (EPGS) provided a briefing on "The changing face of Scotland's power generation" which took place on 16th November 2016 at the Scottish Parliament, in Committee Room 1. This event was hosted and chaired by Gordon Lindhurst MSP who is Convenor of the Economy, Jobs and Fair Work Committee at the Scottish Parliament.

There were two presentations. The first was from Mr Robin MacLaren, a past managing director and chief engineer at Scottish Power and also a founder chairman of the Electricity Networks Association. The second presentation was from Mr Duncan Botting, Managing Director of Global Smart Transformation based in Scotland and Director of the European Utilities Telecom Council based in Brussels.

First Presentation

The first presentation from Robin MacLaren focussed on the Electricity Grid. He pointed out that:

- The electricity industry is not a single entity. Some elements of the industry are monopolies while others are competitive businesses. Power generation; the transmission of power on high voltage systems and then: the distribution of power at lower voltage to consumers are three different parts of the system, each with a differing set of priorities.
- The over-riding aim in this complex inter-dependent arrangement is to deliver low carbon power, reliably and; at a reasonable cost.
- The grid has been developing for nearly 100 years. Particularly in the last 20 years, a notable recent feature has been the growing importance of renewable power. Typically this is generated from multiple small scale sources which are often intermittent. Problems arise since storing power is difficult although one solution is increased reliance on electricity inter-connectors, connecting our system to foreign grids.
- Traditionally, large generating stations supplied reliable "base load" power, but many of these have now closed or will do so shortly. The coal fired Longannet station was shut down in March 2016 and the two remaining nuclear stations will also be closed in 15 years' time.
- Patterns of demand for electricity are also changing. Since new power generation capacity, and any reconfiguration of the grid are both major capital investments, plans need to be made well ahead of anticipated changes. A time frame from concept to delivery of around 15 years is typical.
- Not only is storage of electricity difficult, and both demand and supply variable, but transporting power over long distances also results in power loss. Keeping the system balanced, resilient and stable is a considerable technical challenge, particularly in winter when demand is high and problems arising from weather fluctuations are most acute.
- Electricity transmission is planned on a UK wide basis with four licensed transmission areas within the grid which then feed into ten licensed electricity distribution areas. Technical challenges in operating the system include: voltage control; balancing the system in real time; planning for the capacity for electricity to flow between regions and; the need for a resilient system.
- While Scotland's power network is now more reliable than in the past (in that there are fewer breakdowns), it is however less resilient. It is estimated that the technical recovery process, known as "black start", could take up to five days! After such a major breakdown, recovery would be protracted, slow and uncertain. This would have severe social and economic consequences far beyond any previously experienced. The likelihood of such a "low probability but high impact event" has increased in recent years.

Second Presentation

The second presentation from Duncan Botting addressed the challenges in planning the electricity system of the future. He demonstrated how this must be done by understanding the inter-dependencies and complexities of the whole energy system. The "whole system" can be viewed as including all physical, commercial, policy, data and regulatory elements as well as the generation, network and end-use aspects.

Duncan Botting is a leading member of the IET Energy Panel and was actively involved working with Government on the recent Future Power Systems Architecture Project (FPSA), a major collaborative venture to address the challenges facing Great Britain's power networks as the electricity system undergoes a period of transformative change. In his presentation he pointed out that:

- The three main challenges ahead are: to maintain a secure and reliable electricity supply; to deliver on the legal commitment to decarbonise and; to provide value for money, as new technologies are introduced. To address these challenges and also to cope with emerging business models, the underlying structure of the electricity system needs to be reformed by 2030.
- In order to ensure a seamless transition between today's legacy infrastructure and the transformation required to meet users expectations many elements have to be taken into account including the inter-action of: the market structure of the system (taking into account the commercial organisations involved); the diverse technical requirements; the need for conformity to many different types of regulation and; the necessity to fit in with both present and anticipated societal needs.
- Both the supply and the demand sides of the energy equation are in a period of rapid change. While on the supply side there is likely to be more smaller scale generation and micro-generation, on the demand side innovations such as new smart appliances and electric vehicles will also effect traditional patterns of energy consumption. It is not possible to accurately predict either the degree of uptake of new technology or how, for instance, consumers might adapt to home energy automation but these changes have to be factored into future planning.
- One of the major challenges in Scotland at present is the loss of base load power generation, together with an increase in intermittent generation, provided by renewable energy sources. While the use of inter-connectors to grids outside the UK will help to deal with the intermittency issue, power may not always be available from these sources at the time when it is needed. In future, power demand in part will have to match power supply using mechanisms such as automation, smart technologies and price signals.
- Bearing in mind future developments such as the "Internet of Things", whereby machines interact with each other automatically, there will be a need to "reach beyond the meter". The result will be hugely increased complexity involving the aggregate behaviour of millions of devices, with consumers as well as businesses, all interacting in more price-sensitive markets.
- By 2030, the power system will be considerably more complex with a dynamic interaction ranging from within the home right up to the largest power station. New players such as "smart cities" or groups of technology users will require new modes of interaction with the power system. To deal with this new environment, the Future Power Systems Architecture Project identified 35 new or significantly extended functionalities.
- If we are to deliver an orderly transition by 2030, we must start right now! Discussion following the event illustrated how the energy debate

within Scotland is different from that in England. It was noted that there is a tendency for engineering and capacity issues to become muddled. The whole system needs to be viewed not just in terms of the technical issues but also by reference to the market structure and to the commercial realities. Points which arose in discussion included the following:

- The resilience of the grid is different to its reliability. Although the chances of a major break-down in power supply are low, the results would be a catastrophe. Restarting the system is complex.
- Energy investment has to be seen in the long term. The length of time in making decisions can be excessive.
- Some elements in relation to the demand side of the equation (e.g. in relation to policy on promoting energy efficiency) are missing.
- There is a vital need to continue with investment to the National Grid and to have this grid running as effectively as possible.
- Often discussion is dominated by talk of specific technology options. Energy planning is best achieved via a co-ordinated "whole system approach".
- Policy options in relation to electricity will increasing dominate general energy policy discussions as this is a major way to decarbonise the economy.
- The provision of an additional modest-sized conventional (probably gas powered) station in Central Scotland would assist in capacity management.
- Often the focus is on power generation rather than demand. In the future much can be done at a community level.

Electricity Transmission
The "Grid" - Our Electricity Backbone

Robin MacLaren

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The Electricity Industry

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Energy Policy

Who is in charge?

Government?
Regulator?
Market?
Customer?

They are all stakeholders to be considered.

Everyone has opinion.
No overarching arbiter.

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Electricity "Industry" in the UK

- Monopoly and Competitive Businesses
- Regulated – OFGEM agreed Price
  - Transmission & Distribution
- Competitive – Market Sets Price
  - Generation, Supply, Connections and Metering
- There is no one "industry" – there are at least three
  - Generation
  - Wires
  - Retail
- All have differing priorities,
- Multiple divisions in the supply chain with limited oversight capability.

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The Energy Trilemma

- Low Carbon
- Low Cost
- Reliability and Resilience

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Solutions need

- Visionary Thinking

…and Realistic Expectation!!

- Technology delivery

….Scale and Timescale

- Economics

….to encourage investment

- Resilience

…..Keep the lights on at all times!

…The Transmission network is a key component

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Transmission Network History

The Grid

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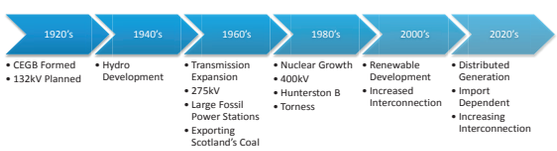
Development of the Grid



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APPROXIMATE FUTURE TIMELINE of major changes

2016	Closure of Longannet
2018	Commissioning of Western Link (designed for Export)
2020	Smart Meter Rollout – New DSM Options?
2022	Planned closure of Hunterston B
2024	Eastern HVDC and/ or new Generation capacity? International HVDC interconnectors?
…	
2030	Planned closure of Torness

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Many possibilities get thrown into planning of the Grid.

- Pelamis
- Nodding Ducks
- Generating Home Boilers
- Smart Meters
- Battery Storage
- Craigroyston
- Electric Vehicles
- Silicon Glen
- Onshore Wind
- Offshore Wind
- Wave
- Tidal
- Lewis Windfarm
- Hyundai in Fife
- Lucky Goldstar
- Interconnectors

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Planning is Difficult

- Technology changes
  - Flavours of the month may or may not materialise
- Technology sometimes delivers, but costs are too high
- Markets change for electricity – uncertainty for investors, uncertainty for technical planning of grid.
  - Scottish Market
  - Pooling and Settlement System
  - CFDs
  - ROCS

etc.

… and changes to Grid can take 14-15 years from concept to delivery!

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Why do we have a Grid?

Energy Transfer

- Large Generators and Energy sources, moving energy to Load Centres such as cities.
- Nuclear, Interconnection, Windfarms, tidal, wave
- Changing geographical Energy sources means changes to Grid to transport electricity to customer.
- This has been the main driver for recent changes
- Long distances from generation source means greater exposure to grid loss

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Why do we have a Grid?

- Delivering Lowest Energy Cost
  - Supported or Taxed Energy Sources compete to provide energy needs at lowest cost
  - Competitive contracts provide the essential technical support to operate the grid eg balancing, voltage control
  - Prices for 'wires' vary little, energy costs do.

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Why do we have a Grid?

Resilience

- Allows a geographical and type diversity of Energy Sources to supply loads in geographical regions
- Options in the event of energy source non-availability.
- Keeping the lights on!
  - Meeting technical challenges
  - 'Riding through' bad weather

….. Like a house of cards. If it all falls over, it takes a long time to rebuild. 'Margin' is only part of it.

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UK Transmission Networks

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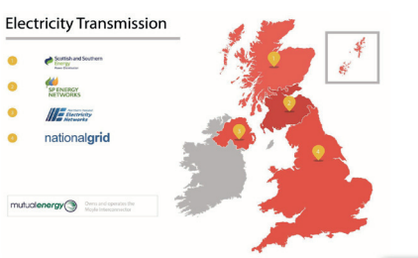
4 Licensed Transmission Areas

Electricity Transmission



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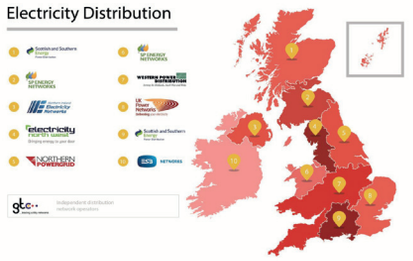
The Grid feeds 10 Licensed Distribution Areas

Electricity Distribution



How is all this controlled?

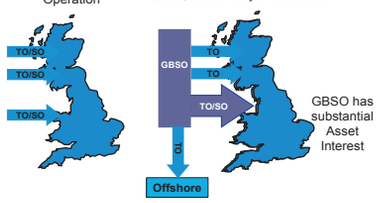
Since 2005 National Grid is the GB System Operator

Pre-Betta

Integrated Owner and Operation

Current Model

Integrated Owner and Operator in E&W, Owner only in Scotland.



GBSO has substantial Asset Interest

Transmission Operation

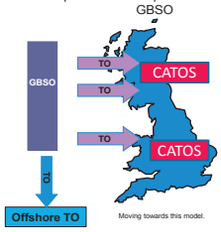
Future Model

GBSO independence to include legal separation and separate licences for GBSO

CATO – Competitively Awarded Transmission Owner

TO – SSE Transmission, SP Transmission, National Grid

GBSO – GB System Operator

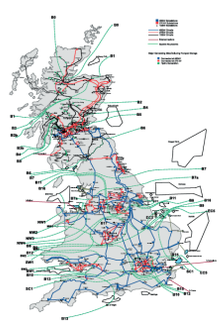


With this, SO has no interest in assets and is visibly separate.

Interconnectors

Managing the Network

- Not like wiring your house!
- A 'house of cards', balanced second by second
- Multiple 'boundaries to be actively managed.
- Scotland roughly 10% of the UK electricity demand.
- Network Challenged in Northern England



Engineering Challenges increasing

- Technical performance issues
  - Voltage Control
  - Frequency and Inertia
  - Network operation with Distributed Generation
  - Resilience with Imports and remote generation
  - Low margins reduce flexibility

.... Will this need other major plant in Scotland. Coal? Gas? Nuclear?. New Technology? Or do we accept the increasing risk, while trying to minimise it.

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Touching on Resilience

What do we mean by Reliable and Resilient?

- Cars are far more reliable.
  - We don't have as many breakdowns!
- Cars are far more resilient
  - A car crash is much more survivable
- Scottish Electricity supplies are far more reliable
  - Customers suffer fewer power cuts.
- Scottish Electricity supplies are less resilient
  - The car crash has been avoided so far
  - Reduced number of large power stations, difficult to restart our networks after a shutdown
  - Interconnection crosses weather exposed areas
  - Wind Generation may shut down in high winds.
  - Technical challenges increasing.

Some history of 'near misses' which would be crashes today.

Cabinet Office National Risk Register

- "A nationwide loss of electricity, for which the technical recovery process "Black Start" could take up to 5 days, would affect millions of consumers and critical services. If significant damage is caused to the transmission lines, it could be weeks before some parts of the network are fully recovered and power is restored. "

Some Scottish History.

12th January 1993	• 76 Transmission Faults, with a significant number on west coast 400kV network
22nd January 1993	• Import ability to zero and frequency responsive Scottish generation called
26-28th December 1998 'Bronze'	• 180 Transmission Faults, mostly transient, with a significant number on west coast 400kV network
27th February 2001 'Snow Blitz'	• 140 Transmission Faults, with significant number on east coast 400kV network • Import Capacity reduced to zero and frequency responsive Scottish generation called • 2 import circuits unavailable for 47hr and 55hr due to severe icing compromising electrical clearances
28th January 2002	• Import transfer reduced to secure system

There is a high probability that at least some of these events would, if they were to occur today, close down large parts of Scotland

Key Message

If this were to happen today:-

Large areas of Scotland would be impacted (measured in millions of customers) and without power for hours or several days.

Restoration would be probably reliant of supplies from the south, and restoration or availability of North England Grid to re start the Scottish Grid

Current plans leave little room for contingency, and are driven by best efforts rather than a definitive standard.

Possible Actions

- **A 'System Restart' standard would one solution.**
- **Standards drive the planning and requirements.**
- **UK and Scotland have none.**
- **South Australia is the one of the most recent Grid Collapses. It has a standard of 40% peak demand *within 4 hours.***
- **Perhaps increased public awareness of risks, to allow family contingency planning?**
- **……moving on.**

Remember the Energy trilemma?

Energy Trilemma

- Low Cost
- Low Carbon
- High Reliability and Resilience

We are making good progress!
..it is risk and reward!

Solutions are complex across the whole energy spectrum

Transmission Networks are key

Addressing the challenges

The Future Power Systems Architecture Project

FPSA Project

CATAPULT Energy Systems

Key outcomes

- By 2030 the power system will need substantial new or extended functionality
- Implementation challenges of the new functionality are significant
- Delivery by 2030 is possible but we need to start now
- Much of the new functionality is concerned with interactions spanning the whole system
- Whole-system functionality, including active consumer engagement, presents challenges for today's institutional arrangements

Thinking of Energy as a Whole System

Duncan Botting
MD Global Smart Transformation
IET Energy Sector Chair
FPSA – Project Delivery Board Champion

Introduction

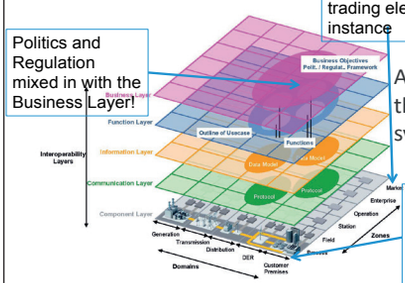
- Understanding the new reality for Energy
- Scotland in the wider GB Energy Landscape
- New work on Whole Energy Systems Analysis
- Summary

Understanding the new reality for Energy

Whole Systems

This 'Market' refers to a back-office function which looks after Market aspects – e.g. trading electricity for instance

Politics and Regulation mixed in with the Business Layer!



An attempt to model the whole electricity system!

The customer's importance is shown here by this pixel!

Source: Smart Grid Architecture Model (SGAM) – M490 (ETSI/CEN/CENELEC)

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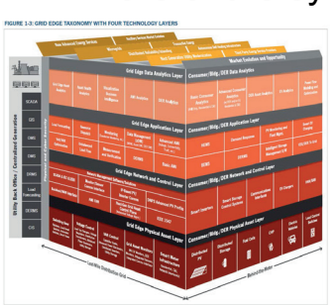
More of the system…..



BUT - Below the meter now VERY important…

Source: GreenTech Media

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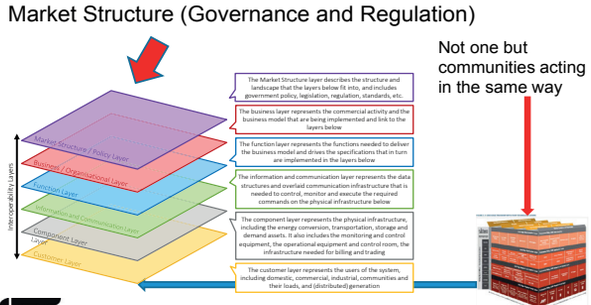
Market Structure

Market Structure (Governance and Regulation)



Not one but communities acting in the same way

Are we wired for success?

- What business models will impact different parts of the power network – Generation, Transmission, Distribution, Private Networks, Customers, etc.,…..
- Is the Market Structure and the governance (Regulation) to provide efficient, safe and reliable energy delivery fit for purpose?

Whole System Impacts -

- Do we understand the inter-dependencies and complexities of the whole energy system:
  - Market Structure (Legislation, Policy, etc.)
  - Regulation (Economic, Environmental, Health & Safety, Technical, Commercial, etc.,)
  - Commercial (Business Layer)
  - Technical (Functional, Information, Communications, Physical Layers)
  - Societal Behaviour (Needs, Requirements, etc.,) –

Smart Conclusions

- There is a need to be "joined-up" in the thinking between Governance, Commerce, Technical and Societal policy implementation
- Today we do not understand the inter-dependencies, inter-relationships of the complex interactions that are now able to take place – inside and outside of the current market, commercial and societal frameworks
- Policy makers need to be informed in easy to digest, pictorial, informatics and other ways to be able to communicate the complexities to legislators in order not to end up with conflicting regulatory and societal behaviour
- EUTC works to facilitate this understanding in different regions and jurisdictions. Technology and Telcoms can only deliver efficiencies within the bounds that are set by legislation, regulation and societal agreement!

Scotland within the wider GB Energy Landscape

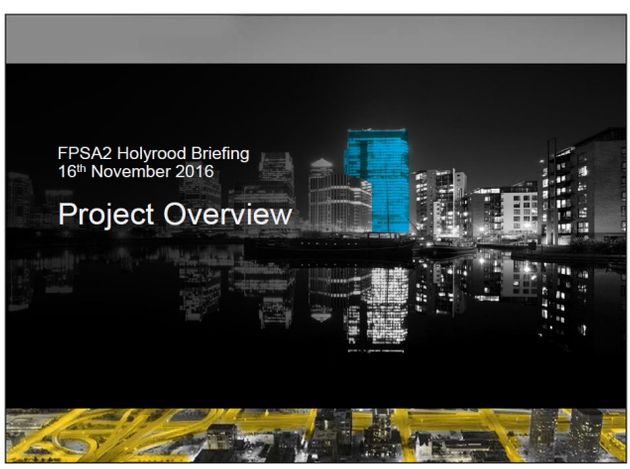
The Reality

- Loss of Base Load Power Generation
- Reduction of inertia on system
- Increase of Intermittent Generation
- Diversity of demand falling
- Community Energy rising
- Cities and communities require different solutions
- Inter-connectors only provide half the solution

A Need for Whole System Thinking

- Using the system in the way we have traditionally may not be optimal in the new reality
- The Power System is going to be transformed – with or without policy control
- Advanced analysis already in progress

New work on Whole Energy Systems Analysis



Vision

CATAPULT Energy Systems

To work with the full set of stakeholders to create a platform to determine a system architecture for the whole GB electricity system fit for the transformation currently in its early stages in electricity and energy, and to catalyse the implementation of this architecture.

Whole System *is widely defined, to include the physical, commercial, policy, data, regulatory, consumer and other aspects of the complete electricity system including all generation, network and end use aspects, and its interaction with other energy systems at the point of end use.*

Stakeholders *include existing and new parties: generators at all scales, users at all scales, networks, supply chains, service providers, government, wider society, future users, and all those who interact or could interact with the present or future electricity system.*

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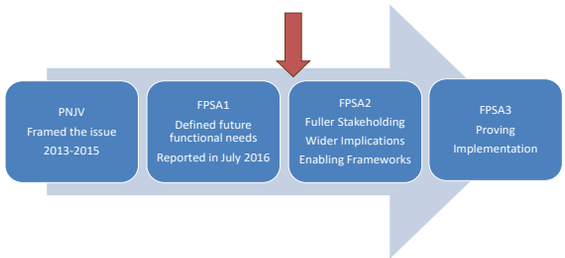
FPSA Journey



FPSA1 Background

Mandate

What are the functions that will be required to make the future, low carbon, power system work in the face of transformative change?

- Consider a 2030 horizon
- Identify the functions: new or significantly enhanced
- Provide supporting evidence
- Identify sequencing and interdependencies
- Focus on technical challenges, not institutional arrangements
- Do not develop solutions
- Apply whole systems thinking
- Use systematic, systems engineering, open approach

Delivery of FPSA1

- Commissioned by DECC
- Undertaken by a Catapult – IET collaboration
- Supported by specialist experts
- Strengthened by stakeholder engagement
- Applied a rigorous System Engineering approach
- Built a substantial evidence base
- Managed following best practice

Deliverables

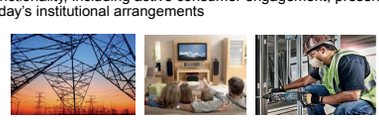
- FPSA1 Summary Report
- Main Report and appendices
- International Study
- System Engineering Methodology
- Functional Matrix Spreadsheet
- Function Sequencing Spreadsheet

All the reports are available at:

http://www.theiet.org/sectors/energy/resources/fpsa-project.cfm?origin=reportdocs

Key Outcomes

- Substantial new or extended functionalities are needed for the power system by 2030
- Implementation challenges of the new functionality are significant
- Delivery by 2030 is possible but we need to start now
- Much of the new functionality is concerned with interactions spanning the whole system
- Whole-system functionality, including active consumer engagement, presents challenges for today's institutional arrangements



New or extended functionality

- 35 new or significantly extended functions identified
- Heavy interaction between functions, so no simple prioritisation
- Incremental delivery would be risky
  - Extra costs
  - Breached engineering limits
  - Compromised system security
  - Policy objectives not met
- A coherent transformation programme is needed
- It's a whole-system challenge, that involves many parties

The new system Functions and their drivers

Headlines

- Seven drivers of new functionality identified - leading to 35 new or extended functions for the 2030 power system
- Spread across four functional timeframes:
  - Investment Planning
  - Operational Planning
  - Real-time Operations and Balancing
  - Markets & Settlement
- Drawing on National Grid Future Energy Scenarios (Gone Green emphasised) and 5th Carbon Budget
- Functions largely independent of future power sector evolutionary pathways (four considered)
  - Power Sector Adaptation
  - Power Sector Leadership
  - Customer Empowerment
  - Community Empowerment

Drivers of New or Extended Functionality

- The flexibility to meet changing but uncertain requirements
- The change in mix of electricity generation
- The use of incentives to enable customers to benefit and the system to operate more efficiently
- The recovery from major events or emergencies
- The active management of networks, generation, storage and demand
- The emergence of new parties providing new services to customers
- The emerging need for coordination across energy vectors

Each of the 35 identified functions can be aligned with one (or more) of these seven key drivers

Examples of New or Extended Functions

- The flexibility to meet changing but uncertain requirements
- The change in mix of electricity generation
- The use of incentives
- The recovery from major events or emergencies

Continuously review the energy landscape to enable the power sector to respond readily to rapid and continuous change, and ensure the timely introduction and implementation of new functions (investment planning)

Enable timely restoration of supplies following a national failure - with an increasingly distributed and weather dependent generation portfolio (investment planning)

Provide a mechanism for peer to peer trading (intra and inter community) with appropriate charging for use of the power system (markets & settlement)

Enable restoration of supplies following a prolonged local supply failure - leading to loss of both local generation and diversity in demand (investment planning)

Examples of New or Extended Functions

- The active management of networks, generation, storage and demand
- The emergence of new parties providing new services to customers
- The emerging need for coordination across energy vectors

Provide automated and secure management of demand, generation and an increasing range of energy resources and ancillary services, including smart appliances, and building and home energy management systems (real time)

Collect forecast information from all significant parties within the power sector, identify and resolve constraints and conflicts, with assigned responsibility for security of supply (operational planning)

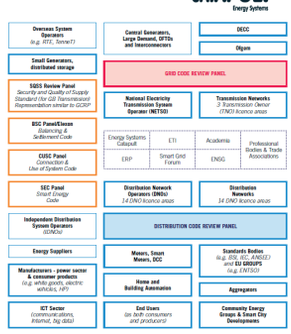
Collaborate with other energy sectors across multiple sites to make the best use of available energy resources and to provide the flexibility to meet environmental and financial priorities (markets & settlement)

Overall Conclusions

Substantial new or extended functionality is required to meet energy policy objectives by 2030	The interaction between functions and the need for coordination implies the sector is facing **transformative change**
The new functionality presents **substantial implementation challenges** from technical, market and commercial perspectives	These arise from **greater complexity and technical challenge** - with scope for adverse interactions between system components
It is feasible to deliver the changes required but **the scale and complexity warrant special focus and urgency**	These **developments are already having an impact** on the power system and 14 years to 2030 is a demanding timetable
Much new functionality involves **interactions** spanning from **smart appliances to traditional power stations**	**New approaches are required** to develop the necessary whole-system solutions to power system architectural evolution

Cross Boundary Challenge

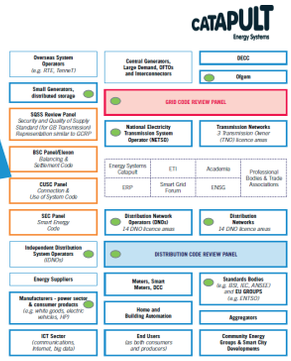
- The 35 new functions are not organizationally aligned
- The power sector comprises many formal (and informal) organizations
- Boundaries themselves are not a barrier, but the administrative complexities and the behaviours they create can be



Consider an actual example:

The modification to Engineering Recommendation G59 (Connection of Generators) involved the parties indicated here.

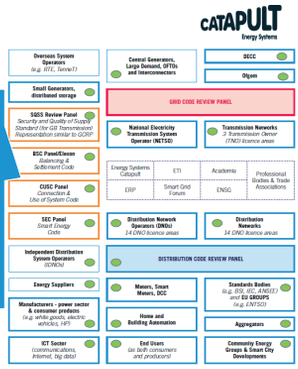
It took 3 years to complete – the green dots indicate the parties (and boundaries) involved



Active Management of Networks: Provide automated and secure management of demand, generation and an increasing range of energy resources and auxiliary services, including smart appliances, and building and home energy management systems (real time)

The green dots highlight the parties (and boundaries) that will be involved.

How realistic is it to approach



Developing a shared view for implementation

Some common principles to apply

Common Principles for implementation:

- Enable beneficial opportunities for all parties, existing and new
- Build on findings from innovation projects and progress already made
- Enhance energy Flexibility, promote demand side engagement
- Identify options, recognise uncertainty and ability to respond
- Consider technical + commercial + societal aspects
- Less government, more markets and more industry leadership
- Enable access for entrepreneurial parties, new customer services
- A presumption for Open Systems enabling shared and secure data
- Any wider energy system issues that arise will be noted

5. Extend the evaluation of R&D

Stakeholder-led

Developing a shared view for implementation

9GW solar deployed | Multiple parties contracting ad hoc for DSR | 1m EVs on the road | Heat Pump load ~ 3GW | 60% of capacity is from variable sources — < SIGNIFICANT DRIVERS OF SYSTEM STRESS

DECC Smart Energy call | ESC mobilising | Role of SO? DSO? Clarity required for defining these roles | ET2 review Discussions commence | ED2 review Discussions commence | Smart Metering Rolled Out — < KEY SECTOR ACTIVITIES

2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | > 2030

DECC-led

Stakeholder-led

The programme of work scoped, resourced and mobilised

Implementing the detail to enable delivery of the required new functionalities

Ongoing work in response to consumer requirements and technology /commercial developments

Build on current work | Implement the No Regrets / Urgent actions | Progress the actions that are confirmed as urgent | Actions completed through the main change programme

Why an Enabling Framework?

- Understanding the need for an Enabling Framework
- What is an Enabling Framework?
- How would an Enabling Framework Help?
- What might one look like?

Today's Industry Change Process

Implementation of the agreed changes

Established Industry Stakeholders | DETAILED CHANGE PROPOSAL | Formal Processes for each Code Change Panel | Ofgem Board Approval | Changes & Promulgation by the Code Custodian (eg ENA)

CHANGE PROPOSAL FORMULATION | CHANGE DESIGN/ CONSULTATION/APPROVAL | OUTCOME IMPLEMENTATION

Today's Industry Change Process - and some of the challenges for new parties

Implementation of the agreed changes

Many parties, especially 'beyond the meter', were not active in the sector when today's arrangements were formulated.

Not agile or responsive to the emerging demands

The membership of the Panels does not include parties new to the sector. The members are unlikely to have first-hand knowledge of new products and services coming into the sector, or business barriers being experienced by SMEs and new entrants.

Today's process can be very lengthy, typically with a queue even to get into the work plan.

CHANGE PROPOSAL FORMULATION | CHANGE DESIGN/ CONSULTATION/ APPROVAL | OUTCOME IMPLEMENTATION

Today's Industry Change Process

Some pointers for change

INITIAL THOUGHTS

An Enabling Framework for sector change

Established Industry Stakeholders

New Industry Stakeholders, including SMEs and those 'beyond the meter'

Access for all parties on an equal footing and 'with all options open' for consideration

Assistance with Change Proposal formulation especially for new parties; wider representation of stakeholder interests in the change processes

A Forward-looking capability including knowledge continuity for continually-changing topic areas

Options for 'lighter-touch' processes to trial new alternatives and streamline the turn-around time

Technical Specialists/Legal Advice/Market Specialists/New Services Expertise/Policy/Regulatory Specialists/New Technology Expertise/etc.

These skill areas will need to be much more integrated than today to achieve agility across people/process/technology. This is beyond today's linear 'manual' design processes.

Structure that can accommodate continual change

New stakeholders could include Aggregators, Energy Service Providers, Community Energy enterprises, and in the future, other energy vectors such as heat, gas or hydrogen

CHANGE PROPOSAL FORMULATION | CHANGE DESIGN/ CONSULTATION/APPROVAL | OUTCOME IMPLEMENTATION

Today's Industry Change Process

Some pointers for change –

INITIAL THOUGHTS

LESS DISTINCTION BETWEEN 'EXISTING & NEW' – helpful and effective processes for all

TAILORED ACCESS POINTS FOR DIFFERENT SECTORS OR INTEREST GROUPS

An Enabling Framework for sector change

Established Industry Stakeholders & New Industry Stakeholders, including SMEs and those 'beyond the meter'

Access for all parties on an equal footing and 'with all options open' for consideration

Assistance with Change Proposal formulation especially for new parties; wider representation of stakeholder interests in the change processes

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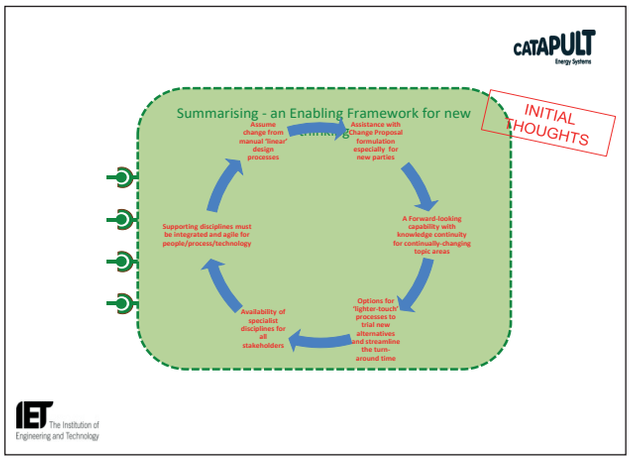
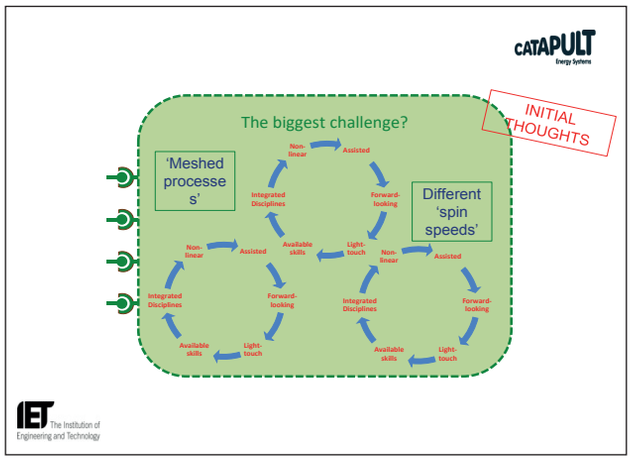
RE-THINKING WILL BE REQUIRED HERE

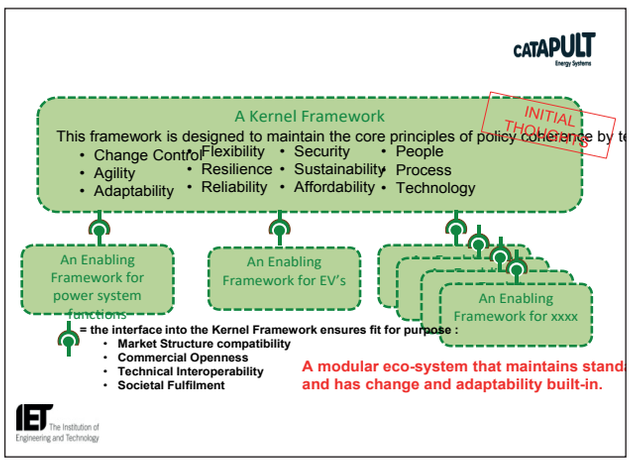
In an agile world, what is a 'Change Proposal'? Could it be a 'publish – subscribe' model as used in software messaging architectures?

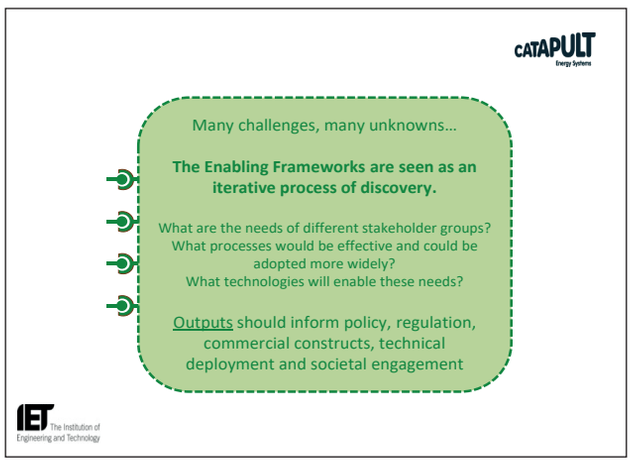
In an agile world, what is a 'Consultation'?

CHANGE PROPOSAL FORMULATION | CHANGE DESIGN/ CONSULTATION/APPROVAL | OUTCOME IMPLEMENTATION


CATAPULT
Energy Systems
Summarising - an Enabling Framework for new Thinking
INITIAL THOUGHTS
Assistance with Change Proposal formulation especially for new parties
A Forward-looking capability with knowledge continuity for continually-changing topic areas
Options for 'lighter-touch' processes to trial new alternatives and streamline the turn-around time
Availability of specialist disciplines for all stakeholders
Supporting disciplines must be integrated and agile for people/process/technology
Assume change from manual 'linear' design processes
The Institution of Engineering and Technology


CATAPULT
Energy Systems
The biggest challenge?
INITIAL THOUGHTS
'Meshed processes'
Different 'spin speeds'
Non-linear
Assisted
Forward-looking
Light-touch
Available skills
Integrated Disciplines
The Institution of Engineering and Technology


CATAPULT
Energy Systems
A Kernel Framework
INITIAL THOUGHTS
This framework is designed to maintain the core principles of policy coherence by te
• Change Control
• Agility
• Adaptability
• Flexibility
• Resilience
• Reliability
• Security
• Sustainability
• Affordability
• People
• Process
• Technology
An Enabling Framework for power system functions
An Enabling Framework for EV's
An Enabling Framework for xxxx
= the interface into the Kernel Framework ensures fit for purpose :
• Market Structure compatibility
• Commercial Openness
• Technical Interoperability
• Societal Fulfilment
A modular eco-system that maintains stand
and has change and adaptability built-in.
The Institution of Engineering and Technology


CATAPULT
Energy Systems
Many challenges, many unknowns…
The Enabling Frameworks are seen as an iterative process of discovery.
What are the needs of different stakeholder groups?
What processes would be effective and could be adopted more widely?
What technologies will enable these needs?
Outputs should inform policy, regulation, commercial constructs, technical deployment and societal engagement
The Institution of Engineering and Technology


Thank You
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