Written evidence submitted by Lancaster University (IND 0042)

Does the UK have the supply chain capacity to deliver the required energy infrastructure by 2035, including an expanded electricity network?

The main inputs (other than finance) needed for Net Zero technologies to be delivered over the next ten years are:

1. Power systems and control engineers to design the system and specify the combination of components necessary to achieve the target and how these should be interconnected and controlled.

2. Design, manufacturing and supply of the specialised components (e.g. wind turbines, solar panels, reactor vessels, heat pumps, power transformers, semiconductor converters, high-voltage switchgear and cables) that will form part of the system.

3. Supply of generic materials, *commercial off the shelf* (COTS) components and services (e.g. cement, reinforcing bars, steel sections, pumps, fans, wiring, EV chargers, earthmoving and tunnelling equipment, heavy haulage, cranes and hoists).

4. Installation design engineers, site engineers, technicians, and tradespeople (e.g. construction workers, certified welders, fitters, electricians and plumbers) to assemble, install, test and commission the various components and subsystems.

All four of the above areas have serious problems:

1. After the last large expansion of the National Grid in the 1960/70s, electrical power engineering became an unpopular UK degree choice. Privatisation led to a reduction in sponsored students and many electrical courses concentrated on electronics. For the past decade, a high proportion of students studying power engineering are from overseas. Immigration policy has created a "hostile environment" for graduates from overseas who want to pursue a career in the UK. Political arguments around the time of the general election, the growth of the Reform Party and other parties' recent responses to this have made the environment yet more hostile. Power system engineering (like General Practice in medicine) is a complex subject area that requires a degree, postgraduate study and supervised experience.

2. In the 1970s, the UK was a significant exporter of power system components (generators, turbines, switchgear, nuclear reactors, transformers, etc.) produced by UK-owned companies. The Thatcher government largely destroyed this industrial capacity and much of the current industrial base is owned overseas. For example, most of the wind-turbine market in the UK is with Siemens Gamesa (Germany) and Vestas Wind Systems (Denmark), with "high-tech" components often brought-in from overseas. For several years, the international market for some specialist components, such as large power transformers, has been tight. The World Nuclear Association has stated that "a critical issue for accelerating nuclear power plant construction is the availability of heavy engineering plants to make the reactor components". It is too early to predict how the imposition of tariffs by the Trump administration will affect the operation of the power system equipment market but, particularly if the UK becomes further separated from the EU, it could be disruptive. It has to be remembered that both specially designed and COTS components have their own supply chains, which may have been affected by recent political events and by demand in other markets; in particular, Chinese restrictions on export of *rare earth* elements, which are used in many wind turbine

generators and EV motors, could have detrimental effects on the expansion of low-carbon generation.

3. For generic materials and COTS components, competition can come from many other sectors – house building, tunnels under the Thames, new airport runways, storm drains, roads and rail lines, production facilities for defence equipment or EVs, as well as refurbishment of schools and hospitals. The UK's ambitious plans for expansion of both the high-voltage transmission grid and street-level distribution networks will place large demands on copper supplies. The UK is not self-sufficient in all construction materials so a sudden surge elsewhere in the world (e.g. rebuilding Ukrainian infrastructure) could also affect material availability for UK projects.
4. For years, industry has complained that the UK does not produce enough engineers. Power system engineering is a niche profession, but the Net Zero energy industry will be in competition with many other industry sectors for more generalist engineers and technicians, of which tens of thousands will be needed. When it comes to skilled workers, a certified welder could easily move between an offshore wind turbine and a chemical works. Construction workers, electricians and many other trades are readily able to move between sectors.

All four areas carry risk that could result in roadblocks to a Net Zero plan. In the short term, many delays and other risks can be ameliorated by money. For example, shortages of welders can be solved by greatly increasing pay rates to recruit staff from other sectors; onshore wind turbine installers can outbid housebuilders for concrete and rebar. But, from a longer perspective, predatory procurement is not a satisfactory solution.

The longer-term solution has to involve addressing supply-side problems – e.g. encouraging the *onshoring* of critical industries, adequately funding FE colleges, making engineering a more attractive career than the City, and welcoming professional movement between the UK and the EU. Probably most important, bearing in mind the decade-long timescales to build manufacturing facilities for large-scale power equipment, is to establish stable policies, not subject to the periodic reversals we have seen in the recent past.

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