

Written evidence submitted by Ofgem (ADM0027)

Summary of key points

- Ofgem closely monitors the conduct of the energy market and the companies we regulate. We have wide ranging powers allowing us to carry out investigations into company behaviour when we believe they may have breached a condition of their licence, or have breached the requirements of consumer protection or competition legislation. This includes industry errors to do with algorithms.
- While we do not currently monitor the development and use of algorithms, we actively monitor the consumer outcomes that may be impacted by such algorithms – and if there is a poor outcome, we stand ready to intervene.
- Digital advances, including algorithms and machine learning, can present great opportunities for energy consumers. They can make the market function more efficiently, enable consumers to more easily manage their consumption and costs, and offer consumers a simpler, easier experience within the market. However, we are also mindful of the potential for adverse outcomes for some consumers.

About Ofgem

1. Ofgem¹ is a non-ministerial government department and an independent National Regulatory Authority, recognised by EU Directives. Our principal objective when carrying out our functions is to protect the interests of existing and future electricity and gas consumers. We do this in a variety of ways including:

- promoting value for money;
- promoting security of supply and sustainability, for present and future generations of consumers, domestic and industrial users;
- the supervision and development of markets and competition; and
- regulation and the delivery of government schemes.

2. We work effectively with, but are independent of, government, the energy industry and other stakeholders within a legal framework determined by the UK government and the European Union.

Our response

3. This response seeks to address the following points raised by the Committee where relevant to Ofgem's responsibilities:

- What policy, if any, you have in regard to the use of algorithms in your sector;
- What rules or guidance you have issued about algorithms in your sector;
- Any arrangements for bodies in the sector to make available, to you or the public, (i) the details of any algorithms used and/or (ii) an explanation of the way any algorithm functions, to aid understanding;
- What arrangements are in place in the sector to monitor the development and use of algorithms;
- The accountability that bodies in the sector have to you for their use of algorithms; and

¹ Ofgem or the Office of Gas and Electricity Markets is the name used to describe the body of civil servants responsible for performing functions on behalf of the Gas and Electricity Markets Authority.

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- What assessments have been made of the impact that the Data Protection Bill, and the EU General Data Protection Regulation, will have in your sector in regard to the development and use of algorithms.

4. We would be pleased to provide the Committee with further information if it would be useful.

The use and regulation of algorithms in the energy sector

5. In the section below we summarise the use of algorithms in the retail energy market, wholesale markets, by the electricity and gas system operator, in cross border trading, and by electricity and gas network companies. In each case we explain how activities are monitored or regulated.

Retail market

6. The retail energy market is where households and businesses buy the energy they need from suppliers.

The nature of competition in the retail energy market helps to determine consumer prices and service quality.

7. In regulating the retail energy market we have committed, over time, to rely more on enforceable principles rather than detailed rules about how suppliers should run their businesses. In 2013 we introduced tough new Standards of Conduct that require suppliers treat customers fairly. This now includes particular obligations to ensure that they identify and respond to the needs of customers in vulnerable situations.

8. We do not have specific rules or guidance in place with respect to algorithms in the retail energy market at this time. We are instead focused on the consumer outcomes that industry delivers. This includes how industry uses information about consumers to target products and services, and the quality of service that consumers receive when using these products and services. We stand ready to take action where these outcomes are poor.

Wholesale markets

8. Very significant volumes of power are traded via wholesale gas and power markets. These are the places in which generators sell their gas or power, supply companies buy gas or power and where parties hedge their risk exposure. These are competitive markets and parties active in these markets are free to make decisions about the market place in which they trade (for example via a power exchange, via over the counter markets or bilaterally) and the method of trading they use. Many of the firms active in these markets use highly sophisticated trading strategies, some of which include algorithms.

9. Ofgem is active in monitoring these markets to prevent abuse, but does not place limitations on the way that trading takes place. For instance, we are aware that several parties use algorithmic trading, sometimes referred to as 'robot trading', to trade power in many markets around the world, including Great Britain.

10. Ofgem closely monitors conduct in wholesale markets via a dedicated team. We have wide ranging powers – via the domestic regulatory framework, competition law and the European Regulation on Market Integrity and Transparency (REMIT) – which allow us to take enforcement action in the event that we detect market abuse.

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11. Since 2013 we have been monitoring for and investigating potential breaches of REMIT. REMIT prohibits insider trading and market manipulation, bringing regulation of the wholesale power and gas markets in line with equivalent financial markets. Our REMIT work supports effective competition and promotes trust and confidence in the wholesale markets. We have the ability to open both civil and criminal investigations into potential REMIT breaches, and the maximum penalties are unlimited fines or 2 years' imprisonment respectively.

The system operator

12. National Grid performs the role of electricity and gas System Operator (SO) across Great Britain. The electricity system operator is principally responsible for ensuring that demand and supply balance in real time. This is a highly complex task requiring very powerful IT systems to monitor the networks, take actions very rapidly to control changes in system frequency and to alter the balance of demand and generation on the system in order to maintain an equilibrium. The gas system operator has to balance supply and demand over longer timeframes, as there is inherent flexibility within the gas system that means that supply and demand can be balanced on a daily basis.

13. National Grid's control rooms use various algorithms – or at least highly complex pieces of bespoke software – as part of these processes. Examples of these include:

- Forecasting the demand that will be on the electricity and gas systems ahead of time;
- Wind forecasting, to determine the volume that can be expected to be delivered at a future point in time; and
- Determining the actions that the system operator should take to balance the system efficiently.

14. There is only a single system operator in GB for gas and electricity and this role is a natural monopoly. As such, the actions of the SO are regulated by Ofgem and there is significant oversight of the SO's activities.

In simple terms, Ofgem analyses the level of investment suggested by the SO and allows funding for plans which we consider efficient. This includes IT projects. We also scrutinise the level of costs the SO incurs in balancing the system and provide incentives to minimise that cost. Our role also involves ensuring the SO complies with the requirements of its licence and is acting in the interests of consumers. This will include overseeing the delivery of IT projects, ensuring sufficient transparency around the SO's activities and investigating concerns raised by market players. However, we do not approve any decisions which the SO makes to use algorithms or provide any guidance on the areas where it should – or should not – do this.

Cross border power trading

15. The GB gas and electricity markets are interconnected to other European markets via subsea pipes and wires, termed interconnectors. The arrangements via which parties trade on those interconnectors use several algorithms, particularly in electricity.

- Market coupling and the EUPHEMIA Algorithm: Electricity is sold in different time horizons, with different approaches to trade in each market. In the day ahead markets, a single, EU wide algorithm, called EUPHEMIA calculates the price for each half hour and the volume of power which will flow.
- Developing intraday and balancing markets: We are also in the process of developing markets which allow market players to trade closer to real time (in so

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called intraday and balancing markets). Prices in these markets will also be calculated using algorithms.

16. Various European regulations set out a set of rules for cross border power trading in Europe. These regulations specify the way in which electricity and gas should be traded and assign responsibilities for the various parts of the process. Regulators have the ability to take enforcement action if these rules are not followed.

Energy networks

17. We expect that energy network companies, which move and deliver electricity and gas to homes and businesses, use algorithms in operating their networks (e.g. opening and closing switches to ensure safe operation) and in how they approach certain problems (e.g. how to prioritise restoration of supplies following a storm).

18. We do not monitor the use of any such algorithms directly, but instead we monitor and hold the companies to account for the ultimate outputs that are delivered for consumers. For example, our networks price controls have incentives that provide the companies with rewards or penalties depending on whether they can beat the targets we set them in areas such as reliability and customer satisfaction. These incentives are working well, with power cuts having almost halved since 2002 and customer satisfaction at record highs.

Future opportunities and risks

19. Digital advances, including algorithms and machine learning, can present great opportunities for energy consumers and can make the market function more efficiently, enable consumers to more easily manage their consumption and costs, and offer consumers a simpler, easier experience within the market. Indeed, there are already automated switching services in the retail market, which automatically switch participating customers to the cheapest tariff for them, based on information the services hold about those customers' needs, preferences and consumption. Such services often use algorithms when matching a consumer to a particular tariff, or calculating potential savings for consumers. Although these services are – at the moment – used by relatively few people, we expect their usage to increase. This should help facilitate consumer engagement and competition in the retail market – but may raise other issues related to consumer protection.

20. The International Energy Agency (IEA) 2017 report on Digitalisation and Energy also notes several benefits through industry adoption of algorithms to drive efficiency. For example, uptake of new technologies, paired with algorithms and market information, can help to drive down transaction costs between electricity generators and consumers. In retail markets, aggregating distributed energy loads across multiple end-users enables demand shaping, both reactively (e.g. using price signals) or proactively (e.g. using input on consumer preferences). There will likely be a greater role for both matching (e.g. on price comparison websites or within collective switching activities) and predictive (e.g. load control services) algorithms as multi-part tariffs and demand response or other customised services pick up.

21. Increasingly, learning algorithms in smart thermostats are taking the predictive element one step further, automatically pre-heating or pre-cooling a building space relative to expected occupant presence, user preferences, forecast weather conditions and other input information (e.g. energy prices). This has potential to save consumers money.

22. At the other end of the energy supply chain, algorithms can play a role in improving efficiency of energy generators. Within energy generators, digital meters and sensors collect

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data on system performance, with optimisation actions determined by control algorithms and automatically implemented digital systems. This can result in efficiencies and cost savings that can be passed on to the end consumer.

23. We also see increased potential for use of algorithms in the following areas across the energy sector:

- Any digital tool or business model that benefits from increased understanding of individual behaviour or purchasing decisions. For example, a household that only consumes energy at certain times of the day may be offered certain time-of-use (TOU) tariffs that match these consumption patterns.
- Most blockchain models². The transactions within a blockchain are governed by algorithms, which may or may not learn over time. In the energy sector, blockchain is becoming an increasingly popular idea to manage peer-to-peer transactions. For example, where a consumer is transacting with a number of parties across the supply chain – these transactions can be managed via a ‘blockchain’ (in other words, a ‘distributed ledger’).
- Automated trading algorithms. As with many advanced financial trading platforms, algorithms play a key role in energy trading at various points across the supply chain.

24. But we are mindful of potential adverse outcomes related to privacy concerns (e.g. use of granular data to interact with a customer in a very specific way), inappropriately narrow market segmentation and removal of consumer choice more generally (e.g. where a customer is only offered certain products or services that, while tailored to meet their needs, effectively remove other options that may be in the consumer’s interests). There is a risk that with smart meters, richer customer data and artificial intelligence, the opportunity to segment the market to the detriment of the least active consumers will become greater, not less.

25. These issues are not unique to the energy sector – and we are keen to understand and work with other sectoral regulators as they think about consumer protections in this area.

Arrangements for bodies in the sector to make available, to Ofgem or the public, (i) the details of any algorithms used and/or (ii) an explanation of the way any algorithm functions, to aid understanding.

26. We do not at this time have specific arrangements for sector participants to make available details or explanations of algorithms used. However, if necessary, we could use our powers to compel licensed entities to provide this information to Ofgem.

27. This could include compelling information from any person operating in the energy sector – whether licensed or not – if there were grounds to suspect that algorithms were being used in connection with anti-competitive behaviour or were otherwise a feature of a market that was harming competition. This would involve either opening a competition law investigation, which would require Ofgem to have reasonable grounds to suspect an infringement, or launching a formal market study, which would have to be publicised and completed in statutory timescales.

Accountability that bodies in the sector have for their use of algorithms

² A blockchain, or distributed ledger, is a peer-to-peer database shared across a network, so that each participant has the same record of transactions. These transactions do not have to be financial, and can describe any digital aspect of an asset. For example, switching a meter from one supplier to another can be recorded as a transaction.

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28. The companies we regulate are accountable for the ultimate service that they provide to their customers. We have incentives and obligations in place to ensure that consumers receive a high standard of service.

29. Ofgem actively monitors and intervenes where consumers are experiencing poor outcomes. We do not actively monitor or have policies relating to algorithms themselves, but stand ready to take action where improper use of algorithms has the potential to harm consumers – and would take this very seriously.

30. Where there are industry errors as a result of an algorithm, we would treat this as we do any other poor industry behaviour – because we are focused on the consumer outcome and will take action where this is a negative outcome.

The impact that the Data Protection Bill, and the EU General Data Protection Regulation, in regard to the development and use of algorithms

31. Ofgem's priority for the EU General Data Protection Regulation has been to ensure our own compliance – in light of the fact we hold very large volumes of data.

32. In general, we view it as the responsibility of market players to ensure compliance – and the main data protection issues with algorithms are a matter for the Information Commissioner's Office. However, if we identify any data protection concerns we would be able to share information with them.

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