

# Circularity in Ørsted

A close-up, low-angle shot of a white wind turbine blade and nacelle against a clear blue sky. The blade is the central focus, showing its aerodynamic shape and a small, dark, rectangular opening near the base. The nacelle is visible on the right, showing its complex mechanical structure and a circular opening. The lighting is bright, creating strong highlights and shadows on the white surfaces.

Ailsa Nicol  
Head of Public Affairs, Scotland

# Ørsted in the UK and Ireland

- Over **1,400 UK employees**
- Ørsted has already **invested over £14bn** in the last decade and will invest **at least another £16bn in the next few years.**
- 12 operational offshore wind farms including the world's largest, Hornsea Project Two, at **1.4GW**
- Our offshore wind projects are **generating over 7% of all electricity demand** in the UK.

Science-aligned climate action

**2025**

98 % reduction in emissions intensity

**2040**

Net-zero value chain

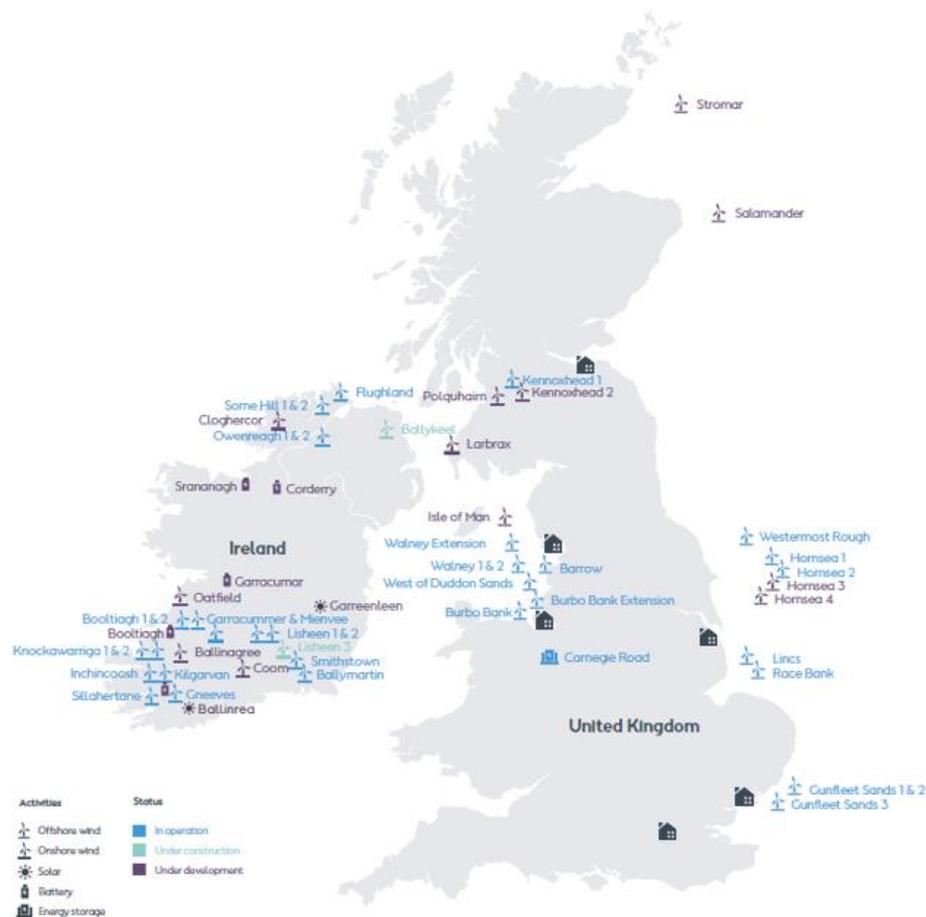
Green energy that revives nature

**2030**

No later than 2030, all new renewable energy projects commissioned must have net-positive biodiversity impact

**Today**

Zero wind turbine blades to landfill  
Zero solar panels to landfill



# Circularity plays a key role in mitigating impacts while ensuring a more resilient supply chain for the build-out of green energy

## Top drivers for circularity in renewables industry

### 1. Sustainability is a must – circularity is an enabler

#### Resource extraction responsible for half world's carbon emissions

Extraction also causes 80% of biodiversity loss, according to comprehensive UN study



▲ Massive energy tracks by the synchrotron project, Canada. The far south are the largest industrial project on the planet, and the world's most environmentally destructive. Photograph: Rex/Shutterstock

Extractive industries are responsible for half of the world's carbon emissions and more than 80% of biodiversity loss, according to the most comprehensive environmental tally undertaken of mining and farming.

### 2. Increasing scrutiny from media and investors

Sustainable Business Practices

#### The Dark Side of Solar Power

by Atalay Atasu, Serasu Duran, and Luk N. Van Wassenhove

June 18, 2021



Illustration/Getty Images

**Summary.** Solar energy is a rapidly growing market, which should be good news for the environment. Unfortunately, it's not all sunshine and rainbows. The environmental costs of solar energy are high.

### 3. Growing demand from public and private customers

Sustainable Business

#### Offshore wind faces shake-up as tenders abandon price-only criteria - report

Reuters

May 18, 2022 10:39 PM GMT+2 · Updated a year ago



REUTERS view of the Humbly Grove offshore wind farm operated by Ørsted off the coast of Denmark. Orlan REUTERS/Pho toline

OSLO, May 18 (Reuters) - A new set of factors beyond bidding price is gaining

### 4. Supply chain bottlenecks and volatilities

Sustainable Business Practices

#### The Green Economy Has a Resource-Scarcity Problem

by Dave Young, Rich Hutchinson, and Martin Reeves

July 08, 2021



Illustration/Getty Images

# Hotspot materials and components in the wind industry

## Material hotspots across key circularity drivers

### Climate change

- Approx 80% of entire footprint comes from activities before the turbines start spinning
- Up to 50% comes from steel and iron alone

### Biodiversity

- Copper especially, and aluminum too, big impact on upstream biodiversity due to mining and processing

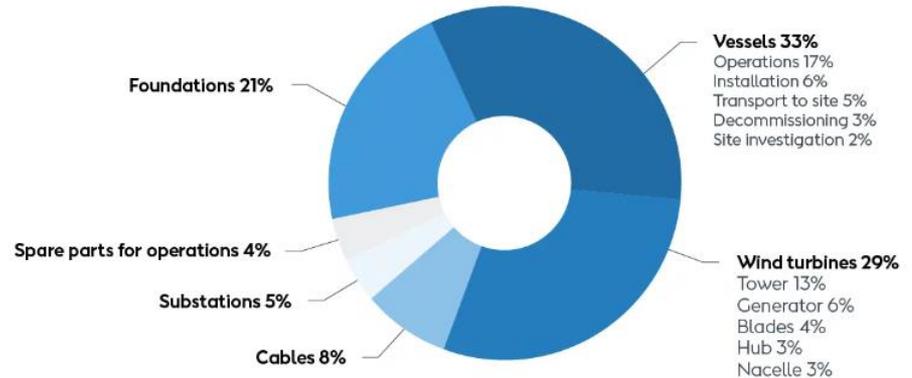
### Recyclability

- Composite materials in blades, as well as hard-to-recycle plastics in cables are main challenges to solve today

### Supply chain risks

- REEs (Rare earth elements) from permanent magnets often mentioned as key critical/strategic materials to the green transition

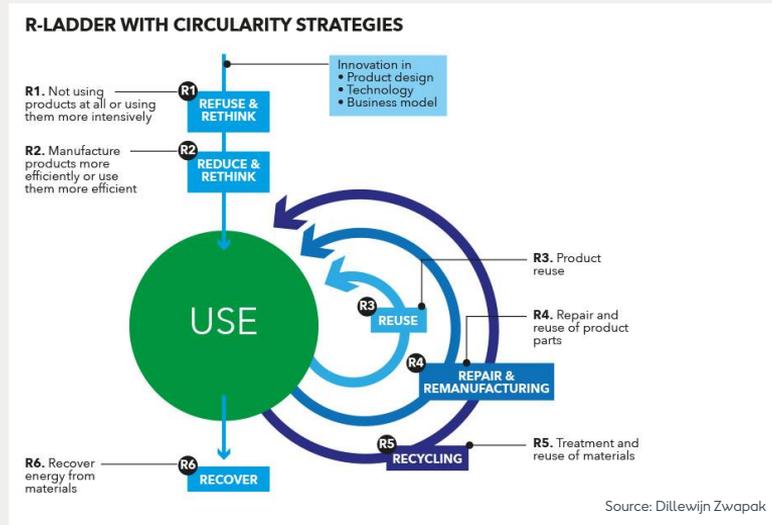
Fig. 1 – CO<sub>2</sub>e-emission breakdown from average offshore wind farm



# To achieve *full* circularity, we must move beyond the mainstream focus on 'recycling' of materials at their end-of-life

## The R-Ladder

- Recycling is just one of many circularity (R) strategies we can apply throughout the entire value chain of our assets



## The Zero Waste Hierarchy

- Recycling should always be our last resort when considering our circularity strategies and options



# As a developer, Ørsted has a key opportunity to ensure circularity across the full life-cycle of our renewable energy assets



## 1. Design and supply chain

- Minimise input materials by rethinking designs and processes
- Ensuring longevity and recyclability of components
- Increasing use of secondary (recycled) input materials



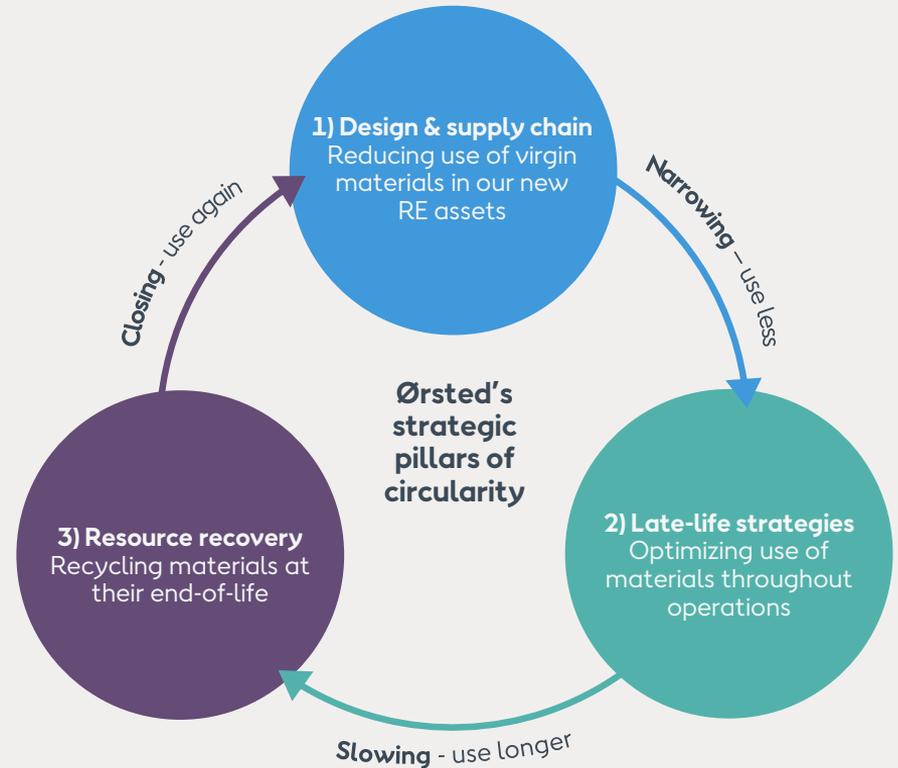
## 2. Late-life strategies

- Repair, refurbish and reuse major and minor wind turbine components
- Lifetime extension of our assets



## 3. Resource recovery

- Increase recyclability rates
- Circulate end-of-life materials back to renewables supply chain when feasible

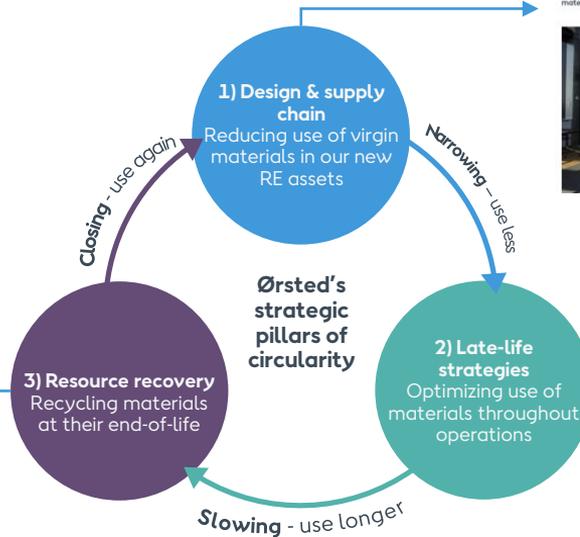


# We have launched major partnerships, commitments and pilots across our value chain



## Initiatives

1. DecomBlades cross value chain innovation project on blade recycling
2. Partnership with Salzgitter on directing scrap steel from Ørsted back to steel supplier to use in manufacturing of new wind farm components



## Ørsted and Vestas in industry-first pioneering partnership towards net-zero wind farms

07/06/2023 17:00

Today, Ørsted and Vestas, global leaders in renewable energy, are announcing a commercial sustainability partnership. Ørsted will procure low-carbon steel wind turbine towers and blades made from recycled materials from Vestas in all joint offshore wind projects.



06/10/2023 14:00

## Ørsted enters remanufacturing agreement on UK turbines

Simultaneously, the companies are to develop technology that increases sustainability and reduces carbon footprint in the supply chain.



## Initiatives

1. Coalition for Wind Industry Circularity (CWIC) in UK to establish circular supply chains in industry
2. Life-time extension of assets – enabling +10-year extension of our offshore assets



Renewable  
Parts Ltd

# Circular economy in action

James Barry  
Chief Executive



# Where we are

**Refurbishment & Innovation Centre**  
Lochgilphead, Scotland

**Operations & Logistics Hub**  
Renfrew, Scotland

**Supply Chain Operations** ■  
Various Countries

**Local Representation**  
Spain  
East Anglia



# What Renewable Parts does

**Parts supply & inventory management** - to minimise lead time and maximise turbine availability

**>150,000**

Items travel through our supply chain annually

**>350t**

Of material diverted from landfill and scrap

**Development and production of recirculated products** – refurbishment, remanufacture, reuse and redesign of parts to provide a more sustainable alternative to new

**>1,000tco<sub>2</sub> eq**

Of carbon emissions reduced for our customers since 2019

**5000+**

Turbines are currently supported across our global supply chain

# The uncomfortable truth



The wind industry is a green energy source, but the aftermarket remains largely non-green



Today we still prefer to buy new instead of reuse, this is unsustainable



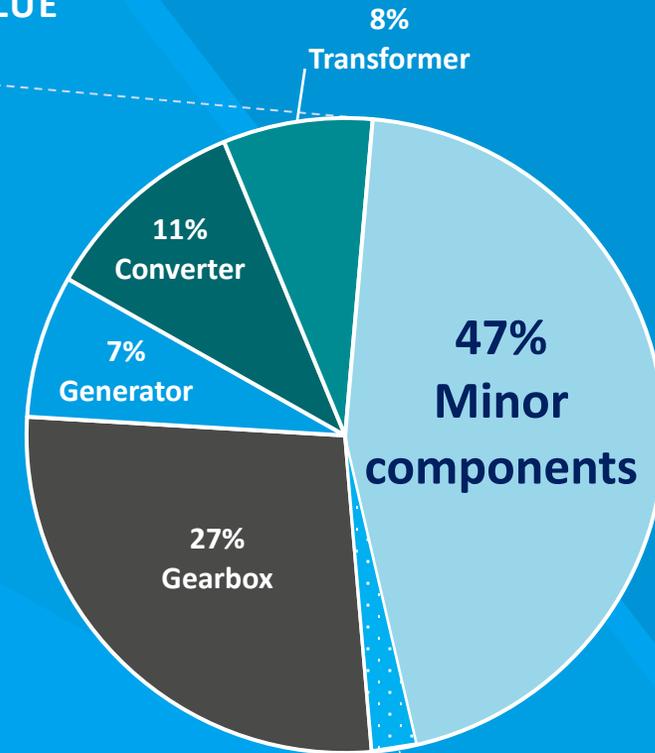
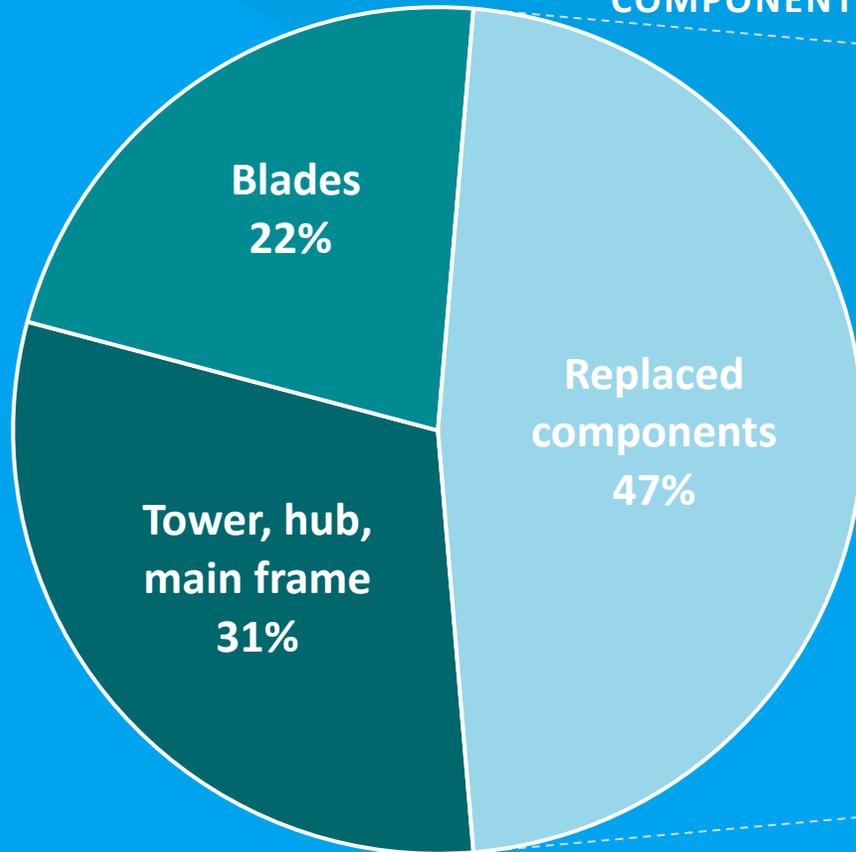
The opportunity to become more sustainability means we reduce carbon and slow global warming



But this requires a change in behaviour where we prefer to buy reused parts

# Developing sustainable parts solutions

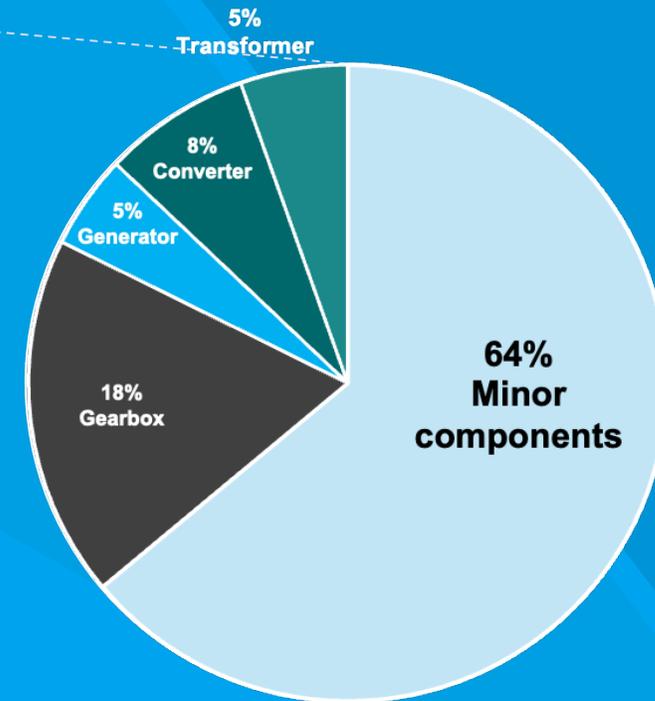
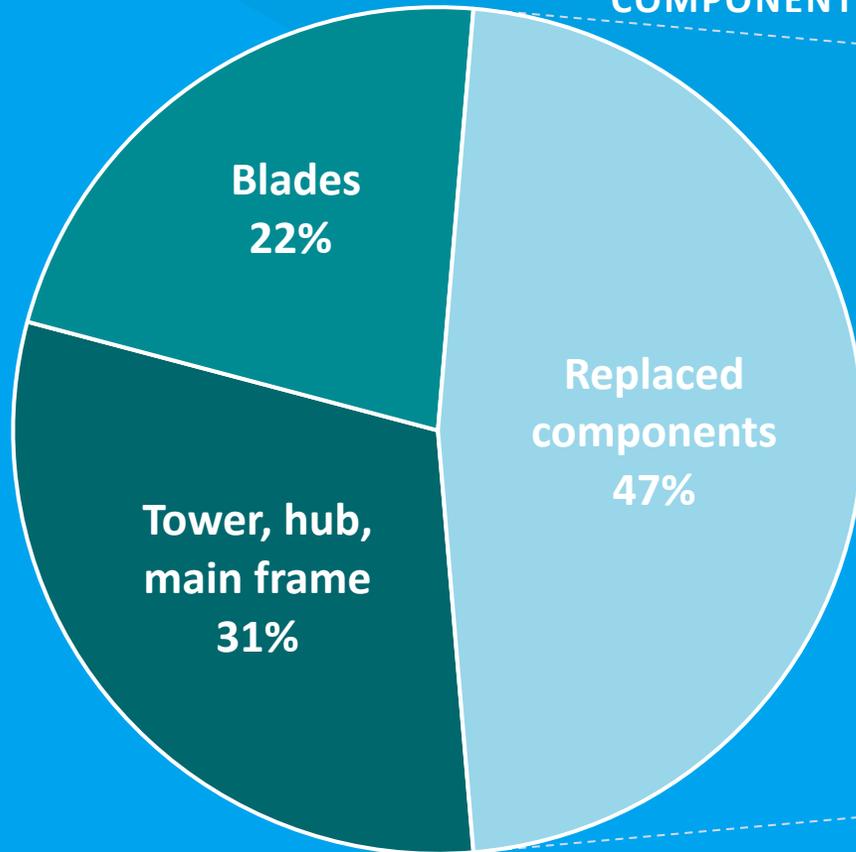
COMPONENTS BY PERCENTAGE VALUE



<5% remanufactured to-date

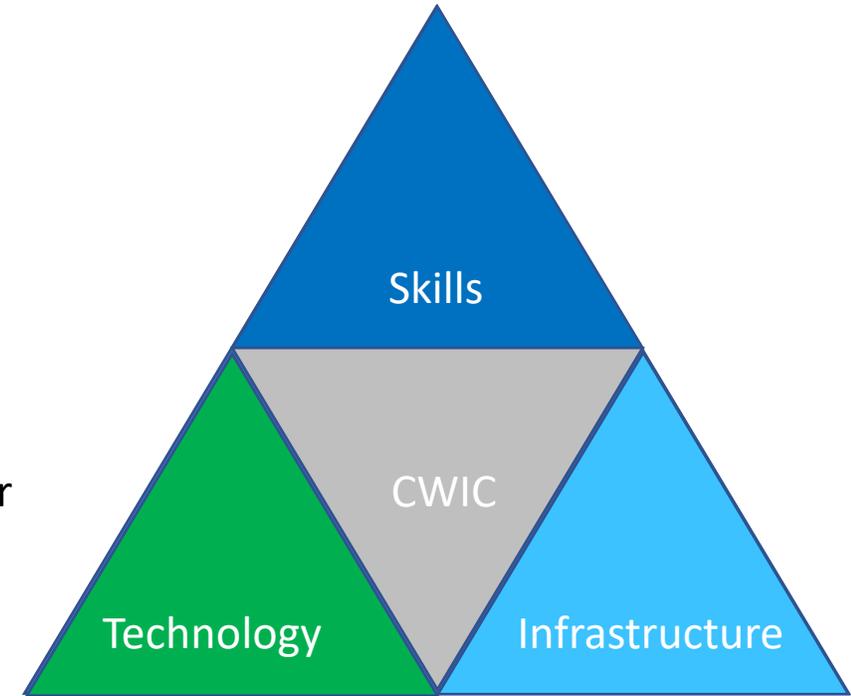
# Adjusting for the true Aftermarket value

COMPONENTS BY PERCENTAGE VALUE



# CWIC – driving a sustainable supply chain

- The three key enablers to CWIC are technology, skills and infrastructure
  - **Technology:** remanufacture is related but distinct from manufacturing. These skills are relatively scarce but form the backbone to parts reuse
  - **Skills:** at all levels there remains an absence of people with the skills and experience to develop a circular economy
  - **Infrastructure:** the facilities and tooling to remanufacture are limited and require development. An integrated supply base aligned to deliver best in class product is required
- **But it all starts with the vision, strategy and plan to develop the model capable of rapid scale-up**



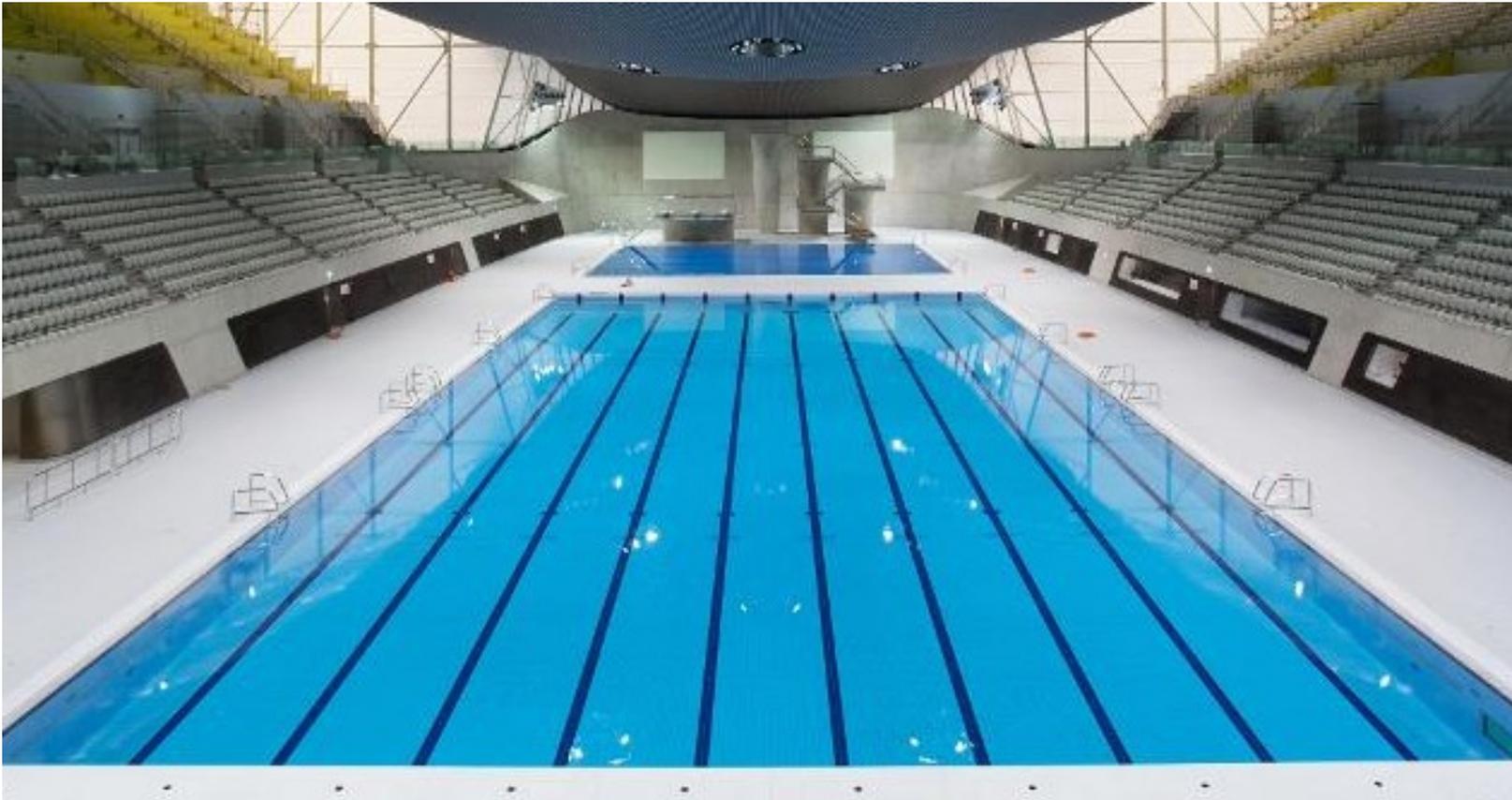
# Case studies

- **Orsted brake caliper programme** will remanufacture 588 calipers this year saving 100 tonnes of scrap and 300 tonnes of CO<sub>2</sub> Year one of a multi-year programme representing 15% of Orsted's fleet
- **Yaw gear programme** now approaching it's 1,800 gear saving 290 tonnes of scrap and almost 900 tones of CO<sub>2</sub>



# The results – translating theory to practice

- To date our refurbishment work has generated over a 1,000 tonne reduction in CO<sub>2</sub> emissions, the equivalent of 230 Olympic sized swimming pools
- That has been achieved using a modest 5,000 ft<sup>2</sup> sized facility over the past 2 years which is now approaching capacity, so what next....



# Coalition *for* Wind Industry Circularity



CWIC has been formed by SSE Renewables, Renewable Parts, and the University of Strathclyde to promote the adoption of the circular economy.

The coalition currently has over 45 members including ScottishPower Renewables, Orsted, The Crown Estate, Zero Waste Scotland, Statkraft, TotalEnergies, RES, and Scottish Renewables.



# Ambition



- To **transition the wind industry from linear to circular** to support the journey to net-zero.
- Make **Scotland/UK a global leader in wind industry circularity**, delivering jobs and economic opportunities.

# Ambition



By....

- Developing parts remanufacture solutions that **enhance turbine operational performance**, reduce failure downtime and accelerate the adoption of net-zero practices.
- **Establishing collaborative partnerships** to achieve investment in and deployment of circular economy technology.
- Working with government to **influence policy**.
- **Developing people and skills**, including development of remanufacture higher educational courses that combine academic and industry applied learning opportunities.

# Objectives



## 1. INCREASE CIRCULARITY OF IN-SERVICE PARTS FOR WIND TURBINES

- Objective: Increase the proportion of minor components that regularly need replaced which are reused/remanufactured/refurbished, to minimise embodied emissions and maximise value retention.

## 2. ESTABLISH END-OF-LIFE CIRCULARITY STRATEGY

- Objective: Deliver a circular strategy and business model to minimise waste and carbon emissions from turbine decommissioning.

## 3. DELIVER WORLD-LEADING UK-WIND CIRCULAR ECONOMY SECTOR DEAL

- Objective: Deliver a sector-wide strategy/solutions through Sector Deal or other mechanisms which establishes Scotland/the UK as the global leader in delivering circular solutions for wind farms.

## Strengths

Onshore Wind Sector Deal  
Scot Gov supportive  
NPF4 National Priorities – Circularity  
infrastructure  
Decommissioning bonds  
Levels of renewable deployment  
Use of Carbon Calculator for renewables

## Weaknesses

Lack of strong business case  
Lack of circularity services/infrastructure/skills  
How strong is the energy security argument?  
How does Carbon Calculator link to circularity?

## Opportunities

Scot Gov Green Industrial Strategy  
UK Green Industrial Strategy  
Scot Gov Circular Economy Bill  
SG Energy Strategy & Just Transition Plan  
De-Globalisation/shorter supply  
chains/jobs/security  
UK Critical Minerals Strategy  
CfD SIR – future rounds

## Threats

Rising project costs/tight margins  
OEM & Owner internal policies  
don't support circularity  
SEPA waste regulations  
EU Critical raw material legislation + Carbon  
Border Alignment Mechanism (CBAM)  
EU/UK misaligned?



# Opportunity



## Re-use, refurbishment and re-engineering of broken wind turbine parts could create **20,000 UK jobs** and **multi-billion-pound supply chain**.

- Building the capabilities to refurbish wind turbine parts in the UK could generate more than **20,000 full-time equivalent jobs** by 2035 and prevent more than **800,000 tonnes** of parts from being scrapped.
- Analysis by BVG Associates found around **120,000 wind turbines** (584 GW of capacity) are forecast to be operational across the UK, Belgium, Denmark, France, Germany, the Netherlands, Poland, Portugal, Spain and Sweden by 2035.
- A UK supply chain capable of refurbishing just ten out of the thousands of parts which make up a single wind turbine could access a European-wide market worth almost **£10bn to UK GDP** between 2025 and 2035.

# Questions

