

HOW WILL OPEN DATA AND DIGITALISATION

HELP ACHIEVE THE NET ZERO TARGET?



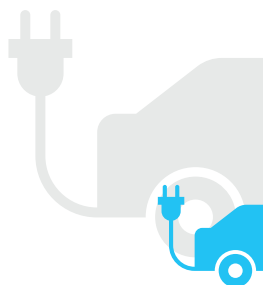
**WITH JUST 30 YEARS
BEFORE THE DEADLINE
TO ACHIEVE THE UK
GOVERNMENT COMMITMENT
OF NET ZERO CARBON
EMISSIONS BY 2050,
NATIONAL GRID ELECTRICITY
SYSTEM OPERATOR (NGESO)
PUBLISHED ITS LATEST
FUTURE ENERGY SCENARIOS
2020 (FES 2020)**

**LOOKING AT WHAT WE NEED
TO DO TO ACHIEVE IT.**



THE FES 2020 PREDICTS THAT BY 2050:

- up to 80% of households will own electric vehicles (EVs) which they 'smart charge' at times where demand for electricity and prices are lowest (likely to be at night), and 45% of households provide vehicle to grid (V2G) charging (where the EV acts as a mobile storage battery and can return power to the grid at times of higher demand for electricity).
- 8.1m households will actively manage their heating demand with residential thermal storage and load shifting (i.e. storing heat generated at times where demand and price for energy is low (likely to be at night), and releasing it in the homes when it is needed (likely to be early evening)).
- over 8m premises will have hybrid heat-pumps switching between hydrogen and electricity systems depending on market signals of demand and price.



The significance of these changes is that the energy system is becoming increasingly complex and the number of consumers continues to increase.

Technology choices by consumers (e.g. the adoption of electric vehicles) will influence how we most efficiently use the system, and how generators can provide sufficient supply of energy to meet the demand.

FES 2020 asserts that *“transparent and advanced analysis is critical in making the best decisions for consumers”* and that *“open data and digitalisation underpin the whole thinking required to achieve net zero.”*

WHAT IS “OPEN DATA”?

Open Data is publically accessible data which may be used, re-used and redistributed by anyone for any purpose.

In the context of the energy market, open data would mean that all contributors to the UK energy system would agree to share and make publically accessible any energy data (such as data relating to energy demand or generation capacity and system constraints) for use by others.



“TRANSPARENT AND ADVANCED ANALYSIS IS CRITICAL IN MAKING THE BEST DECISIONS FOR CONSUMERS” AND THAT “OPEN DATA AND DIGITALISATION UNDERPIN THE WHOLE THINKING REQUIRED TO ACHIEVE NET ZERO.”

HOW WILL OPEN DATA HELP NGESO ACHIEVE MORE TRANSPARENT AND ADVANCED ANALYSIS?



The high-level national statistics currently available on the UK energy sector are out of sync with the level of granularity and localised data required to drive new business efficiencies and innovation. Moving to a more data-orientated system, where data relating to demand, generation capacity and system restrictions is openly available to industry innovators and academics alike would widen the pool of analysts of such data, and essentially improve the quality of knowledge ascertained by data sets.

The theory goes that the fundamental principles of transparency, peer review, reproducibility and traceability are almost impossible to implement without open access to models and data¹. You don't need to be a scientist to understand that peer review and independent retesting of theories produced from data sets will reduce the chance of errors or misinformed conclusions being reached.

As far back as 2005, the House of Lords recognised that the UK's decarbonisation plans were delayed for years due to economic models which greatly underestimated the scale of the challenge and inaccurate cost assumptions for onshore wind.²



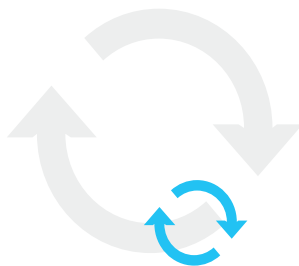
YOU DON'T NEED TO BE A SCIENTIST TO UNDERSTAND THAT PEER REVIEW AND INDEPENDENT RETESTING OF THEORIES PRODUCED FROM DATA SETS WILL REDUCE THE CHANCE OF ERRORS OR MISINFORMED CONCLUSIONS BEING REACHED.

¹ DeCarolis et al. 2012; Nature 2014)

² House of Lords, 2005. The Economics of Climate Change. Vol. II. 2005, HL 12-II of 2005-06, QQ 407-408.

HOW WILL TRANSPARENT AND ADVANCED ANALYSIS HELP US ACHIEVE THE NET ZERO TARGET?

It is now recognised that “data is the single biggest enabler of a decarbonised, decentralised and digitised energy future. It’s the tool that will bridge the gap between where we are now versus where we need to be to achieve net zero.” as highlighted by Matt Hastings, Innovate UK, in [Modernising Energy Data Access. A more data orientated energy market allowing the use of data analytics and insight capabilities by making data openly available would facilitate the Net Zero target by:](#)



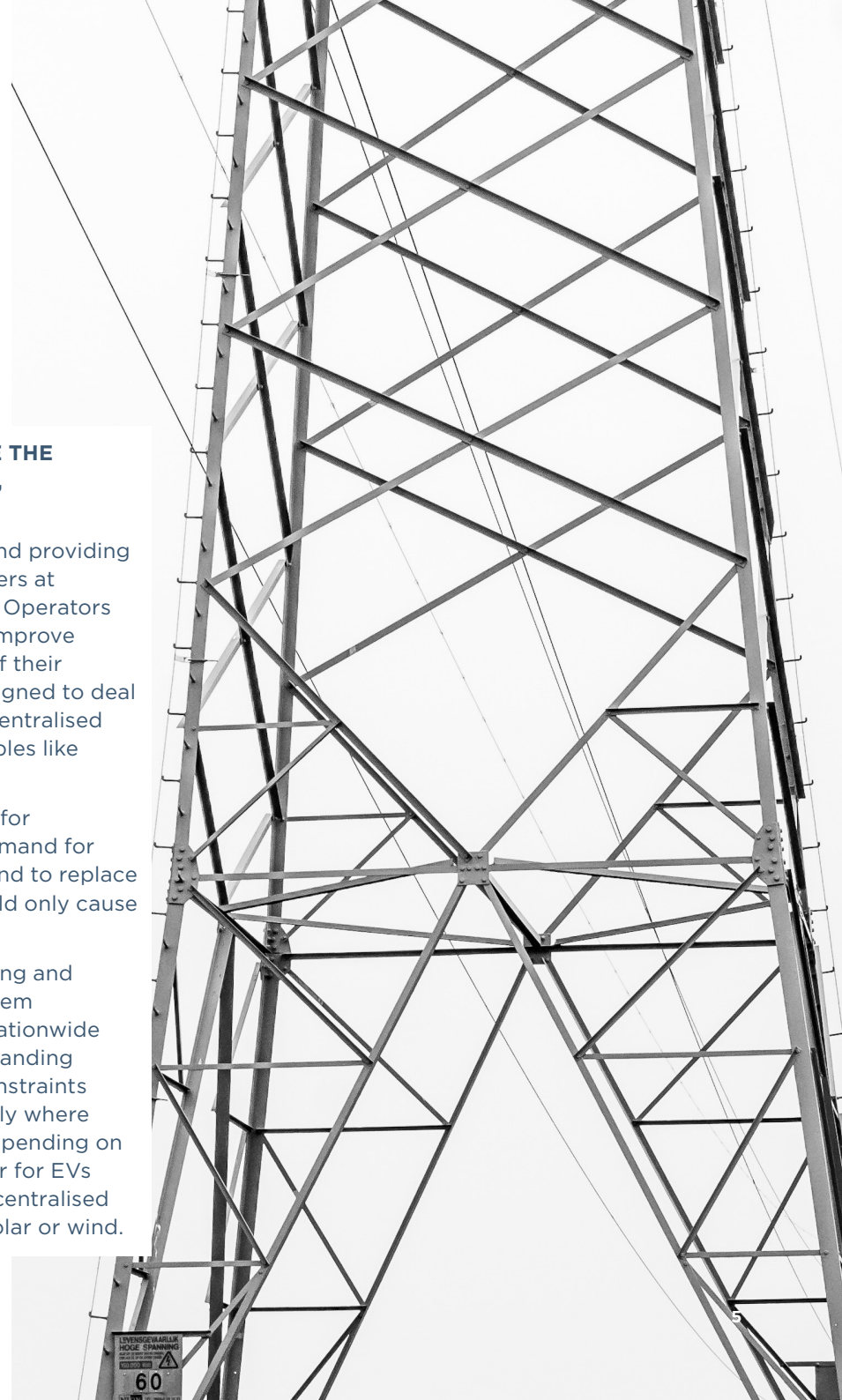
IMPROVING DATA FLOWS TO OPTIMISE THE OPERATION OF, AND INVESTMENT IN, THE ENERGY SYSTEM.

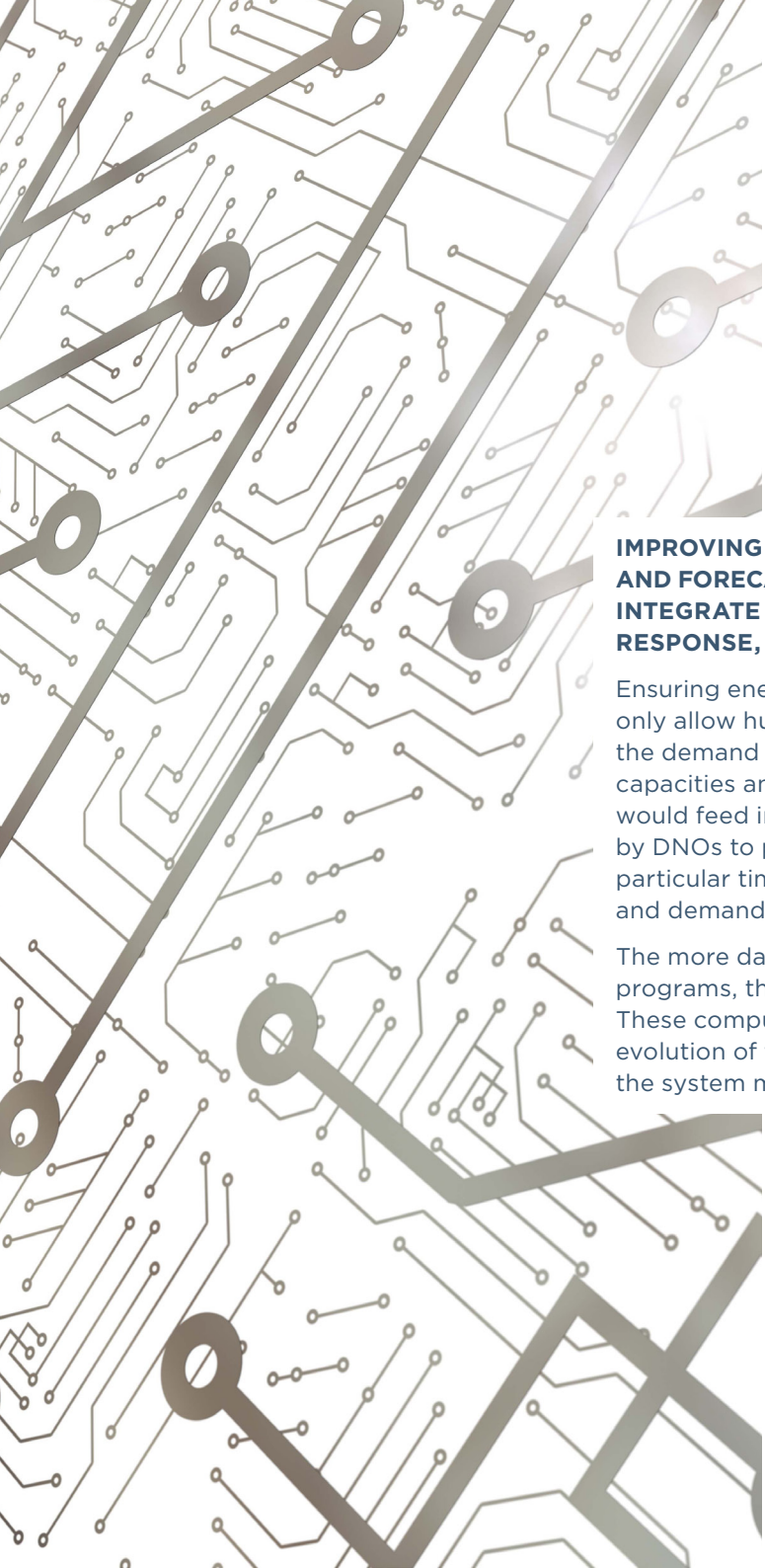
With the aim of being more responsive and providing real time information updates to consumers at times of an outage, Distribution Network Operators (DNOs) are investing in technologies to improve the design, operation and maintenance of their networks but the network was never designed to deal with bi-directional flows required for decentralised generation (e.g. from small scale renewables like solar) or V2G.

Graeme Cooper, National Grid's Director for Decarbonisation, reports that general demand for electricity has fallen by 16% since 2002 and to replace all combustion engine cars with EVs would only cause a 10% increase³.

This suggests that the wholesale upgrading and reinforcement of the existing energy system would not be necessary to support the nationwide adoption of EVs. Rather, a better understanding of the energy system's capacities and constraints would allow NGENSO to identify specifically where local reinforcement might be required depending on the demand in a particular area - whether for EVs with potential V2G capabilities, or for decentralised renewable generation facilities such as solar or wind.

³ Weforum 2019 Renewables Report





IMPROVING THE HANDLING OF REAL-TIME DATA AND FORECASTING CAPABILITIES TO EFFICIENTLY INTEGRATE SOLUTIONS SUCH AS DEMAND RESPONSE, EVS AND THERMAL STORAGE

Ensuring energy data is openly available will not only allow humans to deepen our understanding of the demand on the energy system, the generation capacities and restrictions in a particular area, it would feed into artificial intelligence programs used by DNOs to predict the demand in an area at a particular time, automatically balancing the supply and demand on the system.

The more data available to such artificial intelligence programs, the more accurate their decisions will be. These computerised technologies will accelerate the evolution of the energy system, making our usage of the system more efficient.

IMPROVING DATA VISIBILITY AND TRANSPARENCY, CREATING BETTER ACCESS TO DATA FOR BOTH EXISTING AND NEW PLAYERS IN THE MARKET

Openly available data would not only level out the playing field but it would generally also ensure a more competitive marketplace. With open data comes greater understanding of consumption behaviours, greater innovation and more competition amongst industry players.

ADDRESSING EXISTING BARRIERS, WHERE PARTIES HOLDING DATA FOR COMMERCIAL PURPOSES PREVENT MARKET OPPORTUNITIES FOR OTHER PARTICIPANTS

Currently many modelling consultants in the energy sector commoditise their know-how and models, and sell their expertise in this area to those willing to pay for it. This active withholding of data from others is, however, a barrier to entry for others, preventing the innovation and competition described above. Opening data would clearly remove such barriers, but as it may also undermine the current market, the appetite is not necessarily there to adopt change.

SO WHY ISN'T ENERGY DATA ALREADY OPEN TO ALL?

The primary reasons energy data is not open revolve around ethical, legal and national security concerns. Some may fear that disclosing the make-up of our national energy infrastructure may expose us to the risk of terrorism if information ends up in the 'wrong hands'. Opening access to what are often increasingly localised energy networks will also create localised data security risks in terms of diversion, corruption and in some cases unlawful disclosures (with decentralised power generation from smaller scale solar and district energy centres etc). Indeed, the more localised the data sets, the more likely this will result in personal data about users which brings with it data protection concerns. Even in an open data environment, restrictions and exclusions may be required to regulate access to sensitive commercial data or to personal data (in the case for instance of decentralised smart grids focused on individual households). The right to privacy of individuals overrides any open data policy and would need to be protected by access and disclosure regulations.

In most industries, when personal data is involved, anonymisation and/or aggregation may be used to mitigate privacy concerns. In addition, access to data will most likely trigger substantial use of data analytics which produce maximum results when different datasets are combined. However, mixed data sets are still personal data and protected as such. Privacy laws and legislation duly apply all times and the General Data Protection Regulation (EU) 2016/679, (**GDPR**) provides clear guidelines on how to deal with data sets that include personal data.



WHAT CAN THE UK DO

TO ACTUALLY IMPLEMENT A STRATEGY OF DIGITALISATION AND OPEN DATA?

DIGITALISATION

Energy suppliers have already commenced the ‘silent revolution’ of introducing smart meters to measure energy usage digitally. The consumption data harnessed from such smart meters is automatically sent to the energy supplier and is used primarily for billing purposes but it would also allow NGENSO to manage and balance the energy system. Knowing when the peak times of demand are, allows incentives to be designed into energy pricing plans to incentivise consumers to use in these off-peak times when the energy system has sufficient capacity to meet demand. Overnight charging of EVs is an example of this. EV charging infrastructure needs to be capable of assessing when the price for electricity is low to commence charging. Similarly, EVs with V2G capability would need to know when the value of electricity is high to determine whether to put power back on to the network in return for

payment. If energy data is openly available – and can be bi-directional – then this would allow charging infrastructure innovators to develop technologies that support a smarter use of the existing energy system.

More widespread smart meter use could allow NGENSO to effectively implement a patchwork of renewable sources (which tend to be decentralised generation sources), and to switch off some of the remaining fossil fuel plants that currently buttress the energy system.

In their June 2020 statement, BEIS estimated that investing in installing smart meters could reduce “carbon emissions by 45 million tonnes – the equivalent of taking 26 million cars off the road”. This would be a huge contributor to achieving that elusive Net Zero Target.



IN THEIR JUNE 2020 STATEMENT, BEIS ESTIMATED THAT INVESTING IN INSTALLING SMART METERS COULD REDUCE “CARBON EMISSIONS BY 45 MILLION TONNES – THE EQUIVALENT OF TAKING 26 MILLION CARS OFF THE ROAD”. THIS WOULD BE A HUGE CONTRIBUTOR TO ACHIEVING THAT ELUSIVE NET ZERO TARGET.



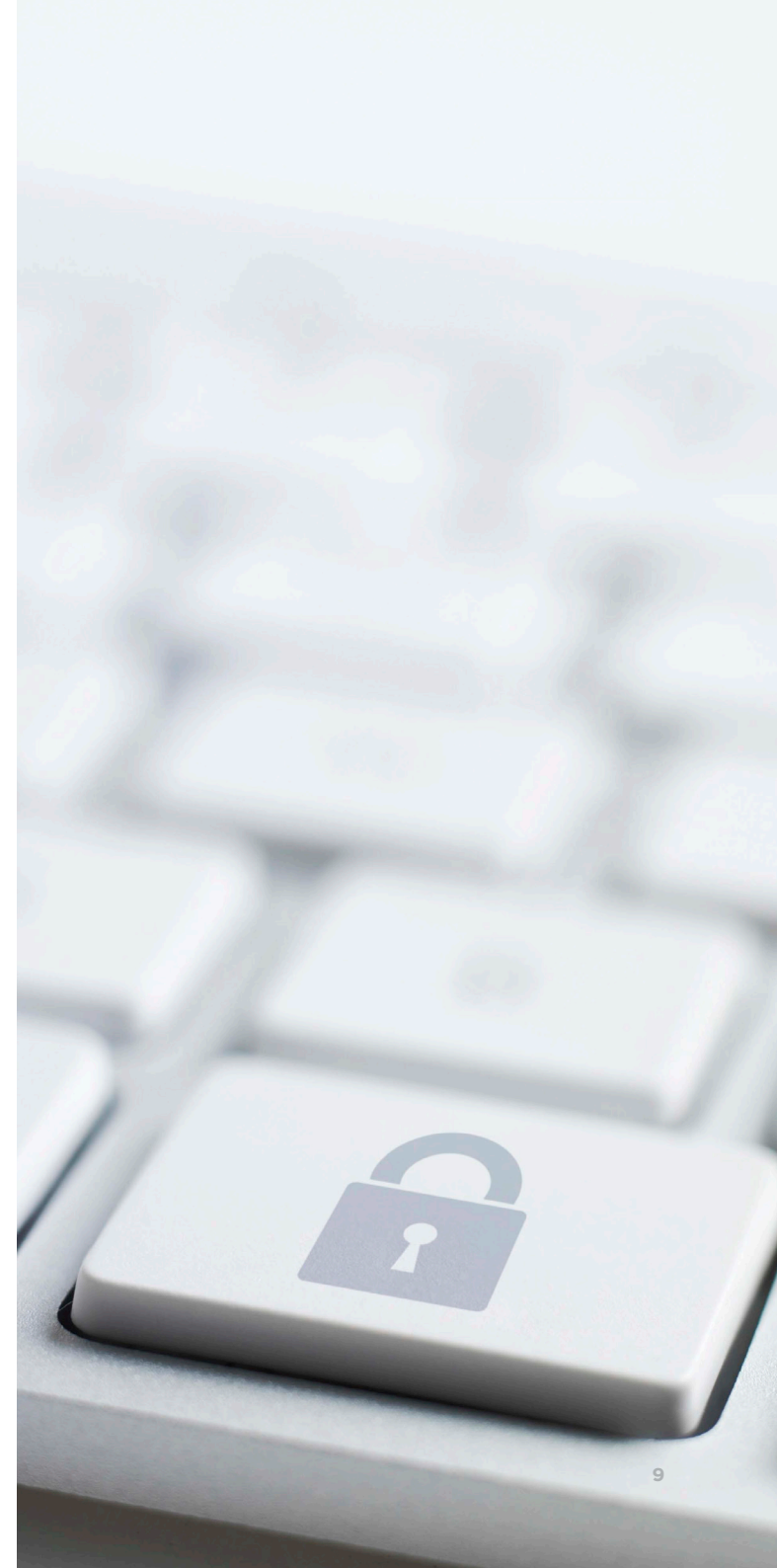
OPEN DATA

There has already been some legislative intervention to require the sharing of data from the 2050 Carbon Calculators launched by the then UK Department of Energy and Climate Change, and the EU Regulation on Wholesale Energy Market Integrity and Transparency (known as REMIT) which required participants to publish electricity market data to combat market manipulation. However, NGENO clearly believes that more is required, so what can be done to encourage such an increase in open access data?

BEIS, Ofgem and Innovate UK established the Energy Data Task Force – with the mandate to emphasise the importance of opening up data on the energy sector, which its Chair, Laura Sandys said *“will become increasingly central to managing the new decarbonised, decentralised and digitalised energy system”*. The Energy Data Task Force aims to establish ‘openness’ principles, propose data sharing methodologies, identify gaps in data as well as advise generally on the risks associated with data.

THE ENERGY DATA TASKFORCE IDENTIFIED THAT A STAGED APPROACH NEEDED TO BE TAKEN TO ACHIEVE A MODERN, DIGITALISED ENERGY SYSTEM IN ORDER TO FILL THE DATA GAPS AND MAXIMISE DATA VALUE:

- **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.



BASED ON THOSE FINDINGS, THE ENERGY DATA TASKFORCE DEVELOPED FIVE RECOMMENDATIONS FOR GOVERNMENT, OFGEM, AND INNOVATE UK:

DIGITALISATION

1: DIGITALISATION OF THE ENERGY SYSTEM

Government and Ofgem should direct the sector to adopt the principle of Digitalisation of the Energy System in the consumers' interest.

2: MAXIMISING THE VALUE OF DATA

Government and Ofgem should direct the sector to adopt the principle that Energy System Data should be 'presumed open'

3: VISIBILITY OF DATA

A Data Catalogue should be established to provide visibility through standardised metadata of Energy System Datasets across Government, the regulator and industry. Government and Ofgem should mandate industry participation through regulatory and policy frameworks.

4: COORDINATION OF ASSET REGISTRATION

An "Asset Registration Strategy" should be established to coordinate registration of energy assets, simplifying the experience for consumers through a user-friendly interface in order to increase registration compliance, improve the reliability of data and improve the efficiency of data collection.

5: VISIBILITY OF INFRASTRUCTURE AND ASSETS

A unified "Digital System Map" of the energy system should be established to increase visibility of the energy system infrastructure and assets, enable optimisation of investment and inform the creation of new markets.



Whilst the trial to register the location and type of all underground utilities assets that is underway in London and the North East suggests there are some signs of putting recommendations 4 and 5 into action, presumption that data is open in recommendation 2 falls short of mandating that it is. The recommendations fall short of making open data a requirement for projects or research looking for funding, unlike the health sector where this is more common when seeking funds from the likes of the Wellcome Trust.

In its Energy White Paper "Powering our Net Zero Future", the Government reinforced the importance of Net Zero as being at the core of the UK's energy policy. In doing so, it commits to building a world leading digital infrastructure for the energy system, accepting the Energy Data Task Force's recommendations. The White Paper pledges to develop and implement IT strategy to make it easier for analysts, contractors and collaborators to develop and maintain models by harmonising development. It seems the Government has recognised the need for open data sources goes further to recognise the need for open source modelling, and will develop a protocol to share government developed models and create an open, secure modelling platform.



CONCLUSION

CLIMATE CHANGE

MITIGATION, TECHNOLOGICAL ADVANCEMENTS AND ECONOMIC DRIVERS ARE RESULTING IN A SUSTAINED TRANSFORMATION OF THE ENERGY SECTOR. OUR NATION'S DEMAND HABITS FOR ENERGY ARE BECOMING EVER MORE COMPLEX. AS SUCH, THE ABILITY TO ANALYSE ENERGY DEMANDS, AVAILABLE GENERATION CAPACITY AND SYSTEM CONSTRAINTS IS NEEDED NOW MORE THAN EVER IN ORDER TO:

- allow NGESO to make real-time balancing decisions (or even allow artificial intelligence software to anticipate these demand fluctuations) within the existing system constraints; and
- to understand how and where we need to develop the energy system to enable the adoption of technologies like EVs and thermal storage to help meet our Net Zero Target.

If the commitments set out in the Energy White Paper are implemented, then the UK may establish a more data-orientated energy market with digitalised metering and real-time open data flow - increasing the UK's chances of meeting the Net Zero Target.

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