Helping businesses to improve the way they use energy

Northern Powergrid's response to the Department for Business, Energy and Industrial Strategy (BEIS) call for evidence

KEY POINTS

It is important that energy efficiency is not seen as a standalone action and that it is complemented by the range of actions being taken to meet the UK Carbon Budgets. We see merit in having a holistic energy policy framework that optimises the UK energy system as a whole.

- Any new policy decisions on energy efficiency should take into account the more **fundamental market reviews** being carried out in parallel and the on-going **transition to a smart flexible energy system.** Progress should also be measured using indicators that reflect the wider transition to a smarter, more flexible energy system.
- We believe that **low carbon electricity has a central role to play** in the future energy mix. We expect that the carbon intensity of electricity will continue to fall substantially over the next 10 to 20 years.
- Currently, electricity accounts for 18% of final energy consumption in the UK. We expect that the **demand for electricity may rise with an increasing appetite for low-carbon energy in transport, heating, and industry.** A permanent reduction in energy demand can not only facilitate lower greenhouse gas emissions and lower bills, but also potentially lower the costs of infrastructure by offsetting the likely increased demands for electricity.
- We support **tighter building standards for energy efficiency** to meet the standards of zero carbon buildings (or above) as a vital action for driving the decarbonisation of heat. The UK offers significant potential to increase the building energy efficiency standards for both new build and existing properties (domestic and non-domestic).
- **Electrification of heat is likely to result in an increased electricity peak demand and an associated opportunity to use the power required when it is being generated.** Smart technologies like heat pumps, storage heaters, batteries and smart appliances enable shifting the electricity demand outside the peak.
- With the introduction of smart grid and grid flexibility services, we will be able to mitigate much of the negative effect from increased peak demand. **Northern Powergrid will openly test the market for flexibility solutions for any material reinforcement requirement.**

Our response to the *A future framework for heat in buildings* consultation should also be viewed in this context.

Detailed responses to Ofgem's consultation questions

Question 1: What do you see as the key developments and trends that will impact on the energy efficiency market over next 10 years?

1) Over the next 10 years, we expect to see substantial changes in energy emissions' intensity and shifts in energy demand:

   a. In line with our responses provided to the *A future framework for heat in buildings*[1] consultation, we expect that the emissions' intensity of electricity will continue to fall substantially over the next 10 to 20 years[2]. Thus, low-carbon electricity will have a central role to play in the future energy mix, including as a key way of decarbonising both heat and transport.

   b. One of the main barriers for the uptake of electric heating at present is that electricity is not competitively priced, when compared to other fuels. Electricity to natural gas price (BEIS central estimate[2]) ratio, depending on sector, is 4.1:1 (domestic), 4.6:1 (commercial/public sector) and 4.9:1 (industrial). This is driven, in part, by how electricity and gas are taxed.

   c. To efficiently meet decarbonisation targets, it is important that electricity and other sources of energy are taxed on a fair basis, reflecting their carbon intensity and wider environmental effects – this would allow different low-carbon technologies to compete fairly on their relative merits across the energy system.

   d. A forecast of increasing summer temperatures indicates that the fuel consumption for cooling is likely to increase in the future[3], thus contributing to an increase in energy costs. Likewise, we believe that the energy use associated with data processing and computing will increase[4].

2) National Grid's Future Energy Scenarios[3] illustrate how electrifying heat and transport could change the current peak demand on the networks. The two scenarios that meet the 2050 decarbonisation target, *Community Renewables* and *Two Degrees*, would see a substantial

[1] BEIS, 2018. A future framework for heat in buildings: call for evidence.

[2] BEIS, 2018. Treasury Green Book supplementary appraisal guidance on valuing energy use and greenhouse gas (GHG) emissions. Data tables 1-19 supporting the toolkit and the guidance.

[3] National Grid, 2018. Future Energy Scenarios.

[4] Danilak, R. Why energy is a big and rapidly growing problem for data centers. Forbes. Published on 15 December 2017.

increase in electricity demand, and mandate a 4-8 TWh (6-10%) increase in industrial electricity peak demand.

3) Irrespectively of that, we believe that the availability of smart tariffs, half-hourly data from smart meters, smart electric vehicle charging, and future flexibility contracts will lead to efficiency in the energy system.

4) At the moment, peak demand largely follows business or people's preferred patterns of energy consumption. If patterns of energy consumption change, with some demand following lower pricing or higher generation availability, then the timing of peak demand is likely to change in future.

5) We welcome the recognition of the relevance of the *Smart Systems and Flexibility Plan* and the demand side response opportunities (and challenges) for businesses. We believe that another key development that could have a potential effect on the energy efficiency market over the next 10 years could come from the developments associated with this document.

   a. Through the Energy Networks Association Open Networks project[5], electricity distribution and transmission companies are collaborating to consider the future role of a Distribution System Operator (DSO) and what this would entail. We consider that the DSO will be central to enabling customers' participation in both energy and network services markets.

   b. Network operators should expand their roles as simplifying forces in the energy system. DSOs can be the key enablers of the energy system of the future, by providing the smart common infrastructure centred around the customer, upon which a competitive energy services model may operate locally. This can be designed to offer high standards of stability, security, and transparency to all market participants; and to align with the true cost structure of new technologies. In other words, DSOs form stable, safe and secure platforms upon which the wider systems and markets then operate and customers can get the most from their energy assets.

   c. DSOs will address network constraints with non-reinforcement solutions (such as energy efficiency and load shifting) wherever doing so is the cheapest, reliable and secure solution. This should be technology neutral and we should avoid prescribing specific technologies and approaches and let the options compete on their merits.

[5] Energy Networks Association, 2018. Open Networks Project.

d. This transition to the role of DSO is happening now. We are committed to putting flexibility services at the heart of our business operation. To that end, in common with other DNOs, we are partnering with Piclo to assess the potential for a national flexibility procurement platform in identifying flexible assets across the network.

Question 3: What other measures and energy efficiency potential might be available to businesses to reduce energy demand?

6) Progress needs to be measured using indicators that reflect the wider transition to a smarter more flexible energy system. It is important that energy efficiency is not seen as a standalone action and that it is complemented by the range of actions being taken to achieve climate change objectives.

7) In addition to the measures proposed, we believe that the current fiscal distortions affecting fuel prices need to be addressed to enable the adoption of low-carbon solutions. There is a market failure stemming from different, inconsistent taxation of different fuels and fuel prices not being reflective of externalities, such as the abatement cost of greenhouse gas emissions. We believe that the price of a fuel needs to be reflective of its carbon content.

8) Currently, policy costs are disproportionally levied on electricity bills, making up more than 15% of an electricity bill[6] (see Figure 1); this has created significant distortions in the market and is leading to inefficiency and perverse outcomes as bill payers are seeking ways to avoid these costs, such as generating behind the meter and setting up inefficient private networks.

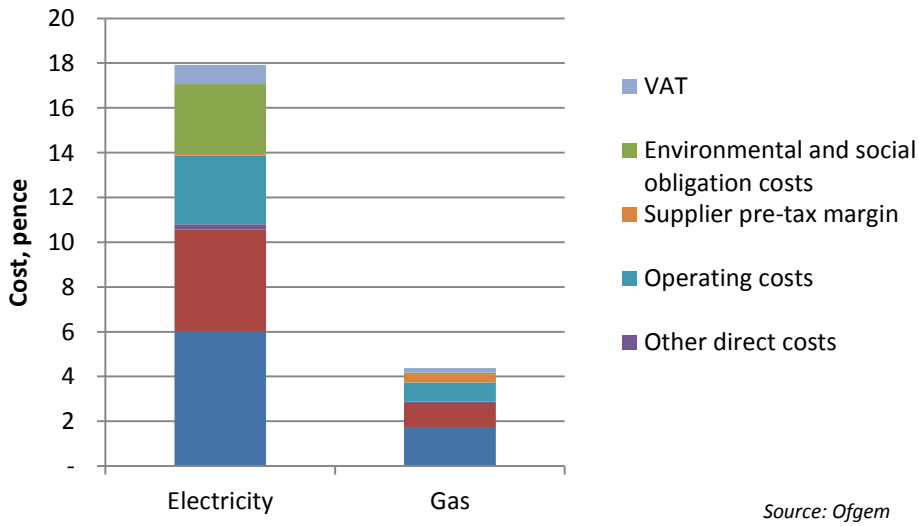

Figure 1. Price components of a unit of energy.

[6] Ofgem. Energy bill breakdown.

Question 4: What evidence do you have on how increasing building standards could drive improved energy efficiency, or how energy efficiency improvements in buildings have resulted in wider benefits? Is there any evidence that increasing building standards would not drive improved energy efficiency?

9) By definition, tightening Part L *Conservation of fuel and power*[7] of the Building Regulations will result in a reduced energy consumption of the particular type of building. This can be observed from the decreasing energy consumption by building age in domestic buildings. For example, the gas consumption in buildings completed after 1999 is 7-25% lower when compared to older buildings[8]. We believe the same relationship to hold true for non-domestic properties.

10) As an effect of increased energy efficiency, changes to building standards result in carbon savings and associated reduction in energy costs, when compared to a building with a lower energy standard.

11) There are a number of health benefits stemming from improved building energy efficiency, as highlighted in the modelling carried out by BEIS[9]. We believe they stand true for non-domestic and domestic buildings alike.

Question 6: What level of minimum standards and supporting trajectories could work for the wide range of business buildings? What are the key risks?

12) In line with our response to *A future framework for heat in buildings*[1], we believe that

a. The least-regrets option to achieve heat decarbonisation is to increase building energy efficiency standards to the level of *zero carbon* or higher to reduce the overall energy demand. When a building life cycle is considered, this approach ultimately offers a range of benefits such as increased comfort and lower energy bills to the property owner.

b. Having a lower energy demand initially, and consequently meeting this demand with a low carbon technology, has a higher potential to reduce the overall emissions from heating, when compared to using low carbon technologies to meet the energy demand stemming from the current energy efficiency standards.

[7] Ministry of Housing, Communities & Local Government. Conservation of fuel and power: Approved Document L. Statutory Guidance.

[8] BEIS, 2018. National Energy Efficiency Data-Framework (NEED). Headline figures: Summary consumption statistics. Data as of 2016.

[9] Page 19 - BEIS. Energy Company Obligation. ECO3: 2018-2022. Consultation Stage Impact Assessment.

c. We believe that fossil fuels, especially high carbon fossil fuels, should be made unavailable as an option to provide heat in new buildings. This could be done by, for example, further reducing the Target Emissions Rate stipulated in Part L (Conservation of fuel and power) to the Building Regulations.

d. In line with our responses provided to the *Proposals for smart appliances*[10] consultation, we believe that efficient and smart systems can regulate the amount and time of consumption, creating a benefit for customers and the distribution system operator.

e. For new buildings, a low-regrets pathway is increased energy efficiency standards and the electrification of heat. This would allow reducing the final energy demand at the least cost. Installing an energy-efficient heating system in new buildings would likewise avoid the additional costs[11], including hassle costs[12], associated with retrofitting a heating system.

f. Fossil fuel heating (including natural gas), although it currently provides a competitive fuel cost, is not a feasible option for any off-gas-grid new-build. There are high costs associated with installing gas connections' infrastructure in terms of pounds per units of heat required.

g. We believe there is a combination of approaches needed to address the carbon emissions produced from heating current building stock.

h. While it will take several decades to phase out gas, oil, and other fossil fuel heating from the existing housing stock (which typically have high peak energy demands), new buildings should be built to high energy efficiency standards such that their heat demand is reduced to a few kW (peak) and easily met through electric heating, be that resistive heating or heat pumps. Building out new gas infrastructure to connect new buildings risks stranded assets and unnecessarily pushing up bills for existing gas-connected customers.

Question 7: We would welcome your further views on how we can address the challenges of moving to higher building standards across the diversity of businesses and their buildings.

13) We believe there are differences with respect to multi-occupancy buildings, as highlighted in earlier consultation responses[1,10]:

[10] BEIS, 2018. Proposals regarding setting standards for smart appliances.

[11] Cambridge Econometrics, 2014. Building the Future: The economic and fiscal impacts of making homes energy efficient.

[12] For illustration, please see the negative *willingness to pay* associated with perceived 'hassle', such as digging up garden, requirements for space and/or a hot water storage cylinder, demonstrated in Figure 5 of Element Energy, 2008. The growth potential for Microgeneration in England, Wales and Scotland.

a. The electrification of heating within a multi-occupancy building would fall under the principles set out in Distribution Connection and Use of System Agreement (DCUSA) DCP205 and DCP205A – Recovery of costs due to load and generation increases from existing customers in RIIO-ED1. The costs of any reinforcement caused by load or generation growth by domestic and small business customers would therefore be recovered through distribution use of system charges (DUoS) charges i.e. we will fund the work through our capital reinforcement programme.

b. Northern Powergrid is embarking on a programme of refurbishment and replacement of the rising mains within high-rise properties which run through the internal fabric of buildings. In instances where we have to replace the riser we will size the cable appropriately for the current and future needs of the customers and therefore should be capable of supplying the power to electrically heat the properties if required.

c. However, the wider network may not be able to service the additional load generated by wholesale electrification of a high-rise building and would need to be reinforced upon notification from the council/building owner/building operator of their intention to install electric heating. Under the principles of DCP205 we would also fund this wider reinforcement work and recover the cost via DUoS charges. (We will be liaising with the building operators as we plan the work so will make sure that we are not going back to reinforce the rising mains after we have just replaced them.)

Question 11: How can the barriers to the development of the energy services market be overcome? Does this differ between sectors? Is there a role for government?

14) As set out in our Business Plan for 2015 to 2023, Northern Powergrid is committed to seek market solutions to defer the need for assets to be built or replaced to introduce more capacity.

15) Northern Powergrid already has 408MW of contracted flexibility with more expected to be turned on in 2019:

a. This is currently in three areas where we are operating active network management (ANM) with generators. The first was commissioned in 1997 and the most recent in 2013.

b. In Q1 2019 we expect to turn on our new ANM system for generators connecting in the Driffield region enabling a further 25MW of contracted flexibility. This is a scalable system that we can roll-out in other areas at lower cost than our previous bespoke systems.

c. Over several years, we have seen reduction in net demand on our network due to reduction in load from energy efficiency, distributed generation masking demand, and reduced industrial activity. Our business plan reflects the near term effect of changing patterns of network usage, resulting in relatively low levels of reinforcement at extra-high voltage (EHV) over 2015 to 2023.

16) The areas of our network where we may need extra capacity due to load growth is being assessed to understand if peak load reduction is required. Northern Powergrid will engage with the market in 2018 to understand the availability and price of market-procured flexibility to provide a service to reduce peak load instead of building more network capacity.

17) In line with the Open Networks project road map we are committed with other DNOs to develop enduring common processes to procure flexibility. As explained in response to question 1, we are partnering with Piclo to identifying flexible customer assets across the network.

Question 13: What more needs to be done to improve standardisation to drive investment in energy efficiency? What role could government usefully have, if any?

18) We acknowledge the potential benefits to the energy system from enabling *demand-side response* (DSR) for consumers through smart appliances. In line with our response to BEIS *Proposals regarding setting standards for smart appliances*[10] consultation, Northern Powergrid is supportive of mandating standards to achieve a uniform compliance and competitive market for 'smart appliances' and their inter-operability, and to facilitate their uptake, which, in turn, would enable customers to participate in DSR:

a. Northern Powergrid's Customer-Led Network Revolution (CLNR)[13] was a major smart grid demonstration project which brought together the key stakeholders in the electricity system (customers, energy suppliers and distributors) developing innovative technologies and commercial arrangements. In addition to the integration of people, processes and technology, this is one of the most significant trials undertaken in GB of customer electricity practices and attitudes.

b. The CLNR project involved designing and developing interfaces to connect smart washing machines, heat pumps, and hot water systems to provide value to customers through the provision of flexibility to the energy system. It demonstrated how flexibility could be used to benefit customers. Also, the challenges of integrating the different appliances and technologies for these first-of-a-kind systems were considerable.

[13] Customer-Led Network Revolution, 2015. Project closedown report.

c. We believe that standardisation is key to commercialise the technology and provide customers with access to markets. Standards also lead to greater simplicity in terms of inter-operability of energy systems. This simplicity is beneficial to customers as it introduces opportunity to access electricity markets without the difficulty of picking the appliance that provides this functionality.

d. We believe that standardisation of smart appliances is needed, provided there is compatibility between the standards set for smart appliances and the procedures set for the electric vehicle charging and the use of more sizeable energy storage (such as batteries, heat storage) and provided it ensures compliance with the Distribution Code and the Grid Code.

e. Additionally, a data sharing process should be in place to enable management and verification of the DSR agreements and the actual usage, e.g. whether the contracted DSR has been deployed or whether the smart appliance has been replaced by a non-smart appliance. An understanding of the consumption that has been deferred or avoided, irrespective of the party initiating the DSR, needs to be available to the DNO so that they can design a network in accordance with Engineering Recommendation P2/6, Security of Supply.

f. There are a variety of benefits stemming from the use of smart appliances. It is important to safeguard that the financial benefits are not double-counted for different smart grid-related initiatives, e.g. the network reinforcement benefits associated with smart appliances and smart meters.

g. Measures need to be carefully evaluated, especially if a smart appliance is to receive signals from network operators (i.e. Electricity System Operator and a Distribution Network Operator) and an energy supplier to avoid potential signalling conflicts and to ensure certainty of the appliance response.

Question 16: Would digitalisation and data analytics offer opportunities to improve the way businesses manage their energy use and make investment decisions? Please provide any evidence of whether this is already having an impact on the market for energy efficiency.

19) We agree that the roll-out of smart meters and thus making the users aware of their half-hourly consumption could encourage the uptake of energy-efficiency measures. But half-hourly settlement is also required to incentivise more efficient operation of the energy system and energy suppliers need to offer time of use tariffs to customers.

20) We have evidence of changes to network charging that had no influence on customers' behaviour. Our analysis of business customers' use of energy before and after the introduction of peak charging led to no change in energy use.

21) In relation to network charges in particular, analysis in our CLNR project[14] demonstrated that industrial and commercial customers did not change their pattern of use following the introduction of a new distribution price signal to avoid system peak in 2010. This might be partly explained by the discovery that, initially (in 2010 to 2012), for the sample population, only around 5% of suppliers had passed on the price signal to the end customer. It may be economically rational for energy suppliers, operating in a commercially competitive market, to absorb these signals but the overall effect of such action needs consideration in the future.

22) In the light of this experience, we conclude that whilst a greater number of time of use distribution tariffs may have the merit of being more cost-reflective, they may fail materially to alter patterns of usage at the aggregate level where locational decisions have already been made by customers at the time they connected. Because of this, we believe that DSO contracting may be more effective in sending appropriate signals to those customers that are able, and willing, to react.

23) In general, digitisation is likely to provide more visibility for customers and enable wider participation in energy and network services markets. As such, it should enable more time of use offerings from energy suppliers to customers as well as support contracting for flexibility services.

24) Please also refer to our response to Question 1.

Question 18: What more could be done to facilitate the availability of better data on energy use for businesses?

25) We believe that access to smart metering data is a key enabler for facilitating the availability of better data on energy use for businesses, and thus raising awareness of their energy consumption.

26) We agree that energy consumption benchmarking could provide a useful tool for initiating and facilitating improvements in energy efficiency.

[14] CLNR, 2015. Developing the smarter grid: The role of industrial and commercial and distributed generation customers.

Question 29: To what extent are large companies able to influence the energy efficiency performance of their supply chain? Please provide examples of where this is working well.

27) We use Achilles Utilities Vendor Database for all major procurement requirements. This database holds diverse information regarding its members, including any certifications held. Thus, among other functions, it enables us to filter for and select service providers who hold environmental continuous improvement standard ISO 14001. At Northern Powergrid, we only permit service providers to tender for our works if they are ISO 14001 certified, unless we consider that it is not relevant or proportionate to the tender event.

28) As part of our procurement process, businesses are asked to explain the ways in which their carbon management contributes to our reduction plans if their bid was successful. We then score the business on their initiatives to reduce business carbon footprint.

29) In order to monitor our Business Carbon Footprint, each service provider contracted by Northern Powergrid is asked to provide an annual report on their fuel consumption. Additionally, our Terms & Conditions stipulate that we can audit the supplier or service provider with respect to their environmental performance.

30) In the case of those service providers with whom we have a long-term collaboration we have arrangements in place to improve our mutual environmental performance through bi-directional information exchange, either through formal Safety, Health & Environment forums or through informal discussion with our environmental peer group. We openly discuss our environmental objectives and determine how we might best achieve our goals together. An example of this is a recent collaboration with one of our contractors to recycle plastic resin buckets.

Question 31: What more can be done? What are the key barriers for industry (and how do they compare to those in wider businesses)?

31) The use of high carbon forms of fossil fuel are driven by process heating requirements; with space and water heating requirements secondary to this. Still, we believe that there are different approaches to take based on building tenancy.

32) It is important to identify sectors that are dependent on the use of fossil fuels or high grade heat for their core activities, and it would be appropriate to create a bespoke heating policy in these cases. This is a proportionate approach to determining policy.

33) We agree that decarbonisation potential is more readily achievable in cases where low grade heat is required. For example, we believe it would be feasible to fully electrify the heat in

commercial office buildings, so that the space heating and hot water demand would subsequently be met through the use of low carbon electricity. This, in turn, could be partially achieved or mitigated with higher standards for building energy efficiency.