OCTOBER 2025

Glass for Europe's contribution to the call for evidence on the future Electrification Action Plan

Glass for Europe takes the opportunity to provide a contribution to the call for evidence on the future **Electrification Action Plan**, which brings together both the flat glass industry's efforts in the decarbonisation of its processes, including through electrification, and its contribution to the electrification of the building and transport sectors, in line with the objectives of the **Clean Industrial Deal**.

As the European Union accelerates its transition toward a decarbonised economy, the **electrification of the transport, building and industry sectors** has emerged as a critical pillar of the EU's climate and energy policy.

The EU flat glass sector provides products necessary to the **EU's decarbonisation and strategic autonomy objectives.** Flat glass products help to improve the energy efficiency of buildings, support the transition to clean mobility, and contribute to efficient renewable solar energy generation. In all its applications, flat glass is an irreplaceable material whose technological advances, availability and affordability are critical to many of the EU's flagship industries, its economic security and low-carbon future[1].

While already producing **net carbon-avoidance products** throughout their life cycles[2], the flat glass sector has worked tirelessly at reducing CO_2 emissions from its manufacturing processes and continues to do so despite greater economic, international competition and technological constraints.

Glass for Europe is the trade association for Europe's flat glass sector. Flat glass is the material that goes into a variety of end products, primarily in windows and facades for buildings, windscreens and windows for automotive and transport as well as solar energy equipment, furniture and appliances. Glass for Europe brings together multinational firms and thousands of SMEs across Europe, to represent the entire building glass value chain. It is composed of flat glass manufacturers, AGC Glass Europe, Guardian, NSG-Group, Saint-Gobain Glass Industry and Şişecam, and works in association with national partners gathering thousands of building glass processors and transformers all over Europe.

[1] Glass for Europe – *2050 I Flat glass in a climate neutral Europe* – 2020
[2] Up to 37% of the total energy consumption in the EU building stock can be saved in 2050 thanks to high-performance glazing products – TNO *Built Environment and Geosciences*, 2019

1. ELECTRIFICATION OF FLAT GLASS PRODUCTION

The flat glass sector is different from other glass industries in that it has bigger furnaces and a very high melting temperature. It also has a continuous process. Electrification is seen as a strong option to reduce emissions in the sector, which the industry is currently testing.

Today, flat glass is not on the **indirect emissions compensation** list under the EU ETS Directive. Therefore, no support has been granted by any Member State that could incentivise the uptake of electrification in the sector. The eligibility of the flat glass sector would represent a **support to greater electrification**, which goes along with less free allocation, more indirect carbon costs and therefore a reinforced total risk of carbon leakage.

Along the same lines, preserving the exemption for mineralogical processes, among which flat glass, in the **Energy Taxation Directive** is of significant importance for the existence of a business case in further electrification of the EU flat glass industry.

The flat glass industry is **highly energy intensive**. Flat glass is produced in very big furnaces (typically 700 t/day) and at a very high temperature (typically 1,600° C). While the main energy source is natural gas, electricity is used mainly to feed auxiliary heating systems (electric boosters), and currently typically represents around 10-15% of the total energy consumption. In addition, hybrid partially electrified furnaces represent a significant field of exploration for the reduction of CO_2 emissions – see below.

Energy demand in a single float plant is significant. Flat glass making is a **continuous process**, functioning 24/7, 365 days per year. An uninterrupted supply of energy is needed to keep the flat glass furnace at the required temperature, for the proper functioning and safety of flat glass manufacturing installations. Changes in temperature generate stress on the refractory bricks, which constitute the shell of the melting furnace, and thus create a risk of industrial hazards.

During the energy crisis, accelerated by the Russian invasion of Ukraine in 2022, electricity prices in the EU have been subject to **significant increases**. This shows clearly in industrial costs which are today oscillating at much higher levels than in 2019. Over the last years, the energy cost share in the total production cost of flat glass has been above 30% in the EU (see DG ENER study on energy prices and costs[3]). Glass for Europe has consistently alerted the European Commission of this impact throughout the energy crisis.

The latest DG ENER study considers the EU flat glass sector as one of the sectors with the **highest energy-related costs**. It found that electricity prices in the EU in 2023 are more than double compared to 2019. For flat glass specifically, it is found that the average cost of electricity per tonne **increased by 4.77 times** in this period.

There have been **plant or line closures in the EU flat glass sector in the last 10 years**, including amid the energy crisis. In addition, not all plants operate at capacity today. Due to the high OPEX, in addition to CAPEX, profitability is negatively impacted to the point of idling part of the capacities. DG ENER's study has found that the EU flat glass sector experienced a decrease in production since its energy costs increased, equivalent to 18% between 2019 and 2023.

[3] DG ENER's study on energy prices and costs, 2025, https://energy.ec.europa.eu/data-and-analysis/energy-prices-and-costs-europe_en

The flat glass sector typically today uses around 85-90% of natural gas and 10-15% for electricity boosting in the furnaces. Greater electrification to bring the share of electricity to 15% or eventually 20% is currently undertaken in many sites, after which this technology will have reached its potential. The electric part is used as a boost, which is the common technology not only at the EU level, but also globally. A world-first trial of a small-scale hybrid plant (50% electricity & 50% oxyfuel) is currently being conducted in the Czech Republic, with conclusions regarding the technology expected in 2028 – see Volta project[4] launched jointly by two flat glass companies, AGC and Saint-Gobain, to shield the significant financial and industrial risks.

It is important to understand that the flat glass sector is characterised by **long investment cycles**, with a furnace typically lasting 16-20 years. This means that technology changes need to be performed at the end of the furnace's life.

The European Commission's scoping paper rightly points out that "***the uncertainty regarding the operational costs of using electricity instead of fossil fuels is a deterrent to investment decisions***".

The availability of a mature technology deployable at scale, and electricity availability and affordability are the main challenges in the flat glass sector related to electrification. Investment plans in hybrid partially electrified furnaces are all the riskier in the current electricity market context. Hybridisation bears significant benefits in reducing gas consumption and CO_2 emissions but makes **plants more sensitive to electricity price variations**. This impact is significant, especially for an industry with very short margins.

A December 2024 Compass Lexecon study[5] for the Enel Foundation recognises that flat glass production is characterised by very high temperatures and process heat requirements. Flat glass making is associated with high technological and economic barriers. The study also concludes to a **substantial cost gap between fossil-based and low-carbon technologies**, finding that both CAPEX and OPEX incentives would be needed to tie industrial realities and policy objectives together.

A September 2025 study[6] commissioned by the Federal Climate Change Department of Belgium has found that **high electricity prices are a key barrier** to economically viable decarbonisation in the glass sector: *"Current electricity costs often make electric melting uneconomic without low-cost renewables or policy support".* **Grid capacity** is also noted as a constraint, given the fact that electricity demand, especially for flat glass melting, is substantial. If the industry were to bear the costs and risks associated to expanding the infrastructure, the existence of a business case would be all the more jeopardised.

2. ELECTRIFICATION OF BUILDING STOCK

Through the use of advanced flat glass technologies, from solar-active façades to smart windows, the EU can unlock a new generation of electrified, energy-generating buildings. Supporting the uptake of

[4] Volta project, https://www.agc-glass.eu/en/sustainability/hybrid-mid-sized-pilot-furnace-for-flat-glass

[5] Compass Lexecon study, *Reviving Europe's Industrial Power: How to boost competitiveness through energy*, December 2024, https://www.enelfoundation.org/topics/articles/2024/11/potential-and-benefits-direct-indirect-electrification-eu-industry

[6] BSoG-VUB study for BELSPO, *DeepIn: Technico-economic potential of deep decarbonisation options in the industry: survey and lessons for Belgium*, https://www.brussels-school.be/research/publications/deepin-deep-industrial-greenhouse-gas-reductions-belgium

these flat glass materials should be a key element in the EU's strategy to achieve a carbon-neutral, electrified built environment.

Buildings, like other sectors, will need to electrify to decarbonise. Today, however, there is not enough capacity on the grid. Efficient windows can cut demand in buildings and are essential parts of efficient building envelopes that are key to mitigate the electricity peak demand. Thus, energy efficiency in buildings not only helps buildings to decarbonise but also helps free up capacity on the grid for other sectors. A sound electrification strategy needs to start with boosting **energy efficiency in buildings**, which will also help reduce energy bills.

From heating and cooling to on-site renewable energy generation, buildings are envisioned as increasingly becoming both energy consumers and producers within a smarter, greener grid. In this context, flat glass products, for example integrated into building envelopes, are playing an essential **enabling role in the electrification of the building stock**.

Today's **advanced glazing solutions can actively support electrification** through multiple pathways. For example, Building-Integrated Photovoltaics (BIPV) mean that flat glass can be transformed into energy-generating surfaces by embedding photovoltaic cells directly into façades, curtain walls, or windows. BIPV enables on-site renewable electricity generation without occupying additional land. This not only contributes to energy autonomy but reduces grid demand and supports decentralised electrification strategies. Other innovations, such as electrochromic and thermochromic glass regulate solar gain and interior temperature by changing tint in response to electric signals or heat. Advanced glazing solutions can dramatically lower heating demand in winter by improving insulation, while in summer they can mitigate overheating and reduce the reliance on air conditioning. These technologies reduce electricity demand for air conditioning and lighting.

3. ELECTRIFICATION OF TRANSPORT

Flat glass products also support the **electrification of transport**, both within vehicles and across the broader transport ecosystem. Advanced glazing systems, which can impact the electricity consumption and generation of vehicles, should be incentivised through existing schemes like the eco-innovation scheme and new ones (e.g. targets for reducing the energy impacts of air-conditioning in vehicles, market mechanisms to encourage use of advanced glazing systems in light-duty vehicles, etc.)

Innovative use of photovoltaic glass in vehicle roofs allows solar energy to be harvested directly by the vehicle. This can play a positive role in an extended driving range for electric vehicles (by charging the battery or auxiliary systems), a reduced load on the grid, especially when solar power is used for pre-conditioning or ventilation. This contributes to improved energy efficiency, contributing to EU goals for sustainable mobility.

Today, automotive glass parts can incorporate transparent heatable glazing, solar control coatings, or dynamic glazing solutions (to adapt the light transmission of the glass) so as to improve the energy efficiency of vehicles. Such solutions can reduce the need for energy-intensive defogging/defrosting systems and contribute to energy savings of the mobile-air conditioning system. Automotive glazing can also integrate antennae and sensors which support vehicle connectivity and automation, and enable weight reduction through multifunctional components.

Flat glass also supports the electrification of transport infrastructure with BIPV in charging stations, bus shelters, and transport hubs enabling local renewable electricity generation, as well as safety and performance in public transport systems through durable, smart glazing solutions.

Flat glass is contributing to the transition to electrified transport, more efficient buildings, while looking into further decarbonising its processes including through electrification. Recognising and supporting these developments will strengthen the EU's efforts to build a cleaner, more resilient society.

***