

Net Zero Review: Call for evidence

The Institution of Engineering and Technology's response to the Net-Zero Review

About the Institution of Engineering and Technology (IET)

The IET is a trusted adviser of independent, impartial evidence-based engineering and technology expertise. We are a registered charity and one of the world's leading professional societies for the engineering and technology community with over 155,000 members worldwide in 148 countries. Our strength is in working collaboratively with government, industry and academia to engineer solutions for our greatest societal challenges. We believe that professional guidance, especially in highly technological areas, is critical to good policy making.

Introduction

The IET welcomes the opportunity to respond to this important review into the government's approach to delivering net-zero that is both pro-business and pro-growth. The evidence presented in this consultation response focuses on the Overarching Questions 1-7, together with Questions for academia and innovators 29-30. Below, we have summarised the key points from our significant research and expert advice that will enable the UK to achieve net zero, whilst providing business opportunities. We would be happy to provide you with further detail on these findings. More information can also be found in the reports listed in the footnotes.

Key Points

- **A wide range of net-zero technologies are currently available that together can deliver solutions in many business areas and generate growth. No single technology will be suitable for all challenges. Net Zero increases our opportunities for growth and reduces our risk levels in coping with the effects of climate change and related economic decline. Net zero business developments can give the UK a significant competitive advantage over its international competitors.**
- **A whole-system, integrated approach that focuses on energy efficiency and resilient, sustainable energy infrastructure networks is key to delivering sustainability in an economically-viable manner. This can help us use less energy and produce more of our own.**
- **The government should focus on energy security resilience, minimise exposure to fuel price volatility and provide a high level of cyber security to prevent system vulnerabilities. Such liabilities could dampen business confidence with knock-on effects on investment, growth and employment opportunities.**
- **An integrated drive is needed to ensure net zero new build and the retrofitting of existing stock. This will lessen the need for increased energy supplies, as well as enhancing business and employment opportunities as economies of scale take effect, and sustainable measures become more cost-effective.**
- **There should be a fair and just transition to net-zero that works to level up communities. This will bring its own economic benefits, and provide health and social improvements for individuals.**

The above measures need to be done at scale and at speed as they require a long lead time for implementation. Driving the changes requires government leadership and consistent, long-term, outcome-oriented policies so as to give industry the confidence to innovate and to invest in developing the technology, skills, supply chains and infrastructure that underpin future long-term growth.

Ongoing, co-ordinated and strategic government–industry-academic collaboration is needed to develop new economically-viable business models to fund the necessary scale up of the net zero sector.

Significant government communication measures will be needed to promote net zero strategies to the public so as to gain buy-in. In turn, public support will drive a virtuous circle, boosting industry demand and hence economic growth.

There are significant challenges, and innovative thinking and ongoing commitment is essential for success. However, delivering a programme of development will enable the government to meet its net zero commitments and stimulate growth and economic opportunities. The longer that developments are delayed or reduced in scale, the greater the financial consequences and the larger the remedial economic and social costs to deal with the impact of climate change.

Professional institutions, with their extensive networks with all parties, can support government to develop policy and drive the necessary changes.

Below we have looked at key aspects in more detail:

New technology driving competitive advantage and growth

Technology brings great benefits to society, and innovation will continue and thrive in this vital area. New consumer products and controls, smarter system management techniques and advances in system diagnostics and incident recovery will play a large part in a world where the services delivered by electricity are more vital to society than ever.¹ A focus on sustainable technologies reduces our level of risk in coping with the effects of climate change. It also reduces the impact on our economy of dealing with its consequences.

A wide range of technologies exist² to help the UK reach net-zero targets, though there isn't a single solution to all the challenges the UK faces. We have a vast quantity of natural resources to produce net zero energy (wind, tidal, hydro, solar etc). Government support to such technologies has led to market developments and major price falls which have significantly increased the economic viability of such technologies.

We can also enhance hydrogen production and distribution to support its use in transport, the built environment and industrial processes. There is the challenge of its mass production, and transportation from production to the point of use. However, we do have a ready supply of skilled people who have worked in oil and gas sectors that could be reskilled relatively easily.

We recommend the government should continue investing in developing technological markets, matched with investment in skills. This will ensure we have an agile and adaptive workforce that can take advantage of technological developments. It will lead to more highly paid jobs, growing businesses and increased skills and product exports.

Skills touch every part and level of net zero development, from design to materials, components and finished products. Sustainability needs embedding within all engineering and technology courses, especially at higher education levels. Focussing on reskilling and upskilling the workforce is critical in helping UK industry become a world leader in developing and harnessing new and effective technology to meet its sustainability targets and open up major export markets.^{3 4} Knowledge exchange and upskilling are at the heart of process improvement. They do not always require

¹ IET, UK renewables, limitless energy or precious resource? 2022 <https://www.theiet.org/media/10062/uk-renewables-limitless-energy-or-a-precious-resource-flyer.pdf>

²IET, Energy technologies for net-zero, 2021, <https://www.theiet.org/impact-society/factfiles/energy-factfiles/energy-generation-and-policy/energy-technologies-for-net-zero/>

³ IET, Skills for a net-zero and green recovery, 2021 <https://www.theiet.org/impact-society/factfiles/innovation-and-skills-factfiles/iet-skills-survey/iet-skills-for-net-zero-and-a-green-recovery-2020-survey/>

⁴ IET, Skills and Demand in Industry Survey, 2021 <https://www.theiet.org/impact-society/factfiles/innovation-and-skills-factfiles/iet-skills-survey/iet-skills-survey-2021/>

significant capital expenditure, but creativity within business operations. It also requires a culture shift in the workforce.⁵

However, whilst 81% of employers with a sustainability strategy report that their organisation needs additional skills to deliver it, only 20% of businesses are upskilling their current workforce to improve their sustainability⁶. **Continued support from government and a drive from business to reskill and upskill the existing workforce is vital** to improve such figures.

Harnessing new digital technologies will give a critical edge to sectors such as manufacturing, delivering growth, market share and export potential. The IET report, *Delivering Net Zero through Digital*, outlines that technology can be a facilitator of efficiency. However, businesses must also consider the knock-on impact of new technologies and the total carbon footprint⁷. Typically, digitalisation has been used to improve labour productivity but it can also drive energy efficiency and help to organise data on material flows⁸. Businesses should question and adapt existing processes, practices and infrastructure on an ongoing basis. This will help provide solutions around manufacturability and reliability; it will tackle the ease of installation, use and maintenance, and support design for remanufacture and recycling. Managing such challenges will make industry agile and responsive and help them grow profitably whilst meeting their net-zero targets efficiently. The opportunities are there, but **it needs both government policy intervention and industry innovation to overcome user hesitation**.

An integrated, system of systems approach for greater commercial effectiveness

The world is increasingly interconnected and a core challenge for net-zero is becoming more integrated locally and nationally, between providers and customers, businesses and government.⁹ This integrated approach can improve efficiency and reduce emissions. It underpins:

- widening the carbon price regime to include more sectors beyond the power and energy intensive industries (eg transport, heavy industry and the built environment);
- supporting clean technologies such as bioenergy, green hydrogen and carbon capture and storage, so as to leverage private investment and achieve per unit energy cost parity. The government should provide stable, appropriate and long-term price signals and technology-specific support policies to attract private sector investment and reduce the barrier to scaling up and commercialization;
- promoting citizen engagement to achieve a low-carbon lifestyle and carbon footprint reductions through reward and recognition policies. **The government should provide incentives, financial or otherwise, to incentivise behavioural change in people towards net zero.**

Changes in the UK need to be overseen by a system architect that has oversight and accountability for net-zero. The IET has highlighted the example of the public switched telephone network withdrawal to emphasize its unintended effects on the gas energy network in its report *'Interdependencies and Resilience in Digital Transformation'*¹⁰. Viewing the route to net-zero as a system of systems will help to ensure that the UK is resilient to new challenges and help sectors learn from each other. **The UK would benefit from regulatory oversight of its critical national infrastructure, including manufacturing, which is not currently listed as critical**¹¹.

⁵ IET, Delivering net-zero through digital, 2021 <https://www.theiet.org/media/9618/delivering-net-zero-through-digital.pdf>

⁶ IET, Skills and Demand in Industry Survey, 2021 <https://www.theiet.org/impact-society/factfiles/innovation-and-skills-factfiles/iet-skills-survey/iet-skills-survey-2021/>

⁷ IET, Delivering net-zero through digital, 2021 <https://www.theiet.org/media/9618/delivering-net-zero-through-digital.pdf>

⁸ IET, Delivering net-zero through digital, 2021 <https://www.theiet.org/media/9618/delivering-net-zero-through-digital.pdf>

⁹ IET, Decarbonising the Built Environment (unpublished) 2022

¹⁰ IET, Interdependencies and resilience in digital transformation, 2021 [https://www.theiet.org/impact-society/factfiles/energy-factfiles/energy-generation-and-policy/interdependencies-and-resilience-in-digital-transformation/dependencies-and-resilience-in-digital-transformation-\(theiet.org\)](https://www.theiet.org/impact-society/factfiles/energy-factfiles/energy-generation-and-policy/interdependencies-and-resilience-in-digital-transformation/dependencies-and-resilience-in-digital-transformation-(theiet.org))

¹¹ IET response to Critical National Infrastructure and Climate Adaptation consultation, 2022 <https://www.theiet.org/impact-society/government-policy-and-submissions/submissions-archive/critical-national-infrastructure-and-climate-adaptation-2022/>

Decarbonisation delivering energy efficiency

There are a variety of options for decarbonising heat, transport and industry though no ‘one-size-fits-all’ solution. Choices must be efficient and effective within a stable base energy mix, that provides convenient solutions and value to the customer. *The IET Precious Renewables Survey* highlighted that 85% of respondents believe that there isn’t enough attention being paid to the demand side of net-zero such as customer behaviours, technologies and community energy¹².

Domestic energy efficiency is one of the most under-appreciated opportunities in the UK’s efforts to tackle climate change. The IEA (International Energy Agency) has said energy efficiency should be recognised as the ‘first fuel’, offering a win-win-win in terms of lower emissions, lower energy bills and improved energy security¹³.

Retrofitting homes offers one of the most cost-effective and reliable routes to reducing emissions and will be crucial to ensuring an affordable transition to a clean energy system.¹⁴ ***A commitment by government to a large-scale, long-term drive in the insulation / ventilation / retrofit sector for existing buildings will lessen the UK’s need for energy supplies; it will drive business growth and skills development.***

Embodied (17%) and operational carbon (23%) in buildings represent significant UK emissions. ***We recommend that all new builds are constructed to net zero standards, and that existing buildings are upgraded to net zero operational emission levels.*** This would lead to long-term savings in energy and retrofitting costs. It would lead to healthy, comfortable homes with low heating requirements.

Reducing VAT further on energy efficiency measures, insulation products, heat recovery ventilation, A++ rated appliances and products such as triple glazed windows, micro generation equipment and solar shading products will stimulate growth and save on energy usage. ***We recommend that building and other regulations should stipulate clear requirements for minimising the impact of climate change.*** For example, for minimum cost, all new roofs could include measures to reduce thermal gain. This will reduce the need for air conditioning. It is rare for this type of construction to be adopted in the UK, but it is standard across much of Europe.

The E.U. estimates creating net-zero buildings will increase GDP by 1%, create 1.2 million new jobs, cut heating bills, reduce NOx emissions by 90%, and reduce gas imports.

The UK is well-placed to take advantage of the business opportunities resulting from such work. But building cleverly and efficiently requires engineering innovation, incentives, and accountability. If industry sectors are incentivised to deliver energy efficiency, or penalised for not doing so, change will happen.

A recent survey of engineers in the energy sector highlighted that consistent and long-term financial support was the most important driver of energy efficient measures¹⁵. Progress on decarbonisation relies on breaking down the walls between and reconfiguring relationships across many specialist sectors that have traditionally operated with a great deal of autonomy. ***Substantial improvements are essential, whichever solutions we choose, and whilst often costly, will provide great social, health and welfare benefits and help make our buildings fit for their future purpose. The government can act as a catalyst for business in ensuring these methods develop at scale.***

¹² IET Precious Renewables Survey, 2022

<https://tgtxbackoffice.blob.core.windows.net/files/IET%20Precious%20Renewables%20Survey%20Report%20Summary.pdf>

¹³ IEA [Energy efficiency is the first fuel, and demand for it needs to grow – Analysis - IEA](#)

¹⁴ IET, Scaling up Retrofit 2050, <https://www.theiet.org/impact-society/factfiles/built-environment-factfiles/retrofit-infographic/>

¹⁵ IET Precious Renewables Survey, 2022

<https://tgtxbackoffice.blob.core.windows.net/files/IET%20Precious%20Renewables%20Survey%20Report%20Summary.pdf>

Sustainable energy supporting business growth

A large amount of generation infrastructure using sustainable sources will be required to provide the energy needs of society. Earlier this year, the IET published its report, *UK renewables – limitless energy or precious resource?* and the results from a survey¹⁶ of engineers in the energy sector. This highlighted that although the UK has strong opportunities for investing in renewable energy, the demands from heat, transport and industry will be much higher than current capacity. ***A whole system approach with strong strategic direction to focus not only on capacity, but also energy efficiency, will be vital to meet targets and ensure UK energy independence.***

The challenge for the energy sector is huge and there is an urgent need to design and implement new systems that support the UK. The task is to ensure there is a secure and reliable supply of electricity whilst ensuring value for money and integration at scale.¹⁷

The benefits are clear – the more sustainable energy that the UK can produce itself, or save, the lower the need for imports to keep the lights on and support business growth. It's a win-win outcome.

Increasing energy security

Significant engineering changes are needed within the electricity system to maintain security and resilience while accommodating new demands and a generation mix¹⁸. Investment in sustainable energy will mean greater energy security and a reduction in supply chain challenges that rely on imported fuels¹⁹. Cyber security is going to be critical as vulnerabilities in the power system communications and controls could have disastrous economic and social consequences²⁰.

Sustainability enabling levelling up and growth

Sustainability needs to be a fair and just transition. It must ensure that changes do not adversely affect certain parts of society.²¹ For example, retrofit offers wide-ranging benefits for residents and communities, providing a lasting solution to fuel poverty and addressing rising energy bills. It can prevent vulnerable households from having to live in dangerously cold homes. This not only benefits individuals, it also reduces knock-on financial and other resource pressures for our overstretched health and social services. It can also create skilled local jobs in construction across the whole of the UK.²² A focus on sustainability is pro-growth because it brings immediate savings to the public and to services, thereby increasing the capability of businesses to invest and grow.

¹⁶ IET Precious Renewables Survey, 2022

<https://tgtxbackoffice.blob.core.windows.net/files/IET%20Precious%20Renewables%20Survey%20Report%20Summary.pdf>

¹⁷ IET and Energy Systems Catapult, Future Systems Architecture Phase 1, 2 and 3 <https://www.theiet.org/impact-society/factfiles/energy-factfiles/future-project-phase-one/>

<https://www.theiet.org/impact-society/factfiles/energy-factfiles/future-project-phase-two/>
<https://www.theiet.org/impact-society/factfiles/energy-factfiles/future-project-phase-three/>

¹⁸ IET, UK renewables, limitless energy or precious resource? 2022 <https://www.theiet.org/media/10062/uk-renewables-limitless-energy-or-a-precious-resource-flyer.pdf>

¹⁹ IET, UK renewables, limitless energy or precious resource? 2022 <https://www.theiet.org/media/10062/uk-renewables-limitless-energy-or-a-precious-resource-flyer.pdf>

²⁰ IET, Energy technologies for net-zero, 2021, <https://www.theiet.org/impact-society/factfiles/energy-factfiles/energy-generation-and-policy/energy-technologies-for-net-zero/>

²¹ IET, Energy Technologies for net-zero, 2021 <https://www.theiet.org/media/9032/energy-technologies-for-net-zero.pdf>

²² IET, Scaling up Retrofit 2050, 2020 <https://www.theiet.org/impact-society/factfiles/built-environment-factfiles/retrofit-infographic/>

Barriers to net-zero – present, but surmountable

Barriers to net-zero are wide ranging but not insurmountable if long-term action starts now. Key barriers include:

- limited current customer demand – without regulatory mandates, net-zero is not seen by the public as a priority requirement. The perception that the cost accrues to the individual, but the benefits to society, needs to change.
- limited government policy commitments – whilst most governments accept the need to transition to a net-zero economy, there is a reluctance to mandate the changes.
- perceived or actual cost – costs, particularly capital costs, are a significant barrier. Government incentives are needed.
- perceived or actual risk – customers, suppliers and sources of finance may be reluctant to take the risk that innovative methods and technologies may not deliver as promised or be economically viable, without support. Where reliable evidence is lacking, suppliers and customers lean towards traditional approaches.
- insufficient supply chain capacity and skills. ***Incentives to drive investment in sustainable skills are essential - from early education stages through to ongoing industry upskilling / reskilling.***

Conclusion

Policymakers can implement measures to push clean technology and support citizen engagement in ways that benefit businesses and deliver growth. The public's awareness of climate change is rising. Around 80% of the population is concerned about it and supports a net-zero transition.

Clean technologies exist^{23 24} but they need to be adopted quickly and in a strategically joined-up way to be effective. Success depends on the active involvement of all areas of society from government and employers to people making low-carbon choices for travel and their homes. ***The government can play a key role in promoting sustainable solutions with supporting financial models that are economically viable for industry.*** Measures need taking that gain the willing adoption of the general public²⁵ as the success of net zero economic strategies, with its resultant business growth, depends on it.

The engineering profession can play a significant role in smoothing the path to net-zero through technological innovation and integrated systems approaches. Their influence will be strongest when design and technology come together to reduce barriers and support positive market trends. These include areas such as:

- Innovating to reduce cost and risk.
- Simplifying to overcome problems with skills and capacity.
- Innovating to provide better solutions to specific challenges.
- Improving buyer confidence through better performance evidence and information.
- Reducing energy demand through better design.

Reaching net-zero relies on a system of systems methodology and new business models for a holistic approach. It requires an upgrade to skills, an integrated multi-disciplinary model and a transfer of knowledge across sectors. ***Government strategic oversight, accountability and the inclusion of business and society are key to ensuring net zero efficiency, resilience and security. The government can support business and consumers by committing to a consistent, long-term policy of significant investment in net zero energy efficiency and retrofit. In addition we recommend that***

²³ IET, Energy Technologies for net-zero, 2021 <https://www.theiet.org/media/9032/energy-technologies-for-net-zero.pdf>

²⁴ IET Precious Renewables Survey, 2022

<https://tgtxbackoffice.blob.core.windows.net/files/IET%20Precious%20Renewables%20Survey%20Report%20Summary.pdf>

²⁵ IET, Energy Technologies for net-zero, 2021 <https://www.theiet.org/media/9032/energy-technologies-for-net-zero.pdf>

the government provides support for the reskilling and upskilling of workforces to adapt to new technologies. This will not only bring benefits to the finances, health and wellbeing of people. It will enable businesses to develop and become world leaders in growing technological markets for the benefit of the UK economy and society at large.

The IET has professional expertise and extensive networks across the engineering and technology sectors. ***We would welcome the opportunity to support the government in its net zero ambitions.*** For further information, please contact please contact Alex Taylor, Head of Strategic Engagement (alex.taylor@theiet.org) or Stephanie Baxter, Senior Policy Lead (SBaxter@theiet.org).