Written evidence submitted by Enertechnos (EVP0103)

About Enertechnos

1. Enertechnos is a pioneering UK clean tech company. We are developing innovative solutions to improve how electricity is delivered – boosting the capacity of the grid, enabling the electrification of our economy, and supporting the transition to net zero. Our revolutionary cable technology – the Capacitive Transfer System, 'CTS' – reimagines traditional cable design to reduce costly energy losses, delivering more power and slashing carbon emissions.

2. Enertechnos has been working closely with Ofgem and other industry members of the Decarbonisation and Environment Working Group to ensure the 2023-2028 RIIO-ED2 price controls for distribution network operators (DNOs) helps to facilitate investment in technology to cope with the additional demand that EVs will create. These price controls are a step forward in supporting the decarbonisation of transport and accelerating the roll out of zero emissions vehicles. However, challenges remain in ensuring the cost benefit analysis system used to inform investment decisions recognises the value of installing more efficient infrastructure, both in terms of carbon cost and grid support.

3. In addition to our work around grid reinforcement, we are currently working with the Department for Business, Energy and Industrial Strategy (BEIS) – through the Energy Entrepreneurs Funding (EEF) programme – to dramatically reduce electric vehicle (EV) charging times.

The feasibility, opportunities, and challenges presented by the acceleration of the ban of the sale of new petrol and diesel vehicles to 2030

4. The government's ban on the sale of petrol and diesel paves the way for EV ownership to become the norm. It is a statement of intent that sends a clear signal to industry and is welcomed.

5. The National Grid predicts that the UK stock of EVs could reach between 2.7 and 10.6 million by 2030 and could rise as high as 36 million by 2040.[1] Such transference will inevitably lead to increased electricity demand which will place significant pressure on the distribution networks and their capacity to deliver energy to businesses and consumers.

6. Every single day in 2019, drivers in the UK poured 100 million litres of fossil fuel into cars, vans, and trucks. The energy needed to power our roads must be replaced by cleaner electricity.

7. The annual electricity demand from road transport alone is expected to reach between 81 and 87 TWh in 2050, according to National Grid's Future Energy Scenarios 2020. For comparison, in 2019 electricity demand from road transport was 0.8 TWh.[2]

8. At the same time, peak demand is set to increase from 58.7 GW now to anywhere between 76 GW to 96 GW in 2050.[3] To meet the lowest demand prediction in FES, we will need an additional 14.1GW of electricity on the grid. For comparison, that is the equivalent of four and a half Hinkley Point C nuclear power stations.

9. Delivering this power could push our grid way beyond the capacity it can currently deliver – particularly at peak times. This is not just an issue of the level of generation needed to supply demand. Distribution networks do not currently have the capacity to deliver the power necessary to service demand, even if generation were plentiful. Without getting on the front foot, reducing losses, and increasing capacity through using efficient infrastructure, networks will be unable to deliver the power needed at a distribution level. A lack of sufficient capacity, leading to reductions in system voltage, could undermine the integrity of the grid, causing brownouts in areas of high demand.

10. This is a nationwide challenge, and one which distribution networks must be supported in tackling. Cities have more power supplied to them, but electric vehicles are expected to be most popular in these areas, putting an additional strain on cities' power grids which will require careful balancing and management on top of measures to boost capacity. Rural and suburban areas face a different problem. While fewer people in these areas will be early adopters, a small number of electric vehicles will create a big problem for areas which already have lower capacity. As numbers climb across the country, the problems and risks only worsen.

11. Ahead of this potential crunch point, the spotlight must turn to how we can make efficiencies within the system to cope with added pressures. One such efficiency must be addressing energy losses to ensure that we are using power in the system as efficiently as possible so that it can reach end users. Tackling the losses alone will not solve the whole capacity problem. However, increases in the efficiency of the network enhance the benefit brought by each new generation project. Relying on standard, inefficient infrastructure which loses significant amounts of energy means that more energy than is required by consumers must go through the grid in order to meet demand. This means that renewable or low-carbon energy sources will be wasted at the same time that the grid is put under more strain, limiting its ability to deliver power.

12. Losses present one of the biggest challenges to the UK's energy sector, threatening to undermine the shift to net zero and ambitions for a low carbon, green future. However, despite their impact and cost, they go largely unacknowledged in the energy policy space, owing to their 'invisibility' and the conventional wisdom that they are inevitable.

13. As it stands, we are losing an enormous amount of energy. Every day energy is generated and never reaches its intended destination. It is simply lost. In 2019, energy losses in the UK totalled 26,412 GWh.[4] This is enough energy to power 7 million homes for an entire year or charge 6.8 million electric vehicles. It also makes up 1.5% of our carbon emissions and bears an annual cost of £1.5 billion.[5] If we do not tackle losses, we need to pump over and above that amount of electricity into the system to meet additional demand and power the EV revolution. This puts grid resilience at risk and means more generation is required at a time when we need to maximise the output and use of renewable, low-carbon generation sources.

14. There are different types of losses in the energy system. Enertechnos' technology – the Capacitive Transfer System, 'CTS' – addresses technical distribution losses. These losses, also known as 'physical losses', refer to energy which is transformed to heat and noise through the process of distributing it across the network. They are the costliest losses, but

they are also the losses that can be tackled most effectively with more efficient infrastructure.

15. The cabling which makes up the UK's system is little changed from the cables installed by the Victorians, built for a bygone era where electricity travelled one way and to fewer end points. These cables are inefficient with high levels of resistance. Resistance causes a form of friction for the electricity passing through, meaning the electricity intended for our homes and businesses converts into other forms of energy (heat and noise) and is physically 'lost'.

16. The problem is only going to get worse. As demand grows and more electricity flows through our networks, losses will rise. The losses in cabling caused by resistance rise as more energy passes through the cables. The more energy passing through, the more impact resistance has. The effect is that losses do not increase at a constant rate, but instead they multiply. Therefore, as electric vehicles grow in popularity, this problem becomes increasingly pressing, risking undermining the decarbonisation of transport.

The actions required by Government and private operators to encourage greater uptake of electric vehicles and the infrastructure required to support them

17. To service increased demand from zero emissions vehicles, networks will need to increase their capacity so more energy can pass through. As well as having a cost and carbon impact, losses threaten to undermine the ability of networks to deliver on an increased need for electricity.

18. Innovative solutions such as Enertechnos' CTS-enabled cable now exist, which can be incorporated into the grid to stem losses, enhancing resilience, and contributing to reaching net zero. However, these solutions must be installed now, or we risk it being too late. New investment in long term infrastructure must anticipate and reflect the needs of tomorrow.

19. The typical lifetime of an underground cable is around 40 to 50 years.[6] Replacement programmes replace around 2% of cabling a year and the overall installed distribution line length grows by an average of 2.6% annually, as new infrastructure is built and connected. This might not sound significant, but it is an enormous amount of new cable going into the ground when you take the network as whole. At least 3,300 km of 11kV and 33kV cable is replaced each year in the UK.

20. New cables installed now must be able to cope with future demand. Using more efficient cables will prepare our system and mitigate the need for extensive costly grid reinforcement down the line.

21. Enertechnos believes that DNOs should be empowered to use strategic investment in technologies which improve network efficiency, such as low-loss cable technology. Doing so is in line with the National Infrastructure Commission's (NIC's) recommendation that Ofgem take a more proactive approach to preparing the grid.[7] The Committee on Climate Change's recommendation is that when network infrastructure is upgraded, its capacity should be augmented sufficiently to avoid the need for further upgrades to 2050.[8]

22. We welcome Ofgem's commitment in its final decision on the RIIO-ED2 price control methodology to support strategic investment to deliver net zero emissions targets, ensuring companies can increase capacity to support growing demand. We also welcome Ofgem's decision to include loss reduction in mandated Environmental Action Plans and to reward any action from DNOs that goes 'above and beyond' under the Customer Value Proposition. This should go some way in encouraging and supporting DNOs to invest in low-loss technologies like Enertechnos' CTS-enabled cable.

23. Ofgem has committed to strengthening the cost benefit analysis structure, which Enertechnos called for recently in its policy paper.[9] **It is crucial that the benefits of low-loss technology are recognised as part of the cost benefit analysis process to unlock the necessary investment in these technologies.** This should include calculating costs and benefits over the lifetime of infrastructure, accounting for the increase in capacity and reduction in losses.

24. **To ensure the full cost of losses is considered and accurate benefits are identified, Ofgem's financial indicator, the 'societal cost of losses', should also be updated.** Ofgem has committed to considering this. Currently, the figure is set at £48.42/MWh as per 2012/13 prices – this should be updated to reflect today's prices and updated on an annual basis.

25. **Government should publicly state that it expects Ofgem and industry to take action to increase capacity and reduce losses to underpin the required infrastructure and power necessary to support the transition to electric vehicles. This should include consideration given to the development of a stronger signal to DNOs that helps to ensure all new cable infrastructure laid is as efficient as possible.** There was no mention of energy losses in the Energy White Paper and, whilst Enertechnos welcomes the scale of ambition in the Energy White Paper, we are concerned that without clear direction from government, the challenge of losses will continue to not be addressed at sufficient pace.

Using CTS-enabled cable to revolutionise electric vehicle charging

26. Outside of the grid support that CTS-enabled cable can provide, Enertechnos is also working with BEIS – using EEF funding – to develop efficient charging technology for electric vehicles.

27. A CTS-enabled cable boosts efficiency, speeding up the charging process by connecting to rapid charging technology – including contactless charging – without overheating.

28. We are also exploring the use of CTS-enabled cable to distribute power more effectively to a number of electric vehicle charging points, such as in an office or supermarket car park. Using traditional cable creates problems for load sharing, as power is distributed unevenly across the chargepoints using the cable. Using CTS-enabled cable balances the load distribution, ensuring more even charging for vehicles plugged in along the length of cable.

29. We are in the early stages of discussions with other innovative companies working on charging solutions, investigating how CTS-enabled cable could play a key role in underpinning technologies which provide varying levels of charging for electric vehicles

based on their need. For example, in an office car park, technology could ensure that the vehicles of employees who have longer commutes are prioritised in terms of charging services, over those travelling short distances to work, and priority could be given to employees who are time-constrained, for example having to leave for a long-distance sales meeting.

30. Solutions such as the above will be crucial in ensuring that consumers have confidence to make the switch to electric vehicles. Alongside ensuring that networks have the capacity to deliver the power necessary to decarbonise road transport, Enertechnos' CTS technology can help to underpin innovative rapid charging solutions which provide this confidence.

February 2021

Endnotes

[1] House of Commons Library, Electric vehicles and infrastructure, March 2020.
[2] National Grid, Future Energy Scenarios (FES), 2020.
[3] National Grid, Future Energy Scenarios (FES), 2020.
[4] Department for Business, Energy and Industrial Strategy, Digest of UK Energy Statistics, 2020.
[5] Based on Ofgem's societal cost of losses updated to reflect today's prices.
[6] Valle Y.D, Hapton N., Perkel J., Riley C., Underground Cable Systems in Meyers, R. A. (ed), Encyclopaedia of Sustainability Science and Technology, 2012
[7] National Infrastructure Commission, National Infrastructure Assessment, 2018
[8] Committee on Climate Change, Reducing UK Emissions – 2019 Progress Report to Parliament, 2019
[9] Enertechnos, The road to 2050: Is our energy infrastructure ready to deliver net zero emissions?, 2020. Available at: https://www.enertechnos.com/wp-content/uploads/2020/09/Enertechnos-Policy-Paper-The-road-to-2050-Is-our-energy-infrastructure-ready-to-deliver-net-zero-emissions.pdf