



A Strategy for a Modern Digitalised Energy System

How data can unlock the opportunities in a smart energy system



Laura Sandys is an Independent Director at SGN Network, has recently been appointed Chair of the BEIS/Ofgem Energy System Data Taskforce, and is a Co-Chair of the IPPR Environment and Justice Commission. She is also a Non-Executive Director of the Energy System Catapult, a member of the Advisory Panel for the Government's Cost of Energy Review, and is on the Council for Carbon Capture Utilisation and Storage. Previously a member of the Energy and Climate Change Select Committee, and Parliamentary Private Secretary to the Minister for Energy and Climate Change, she was once described by The Times as 'one of the sanest of all MPs'.



John Scott has 45 years experience of electricity distribution, transmission and regulation. His previous roles include Director of Engineering for National Grid, Technical Director for Ofgem, and Director Network Innovation for KEMA Consulting. He takes a particular interest in innovation and sustainable energy systems. He is a member of the management group for the Future Power System Architecture project (FPSA) being led by The IET and the Energy Systems Catapult.



Steven Steer is Head of Data at Ofgem. He previously worked in regulatory finance; as a data scientist (predicting commodity prices, energy demand and renewables generation); as a commercial physicist delivering new radio oncology products to market, and as an academic in the fields of energy economics and nuclear engineering. He holds a PhD in nuclear physics.



Randolph Brazier is the Head of Innovation & Development at the Energy Networks Association, and has over eight years of experience in the electricity and energy sector in the UK, Europe and Australia. He is responsible for co-ordinating and delivering a broad range of strategic initiatives, including the development of smart grids, DSO Transition, Electricity Networks Innovation Strategy, roll-out of low carbon technologies and the decarbonisation of heat and transportation via heat pumps and electric vehicles. He has previous experience in the design and management of multi-disciplinary power projects in the power and renewables sectors. Randolph has an M.Phil in Engineering for Sustainable Development from the University of Cambridge and has presented at a range of events and conferences.



Goran Strbac is a Professor of Energy Systems with extensive experience in advanced modelling and analysis of operation, planning, security and economics of energy systems. He led the development of novel advanced-analysis approaches and methodologies that have been extensively used to inform industry, governments and regulatory bodies about the role and value of emerging new technologies and systems in supporting cost effective evolution to smart low carbon future. He is a member of the Steering Committee of the SmartGrids European Technology Platform, co-chair of EU WG on Sustainable Districts and Built Environment of Smart Cities, Director of the UK Centre for Grid Scale Energy Storage, participates in working groups and committees within CIGRE, CIRED IET, IEEE and IEA. He has co-authored 4 books and published over 180 technical papers.

Introduction

In June 2019, the Energy Data Taskforce published “**A Strategy for a Modern Digitalised Energy System**”, setting out five overarching recommendations to modernise the UK’s energy system and help drive it towards a net-zero carbon future;

1. **Digitalisation of the Energy System**
2. **Maximising the Value of Data**
3. **Visibility of Data**
4. **Coordination of Asset Registration**
5. **Visibility of Infrastructure and Assets**

The report makes clear that any initiative to deliver a digitalised system at present will largely be stymied by poor-quality, inaccurate or missing data, while data that is regarded as valuable is often restricted or difficult to find. In order to fill these data gaps and maximise data value, the Taskforce advocates a staged approach, based on the following key principles:

- **Data Visibility:** Understanding the data that exists, the data that is missing, which datasets are important, and making it easier to access and understand data.
- **Infrastructure and Asset Visibility:** Revealing system assets and infrastructure, where they are located and their capabilities, to inform system planning and management.
- **Operational Optimisation:** Enabling operational data to be layered across the assets to support system optimisation and facilitating multiple actors to participate at all levels across the system.
- **Open Markets:** Achieving much better price discovery, through unlocking new markets, informed by time, location and service value data.
- **Agile Regulation:** Enabling regulators to adopt a much more agile and risk reflective approach to regulation of the sector, by giving them access to more and better data.

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On 29 November 2019, Capita hosted an industry stakeholder event in London to examine the main issues and themes arising from the report and its findings.

Chaired by **John Scott**, former Director of Engineering at the National Grid, the event featured presentations by **Laura Sandys**, chair of the Energy Data Taskforce, and

Steven Steer, Head of Data at Ofgem, the government regulator for UK gas and electricity markets. They were joined in a panel discussion by **Randolph Brazier** of the Energy Networks Association (ENA) and Professor **Goran Strbac** of Imperial College London.

Key conclusions:

- Importance of industry **readiness to mine, vet and share data**
- **Organisational culture change** is required in respect of how data is managed and optimised
- Energy can **learn from the data/digitalisation experiences** of other sectors - and avoid some of the mistakes they made
- Market modernisation will likely be an iterative, collaborative affair where **interoperability** - both within the energy sector and between energy and other sectors - will be key
- **Impact on end users** (i.e. consumers, households) needs to be considered in greater detail - data security/privacy (GDPR), pricing/cost, environment/carbon footprint, etc.

Challenges for the industry - John Scott

Setting the scene, John outlined three key challenges facing the industry as a whole:

- Understanding the language of modern energy systems - i.e. digitalisation versus digital transformation
- Assessing the impact on organisations - the importance of data literacy and what “adopting a digital mindset” actually entails in terms of workplace culture and change
- Harnessing new technologies - in order to resolve the myriad issues of complexity, coordination, accountability and authority

Citing the near-seamless network management now taken for granted in cross-border mobile telecoms as an example, he suggested that this is the direction in which energy is now heading too. But getting there involves the resolution of complex questions and challenges, spanning issues from service operations and stability to systems compatibility, automation, compliance and control.

Understanding data, mastering digitalisation - Laura Sandys

These themes were taken up by Laura, who emphasised that developing new skills and mindsets will be crucial in a digitalised energy landscape, as will questions around safety, openness and governance. In addition, the extent to which consumers will be prepared to entrust their personal data to energy distributors, network operators, retailers and government/regulatory bodies - all interacting seamlessly - is set to be a major issue.

She suggested that the introduction of smart-metering systems over the past decade effectively took place against a backdrop where the critical importance of the key information asset underpinning such systems, i.e. data, simply wasn't sufficiently understood or properly appreciated by the key stakeholders - operators and regulatory authorities alike.

Data, in all its forms, underpins much of what the UK energy industry is currently doing. The quality of data, how to mine and leverage data, how to manage data and keep it safe, how to use data to optimise operations and reduce costs - these are the key challenges facing the industry today.

The digitalisation of data was a central theme of the Taskforce report. In many ways, however, data digitalisation in the energy industry is in its infancy. The Taskforce therefore set out to establish a series of 'principles-based' recommendations to provide the industry with an overarching operational framework for dealing with data in all its forms.

The Taskforce identified three key issues that the market needs to consider on its journey to a modern digitalised energy system: **data visibility, infrastructure and asset visibility, and operational optimisation.**

In respect of data visibility, decision makers need to know what data exists. Where is the data, what's good about it and what's bad about it? Where are the biggest gaps and how do we plug those gaps? Data openness and sharing is critical - the industry at all levels needs to get its head around the idea that data sharing is a good thing. Transparency isn't an optional extra if the industry is serious about optimising our energy system for the 21st century - companies have data and they need to share it, irrespective of gaps and quality. This is a leap of faith for many, but companies shouldn't be ashamed of their data - even if it's poor. At the end of the day, it makes sense to let the market demand, and then drive, the prioritisation of improving data quality and plugging gaps.

Linked to this, is the need to identify the available data assets and infrastructure across the board. Again, the two key imperatives here are filling the gaps & maximising value.

The energy industry lags behind many other sectors - telecoms and logistics, for example - when it comes to managing, quantifying and controlling the quality of our data. This is both a challenge and an opportunity - if stakeholders can look to what other sectors have been doing over the past two decades and learn from their experiences, they can avoid (some of) the pitfalls associated with digitalisation.

The principle of '**presumed open**' is a critical one when it comes to data. The Taskforce has assumed that all data is open - that it is there to be shared by, and between, all parties. There will be instances where the obligation to provide data can be contested - and thus potentially redacted or obscured - for reasons of security and commercial sensitivity, but the starting point needs to be that all data is 'presumed open'.

Laura emphasised that energy stakeholders - operators, distributors, retailers, government and regulators - are all in this together. The only way to optimise future energy systems is to ensure that data is shared openly and transparently. This will be a challenge for many in the industry, she reiterated, but it's the new reality.

Operational optimisation means being able to leverage the right data at the right level in the right way. She pointed to Estonia as a good example of a market that seems to have got this bit of the equation right.

The Taskforce also recommended that three key 'building blocks' be put in place at the outset: a **data catalogue**, an **asset registration strategy** and a **digital system map**. These are intended to ensure data visibility, infrastructure and asset visibility, and operational optimisation.

The data catalogue would be created by government/regulators to securely hold and manage an inventory of all data held by all players. To be included in the catalogue, a company's dataset needs to be "triaged". In other words, companies will have to provide all of their data so that it can be opened up, analysed, diagnosed and evaluated. The catalogue is not merely a depository - it will be curated so that valid comparisons can be made between the data held by different players.

Asset registration is required to rationalise and streamline the registration of energy assets across the sector. Similarly, a digital mapping system will allow the sector to start layering assets and infrastructure. The ENA (what is this) is driving this and a beta product is expected to be trialled by the middle of 2020.

In conclusion, Laura acknowledged that some networks in the sector have already started to make data visibility “a competitive thing”. Whilst this is undoubtedly a good thing, she believes it has only happened because the Department of Business, Energy & Industrial Strategy (BEIS) and Ofgem have spoken clearly and with one voice on the issue.

Iterative modernisation and the interoperability imperative - Steven Steer

In so far as digitalisation and data are concerned, Steven said that Ofgem had two overarching objectives:

- Accelerate the development of tools and processes to modernise data services for the energy sector
- Interoperability by design: solve the fundamental problem of exchanging different sources of digital energy information between monopolistic digital services in order to leverage added value applications for consumers and business.

The regulator’s current focus is on data transparency - advising on best practice and shared strategies.

Describing Ofgem’s approach as “regulation at its softest”, he said its aim was to encourage networks and electricity-distribution companies to share what they currently do and what they are planning on doing, with their data.

Steven stressed that Ofgem is not demanding ‘perfection’ in terms of data strategies and data sharing. Continuous and iterative delivery is a key part of how it is approaching the data issue - “we just want to see where we are up to, to see what’s missing and to help operators learn.”

The aim is to progressively build an environment where the energy industry can share data with others in the sector, but also outside it too.

When should Ofgem be using data? According to Steven, that will vary in different parts of the market. A distinction can be made between the monopolistic parts of the energy market compared to the more free-market parts, and that could change the extent to which the regulator might take a view on how information should be worked with.

He also confirmed that Ofgem aims to create a set of principles and use-case examples that will explain what better use of data looks like.

Whilst welcoming the work of the Taskforce, particularly as it applies to smart metering, Steven pointed out that the current data environment across business sectors is replete with uncertainty. He said that Ofgem was “keeping an open mind” on the Taskforce’s

recommendations and that they may yet prove useful in time. He also sounded a note of caution about the energy industry developing tools (like data visibility catalogues, asset registers and digital maps) in isolation from other sectors of the economy. In order that data can be used interoperably, not only within but also between those sectors, he said Ofgem is talking with officials across government departments to establish the degree of commonality that currently exists between them.

Ofgem is trying to arrive at a place where it has a coordinated approach across sectors to ensure that it is making the best use of data as a set of regulatory rules. If it can achieve coordination and simplification of the regulatory rules in regards to data and information, it will be to everybody’s benefit.

One of the important questions that the energy industry needs to think about is where new monopolies may potentially arise, i.e. in the digital parts of the sector. Just as there are monopolistic elements in the physical industry at present, something like a data visibility catalogue sounds to Ofgem like it would be a monopolistic service – unless someone can explain how a market place for metadata would work. This would be a new kind of monopoly that didn’t exist before - and the industry needs to think about the issue.

Panel discussion: A collective vision of industry transformation

Randolph Brazier (ENA) observed that optimising the entire energy system is where effective gains for customers can be made and help get towards net zero faster (what does this mean). Three years ago, data wasn’t even on the ENA’s radar but the Association now recognises the significant benefits that data holds, not only for networks but for end users too.

Inviting contributions from all energy stakeholders for the development of a digital systems map, Randolph said that some networks already have this data (for mapping purposes). It may not be easy to find, nor is it necessarily presented in common standards and formats, but it exists - and ENA is trying to help standardise it all in collaboration with its stakeholders.

Goran Strbac (Professor of Energy Systems at Imperial College London) focused on the need for a cost-effective transition to a low-carbon energy system. He said that leveraging digitalisation means potentially delivering a low-carbon system for between 30% and 50% of the cost of getting there without digitalisation. It would also massively reduce bills for flexible energy consumers.

Going forward, the way energy is consumed will be much more important than the volumes that are consumed. The main challenge is that the complexity of systems operation will increase the order of magnitude (of moving to net zero). Moving from historical assets-based provisions supply to smart control - and making use of data to control consumption - is a complex process. Things will go wrong - that needs to be recognized - but if the sector gets it right, it will enhance resilience of the system very significantly.

Goran also questioned how the overall network is going to cope with the huge demand arising from increased electric-vehicle (EV) take-up. In other words, how can the sharing of data make the network more efficient and therefore minimise the level of investment required for reinforcement? He pointed out that there's no issue with the industry being able to satisfy demand - this is more a question of how much it will cost to facilitate and prepare for.

The impact of digitalisation on consumers and end users (e.g. connected homes, smart heating systems, smart fridges, electric vehicles, etc.) dominated much of the panel discussion and contributions from the floor. One participant warned that if the move to digitalisation ends up being too complicated, too confusing or too costly for the end user (households), the whole initiative risks ending in failure. The impact of personal energy-data usage on issues such as privacy, security and GDPR also needs to be addressed in this context.

Other inputs from the panel and the floor further underlined the importance of getting the data issue right from the outset. From visibility, registration and mapping at operator level right down to individual consumers making individual energy choices in their living rooms, the industry now has an unprecedented opportunity to transform the UK's energy system.