How can the UK achieve a net zero power sector?

CHALLENGE 1:

Insufficient deployment of renewables and low carbon generation

Foreword

The new UK government has set a target of reaching a decarbonised power sector by 2030. This fast-tracks previous targets and would place the UK at the forefront of the energy transition. The target aims to not only accelerate decarbonisation, but also increase the UK's energy security and affordability for consumers.

This briefing note series highlights the challenges facing an accelerated energy transition and signals direction to potential policy solutions throughout the power sector.

In this briefing note, we analyse challenges to deploying enough renewable and other low carbon generation assets across five lenses and hear from our experts on how these can be addressed:

POLICY

Ongoing market reform discussions, extensive permitting times and low forward visibility of CfD auction volumes have contributed towards investor uncertainty when deploying renewables.

FINANCE

Competition for international capital, coupled with the uncertain macroeconomic environment have raised concerns over the viability of financial returns.

TECHNICAL

Slow grid connection and limited capacity has led to a significant backlog of projects in development. Developments are also required in less mature technologies such as floating offshore wind and nuclear small-modular-reactors (SMRs), and if not addressed quickly, these assets may find they play a limited role in reaching net zero targets.

SUPPLY CHAIN

The speed of energy transition presents challenges upstream in the supply chain with skills shortages, manufacturing constraints and critical mineral constraints posing potential bottlenecks.

SOCIAL COST AND AFFORDABILITY

The costs involved with an accelerated transition may impact end consumers. The potential backlash to this and objections to the increased local infrastructure would be headwinds to renewable deployment.

Addressing these challenges will be key to accelerating deployment in line with targets, and our experts will outline the levers that can be deployed to influence this.

MARK TURNER
Partner, Expert in Power & Low Carbon Solutions

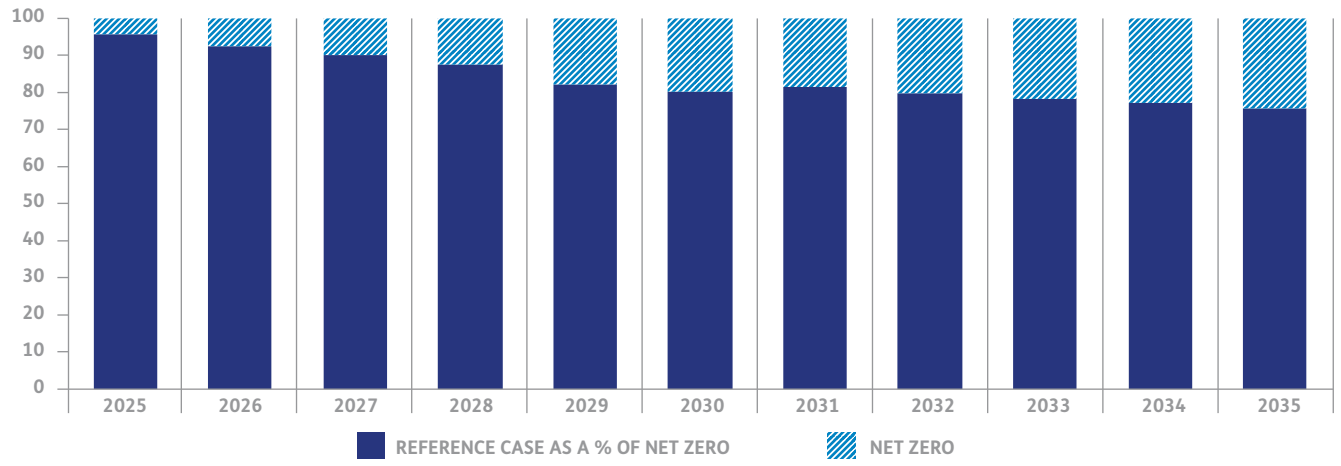
GRAZZIA HORN
Partner, Expert in Delivery of Policy and Regulation

Deployment of renewables is set to miss net zero targets

Under our central projection of renewable and low carbon supply, our Reference Case, low carbon capacity required to meet the current decarbonisation objective will fall short by 25% in 2035. Where solar and wind capacity is required to grow by 152% between 2025 and 2035 to meet net zero targets, our Reference Case projects the combined capacity will fall short and grow by 108% in this period. The projected rate of deployment is therefore insufficient to meet the growing power demand of an electrifying economy, potentially leading to more use of CO_2-emitting power stations which could delay the net zero emissions targets.

UK Ref Case low carbon supply capacity as a proportion of Net Zero scenario (%)

Chart excludes Northern Ireland



Risks to deploying renewable and low carbon generation

	POLICY	FINANCE	TECHNICAL CHALLENGES	SUPPLY CHAIN	SOCIAL COST AND AFFORDABILITY
KEY RISKS	▸ Uncertainty around market reforms ▸ Permitting ▸ CFD auctions visibility	▸ International competition for capital ▸ Uncertain macroeconomic environment	▸ Grid connections and capacity ▸ Need for technological innovation	▸ Skill shortage ▸ Manufacturing and installation constraints ▸ Critical mineral constraints	▸ Consumer bill price increases ▸ Community disengagement and local impacts
OTHER RISKS	▸ Carbon pricing and risk for prices designed for renewables ▸ Uncertain onshore wind targets and planning regime	▸ Large investment required for nuclear assets	▸ Grid management and flexibility	▸ Accelerated near-shoring supply chains	

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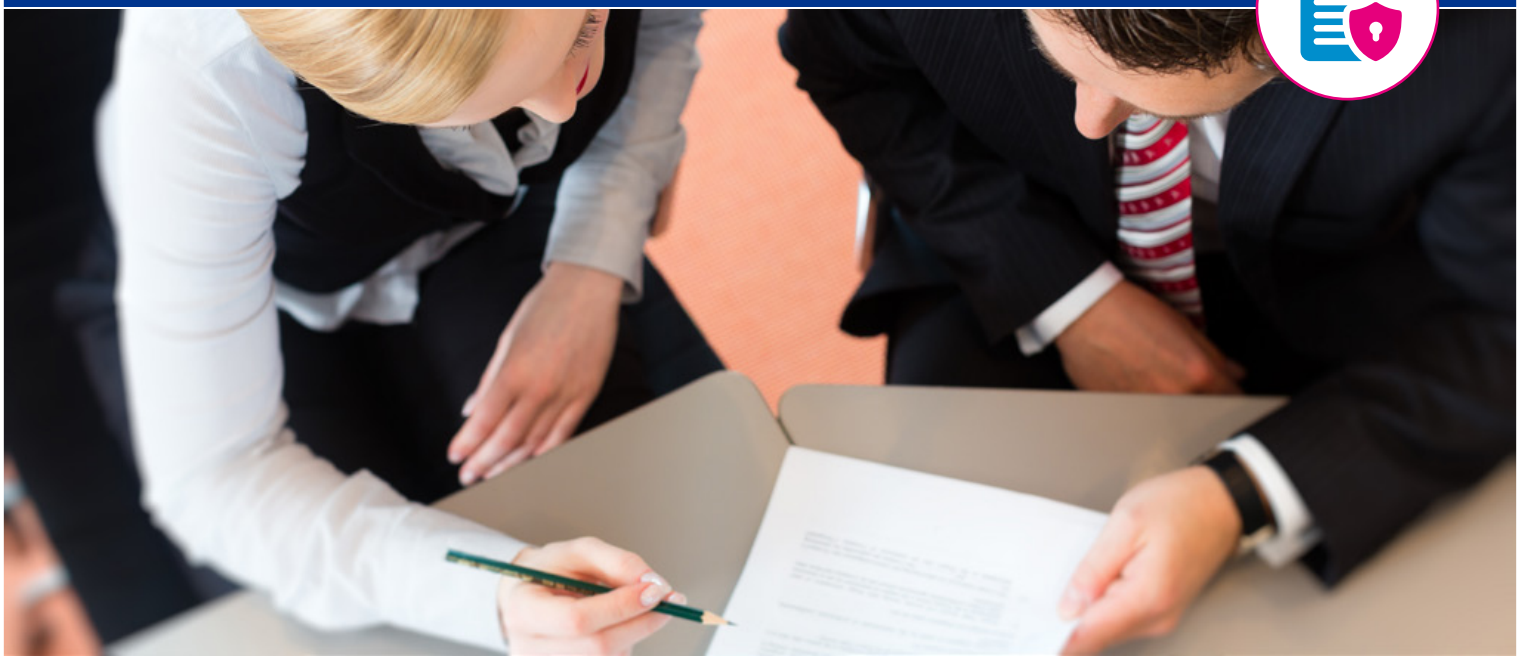
Lens 1: Policy



CHALLENGES TO DEPLOYMENT

1. Uncertainty around market reforms

Uncertainty of timelines and outcomes around reforms to power markets under the Review of Electricity Market Arrangements (REMA) introduces extra risks and a lack of clarity for investors. In particular, zonal pricing and how this might interact with CfDs makes projects harder to value as capture prices may vary widely between zones, and potential CfD treatment of zonal differences remains unknown. This uncertainty may increase risk and drive up financing costs, especially for some of the longer-term projects (e.g. early-stage onshore wind), though we expect key changes to be grandfathered and uncertainty resolved to some extent by the time these projects reach FID.

2. Permitting

Complex permitting processes have led to generation assets in the UK facing long lead times (solar c. 4 years, offshore wind c. 10 years). This is due to insufficient policy to streamline permitting therefore delaying the deployment of renewables. Existing policy for onshore wind requiring permission from the Local Planning Authority has also posed an additional backlog and delay.

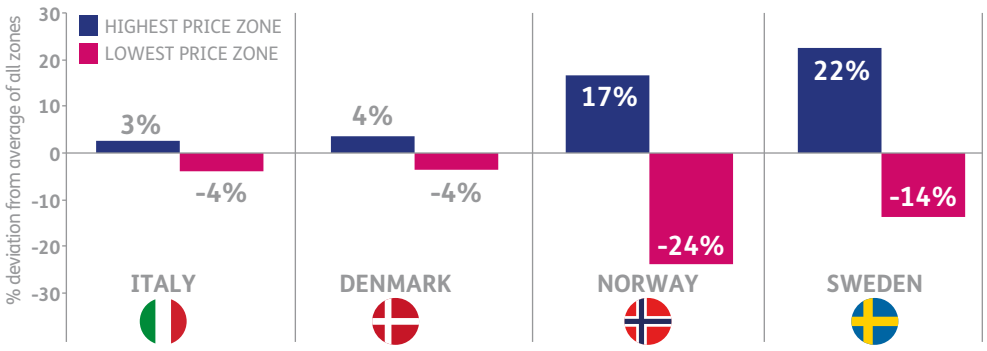
3. CfD auctions visibility

Limited forward visibility of volumes in CfD auctions hinders the ability of developers and the supply chain to plan ahead and leaves them facing uncertainty on the prospects of getting CfDs. Additionally, the long time between the CfD bid and FID allows for macroeconomic conditions to vary the input costs faced by investors, rendering some projects no longer economically viable.

LENS INTERSECTIONS

EVIDENCE

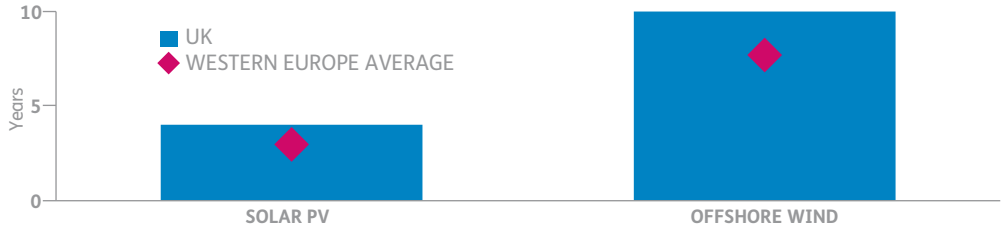
1. Zonal wholesale pricing deviation from averages, IT, DK, NO, SE, 2024



Data from European countries with zonal pricing shows varying deviation from country-level average. This creates uncertainty around the range of pricing if the UK is to adopt the zonal model.

Source: Baringa analysis

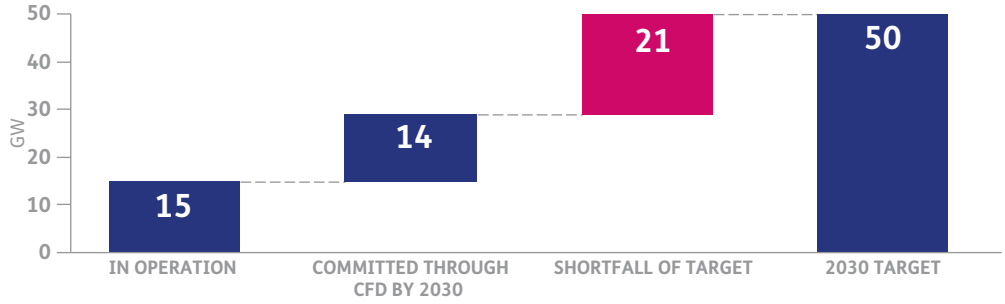
2. Estimated lead timelines in the UK



UK lead times are noticeably above the western European average, especially higher for offshore wind.

Source: Baringa analysis

3. UK offshore wind capacity outlook



CfD scheme has secured 14 GW of offshore wind. However, a 21 GW deficit remains to reaching the 2030 target.

Source: Energy UK

HEAR FROM OUR EXPERTS

MARKET REFORM INCLUDING ZONAL PRICING	*"Deployment of renewable capacity, at the scale required to meet ambitious targets, will require acceleration of development timelines and clarity on key policy decisions. A decisive approach to market reforms, particularly zonal pricing, will reduce uncertainty for investors and project developers."*	 **Duncan Steen**	**Key levers:** ▸ Grandfathering existing contracts to bolster investor confidence ▸ A decisive approach to zonal pricing and market reform
PERMITTING	*"The current observed delays in consenting and permitting of grid scale renewable projects highlight the challenges faced in aligning regulatory processes with the UK's ambitious renewable energy targets. If the UK is to reduce the project development bottlenecks it will need to implement proposed reforms earlier in order to accelerate project development ahead of the 2035 target."*	 **Sanjay Rathod**	**Key levers:** ▸ Increasing the size of planning resources to assess the feasibility of projects
CFD AUCTIONS VISIBILITY	*"Greater forward visibility of future auction targets and budgets, aligned with an ambitious renewables deployment pathway, would provide the GB renewables industry and supply chain a boost to attract the level of private investment required for the net zero transition."*	 **Manon Derelle**	**Key levers:** ▸ Increased forward visibility of the CfD budget ▸ Setting out anticipated capacity targets for the following year of awarded contracts

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Lens 2: Finance

CHALLENGES TO DEPLOYMENT

1. International competition for capital

Capital which is financing the energy transition is internationally mobile, meaning the UK is in competition with other markets for investment. Moves that have made other markets more attractive, such as green investment incentives under the US Inflation Reduction Act, or the European Green Deal, therefore can draw capital away from the UK. This may result in reduced private financing all else equal, therefore reducing the deployment rate.

2. Uncertain macroeconomic environment

Interest rates remain at 15-year highs, therefore increasing financing costs through the increased cost of debt faced by investors, which will include a risk premium on top of the risk-free base rate. This particularly affects renewables, where high up-front costs must be financed and then paid for by long-term returns. Higher rates increase the cost of borrowing and the discount applied to the future revenues, leading to a higher hurdle for a project to be investable. This can render marginal projects unviable and lead to their cancellation. Additionally, the higher interest rates have combined with increased embedded costs within the supply chain, further increasing the cost of renewables. This has cumulatively reduced the pace of deployment in recent months, as policies lagged evolutions in the wider macro-environment.

LENS INTERSECTIONS

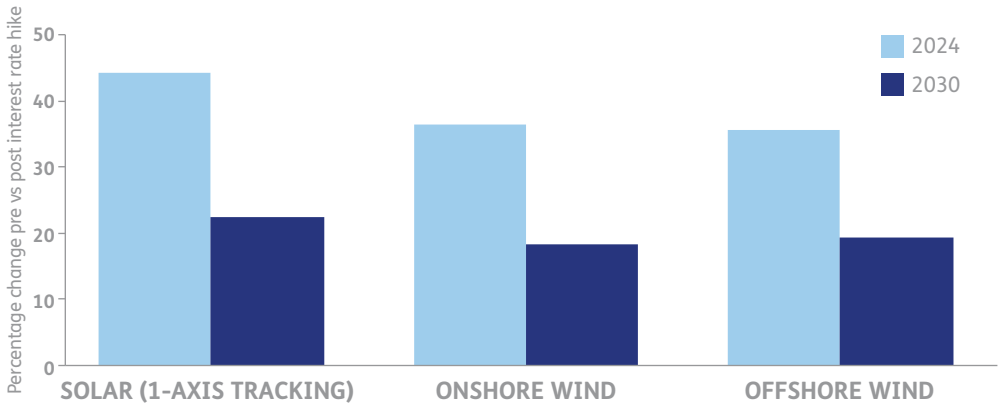
EVIDENCE

1. The IRA pushes US profitability higher than Europe, for onshore wind

The introduction of producer tax incentives in the US under the IRA has significantly increased average profitability to above the European average. This risks greater competition for green capital between the US and UK.

Source: Baringa analysis

2. Financing cost growth pre vs post interest rate hike, 2024 and 2030



Forecasts suggest increased financing costs in 2024 and 2030 relative to 2030 in renewable generation, owing to raised interest rates.

Source: Baringa analysis

HEAR FROM OUR EXPERTS

INTERNATIONAL COMPETITION FOR CAPITAL

"The US subsidies embedded in the IRA have fired the starting gun on a global race for green capital. Fiscal challenges in Europe mean that attempts to outbid the US on subsidies are likely to fail. Attention should focus on reducing costs of deployment such as permitting and grid connection costs as well as improving overall business attractiveness and supply chain availability such as components and skills."

Caspian Conran

Key levers:

- Encouraging use of PPA agreements to increase demand liquidity
- Invest in supply chain and skills availability – see supply chain lens

UNCERTAIN MACROECONOMIC ENVIRONMENT

"The era of ultra-low financing costs has now passed. This means it is even more important for developers to manage risk effectively across the whole value chain."

Nick Forrest

Key levers to reduce financing costs:

- Reducing the timelines between a CfD bid and final investment decision can reduce exposure to volatile macroeconomic conditions
- Introducing protection from inflation, specific to clean technology supply chain components
- Expanding capacity in existing projects rather than developing new projects
- Achieving and demonstrating track record to finance providers

Lens 3: Technical

CHALLENGES TO DEPLOYMENT

1. Grid connections and capacity

The pipeline of renewable generation projects waiting to connect more than meets the range of net zero-compatible scenarios. However, connection delays are averaging five years, with some projects having to wait ten years or more for network capacity to be available. The relative ease of applying for a connection has led to a large number of 'speculative' applications, exacerbating queue length and making it difficult to know the true pipeline of projects.

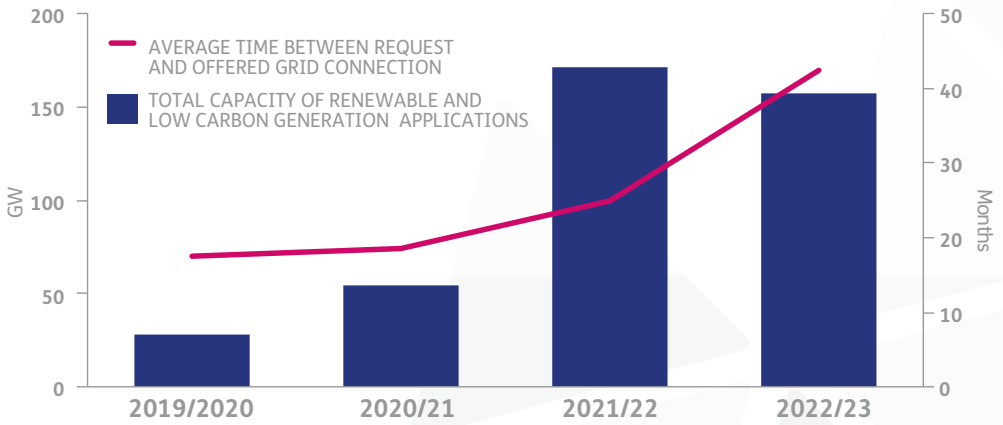
2. Need for technological innovation

While many generation and grid technologies have reached maturity, technological advancements continue. For example, from the generation side, emerging technologies such as floating offshore wind and small modular reactors (SMRs) are still in the early stages of deployment. For these technologies to be deployed effectively, they must be cost-competitive. Historical trends indicate that costs will likely decrease through economies of scale and high learning rates, similar to what has been observed with established technologies. However, if this cost reduction does not occur swiftly, these innovative technologies risk being sidelined, thus limiting their potential to contribute significantly to achieving net-zero targets.

LENS INTERSECTIONS

EVIDENCE

1. Growing delays in requested vs offered grid connection date

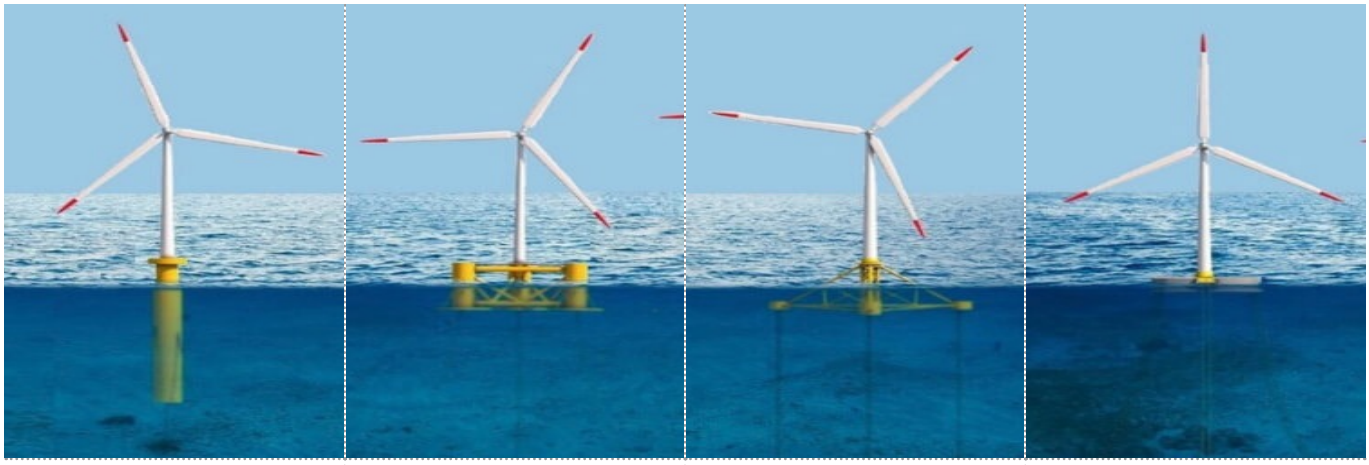


Rise in connection requests is driving longer connection delays.

Source: Connections Reform Consultation and DESNZ

2. Floating offshore wind tech types

Technical variations in floating offshore wind foundations with less mature models offering added benefits as potential seabed sites increase and wind turbine models increase in size.



Spar	Semisubmersible (semi-sub)	Tension leg platform (TLP)	Pontoon/barge (P/B)
Maturity: High	Maturity: High	Maturity: Medium / Low	Maturity: Medium / Low
		Challenging installation due to need for purpose-built vessel and a specialised boat. Once in operation, very sensitive to soil conditions and has difficulty in anchoring.	Despite being in the most shallow water of all the foundation types, once in operation, has low stability and requires a robust anchoring system.

HEAR FROM OUR EXPERTS

GRID CONNECTION AND FLEXIBILITY	*"Slow and inefficient connections could be a significant barrier to achieving the rates of renewable deployment required to meet net zero. Connections reform will be a key enabler to minimise speculative applications and bring forward viable projects. A more strategic and coordinated planning approach would deliver further speed and cost improvements. Some curtailment of renewables is inevitable, but the deployment of grid-scale batteries and the use of flexible demand (such as 'smart' electric vehicle charging) will be critical to keeping costs under control and maximising the output of low-carbon generation."*	 **Chris Collins**	**Key levers:** ▸ Connections reform and strategic planning for future requirements ▸ Grid storage and flexible demand, particularly making use of the flexibility inherent in EVs
TECHNOLOGICAL INNOVATION FOR LOW-CARBON ASSETS	*"Reaching net zero requires continual sustainable advancement of low-carbon technologies across all fronts, not just generation. This encompasses energy storage, grid infrastructure, and demand-side technologies. (e.g.floating wind, SMRs, conductors, heat-pumps). For decarbonisation ambitions to become a reality, these low-carbon technologies need to be manufactured and deployed, at scale with lower cost. This requires significant investment, not just to fund innovations, but also to reduce supply and value chain constraints. Investments, subsidies and incentives for technological advancements are crucial steps towards creating a net-zero future that we all envision."*	 **Bora Demiralan**	**Key levers to reduce financing costs:** ▸ Incentivising and enabling further investments in low-carbon technologies ▸ Securing supply chains, particularly in skills shortages through increased attention to engineering capabilities

Lens 4: Supply Chain

CHALLENGES TO DEPLOYMENT

1. Skill shortage

Because the energy transition calls for much faster rates of deployment of generation assets than in the past, we face a shortage of the skilled and experienced engineers and other professionals who can make this deployment happen in both renewables and nuclear. Skills can therefore become a significant bottleneck if not adequately addressed. We also risk missing out on the economic benefits of skilled green jobs if we do not have the necessary skills in the workforce.

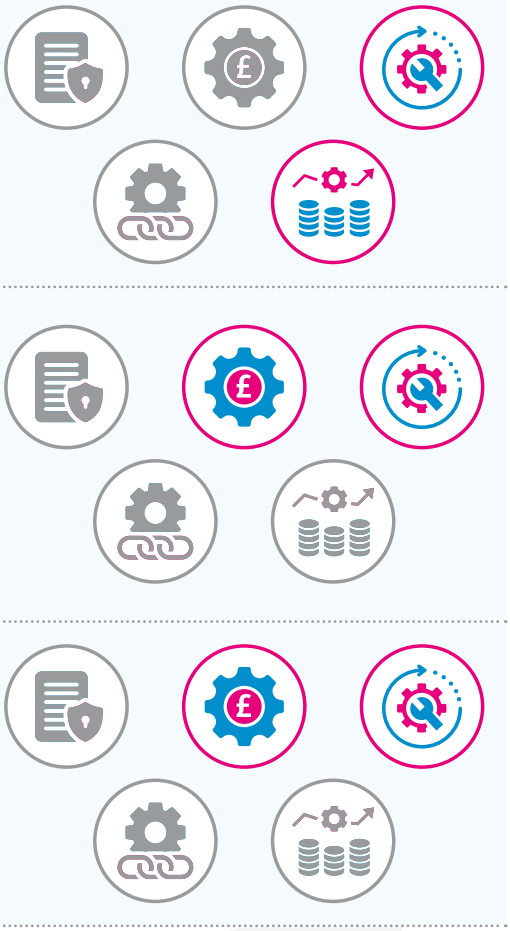
2. Manufacturing and installation constraints

Deploying renewables relies on a steady and secure supply chain. Challenges in manufacturing have been noted particularly for offshore wind, wherein supply chains are unable to keep up with the technological innovation of turbines and their required components (see Baringa's previous work for *DESNZ manufacturing constraints*). This stretches further upstream in the supply chain with existing port infrastructure not being able to service the depth and width required for floating offshore wind. This supply deficit of components risks driving up costs and delaying deployment.

3. Critical mineral constraints

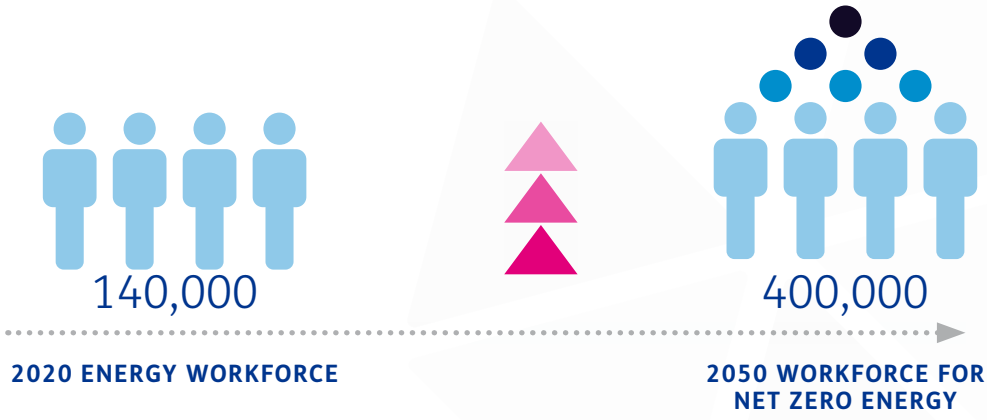
We are likely to see annual deficits in the production of the critical metals and minerals needed for renewable generation assets. Significant investment is required now to secure future supply, yet investor sentiment remains low in some of these commodities at the extraction phase (see Baringa's '*Securing access to critical minerals*' report). In the absence of alternatives, this supply deficit could drive up costs and/or delay deployment of renewable energy infrastructure.

LENS INTERSECTIONS



EVIDENCE

1. UK net zero economy workforce challenge

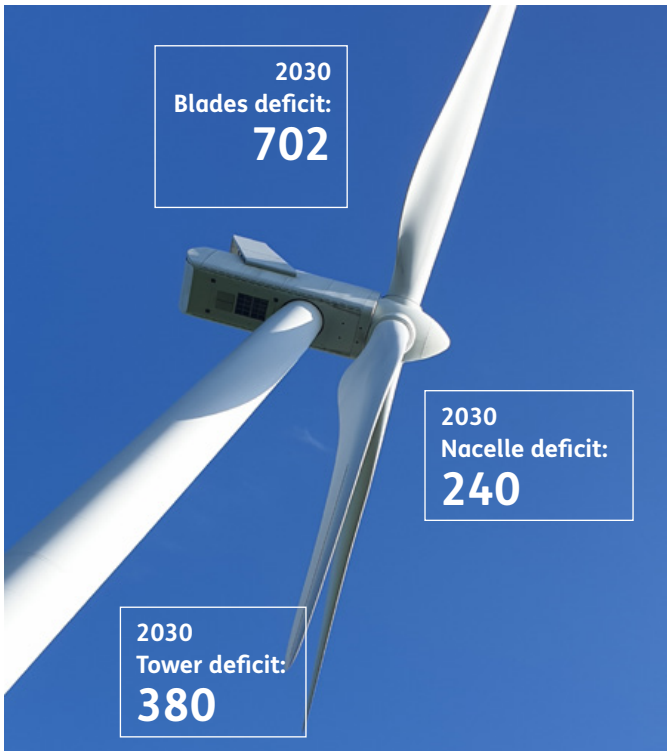


Significant growth in the labour force size is required to meet the demands of a net zero economy.

Source: National Grid, Baringa DEZNZ Report

2. 2030 Forecasted deficit in wind turbine components, UK, EU, US, (number of)

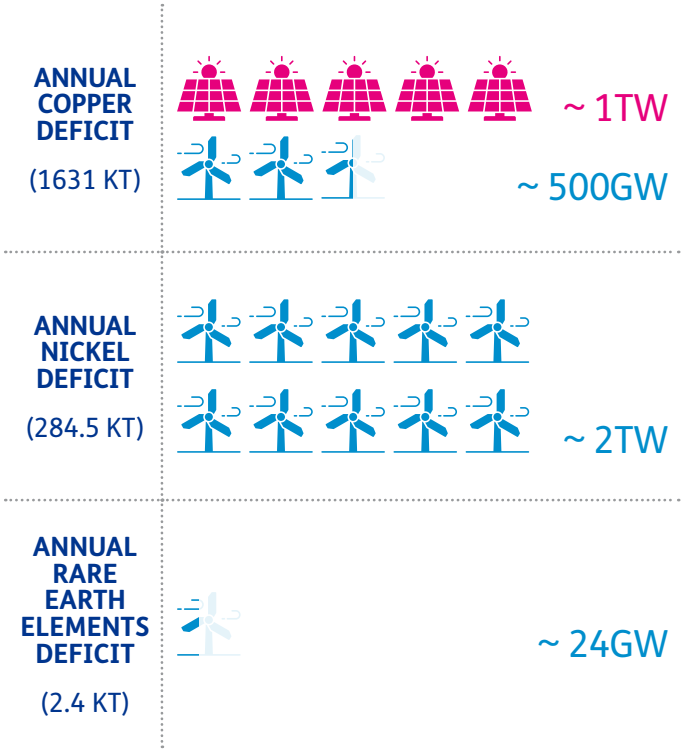
Widespread component shortages due to manufacturing constraints



Source: Baringa analysis

3. Annual global critical mineral deficit in 2030

Widespread critical mineral shortages due to upstream investment constraints.



Source: Baringa analysis

HEAR FROM OUR EXPERTS

SKILL SHORTAGE	*"The current skills shortage provides a huge opportunity to create well paid, UK jobs from design engineers to solar installers if the sector invests in apprenticeships and retraining – and retaining existing staff so they are not lost to other sectors or overseas markets."*	 **Stuart Williams**	**Key levers:** ▸ Reskill existing labour force across developers, networks operators and suppliers, and increase intake of apprenticeships across manufacturing and installation
MANUFACTURING AND INSTALLATION CONSTRAINTS	*"The UK's renewable energy ambitions are unachievable in the current timeframes without significant investment in supply chain capacity. The UK has a critical choice - invest in domestic capacity and realise the long-term industrial benefits, or pursue global supply to maximise short-term delivery."*	 **Rob Gilbert**	**Key levers:** ▸ Government should ensure the CfD strike price and budget remains sufficient to secure investment by developers ▸ Developers, network operators, component suppliers and installers should work together to standardise turbine size, HVDC connection capacities and floating foundation designs ▸ Government and developers could aggregate demand and pool investment to support upgrades to ports
CRITICAL MINERAL CONSTRAINTS	*"Minerals and metals are a critical component of renewable generators' supply chains. Price and demand uncertainty, coupled with geopolitical risk, are holding back investment in expanding production, meaning future access to supplies is likely to be constrained. Proactive companies who secure limited supplies of critical transition metals early will therefore be the winners in the race to cash in on renewable energy production"*	 **Andy Churr**	**Key levers:** ▸ Increased vertical integration: private investors can buy into supply mines and refineries ▸ Risk sharing: invest in increasing mining and processing capacity

Lens 5: Social Cost & Affordability

CHALLENGES TO DEPLOYMENT

1. Short term price increases

The accelerated pace of deployment and infrastructure improvements to meet net zero targets requires significant investment. Historically, much of this investment has been subsidised through the CfD and other mechanisms, funded through levies on electricity prices. During the recent energy crisis, CfDs actually paid money back, dampening the impact of price spikes. However, with the costs of renewables increasing, the consumers will be exposed to rising prices through the increased policy component of energy bills. The rising short-term prices may therefore require more budget and/or delay deployment.

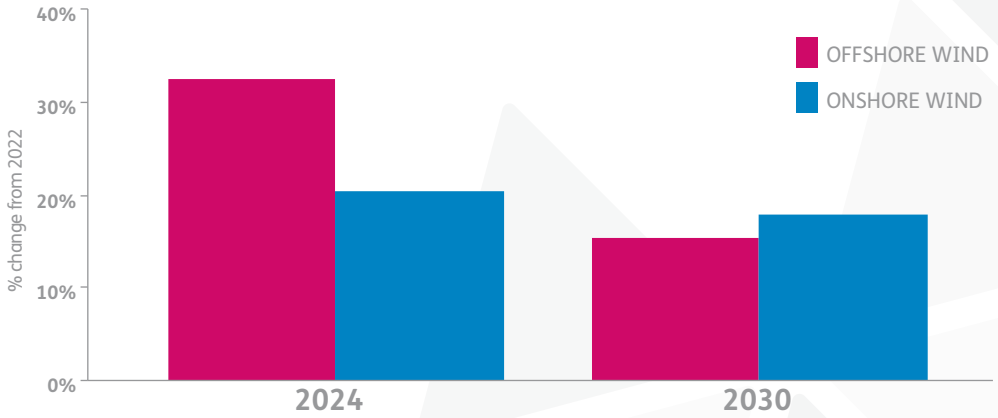
2. Community disengagement and local impacts

Reaching net zero will require deployment of a large volume of renewables across the country and seabed as well as the decommissioning of a large number of carbon intensive sites. Local impacts of these projects, such as changes to landscapes, visual amenity, noise, local service disruption and environmental impacts, can lead to objections if not properly mitigated and addressed with local communities. This can lead to political backlash and obstructions to projects, including planning objections and judicial review processes that can delay projects, add to costs, or prevent them from going ahead entirely.

LENS INTERSECTIONS

EVIDENCE

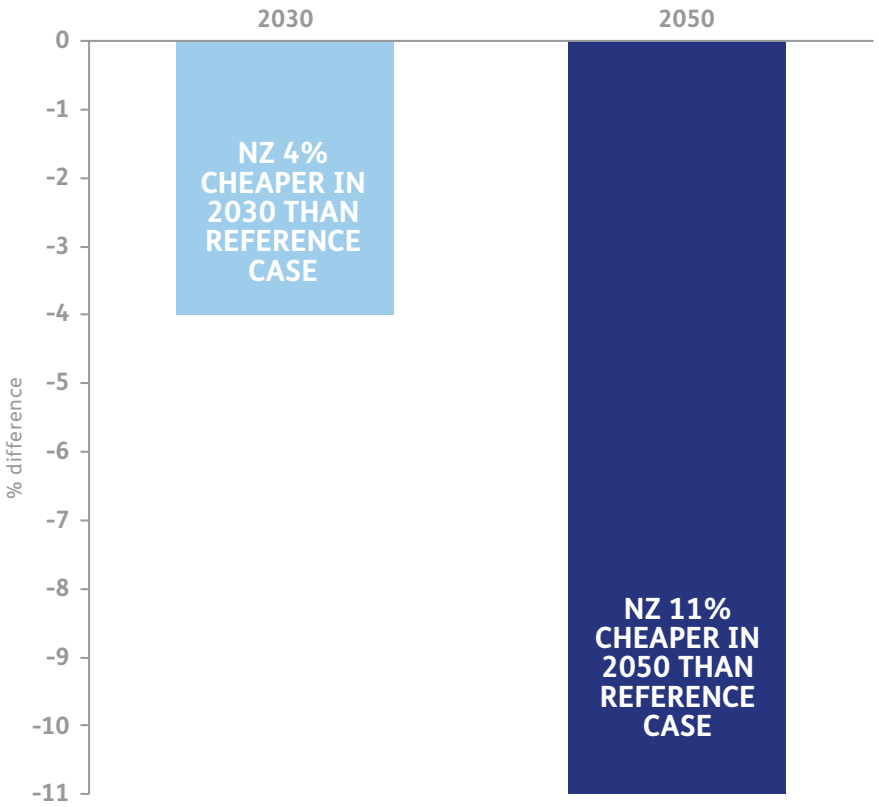
1. Change in CAPEX compared to 2022



Significant rise in CAPEX cost for wind in 2024 and 2030 relative to 2022 levels.

Source: Baringa analysis

2. % Difference in retail prices between Reference Case and Net Zero, 2030 and 2050:



Source: Baringa analysis

Long-term retail prices are forecasted to decrease faster and more significantly under a Net Zero scenario vs Reference Case.

HEAR FROM OUR EXPERTS

ACCELERATION OF DEPLOYMENT	*"The communities directly impacted by new low-carbon infrastructure are often some of the most deprived communities in the UK and also those that will feel the pressure of cost increases most. It is therefore important to also consider the up-side renewables developments can create for people and communities. Short term cost increases and disruption can be mitigated by integrating a broad view of social and environmental value creation as core to development programmes and ensuring the social, economic and wellbeing benefits are felt by those who need it most."*	 **Megan Claverley**	**Key levers:** ▸ Integration of social and environmental value creation into infrastructure development programmes ▸ Inclusive, transparent and community led engagement to drive local ownership and social benefits
LOCAL IMPACTS	*"We must consider local communities and environmental impacts when deploying new low-carbon infrastructure. Brownfield sites and rooftop solar have a large part to play, but there will be greenfield development too. Projects can provide value for communities and for nature if done properly."*	 **Chris Kavanagh**	**Key levers:** ▸ Brownfield and rooftop development ▸ Invest in benefits for local communities and nature

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