

# Grid Enhancing Technologies Ltd Response to ED3 Framework Consultation

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# Response to ED3 Framework Consultation

## 1. Introduction

Grid Enhancing Technologies Ltd (GET) welcomes the opportunity to respond to the ED3 Framework Consultation.

GET advocates for the rapid adoption of new technologies on electricity networks to drive cost savings, enhance efficiency, and improve resilience.

The electricity networks being built this decade will be in place for the next 50 years. It is essential they are developed using the most up to date technologies that provide long-lasting benefits to consumers and society, lowering the cost of energy for all, and ensuring the UK economy is supported by national infrastructure that is reliable, efficient, and sustainable.

The ED3 framework will set the mechanism for building out this infrastructure and if properly constructed, will pave the way for the UK to develop world leading, sustainable, electricity networks at the lowest price for consumers.

This response focuses on ways the framework can be improved to ensure the best solutions are used by DNOs when adding capacity to the networks or replacing aging infrastructure. It outlines innovative grid hardware solutions not in widespread use on the UK network, the benefit of promoting their adoption, and proposals to ensure new technologies are not only trialled but are rolled out at scale across the UK's distribution grid. Recommendations include:

- Enhance the design of funding programs such as SIF and NIA to include funding for DNOs to scale up and roll out new technologies that have been successfully trialled (in UK or elsewhere)
- Ensure emerging technologies are not put at risk of “Death by Pilot” i.e. trials by multiple DNOs. This can be achieved through mandating that successful trials undertaken by one DNO are accepted by all DNOs and included in all DNO (and TSO) technology toolboxes.
- Ensure technical losses are consistently evaluated as part of network investment cost benefit analysis and that wider system costs such as contribution to GHG and societal impact of infrastructure are part of the assessment.
- Ensure sufficient funding is made available to DNOs to resource technology trials and widespread adoption. It is extremely important that DNO productivity and efficiency measures do not result in insufficient or underqualified resources being hired by DNOs. We need the very best engineers and energy professionals designing the networks and overseeing their construction and operations. Cost saving measures that impact on the quality and number of DNO resources will have an enormous impact on the quality of

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network investment plans and delivery, resulting in much higher costs to consumers than are saved through efficiency measures.

- There are several technology roadmaps underpinning the future energy system in the UK including the Smart Systems and Flexibility Plan. However, there is a gap when it comes to network hardware-based solutions. ED3 should require the Energy Networks Association (ENA) or other body to develop a national roadmap for network modernisation that clearly identifies priority areas for innovation using hardware-based network solutions and Ofgem should align DNO targets and investment plans with this roadmap to ensure cohesive progress across the sector

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## 2. Innovative Grid Hardware Solutions

Innovative Grid Hardware Solutions include a wide range of products that increase the capacity of networks and improve their resiliency, reliability, and efficiency. They include:

- **Advanced Conductors** that use the latest conductor technology and innovative designs to deliver much higher capacity than can be achieved using conventional copper, aluminium and steel conductors. They include **Superconductors**, **Capacitive Transfer System (CTS) cables**, and **Composite Core** overhead line conductors (**ACCC**).
  - Superconductor cables deliver 5-10x the capacity of the traditional copper and aluminium cables and require much smaller rights of way. They have no electrical losses making them the most sustainable technology available for power transmission. Superconductors are ideal for reinforcing urban networks where space is limited for building or upgrading infrastructure.
  - Capacitive Transfer System (CTS) cables utilise a highly efficient cable design that reduces losses, improve voltage performance, improve grid stability, and use less copper than today's cable designs.
  - Composite core overhead line conductors (ACCC) provide at least double the capacity of traditional overhead line technologies and are light weight meaning existing lines can be updated without changing towers/pole sets. ACCC conductors have lower losses than existing ACSR conductors.

All three Advanced Conductor technologies represent better value investments than traditional alternatives, provide for more sustainable networks, and are key tools for lowering the GHG associated with DNO technical losses.

- Technologies that get **better utilisation** from existing networks such as **dynamic line rating**, and power electronics devices such as **modular power flow control** and **Network Exchanger**. In addition to adding capacity to networks, FACTS devices improve the voltage and dynamic stability performance of the networks using the latest in power electronics.

## 3. Benefits

### 3.1 Benefits for Networks and Consumers

Innovative Grid Hardware Solutions have been proven to provide many benefits over existing technologies and are usually delivered in a much shorter time frame and at lower cost than conventional alternatives. Benefits include:

- Delivering much higher capacity whilst using less space (e.g. advanced conductors) reducing the societal impact of new infrastructure
- Using efficient materials and designs that result in much lower losses, a benefit that persists for the lifetime of the asset by reducing long term operating costs (e.g. Capacitive Transfer Cables (CTS), Superconductors, ACCC)
- Providing better network voltage and stability performance (CTS Cables, PFC) avoiding investment in additional infrastructure
- Upgrading existing lines without changing existing towers (ACCC, Superconductors) reducing the cost, lead time, and societal impact of new infrastructure
- Delivering solutions faster than conventional technologies (All)
- Maximising the use of the existing grid (e.g. Dynamic Line Rating (DLR), Power Flow Control (PFC)) extracting more value from already paid for assets
- Improving the sustainability of new networks by using fewer raw materials including copper
- Avoiding over-sizing new infrastructure and reducing costs for consumers (NNS)
- Avoiding bottlenecks in the global supply chain for traditional technologies such as transformers and cables that are driving delays in projects and higher costs.

### 3.2 Benefits for the UK Economy

The ED3 determination will result in an investment of more than £20 Billion by UK consumers in its energy system. It is vital that this investment is optimised to reduce the cost to consumers and to secure competitive energy prices for UK industry.

There are potential benefits for the UK that go beyond the direct impact on electricity networks and consumers. For example, by ensuring DNOs roll out new technologies faster on the network, the ED3 framework will promote growth of UK-based technology companies, creating high-quality engineering and manufacturing jobs in the UK and building a thriving export industry.

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The UK has invested heavily in research and development, enabling many companies in the UK to develop innovative grid solutions and technologies that greatly enhance the efficiency of the UK electricity grid. This R&D investment, coupled with support from OFGEM, DESNZ, Innovate UK, and DSIT through programs such as NIA, SIF, and NIC, has seen many of these companies successfully develop and trial technologies on the electricity networks. Unfortunately, DNOs are not leveraging their own trials or the trials of other DNOs to roll out these technologies at scale on their networks. Consequently, these industries are struggling to commercialise and scale up production and repay the investment of consumers and taxpayers through job creation and economic contributions. ED3 should focus on scaling up adoption of new technologies:

### 3.3 Benefits of Scaling Up Production

- Scaling up of production of these technologies lowers their costs ultimately benefiting consumers.
- Easy access to home grown technologies reduces the risks of global supply chain dynamics that are currently delaying projects and driving up costs.
- The UK can become a major supplier of grid technologies to the rest of the world, but it requires these technologies to be adopted in the UK and production scaled up.
  - The energy transition is being implemented globally and driving unprecedented and unparalleled investment in grid technologies.
  - The IEA estimated the investment in grids between now and 2050 will be \$21.4 Trillion representing an enormous industrial opportunity for UK based companies.
- If the UK does not scale up and commercialise new technology, then it will continue to be dependent on suppliers from Europe, USA, Asia and particularly China – countries that are investing heavily in home grown grid technology. Today there are significant bottlenecks in the supply chain for network assets such as high voltage cables and transformers delaying projects and driving up costs for consumers. This situation is going to get worse as utilities worldwide compete for access to these products.
- Other countries have recognised this threat and focused their investment on building out manufacturing “at home” to reduce the dependency on the global supply chain. The Biden administration in the United States has invested billions of dollars in the manufacturing industry and is supporting commercialisation and rollout of technologies on their grid through multiple funding mechanisms including ARPA-E and GRIP projects. The UK needs to do the same and ensure that the investment is not wasted by the utilities failing to support it through adoption.

## 4. Technology Adoption

New technologies provide alternative solutions to traditional infrastructure that can greatly reduce the amount of network that needs to be built and significantly improve the efficiency of any new network that is built. Nonetheless, Transmission and Distribution companies in the UK are slow to adopt proven innovative grid hardware solutions are not investing in the tools, policies, and processes required to promote widespread adoption in a coordinated or strategic way.

### 4.1 What is it not working today?

There is an absence of competitive forces due to the monopolistic nature of the industry. A lack of competitive forces in any industry leads to stagnation and a failure to innovate and impacts on the culture and motivation for management and staff to do better. Insufficient (or ineffective) oversight of technology adoption coupled with a lack of appropriate incentives to drive research, testing and adoption has held back widespread roll out of new technologies, particularly hardware-based solutions.

Frameworks such as NIA, NIC, and SIF have provided beneficial funding for R&D of network solutions and have successfully promoted trialling of many grid technologies, however these trials are not resulting in widespread adoption. This could be for cultural, financial, or resourcing reasons. Integrating a new technology into the “solution toolbox” of a DNO requires a change-oriented culture and the use of significant resources across the company to undertake changes such as developing and integrating system models, upskilling workers, developing asset management and maintenance policies and processes, integrating data and models into existing scada systems, development of operational policies, etc. DNOs that are resource constrained are unable to undertake this workload even though the effort will provide long term benefits for the organisation and consumers.

Ofgem as regulator plays a critical role in simulating competitive forces and promoting innovation by introducing mechanisms and policies to incentivise efficiency, innovation, and continuous improvement.

### 4.2 What does work?

#### **Policy, Profit, Pain, Profile.**

- Policy: Government led policy mandating change, accompanied by appropriate regulatory oversight and frameworks, is the most successful approach to driving change in monopolistic industries. For example, the UK set a goal of generating 30% of electricity from renewables by 2020, achieving around 43.1% of electricity from renewable sources in

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that year. Achievement of this goal was supported by a number of regulatory frameworks including as RIIO, EMR, NIA, and NIC.

- Profit: Properly administered financial incentives (e.g. funding and benefit sharing) with full accountability and independent oversight by experienced industry practitioners helps focus and motivate management on the importance of evaluating and adopting new technology. Funding of technology trials and rewarding rapid adoption is an important mechanism for driving change in the behaviours of network owners and operators.
- Pain: Failure to adopt technologies that can deliver solutions efficiently and with less societal impact manifests itself in significant delays to building out a network that meet the current and future needs of society. However, the ‘pain’ of delayed delivery is not usually felt financially by the network companies. Instead, industrial and residential consumers bear the cost of constraints and losses, and the UK suffers the consequences of not delivering on its climate change obligations. Policies that both reward and penalise network companies and makes them more accountable for these delays would incentivise better performance.
- Profile: Raising the profile of the importance of a more efficient grid delivery through technology adoption will put pressure on all actors to do better. This can be achieved by putting in place strong government and regulatory oversight and accountability for delivering this agenda. It is important that independent, experienced industry professionals are involved in this oversight process.

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### 5. Proposals for Inclusion in the ED3 Framework

The ED3 framework should ensure that Distribution Network Operators (DNOs) are sufficiently funded, incentivised, and held accountable for adopting and advancing new technologies.

Previous frameworks have successfully incentivised the trialling of innovative grid solutions (network technologies and non-network solutions) and whilst this should continue there now needs to be a strong emphasis on deploying proven technologies at scale. Using a combination of reporting obligations, benchmarking, oversight, and appropriate incentives, the UK networks can be rapidly modernised using the most efficient and sustainable technologies all at lower cost to consumers. The following proposals are recommended for inclusion in ED3

1. Dedicated funding must be put in place to scale up and deploy technologies that have come through the technology trial process, ensuring that learnings from pilot projects are translated into widespread adoption.
  - Ofgem should ensure that DNOs have access to dedicated funding streams that enable both technology trials and the rollout of proven innovations to drive down the costs over time by funding innovation all the way through the lifecycle of implementation. Most funds only apply up to the point of completing an initial trial of a technology and do not fund the most important part, which is the program to incorporate that new technology into the “business as usual processes” within a DNO. This is a key reason many trials never result in widespread adoption.
  - The Network Innovation Allowance (NIA) should be expanded to provide greater funding for projects that progress technologies from mid-level TRLs (Technology Readiness Levels) to full deployment.
  - Costs of technologies decrease as adoption scales up however, at the beginning of the adoption curve, technologies may be more expensive than conventional (yet less efficient) alternatives. Innovation funding needs to bridge this gap to ensure the best long-term outcome are achieved
2. Incentives to reduce the losses. The consultation correctly highlights that the biggest contribution to GHG comes from network losses. There are cable technologies such as superconductors (that have no electrical losses) and capacitive transfer system cables that have lower losses than traditional cables, and ACCC overhead line conductors that also have lower losses. It is essential that ED3 ensures lifetime losses (over 45-year life) are consistently evaluated as part of network investment CBA and that wider system costs such as the contribution to GHG are part of this assessment. The extra generation needed to cover the electricity lost also represents a significant system cost to consumers and the avoided cost of extra generation should be factored into evaluations by attributing the highest incremental cost per MWhRs to losses (and not average costs). Assets that are

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expected to have high utilisation should be prioritised for the application of high efficiency technologies. The ED3 framework must go much further than ED2 to ensure system losses are reduced as much as possible.

3. The framework promotes the modernisation of aging infrastructure, including the replacement of outdated conductors and transformers with more efficient alternatives and encourages the adoption of smart grid technologies, such as voltage optimisation and dynamic line rating, to manage losses more effectively. The list of innovative technologies should be expanded to explicitly refer to low loss conductors. ED3 framework should create financial incentives for DNOs to adopt hardware-based solutions that demonstrate lower technical losses compared to traditional alternatives, such as advanced conductors, transformers, and real-time grid optimisation tools.
4. GET Ltd recognises and welcomes the emphasis on innovation in the consultation document. Throughout the document emphasis is placed on innovation from the perspective of flexibility, data, digitalisation, and integration. It is important that incentives seeking to foster innovation explicitly include the critical area of using innovative hardware solutions to deliver the best networks.
5. It is unacceptable that a technology successfully trialled by one DNO is not immediately considered as proven by all DNOs. Today DNOs still favour conducting their own trials before incorporating a new technology into their business as usual. This results in 'death by pilot' whereby technology companies are required to go through so many trials before mass deployment that they either run out of financing or their technology evolves past the point of the original trial. ED3 framework can address this by strengthening reporting and knowledge sharing between DNOs and with TSOs so that technologies trialled by one DNO can be rapidly adopted by others without the need for further pilot projects. It is important to mandate annual reporting from DNOs on their innovative activities, including outcomes of trials and plans for deployment and to require DNOs to publish best practices and lessons learned from technology trials to benefit the wider industry. Ofgem must also ensure there is oversight of the technologies evaluated by DNOs in their investment plans to ensure the full suite of best available proven technologies are included.
6. There are several technology roadmaps underpinning the future energy system in the UK including the Smart Systems and Flexibility Plan. However, there is a gap when it comes to network hardware-based solutions. ED3 should require the Energy Networks Association (ENA) to develop a national roadmap for network modernisation that clearly identifies priority areas for innovation using hardware-based network solutions and Ofgem should align DNO targets with this roadmap to ensure cohesive progress across the sector.
7. The ED3 framework should include proposals that hold DNOs accountable and encourage the timely adoption of proven technologies and could achieve this by:

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- Implementing a scorecard system that measures each DNO's progress in adopting and deploying innovative solutions. Metrics could include:
    - Number and scope of technologies trialled.
    - Time from trial completion to full deployment.
    - Impact on system efficiency and reliability.
  - Establish an independent advisory committee to oversee the scorecard evaluation, ensuring impartiality and alignment with broader energy transition goals.
8. As highlighted above there is an abundance of UK based companies that specialise in the development, testing, and production of IGTs and have benefited from government investment in R&D. Ofgem frameworks should promote growth of these UK based companies and through faster adoption of these technologies. In its ED3 framework policies should emphasise the importance of adopting UK based technologies.
9. The ED3 framework has identified a need for better regional coordination. This should explicitly include better coordination between DNOs and TSOs (as well as between DNOs). The framework should ensure network planning is coordinated between TSOs and DNOs such that the best solution (from a cost and efficiency perspective) is chosen regardless of whether that is a transmission or distribution solution. It should encourage DNOs to propose and deliver distribution solutions that are a better alternative to TSO proposed solutions. For example, where new grid supply points are required, particularly in urban areas, a DNO installing a 132 kV superconductor cables may be a better option than the TSO installing 400 kV infrastructure to create new grid supply points.
10. Ofgem proposes that DNOs should focus on building networks that enable flexibility to manage system intermittency effectively, rather than solely relying on flexibility to defer investments. There is potential for this proposal to be misinterpreted and take a step in the wrong direction for consumers. Non-network solutions such as demand reduction and energy storage can provide a reliable, long-term, alternative to network investment and are not merely a tool to defer investment. New networks are required but the policy must ensure that DNOs use a combination of network and non-network solutions to build out the most efficient, resilient, and lowest cost network.

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### 6. Answer to Specific Questions:

Below are answers to the specific questions in the consultation.

Q1. Do you agree with our characterisation of the wider context for ED3? Are there any other areas of context that you consider material for ED3?

- Yes. The characterisation could be improved by highlighting that following significant investment by the UK government and consumers, many technologies have been successfully trialled on the UK networks providing an opportunity to build out the net-zero networks using the latest technologies and most efficient and effective solutions.

Q2. What are your views on our overarching objective and proposed consumer outcomes

- GET agrees with the proposed consumer outcomes with the proviso that the concept of Smarter Networks is not limited to data and digitalisation related innovative solutions but includes a strong emphasis on the smart use of new hardware-based technologies that get better outcomes than conventional hardware solutions.

Q3. Do you agree that the network investment elements of the framework should be more input based?

- GET agrees there is a need to build a network that meets the long-term needs of society and to invest in projects that achieve a least regrets outcome over that time frame. Regional Energy Strategic Plans (RESPs) have an important role to play to ensure network development is coordinated and achieves policy goals.
- GET believes an inputs-focused framework runs the risk of overinvesting in the network and a failure to adopt the best value solutions for consumers. It can lead to unnecessarily front-loading of costs for existing consumers, exacerbating the risk of more customers experiencing energy poverty.
- Where solutions that defer or minimise investment using flexibility to reduce peak load have a positive cost benefit analysis, they must be supported. These options will save consumers money and reduce the risk of making poor investment decisions due to a) a lack of awareness of emerging technologies that provide better solutions b) uncertainty over future load growth c) provide an opportunity to learn more about the impact of electrification on the network and better understand the needs of the system. Reducing peak load has benefits beyond deferring or optimising new capacity, it also reduces the need for new generation capacity and reduces operating reserve costs so it must be encouraged to ensure the overall energy system costs are optimised, not just network costs. The framework proposals run the risk of disincentivising DNOs from considering these alternatives.

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- GET believes the framework must incorporate a focus on outcomes that achieve the goals set out in the RESPs and include several degrees of freedom on how to achieve these.
- GET agrees that network investment must consider the long-term needs of the system as a whole and not just the needs over the price review period. When considering long term needs of the system the degree of uncertainty over the needs and timing must be an input into the investment decision. This approach ensures network investments are optimised in the long term and minimises the potential for solutions to be inappropriately sized for future needs with the risk of driving higher investment costs in the long run.
- In summary, GET agrees that investment decisions must consider long term needs, and that coordination is essential as long as DNOs retain the right to investigate and bring forward different options for achieving the overarching goals of the strategic plans.

Q4. Do you agree that we should consider introducing additional controls around network investments and what features should these controls contain?

- Regulatory oversight over the technology toolbox being used by NESO and the DNOs when considering how to deliver solutions would ensure they are using the best available technology solutions. Oversight could be achieved through annual reviews of the technology toolbox by an independent industry body that has expertise in emerging and newly proven technologies. This body can also ensure that all DNOs (and NESO) are using the latest proven technologies and are not deferring their inclusion pending individual trials by each DNO (Death by Pilot)

Q5. Do you agree that the incentives on DNOs will need to adapt from RIIO-ED2 and if so, how?

- The benefit sharing aspect of ED2 which incentivises DNOs to find better solutions should be retained.
- ED3 should include incentives around project delivery timelines that encourage DNOs to use all tools available to deliver projects on time. Late delivery of projects gives rise to real costs for consumers and early delivery can yield real savings. The framework should require that all project investment appraisals include an estimate of the cost impact of delayed delivery for every year the project is delayed, and a benefit for every year early the project is delivered. These estimates can be used to provide a benefit or cost sharing incentive that rewards or penalises DNOs for early or late delivery.
- If the framework becomes more input based, then incentives should be provided to reward DNOs for achieving those outcomes at a lower cost or in a faster timeframe by using better technologies.
- Given the GHG impact of technical losses the framework should place strong incentives on the long-term reduction of losses on the network
- The consultation asks if stage gates are a good idea. GET supports the idea of stage gates for projects over a specific size or with a high degree of uncertainty. Stage gates allow effective control of investment and ensure that the value for consumers is regularly reviewed throughout the lifecycle of a project. ED3 projects will be delivered at a time when

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the global supply chain will be under considerable pressure. This will have implications for project delivery timelines and costs, and it is important projects are continuously assessed throughout their lifecycle to evaluate these impacts on the investment decision. However, stage gate processes must be efficient and must also feedback into investment decisions in projects at earlier stages in the process as part of a lessons learnt cycle. Often project delivery timelines are long, and it is not practical to restart or change a project that is well into its planning, design and implementation phase so an option to change the project may not be pragmatic. Nonetheless, stage gate reviews provide valuable lessons for other projects at earlier stages in their lifecycle where changes are still possible.

Q7. Using RII0-ED2 as the counterfactual, what alternative regulatory models or characteristics are needed in ED3 to ensure the DNOs deliver the above consumer outcomes? What are the trade-offs we should consider?

- Totex is an important assessment to ensure lifetime costs of new assets are accounted for at the outset of the investment. This is a particularly effective way to ensure lifetime losses are properly evaluated and the best technological solutions are progressed. Many new technologies have higher capex costs but lower opex costs and overall represent better value for consumers. Changes that focus on capex are not welcome and are not in the best interest of consumers

Q11. To what extent are global supply chain and workforce pressures contributing to longer lead times for delivery network reinforcement?

- Both are clearly impacting lead times and costs and need to be strategically managed. New technologies generally provide better use of critical raw materials, are available faster than conventional solutions, reduce the total amount of network that needs to be built and reduce dependency on suppliers based in other geographic regions. ED3 is right to consider the supply chain issues and seek mechanisms to mitigate them. ED3 projects will be delivered at a time when the global supply chain will be under considerable pressure as economies around the world seek to decarbonise through electrification and as the globally aging networks are renewed. Strategies for managing these risks need to consider much longer timeframes than ED3 as this is likely to be an issue for the next 30+ years (The IEA estimated the investment in grids between now and 2050 will be \$21.4 Trillion which is a strong indicator that the supply chain will continue to be under stress for decades).

Q13. What are the benefits and risks to deliverability if network reinforcement is deferred to future periods?

- Deferring network reinforcement through use of flexibility or other technologies offers many benefits including the potential for technological advancements that provide better solutions and the opportunity to get more clarity on the network need. It also protects consumers from investing in underutilised assets. However, there are risks associated with deferrals that must be weighed up. Where an investment is certain to be needed then

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deferral exposes the DNO and consumers to the risks that supply chain dynamics, cost increases, and resource availability could result in unacceptable delays and higher costs. GET believes deferral is a good strategy where there is high degree of uncertainty over the project need, or where newer solutions are emerging that negate or mitigate the scale of investment, or where interim solutions are costly and unreliable.

Q19. Do you agree that investment optioneering should aim to reduce the lifetime costs by sizing elements of works for long-term need, including considering the impact of thermal losses?

- Yes, this is important for the protection of consumers today and in the future.

Q20. Is a 5-year price control (2028-33) the right duration to achieve the objective of securing timely network capacity for the net zero transition at least cost to consumers over the long run?

- Yes, if it is done in the context of an overarching strategy to deliver the net zero network for 2050.

Q21. To what extent should the price control be more directive on specific anticipatory and strategic investments to achieve the 'networks for net zero' consumer outcome?

- There are many advantages to a directive price control, but it must be flexible to adapt to emerging solutions that offer better value to consumers and emerging information about the underlying needs. It is important that technological advances can be accounted for during the price control period and plans adapted to take advantage of these.

Q23. Should the price control provide more guidance or guardrails around the use of particular network solutions to achieve the 'networks for net zero' consumer outcome?

- Guiderails are an important control to ensure the best solutions are being evaluated.

Q40. How can we optimise late and early competition models for application in electricity distribution?

- Late and early competition models can be optimised to ensure that distribution level solutions to transmission level problems are provided the opportunity to compete at both early and late stage. The framework should ensure network planning is coordinated between TSOs and DNOs such that the best solution (from a cost and efficiency perspective) is chosen regardless of whether that is a transmission or distribution solution. It should encourage third parties (and DNOs) to propose and deliver distribution solutions that are a better alternative to TSO proposed solutions. For example, where new grid supply points are required, particularly in urban areas, a DNO installing a 132 kV superconductor cable may be a better option than the TSO installing 400 kV infrastructure to create new grid supply points. Early competition provides an opportunity to make these proposals.

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Q41 How should our approach to cost assessment evolve, to enable us to better manage increasingly pronounced trade-offs between consumer protection, efficiency and investment in the distribution network

- Increasing the role of technical assessment to ensure the best available technologies are being considered and evaluated for projects

Q42. How should our guidance for cost benefit analysis evolve to better enable optioneering between different interventions, taking relevant long-term risks and benefits into consideration?

- The guidance should evolve to allow for an independent third party to review the technology solutions toolbox and roadmap to ensure the best available technologies are considered and evaluated. CBA must include a consistent (across all DNOs) evaluation of losses, comparison of environmental impacts of different solutions, evaluation of supply chain risks, dependency on critical raw materials, life cycle analysis, and expected lifetime operational costs.

Q43. Do you agree that the current Real Price Effect (RPE) methodology should form the basis for adjusting allowances in ED3?

- Yes, however the RPES methodology must accurately account for the supply chain and resource challenges that will continue to mount up during the Price Control Period.

Q44. Do you agree that the current approach to setting the ongoing efficiency challenge is a suitable starting point for ED3?

- No. The efficiency challenge is predicated on the idea that you can continuously do more with less and constantly reduce the effort required to produce the same outcomes. DNOs are entering an unprecedented era of growth, and this requires investment up front in skills and resources. The current approach has the opposite effect. Whilst there are opportunities to gain efficiencies e.g. through better use of AI and Machine Learning to perform data driven tasks, the need for complex engineering, system planning, design and integration skills will increase and requires investment. There is a lot of competition for these scarce resources in the industry which is driving up the costs and availability of resources. The current approach to efficiency is likely to result in underinvestment in these skilled resources which in turn will result in sub-optimal system design, development and operation at a much greater cost to consumers.

Q47. What are the key factors (including benefits and costs to consumers) that Ofgem should take into consideration when conducting its review of the appropriate approach to regulatory depreciation in ED3 and beyond?

- Network assets lifetimes vary between different classes of assets and as such the approach should consider different depreciation timelines by category of technology e.g. 45 years for far cables, transformers, switchgear but 20 years for power electronic devices.

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Q53. Our aim is for the ED3 framework to be structured to deliver high impact, transformative innovation – do you think that further changes, alongside those proposed for the other sectors in our RIIO-3 SSMD, are required to deliver this?

- Yes, there are many changes required, and these are outlined in Section 5 of this response.

Q54. Are there any factors particular to DNOs that facilitate or challenge deployment of innovation on their own and across networks

- Yes, one of the factors particular to DNOs is their ability to support the resource intensity of implementing transformative change associated with deployment of new innovations. DNOs are competing with each other to acquire experienced and skilled resources. ED3 must provide sufficient funding to ensuring adequate resources are in place and must mandate much higher levels of collaboration between DNOs so that trials completed by one can be implemented by others. It is also important to ensure innovation is funded all the way through to implementation at scale and does not just stop on the completion of the pilot project. Most funds only apply up to the point of completing an initial trial of a technology and do not fund the most important part, which is the program to incorporate that new technology into the “business as usual processes” within a DNO. This is a key reason many trials never result in widespread adoption.

Q60. Do stakeholders agree with retaining and strengthening the main components of the environmental framework from RIIO-ED2

- The consultation correctly highlights that the biggest contribution to GHG comes from network losses. There are cable technologies such as superconductors (that have no electrical losses) and capacitive transfer system cables that have significantly lower losses than traditional cables, and ACCC overhead line conductors that also have lower losses. It is essential that ED3 ensures lifetime losses (over 45-year life) are consistently evaluated as part of network investment CBA and that wider system costs such as the contribution to GHG are part of this assessment. The extra generation needed to cover the electricity lost also represents a significant system cost to consumers and the avoided cost of extra generation should be factored into evaluations by attributing the highest incremental cost per MWHRs to losses (and not average costs). Assets that are expected to have high utilisation should be prioritised for the application of high efficiency technologies. The ED3 framework must go much further than ED2 to ensure system losses are reduced as much as possible.