At the leading hedge: Europe’s metal recycling and hydrogen push

Europe is turning towards metals recycling as a core component of an industrial hedging strategy around decarbonisation, reshaping its energy security in the process.
At the leading hedge: Europe’s metal recycling and hydrogen push

Solar panels, wind turbines, heat pumps and batteries are all made of metal and —unlike a barrel of oil or ton of coal—metals can be recycled. Countries heavily dependent on imports of crucial decarbonisation minerals are seeking as many sources of supply as possible, and while hedging behaviour is not new in the world of energy security, it is increasingly important for mining & metals markets, as partners Rebecca Campbell, James Killick, Kamran Ahmad and associate Paddy Mohen explain.

Hedging behaviour is nothing new in the world of energy security, but increasingly important for mining & metals markets. Countries heavily dependent on imports of minerals, metals, and crucial decarbonisation inputs are now seeking as many sources of supply as possible while onshoring more refining and production to minimise the harm of potential interruptions in supply. Solar panels, wind turbines, heat pumps and batteries are made of metal and, unlike a barrel of oil or ton of coal, metals can be recycled. Europe is turning towards metals recycling as a core component of an industrial hedging strategy around decarbonisation, reshaping its energy security in the process.

The European Commission’s Critical Raw Materials Act (CRM) sets out an ambitious recycling agenda to counter the bloc’s over-dependence on supplies of raw and refined strategic materials from China. Specifically, the CRM sets aggressive targets to increase domestic mining, refining and metals production capacities by 2030 to protect energy security.

An overview of supply risks, bottlenecks and key players along the supply chain of Li-ion batteries

<table>
<thead>
<tr>
<th>Raw materials</th>
<th>Processed materials</th>
<th>Components</th>
<th>Assemblies</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>2%</td>
<td>4%</td>
<td>3%</td>
</tr>
<tr>
<td>Rest of Europe</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Russia</td>
<td>3%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>USA</td>
<td>2%</td>
<td>1%</td>
<td>4%</td>
</tr>
<tr>
<td>China</td>
<td>37%</td>
<td>72%</td>
<td>67%</td>
</tr>
<tr>
<td>Japan</td>
<td>1%</td>
<td>6%</td>
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<tr>
<td>Korea</td>
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<tr>
<td>Taiwan</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Rest of Asia</td>
<td>11%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
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<tr>
<td>Latin America</td>
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<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Others</td>
<td>10%</td>
<td>3%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Source: JRC analysis
An overview of supply risks, bottlenecks and key players along the supply chain of fuel cells

The EU's CRM Act sets out ambitious recycling targets as absolute consumption grows

EU projects must account for:
- 10 per cent of annual consumption of extraction
- 40 per cent of annual consumption of processed materials
- 15 per cent of all recycled materials consumed
- And no more than 65 per cent of the EU's annual consumption of any strategic raw material at any stage of production can come from a single third country

Building a market for metals recycling

The CRM builds on existing standards already shaping investment plans among auto and battery makers. Companies will be required to report their products’ entire carbon footprint from mining to production and recycling as early as July 2024, with the eventual aim of setting an EU-wide maximum CO₂ limit for each battery produced.

As the regulatory regime mandating recycling expands, so do market incentives to onshore supply chains within Europe. The European Battery Alliance counts more than 35 lithium-ion battery

Critical - One step is considered critical if at least 30% of its elements are critical

Source: JRC analysis

Note: In the case of components, the graph represents combined categories for Europe (EU27 together with Rest of Europe), North America (USA + Canada), and Asia (China, Japan, Korea, Taiwan, and Rest of Asia) presented at the level of the main source.

Source: EU CRM Act
Solar PV manufacturing capacity by country and region, 2010

Solar PV manufacturing capacity by country and region, 2021

Continuing rollouts of solar PV, wind and battery storage projects across Europe—coupled with regulatory change and concerns around European supply chain and energy security—could also boost manufacturing projects for the key components of these renewable power projects, and further stimulate local demand for raw metals, including from recycled sources. Currently, outside the wind turbine sector, European manufacturing capacity for renewable energy components is limited, and where it does exist, continues to depend on imported components and systems from a limited range of producers, with expansions in manufacturing capacity facing constraints due to

### An overview of supply risks, bottlenecks and key players along the supply chain of wind turbines

Source: JRC analysis
Onshoring and friendshoring are being coupled with recycling to provide an additional hedge against supply shocks allowing countries with limited domestic resources and comparatively high ESG standards to reduce pressure on upstream investments.

In Europe where energy security has become far more salient in the past two years. The relatively short average design life of 20 to 30 years for a wind turbine or solar PV panel, and a considerably shorter life for a battery energy storage system, means that increased deployment of renewable technologies not only creates an increased demand for metals and potential local manufacturing. It also creates another steady and growing stream of locally available feedstock for metal recycling projects in Europe.

Hydrogen and recycling
The implications for recycling go beyond batteries to include broader industrial supply chains consuming metals of all kinds. The passage of the Inflation Reduction Act has added an additional urgency for metals end-users and metallurgical firms in Europe that are worried they may be left behind in the race to commercialise hydrogen at scale and reduce emissions from metals production that account for roughly ten per cent of global CO\textsubscript{2} emissions in any given year.

The EU currently leads the market for hydrogen electrolyser components and assembly, and is well placed to contribute to the roll out of hydrogen powered industrial processes, both in Europe and globally. On 5 May 2022, European Commissioner for the Internal Market Thierry Breton met with 20 CEOs from electrolyser manufacturers to sign a Joint Declaration committing to increase electrolyser manufacturing capacity ten-fold to 17.5GW per year to meet annual production of 10 million tons of renewable hydrogen by 2030.

The UK is also in on the act. As part of the UK’s national Critical Minerals Strategy announced last year, the British Geological Survey published an initial report for prospective finds on 18 April 2023. Exploration works at specific sites are expected to follow in the year ahead to determine the viability of projects. Efforts to restart projects such as Tungsten West’s Hemerdon tungsten and tin mine, and similar projects that have stalled continue. Though the UK has not announced a large package of subsidies, efforts are being made to coordinate policies, R&D and knowledge sharing, and investment with Canada and Australia.

What is novel about these initiatives is that onshoring and friendshoring are being coupled with recycling to provide an additional hedge against supply shocks. Recycling allows countries with limited domestic resources and comparatively high standards for ESG or similar requirements to reduce pressure on upstream investments. Circular economies mitigate security risks, especially in Europe where energy security has become far more salient in the past two years. The relatively short average design life of 20 to 30 years for a wind turbine or solar PV panel, and a considerably shorter life for a battery energy storage system, means that increased deployment of renewable technologies not only creates an increased demand for metals and potential local manufacturing. It also creates another steady and growing stream of locally available feedstock for metal recycling projects in Europe.

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Recycling and green metals production are also affecting competition law. The European Commission took Hydro’s takeover of Polish recycler Alumetal into an in-depth Phase II review because of concerns that the deal could have a negative impact on the competitive landscape for green aluminium products for European automotive customers. The Commission made particular note of Alumetal’s importance as a competitive force with strong growth potential for the supply of advanced foundry alloys made from recycled aluminium, a crucial input to produce vehicles that are more fuel-efficient and emit less. Antitrust analyses now must take account of the green credentials and lower emissions of recycled metals.

Going for platinum
Meeting the steep demands of decarbonisation and improving Europe’s supply chain and energy security will require increases in the consumption of critical minerals. Just as batteries and electrified vehicles require large volumes of nickel, copper, cobalt, and lithium, hydrogen electrolysers require graphite, zirconium, platinum, strontium, gold-plated copper, and the incredibly rare metal iridium. Wind turbines also require material quantities of steel, copper, zinc, nickel and rare earths. Solar PV panels are also currently a significant consumer of global silver production. Metal recycling provides an opportunity to help meet this rising demand for metals, while creating a more circular and resilient European based metal supply chain.

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