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Ofgem RIIO-2 Consultation

Response from the UK Energy Research Centre (UKERC)

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ABOUT UKERC

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Giving consumers a stronger voice

Q1. How can we enhance these models and strengthen the role of stakeholders in providing input and challenge to company plans?

We support the principle that network licensees should engage closely with their stakeholders and deliver customer requirements, whilst also taking into account the views of other parties affected by the gas and electricity networks.

Through RIIO-1, network licensees have been encouraged to engage with stakeholders and, as far as we are aware, they have[1]. However, the quality of that engagement varies and we are unclear what impact this has had on business planning. At present, the strongest driver for engagement with stakeholders arises when network companies are seeking planning permission for network reinforcement rather than through RIIO or any other aspect of the regulatory environment. Forums for customers to share their views about, for example, connection processes and charging arrangements provide another important means for stakeholder engagement. Stakeholders also take part in panels concerned with reviews of codes, e.g. Grid Code, Connection and Use of System Code. It has been argued by some that the sector's processes for ensuring continued coherence and fitness for purpose of the full suite of relevant codes is no longer adequate[2] although precisely how they can be improved is open to question. In our view (a) proposed code modifications are not always brought forward in a timely manner and (b) some stakeholders sometimes take a very parochial view, objecting to changes that, at the very least, delay their implementation[3].

Other forms of engagement of which we are aware include more general events to which almost anyone is welcome and at which the network licensees give high level presentations on recent work and forthcoming priorities.

Aside from the impact of planning applications, we are unclear what impact licensees' direct stakeholder engagement has had to date on networks licensees' business processes and planning. It is unclear whether capital expenditure plans have been changed as a result except, for example, in measures to reduce the visual impact of network developments. In spite of improvements (e.g. in respect of the publication of 'heat maps' of connection opportunities) distribution network operators (DNOs), in particular, still seem to face criticism in respect of connection processes, the provision of information and the sharing of risk[4].

Ofgem's stakeholder engagement proposals appear to be oriented towards the determination of a price control settlement. This will help ensure that stakeholders are

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[1] See for example: SP Energy Networks. (2018). Engagement. https://www.spenergynetworks.co.uk/pages/stakeholder_engagement.aspx [May 2nd, 2018]; and National Grid. (2018). Stakeholder Engagement. http://www.talkingnetworkstx.com/stakeholder-engagement.aspx [May 2nd, 2018]

[2] See Energy System Catapult, Future Power System Architecture, August 2017.

[3] See for example: National Grid. (2018). Grid Code. https://www.nationalgrid.com/uk/electricity/codes/grid-code?meeting-docs [May 2nd, 2018]

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

drawn into the price control process and have the chance to reflect on plans in a considered and informed way. If successful then the proposed three stage process of (i) "user groups" for the transmission licensees[5] or "independent Customer Engagement Groups" for distribution, (ii) a "Challenge Group" appointed by Ofgem and (iii) "Open Hearings" would provide additional insights into whether proposed expenditures are needed. They may also provide information that complements analyses commissioned by Ofgem about costs.

One concern expressed at Ofgem's "The Future of Networks" event in Glasgow on April 19th 2018 was that stakeholder groups, presented with plans that make extensive use of highly innovative methods or technologies, would prefer something more conservative. On the other hand, a stakeholder group might naturally want a plan with a lower total cost.

We are pleased to note that Ofgem recognises the need for stakeholder engagement groups to have access to expert support. We also note that stakeholders need to make significant commitments of time to attend consultative meetings and review documents. Ofgem proposes that the individuals or organisations concerned should be compensated for their time, though, in the case of licensee user or Customer Engagement groups, this might also change the level of independence that the stakeholders feel, or are perceived to have, with respect to the network licensee. Given the existence of the Challenge Group and 'open hearings', the added value of user groups or Customer Engagement Groups to the price control process might therefore be questioned. In addition, we wonder about the extent to which these groups, the Challenge Group or Ofgem may be expected to be pro-active in proposing additional expenditure, e.g. to safeguard against cyber security risks.

- *What are your views on the proposal to have Open Hearings on areas of contention that have been identified by the Groups?*

One major question we have about the 3 level process outlined by Ofgem is whether it can be implemented - the groups formed and considered, informed views reached - by the time Ofgem is required to define allowed revenues and revenue adjustment mechanisms for the RIIO-2 period. How does Ofgem envisage their role during the RIIO-2 period and before RIIO-3? Perhaps their constitution as part of the RIIO-2 settlement process should be treated as a trial informing some better developed process for RIIO-3.

Responding to how networks are used

Length of price control

Q2. Do you agree with our preferred position to set the price control for a five-year period, but with the flexibility to set some allowances over a longer period, if companies can present a compelling justification, such as on innovation or efficiency grounds?

- *What type of cost categories should be set over a longer period?*

[5] Some form of which should have been happening in the RIIO-1 period anyway. We would welcome any evidence that Ofgem can provide that existing stakeholder groups have made any difference to the licensees' allowed revenues or plans.

- *How could we mitigate the potential disruption this might cause to the rest of the framework?*
- *What additional measures might be required to support longer-term thinking among network companies?*
- *Do you instead support the option of retaining eight-year price controls with a more extensive Mid-Period Review (MPR)?*
- *What impact might the alternative option of an eight-year price control with a more extensive MPR have on how network companies plan and operate their businesses?*

The main advantage of a long price control period is to provide an incentive to the licensees to innovate. If licensees invest in innovation in the early part of the period, they have time to earn a return on this, by lowering the cost of delivering a service to their customers and meeting licence conditions at a lower cost than was assumed in the price control settlement. Only under such circumstances might shareholders be expected to put their money at risk in the pursuit of innovative methods and technologies.

However, long price control periods also have significant disadvantages. Given the speed of change in the electricity sector, shorter periods with significant flexibility will allow income to be adjusted as the energy system evolves. This is illustrated by the experience of RIIO-1. The various factors that, with the benefit of hindsight, led to a number of commentators (Dieter Helm, Citizens Advice and Centrica) arguing that network licensee profits were excessive, could not have been known with any confidence at the times of the RIIO-1 settlements. These include the number, size and location of new connections, demand growth, and asset procurement and commissioning costs. Procurement and commissioning costs depend on many aspects of the supply chain in respect of both equipment – in turn affected by the state of the world market, commodity prices and exchange rates. They also depend on employment costs for staff, which may be affected by economic conditions in Britain and elsewhere. Brexit introduces additional uncertainties to this wider economic backdrop.

The development of effective 'long-term thinking' that takes adequate account of the whole energy system will be of increasing importance in decarbonising Britain's energy system in a secure and affordable way. To a large extent, this depends in (a) understanding the potential medium to long-term energy system pathways, including key uncertainties[6]; and (b) the identification of least regret investments that, while attracting an option cost, enable the future to be adapted to as factors exogenous to the energy networks develop and uncertainties are resolved. The latter also requires identification of the times by which key decisions should be taken.

We discuss potential barriers to long-term thinking in our answer to Q3 below but note here that, while foresight is important, it is not clear who should be responsible for this – especially given the separation between not just between distribution and transmission but also between transmission system operator and transmission owner. We discuss this further in our answer to Q6.

[6] See, for example, Watson, J., Ketsopoulou, I., Winskel, M. and Gross, R. (2015) The impact of uncertainties on the UK's medium-term climate change targets. Energy Policy 87: 685-695

Whole system outcomes

Q3. In what ways can the price control framework be an effective enabler or barrier to the delivery of whole system outcomes?

- *If there are barriers, how do you think these can be removed?*
- *What elements of the price control should we prioritise to enable whole system outcomes?*

<u>Influences on load-related investments</u>

As we discussed above, the price control framework – the setting of income allowances over a given period of time in order to allow the recovery of reasonable capital expenditure and operational costs, and any mechanisms that change income – is a major influence on network licensee behaviour, but so are a number of other things. For example, the importance of codes and standards in driving the network licensees' capital expenditure plans should not be underestimated. The network design standards for electricity – relevant chapters of the Security and Quality of Supply Standard (SQSS) and Engineering Recommendation P2 – are obvious, fundamental drivers in respect of load-related expenditure. So too, however, are provisions in respect of the sharing of information between DNOs and the transmission licensees and the monitoring and control of distributed connected equipment. These are primarily determined by the Grid Code and, if a transmission licensee/DNO is unaware of most cost-effective ways of meeting a need using distributed resources, they will end up spending more than is necessary.

Arrangements for the procurement of balancing services are also important. These include: the correction of energy transaction imbalances in individual settlement periods; the buying of additional energy at particular locations to ensure that network import constraints are respected or, in effect, the buying back of access when there are export constraints; and the purchase of other services outside the energy market to enable system operation, i.e. ancillary services. With the exception, to date, of the purchase of energy at particular locations to respect import constraints, services such as these bought from distributed energy resources (DER), i.e. generation, storage or flexible demand connected to a distribution network, are of increasing importance to the whole electricity system. For example, inflexible DER is beginning to impose additional costs on operation of the transmission systems, e.g. in sunny, low demand conditions in the summer. On the other hand flexible, schedulable DER might also offer cost-effective alternatives to transmission connected resources.

<u>Responsibilities for asset-based and operational measures</u>

For the longer term, an economic and sufficiently reliable electricity system depends on an adequate balance between the buying of balancing services – operational measures – and their cost, and asset-based interventions such as the installation of new network facilities.

RIIO-2 takes place against a changing background in respect of institutional arrangements for the procurement of balancing services and investments in new network facilities described elsewhere[7] – principally the separation of the electricity system operator from transmission owner.

There are important information-related differences between the SO's relationship with the TOs and with the DNOs:

- The SO has a detailed electrical model of the existing and planned transmission networks and formal processes under which the need for 'load-related' transmission network investment can be flagged: the new connection process under which transmission connection applications are made to the SO; and the NOA process.
- The SO currently possesses only quite poor information on the distribution networks and how they are operated.

In both instances, the SO might wish for a TO or a DNO to carry out some investment in new facilities in order to reduce the total cost of balancing services, but it cannot oblige it. In addition, although the SO has an electrical model of the TOs' networks, it lacks information on the condition of existing assets or the local geography that are important inputs to the evaluation of options to meet a new network capacity need. The SO therefore depends on the TO for economically efficient delivery of new capacity. On the other hand, the TOs are now being required to develop capex plans for the RIIO-2 period with only limited information from the SO. As we noted in our answer to Q1, capital expenditure planning is subject to significant uncertainty; each of the network licensees will be making their own forecasts of credible generation developments – openings and closures – and demand growth. These need to concern the whole electricity system as what happens on the distribution networks affects what transmission is required and neighbouring transmission networks interact with each other. There is a similar need for consideration across scales for gas network planning. As heat and transport begin to be decarbonised, network owners must take account of the whole energy system.

It is our understanding that some of the tensions that may be expected to arise from the split between TO and SO are already showing themselves, for example:

- The electricity SO (ESO) would like to have access to quite comprehensive, reliable phasor measurement unit (PMU) data in order to help with characterisation of, among other things, system inertia but the provision of PMUs and the associated communication infrastructure depends on the TO which, in England and Wales, has not yet brought forward the associated investments.
- The ESO continues to spend significant sums on constraining generation to operate 'in the lead' and absorb excess reactive power under low transmission demand conditions. It may generally be expected that it would be economic for shunt reactors to be installed at key locations to address the problem and reduce dependency on 'out of merit' generation. However, a cost allowance for such investment had not been included in the last price control and the England and Wales TO sought extra

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[7] See for example: Ofgem. (2017). Future arrangements for the electricity system operator: its role and structure. https://www.ofgem.gov.uk/publications-and-updates/future-arrangements-electricity-system-operator-its-role-and-structure [May, 2nd, 2018]

income to pay for it. Ofgem judged that the TO had failed to adequately make the case and, hence, did not allow extra income. Although the TO might still have made the investment, our understanding is that it chose not to.

In the latter example, if 'the right answer' in respect of licence conditions was to install the shunt reactors, does a failure to do so imply a breach of licence? Presumably, in this case, the TO would be in breach as it had failed to deliver the required assets. However, what is the materiality of their failure: failure to install the assets; or failure to persuade Ofgem that the investment was economic and efficient and, hence, that it was reasonable for the additional, previously unforeseen capex, to be recovered via additional income? To what extent – if any – was failure to make the case a consequence of inadequate information from the SO, and how much of that was a consequence of a strict interpretation of the data confidentiality provisions of the Electricity Act 1989? Or, has Ofgem simply made a poor judgement that is not in consumers' best interests?

We do not offer a view on the 'right answer' but offer these examples to illustrate the tensions created by the new arrangements. The tensions and difficulties may be contrasted with the 'totex' arrangement introduced for distribution in RIIO-1 under which a single party – the DNO – has access to information regarding both asset-based solutions and operational measures and has an incentive to choose that with the least cost. However, in respect of distribution network investments that would benefit whole system operation, problems re-emerge.

It may be supposed that one solution to the apparent disconnection between SO need and network owner delivery would be for the SO to have a stronger role in commissioning work. For one thing, it may also be supposed that the SO, because they do not own the assets, would have no incentive simply to make the asset base as large as possible[8]. However, system operation would be enhanced – and, in general, made much easier – by having plentiful network capacity. Might there still be an incentive for the SO to over-specify?

<u>Interactions between electricity transmission and distribution</u>

We are pleased to note that the Open Networks project is addressing interactions between transmission and distribution, and between the respective network licensees. In our view, there are three key issues to resolve[9]:

1. Which party procures balancing services from DER? At present, either a DNO or the electricity SO might do it, or both. The latter runs the risk of conflict between different requirements.

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[8] The shunt reactor example suggests that the England and Wales TO, at least, preferred not to spend money that had not already been allowed even though it might still have been added to the asset base in the next price control if it could be shown that the assets were not stranded. In other words, the apparent network owner incentive to maximise the size of the asset base is perhaps not as strong as some commentators have suggested.

[9] For further discussion see Bell, K. and Gill, S. (2018) Delivering a highly distributed electricity system: Technical, regulatory and policy challenges. Energy Policy 113: 765-777. Ongoing UKERC research is also developing a number of 'archetypes' of possible future institutional arrangements for contracting on the electricity system that it is intended to publish in the coming weeks.

2. What information is required to be exchanged between parties in different institutional models, and what information and communication system investment is required to deliver it?
3. What benefits (or risks) may be expected to come from having multiple parties involved in operation of the system? For example, would different distribution systems operators (DSOs) in different areas, each interacting with the transmission system operator, provide scope for innovation that would be lost if one party had absolute control?

Ideally, in order to enhance confidence that an economic and efficient whole electricity system business plan can be identified and delivered, the questions being addressed within Open Networks would have been resolved before the RIIO-2 price controls are set. Realistically, this will not be possible. However, the adverse consequences of this should be reduced by having a 5-year RIIO-2 period instead of an 8 year period with the major impacts – not least those arising from the potential for significant growth in electricity demand – probably not occurring before a putative RIIO-3 period.

<u>Uncertainty</u>

We have noted in our answer to Q1 that price control settlements are subject to significant uncertainty. This has always been the case, not least in respect of:

- the number, size and location of generation openings and closures;
- the need for replacement of aged assets; and
- 'unit costs' of delivery of new network assets.

Except in respect of individual locations and whether demand will grow enough to trigger the reinforcement of a demand group's connection to the rest of the system, demand growth has not been a significant factor in the liberalised electricity industry. However, that is likely to change. Carbon budgets set by the Committee on Climate Change suggest that the decarbonisation of space and water heating, industrial processes and transport should begin in earnest in the next decade. How quickly it will happen and what form it will take are currently uncertain but will have a major influence on demand for electricity as well as on generation capacity.

In one respect, uncertainty of the generation background is less than in the past: although the associated generation capacity is still not guaranteed to be delivered, central contracting of generation for four or more years ahead gives a clearer basis for transmission network planning than in the past. The main examples of this are the capacity market and contracts for difference for low carbon generation. There seems to be confidence within much of the renewables sector that 'subsidy-free' renewables can be achieved though it is also argued that long-term income uncertainty still means that some form of centralised long-term contracting would provide significant benefits in terms of reduced cost of capital. Such contracting would help to provide signals for network development that would otherwise depend – as in the past – on knowledge gained from generation connection applications.

Q4. Do you agree with our minded-to position to retain the current start dates for the electricity transmission and electricity distribution price controls, and not align them?

Ideally, the dates would be aligned as interactions between the respective investment plans could be addressed (see our points above on such interactions). However, we recognise the practical difficulties not only for Ofgem to assess the respective plans but also for stakeholders to review them all at the same time and engage in the consultation process.

Q5. In defining the term 'whole system', what should we focus on for the RIIO-2 period, and what other areas should we consider in the longer-term?

- *Are there any implementation limits to this definition?*

The 'whole system' has a broad definition. UKERC uses a definition that includes all energy sources, networks and end uses. It also includes technical, economic, environmental, policy and social aspects of energy systems – as well as the interaction between energy systems and related systems (e.g. ecosystems and the economy).

Clearly, RIIO cannot address the full scope of this definition. However, it illustrates the need to take into account the wider context in making decisions about network regulation. This includes interactions between networks and other parts of the energy system, and the need for networks to facilitate the transition to a low carbon energy system and economy. Sustainability First have called for the RIIO-2 framework to include a new over-arching low carbon incentive, which merits serious consideration[10]. This would not be straightforward to implement, but Sustainability First also provide some useful discussion of the practicalities. We suggest that Ofgem work with BEIS and wider stakeholders to give further consideration to this proposal.

The shift towards a low carbon energy system that is already underway is the principle reason that we may need for such an approach. There are already interactions between key energy vectors – gas and electricity. It is not yet clear how heat and transport will be decarbonised, but electric vehicles are gaining in popularity and will present major challenges in respect of electricity system infrastructure if adoption levels start to increase rapidly, particularly in respect of network capacity.

In our view, one key to development of the future energy system will be how energy users are encouraged to make choices that help to reduce the total costs of the transition towards a decarbonised energy system. Central to that would seem to be the articulation of 'appropriate' price signals (reflective, at least to some extent, of cost). To inform development of the whole energy system, these should be consistent and accurate across different energy vectors, including hot water in heat networks.

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[10] Sustainability First (2018) A Low Carbon Incentive in RIIO-2. Discussion Paper.

We understand that Ofgem, among others, has started some work on new network access and pricing arrangements for electricity. There are a number of difficult issues to resolve so it is very unlikely that a new set arrangements will be ready for the RIIO-2 period. It should, however, be regarded as a priority for implementation after RIIO-2.

Among the choices for how to design price signals are the spatial and temporal granularity and what influences on cost are taken into account. In principle, they ought to lead to the 'right' level of both network and generation capacity being developed (and in more or less the 'right' places). However:

1. the signals can be difficult to interpret, especially if they vary significantly hour by hour;
2. not every actor has the scope to respond to signals and make a different choice in respect of time or place of electricity use or production.

A price signal will be useful if an actor has some flexibility (in terms of time of use or production of energy or the location) and the actor is able to be informed by the signal such that it influences the choices they make.

Current spatial and temporal dimensions of electricity price signals are neither clear nor consistent across different voltage levels and reform is well over-due. However, care should be taken that new arrangements are not seen as penal, especially in respect of the smallest users. This is likely to require some degree of compromise in the arrangements between social acceptability and economic optimality. As well as allowing network users to make informed choices, the choices they make – if confidence can be gained in the level of continued user commitment (while still giving them flexibility) – will represent important signals to the network licensees in respect of the ongoing need for network capacity.

System Operator price control

Q6. Do you agree with our view that National Grid's electricity SO price control should be separated from its TO price control?

Ofgem's stated ambition is to extend competition in the provision of transmission network assets beyond the tendering exercises that are currently carried out for the delivery of equipment, construction and commissioning, to a given specification to competitive assessment that, we suppose, includes also design and maintenance. If this ambition is to be fulfilled, it will be imperative that National Grid's TO business is not privy to any information that is not available to potential TO competitors. This is the primary rational for a separation between TO and SO business activities, including separate price controls. However, as we note in our answer to Q3, the separation between ownership and operation gives rise to problems and tensions of its own.

Q7. Do you agree that we should be considering alternative remuneration models for the electricity SO?

- *If so, do you have any proposals for the types of models we should be considering?*

Although the electricity system operator (ESO) has a much smaller asset base than that of the network owners, it is not negligible. In particular, much capital is tied up in its main and emergency control centres and the associated information and communication systems. The ESO's main role is in managing around £1 billion per annum of balancing service costs, all of which are incurred through contracts with various other industry actors.

The Balancing Service Incentive Scheme (BSIS) has been in place for some years. Although history shows that National Grid has mostly been a winner under the scheme, it could also be argued – through perhaps difficult to prove in the absence of a counterfactual – that it has been successful in keeping total balancing service costs down.

The costs incurred in balancing the system are predominantly a function of decisions made by actors other than the ESO, in particular the generators and the TOs but also the DNOs. As was discussed in our answer to Q3, it seems that the new network assets that the ESO believes are necessary are not always delivered. Meanwhile, the changing generation mix suggests that balancing service costs will grow as they become more important on a system increasingly dominated by renewables, with the provision of such services becoming more significant sources of income in an energy market dominated by generators with low short-run costs.

We note that Ofgem is "*driving the ESO to take a more active approach to managing the energy transition and to supporting system planning (and whole system outcomes), which is one of the core enduring roles we have identified for it. Furthermore, as we are seeking to promote the role of competition in networks (and more widely), we expect the ESO to support this.*"[11] As with any regulated entity, there is a challenge in ensuring that it discharges its responsibilities in a competent manner. There remains a risk that current regulatory arrangements drive a focus on cost minimisation, in particular staff costs[12]. In our view, this has led in the past to a failure to address emerging system issues either quickly enough or deeply enough, e.g. in respect of changes to the dynamic behaviour of the system or the closure of generation that would contribute to system restoration in the event of a blackout. That is now changing and we welcome initiatives such as the 'System Operability Framework' and the 'System Needs and Product Strategy' review. It will be imperative that such work is continued and that National Grid has access to the requisite depth and breadth of expertise. In a number of instances, this can be found within the other network licensees; collaboration will be essential while respecting the need to avoid any bias towards National Grid's own TO business. The other network licensees' contributions to ongoing operability of the whole electricity system should be recognised.

One question that always arises, for all the network licensees not just the ESO, is what can be regarded as 'the day job' that the licensees should just get on with and what constitutes 'innovation' that might, under current regulatory arrangements, attract additional funding. National Grid's system operator function in the past was a poor supporter of research and development to inform innovation. Its focus was on making a return within the 1 or 2-year timeframe of BSIS settlements. We welcome the award of a network innovation allowance to the ESO and observe that it is now commissioning innovation projects. We discuss innovation

[11] Ofgem, RIIO-2 Framework Consultation, March 2018

[12] We discuss the cost of the human resource further in our answer to Q22.

below but note that research is required not just to identify and exploit opportunities to reduce costs for future consumers – relative to what they otherwise would have been – but also to understand emerging threats. Whether the latter is regarded as part of the ESO's 'day job' or 'innovation' is open to question but it is essential that it is done.

Whilst we do not have a specific proposal to ensure that the ESO discharges its growing set of responsibilities cost effectively, it might be worth considering the establishment of an SO-specific 'Challenge Group'. This would be similar to that proposed by Ofgem for the network owners.

Network utilisation, stranding and investment risk

Q9. What options, within the price control, should be considered further to help protect consumers against having to pay for costly assets that may not be needed in the future due to changing demand or technology, while ensuring companies meet the reasonable demands for network capacity in a changing energy system?

Ofgem notes in its RIIO-2 framework consultation that its focus is "ensuring that network companies choose investments that maximise the long-term value for consumers and not just short-term profits" and that they want to "protect consumers from having to pay for costly new investment in network infrastructure that is not used, or needed." We agree with these general aims, though they are difficult to achieve in practice – especially given the amount of uncertainty about the future evolution of the energy system. We also note that, once a revenue stream has been set, the network owners would appear not to be driven simply to increase the size of the asset base.

When designing regulatory arrangements for the future, it is worth reflecting on the past. In broad terms, there are two views which have been expressed in recent months:

1. Costs have come down and performance has improved.
2. Profits are excessive.

In our view, both of the above are likely to be true. If the second view suggests that regulatory arrangements to date have been less than perfect, care should be taken to ensure that any new arrangements continue to achieve the first outcome. Fundamentally, the challenge has not changed: how to make sure that the network licensees do what competent network utilities should do at least cost.

One of the most difficult things to assess is the need for asset replacement. Much of the existing electricity network asset base is reaching or has reached the end of its financial life. 'Non-load related' capex represents a large part of a network business plan. The planning of asset replacement is difficult and should take account of the condition of the asset, the availability of finance, project managers and field staff to effect a replacement, and the need for outages. The necessity for outages and the need to maintain a network service in the meantime is a constraint that was not faced when the particular section of network was first developed. It leads to consideration of bundling of works with other assets that would all need the same outage. In the case of, for example, National Grid's 'London Power Tunnels' development, it entailed an investment in additional network capacity prior to asset replacement work in order that outages could be taken without compromising reliability of supply. The condition aspect must be considered alongside the cost of replacement, the ongoing cost of maintenance, whether an upgrade to an asset would serve both reinforcement and replacement needs, and what the consequences of asset failure would be. Given the interactions between asset replacement, outages and network capacity enhancement, we are unsure how decision making will be undertaken when there is a clearer split between TO and SO and an enhanced role for the SO in capacity planning while the TO, presumably, retains responsibility for management of asset health. A further problem is that failures to adequately manage asset health, particularly those in critical locations, are likely to become apparent only after a number of years. At the very least, we would encourage the network licensees to make use of the most up-to-date methods for monitoring asset condition, making prognoses about future health and prioritising maintenance, refurbishment and replacement works in light of the improvements in network reliability that might be realistically be expected from new assets[13]. However, in enhancing monitoring capability, account also needs to be taken of cyber security risks that may only be mitigated through replacement of particular assets.

In its RIIO-2 framework consultation, Ofgem notes that "new investment agreed through RIIO-2 could have an asset life of over 45 years." However this is true only in respect of 'primary' assets, i.e. those that carry energy from generators to end users. Even then, different components of particular primary assets, such as overhead lines or circuit breakers, have different lifetimes, some rather shorter than 45 years. The system also depends on 'secondary' systems for monitoring, communication and control. Secondary assets typically have much shorter lives, in many instances due to original equipment manufacturers' failure to support them beyond a few years. Replacement offers new facilities such as enhanced operational flexibility and better information on the condition of primary assets. However, inter-operability, reliability and security can be difficult to maintain as technologies develop and the threat of cyber attacks on power networks increases.

We would urge caution when defining how 'network utilisation' is measured and linking this to income. The network licensees have limited influence over what network users do; although price signals can encourage network users towards different choices and behaviours, the network licensees are largely in a position of responding to need, a need that changes. It is reasonable that the network licensees should be encouraged to show competence in anticipating future needs and how they might change; however, uncertainty cannot be completely eliminated. Ofgem draws an analogy with interconnector developments and the 'cap and floor' regime. However, we would note that merchant or quasi-merchant interconnector development generally leads to less than the optimal amount of network capacity.

Total elimination of stranded assets or windfall profits is likely to be impossible. Moreover, it might be argued that an excessive concern with the risk of stranded assets has led on some occasions to excessive costs to consumers through delays to regulatory approval for the recovery of major reinforcement costs and high constraint costs in the interim.

[13] Some new assets turn out to be less reliable than old ones.

In our view, what is required is a clearer understanding of upside and downside risks[14], i.e:

1. what would be the consequence of over-investment in network assets?
2. what would be consequences of under-investment?

We believe that it will be important that such an understanding is developed both by the network licensees and, because of its role in setting income allowances, by Ofgem. It will also lead to a requirement for new planning methods and tools, something that, notwithstanding some recent developments, the network licensees have generally been slow to address in the past[15]. As noted in our answer to Q2, 'least regret' analysis[16] will be an increasingly important approach, though it should be treated with care as results are sensitive to choice of scenarios. Either an approach such as management of conditional value at risk should be used (in effect, an extension of least regret that takes account of the probabilities of the outlying scenarios, though these are themselves a matter of judgment), or some 'challenge and review' of future scenarios instituted, perhaps through Ofgem's mooted Challenge Group. This might go some way to providing some consistency in the sets of assumptions used by the different network licensees[17].

Just as the balance of cost and risk has led to quite different design principles for electricity transmission compared with distribution, an assessment of upside and downside risks is likely to lead to a slightly different regulatory treatment of transmission and distribution. The radial nature of distribution networks and the smaller size of groups connected via each circuit mean that the impacts of failures are not as large as they might be at a transmission level. Uncertainty in demand growth might be managed in the shorter-term on distribution networks by the use of temporary storage facilities or small amounts of temporary generation until confidence is gained that a particular network reinforcement is 'the right answer'.

End-use energy efficiency

Q10. In light of future challenges such as the decarbonisation of heat, what should be the role of network companies, including SOs, in encouraging a reduction in energy use by consumers in order to reduce future investment in energy networks?

- *What could the potential scale of this impact be?*

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[14] A further question is which parties are best placed to bear and manage different risks. In particular, are they best borne by network licensees and their shareholders, or should they be, in some way, socialised.

[15] For further discussion, see K Bell (2015) Methods and Tools for Planning the Future Power System: Issues and Priorities The IET and K Bell, J Sprooten, A Vergnol and W Bukhsh (2018) Managing risk: recommendations for new methods in system development planning. Paper C1-301, CIGRE Session 2018, Paris.

[16] It should be noted that 'least regret' does not mean 'no regret'.

[17] At present, National Grid's "Future Energy Scenarios" (FES) have a significant influence over these assumptions. We understand that many of the network licensees are starting from the FES when developing their own business plans. However, it should also be noted that the FES include insufficient detail to fully inform network business planning.

Network companies do not have a great deal of influence on end use energy demand. However, given the right incentives, system operators (especially future DSOs) could indirectly influence the level of demand through incentives for system balancing at least cost. As discussed in our answer to Q5 above, we support consideration of a low carbon incentive within RIIO-2. That would reinforce the incentive for network companies or system operators to use a whole systems approach that is aligned with achievement of UK climate change targets. Such an approach includes consideration of demand side flexibility – and potentially reduction – as part of a least cost approach to meet these targets.

Driving innovation and efficiency

Innovation

Q11. Do you agree with our proposal to retain dedicated innovation funding, limited to innovation projects which might not otherwise be delivered under the core RIIO-2 framework?

Network licensees are unlikely to invest in innovation – or research and development in general – if it does not deliver benefits to the company within a price control period. As we explain below, innovation entails uncertainties and there are well-known arguments associated with the positive externalities associated with innovation that lead to under investment from a societal perspective. We therefore support the proposal to retain dedicated innovation funding. There may be definitional/allocation questions – what might a licensee be expected to do in the normal course of events, what constitutes 'additional' innovation. However we do not believe that these undermine the fundamental important of retaining innovation funding.

One general principle concerning innovation and its funding is that it involves uncertainty: an idea that seems good requires some development to establish that it really is good, or to develop it further. If the potential benefits are significant and their realisation is some way into the future, it may be reasonable for the risk associated with resolving the uncertainties to be socialised in some way, e.g. through tax payers or customers. In addition, innovation should underpin the whole energy system's transition, not just that in one sector. For example, an innovation in the electricity networks sector might result in benefits in the gas sector (such as, for example, reduced need for new compressors). This suggests two tests for the appropriateness of specific innovation funding for the network licensees:

1. The benefits (in respect of lower costs to consumers, reliability of supply, or improved social acceptability, e.g. safety or environmental impacts) would either:
    a. accrue to another network licensee; or
    b. accrue to the funded licensee only in a future price control period.
2. The uncertainties are such that some socialisation of risk is appropriate.

The level of uncertainty and risk associated with innovation is conventionally categorised by reference to 'Technology Readiness Levels' (TRLs). However, the standard definition was adopted from the defence and aerospace sector and, as a consequence, has a focus on technology to the neglect of methods or working practices, and addresses risk in respect of costs and successful operation. While some definitions refer to readiness 'for full commercial deployment', 'commercial viability' often seems to require something more.

We would encourage the various parties with a stake in energy sector innovation – energy companies, Ofgem, the research councils, Innovate UK and relevant academics, in particular – to agree:

a) a revised definition of TRLs (or "innovation readiness levels"); and

b) a common approach to which funding sources are appropriate to support work at different levels.

We do not agree with the view of one network licensee, reported in Ofgem's RIIO-2 consultation document, that "after 13 years of access to innovation funding for DNOs, it may now be appropriate to re-focus support towards larger-scale, whole-system orientated projects." In our view, this risks the neglect of important, smaller developments and smaller projects concerned with developing knowledge and understanding as pre-requisites to future consumer benefits and mitigation of longer-term system risks. It also risks an over-emphasis on 'prestige projects' that, in some cases, are more notable for the big numbers and headlines generated than the learning achieved and shared.

Q12. Do you agree with our three broad areas of reform:

i) increased alignment of funds to support critical issues associated with the energy transition challenges

ii) greater coordination with wider public sector innovation funding and support and

iii) increased third party engagement (including potentially exploring direct access to RIIO innovation funding)?

We agree that greater coordination with wider public sector innovation funding and support would be of benefit. As noted above in our answer to Q11, we would encourage a revised definition of 'technology' or 'innovation' readiness levels that addresses the gathering of knowledge and understanding through to the establishment of commercial viability. This could be used to map the scope of different funding streams. However we would also note that different streams can – and do – overlap. For example, research council funding can support the design, development of technologies or methods, and testing in physical labs, small scale 'living labs' or in deliberative social research; so, we believe, can Network Innovation Allowance funding. We see no reason why this cannot continue to be so and note the potential benefits of leveraged funding.

Universities in the UK can play a key part in helping energy companies' transition to the new, low carbon world. This requires not only individual academics who meet standard university performance metrics by publishing learned papers, but also teams capable of helping industry navigate the challenges facing them, resolve key uncertainties and adopt appropriate innovations. In a context of continually squeezed public spending where the research councils are under the same pressures as other public bodies, the support provided by the Network Innovation Allowance (NIA) and Network Innovation Competition (NIC) is extremely valuable in helping to ensure that academic work is industrially relevant and has 'impact', and in providing funding to employ researchers. However challenges arise for academic groups trying to retain intellectual capacity through short/fixed term contracts. . One example of a need for greater coordination therefore lies in investment in building and retaining research capacity. This is, in our view, of long-term importance and could be enhanced through more effective coordination of Government and private sector funding sources.

Q13. What are the key issues we will need to consider in exploring these options for reform at the sector-specific methodology stage, including:

- *i) What the critical issues may be in each sector and how we can mitigate the bias towards certain types of innovation through focusing on these issues?*
- *ii) How we can better coordinate any dedicated RIIO innovation funding with wider public sector funding and support (including Ofgem initiatives such as the Innovation Link and the Regulatory Sandbox)?*
- *iii) How we can enable increased third-party engagement and what could be the potential additional benefits and challenges of providing direct access to third parties in light of the future sources of transformative and disruptive innovation?*

We agree with Ofgem that some of the future challenges relate to "*larger volumes of consumer data, enabling consumers to shift patterns of demand*" and that it would be appropriate for funding to be made available to the sector to maximise the value from data and facilitate demand side flexibility. Ofgem also notes a future challenge in "*identifying those consumers in vulnerable situations*". Our understanding is that the DNOs, in particular, already have a responsibility to develop and maintain a Priority Services Register for people in need (that might be more strongly enforced). We presume that the identification of 'priority services' extends also to key institutions such as hospitals, water treatment works and communication facilities.

A systematic review of the more than 60 Low Carbon Network Fund (LCNF) projects carried out on behalf of UKERC and HubNet[18] found that few LCNF projects addressed the potential for distribution connected resources to help manage the wider electricity system in respect, for example, of whole system balancing, with relatively little attention to novel methods, working practices or commercial arrangements. DNOs' focus in LCNF projects was predominately on equipment which was new to them.

Focusing less on benefits to network licensees' own customers and more on energy users as a whole may help to mitigate some of the biases that Ofgem perceives and help to ensure more of a 'whole system approach'. As we have already noted, we believe there is a need to address risks not only possible opportunities.

In respect of better coordination of RIIO innovation funding, see our answers to Q11 and Q12.

In principle, opening up access to network licensees' customers' money to pay for work both proposed and undertaken by 3rd parties promises to widen the scope for innovation. However, proposals should be assessed with a critical eye as, in many cases, the proposers may lack knowledge of quite what the network challenges really are or be motivated by a 'quick buck' regardless of longer-term energy system or consumer benefits.

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[18] Damien Frame, Keith Bell and Stephen McArthur, *A Review and Synthesis of the Outcomes from Low Carbon Networks Fund Projects*, UKERC/HubNet, August 2016.

It should be noted that 3rd parties are already heavily involved in network innovation projects. However, we have some concerns about the way they sometimes seem to be engaged. Innovators' primary currency is their ideas, formed as intellectual property and the associated intellectual property rights (IPR). They depend both on other people picking up their ideas and on gaining some value from them themselves in order to help to fund their continued creative and developmental work. The network licensees are regulated and, for the most part, are monopolies whose activities are closely scrutinised by Ofgem to ensure value for the licensees' customers, both present and future. Ofgem has deemed that it is permissible for licensee customers' money to be used to fund licensee innovation through the Network Innovation Allowance (NIA) and Network Innovation Competition (NIC), subject to a number of conditions. For example, "*One of the purposes of the NIA is to allow learning to be shared amongst Network Licensees. The NIA Project must develop new learning that can be applied by Relevant Network Licensees.*"[19] In addition, "*We recognise that the Projects financed by the NIA may create IPR either for the Funding Licensee or for any Project Partners (whether for one, both or jointly)*" and "*Network Licensees must ensure that their IPR arrangements allow for the Dissemination of knowledge in respect of a Project. This knowledge includes the knowledge necessary to reproduce or simulate the outcome of a Project. … It is not expected that the confidential details of IPR would be disclosed in Project Progress Information, only sufficient information to enable others to identify whether the IPR is of use to them. … Foreground IPR within Commercial Products is not deemed Relevant Foreground IPR. However, these must be made available for purchase by Network Licensees after the Project. … Each Participant shall own all Foreground IPR that it independently creates as part of the Project. Where Foreground IPR is created jointly, it may be owned in shares that are in proportion to the funding and work done in its creation*."

We have become aware that some network licensees are adopting the following practices in respect of innovation projects:

a) insisting that all Foreground IPR in an innovation project is fully and exclusively owned by the network licensee;

b) asking third parties to volunteer their ideas but then commissioning others to take them forward.

The explanation given to us of practice (a) has been that it is needed in order that the network licensee can disseminate the learning. It seems to us that such a position is incorrect given the various stipulations of the NIA governance arrangements summarised above. Moreover, at least in respect of many universities, it is common practice for the university to own any Foreground IP independently developed or to institute shared ownership, to offer a free licence to the client to use the university's Foreground IP developed in the project, and to actively promote dissemination of knowledge.

We are not clear on how widespread the above practices are but both of them are likely to act as deterrents to 3rd parties volunteering to become involved with network licensees or to offer their ideas.

[19] Ofgem, Electricity Network Innovation Allowance Governance Document version 3.0, 2017.

Q14. What form could the innovation funding take.

- *What would be the advantages and disadvantages of various approaches?*

The UKERC/HubNet LCNF review found that, in a number of cases, there appears to have been poor initial design of experiments, with a failure to clearly state what information is sought and to define robust methods to obtain it. This may be due to DNOs' inexperience up to that point with the specification, management and execution of research, development and demonstration (RD&D) projects. Of 63 projects reviewed, 30 had a university as a delivery partner; a key aspect of a university's contribution should be expertise on the framing, testing and reporting of research, but it appears this may not have always been utilised effectively.

Successful delivery criteria linked to a recoverable funding contribution, as applied in the LCNF arrangements, may be an appropriate method of incentivising performance in learning outputs in regulated industries; however, any reward criteria must be focussed on the quality of learning outputs not just their delivery[20]. A framework and good practice guide for shaping, capturing and assessing the learning outputs of funded innovation projects is, we believe, essential and should be developed. Although Ofgem's Electricity Network Innovation Allowance Governance Document outlines "Required Project Progress Information", it is our impression that the stipulations are not being clearly or consistently followed. Moreover, Ofgem guidance says little about design of experiments or trials in which stakeholders can have confidence in respect of generation of learning and the associated evidence.

A framework should support both assessment of projects at the bid stage and ongoing evaluation of success, and should be oriented towards the following: are projects targeting key uncertainties with an appropriate set of planned experiments and, once funded, are they producing high quality learning that moves the knowledge of the sector forward? And, if core business deployment is not yet fully proven, can the knowledge generated and shared be easily built on by subsequent innovation projects?[21]

Q15. How can we further encourage the transition of innovation to BAU in the RIIO-2 period? How can we develop our approach to the monitoring and reporting of benefits arising from innovation?

Fundamentally, the network licence conditions should drive 'the right answer'. Once an innovation has been tested and shown to be commercially viable, failure to adopt the innovation when conditions arise that would make use of it could be a breach of the licence. Of course, the difficulty would lie in proving such a breach.

The UKERC/HubNet review of LCNF developed a framework for evaluating innovation adoption readiness. This could provide a useful component of ongoing formal evaluation of

[20] For further discussion, see Frame et al, "Innovation in regulated electricity distribution networks: A review of the effectiveness of Great Britain's Low Carbon Networks Fund", Energy Policy, July 2018.

[21] In our view, the ENA's 'Smarter Networks Portal' remains a very imperfect platform for dissemination. It could be much improved in respect of, for example, tagging of projects via an improved set of keywords, access to data, summaries of key conclusions (with citation of the supporting evidence and where to find it) and listing of project partners.

the ‘success’ of innovation projects. It could be enhanced to allow formal self-assessment of an innovation's readiness to be deployed when required, and the required progression in respect of reduction of uncertainty. It could be accompanied by an in-depth discussion of the supporting evidence produced by the project. For projects with a positive score, a description of the expected pathway towards deployment should be provided. This ‘innovation adoption readiness pathway’ could then be subject to independent expert scrutiny and would support ongoing knowledge capture, strategy development, and appropriate design of future innovation projects.

Whether it is around the adoption of innovative solutions or the use of more established methods or technologies, it has will continue to be a challenge for the regulator to establish if a network licensee is discharging its duties competently. As far as we are aware, to date, the only attempt that has been made has been as part of a price control review in which past capital expenditure has been assessed with a view to deciding whether particular items can be added to the asset base. One approach that might (a) provide enhanced information and (b) spread the assessment workload would be a random audit approach. This would be analogous to financial audits in which randomly selected transactions are followed through all stages. Where these closely scrutinised transactions are shown to have been treated correctly, confidence can be gained that business processes are appropriate and that the majority of accounts are correct. In the network licensee audit analogy, randomly selected investments would be assessed in detail in terms of their origin, analysis, business case development, evaluation, final decision and implementation.

Competition

Q16. Do you agree with our proposal to extend the role of competition across the sectors (electricity and gas, transmission and distribution)?

- *What are the trade-offs that will need to be considered in designing the most efficient competitions?*

The main evidence usually cited in support of competitively awarded network development and ownership contracts is the experience of Offshore Transmission Owners (OFTOs). When claiming specific savings, Ofgem should state clearly what these savings are relative to and how any counterfactual was formed.

While there may well be some consumer benefits to come from extended competition in the provision of electricity and gas network capacity, we would counsel against reading too much into the apparent evidence from OFTOs:

- None of the OFTOs has actually designed and built anything yet.
    - The OFTOs have acquired assets that were commissioned and initially financed by the generation developers.
- OFTOs own and operate connections to the main interconnected transmission systems (MITS) and not any assets within the MITS.
    - The costs and benefits of different configurations of connections to the MITS are relatively easily defined, especially once a connection design standard as expressed in the Security and Quality of Supply Standard (SQSS) has been set.

- As far as we understand it, the OFTO personnel responsible for maintenance of the assets have been inherited from the generation developers.

OFTOs may have given rise to more innovative and more cost-effective maintenance practices than the established transmission licensees. However it the OFTO arrangement also permits benefits that may come from 'financial engineering' rather than physical engineering. The generation developers can raise finance for development of the connection to the MITS knowing that they can sell it on almost immediately to another party, an OFTO. The OFTO knows that its risk is strictly limited by the floor of the cap and floor income model and so can raise finance quite cheaply. We are not clear on the extent to which they are exposed to the main risk – cable failure entailing unavailability of the connection for many months – and how this compares with that faced by the established, regulated TOs in respect of onshore connections.

The difficulties we highlighted in answers to earlier questions associated with separation of network ownership from system operation would also arise in respect of CATOs.

Q18. What could the potential models be for early stage competitions (for design or technical solutions)?

- *What are the key challenges in the implementation of such models, and how might we overcome them?*

Whatever clever ideas are used in maintaining an asset, the biggest savings come from not needing it in the first place, whilst the biggest benefits come from the asset being available. It seems to us that the main potential benefit of the competition envisaged by Ofgem is to provide scope for genuine innovation in respect of the design of new electricity network capacity, e.g. to consider different technologies or different routes, such as taking a Western Isles connection along the sea bed to the south of Scotland rather than across the shortest stretch of water and across land to somewhere in the north. However, the winning bidder would be required to present a business case addressing, at least, whole electricity system benefits and to take on the planning consents risks. It should also be recognised that considerable work would be needed from each and every bidder to assess the different options and develop a case for the preferred one, effort that would be priced into a bid. Moreover, the capability of consultants to undertake this and to assess whole electricity system benefits will be limited relative to that of the network licensees, whose 'day job' is to know their network and its place in the wider system.

The potential consumer benefits of a late model will be much less, simply as a consequence of the design having been largely set. The network licensees go out to tender, for construction and delivery of the assets; the extent to which a 'competitively awarded transmission owner' (CATO) can achieve further savings is open to question. For example, as we understand it, one of the constraints, at least in the recent past, comes from a set of standard technical specifications, largely inherited from CEGB days and tending to be quite specific to Great Britain and therefore sometimes requiring bespoke modifications of equipment available on the global market.

The contracting out of detailed design, construction, commissioning and maintenance of transmission network assets to a given, quite high level functional specification has been tried before by National Grid – the "Alliances". Our understanding is that it was not a success;

we would therefore advise Ofgem to delve deeply into learning why this was the case before committing to any particular CATO model.

Simplifying the price controls

Our approach to setting outputs

Q19. What views do you have on our proposed approach to specifying outputs and setting incentives?

- *When might relative or absolute targets for output delivery incentives be appropriate?*
- *What impact would automatically resetting targets for output delivery incentives during a price control have? Which outputs might best suit this approach?*

We believe that the principle of rewarding – or penalising – the network licensees according to their performance in delivering core services to network users is a good one. However, the devil is in the detail of quite how it is done. There are factors that influence measured outputs that are genuinely outside their control, and there will be random variations from one year to another.

Our approach to setting cost allowances

Q20. What views do you have on our general approach to setting cost allowances?

As has been noted by many, including Ofgem and by us in our answers to earlier questions, there is considerable uncertainty around both the future need for network investment and how much it will cost to deliver. Generation connections and closures are outside the control of the network licensees and the demand for electricity and gas will undoubtedly change in the next decade or two. New methods and technologies, such as making use of the flexibility afforded by power electronics or offered from the demand side, promise to reduce the need for conventional primary assets though they also present new operational challenges. Effective utilisation of flexibility depends on monitoring, control and coordination and this depends on assets that become obsolete quickly and, if not appropriately designed and managed, are vulnerable to cyber-attack. There is also considerable variation in the cost of particular assets, in respect of land, civil works, the cost of design and commissioning personnel, and the cost of equipment. The last of these is in turn affected by the state of the global market, exchange rates and commodity prices.

In principle, the impact of at least some of these uncertainties on the network licensees' ability to meet their licence conditions within a set revenue stream ought to be manageable by income adjustment factors. Of course, this is conditional on making the factors dependent on the right things and assigning the right size to them.

Given enough relevant data, statistical analysis would reveal interdependencies and correlations between factors, such as those influencing prices of particular items of equipment[22]. Access to relevant data is clearly critical; however, much of it is not published. Ofgem may have better scope to access this than others.

Q22. What impact would resetting cost allowances based on actual cost performance (eg benchmarked to the average, upper quartile or best performer) during a price control have? Which cost categories might best suit this approach?

We offer no particular views on this question in general but highlight one specific issue that has arisen in the past in relation to measurement of network licensees relative to each other.

It has been asserted, for example by network licensees to trades unions representing their staff, that, due to the revenue constraints set by Ofgem, pay settlements should be at or around the median for the sector. This neglects the fact that there would normally be a spread, for all sorts of reasons. If every company paid at the median, they would all be paying the same. In our view, a spread is reasonable as it might be more difficult to recruit and retain staff in some locations than in others; companies should also be free to choose what emphasis they wish to place on high levels of skills and what that means for the business as a whole.

Our understanding, e.g. via the IET Power Academy, is that the electricity sector, in particular, still finds it quite difficult to attract enough engineers of sufficient calibre. This seems to be applicable across the sector from fitters, technicians and Senior Authorised Persons to Chartered Engineers and engineering managers. Much of that difficulty can be traced to the challenge of attracting young people to study engineering and pursue it as a career, a challenge that is especially acute in respect of young women. Many companies have depended on recruits from outside the UK, especially from elsewhere in the European Union. We therefore highlight the significant challenge to recruitment and retention that is likely to be faced when the UK withdraws from the EU. Two broad outcomes might be expected to arise: skills found within the body of recruits would generally be lower, raising risks for business activities that might only be mitigated by increased expenditure on training and education by the businesses themselves; or higher salaries will need to be offered to attract those who already have the required knowledge and skills.

Annual reports/reporting

Q32. How can we make the annual reports easier for stakeholders to understand and more meaningful to use?

One of the most important performance metrics for the DNOs is the reliability of supply to consumers as quantified through ‘customer minutes lost’ (CML) and ‘customer interruptions’

[22] An example of a similar approach used to try to understand influences on the capital cost of wind farms is D. McMillan and G. Ault, “Wind farm capital cost regression model for accurate life cycle cost estimation”, International Conference of Probabilistic Methods Applied to Power Systems (PMAPS), Istanbul, 2012.

(CI). These are subject to a quality of service incentive. Consolidated, up to date annual reports on these metrics for each licence area enable ready comparison of the actual CML and CI performance but we believe that it will not be immediately obvious to many stakeholders that they can be found in an appendix of a “RIIO-ED1 Annual Report”. It could be improved by clearer presentation of licensee performance in terms of the service delivered to network users, for example: reliability of supply; number of new connection facilitated relative to the price control forecast; how quickly connection offers are made and how many are accepted; the proportion of the population of different asset types that were planned for replacement versus how many have actually been replaced, number of frequency and voltage excursions, etc..

Fair returns and financeability

Financeability

Q39. Do you consider the introduction of a revenue floor, to protect the ability of companies to service debt, to have merit?

Aside from times when politicians have responded to major loss of supply events by claiming that they are evidence of under-investment by the network companies, we are not aware of particular public concern - since liberalisation of the gas and electricity supply industries - about under-investment in the networks. Rather, some commentators have claimed over-investment or excessive profits[23]. In addition, connection applicants sometimes complain about delays to connections being completed, or excessive use of system charges. The regulators’ predominant concerns, echoed in the most recent RIIO-2 consultation, also seem to have been over-investment, excessive returns or failure to meet users’ needs. It is right that Ofgem seeks to safeguard consumers’ interests in these respects.

There is always an element of “they would say that, wouldn’t they” whenever the network licensees complain about squeezed returns but it seems to us that there is a tone to the initial reactions to Ofgem’s ‘competition-proxy’ proposals for Hinkley Point – Seabank and what it augurs for the RIIO-2 settlements that seems different. It may be necessary, for the first time, to consider the possibility of under-investment due to decisions by the network licensees, many of which are part of companies that operate in many different markets, to spend their money elsewhere. As we noted in our answer to Q9, the consequences of both over-investment and under-investment should be considered by both the network licensees and Ofgem. Over-investment would have unwelcome impacts on consumers’ bills; under-investment might lead to excessive constraint costs, put security of supply at risk or delay the achievement of the UK’s decarbonisation targets.

[23] For example, Helm, D (2017) Cost of Energy Review. Report for the Department of Business, Energy and Industrial Strategy.