Ofgem consultation:

RIIO-ED2 sector specific methodology

UKERC Consultation Response

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Introduction to UKERC

The UK Energy Research Centre (UKERC) carries out world-class, interdisciplinary research into sustainable future energy systems.

It is a focal point of UK energy research and a gateway between the UK and the international energy research communities.

Our whole systems research informs UK policy development and research strategy.

UKERC is funded by the UK Research and Innovation, Energy Programme.

Currently in its fourth phase running from 2019-2024, UKERC delivers an ambitious programme of research on the challenges and opportunities for delivering the transition to a net zero energy system and economy. The programme brings together engineers, natural scientists and social scientists to generate evidence that informs real-world decisions.

Our research programme encompasses major themes on global energy challenges and their implications for the UK; the role of local and regional energy systems; interdependencies between energy systems and the environment; decarbonisation of specific sectors including transport, heat and industry; and transitions in energy infrastructures.

The programme is complemented by a set of national capabilities. These will carry out systematic evidence reviews, host and curate energy data, map and monitor public engagement with energy systems, and improve the transparency and understanding of energy models. UKERC also supports the wider energy research community in the UK by promoting engagement with other stakeholders, supporting career development and capacity building, and enhancing international collaboration.

1. Planning to enable net zero

As Ofgem has noted, pathways that are consistent with legislated net zero targets are likely to see highly significant changes to demand for electricity. However, exactly when these changes will start to take place and how quickly is uncertain. Different patterns of demand for electricity are also likely to be highly localised as clusters of changes develop, impacting the means by which heat is provided, or electric vehicles are adopted.

1.1 Flexibility

To a valuable extent, the need for network reinforcement can be reduced by the appropriate use of flexibility, e.g. in the timing of EV charging or as provided by means of storing heat. Active power outputs of generation and appropriate regulation of network voltages can also provide cost-effective ways of enabling services provided by a network to be delivered at least cost. However, the means by which different sources of flexibility might be encouraged to be made available and then utilised are immature. Although a number of different classes of actor may have an important to role to play - for example, DNOs, aggregators, Suppliers, individual owners of generation and the ESO - it is not yet clear which will prove to be the most significant and efficient in providing services[1].

Flexibility can only go so far in helping meet power supply needs; at some point, network capacity often proves the most cost-effective means, especially when considering its reliability and lifetime, and the opportunities provided by asset replacement. In practice, network capacity in any one location is discrete in that it uses specific physical assets that have specific characteristics. A threshold is reached when the power transfer capacity of a particular network branch is exceeded even when flexibility of distributed resources is exploited and network operation measures such as real-time ratings, optimal voltage regulation and dynamic network reconfiguration are used. Specific assets would need to be replaced or added to. This presents an opportunity not just to meet the immediate need or that forecast for the next few years, but to provide for the maximum transfer that can be envisaged throughout the path to net zero and can be accommodated at that nominal voltage. As Prof Goran Strbac and others have shown, this will be cost-effective for network users in the long-term as the incremental cost of additional electrical capacity is generally a small part of the total cost of a reinforcement project. Reinforcement projects generally include significant costs for civil engineering works, project management, etc., and there will be savings in terms of the cost of losses over the lifetime of the new assets as well as in reducing the likelihood of needing further upgrades. If any of the assets were due for replacement due to reaching the end of their economic life, further efficiencies can be realised. Where a reinforcement or replacement is triggered, the general aim should be to, as Ofgem has put it, ‘touch the network once’.

1.2 Scenario development

Ofgem has noted in the consultation document that some form of scenario planning of investment is likely to be needed. In our opinion, a number of scenarios should be developed that encompass key uncertainties but are consistent across Britain in respect of the whole, ‘multi-vector’ system and assumptions about access to different sources of energy,

[1] For further discussion, see, for example, Bell, K., & Gill, S. (2018). Delivering a highly distributed electricity system: Technical, regulatory and policy challenges. Energy policy, 113, 765-777.

development of the economy, and energy users' and generation developers' choices. For example, it makes little sense that one DNO's plans should be based on an assumption of annual electrical energy demand growing to something of the order of 900 TWh by 2050 while another assumes it will not exceed 600 TWh.

Importantly, it should be recognised that the network customers in whose interests Ofgem seeks to act are also voters in different local, regional, devolved and national government structures and that policy makers are accountable to their electorates and have been empowered to set targets, and policies for delivery, on their behalf. Thus, although different scenarios might reflect different policies to achieve net zero and how effective they are at different points in time, the scenarios should start from the presumption that emissions reduction targets legislated in the UK Parliament and the Parliaments of the devolved administrations will be met.

We agree with the observation that there should be engagement with Local Authorities and other stakeholders to develop regional plans of future energy needs, such as a Local Area Energy Plan. The set of stakeholders should include the Governments of Scotland and Wales to which significant powers are devolved. This engagement is important as local, regional or devolved administration policies as well as different geographies and starting points can drive different actions. However, these local plans should themselves be consistent with system-wide emissions reduction pathways, e.g. in terms of the availability of low carbon energy from different sources and the presence of national policies.

2. Innovation

2.1 Realising benefits from innovation

Innovation is a long-term process and uncertainty is inherent to it. By its nature, it concerns something that is new – a new process, technique, technology or business model, for example – and, because it is new, quite how it works cannot be fully known and there is always the potential for unforeseen things to arise. Part of the challenge of innovation is to use learning from research, development and demonstration to develop an improved version of the innovation that prevents, corrects or works around the adverse outcomes found from experiments or trials. This often takes many years[2]. On occasion, it will be judged that the problems that emerge from experiments or trials render the proposed innovation not worth pursuing any further. This does not mean that the initial investment was not worthwhile. Rather, it shows the value of testing it properly and developing a base of evidence on which to make a decision on whether to take it further.

What this means for the energy system is that:

1. Within a portfolio of innovations, some will realise the intended benefits, but some will not.
2. Where benefits are realised for energy users, they will, in general, take time to be accumulate.

As result of the uncertainty and the potential for benefits to energy users, (e.g. reduction of risk of interruptions to supply, reduction in cost of energy or facilitation of an increased rate of reduction of greenhouse gas emissions) it seems reasonable that the risk involved in

[2] See, for example, https://ukerc.ac.uk/project/innovation-timelines/

innovation, and the costs of research development and demonstration be shared among different parties.

The presence of risk, the possibility of failure and the different possible aims of an innovation project – which may not be directly concerned with reduced cost to consumers but, for example, higher reliability, quality of supply or lower emissions – means that it should not be assumed that innovation expenditure in a previous price control period will result in any particular level of reduced cost to consumers in a subsequent period.

We welcome the proposal to establish a Strategic Innovation Fund to provide significant support for research and development and innovation-led trials for technologies such as hydrogen in order to minimise the cost of decarbonisation. We also welcome the retention of innovation funding for DNOs via the Network Innovation Allowance (NIA) to help address issues related to the energy system transition and consumer vulnerability.

2.2 Who pays for innovation?

As has been noted previously[3], where there is uncertainty about the effect or cost of new practices or technologies on an energy system and its users (who ultimately pay), it is reasonable for those users to share the risk by sharing the cost of resolution of the uncertainties. However, arguments might be made that costs should be shared not by energy system users, i.e. its 'customers', but by taxpayers, e.g. through funding by UKRI. Also, when there are many commercial actors that are active in the energy system, e.g. different operators of gas or electricity networks in different locations, and the costs of investments fall within one part of the energy system but the benefits fall in another, how should the precise cost contribution of different sets of customers – and companies – be determined?

Although different models for promotion of innovation and support for R&D might be envisaged, pursuit of a theoretically ideal model should not stand in the way of actually undertaking R&D and innovating. Given the democratic mandate for emissions reduction, the significant challenges involved in achieving this whilst providing a reliable supply of energy, and the uncertainty about how best to achieve emissions reduction, some degree of socialisation of the costs of R&D to support the energy system transition will be necessary.

A less than perfect set of arrangements for the sharing of costs between different parties should be accepted if that is what is necessary to support R&D capacity, address risks and drive innovation. Moreover, although we would always argue for more money for R&D (provided it is wisely spent), the amount of network customers' money that is being proposed to support innovation is modest compared with the network companies' total expenditure and the benefits that accrue to customers and society as a whole in the energy system transition.

2.3 Governance

As has been noted in a previous RIIO-2 consultation response by UKERC, the NIA and its relatively light administrative burden provides very useful flexibility in responding to different issues or opportunities as they emerge - 'testing the water' in respect of new ideas and addressing not just innovation opportunities but also assessing system risks. However, good governance and good practice on the part of network licensees is essential to ensure that

[3] See also UKERC's response to a previous RIIO-2 consultation https://ukerc.ac.uk/news/keith-bell-riio-2-consultation/

customers' money is used effectively. In particular, we agree with Ofgem that data transparency associated with network innovation projects needs to be much improved.

Ofgem has noted that NIA funding should relate to "*projects [network licensees] would not otherwise undertake within the price control; namely, energy system transition, whole system, or vulnerability-related innovation, which have the potential to deliver net benefits to network customers, although the cost to the individual DNO may outweigh the share of the benefit they would receive*."

We broadly agree. However, in order that the scope of NIA funding is not set too narrowly, we think it important to have a clear understanding of what a successful energy system transition involves. We would propose the following as a first draft of a definition:

The energy system should transition in such a way that:

- greenhouse gas emissions are progressively reduced on a pathway consistent with net zero targets for the UK and the whole of its economy;
- energy users are provided with a sufficiently resilient supply of energy; and
- the environmental impacts of the system are acceptable and the system is well adapted to climate change.

It should furthermore be clarified that:

- The energy system transition should be achieved at least cost to energy users as a whole with a fair distribution of cost among different energy users across time, taking account of the increasing value of emissions reduction.
- Energy supply resilience concerns the system's ability to prevent, contain and recover from interruptions to supply and the provision of essential services during such times.
- Emissions reduction in the energy system depends particularly on appropriate commercial and regulatory models to encourage investment in energy efficiency, replacement of high carbon uses of energy with low carbon, and the development and utilisation of low carbon sources of energy.
- Resilience depends on having a good understanding of risk and an appropriate mix of actions concerning system design and operation, asset management and logistics, and appropriate back-up measures by providers of essential services and community support.
- Least cost over time depends on good planning, flexible operation, and cost reduction and de-risking of new methods and technologies with appropriate consideration of uncertainty and accounting for future impacts. Least cost and a fair distribution of cost also depend on appropriate commercial and regulatory structures.

In order to minimise use of network customers' money for research or development in which network licensees might be expected to invest, any project that has the objective of enabling any aspect of the energy system transition should be valid for NIA or Strategic Innovation Fund (SIF) support, provided:

- there is a clear articulation of the key uncertainties, the risks or opportunities being being addressed and the benefits that would accrue to energy users or threats to supply avoided;
- there is a clear plan for how to resolve the uncertainties supported by the collection and evaluation of evidence;
- the uncertainties are such that some socialisation of risk is appropriate;

- any benefits to the network licensee seeking to use NIA money would accrue to them only in a future price control period, i.e. the project is not something that the licensee might expect to undertake as 'business as usual'.

As already noted, however, a question might arise as to the extent to which network users in a particular area should fund or co-fund research and development where benefits would accrue largely to other network users. It might be argued that such a case should be addressed through the SIF. However, excessive bureaucracy and 'transaction costs' should be avoided. In other words, although some kind of common pool of funding (recovered from network customers across multiple licence areas and, potentially, from both gas and electricity customers) might be defined, the flexibility of NIA should be retained as far as possible, albeit, as has already been discussed, backed up by stronger guidance on good R&D and governance.

"Success" of an innovation R&D project should concern the quality of the evidence gained that an innovation should:

- be adopted;
- be regarded as a standard, commercially viable option (with knowledge on how and when to use it);
- be further developed; or
- not be adopted (if certain conditions are not met).

It seems to us that one of the greatest challenges faced by DNOs in forming investment plans relates to the gathering and use of information with suitable levels of spatial and temporal detail. Access to 'smart meter' data should help, but innovation will be required to turn data into useful information. Moreover it will need to be complemented by sound scientific modelling to explore developments, such as use of 'heat as a service' or novel uses of electric vehicles, for which no observations are yet available.

A final observation is that it is important for the UK's economy as a whole that the UK has the capacity to undertake research and development, to innovate and to generate evidence in order to drive the commercial viability of ideas. In principle, UKRI is one avenue through which R&D capacity can be developed and maintained. However, its budgets are under increasing pressure and it has, for example, cut its support for Centres of Doctoral Training in energy networks from which industry, in particular, may be expected to recruit future leaders who can playing key roles in realising the energy system transition. Both energy network licensees and their customers will benefit from energy system R&D capacity in the long-term. They might therefore be expected to make some contribution to the cost of the associated investment.