

Pulling all the levers

**Learning from Biden -
a UK clean industrial
strategy that protects
workers and the
climate**



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Summary

Active industrial strategies have become normalised in industrial nations eager to secure their domestic industries in the race to net zero. Biden's Inflation Reduction Act is pouring billions of dollars in public investment into cutting carbon emissions, growing US industrial activity and creating jobs. Similar policies are being implemented in China and across the EU. The greatest success is delivered when a holistic approach is taken – for example, the USA also has an innovation strategy and a clean energy strategy.

Economists, green groups, trade unions and politicians from across the political spectrum have called for a UK equivalent of the Inflation Reduction Act. As new industries grow and existing industries transform, the UK cannot afford to remain stuck in the 20th Century. Without our own active net zero industrial strategy, the UK economy will be left behind, our industries will become less competitive and many jobs will be put at risk.

This report lays out a plan for a successful net zero industrial strategy, including

- Identifying institutions and cross-cutting frameworks that government will need to deliver success
- Levers that government can pull to ensure desired outcomes including protecting industrial jobs through decarbonisation and new job creation
- Conditions that government can set - for example to ensure jobs are created, that these are quality jobs, and to minimise skills bottlenecks
- Range of specific interventions by sector, targeting a rapid and just climate transition in each sector.

New TUC analysis shows that between 660,000 and 834,000 jobs could be offshored from Britain if the UK fails to deliver comparable clean industrial policies to our peers.¹ The analysis identifies jobs that, unless government acts now, could be moved offshore to countries that offer superior green infrastructure and greater support for decarbonising industry.

Manufacturing jobs in steel and automotive are most immediately at risk, but other high carbon manufacturing sectors like ceramics, glass and chemicals also need support to decarbonise. North West England, Yorkshire and the Humber, and West Midlands are regions with most jobs at stake.

¹ This analysis uses updated data alongside the same methodology as the TUC's "Safeguarding the UK's manufacturing jobs with climate action: carbon leakage and jobs", with the addition of the automotive sector.

These industries can be decarbonised and future-proofed. Doing this sooner rather than later will protect current livelihoods and ensure industrial communities can provide jobs for future generations.

Introducing an active industrial strategy – with similar ambition levels to our peers in Europe and across the Atlantic – can help future-proof an estimated 834,000 manufacturing and supply chain jobs.

It will also be necessary if the UK is to see the creation of significant numbers of new jobs as part of our journey to net zero, and to ensure that these are quality jobs.

The TUC calls on all parties to urgently lay out detailed plans for a clean industrial strategy for the UK, including the conditions applied, the levers used, and the institutions that will deliver it.

The rewards of an active clean industrial strategy, and the risks of falling behind the US and EU as they power ahead and seize advantage

The UK has not implemented an effective industrial strategy to support foundation industries or jobs, or to create jobs in new clean sectors at pace.

As a result, industrial capacity and the number of industrial jobs has declined steadily. Almost 200,000 manufacturing jobs have been lost since the Conservatives came to power in 2010², and the UK haemorrhaged more than 150,000 manufacturing jobs between the 1980s and 2017.³ This is bad for workers and communities and it is bad for the climate: offshoring is the largest structural factor contributing to energy savings by UK industry, responsible for 40% of the reduction in energy use.⁴

The rapid growth of offshore wind industry – often hailed as an industrial success story – has failed to bring the numbers of jobs that had previously been promised.⁵ Starved of investment, ports and construction yards stand empty while fabrication work is contracted out to Spain, United Arab Emirates or Indonesia.⁶ Renewable sectors like offshore wind have seen repeated reports of pay below the minimum wage,⁷ and workers seeking to transfer from high-carbon to net zero sectors can face burdensome obstacles⁸.

A climate transition that sees decently-paid jobs in high-carbon industries replaced with worse-paid, insecure jobs, where foreign companies extract profits at the expense of local communities, where existing industry closes down and is shuttered or offshored – that is not a successful transition.

The success of President Biden’s industrial strategies (including the Inflation Reduction Act (IRA), CHIPS Act, and Infrastructure Act) demonstrates that ambitious enough programmes can turbo-charge industries.

² <https://www.gmb.org.uk/news/almost-200000-manufacturing-jobs-lost-2010>

³ <https://www.gmb.org.uk/news/shock-figures-show-150000-uk-steel-jobs-gone>

⁴ <https://www.sciencedirect.com/science/article/pii/S0306261918304653?via%3Dihub>

⁵

[https://stuc.org.uk/files/Policy/Research Briefings/Broken%20promises%20and%20offshored%20jobs%20report.pdf](https://stuc.org.uk/files/Policy/Research%20Briefings/Broken%20promises%20and%20offshored%20jobs%20report.pdf)

⁶ <https://www.bbc.co.uk/news/uk-scotland-scotland-business-54214195>

⁷ <https://www.energyvoice.com/renewables-energy-transition/wind/uk-wind/322813/union-says-minimum-wage-laws-flouted-amid-offshore-renewables-rush/>

⁸ <https://www.gov.uk/government/publications/green-jobs-taskforce-report>

Biden's IRA has caused a 'gold rush' for battery manufacturers, with large numbers of companies pledging to build new manufacturing facilities.

But IRA is not simply an injection of public funds into private markets. Biden's transformative industrial strategy fundamentally shifts employment relations, by setting conditions that facilitate good pay, and incentivise domestic supply chains and the use of unionised labour. In the US, thanks to active industrial strategy, companies now proactively come to unions for partnership.

The EU is developing its own plans to boost homegrown European green industry. By accelerating subsidies, repurposing hundreds of billions of existing funding streams, setting production targets and re-aligning trade deals, the European Commission aims to boost investment and manufacturing within the bloc. The EU is targeting domestic growth in batteries, critical minerals, renewable power, heat pumps, CCS and electrolyzers.⁹

Meanwhile in the UK, many large and small manufacturing and net zero technology companies increasingly consider the landscape unfavourable for siting new production, due to a combination of high energy costs and lack of incentives. But JLR's investment into a battery gigafactory in Somerset shows that industry will make significant new zero carbon investments in the UK – if there is enough action by government, the required skills base and domestic demand.

The US and Europe have a head start, but there are ways the UK can catch up. More than catch-up – we can still be world-leaders in developing, manufacturing and installing zero carbon technology, grow a larger, more productive and sustainable economy, create hundreds of thousands of new quality jobs, and ensure the benefits are shared across the public.

In a speech outlining Labour's response to the IRA, Ed Miliband MP said, "*We need to stop moaning about the Inflation Reduction Act and start matching its ambition.*"¹⁰

To match the ambition of the IRA, the UK needs public investment, empowered and well-resourced institutions, the right investment and regulatory levers, and a set of conditions to make sure that good quality jobs are created where they are needed.

The rest of this briefing sets out, from a trade union perspective, what a UK version of an Inflation Reduction Act might look like, in order to secure and onshore good quality jobs.

⁹ <https://www.euronews.com/my-europe/2023/02/01/eu-presents-new-industrial-plan-to-counter-american-green-subsidies>

¹⁰ <https://www.independent.co.uk/news/uk/politics/ed-miliband-green-energy-inflation-b2309163.html>

Section Two

Institutions and Frameworks: Cross-cutting principles and capacity to catalyse a transformative clean industrial spiral

A powerful and transformative net zero industrial strategy will need to weave together economic, labour, skills, trade and climate policy together. Shaping the industrial composition of the economy works best as an all-of-government affair – this will help the UK to hit our net zero targets and ensure the public benefit from the transition.

Commitments like Labour’s £28 billion Green Prosperity Plan of annual public capital investment can provide a strong financing commitment to underpin a powerful industrial transformation.

But it needs to be backed up by setting, establishing and empowering the institutions, the values and the processes to deliver the strategy itself. Turning a strategy from words and numbers into actual factories, jobs and infrastructure requires attention to delivery, and overcoming challenges and obstacles. The guiding, entrepreneurial state is pro-active, empowered and coordinated.¹¹

Institutional and public sector capacity

The US recognised that to reshape its economy through the Inflation Reduction Act, it needed to empower existing organs of US government and give civil servants sufficient discretion to pursue their legislatively defined mission.¹² The US’s historic experience of powerful state bodies and civil servants has underpinned much of the USA’s past economic power, innovation and the capacity of the state to act.

IRA explicitly gives civil servants “the ability to direct demand and foster innovation.”¹³ While empowering existing departments, it also creates a new Joint Office of Energy and Transportation to support the deployment of \$7.5 billion to build out a national EV charging network, as well as a new Office of Clean Energy Demonstrations at the Department of Energy.¹⁴

UK governments have repeatedly hollowed out state capacity and the government’s ability to execute industrial strategy, from the top down to local authorities. This leads

¹¹ M Mazzucato 2021 <https://www.bostonreview.net/forum/industrial-policys-comeback/>

¹² https://green-alliance.org.uk/wp-content/uploads/2023/03/IRA_essays.pdf

¹³ https://green-alliance.org.uk/wp-content/uploads/2023/03/IRA_essays.pdf

¹⁴ https://green-alliance.org.uk/wp-content/uploads/2023/03/IRA_essays.pdf

to a belief that in the UK, government is unable to act, and is dependent on the private sector for delivery. This percolates through to a high dependency on consultant companies for analysis.

The bottleneck on renewable deployment from the lack of planned and coordinated investment into expanding electricity transmission and distribution grids is just one of many areas where the UK needs to see public bodies taking an active coordinating role.

If we agree that climate industrial strategy is important for achieving our climate, national security, and economic objectives, then we need to identify the institutional arrangements and resources needed to coordinate across government. Rebuilding democratic institutions with the capacity to act is essential to delivery – especially at the pace required. We need to build the state’s capacity and willingness to make investments, develop dynamic public sector organizations that welcome experimentation and create political consensus that builds long-term investor confidence. The response to the Covid pandemic showed the potential of the UK government to transform and empower itself when push came to shove.

To deliver an industrial transformation similar to Biden in the USA, the UK will need to

- Create new institutions to coordinate and invest into the transition and clean infrastructure where required, to administer funding pots, and to coordinate across government, with other public bodies and combined and local authorities, and with non-public entities like the private sector and trade unions
- Alongside the National Economic Council proposed by the Labour Party¹⁵, new national institutions should include a Net Zero Energy Agency¹⁶, the Future Systems Operator, a publicly-owned energy generating champion along the lines of a well-capitalised Great British Energy, and a Just Transition Commission (tasked with ensuring sectoral and collective bargaining in net zero sectors).
- Additionally, existing institutions (like government departments or the UK Infrastructure Bank) need to be resourced appropriately with sufficient staff levels to ensure delivery and coordination
- Boost skills, technical abilities and capacity within the public sector and civil service, through recruitment, trainings and secondments.
- Empower civil servants to direct demand and investments and to shape innovation
- A successful industrial strategy will work with the contours of devolution, and empower rather than disempower. Regional Just Transition Commissions should be established, with formal mechanisms for tripartite policy processes that bring together government, business and unions, and formal processes for community engagement. Explicit processes for on-the-ground union, business

¹⁵ <https://labour.org.uk/press/rachel-reeves-shadow-chancellor-of-the-exchequer-conference-speech/>

¹⁶ <https://library.prospect.org.uk/download/2023/00521>

and community partners to feed into policy reformulation and negotiations, can help solve the so-called Hayekian information problem (ie that government lacks the knowledge that resides in the private sector).¹⁷

Explicitly Progressive Values

A transformative industrial strategy needs to explicitly identify the values at its heart. These must include dedication to quality union jobs, climate and environmental sustainability, equity and diversity (including on gender and race), democracy, and public good, as well as international justice and addressing historic exploitation.

The climate transition is an opportunity to reshape the UK's social and economic fabric for the better. In shaping this transformation, a net zero industrial strategy should aim to build and deepen an equitable, sustainable and socially just democracy.

There is a moral and political imperative to deliver benefits of the energy transition to UK workers and to held-back regions that have suffered from past industrial transitions. This can cultivate secure and resilient energy supply chains and skills bases, and is essential to sustain political will for future climate action.

Catalysing a socially-just net zero feedback loop

Similar to Biden's climate interventions, a UK net zero industrial strategy should aim to catalyse and lock in a politically supportive spiral, unleashing a self-reinforcing feedback loop.

The state can build the political and technological momentum and leverage investments that shift the material interests of key industries, lower the costs of clean energy, and generate political buy-in, to ensure that the UK captures an advantage in the global market for new clean technologies while building resilient supply chains and reliable energy systems.

To achieve positive feedback loops that build domestic economic and political resilience, cut UK emissions, and boost social justice, a green industrial strategy needs to build a powerful and enduring political coalition, by delivering concrete benefits to communities in the near term, including a place-based focus on fossil fuel-dependent and held-back communities. Benefits should include economic investment and diversification, high quality jobs, improvements to public health.

¹⁷ <https://rooseveltinstitute.org/publications/industrial-policy-synergies-reflections-from-biden-administration-alumni/>

The Biden administration has recognised that these objectives won't be achieved with conventional climate policy (e.g. regulations and/or pricing) alone, or by letting markets decide.¹⁸

Policy and delivery measures across the board should be assessed on their contribution to catalysing the positive feedback loops that can lock in a socially-just green spiral.

Employment rights reforms

To ensure that a net zero industrial strategy is creating a baseline of **quality green jobs** (not just any green jobs), it should be accompanied by

- Repealing anti-trade union laws
- Strengthening the floor of employment protection for all workers and raising the National Minimum Wage to £15 an hour
- A new lifelong learning and skills strategy for all workers

Learning by Doing: Acting, Monitoring, Assessing, Redesigning

The urgency of action for both climate and economic reasons means that a powerful industrial strategy will necessarily be a process of 'Learning by Doing', as during the Covid crisis. Not every policy will work immediately as desired, but will need to be improved and adjusted over time.

Government should invest in mechanisms to identify and transparently track performance of these new industrial strategy programs over time. This should include assessing baseline levels of economic activity, production, job numbers and job quality in relevant clean industries and their supply chains, and monitoring and tracking change over time.

Including milestone-based approaches and planning to adjust programmes over time means that the industrial strategy can be continuously improved and targeted, and that government can be held to account for whether they are succeeding.

Welcoming and resourcing worker-led transition plans

¹⁸ <https://rooseveltinstitute.org/publications/industrial-policy-synergies-industrial-policy-climate-policy/>

Workers in high-carbon manufacturing sectors from steel to automotive and beyond are developing plans to future-proof their jobs by decarbonising their sectors and industries – especially where employers and government are dragging their feet.¹⁹

Worker-led transition plans can boost innovation, hold employers to account, strengthen the state’s understanding of the technical and commercial specifics in transitioning these sectors – and should be resourced accordingly.

A successful net zero industrial strategy will seek out, amplify and empower these worker-led transition plans, backing them up with investment and power. By accelerating the decarbonisation of these manufacturing sectors, UK industry can only survive but establish an international competitive advantage, futureproofing livelihoods for workers in held-back regions.

Corporate governance reform

Corporate governance reform to create an institutional environment that encourages the development of business models based on high-wage, high-skilled and secure jobs and environmental sustainability. We need a framework that puts workforce voice at the heart of corporate governance and removes the priority given to the interests of shareholders, which encourages directors to prioritise shareholder returns over wages and long-term investment, fuelling short-termism and poor employment practices.

- The inclusion of worker directors on company boards would bring people with a very different range of experiences into the boardroom, which would help challenge ‘groupthink’ and change the culture and priorities of the boardroom, improving the quality of board decision-making. Company law should require that elected worker directors comprise one third of the board at all companies with 250 or more staff.
- Directors’ duties in the Companies Act should be rewritten so that directors are required to promote the long-term success of the company as their primary aim, taking account of the interests of stakeholders, including the workforce, shareholders, local communities and suppliers and the impact of the company’s operations on human rights and on the environment.

¹⁹ <https://www.theguardian.com/commentisfree/2021/sep/20/green-jobs-car-factory-strike-industry-offshoring>

Conditions: How to make sure good jobs are created?

As explored above, without conditionality, government support for industry carries the risk of “leaking” job creation to other places, or encountering skills bottlenecks, or creating jobs with poor pay or conditions.

Table 2 sets out possible conditions that could be used as eligibility criteria for companies to access public investment mechanisms (as described above).

Table 2. Conditions to ensure good work

Mechanism	Application
Collective Bargaining Agreements	A requirement for employers to participate in collective bargaining agreements with unions could be used to set conditions including pay and pensions, working time and holidays, equality issues (including maternity and paternity rights), health and safety, grievance and disciplinary processes, training and development, work organisation, including the introduction of new technologies, and the nature and level of staffing.
Skills and Workforce Planning	Companies could be required to demonstrate their commitment to workforce planning and skills development, including through showing and being evaluated on explicit skills targets, e.g. numbers of quality apprenticeships, or numbers of workers receiving training from Level 2 to Level 3 skills.
Wages conditions	Companies could be required to meet wage floors across direct employment and supply chain. Wage floors could be set using the existing process of national pay scales set by public bodies (already negotiated with worker representatives), and/or the “going rate” registers already used to allocate skilled worker visas (this is not currently negotiated with worker representatives and should be).
Worker voice conditions	Companies and their supply chains should be required to allow union access to workplaces to enable unions to talk to the workforce about their employment rights and unionisation.

Supply chain conditions

Companies should be required to demonstrate - and be evaluated on - commitments to create and support decent jobs and grow local supply chains.

Organisations should be mandated to carry out human and labour rights and environmental due diligence to help ensure respect for rights and to prevent harms, with liability for when harms occur.

Conditions in trading partner countries

Inclusion in any subsidy scheme should be restricted to trading partner countries where there is respect for fundamental labour rights, and which require companies to undertake human and labour rights and environmental due diligence to prevent harms in their value chains, and that have similar decarbonisation targets as the UK.

Leverage: how can Government influence and grow net zero industry?

There's no one tool to kickstart industries. US and European countries employ a mix of:

- Long-term industrial strategy that provides certainty to investors
- Subsidies, to companies and to end consumers, as in the IRA
- Direct investment in companies
- Accelerated permitting
- Active procurement
- Building critical assets in public ownership, e.g. clean power generation companies like Ørsted, or manufacturing and ship-building companies like Navantia in Spain, or publicly-owned ports

In the UK context, we consider the following levers most viable means of exerting leverage: outlined in Table 1.

Table 1. Leverage mechanisms

Mechanism	Application
Direct investment for an equity stake	Key enterprises that need upgrades could be offered direct investment in exchange for a public equity stake and conditions on good work.
Overhaul Contracts for Difference (or other subsidy mechanisms)	Contracts for Difference are the mechanism already in use for allocating subsidies to renewable energy generation capacity. In its current form it has caused a race to the bottom on costs, including keeping down pay and encouraging offshoring. The system could be overhauled so that in order to qualify to participate, companies have to meet strict standards on employment and supply chains.
Consumer subsidies	Consumer subsidies are regularly used by government to accelerate take-up of clean technologies. These have included grants towards electric vehicles ²⁰ , boiler upgrades and heat pumps ²¹ , and energy efficiency improvements. ²² Conditions are already attached to such

²⁰ <https://www.fleetnews.co.uk/news/latest-fleet-news/electric-fleet-news/2022/06/14/plug-in-car-grant-for-electric-vehicles-pulled-by-government>

²¹ <https://www.gov.uk/apply-boiler-upgrade-scheme/what-you-can-get>

²² <https://www.gov.uk/guidance/apply-for-the-green-homes-grant-scheme>

grants and loans, adding a condition on good work could be straightforward.

Procurement rules	Procurement rules can direct the spending power of public sector organisations to align purchases of goods (e.g. cars for fleets) and services (e.g. construction upgrades) with labour and climate standards and local production.
Licensing conditions	Licensing bodies (e.g. for electricity generation) can require job quality conditions to be met.
Public ownership	Active delivery by public-owned enterprises. These can have an explicit economic development and social justice remit.
Trade rules	Trade rules can provide subsidies to companies located in trading partner countries that form part of low-carbon supply chains. Carbon border tariffs (e.g. Carbon Border Adjustment Mechanism) can incorporate considerations of labour rights.

Specific interventions: what to include in a successful net zero industrial strategy?

This section considers how the investment mechanisms and the conditions outlined above could be used together to support real-economy growth in a way that creates good jobs and meets climate targets. These are some of the interventions that could be made.

Table 3. Industrial strategy interventions by sector

Sector	What's included	Aim	Mechanisms
High carbon manufacturing and process industries	steel, ceramics, petrochemicals, textiles, cement, glass, plastics, wood	Protect and grow numbers of UK jobs wherever possible while aligning production and value chain with Net Zero future	<ul style="list-style-type: none"> • Direct investment with equity stakes • Carbon Contracts for Difference (with preconditions on quality employment)²³ • Direct investment into grid upgrades to enable decarbonisation
New or nascent manufacturing industries	electrolyser gigafactories, battery gigafactories, heat pump manufacturing, sustainable construction materials, remanufacturing	Grow capacity & employment to meet UK demand and, where possible, develop export market. Onshore supply chains wherever possible.	<ul style="list-style-type: none"> • Direct investment with equity stakes • R&D and scaling funding

²³ Building on Germany's introduction of "Carbon Contracts for Difference" to support energy intensive industries to decarbonise <https://www.iea.org/policies/17538-carbon-contracts-for-difference-ccfd-program-for-energy-intensive-industries>

New clean energy and green hydrogen	renewables, electrolyzers for hydrogen production	Ensure clean energy jobs are high quality, develop UK supply chains and jobs for new technologies, meet or exceed targets as outlined by Climate Change Committee, develop zero carbon hydrogen technology for export	<ul style="list-style-type: none"> • Overhaul CfD process as described above to set job creation and job quality as preconditions. • Direct investment into support infrastructure (e.g. ports) and manufacturing sites to ensure local supply chain operations • Public ownership
Automotive	Internal combustion engine cars and parts	Convert manufacturing to Zero Emission Vehicles (or other uses where necessary)	<ul style="list-style-type: none"> • Direct investment with equity stakes • Consumer subsidy akin to IRA • Scrappage scheme aimed at low-income workers who require a car for work, combining grant and interest-free loan • Procurement rules for public sector that require zero emission vehicles purchasing that meets labour standards
Home and building upgrades	Upgrading housing stock and public sector buildings	Reduce energy bills and create good jobs in building upgrades	<ul style="list-style-type: none"> • Direct public sector delivery (e.g. via Local Authorities) • Where subcontracted, strict procurement standards mandating quality work
Nuclear energy	New nuclear and decommissioning	Ensure quality jobs within the nuclear energy construction and operation industry are maintained	<ul style="list-style-type: none"> • Public ownership • And public financing to be tied to strict requirements boosting domestic supply chains and job quality

Zero carbon heating	Hydrogen boilers, heat pumps	Ensure high quality of jobs in zero carbon heat installation & maintenance, shape Just Transition and skills transfer of existing heat installers	<ul style="list-style-type: none"> • Any consumer subsidy for zero carbon heat installation to require a Fair Pay Agreement • Additional higher subsidy if the installer is certified as having worked as a gas boiler engineer
Oil and gas decommissioning	Decommissioning existing oil & gas infrastructure	Ensuring decommissioned platforms are processed and recycled domestically, and jobs created are quality	<ul style="list-style-type: none"> • Require a Fair Pay Agreement covering oil & gas decommissioning • Strict rules on decommissioning and processing of existing infrastructure, to prevent dumping, and encourage domestic processing
Critical Minerals	Critical minerals including lithium, cobalt and nickel – mining, processing and recycling	Grow domestic production of critical minerals and quality jobs within the process	<ul style="list-style-type: none"> • Requirements for domestic sourcing of critical minerals for end products (e.g. batteries or renewable plant)
Skills infrastructure	Further Education and vocational qualifications	Meet demand of skills pipeline for Net Zero transition	<ul style="list-style-type: none"> • Long-term funding settlement for FE colleges • Fund Centres of Excellence to train trainers for Net Zero transition skills • Paid time off to train scheme for green skills

Estimating the numbers of jobs at stake

Manufacturers in high-carbon sectors, such as steel, cement, or glass manufacturers, face costly upgrades and complex technological and process changes to eliminate emissions. Other industries – like automotive and aerospace – require significant technological changes because of the emissions produced by their products. The UK has clear climate commitments, enshrined through international agreements and legislation, so continuing business as usual in these sectors is not an option.

Additionally, as described above, industries in other countries have begun seizing the competitive advantage in manufacturing zero-carbon steel, batteries for electric cars, and other products. If the UK does not employ an active industrial strategy to steer these industries through the transition, it risks industries offshoring production and jobs elsewhere.

To define industries at risk of offshoring, this analysis uses:

- Analysis from the Energy Systems Catapult (ESC) on the industries most at risk of carbon leakage²⁴
- The European Union’s official list of industry subsectors at risk of carbon leakage,²⁵ where they overlap with the ESC’s list of key industries at risk.

Additionally, this analysis includes

- Industries where jobs are at risk of offshoring due to the need for technological change to phase out emissions from burning fuel in their products - i.e., cars with internal combustion engines, construction and mining machinery, aerospace, shipbuilding, furnaces, boilers, and turbines.

Beyond direct jobs in manufacturing industries, the risk of offshoring production affects supply chain jobs: e.g. jobs in manufacturing component parts, goods transport, and other services used by the manufacturing firms. To estimate the numbers of these, this analysis uses Office for National Statistics (ONS) multipliers. (See Appendix: Methodology below for more detail on the calculations).

²⁴

Carbon leakage occurs when businesses transfer production to other countries for reasons of costs related to climate policies.

<https://esc-production-2021.s3.eu-west-2.amazonaws.com/2021/10/idcl-report-final-23.11.20.pdf>

²⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ:L:2019:120:FULL>

All together we estimate that between 318,000 – 342,000 direct jobs in manufacturing, and between 397,000 – 436,000 jobs in supply chains are at stake – see Table 1.

Table 1. Manufacturing and supply chain jobs at risk of offshoring without an active clean industrial strategy

Sector	Direct jobs at risk		Supply chain jobs at risk	
	Estimate 1 (based on EU list)	Estimate 2 (based on ESC list)	Estimate 1 (based on EU list)	Estimate 2 (based on ESC list)
Refineries	9,000	7,200	24,700	19,700
Chemicals	27,800	66,500	31,400	75,300
Iron and steel	48,100	31,000	47,900	30,800
Cement and lime	7,700	1,200	9,900	1,600
Paper, pulp, and printing	8,100	15,000	6,400	11,900
Rubber and plastics	11,500	88,200	4,100	31,500
Glass and ceramics	23,900	38,500	11,900	19,200
Textiles	10,500	15,300	3,400	5,000
Wood	5,000	6,600	1,500	2,000
Automotive	112,400	112,400	162,000	162,000
Shipbuilding	10,400	10,400	5,200	5,200
Aerospace	22,200	22,200	23,400	23,400
Manufacture of engines, turbines, furnaces, and boilers	16,800	16,800	8,000	8,000
Manufacture of construction and mining machinery	5,000	5,000	1,800	1,800
Total	318,400	436,300	341,600	397,400

Annex: Methodology for calculating number of jobs at stake

Direct job numbers for sectors at risk are sourced from the ONS's Business Register and Employment Survey (reference year 2021).

In our broader estimate, the initial sectoral direct job figures were then downgraded based on the TUC's analysis of the relative susceptibility of each sector to offshoring due to decarbonisation. The susceptibility analysis considered a number of factors, including: extent of international competition in implementing new technologies; the sector's overall fossil fuel consumption; carbon intensity; ability for domestic production to be replaced with imports (represented by existing imports); investment in new technology and upgrades needed to decarbonise; and the extent to which sub-sectors of the industry and its supply chain are at particular risk of offshoring. This leads to a more conservative estimate for sectoral jobs at risk.

For the additional sectors, the assessment also considered the emissions associated with industry products, expected future demand, and targets to phase-out the industry's current technologies (e.g. petrol cars). For example, for automotive, we estimate that 70% of jobs are at risk of offshoring. This is consistent with the Faraday Institute's estimate of numbers of jobs that could be lost if no lithium battery gigafactories are built in the UK.

Supply chain job numbers were estimated using ONS latest multipliers (reference year 2019), which quantify the number of indirect (supply chain) jobs in each industry proportional to the number of direct jobs.

To take into account the overlap in supply chain jobs (e.g. a direct job in Chemicals can be a supply chain job for Rubber & Plastics), we used the ONS Input-Output Analytical Tables to calculate the overlap between the input any of the industries covered, and outputs of others. The estimates of supply chain jobs at risk for each sector were reduced accordingly, to avoid double-counting.

Example methodology (for automotive sector): ONS BRES data shows that the Automotive sector (including Manufacture of vehicles, trailers and semitrailers, and Manufacture of motorcycles) directly employs 160,500 people. Our assessment of the susceptibility of the automotive sector, based on Faraday Institute forecasts, is that 70% of these jobs are at risk of offshoring or being lost: 112,350 direct exposed jobs that need future-proofing. The ONS Type 1 employment multiplier for the automotive sector is 1.989, indicating a further 223,464 indirectly exposed jobs in the supply chain. However, our analysis of official Input-Output tables showed that 27.5% of the supply chain jobs in automotive overlap with other sectors assessed in this analysis (e.g. Iron and steel, Rubber and plastics, Glass and ceramics). We therefore reduced the estimated number of exposed supply chain jobs by 27.5%, to 162,013 indirect exposed jobs that need future-proofing.