

How do we deliver an electricity grid fit for the net zero transition? ICE Presidential Roundtable summary

November 2023

Background

According to the UN, more than 70 countries, including the biggest polluters – China, the United States, and the European Union – have set a net zero target, covering about 76% of global emissions.

Achieving these net zero targets requires a fundamental shift. Countries will need to decarbonise their electricity generation early, while also reliably meeting the energy demands of their populations.

New electricity generation from renewables and other low-carbon sources means grids need to be upgraded so they can both carry more and manage the unpredictability of renewables.

A [UK House of Commons report](#) noted that the grid system will need to transition from transporting power from a few large, centralised power stations, to one with millions of flexible assets.

Energy systems have traditionally operated based on one-way energy flows from energy generators to users. In the future, under a decentralised system, power will also flow back the other way.

There is broad political support for grid upgrades. Grids must be upgraded to manage the unpredictability of renewable energy – but how can this be accelerated to meet vital net zero targets?

At an ICE-hosted presidential roundtable with senior infrastructure experts globally, there was strong consensus that clear story-telling to demonstrate community benefits for individuals and a systems-thinking approach working across the entire infrastructure sector, instead of just energy in a silo, is required.

Capacity for delivery

Currently, there are issues impacting multiple countries regarding grid capacity.

Grids need more capacity than ever. Lack of grid capacity is also constraining growth, as outlined in the UK's [first National Infrastructure Assessment in 2018](#).

In the past, issues relating to the grid have been overlooked. Therefore, the grid is not ready to meet the higher levels of demand placed upon it.

Expanded grids are [essential](#) to enable such levels of growth as countries deploy more electric vehicles, install more electric heating and cooling systems, and scale up hydrogen production using electrolysis.

More alignment is needed between governments' policy targets and grid planning to envision what shape of grid is needed to deliver on net zero targets. Industry requires further support from governments to reach these targets.

An incident on the Australian grid in 2015, where a small solar farm connected to the grid that was originally functioning and stable, faced issues four years later when five more solar farms were connected close to the first.

This created instability and capacity issues as the solar farms were unable to work together due to limited capacity and systems strength. Further down the line, solar farms queuing for grid connections had to be placed on hold, leading to delays and financial loss, with the only solution to build a new double circuit line which was both costly and time-consuming.

As highlighted in the [2023 review by the UK's Electricity Networks Commissioner](#), supply chains are also very stretched, especially around high-voltage cables and AC/DC converters. It is important to signal that the supply chain needs more capacity, through developing strategic energy plans. It is also vital that there is strong engagement with the supply chain to get grid equipment early enough to ensure nations are ready for key deadlines.

Moreover, there is a global competition for skills in the supply chain. Over 70 countries have net zero targets and are competing for the same talent and resources. This has been caused by the limitations of a project-by-project approach, which has raised supply chain costs and created further competition. Coordination is needed to bring the supply chain together and work in a more collaborative programme-based manner. A whole systems-thinking approach will build momentum and improve delivery.

Spatial planning and the need for a systems-thinking approach

The discussion focused on the need for a systems-thinking approach, however, this must not be at the expense of inaction in the present moment. Existing projects need to keep moving forward – there is an increased urgency with connection deadlines approaching.

The energy sector must also work with other utilities rather than in a silo as part of a systems-thinking approach. Improved collaboration can thus improve delivery.

A spatial energy plan with design principles would also help bridge the gap between policy and development. This would also facilitate net zero and future infrastructure planning.

New and emerging technologies must be utilised to improve spatial planning issues. This is particularly needed in the UK, where in the world of spatial and technical systems, planning is not necessarily coherent. Time and cost could also be saved in planning through engineers and ecologists working closely together at the early stages of projects to troubleshoot future issues.

Regulation

Stable regulation is also required to deliver an electricity grid fit for the net zero transition. A need to change the regulatory outlook was raised, to improve how new connections are dealt with.

Regulators must become more comfortable with approving spend on a systems basis rather than asset-by-asset and recognise that there is a large cost to not building, as well as a risk of building too much.

Telling a better story to consumers

Participants raised the need for more positive messages around electricity projects to create the consensus required to deliver a net zero electricity grid.

The planning system must be sufficiently flexible to account for public opinion and move from an adversarial process to being focused on collaborative placemaking.

Communities should be made to feel like they have genuine agency and a stake in the projects generating energy to secure their future. Rather than reducing citizen voice and opportunities for input in the planning process, it is important to provide alternative means for public involvement. Public behaviour must change to help hit net zero targets, but this cannot happen without incentives and frameworks from policymakers.

The public must be taken along on the journey to net zero, as highlighted in the ICE's 2023 consultation on [public behaviour and net zero](#).

It will be important to co-produce solutions with communities, rather than impose solutions with the minimum of consultation.

What's next?

A modern, smart, and expanded grid will be essential for a successful energy transition to net zero.

Nature-based solutions can play a key role. It will be important for route alignment (that provides precise routes for transmission lines or cables) to be designed to help deliver nature-based solutions, with engineers and ecologists working together. This would include ensuring that existing assets are repurposed and resources are used efficiently during the grid design process. These considerations should be accounted for in the earliest stages of project planning.

Solutions to improve grid connectivity must also be developed with the future in mind, as net zero is for perpetuity, not just for 2050. The implementation of improved technologies will modernise systems and help demand management and businesses will be a huge vehicle for investing in grid upgrades.

Undoubtedly there are many challenges ahead, but if the energy and wider infrastructure sectors challenge outdated siloed ways of working, future transition pathways for the grid will become clearer and more efficient.

Questions to take away

- Which technologies can be developed to improve future grid connectivity?
- How can policy makers improve the narrative around energy projects for end consumers?
- How can governments improve their planning systems to accelerate project delivery without restricting citizens' voices?
- Who will be expected to pay for grid upgrades in the future?

Further reading

[UK Electricity Networks Commissioner Review \(2023\)](#)

[ICE: How can the UK amp up its electricity transmission network? \(2023\)](#)

[ICE and APPGI Green Paper: what are the public behavioural changes required to meet net zero? \(2023\)](#)

[New Zealand Infrastructure Commission/Te Waihanga \(2023\): The cost of consenting infrastructure projects in New Zealand](#)

[Commonwealth Scientific and Industrial Research Organisation: Australia's Global Power System Transformation Research Roadmap \(2022\)](#)