**Response to Call for Evidence on Workforce Planning to deliver clean, secure energy.**

**Institute of Materials, Minerals and Mining**

The Institute of Materials, Minerals & Mining (IOM3) is a professional engineering, environmental and scientific institution, a registered charity and governed by a Royal Charter. IOM3 supports professionals in materials, minerals, mining and associated technical disciplines to be champions of the transition to a low-carbon, resilient and resource efficient society. With around 15,000 members, IOM3 brings together expertise across the full materials cycle. This submission is informed by consultations with our members across various industries, including professionals in the energy transition field. The expertise of our network provides practical insights into how workforce planning across the materials cycle can support the Government’s ambitions in clean energy and retrofitting.

The information provided can be summarised under three key points outlined below:

***Defining green skills:***

The Government must take a full supply chain approach to green skills. Building a secure, sovereign and sustainable energy system requires skilled workers across the entire materials cycle, including the extraction and processing of transition minerals. The conception of green jobs should be expanded to include professionals in the upstream supply chain that provide the material components of clean energy technologies and retrofitting products.

***Identifying skills gaps:***

Across the materials cycle, sectors which feed into the safe and effective development of green products are facing severe skills shortages. These include, but are not limited to, composites, elastomers, surface technologies, wood technologies, metallurgy and mining. The skills gap in these sectors is at risk of widening in the coming years as the numbers of new entrants are insufficient to meet the growing demand associated with the green transition. Particularly in the case of mining, outdated narratives around the industry present a major barrier to attracting new talent.

***Tackling skills shortages:***

The Government must actively tackle labour supply shortages in mining and materials processing. Raising public awareness of the role of minerals and materials in achieving the green transition is an important first step. Moreover, the Government should play a hands-on role in promoting training and education in these sectors.

Ensuring an adequate supply of skilled workers will require targeted interventions at all educational levels, from primary school curricula to postgraduate training programmes. Additionally, a UK Materials Strategy is needed as an essential component to create a predictable and secure green economy and thus incentivise private investment in green skills.

**Does the Government have an appropriate understanding of the skill needs to deliver the Clean Energy Mission by 2030 as well as decarbonise homes and businesses?**

In assessing the skills needed to achieve clean energy and retrofitting targets, the Government must consider the entire materials lifecycle. The conception of green skills is often limited to activities relating to the assembly, installation and operation of final products. However, the delivery of low-carbon products, technologies and services ultimately depends on the exploration, extraction and processing of transition minerals, as well as engineered materials earlier in the supply chain. This is a systemic feature of the green economy and can be seen across industries.

For instance, in the Clean Power 2030 Action Plan[[1]](#footnote-1), the Government identifies offshore wind as “the backbone of the clean power system”. At the delivery stage, offshore wind relies on the availability of electrical, digital, consenting and marine skills[[2]](#footnote-2). However, these projects are equally dependent on skilled labour at earlier stages of wind turbine development. This includes the extraction and processing of critical materials for permanent magnets, the manufacturing of composites such as carbon fibre or glass fibre-reinforced plastics for wind turbine blades[[3]](#footnote-3), the development of long-life surface coatings to minimise maintenance burdens, and so on. The adequate supply of skilled workers in these fields thus underpins the achievement of offshore wind targets and the clean power system.

A similar situation can be observed in other sectors prioritised by the Government in the pursuit of decarbonisation. Hydrogen storage has a clear role to play in the Clean Energy Mission and this cannot be realised without the engineering of appropriate rubber materials for sealing systems. Similarly, carbon capture, utilisation and storage (CCUS) will not be possible without the development of advanced material coatings that can withstand corrosion. When it comes to transitioning homes and businesses, advances in construction materials, including wood technology, can play a vital role in low-carbon retrofitting projects. As well as increasing the energy efficiency of buildings, innovations around the reduction of the embodied carbon in construction products and the reuse of construction materials can minimise overall energy demand in our economy. Every facet of the green transition is contingent upon the materials, minerals and mining cycle and the workforce that drives it. As such, to gain an appropriate understanding of the labour supply required to meet its ambitions, the Government must base its assessment of green skills on the full lifecycle of green technologies and services.

It is worth noting that, particularly in the mining of transition minerals, the UK has little domestic capacity and instead relies on the resources and labour of trading partners to meet demand. While it is not feasible for the entire supply chain associated with clean energy and retrofitting to be hosted domestically, the overreliance on imports in the upstream supply chain is a concern from a security perspective. As the Clean Energy Mission seeks to bolster energy security while creating good quality jobs, promoting the domestic production, processing and reprocessing of transition materials is crucial to its success. Moreover, developing capabilities for the circular economy, including workforce skills in design, maintenance, repair and end of life, can strengthen both the sovereignty and sustainability of the energy sector.

These developments can only be realised with a strong understanding of the skills required across the materials cycle and a targeted strategy to ensure their availability. A quantitative assessment is required to understand workforce capability needs, map competencies and conduct a gap analysis on education and training provision and provider capacity. This process must include an assessment of the training needed to reskill workers in carbon intensive sectors and determine the feasibility of transferring this labour force to roles in the green energy sector. Extractive and energy industries have a lot of synergies in terms of planning, scale, strategies, operational assets, costs and skills. There are known cases, for example, of individuals being able to transfer their knowledge and skills from the UK coal mining sector to energy and infrastructure projects and organisations.

Analysis of the disparity between skills available and skills required should be undertaken at a local and regional level. This information can be sourced through consultations with local businesses, regional and Government networks and industrial organisations. IOM3 and similar professional bodies are well placed to act as partners in such studies. Any insights from the regional level should be fed into a cohesive national picture and strategic approach.

**To what extent can the Clean Energy Mission and the retrofitting of homes and businesses be carried out by the existing workforce and to what extent will it require new entrants to the workforce?**

There is substantial evidence that both reskilling the existing workforce and attracting new entrants will be required to meet the demands of the energy transition and retrofitting targets. Many sectors expected to contribute to the green economy are already facing skills gaps, including renewables, energy efficiency and manufacturing[[4]](#footnote-4). The Green Alliance estimates that the building sector will require an additional 230,000 trained workers by 2030[[5]](#footnote-5), while the National Grid has stated that an additional 400,000 roles will need to be filled in the Net Zero Energy Workforce by 2050[[6]](#footnote-6).

Across the materials, minerals and mining cycle, new entrants will be particularly important for meeting the demands of the green transition. Job vacancies in the materials sector are three times more likely to go unfilled due to a shortage of applicants compared to the UK average[[7]](#footnote-7). These skills gaps are predicted to widen due to the increased demand for materials associated with the green transition and ultimately threaten the delivery of the Government’s clean energy and retrofitting targets.

The composites sector is an important example in this regard. Composites are deployed in a wide array of green products and technologies, including for producing wind turbine blades, mitigating the effect of heavy lithium-ion batteries through lightweighting of transport vehicles, and hydrogen storage. Despite growing reliance on the sector, the composites industry is facing a severe shortage of skilled workers at all levels. There is very limited workforce capacity in raw materials manufacturing due to an absence of domestic production in this sphere. In the UK there is just one glass fibre plant and one small carbon fibre plant which is in danger of closing. However, to ensure sovereign capability the UK needs the ability to make the raw constituents for composites. The 2016 UK Composites Strategy identified the role of composites in enabling the energy transition and highlighted the need for an additional 50,000 workers in the sector by 2030[[8]](#footnote-8).

The need for new entrants to deliver Government targets is also seen in the elastomers industry. In this sector, there are few graduates with direct experience in the field and qualified candidates are often lost to overseas employers. This is a concerning pattern given the role of elastomers in sealing systems for clean energy technologies. Similarly, the surface technologies sector, with a major part to play in the safe and reliable delivery of renewable energy materials, has identified high quality training and education as a key challenge for the coming decade.

Furthermore, the shortage of metallurgical skills is concerning. Metallurgy underpins a diverse range of industrial processes, including in manufacturing, construction, transport and energy. As these sectors move towards the ambition of net zero, an increasing supply of metallurgy skills will be needed to innovate new solutions and implement environmentally sustainable practices. Technological advancement in this field is essential to improve efficiency at all stages of the green economy by increasing material durability and expanding product lifecycles. Despite these growing demands, there is a widespread and persistent shortage of skilled workers in metallurgy and material sciences more broadly.

Finally, labour supply presents a major challenge in mining. Though essential to secure the domestic supply of transition materials, the mining sector is faced with a chronic shortageof key professionals. This includes exploration geologists, mining engineers, mineral planners and mineral processors. Indeed, in 2023, 86% of mining senior leaders and executives surveyed by McKinsey reported it was harder to recruit and retain the talent they need compared to the two years prior[[9]](#footnote-9). A key issue is that the mining sector is facing an ageing workforce, with a large portion of employees approaching or past retirement age. In the UK in 2022, 80% of mining and mineral processing engineers registered via IOM3 were over the age of 50 and 39% were over the age of 66[[10]](#footnote-10). At the same time, enrolment in relevant mining training and education for these fields is declining. As such, the talent gap in the mining industry is predicted to worsen substantially in the coming years.

While skills shortages across the materials cycle arise from a multitude of factors, a common challenge is public awareness. Materials science, engineering and associated roles are often not well known or understood by young people. Moreover, many of the sectors vital to the green transition are associated with outdated narratives. For instance, there is a widespread public perception of mining as dirty, dangerous and damaging. Particularly as younger generations seek meaning and positive social impact from their working lives, these narratives translate to low demand for training and education in the mining sector. In turn, lack of demand leads to disinvestment in educational programmes necessary to produce a skilled mining workforce. This cycle of public misconceptions, low demand and poor skills provision can be seen in various industries across the materials supply chain and poses a major barrier to ensuring the workforce is in place to deliver Government aims.

These challenges must be addressed through a robust assessment of the skills gap across the materials cycle and targeted interventions to overcome them, as outlined above. Investigation is needed into public attitudes surrounding materials sciences and media campaigns should be deployed to counter misconceptions, particularly in underrepresented sectors. Moreover, the Government, in collaboration with private sector partners, must strive to address gaps in the provision of education and training in these fields. This includes raising awareness of career paths, funding apprenticeships, establishing study grants for university students and supporting the development of educational courses. In striving to grow the materials workforce needed to deliver the green transition, the Government should work across all relevant departments and integrate the perspectives of industry, academia and professional bodies.

Finally, in formulating policy responses, it is important to consider not only professions directly engaged in the delivery of materials, but also roles that support these industries to thrive. For example, life cycle assessment (LCA) has become extremely important in informing materials selection choices throughout the supply chain. Despite this, there is a severe lack of LCA practitioners working in the materials field. This should be addressed to ensure the most effective delivery of green technologies. Similarly, industries that feed into clean energy and retrofitting outputs rely on strong regulatory practices. The skills and expertise of regulators are vital to maintaining sustainability across the materials cycle and investment in this profession is a necessity for achieving Government’s ambitions.

**How might the Government ensure that the job market in clean energy roles is sustainable enough to incentivise private sector investment in training for 2030 and beyond?**

Creating regulatory stability and sending clear and consistent market signals is crucial to encouraging private investment. Inconsistent, stop-start policies around net zero have dissuaded private investment in skills and training[[11]](#footnote-11). The development of decisive long-term strategies such as the Clean Energy Mission is welcome in this regard. That said, a more strategic approach to materials is essential to ensure a stable economic landscape that is conducive to attracting private investment. As noted above, the technologies, products and services needed to reach clean energy, and retrofitting goals depend on access to minerals and materials for which the UK relies heavily on imports. Recent geopolitical developments have highlighted the vulnerability of global supply chains and there is an increasing awareness of the environmental and social risks associated with the extraction and processing of transition minerals across the world. As such, the growth of a predictable and investor-friendly clean energy sector can only be achieved through improving the security and sustainability of the UK’s access to transition materials. Current materials activity is too uncoordinated and uneven to deliver the developments needed to reliably meet growing demand, build confidence in the future of the sector and incentivise investment in workforce expansion.

For these reasons, it is essential that the Government establish and implement a UK Materials Strategy. The Strategy should provide a comprehensive, cross-Government, cross-economy approach to the sustainable management of materials covering the full life cycle. Key goals of the Strategy should include:

* driving the transition to a resource efficient circular economy;
* protecting capabilities, supply chains and technologies of strategic importance;
* supporting the development of manufacturing capability to transform materials into end products;
* developing the UK’s materials processing industry;
* promoting collaboration between industry and R&D; and
* creating a clear regulatory and standards environment across diverse market sectors.

By offering a single point of strategic overview for the materials cycle, the Government can mitigate uncertainty in the green economy and ensure dependable access to the materials that underpin clean energy and retrofitting projects. Such developments are crucial to assure private capital of the long-term feasibility of Government aims and ensure that investment in training for clean energy jobs is a business priority.

It is equally important that Government ambitions and strategies in this area are followed through with reliable funding streams that support industry in building the net zero workforce. To maximise buy-in from industry, the Government should ensure clarity around financing mechanisms and demonstrate a commitment to sustained finance in the years to come. Moreover, to ensure the effective use of public funds it is necessary to maintain ongoing and direct engagement with the private sector to assess the challenges faced in terms of labour supply. Dialogue with industry should serve to illuminate how Government policies interact with market incentives and offer an effective path to promoting investment in green jobs training. Government engagement with industry is also an opportunity to raise the needs of local communities and employees and help foster an inclusive transition.

**How can the new Office for Clean Energy Jobs contribute to workforce planning in the energy sector?**

The establishment of the Office for Clean Energy Jobs is a welcome development with the potential to contribute significantly to the supply of skilled workers for the energy transition. If the dual goals of energy security and good quality jobs are to be met, the Office must take a comprehensive approach to the energy supply chain and define the scope of clean energy jobs accordingly. The Office for Clean Energy Jobs evidence annex for the Clean Power 2030 Action Plan[[12]](#footnote-12) provides important data on the current skills challenges faced. However, this research does not encompass the full materials cycle in its scope, focusing instead on the midstream and downstream supply chain. While skills relating to the assembly, installation and operation of green energy technologies are vital, so too are the minerals and materials which constitute these technologies. Severe skills shortages in the mining and materials processing sectors create a systemic dependence on imports that compromises the core aims of the Clean Energy Mission.

To ensure robust and effective workforce planning in the energy sector, the Office should expand its definition of clean energy jobs to encompass the full energy supply chain. This includes the exploration, extraction and processing of transition minerals, as well as engineering materials and manufacturing technologies. Throughout its communications and engagement campaigns, the Office should aim to raise awareness of the importance of industries across the full supply chain to achieving clean energy. Changing the language around materials, minerals and mining sectors from ‘heritage’ activities to modern industries with an opportunity to support the green transition is essential.

In addition to taking a full supply chain approach, the Office should pursue direct engagement with industry across the materials cycle. The Office should aim to create clear channels of communication and provide ongoing intelligence on spend plans. In addition, workforce consultations and feeding back developments to workers in the materials, minerals and mining sectors would be highly beneficial. It is also important that the Office has open communication with local networks. One strategy for achieving this is by establishing ‘local champions’ or points of contact who work at the local and regional level but have strong lines of communication with national channels. Communication at the local level should be a continuous mechanism ranging from personal interactions to publications, seminars, news media and social media.

As well as delivering key workforce planning measures itself, the Office of Clean Energy Jobs should coordinate projects across relevant Government departments, and work closely with skills bodies across the UK, such as Skills England. Taking this collaborative approach, the Office and its partners can play a vital role in ensuring that all levels of education provide an accurate understanding of contemporary materials industries and that students from all backgrounds are aware of the opportunities available in these fields. Some actions the Office can support in this area include embedding materials science and its role in the transition into school curricula, increasing the emphasis on materials in undergraduate STEM programmes, showcasing job prospects and options, facilitating transfers from related disciplines and industries, and encouraging interactions between universities and industry.

One challenge that arises is that, due to the lead times in expanding and implementing undergraduate programmes, the benefits of initiatives started now would not be felt by industry until 2032 at the earliest. The need to grow the materials workforce in the next five years demands more immediate policy responses to effectively train new entrants and retrain personnel from carbon intensive fields. One solution is a government funding boost for the development of Master’s programmes covering materials and minerals science for the green transition. Such projects can often be put in place quickly and deliver outputs for industry within a year or two once running. The Office should seek to ensure that new programmes and training schemes are strategically located such that trained staff and graduates are delivered in regions where clean energy industries are concentrated.

Industry has already shown a willingness to support the development of learning materials and academic outreach programmes associated with mining and materials sciences. However administrative barriers and the absence of Government support for such projects have posed a challenge thus far. The Office for Clean Energy Jobs is well placed to play a coordinating role in this context. Similarly, though businesses widely rate training, upskilling and staff retention among their top priorities[[13]](#footnote-13), many find workforce development activities such as apprenticeships difficult to initiate. Particularly for enterprises navigating the multiple challenges associated with the contemporary materials and minerals industry, external support is oftentimes necessary to develop successful training programs. The Office can play a role in supporting businesses to access training providers and internally finance, manage and report on suitable training opportunities such as apprenticeships.

**What more can the Department for Energy Security and Net Zero do to ensure the workforce is in place to deliver the Clean Energy Mission and accelerate the retrofitting of homes and businesses?**

Promoting equity, diversity and inclusion (EDI) is an important step to overcoming labour supply shortages and ensuring the workforce is in place to deliver the Government’s green transition goals. In 2024, women made up just 29% of board members in UK energy companies, 34% of leadership roles and 32% of middle management roles[[14]](#footnote-14). Moreover, available statistics suggest that only 5% of the UK energy workforce comes from Black, Asian, and Minority Ethnic (BAME) backgrounds[[15]](#footnote-15). Poor diversity and inclusion pose a barrier to attracting new entrants from marginalised backgrounds and to the advancement of talent within the industry.

This issue is a challenge across the materials cycle, but particularly in the mining sector. It is estimated that women make up just 15% of the mining workforce globally, making the industry one of the least gender diverse in the world[[16]](#footnote-16). The skills gap in this field is projected to grow with the rising demand for critical minerals and is already of such a scale that a significant increase in the workforce is required. This task will be made far more difficult if the full pool of potential talent is not drawn from[[17]](#footnote-17). Ensuring that workers from all genders and backgrounds are given the opportunity to enter and progress within the mining industry is a vital priority in this regard. Moreover, diverse and inclusive teams are shown to be more innovative and efficient[[18]](#footnote-18) and thus better equipped to face the challenges and opportunities of the green transition. The Government should play an active role in supporting EDI in the green economy, particularly in encouraging diverse new entrants in the mining and materials sector.

1. [Clean Power 2030 Action Plan: A new era of clean electricity](https://assets.publishing.service.gov.uk/media/675bfaa4cfbf84c3b2bcf986/clean-power-2030-action-plan.pdf) [↑](#footnote-ref-1)
2. [Net Zero Skills : Jobs, skills and training for the Net-Zero energy transition | Energy Futures Lab | Imperial College London](https://www.imperial.ac.uk/energy-futures-lab/reports/briefing-papers/net-zero-skills--jobs-skills-and-training-for-the-net-zero-energy-transition/) [↑](#footnote-ref-2)
3. [Cooking up cleaner composites | IOM3](https://www.iom3.org/resource/cooking-up-cleaner-composites.html) [↑](#footnote-ref-3)
4. [Net Zero Skills : Jobs, skills and training for the Net-Zero energy transition | Energy Futures Lab | Imperial College London](https://www.imperial.ac.uk/energy-futures-lab/reports/briefing-papers/net-zero-skills--jobs-skills-and-training-for-the-net-zero-energy-transition/) [↑](#footnote-ref-4)
5. [Closing the UK's green skills gap | The Green Alliance](https://green-alliance.org.uk/wp-content/uploads/2022/01/Closing_the_UKs_green_skills_gap.pdf) [↑](#footnote-ref-5)
6. [Building the Net Zero Energy Workforce | National Grid](https://www.nationalgrid.com/document/126256/download)  [↑](#footnote-ref-6)
7. [National Materials Innovation Strategy | Henry Royce Institute](https://www.royce.ac.uk/content/uploads/2025/01/Royce_NMIS_booklet-digital_FINAL-SINGLE.pdf) [↑](#footnote-ref-7)
8. [2016 UK Composites Strategy | Composites Leadership Forum](https://compositesuk.co.uk/wp-content/uploads/2022/03/Strategy-final-version.pdf) [↑](#footnote-ref-8)
9. [Has mining lost its luster? | McKinsey and Company](https://www.mckinsey.com/industries/metals-and-mining/our-insights/has-mining-lost-its-luster-why-talent-is-moving-elsewhere-and-how-to-bring-them-back) [↑](#footnote-ref-9)
10. [The talent gap: critical skills for critical minerals | IOM3](https://www.iom3.org/resource/iom3-submits-report-on-critical-minerals-value-chain-skills-gaps-to-uk-government.html?_gl=1*1i3vxg2*_up*MQ..*_ga*NzQ3NDEzMDkxLjE3MzYxNzg5MjM.*_ga_FS09K3G91Q*MTczNjE3ODkyMi4xLjAuMTczNjE3ODkyMi4wLjAuMA) [↑](#footnote-ref-10)
11. [Net Zero Skills : Jobs, skills and training for the Net-Zero energy transition | Energy Futures Lab | Imperial College London](https://www.imperial.ac.uk/energy-futures-lab/reports/briefing-papers/net-zero-skills--jobs-skills-and-training-for-the-net-zero-energy-transition/) [↑](#footnote-ref-11)
12. [Clean Power 2030 Action Plan: A new era of clean electricity: Assessment of the clean energy skills challenge - evidence annex](https://assets.publishing.service.gov.uk/media/675b3171348e10a16975a422/clean-power-2030-clean-energy-skills-assessment-annex.pdf) [↑](#footnote-ref-12)
13. [Business Barometer| Open University and the British Chamber of Commerce](file:///C%3A%5CUsers%5Crachel.stonehouse%5CAppData%5CLocal%5CMicrosoft%5CWindows%5CINetCache%5CContent.Outlook%5CVJ5WGG1A%5Cindustrial%20strategy) [↑](#footnote-ref-13)
14. [Female representation in the UK Energy Industry 2024| POWERful Women](https://internationalwim.org/wp-content/uploads/2024/10/PfW-annual-state-of-the-nation-summary-May2024-FINAL-WEB-PAGES.pdf) [↑](#footnote-ref-14)
15. [Workforce Renewal and Skills Strategy 2020-2025| Energy and Utility Skills](https://www.euskills.co.uk/download/workforce-renewal-skills-strategy-2020-2025/) [↑](#footnote-ref-15)
16. [Diversity, Equity and Inclusion | ICMM](https://www.icmm.com/en-gb/our-work/social-performance/diversity-equity-and-inclusion#:~:text=Globally%2C%20women%20represent%20just%2015,and%20discrimination%20in%20the%20workplace) [↑](#footnote-ref-16)
17. Ibid [↑](#footnote-ref-17)
18. [Female representation in the UK Energy Industry 2024| POWERful Women](https://internationalwim.org/wp-content/uploads/2024/10/PfW-annual-state-of-the-nation-summary-May2024-FINAL-WEB-PAGES.pdf) [↑](#footnote-ref-18)