EnvC WGREAD 14/19

Response to the National Infrastructure Commission's Resilience Study Scoping Consultation

5 April 2019

About Energy UK

Energy UK is the trade association for the GB energy industry with a membership of over 100 suppliers, generators, and stakeholders with a business interest in the production and supply of electricity and gas for domestic and business consumers. Our membership covers over 90% of both UK power generation and the energy supply market for UK homes. We represent the diverse nature of the UK's energy industry – from established FTSE 100 companies right through to new, growing suppliers and generators, which now make up over half of our membership.

Our members turn renewable energy sources as well as nuclear, gas and coal into electricity for over 27 million homes and every business in Britain. Over 730,000 people in every corner of the country rely on the sector for their jobs, with many of our members providing long-term employment as well as quality apprenticeships and training for those starting their careers. The energy industry invests £12bn annually, delivers £88bn in economic activity through its supply chain and interaction with other sectors, and pays £6bn in tax to HM Treasury.

Energy UK welcomes the opportunity to respond to the National Infrastructure Commission's (NIC) proposed Resilience Study Scoping Consultation. Currently, a level of resilience in the UK electricity generation industry is ensured by the combination of a generating plant capacity margin, geographical diversity of generating plant (together with a national transmission network) and diversity in generation technology. Because of this, the electricity supply system is robust against individual plant failure and, in the last decades, electricity generation has demonstrated a consistently high level of resilience to potential disruptions from extreme events. Provided that these key factors are maintained over the next 20 years, this intrinsic 'robustness' is not expected to change.

Our response largely focuses on the historic and future water requirements of thermal power generation plant for cooling purposes, which even as we decarbonise our energy supply, and in particular electricity generation, will continue to play an important part of the generation technology mix for the foreseeable future. This plant will not only be providing a back-up role during times of system stress, but the gas-fired electricity generation will also continue long-term to provide an essential role in meeting our energy needs, especially at times of low renewable energy output.

Response to consultation questions.

Q1: What are the key questions that the next National Infrastructure Assessment should answer about resilience?

The power industry's dependence on, and interconnectedness with, other components of national and local infrastructure is a source of risk. Access to water for cooling is one of the key traditional drivers for thermal power station location[1] but others, such as fuel routeing (i.e. the supply of gas to gas-fired power stations), transmission or distribution network capacity and geographic distribution of demand, may also present different potential vulnerabilities and therefore either allow or prevent particular resilience measures.

[1] The use of water for cooling by thermal power plant leads to improved thermal efficiency compared with alternative cooling methods such as air cooling. A reliable water supply is therefore vital to ensure freshwater cooled plant can deliver their full market potential for energy production, meet the conditions of Capacity Market contracts or provide flexible grid balancing capacity.

A key goal of the power industry is to ensure that the supply of electricity to consumers, including industry and other sectors, remains robust in a potential future (under climate change) where river flows are impacted more significantly by prolonged periods of low flows and or drought meaning that water quality and availability is consequently reduced.

It is also key not to overlook the importance of the distribution network, which needs to be robust in order to ensure supply to consumers, even when the sector is resilient to potential power generation under-supply to the grid. A greater use of decentralised energy resources, often subject to more decentralised control, increases the challenge of maintaining the stability of the system and leading to a more distributed approach to system operation, as evidenced by the potential development of Distribution System Operators.

At the same time, the electricity system faces the overarching challenge of maintaining resilience throughout the transformation to a truly low-carbon UK economy. The impact on the electricity system of such a transformation manifests in two ways: firstly, maintaining security of supply under a rapidly changing generation mix with greater reliance on intermittent sources of generation, and; secondly the increased demand on generation and networks from the decarbonisation of other sectors and industries.

Q2: On the basis of your response to question 1, what issues should be prioritised in the resilience study?

Energy UK considers there to be three key cross-sectoral issues where the NIC could potentially make a valuable contribution in its proposed study: access to water; the impacts on the electricity system from decarbonisation of other sectors and industries, and; the interdependencies between gas and electricity networks.

Access to water

As indicated above, access to reliable water supply (in terms of both quality and quantity) is key to ensuring the future resilience of the thermal, and therefore, the whole energy generation sector. Accordingly, as Defra progresses measures to address issues associated with the current water abstraction arrangements set out in the England and Wales Abstraction Plan launched in December 2017, and in particular the move to a catchment-based approach, it is vital to understand and recognise the sector's dependence in this respect; past investment decisions that have been made in water-dependent infrastructure assets (including associated developments such as transport and energy networks); as well as potential future investments.

Forecasts for the freshwater needs of electricity generation in the future are variable. They show that in the long-term demand could increase or decrease depending on the future electricity generation technology mix, the uptake of Carbon Capture Use and Storage (CCUS), the future location of new generation plants and the cooling technology used[2]. The power generating sector has engaged in the development of policy measures that may affect the availability of water to the thermal power plant in areas where there is, or is projected to be, water scarcity and/or drought (See answer to Q4).

Decarbonisation of other sectors

Electrification is expected to provide the means of decarbonising other sectors of the economy. Although the most significant examples are the increasing take up of electric vehicles to decarbonise transport and the use of heat pumps to decarbonise heating, other changes may also become important, such as the potential use of electrolysis to produce hydrogen. These changes could have big impacts not only on total electricity demand but also on the location and timing of demand, which in turn will have consequences for the requirements on both generation and networks. They may also necessitate changes in the way that the system is managed and result in other implications; for example, patterns of behaviour in vehicle charging may have impacts on road use.

[2] Environment Agency water supply and resilience and infrastructure Environment Agency advice to Defra

Interdependencies between gas and electricity networks
The supply of gas to gas-fired CCGT power stations creates an interdependence between the electricity and gas systems. Great Britain's CCGT fleet will become increasingly important for resilience as existing coal stations close; although the total volume of gas demand for generation is likely to fall, the peak gas demand on low wind days will not reduce in the same way and may well increase.

The "Beast from the East" weather episode in February/March 2018 demonstrated the increased risk that in the event National Grid Gas had to call a Gas Deficit Emergency (command & control); then 'firm' users would be disconnected, with CCGT generation plant as the largest gas demand coming off the system first, which could lead to increased pressures on the electricity system. Both of these trends merit further review of the implications for resilience. We understand that BEIS is considering whether to undertake a study on these interactions, which we would welcome.

Q3: Are there specific (e.g. policy, knowledge, data sharing or other) barriers to addressing resilience emerging from cross-sectoral interdependencies?
In a strongly competitive market, as is the case for the UK electricity market, resilience measures that are beneficial (from a cost-benefit perspective) are expected to be commercially rewarded and their implementation can therefore be expected to be market-driven, both over the lifespan of an existing fleet, as well as for new plants (with resilience measures preferably occurring at the plant design, planning/ consenting and permitting stage). As with any other investment decisions, electricity generating companies derive the optimal timing for the implementation of beneficial resilience and adaptation measures by evaluating their net present value over different timeframes.

A barrier to the timely implementation of actions to increase resilience might however arise from the high uncertainty intrinsic to the future developments in the energy markets, as well as in the anticipated changes to key weather parameters driven by climate change. The evolution of the electricity market over the next decades is particularly uncertain with National Grid's Future Energy Scenarios (covering GB) only providing possible scenarios, rather than accurate forecasts of the future generation mix.

One of the greatest risks to the current operation and development of future plant at existing and new power station locations is due to water abstraction reform/resilience planning initiatives. These have been identified by our members as: reduced ability of power generating plant to deliver their full market potential for energy production, meet Capacity Market contracts or provide flexible electricity grid balancing capacity; and reduced capability and value of existing and historic generation sites for future development.

Notwithstanding the above, in England and Wales, after a review of the principles of water rights allocation, the UK Government decided to move from a "top down" approach to water abstraction reform using new primary legislation, to a catchment-based "bottom up" approach (as set out in the England and Wales Abstraction Plan launched in December 2017). Under this initiative, the influence of catchment partnerships potentially dominated by water companies (with public water supply statutory obligations) and focussing on local scale issues is a particular concern which could lead to less strategic governance of abstraction reform. Changes to water availability for thermal power plant due to the consequences of such regulatory developments are much harder to predict than the consequences of weather variability and (imperfectly understood) climate change. Regulatory uncertainty of this kind could pose a barrier to the implementation of appropriate adaptive measures.

Individual generating companies may have resilience, continuity or contingency plans to mitigate the effects, but to a certain extent, resilience for generation is dependent on other sectors and the regulators. A further barrier to implementing resilience measures lies therefore in the uncertainties about interdependencies with other stakeholders and their adaptation plans. Risks to generators from climate change, cannot be viewed in isolation from risks to other parts of national and local infrastructure (power transmission and distribution networks, water infrastructure, transport infrastructure, etc) as many of these risks are regulatory and indirect.

Regulatory and policy uncertainty are also barriers to the resilience of the wider electricity system. The sector is characterised by relatively large investments with long pay-back times, which means that stability and clarity in regulatory requirements are important to avoid damaging investor confidence and consequently deterring investments from taking place. Furthermore, regulatory frameworks need to be set on a reasonable and effective basis so as to incentivise the development and maintenance of a cost-effective, decarbonised and secure generation fleet.

To give an example, the Planning System has been known to present potential barriers to the development of certain projects which might otherwise increase the overall resilience of the electricity system. In response to a recent consultation[3], Energy UK called for BEIS to consider raising the threshold level for electricity storage projects within the Nationally Significant Infrastructure Project (NSIP) regime to ensure the planning and decision-making process is proportionate to the potential impacts of each project. This ask was made in relation to storage projects using electro-chemical technologies such as lithium-ion batteries. The retention of such electricity storage projects over 50MW within the NSIP regime may ultimately deter investment given the prohibitive fee structure for this size and scale of project and the increased time and resources required to progress via this consenting mechanism; adversely impacting build out of electricity storage in the GB market and, ultimately, energy security.

Even more pressing, the Capacity Market annulment continues to have an unprecedented impact on energy market participants and has created an unstable and uncertain policy environment. As highlighted in earlier questions, in an increasingly decarbonised electricity system with greater reliance on intermittent sources of generation, it is vital to protect the resilience of the system by procuring capacity among a wide range of technologies to ensure the security of supply. With Capacity Providers facing ongoing financial pressures due to the absence of capacity payments, Energy UK has called for Government to continue to address this as a priority, so as to avoid failure to deliver capacity and ensure the security of supply.

Both examples highlight how a lack of forward-thinking or clarity on policy decisions can result in the deferral or cancellation of new generation and of investment in improvements to existing generation. Consequently, the most effective policy action to secure the resilience of the electricity system is for Government to provide the earliest possible clarity on any future requirements for generation plants and confidence in the stability of confirmed policy decisions (for example, by setting out a timetable for any future reviews on progress and additional measures that provides adequate notice to operators and investors).

The generation sector is also dependent on the UK Government and the relevant economic and environmental Regulators for the delivery of the 'state-of-the-art' climate projection data to be used to inform impact assessments. If the data is missing, or available data is deemed expired, then there can be a barrier to the identification of a sufficiently robust mitigation strategy for that risk. For instance, there is currently a lack of data on future river flow data compatible with future water management strategies and climate change against which to test individual power station cooling water requirements.

Q4: Are there any examples in which barriers to resilience issues, arising from sectoral interdependencies or other causes, have been addressed or overcome?

Adaptive capacity in the UK electricity generation industry is ensured currently by the combination of a generating plant capacity margin, geographical diversity of generating plant (together with a national transmission network) and diversity in generation technology. Because of this, the electricity supply system is robust against individual plant failure and, in the last decades, electricity generation has demonstrated a consistently high level of resilience to potential disruptions from extreme events.

[3] Energy UK Response to BEIS consultation on electricity storage planning proposals - 25 March 2019. Available here: https://www.energy-uk.org.uk/publication.html?task=file.download&id=7091

Provided that these key factors are maintained over the next 20 years, this intrinsic 'robustness' is not expected to change.

Back in 2017, for example, the Environment Agency led on a national review of the resilience of electricity generation to drought and drought-related conditions. Undertaken through collaboration with Defra, BEIS, National Grid, Energy UK and electricity generators, the review assessed freshwater-cooled power stations in England and Wales and the impacts of drought and low flows in rivers on individual power station output. The study concluded that the risks to electricity supplies caused by foreseeable droughts are low at the present time, due to the severe and extreme drought scenarios falling within the range of operational risks that the System Operator typically plans for; it is therefore highly likely there should be sufficient generation available to meet electricity demand for the majority of the time.

Energy UK and its generating companies participate in a number of fora which seek to exchange information on issues around interdependencies and which seek common approaches to maintaining or improving resilience to identified consequences of the future changing climate.

For example, Energy UK represents the power industry at the Infrastructure Operators' Adaptation Forum, which exists to support and challenge national and local climate change policy on matters related to infrastructure and the National Adaptation Plan. The cross-industry representation coupled with Regulators and the UK Government should enable a more integrated and evidence-based approach to be adopted. This should provide the opportunity to learn of existing and new approaches to adaptation, to access knowledge and information in support of adaptation, and to highlight the potential to reduce vulnerability to points of dependence on other systems.

Energy UK also participates in the Energy Emergency Executive Committee (E3C). E3C and its associated task groups exist to support and foster effective engagement by the UK, Scottish and Welsh Governments, Regulators (HSE and Ofgem) and industry (energy networks, power and gas producers, suppliers etc.,) to facilitate collaboration on issues relating to energy sector resilience. All participants commit to engage and co-operate on a voluntary basis in the development of system-wide arrangements to assess, mitigate and manage risks which, if not addressed, can impact on overall system resilience and ultimately impact on consumers of electricity and gas.

A further example is the power industry's involvement with Environment Agency's National Framework Senior Steering Group for water resource planning in England. This group had been established in response to pressure from Defra and Ofwat to establish a more effective and better integrated regional planning system for water resources. With representatives from the main users of water in and from rivers, lakes and aquifers, the main deliverable of this collaborative initiative will be a report that articulates the challenges facing the water industry and other water users, and sets out expectations of the water industry and others at a national and regional scale. This will then feed into the regulatory process and water companies/regional groups can use it to shape their future plans. The power sector is a major user of water across the UK, and the Senior Steering Group provides the opportunity to highlight the essential contribution that water makes to the generation of UK electricity and allows all stakeholders to understand how future water management proposals will impact on future electricity production.

On a regional scale, Energy UK has been a partner in the Water Resources East (WRE) project: a cross-sectoral project led by Anglian Water working with input from the energy, agricultural, water supply and environmental interest groups. The WRE mission is to work in partnership to safeguard a sustainable supply of water for the East of England, resilient to future challenges and enabling the area's communities, environment and economy to reach their full potential. Climate change, population growth and abstraction reductions mean that the risk of water shortages will be even greater in future, unless we take action now. WRE pioneered a new, collaborative approach to water stewardship. The project worked to create a multi-sector long-term water resource strategy, which balances affordability and reliability with sustainability and environmental stewardship.

Energy UK had provided input on the potential impacts of water shortage on the power sector, and is currently deciding its future involvement in the second phase of the project.

Energy UK also attends the EA's National Drought Group (NDG) whose purpose is to ensure that a common picture is held across stakeholders and their communication messages reflect the scale of impacts and the actions we are all taking. The workplan for the group involves specifically looking at interdependencies between the water and energy industry, therefore Energy UK sits on the group to ensure that risks to the power sector are not misrepresented.

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