



Policy Brief: **Enhancing Resilience and Circular Economy in UK Wind Supply Chains**

Summary

The UK has a high ambition to grow onshore and offshore wind energy capacity by 2030. New wind energy infrastructure requires millions of tonnes of components and materials, with a high risk of supply disruption that put energy security and net-zero targets under pressure. Circular economy solutions can enhance resilience in UK wind supply chains, but companies are facing challenges that are rooted in governance.

Cross-government action is necessary by investing in people, to streamline policy and regulation through integration and guidance, enable decision-making for circular economy practices through data sharing, and coordinate and co-produce business support for circular wind supply chains.



Introduction

The **UK's ambitious wind energy targets** will require **millions of tonnes of materials by 2030**. **Access to materials and components for wind turbines cannot be guaranteed** due to insufficient domestic manufacturing capacity combined with global competition for new wind turbines. This poses **risks to the UK's net-zero targets**.

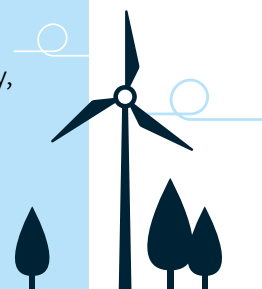
Effective resource management is crucial for **enhancing the resilience of wind supply chains**, enabled through a **transition from a linear to a circular economy** ⁵. Policy and regulation have to evolve to enable circular economy solutions throughout the lifecycles of wind turbines.

Circularity strategies – such as **increasing recycled material use in new wind turbines**, **designing turbines to last longer**, and **repowering current wind farms** – increase **local jobs**, more than **halve material use** in the long-term and, thereby, **reduce capital cost and enable a net-zero carbon wind industry** ⁴.

There are various regulatory and policy frameworks, e.g. the UK Circular Economy Package and Extended Producer Responsibility, that address the importance of effective

resource management ⁶. However, **clear and industry-friendly regulatory and policy guidance is missing**, exacerbated by a high volume of policy and regulation that apply over the lifecycle of wind turbines. This gap hinders stakeholders' ability to navigate governance and limits their potential to implement circular economy solutions.

This briefing outlines the **current policy and regulatory landscape** for the UK's wind industry, discusses **governance related challenges** with implementing circular economy solutions, and concludes with **policy recommendations**.



Wind capacity and material flow forecasts

The UK's Clean Power 2030 Action Plan sets out the ambition for 27-29 GW onshore wind and 43-50 GW offshore wind by 2030 ^[1]. By the middle of 2024, there was ca. 14 GW onshore wind and 15 GW offshore wind. The 2030 target hence represents broadly a doubling and tripling of capacity for onshore and offshore wind respectively ²⁻³.

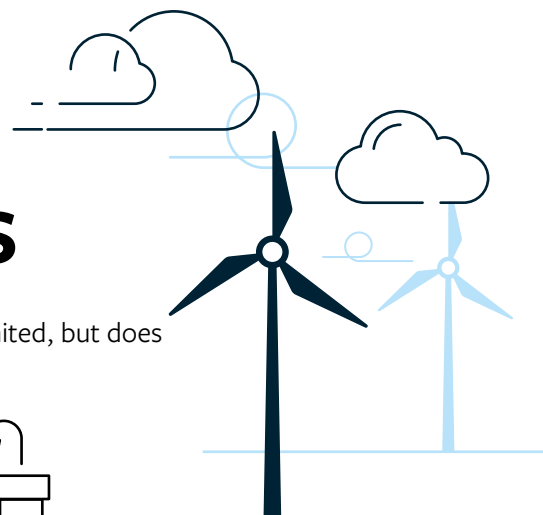
While building new wind farms is accelerating, the first GWs are reaching the end of their first service life. When assuming a 25-year lifetime, ca. 1 GW onshore wind and 0.2 GW offshore wind may be decommissioned by 2030.

In the period 2024-2030, the total new inflow of materials for meeting the wind sector's growth ambitions may amount to approximately ⁴: 9-12 Mt concrete; 12 Mt steel; 500 kt fibre reinforced composites; 400 kt copper; and 110 kt aluminium. Total material inflows may vary depending on technology and end-of-use management choices of the existing wind turbine stock.



Challenges in Wind Supply Chains

The scientific knowledge base on circular economy and UK wind policy is limited, but does reveal common challenges in enhancing resilience in wind supply chains ⁷⁻¹⁹:



Data

1. Lack of reliable material flow data constrains lifecycle assessment and investment decisions.
2. No standard tools to measure resource use and efficiency.

Market

1. Investment challenges.
2. Skilled labour shortages.
3. Inadequate circular economy infrastructure, e.g. at end-of-life.
4. Uncertainty and lack of diversification of material supplies and markets.

Policy and legislation

1. Unclear role of Environmental Impact Assessment in supporting supply chain circularity and resilience.
2. Inconsistency in legal interpretation and definitions (e.g. 'waste' and 'resource' not defined in line with circular economy principles).
3. Frequent policy updates hinder long-term industry planning.

Stakeholder Engagement

1. Lack of industry collaboration along wind turbine lifecycles.
2. Lack of circularity standards in wind manufacturing.

Business Support

1. Fragmented business support landscape, with overlapping support schemes often operating in isolation and with limited coordination which is essential for integrated wind supply chains.
2. Lack of place-based approaches, with generic programmes not incorporating regional differences in infrastructure, skills, and capacity.
3. Lack of specific support that is sufficiently tailored to wind supply chain needs.
4. Funding not easily accessible to companies in a timely manner.

UK business support landscape

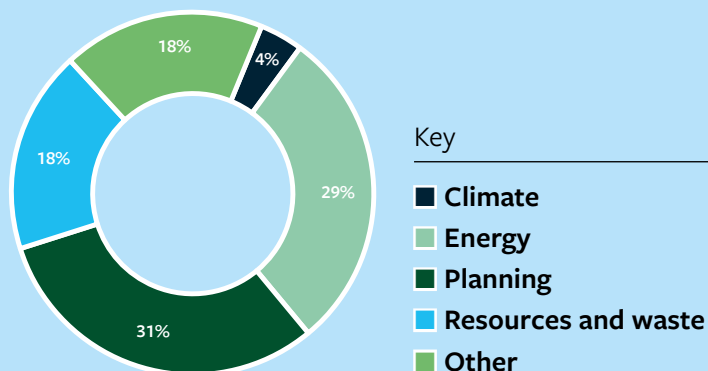
In 2020, there were >100 support schemes dispersed across government, with differing goals, formats and eligibility rules, resulting in a complex fragmented landscape for companies ²⁰.

Recent initiatives focused on wind energy aim to mobilise £8.3Bn in investment and strengthen supply chains, including the Supply Chain Accelerator Fund (£50M), FLOWMIS (£160M), GIGA for manufacturing capacity (£390M), Smart Grants for innovation (£160M), and OWGP for competitiveness (£100M) alongside establishing Great British Energy.

Despite the investments, the Offshore Renewable Energy Catapult survey on supply chain confidence in 2024 ²¹ reported that limited access to public funding remains the greatest barrier to supply chain growth. In addition, support often is time-limited or a single project, lacking continuity and strategic depth to establish long-term capability at scale.

Wind Policy and Regulation: Overview

- **Number of policies and regulations:** Over 170 regulations, policies, guidelines and standards directly or indirectly relevant to UK wind supply chain governance.
- **Thematic areas:** Policies and regulations cover seven categories: Climate, Energy, Environment, Sustainability, Planning, Economy, Health and Safety.



Key Constraints

- 1. Fragmentation:** Policies and regulations governing wind supply chains cover various legal areas. The >170 governance documents are scattered across data sources without a central overview and no clear connections between them. This makes it difficult for companies to identify which documents (or parts thereof) are relevant to them. For government actors too, it is challenging to keep overview of the policy and regulatory landscape and the responsible governing bodies, leading to concerns about regulatory compliance and enforcement.
- 2. Regulatory Conflicts:** Differing assumptions between waste laws and circular economy policies create regulatory conflicts. Circular economy principles have not been well defined and are poorly incorporated into environmental laws, leading to inconsistent interpretation of key terms in law and business practices. Current laws and policies tend to follow a narrow circular economy interpretation of “reduce, reuse, recycle” focused on waste, which limits the full potential through proactive measures to reduce resource use through design and longer use of turbines and parts.
- 3. High administrative costs:** While Scotland and Northern Ireland are streamlining environmental permitting processes to reduce administrative burden, multi-agency involvement remains a big challenge for regulatory compliance. Lengthy administrative processes further limit innovation, for example, a 2-hour industry trial for a new recycling method for wind turbine blades took 9 months to obtain permission.
- 4. Policy and Regulatory Incoherence:** Wind supply chain governance in the UK exist at different levels. Due to devolution, achieving coherence in waste management and planning is challenging, which can hinder the resilience of wind supply chains that require coordination and consistent behaviour among various stakeholders.
- 5. Uncertainty and Instability:** Industry practitioners depend on clear directions of travel for future policy and regulation. However, uncertainty in the UK governance landscape for wind creates confusion about development trends which, for example, challenges investors to accurately assess their portfolios to balance risk and return.





Policy recommendations

To support circular and resilient wind supply chains, we recommend the following:

1. Streamline policy and regulation through integration and guidance

Enable **integration of policy and legislation** through a **cross-government effort** setting out a **clear direction of travel towards a circular economy for wind energy infrastructure**, including environment, resources and waste, energy, health and safety, planning, and economy. This should feed into the **streamlining of permitting processes** by **reducing administrative overlap** and **investing in coordination among regulatory bodies**. Moreover, **co-produce holistic policy guidance** to explain how to incorporate circular economy principles in the implementation of, and compliance with, regulations.



2. Enable decision-making for circular economy practices through data sharing

Incentivise data collection and sharing by industry actors along wind supply chains and throughout the lifecycle of wind turbines, with **regulatory mandates and industry standards**. This will provide the necessary **transparency for decision-making in government**, to cover gaps in policy such as regulatory targets for circular practices in wind supply chains, **and in industry**, to provide the information to evidence investment cases for circular practices for wind energy infrastructure. Regulations and standards should **balance commercial interests**, especially of original equipment manufacturers, **with explicit obligations regarding the level of detail in data sharing**, required by aspiring suppliers of circular economy solutions and regulators.

3. Coordinate and co-produce business support for circular wind supply chains

Balance the **coordination of business support schemes** across government bodies, to **align overlapping schemes** and **reduce complexity for companies**; with the **co-production of business support programmes** with stakeholders to build **targeted, place-based solutions** for wind supply chains. **Investigate the specific needs** of, often highly innovative, companies **in emerging circular wind supply chains** to introduce **tailored business support mechanisms**.

Conclusion

Enhancing a circular economy in the UK's wind supply chains is crucial for sustainability and competitiveness of the industry, thereby ensuring that the UK's targets for energy security and climate action can be achieved.

However, the wind industry faces a broad range of challenges in adopting circular economy practices, that are either driven by the current way in which the governance landscape operates and/or that can be resolved through the government's actions.

To resolve the challenges, cross-government action is necessary to streamline policy and regulation through integration and guidance, enable decision-making for circular economy practices through data sharing, and coordinate and co-produce business support for circular wind supply chains.

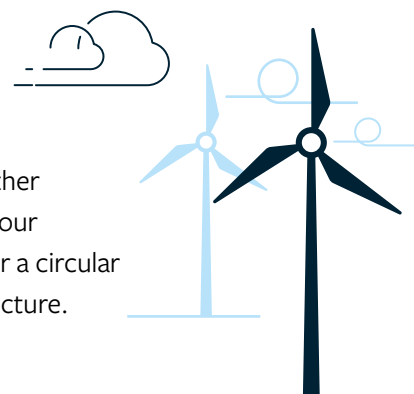
Establishing a more coherent and systematic policy and regulatory environment is essential to support a more circular economy for wind supply chains and foster innovation to secure the UK's position in the global renewable energy landscape.



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