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Engineering and Physical Sciences Research Council

Decarbonising the Glass Sector: Building an Evidence Base

Workshop Summary Report March 2026

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Introduction

IDRIC's first sector-specific workshop on the glass sector was held online on 18th February 2026, discussing techno-economic barriers, opportunities, and policy recommendations for the sector in its transition to low-carbon technologies. Attendees were UK-wide industry stakeholders across flat glass, container glass, and glass wool manufacturers. This document is a summary of the discussions held at the workshop, including key barriers, opportunities and policy recommendations. The workshop formed part of a wider report and related research activity in IDRIC's policy work on harder-to-abate sectors. These activities are supported by EPSRC and DESNZ.

The UK glass sector is motivated to decarbonise and is engaged in exploring a range of decarbonisation technologies and pathways. However, participants identified a range of issues, noting that economic barriers now outweigh technical barriers.

Whilst further research and innovation may be needed for full decarbonisation, many of the core technical solutions already exist such as electric furnaces, hybrid systems, and alternative fuels. However, costs and investment risks inhibit UK deployment as participants highlighted that the transition to low-carbon technologies is taking place in countries where conditions are most favourable. Participants repeatedly highlighted that the UK faces structurally higher fuel and electricity costs as electricity and alternative fuels remain significantly more expensive than natural gas, both in absolute terms and relative to other manufacturing countries. The main barriers are financial as firms have difficulty securing capital for long-lived assets in an uncertain policy environment.

The funding gap between the UK and the EU was a consistent theme throughout the workshop. European competitors benefit from stronger support for electrification, innovation and energy-intensive industries through schemes such as the EU Innovation Fund under the EU Emissions Trading System. International competition amplifies these UK pressures, making it harder for investors to approve such major decarbonisation projects, especially as assets are long-lived with 15–20-year lifetimes. Such investments are only feasible where there is confidence in long-term, favourable and stable policy support.

Participants warned that the carbon price trajectory under the UK ETS poses a growing risk. If sites cannot decarbonise at pace, they will face rising carbon costs over the next decade. Many felt that paying a high carbon price for the next 10-15 years is not a viable option, and that without credible decarbonisation pathways, some facilities may ultimately choose to close rather than reinvest.

There was a universal call for joined-up, cross-government, policy. The sector's business case depends not only on carbon policy but also on energy pricing, innovation funding, planning, waste regulation and trade measures. Misaligned policies erode trust and signal investment risk. Participants stressed that the UK needs coherent, stable, and predictable policy frameworks that reduce uncertainty and enable long-term decision-making.

Without the necessary UK action, the consequences are already visible:

- Investment is flowing to the EU instead of the UK.
- Imports are rising in container glass, flat glass and insulation.

Several participants warned that without a coordinated strategy and targeted support, the UK risks losing parts of its glass industry altogether.

Key Barriers

Technical and Operational

Technical and operational barriers to decarbonisation identified are predominantly concentrated in the electrification of flat glass. Although electric furnaces are technically feasible, participants consistently highlighted flat glass production as particularly challenging to electrify at commercial scale. Fully electric furnaces require immensely high electrical capacity. Concern was raised regarding whether existing electricity infrastructure can meet this demand at a national scale. Grid reliability is also a key concern. Flat glass, container glass and glass wool furnaces operate continuously, meaning power outages and shutdowns would present extreme costs and losses for firms.

Using electricity accelerates the wear of furnace refractories. This shortens the furnace lifespan relative to existing air/fuel furnaces. Replacing these parts, represents not only extra costs but also an inherent safety risk. However, once installed electric furnaces are cheaper to replace.

Economic

Electricity and Grid Connection Costs

High electricity costs remain one of the most substantial barriers to electrification, particularly compared to European competitors, making electrification economically impractical. Even very short connection distances require extremely high capital costs and long lead times, deterring investment.

Recently, some policy progress has been made:

- The Supercharger Scheme exempts eligible sectors from the renewable energy policy costs passed through on electricity bills and the capacity market charge. It originally reduced network charges by 60%. This is being increased to 90% in April this year. This is welcome and is broadly accessible for all glass melters. However, this only partially offsets the price disparity between electricity and natural gas.
- the Supercharger scheme also aims to provide support but is not accessible UK-wide and remains complex in Northern Ireland due to the Windsor Framework and the Single Electricity Market. Electricity prices in Northern Ireland continue to be significantly higher than the rest of the UK, further restricting competitiveness.

Indirect costs of electrification also present significant challenges, particularly for older, more energy-intensive operators. Companies face high capital costs when converting to electric technologies, particularly in high-temperature operations such as melting. These costs reflect the need for new equipment, upgraded electrical infrastructure and in some cases, redesigning fundamental infrastructure. This conversion cost is significantly higher than a like-for-like replacement using alternative fuels such as hydrogen and biomethane.

Participants highlighted that there is no current funding dedicated to bridge this gap, leaving businesses to absorb all conversion costs. This prevents sites pursuing electrification even where it is technically feasible.

Funding and Internal Competition for Investment

UK sites are competing directly with European sites for investment through European Union level schemes such as the EU Innovation Fund. As many major glass companies are globally owned, investment decisions are based on an international comparison. Some countries risk being deprioritised in favour of those offering clearer signals and stronger financial support.

For example, fuel switching is progressing primarily in the countries where the wider policy and cost environment make it feasible. UK sites have lost out to others that benefit from stronger subsidies, funding mechanisms, and substantially lower electricity costs.

Uncertainty surrounding the future of the UK gas network also has a significant negative impact, not only on new investment decisions but also on the viability of existing facilities.

Imports and Competition

Pressure from imports and international competition is growing as participants noted a rise in both EU and non-EU imports across glass packaging, flat glass and glass wool. Imports are entering the UK market at a scale and cost that undermine the competitiveness of UK production. This has wider implications as it is occurring at a time which participants identified as a critical crossroads for the foundation industries.

Participants expressed concern that without stronger safeguards or a more supportive operating environment, UK sites risk becoming increasingly vulnerable. Participants warned that continued competitive pressure from imports, paired with higher domestic production costs, increases the risk of site closures and losing key parts of the UK's industrial base.

Long Asset Lifetimes and Furnace Rebuild Cycles

Long asset lifetimes and furnace rebuild cycles were identified as a key structural challenge and investment consideration as firms assess investments with long asset lives and payback times (10-20 years or more). With many furnaces approaching the end of their current lifecycles, glass companies are faced with significant investment decisions over the next 5-10 years.

Furnace investment decisions often take place multiple years in advance. Once a technology is chosen, it becomes very difficult to change course.

In addition, it is extremely difficult for firms to make these decisions without clear information on future policy, funding models and viable decarbonisation pathways.

Given this uncertainty, especially with the scale of investment and the long asset life cycles involved, the risks are often perceived to be so high that not investing at all can become the default option.

This highlights how important it is to create clarity and to mitigate the risks. Any further significant delay could lead to the loss of a key industry.

Recycling and Issues with Raw Materials

Current recycling systems focus largely on quantity (e.g. collection rates) rather than on quality, leading to substantial volumes of glass being collected together with other dry recyclates or being placed in the wrong bin, reducing the availability of high-quality cullet. Once contaminated, glass cannot be remelted. The absence of consistent, UK-wide kerbside collection schemes further limits recovery efforts and undermines efforts to increase recycled content.

Concerns were raised on the impact of landfill policy. With glass classified as an inert material, the landfill tax structure can unintentionally make disposal a cheaper and more straightforward route than returning material to manufacture.

Participants highlighted that there are currently no meaningful incentives to encourage recycling in the construction industry, despite its significant role in generating recoverable glass waste. While parts of the glass sector are pioneering new recovery efforts and working closely with clients, progress remains voluntary and erratic. Without stronger drivers, opportunities to secure more stable raw material supply chains are being missed.

Research and Innovation Needs

First-generation hybrid furnaces are now an established technology, and are operating in several countries. The next iteration will likely look different as operators learn and refine designs.

Emerging technologies were also discussed in relation to specific processes. Electric melting, hydrogen firing, and innovations in glass wool production were cited as areas where promising work is underway. However, fiberizing and curing remain highly gas-intensive and require further innovation to deliver meaningful emissions reduction.

There was also some interest among participants in the potential for glass furnaces to support grid flexibility and load balancing by adjusting levels of electric boost and firing. While this could offer a future opportunity, operational risks are currently significant. Temperature fluctuations can compromise product quality, and this remains at early stages of exploration.

Methane pyrolysis technologies are still in the early phases of development. This was noted as an area where developers are active and where further research could unlock cost-effective pathways. Participants agreed that there is real opportunity, but the technology is not yet ready for widespread industrial adoption.

Some technologies are technically close to deployment but require focused attention, coordinated support and continued research and development to reach commercial readiness. Structured investment in innovation is needed to bridge the remaining gap.

Key Opportunities

The workshop highlighted that most of the barriers to decarbonisation for the UK glass sector are around policy and economics. A wide range of technologies and technical decarbonisation options are available and proven. Participants emphasised that there is no singular solution and maintaining multiple decarbonisation pathways is essential. Ongoing research is exploring biofuels, liquid biofuels, hydrogen firing, and electric melting, while several gaseous biofuels have been already proven to work effectively in glass furnaces. Electrification may have many applications but a 'flame' is still necessary for many processes in the glass industry.

A key opportunity identified in the workshop centred around exploiting the growing maturity of certain technologies:

Biomethane Substitution

Biomethane was identified as a near-term opportunity with significant potential. Substituting biomethane could reduce emissions without any technology changes or major infrastructure upgrades. However, under current UK Emissions Trading Scheme (ETS) rules, biomethane cannot be zero rated if it is delivered through the grid. In contrast, EU operators can use biogas certificates to offset ETS costs, giving them a major advantage. This policy gap is already influencing investment decisions.

Participants pointed to substantial future supply, highlighting that there is potential for around 17 TWh of biomethane capacity by 2030 – enough to meet the demands of the entire glass sector. Participants outlined that if policy rules were adjusted to allow biomethane purchasing power agreements to be recognised with the ETS, the sector could potentially reduce emissions by up to 80% within 2-3 years, without asset or infrastructure changes.

Hydrogen may well become viable as an alternative fuel. However, since there are many problems for biomethane (which can be substituted with very few, if any, changes compared to natural gas), the barriers for hydrogen where engineering and process changes may also be needed are even greater.

Hybrid furnaces

Participants noted that hybrid furnaces are now an established viable technology, with container glass firms adopting this technology.

Existing measures such as The Supercharger Scheme removes many of the policy-related costs that face other energy-intensive industries. This means that the glass industry is at a more favourable position, as the level of additional financial support required to enable electrification in glass is likely to be lower than in other energy-intensive industries.

Recycling and Cullet

Recycling and cullet are major untapped opportunities for accelerating decarbonisation. Participants noted that a substantial volume of recyclable glass is currently lost due to the

current waste and recycling policy structure. An estimated 200,000-400,000 tonnes of cullet are diverted away from remelt annually, with 230,000 kilotons of glass packaging collected exported internationally in 2023. Current Packaging Recovery Notes (PRN) policy financially incentivises material to be collected, shipped to ports and solved overseas rather than returned to UK manufacturing.

Glass packaging disposed of in general waste may be exported to landfill, and where general waste is incinerated, the glass forms part of the Incinerator Bottom Ash (IBA) which is then recycled as an aggregate.

Flat glass presents compounding challenges. Around 250,000 tonnes of flat glass from construction and demolition currently end up in aggregates or landfill rather than being recovered for remelt. This is a significant missed opportunity, especially given the energy and emissions benefits of using more cullet. Higher cullet use reduces energy demand for melting, cuts process emissions, and lowers the need for raw materials.

The workshop stressed that the UK has considerable scope to improve recovery systems – especially for flat glass, and to retain more cullet within the UK supply chain. This would support both decarbonisation and resource security, whilst reducing reliance on imported raw materials.

Other Potential Opportunities

Energy Efficiency

Energy Efficiency was highlighted as an area where the glass sector has already delivered significant progress in terms of emissions reduction. Over the past 30 decades, energy use per tonne has almost halved in the Glass sector, with efficiency improvements playing a role in delivering these reductions.

Participants noted that further gains remain possible through improved process control, better insulation and the optimisation of additional systems. Whilst these measures may not deliver transformational change on their own, they offer a reliable, low-risk route to continued emissions reduction.

Heat Recovery

Heat recovery is another area mentioned that has already been used in the past 30 years to deliver significant progress in emissions reduction. The glass sector has used waste heat recovery to cut emissions, and new applications could extend this further. Waste heat can be used to preheat raw materials or generate electricity or compressed air for use on-site. However, a key issue with this technology is that when switching to electricity, the volume of waste heat is significantly reduced.

One example raised was the possibility of using recovered heat to support low-cost hydrogen production, with indicative estimates suggesting that hydrogen could be generated at 8-10 pence per kilowatt hour, potentially even lower if industrial waste heat is fully utilised. This approach could produce both low-carbon hydrogen and solid carbon by-product with

commercial value, although it remains at an early stage of development and is not yet commercially viable.

Glass sites outside the UK already use electrolysers to produce hydrogen. In the UK, this option is supported through the electrification business models, making it a more realistic near-term option for industry. Participants agreed that more effective use of waste heat remains a promising opportunity, both for reducing direct emissions and for enabling wider decarbonisation strategies.

Load balancing/Flexibility

Load balancing/flexibility were identified as emerging opportunities, but ones that required significant further work on both the technical and economic aspects, before deployment is possible. Whilst temperature modulation within furnaces could theoretically support grid balancing, the practical challenges remain significant.

There is a need for much closer collaboration with Distribution Network Operators (DNOs) to understand what the grid requires and where feasible flexibility opportunities can be practically delivered. Participants suggested that opportunities may lie in more gradual transitions, such as shifting load over minutes rather than seconds, or taking advantage of lower-cost electricity at night. For sites with dual-fuel capability, there may be scope to modulate between power sources, but only if operators can reliably control the process and manage associated risks. Some felt that AI-based control systems could eventually help, but this remains speculative.

Although some flexibility schemes exist, engagement across the glass sector is minimal as financial returns are not compelling enough to incentivise participation. A few furnaces with 5-10% electric boost could theoretically switch off that load for short periods, but the value proposition is weak without strong incentives. NESO is attempting to roll out new flexibility mechanisms, but uptake remains low for similar financial reasons.

With the right furnace control system and appropriate incentive structures, the sector could play a role in helping to balance the grid. Participants see this as future possibility, rather than an immediate option, but one worth exploring as part of wider decarbonisation planning.

Key Policy Recommendations

Accelerate Deployment of Ready-to-Use Technologies

The workshop identified that several technologies are currently ready to deploy, but uptake largely depends on targeted policy adjustments that reduce electricity costs and level the playing field with European competitors. Focus should be on accelerating the deployment of well-developed, viable existing technologies. Fully electric furnaces and hybrid furnaces operating at 20-80% electricity, are at TRL 9 and can be implemented quickly with the right support mechanisms in place. These “low-hanging fruit” opportunities around electrification and melting should be prioritised, as they offer immediate emissions reductions without requiring major breakthroughs or long deployment timelines.

Electric and hybrid furnaces are already being deployed and implemented at scale throughout Europe. The UK could accelerate adoption by aligning its support framework with those available internationally, particularly in relation to electricity cost.

A key example discussed in the workshop was the Indirect Cost Compensation Scheme, which compensates energy intensive sectors at risk of carbon leakage for the ETS and Carbon Price Support (CPS) carbon costs passed through on electricity bills. Both the flat and container glass sectors are eligible for this support in the EU, reducing operational costs and improving the business case for electrification. However, in the UK, only the glass wool sector currently receives this compensation. Participants suggested that extending this eligibility to the wider glass sector would significantly improve competitiveness and make full electrification more achievable.

Capex Support

Capital support for grid connections and electrification infrastructure is one of the most urgent policy needs for the glass sector and the single largest barrier that must be resolved in the next 2-5 years. Without intervention, many sites will be unable to electrify even where the technology is ready.

The Targeted Energy Discount (TED) scheme appears to have stalled due to funding constraints. The loss of this mechanism removes an important lever for reducing electricity costs at the point of use. At the same time, despite significant growth in onshore renewables, electricity prices remain closely tied to gas prices.

A consistent message was the need to decouple renewable electricity prices from gas markets. Participants stressed that until this happens, electrification will remain economically unattractive and prohibitive, regardless of technological readiness. Capex support for connections, combined with reforms to electricity pricing and targeted discount schemes, was viewed as essential to give the sector a realistic pathway to electrify.

Fix Energy Economics

Participants emphasised that customers for their products in the UK are not willing to pay a premium for decarbonisation. Due to this and other challenges decarbonisation will not be possible without addressing the underlying economics of energy. A variety of policy tools were

discussed and seen as essential to making (more expensive) low-carbon fuels and electrification financially viable for the sector.

A major focus of the discussion was on the treatment of biomethane within the UK ETS. The UK and Northern Ireland's "zero rating" issue was described as a clash between two pieces of legislation that has effectively blocked innovation and market development.

A biomethane purchasing power agreement model, similar to green electricity purchasing power agreements, was proposed as a target mechanism for the glass sector and others. Under this scheme, companies could contract for biomethane quantities, regardless of where they were used within the system. This would bypass infrastructure constraints and delays whilst still contributing to (system/national) decarbonisation.

Participants suggested that a "contracts for benefits" rather than traditional "contracts for difference", could capture the wider environmental and economic gains associated with a scaled bioeconomy. This could help refocus on total lifetime emissions, not just embodied ones. It could also encourage investment more generally by giving producers and/or users the greater certainty provided by a contract as opposed to a regulatory incentive scheme.

Carbon Leakage & Trade

Participants stressed that carbon leakage remains a major strategic risk for the glass sector, and that current UK proposals – particularly a standalone UK Carbon Border Adjustment Mechanism (CBAM) could create more problems than they solve if not aligned with the EU.

The glass sector was initially included in the first phase of the UK CBAM – set to launch in January next year, but the industry successfully lobbied for removal due to the complexity of applying CBAM to glass products. For example, a CBAM applied only to empty container glass would incentivise and encourage producers to fill bottles outside the UK and import them to avoid a tariff. This would undermine domestic production without reducing global emissions. There are also concerns on material substitution. If a CBAM is applied to glass but not to competing materials such as plastic or aluminium, it could raise the relative cost glass packaging and push manufacturers and brands towards higher-carbon alternatives. Participants stressed that this would be an unintended and counterproductive outcome.

The UK should avoid implementing a unilateral CBAM and instead, pursue close alignment with the EU, ensuring that any mechanism is robust, avoids circumvention and does not create competitive distortions. Participants were not opposed to CBAM in principle, but stressed that it must be designed full consideration of the unique complexities of the glass sector, and glass products.

End Policy Fragmentation and Creating Coherent, Cross-Government Strategy

The workshop emphasised that fragmentated policymaking is one of the most significant barriers facing the glass sector, as well as the wider foundation industries overall. They described a system with limited ability to coordinate across departments or align multiple policy objectives. This leads to signals, inconsistent incentives, and an environment that undermines long-term investment confidence.

A strong call was made for a coherent Foundation Industries Strategy supported by cross-department coordination, a designated minister or sector champions, and stable policy frameworks. Without a central point of ownership and decision-making, governments end up with 'whack-a-mole' policies - solving one issue only for another to emerge elsewhere as policies are not aligned. Several examples were given, including Network Charging Compensation increasing from 60 to 90% at the same time as business rates rise, effectively cancelling out the benefit from The Supercharger Scheme. The cumulative effect of these inconsistencies is a perception that the UK is an investment risk, eroding trust and making global companies less willing to allocate capital to UK sites.

Falling demand in both flat and container glass markets adds further pressure, reinforcing the need for a unified approach across DBT, DESNZ, DEFRA and The Treasury. Participants stressed that only a coherent, cross-government policy framework can provide the stability and clarity required for long-term decarbonisation investment.

There was strong support for appointing a Foundation Industries Minister or Champion, to oversee policy impact across government departments, ensuring alignment and to drive rapid decision-making.

Circular Economy Reforms

The workshop identified that policy levers should be used to substantially increase cullet availability and quality, supporting decarbonisation and resource efficiency. Participants identified significant opportunities to strengthen the circular economy for glass, with a clear view that policy reform, particularly within the Department of Environment, Food and Rural Affairs (DEFRA), could unlock significant emissions reductions. This would require more joined-up thinking across government departments in relation to waste policy, local authority systems, and industry practice.

Participants argued that reforming the PRN system and reclassifying glass waste to close the inert-landfill loophole, would help retain more cullet within the UK circular economy. Attendees felt that the UK has strong potential for a cullet market as most glass waste could be used domestically, with only a small portion of green glass likely to require export due to colour-mix constraints.

Support Innovation & Scale-Up: Follow-on funding for NZIP

The UK has built a strong foundation of innovation through programmes such as Net Zero Innovation Portfolio (NZIP), creating a pipeline of technology developers with the potential to supply low-carbon fuel and support domestic decarbonisation and growth. This early-stage investment has positioned the UK well, but that momentum is now at risk. With funding increasingly scarce and difficult to secure, several promising projects have slowed or stalled.

Without follow-on support, the UK may lose the opportunity to commercialise its own technologies. Participants warned that companies developing low-carbon fuels, carbon capture solutions, and other enabling technologies are already looking to Europe, China and Japan for investment. The risk is that the UK continues to import technologies it helped to develop, rather than scaling them domestically. A structured follow-on funding mechanism would allow the UK to build on the achievements of the NZIP programme. Many technologies

are currently at TRL 5-6. With targeted support, this could progress to TRL 8-9, enabling full-scale demonstration. This would allow developers to promote performance, reliability and economics at industrial scale.

Supporting these technologies is a key industrial opportunity to scale UK-based solutions to create jobs, strengthen supply chains, and position British companies to compete globally. This would give the glass industry the confidence it needs to adopt new technologies, whilst ensuring that the economic benefits of innovation remain within the UK.

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