

Climate neutral by 2030

Challenges and potential solutions
for the climate strategy of a responsible
specialty glass manufacturer

GLASSLOVERS



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Executive Summary

- 🌱 The international specialty glass manufacturer SCHOTT wants to make an active contribution to climate protection and has set itself the goal of being “**climate neutral by 2030**” as a key component of its new Group Strategy.
- 🌱 Pioneering spirit, long-term thinking and responsible action have always been deeply rooted in SCHOTT’s DNA. The company is also guided by these principles when it comes to the fight against climate change.
- 🌱 The ambitious goal is to be achieved with the help of an action plan that focuses on four fields of action: Technology change, increasing energy efficiency, switching to green electricity and compensation for technologically unavoidable emissions.
- 🌱 The greatest challenge is the technological change – also with regard to the time factor. Here, SCHOTT is focusing particularly on electrification and hydrogen technology.
- 🌱 The specialty glass industry needs the right political framework conditions and financial support to ensure that the transformation to climate neutral production can succeed.

SCHOTT has always been a pioneer in the specialty glass industry. The company also wants to lead the way in climate protection.





Foreword

Ongoing climate change is one of the greatest challenges of our time. Looking to the future of our planet, it is high time to act. Everyone must take responsibility – politicians, companies and society.

We at SCHOTT are ready to take responsibility. As an energy-intensive specialty glass manufacturer with over 40 production sites worldwide, we want to make an active contribution to climate protection. This is why we have set the goal of climate neutrality as a key component of our new strategy. With the “Zero Carbon” program, we want to further develop SCHOTT into a climate neutral company by 2030 and become the world’s first climate neutral specialty glass manufacturer.

For more than 130 years, responsibility for employees and society has been deeply rooted in our DNA as a foundation company. We want to live up to this commitment and conviction in climate protection even more than before.

Based on the principle “Avoid – Reduce – Compensate,” we are pursuing a decarbonization action plan comprising four fields of action: Technology change, increasing energy efficiency, switching to 100 percent green electricity, and compensation for unavoidable greenhouse gases.

We are convinced that, as an innovation leader, we will provide important new impetus to the specialty glass industry in the years and decades to come.

We have embarked on the arduous journey towards climate neutrality with a clear goal in mind. However, we do not yet know all the possible solutions. In any case, we are working with great passion to achieve this ambitious goal.

The transformation to a climate neutral company is not only an enormous challenge. We also view it as a great opportunity to secure our future viability. We are convinced that in the long term, only truly sustainable companies that reconcile economic, ecological and social responsibility will be successful on the market.

This White Paper is intended to provide deeper insights into our motivation and objectives, as well as the challenges and solutions on our way to climate neutrality.

We hope you enjoy reading it.

Mainz (Germany), March 2021



DR. JENS SCHULTE
Member of the Board
of Management

DR. HEINZ KAISER
Member of the Board
of Management

DR. FRANK HEINRICH
Chairman of the Board
of Management

HERMANN DITZ
Member of the Board
of Management



Specialty glass pioneers with social responsibility

Pioneering – responsibly – together. These attributes characterize SCHOTT as a manufacturer of high-tech materials related to specialty glass. Since our company founder Otto Schott became the inventor of specialty glass and the pioneer for an entire industry more than 130 years ago, the #glasslovers from SCHOTT have been constantly opening up new markets and applications.

The product portfolio ranges from CERAN® glass-ceramic cooktop panels to pharmaceutical glass, ultra-thin cover glass for foldable smartphones, substrate materials for semiconductors, microscopic glass structures for diagnostics and giant telescope mirror substrates. As one of the world’s leading suppliers of pharmaceutical packaging, we as a glass expert have also been playing a key role in the current fight against the corona pandemic. Thanks to our outstanding expertise in the fields of specialty glass, glass-ceramics and related materials, our company is a strong partner to high-tech industries such as healthcare, home appliances and living, consumer electronics, semiconductors and datacom, optics, industry and energy, automotive, astronomy, aviation and aerospace.



Nearly all manufacturers of COVID-19 vaccines rely on pharmaceutical vials from SCHOTT. Photo: Getty Images / Onuroner

Key Figures for Fiscal Year 2019/2020

- Global sales of EUR 2.24 billion
- 16,500 employees
- Represented in 34 countries



Acting responsibly has always been part of SCHOTT’s corporate culture.

Sustainable corporate model

SCHOTT is solely owned by the Carl Zeiss Foundation, one of the oldest foundations in Germany. With its statute from 1896, the foundation established for its two companies, ZEISS and SCHOTT, a unique corporate model to this day that is focused on sustainable development and a special responsibility for employees and society as a whole.

While the social issue was at the top of the sustainability agenda in historical times, responsibility for the environment and climate has long since been added. Environmental protection has been an officially declared company goal since 1987, and targeted measures were taken well before then. SCHOTT continues to set standards in the glass industry through the use of state-of-the-art technologies and by making continuous process improvements, in energy efficiency as well as the denitrification and dedusting of melting tank exhaust gases, for example.

With its strategic goal of being “climate neutral by 2030,” SCHOTT has now initiated a new era in its environmental and climate commitment.

Learn more here:
[Environmental and climate protection](#)



The challenge of climate change

Ongoing climate change is one of the greatest challenges of our time. If the global rise in temperature cannot be limited, the livelihoods of more and more people will be at risk. Against this backdrop, around 200 countries pledged in the 2015 Paris Climate Agreement to limit man-made global warming to well below 2 degrees. In its special report on the subject published in 2018, the Intergovernmental Panel on Climate Change (IPCC) revealed new findings on the consequences of global warming. On this basis, it derives the need to limit global warming to a maximum of 1.5 degrees compared to pre-industrial times. The realization that climate change is threatening the very existence of the planet is becoming increasingly clear to people.

Goal: To become the first climate neutral specialty glass manufacturer

The change in the climate that can be felt in many regions of the world has led to the fight against climate change moving high up on the agenda of many countries and companies. SCHOTT, as a globally active Group, is also facing up to this responsibility and has clearly positioned itself: the specialty glass manufacturer wants to become climate neutral by 2030.



“In view of the advancing climate change and the future of our planet, we can no longer wait. It is high time to act. Everyone must take responsibility – politicians, companies and society. We are ready to do so. We want to make an active contribution to climate protection.”

Dr. Frank Heinrich, Chairman of the Board of Management of SCHOTT AG

No other company in the specialty glass industry or the glass industry as a whole has ever set such an ambitious goal. In line with this, the Group has anchored the goal of climate neutrality in its new Group Strategy adopted in 2020.

Learn more here:

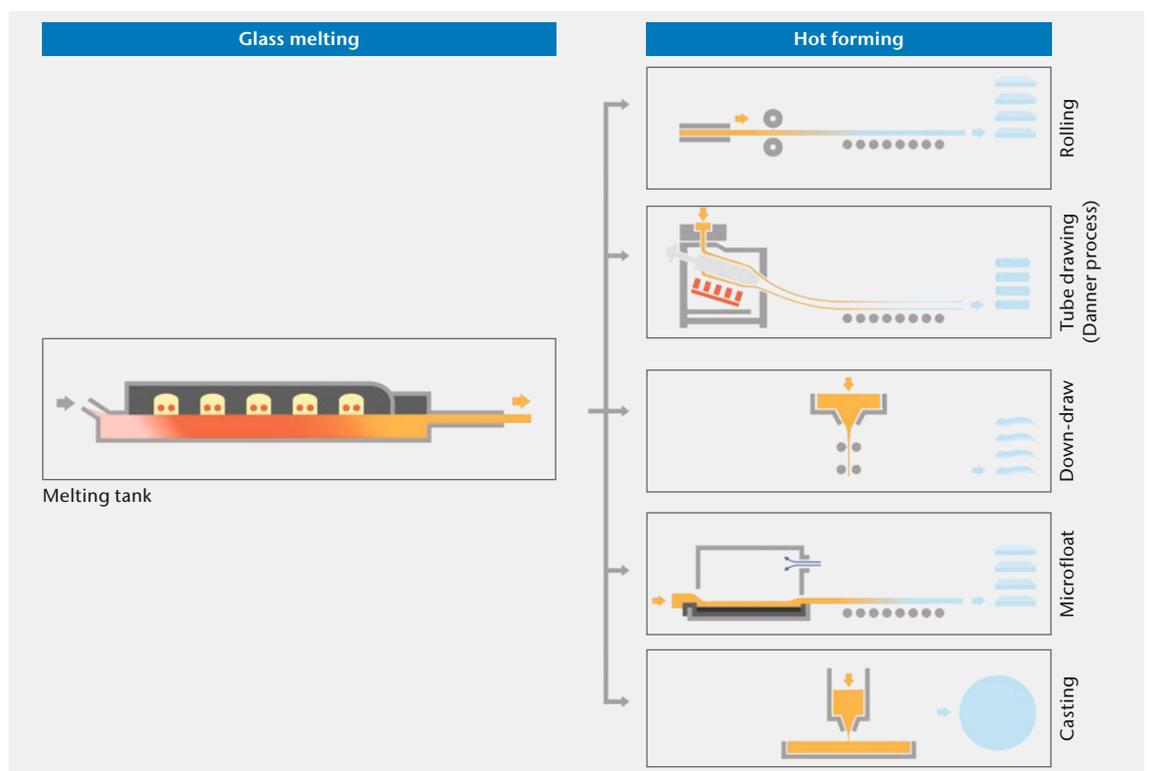
[Press release](#)



Glass production is energy intensive

As a specialty glass manufacturer, SCHOTT operates in an energy-intensive industrial sector, similar to companies in the cement, lime, steel and chemical industries that are at the beginning of the value chain as basic material or material manufacturers.

Specialty glasses and glass-ceramics are melted at temperatures of up to 1,700 degrees Celsius in melting units with a daily output ranging from half a ton to 100 tons. The continuous melting process runs 24 hours a day, 365 days a year, with run times of up to ten years.



Energy-intensive core processes at the beginning of glass production: glass melting and hot forming. Specialty glasses are melted at temperatures of up to 1,700 degrees Celsius.

Besides glass melting, a lot of energy is also required for hot forming and further processing of the glass.

Until now, the melting tanks have been heated mainly with natural gas, and to a much lesser extent, heating oil. In some cases, the melting units have supplementary electric heating in addition to natural gas burners. Smaller units can also be heated exclusively using electricity.

The most common heating technologies for large glass melting tanks are the classic air-fuel technology and the more modern oxy-fuel technology. Air-fuel melting tanks are fired with an air-natural gas mixture, while oxy-fuel tanks are fired with an oxygen-natural gas mixture.

SCHOTT was one of the first companies in the glass industry to introduce oxy-fuel technology on an industrial scale starting in the mid-1990s. It is significantly more efficient than the old air-fuel technology and thus causes considerably lower CO₂ emissions. As a result, SCHOTT has succeeded in reducing the specific energy consumption per ton of glass by more than 30 percent with oxy-fuel firing.

Heating technologies for glass melting units

- Air-fuel:** Combustion of natural gas and heating oil with air
- Oxy-fuel:** Combustion of natural gas and heating oil with oxygen
- Hybrid:** Combination of oxy-fuel firing with electric auxiliary heating
- Electric:** Heating exclusively with electricity. Mostly for smaller melting tanks



Carbon footprint: 1 million tons of CO₂e in 2019

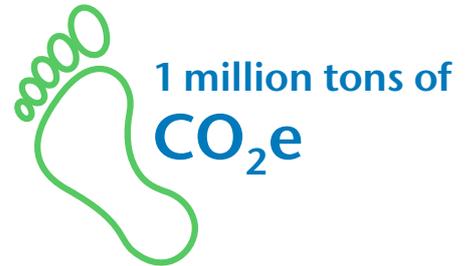
SCHOTT's climate relevant footprint totaled approximately 1 million tons of CO₂e (CO₂ equivalents)* in fiscal year 2019. This is roughly equivalent to the CO₂ emissions of a city in Europe with 150,000 inhabitants.

The company looks at the emissions of all greenhouse gases when collecting data. CO₂ is the main factor here. The other greenhouse gases, such as methane, nitrous oxide, etc., play hardly any role. In its calculations, SCHOTT currently focuses on the direct emissions from its own production (Scope 1 of the Greenhouse Gas Protocol / GHG Protocol), which primarily result from the combustion of natural gas and heating oil, as well as the indirect emissions associated with the electricity purchased (Scope 2 GHG Protocol).

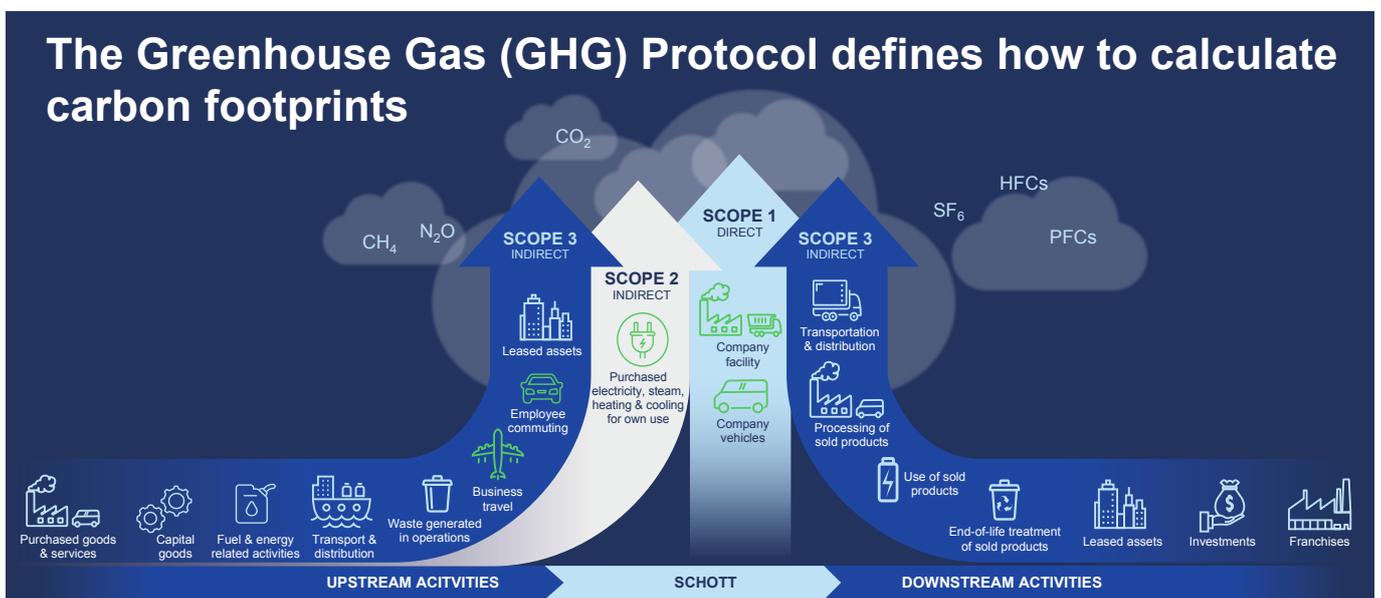
In order to obtain a valid data basis on climate relevant emissions, the Corporate Carbon Footprint (CCF) has been determined in Scope 1 and Scope 2 since fiscal year 2018 and the conformity of the CCF with the requirements of the GHG Protocol has been verified and confirmed by internationally renowned agencies. In doing so, SCHOTT was able to build on annual reporting on the energy consumption of all production sites worldwide, which has been standardized for years, as well as existing ISO certifications for environmental management systems (ISO 14001) and energy management systems (ISO 50001).

SCHOTT also takes business travel and employee commuting from Scope 3 in addition to Scope 1 and Scope 2 emissions into account when determining the Corporate Carbon Footprint. The company is therefore initially focusing on the emissions it can influence itself, but intends to include the other Scope 3 emissions from the upstream and downstream supply chain in the medium term.

* In order to establish comparability in terms of their climate impact, greenhouse gas emissions are expressed in CO₂ equivalents (CO₂e) according to the GHG Protocol.



... was the Corporate Carbon Footprint (CCF) at the starting point of the strategy project "Zero Carbon".

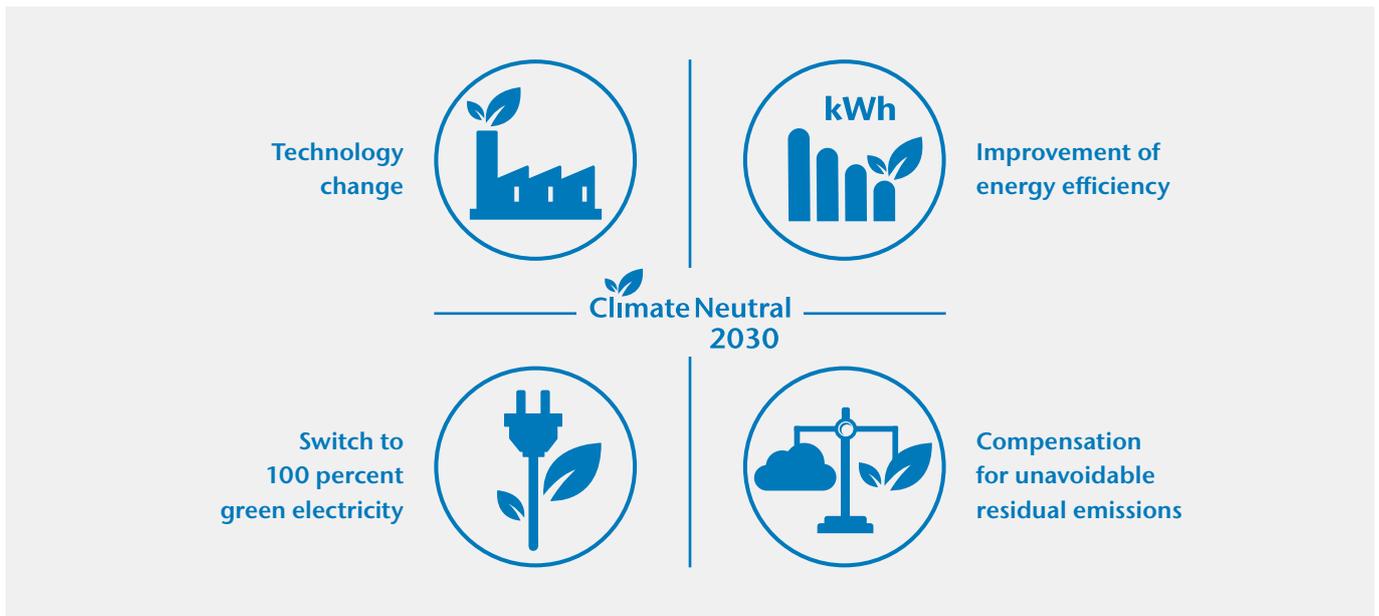


The Greenhouse Gas (GHG) Protocol defines the categories and calculation standards for the climate relevant footprint. SCHOTT initially intends to focus primarily on reducing Scope 1 and Scope 2 emissions.



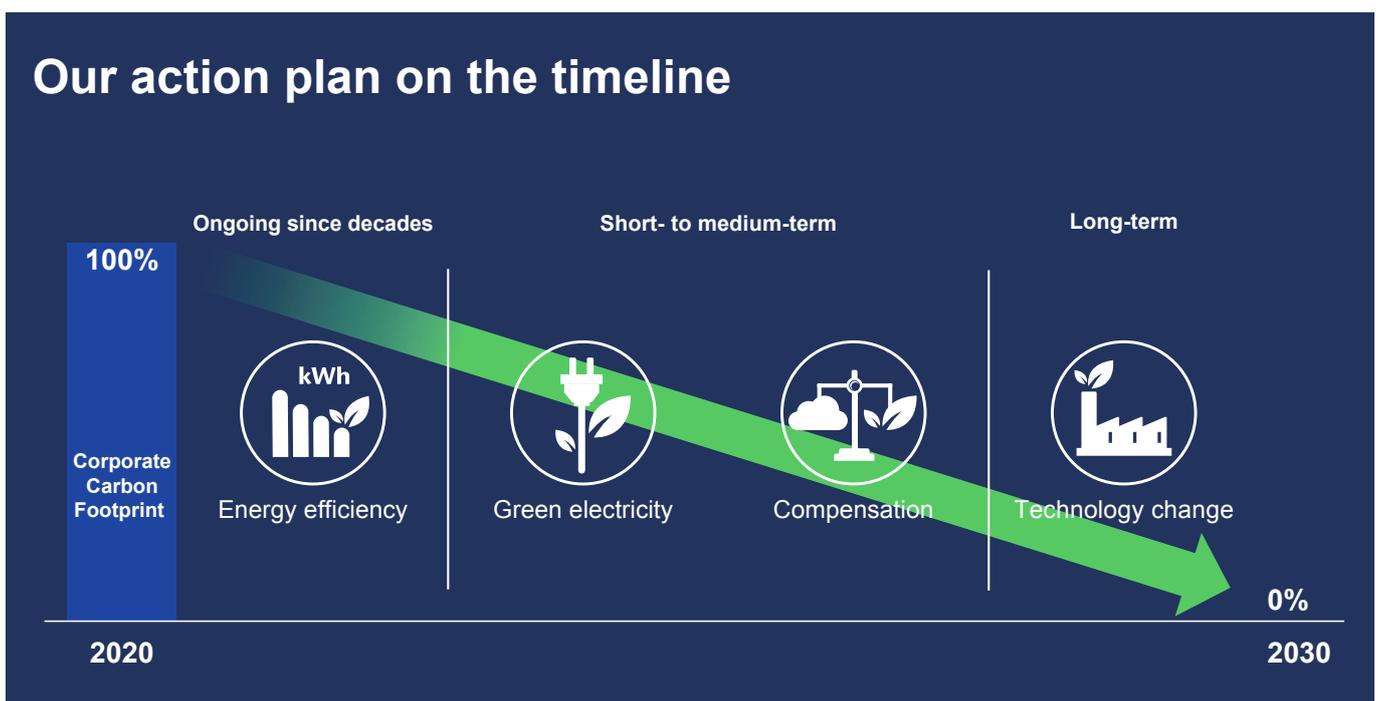
Action plan comprising four fields of action

SCHOTT has defined an action plan for decarbonization based on the principle of “Avoid – Reduce – Compensate” that comprises four fields of action:



Viewed on a timeline, short-term successes can be achieved by switching electricity demand to green electricity and by compensating technologically unavoidable emissions. Technological change, on the other hand, is a long-term task. After all, improving energy efficiency has always been an ongoing task at SCHOTT.

Our action plan on the timeline



SCHOTT is working on four levers on its way to climate neutrality. Technology change will take the longest amount of time.



Technology change with a focus on electrification and hydrogen

Around 30 percent of the climate damaging emissions at SCHOTT currently come from the company's own production, i.e., they are Scope 1 emissions according to the GHG Protocol. They are primarily caused by the use of natural gas in glass melting, hot forming and further processing. Only a switch to CO₂-free or CO₂-neutral energy sources can remedy this situation.

The goal of climate neutrality requires a massive upheaval in glass production, in some cases with groundbreaking innovations. The development of new melting technologies that no longer rely on the use of fossil fuels takes time, involves a great deal of development and expense, and is dependent on external factors. Therefore, the technological transformation process is the biggest challenge on the way to climate neutrality.

Achieving the goal of climate neutrality requires a massive upheaval in glass production.



In developing new technologies, SCHOTT focuses primarily on the most energy-intensive process step of glass melting and pursues two transformation paths: electrification and hydrogen technology.



Electrification transformation path

Electrification is about making greater use of electricity, in particular green electricity, to directly heat the melting tanks. SCHOTT has been operating smaller, fully electrically heated melting tanks for decades. For larger melting tanks, the company has been using hybrid technology since the 1990s, i.e., the combination of fossil oxy-fuel firing, sometimes with electric auxiliary heating. In the future, the task will be to develop technologies that gradually increase the heating share of electricity, ideally up to fully electrically heated large-volume melting tanks based on electricity from renewable energy sources.

Hydrogen technology transformation path

Hydrogen technology is about using hydrogen as a fuel to heat the glass melting tanks instead of natural gas. Here, SCHOTT is focusing on “green” hydrogen, i.e., hydrogen that is produced with the help of electrolysis and electricity from renewable energy sources.

Similar to electrification, graduated solutions are also conceivable for hydrogen technology. One option is to blend hydrogen with natural gas, which has been the dominant fuel to date, while the other is to use pure hydrogen as a fuel. Initial melting tests at SCHOTT on a laboratory scale have yielded promising results. The company is also actively involved in several development projects on hydrogen utilization in the glass industry.

Although the technologies for producing hydrogen are not new, little experience has been gained so far in its large-scale use. Hydrogen is currently still a niche product that is mainly used as a base and process material in the chemical and petrochemical industries. In addition, there is still no large-scale industrial hydrogen production and no nationwide supply infrastructure. It is therefore to be welcomed that the German government and the European Union want to support the development of hydrogen technology.

As part of the “National Hydrogen Strategy”, a comprehensive catalog of measures is to be prepared, feasibility studies on technologies, production, storage, infrastructure and logistics are to be developed, and potential atlases for economically suitable locations in the world for a future green hydrogen economy are to be drawn up. On this basis, the German government then intends to support the market ramp-up with subsidies. With its hydrogen strategy, the European Union also wants to establish an internationally competitive hydrogen industry by 2030.

Alternative: Hydrocarbons transformation path

In addition to the two main technologies of electrification and hydrogen, SCHOTT is examining a third solution involving the use of synthetic or biogenic hydrocarbons as an energy carrier. For example, methane produced with the help of green electricity and CO₂ or biogas produced by methanization, or biogas whose heating value can be increased by methanization. The extent to which liquid biofuels can be used directly is also being investigated.

Hydrogen as an energy carrier – gray, blue or green?

Gray hydrogen

Produced by using natural gas via the process technology route of steam reforming. This produces climate damaging CO₂, which is released unused into the atmosphere.

Blue hydrogen

This is gray hydrogen, where the CO₂ is not released into the atmosphere, but captured and stored (Carbon Capture and Storage / CCS). It is therefore considered climate neutral.

Green hydrogen

Produced using only electricity from renewable energy sources via the electrochemical route of electrolysis, making it CO₂-free. SCHOTT relies on green hydrogen.

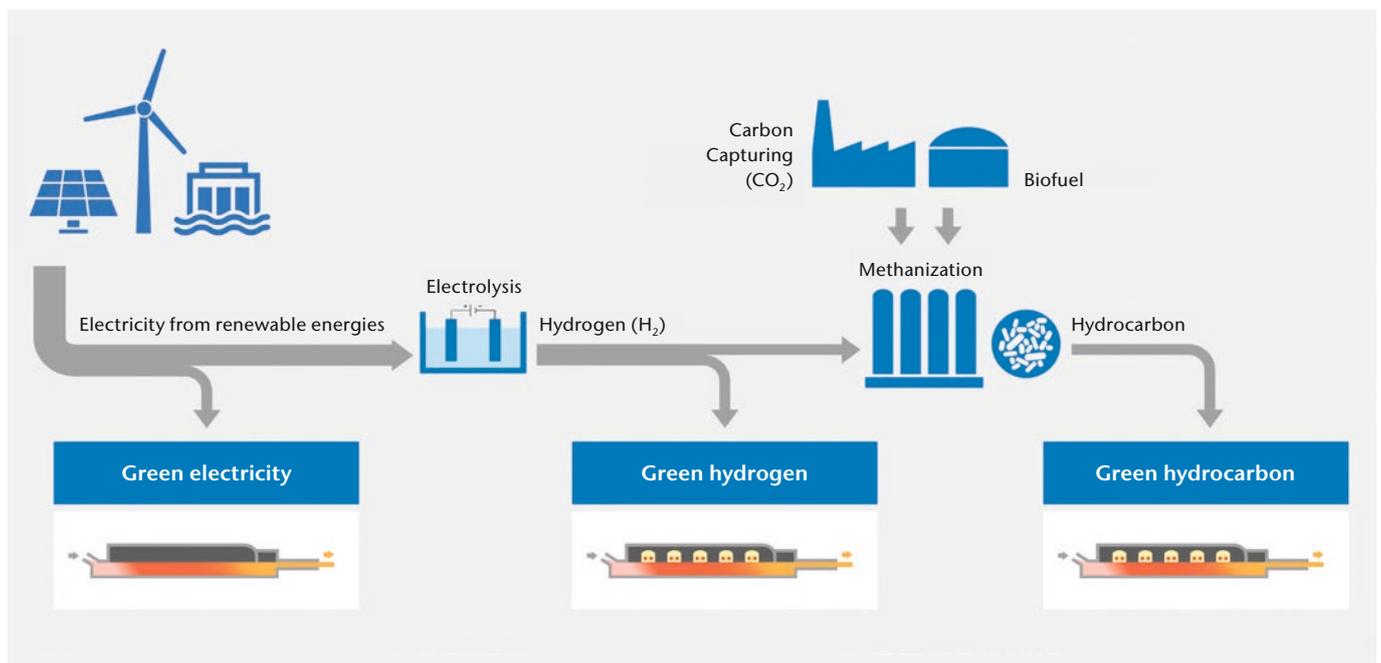
Complex technological challenges

Glass melting is a highly complex and sensitive process. Different glass properties and qualities require different raw material compositions, melting aggregates, melting methods and forming processes. Different interactions must also be taken into account within the melting technologies currently available. Therefore, depending on the type of glass and product, different scenarios for CO₂-neutral or CO₂-free production must be developed with solutions that fit exactly in each case.

Due to the complex interrelationships, the development of new technologies is associated with elaborate process simulations as well as considerable risks and uncertainties with regard to the production process, product quality and the necessary financial expenditure.

Dependent on renewable energy sources

In addition to these complex internal technological challenges, external factors also play an important role. The focus here is on electricity from renewable energies, which forms the basis for all three technology paths.



SCHOTT is pursuing three approaches to technological change. Electricity from renewable energy sources forms the starting point for them all. The most efficient is the direct use of green electricity. In comparison, the overall efficiency of hydrogen and hydrocarbons decreases because some of the electrical energy originally present is lost during their production.

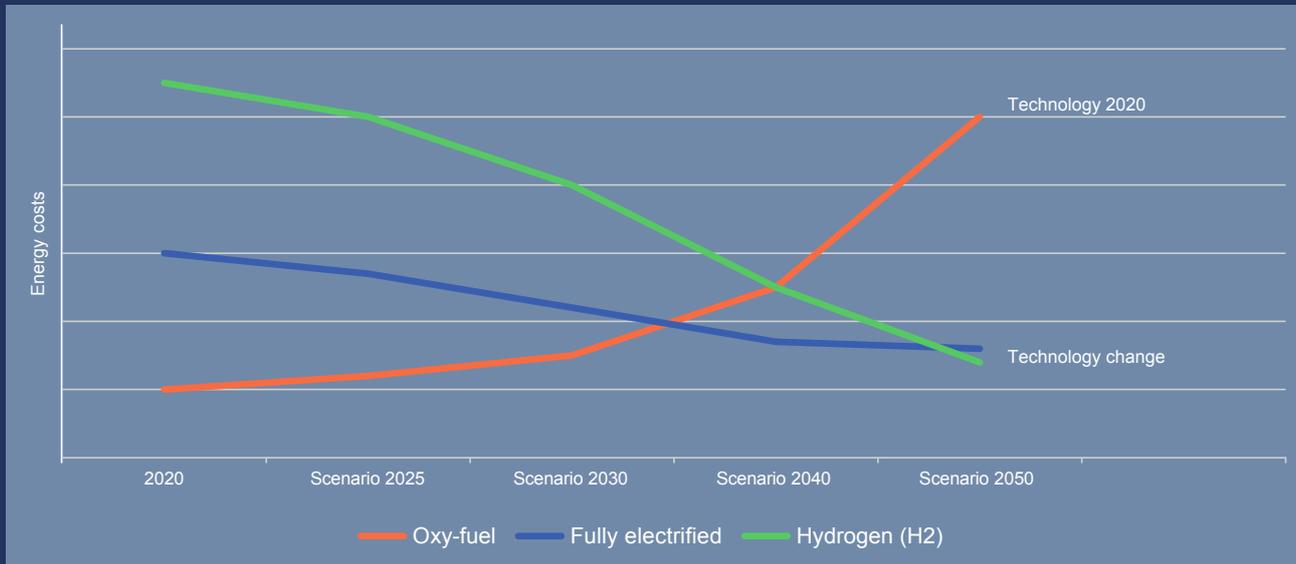
A key problem is that the availability of green power is currently limited and the costs are significantly higher than those of natural gas. Therefore, renewable electricity capacity must be expanded significantly and availability must be assured at competitive prices.

The technology shift and energy turnaround in the glass industry therefore depend to a large extent on developments in the energy sector.



Energy cost scenarios and technology change

Electricity price falls sharply, gas price remains low, green hydrogen becomes available, price of CO₂ certificates rises significantly



Assuming that the price of electricity for renewables decreases over time, the price of natural gas remains stable, hydrogen at some point becomes available, and the price of CO₂ certificates steadily increases, new technologies will be operationally cheaper in the long run than today's oxy-fuel technology.

Based on the specific challenges related to the production process, product properties and customer requirements, each Business Unit must develop its own individual technology roadmap. In addition to the maturity level reached in the technological solution approaches, the runtimes of the glass melting tanks and investment cycles as well as the required investment costs must also be taken into account.

No matter which viable technological solutions SCHOTT will find, immense development and investment costs will be required to achieve sustainable technological change.

The experts at SCHOTT do not expect to see the widespread use of new, climate friendly technologies for at least 20 years.



“We are convinced that, as an innovation leader, we will provide important new impetus to the specialty glass industry in terms of technological change in the coming years and decades.”

Dr. Jens Schulte, member of the Board of Management responsible for the “Zero Carbon” strategy project.



Improvement of energy efficiency

SCHOTT has been focusing on the continuous improvement of energy efficiency and the associated reduction of energy consumption for decades. Due to the high cost of energy, this has always been an important ongoing issue from a business management perspective alone. Based on the principle of “Efficiency First”, SCHOTT is constantly working on identifying and utilizing energy efficiency potential. Due to the permanent optimization of processes, however, the company is increasingly reaching the limits of what is feasible with the technologies currently in use.

Replacing the melting tanks still in operation that use air-fuel technology with melting units that use the more energy-efficient oxy-fuel technology offers some potential for improving energy efficiency, as long as no large-scale solutions are available that work without the use of fossil fuels. However, this is only possible at melting sites that have a stable power supply. After all, oxy-fuel technology requires large quantities of oxygen, and the large-scale production of oxygen requires on-site air separation units, which can only function smoothly if the power supply is stable.

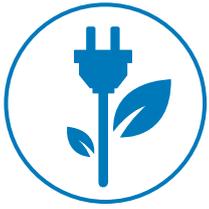
Regardless of this, energy and melting experts are working intensively within the framework of the proven energy management system to leverage further energy-saving potential. The focus here is on various starting points: preheating the raw material mix, more efficient burners, reducing heat losses, utilizing waste heat, and increasing the yield per unit of energy by further optimizing quality control and thus reducing the reject rate.

Increasing efficiency through digitalization

The digitalization of the melting process and artificial intelligence also come into play when it comes to increasing efficiency. Thanks to new sensors and technologies from the field of Big Data, mass data recorded at the melting tanks can be better structured, analyzed automatically and used to achieve process improvements. Process engineers and technicians can thus recognize the complex interactions more quickly and intervene in a more targeted manner, if necessary. This will lead to an improvement in process stability and a higher yield – in short, to a further increase in efficiency.



Artificial intelligence can be used to make the melting process more efficient.



100 percent green electricity from 2021 onwards

Technology change is a long-term goal that is like running a marathon and requires staying power. The situation is different when it comes to indirect Scope 2 emissions, i. e., the CO₂ emissions associated with the electricity purchased. Here, SCHOTT is already moving at a sprinter's pace in order to completely switch its global electricity purchases to green electricity as soon as possible. Already by the end of 2021, the company wants to cover 100 percent of its electricity needs with renewable energies, preferably by wind power and solar energy, and thus reduce Scope 2 emissions to zero.

Share of green electricity already at 75 percent

A major milestone on this path was already reached in fiscal year 2020 with a green electricity share of 75 percent. The initial focus was on the conversion at particularly energy-intensive sites, i. e., above all the plants that melting units operate in.

Green power certificates with high quality standards to start with

In the first phase, SCHOTT will be making the switch to green electricity with a solution that is practical in the short term by purchasing green electricity certificates. These certificates of origin, known as EACs (Energy Attribute Certificates) or I-RECs (International Renewable Energy Certificates), prove the origin and the amount of electricity produced with renewable energies.



SCHOTT intends to cover its electricity needs entirely from renewable energies from 2021 onwards.



When purchasing EACs, SCHOTT makes sure that they meet two criteria. First, that the certificates – as far as possible – come from electricity generation plants in the countries that the company actually consumes the electricity in. The situation is different at the consumption site in Germany. As there is too little market supply, the EACs for electricity consumption at these melting sites have so far come from other European countries.

The second criterion is the quality of certificates. There are, in fact, different standards for the suppliers as well as the green power certificates themselves. SCHOTT pays very close attention to ensuring that the certificates of origin it purchases guarantee a high standard of quality and make a sustainable contribution to the energy transition.

In line with this high quality standard, SCHOTT relies on EACs with the internationally renowned non-profit EKOenergy label or, as in the USA, with the Green-e green electricity label. Both labels guarantee that the operators of the respective plant meet special sustainability criteria.

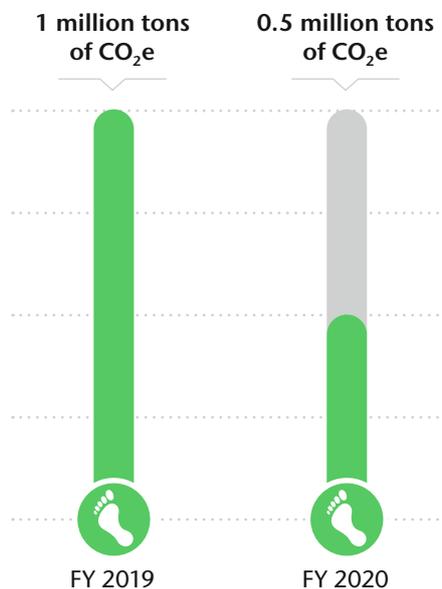
Power Purchase Agreements also on the horizon

In the next step, SCHOTT will also seek to use the instrument of Power Purchase Agreements (PPA) – long-term power purchase agreements made directly with operators of renewable energy plants. Here, too, the focus is on quality: by entering into PPAs, preferably with newly constructed plants, SCHOTT wants to support the expansion of renewable energies and thus make a contribution to increasing the availability of green electricity.



Corporate Carbon Footprint:

By switching to 75 percent green electricity, SCHOTT already reduced its climate damaging emissions by half in 2020.





Compensation for unavoidable residual emissions

SCHOTT will compensate technologically unavoidable emissions that are harmful to the climate by engaging in certified climate protection projects. Efforts to do so have already been made, and the first contracts on compensating projects were concluded at the end of 2020. Now, the Group intends to expand the compensation portfolio step by step by pursuing a clearly defined strategy. The goal is to completely compensate the emissions in 2030 that cannot be avoided by then through technological change, further improvements in energy efficiency and the exclusive use of green electricity so that SCHOTT will be a climate neutral company by 2030.

Strict selection criteria and high quality standards

When selecting offsetting projects, the company is guided by clear criteria and minimum requirements. Thus, the initial focus is on the project categories of forestry and land use. Additional aspects of environmental and social sustainability are also taken into account, such as biodiversity or the projects' direct support for the local population. This creates a link with the Sustainable Development Goals (SDG) of the United Nations.

Political and economic factors are also important criteria when selecting a location. For example, SCHOTT attaches importance to ensuring that politically stable conditions prevail in the countries concerned and that investment security is guaranteed. The company also looks at how the country in question is doing with regard to controlling corruption.

Finally, in order to ensure compliance with the defined criteria and associated high quality, SCHOTT makes sure that the compensation projects are certified according to strict internationally recognized standards.

Cooperation with experienced partners

In developing and continuously refining its compensation strategy and selecting compensation projects, the company works with experienced and independent organizations that continuously take a technical and critical look at the individual projects and overall portfolio.

The portfolio that was recently launched includes five projects in China, India, Colombia and the USA. These comprise afforestation, reforestation and forest protection projects, as well as a biogas project. In total, SCHOTT will thus be able to compensate for CO₂ emissions in the order of 40,000 tons in 2021.

The Group does not see its responsibility solely in reducing its CO₂ footprint. In the future, it also wants to contribute to raising awareness and educating people in the context of climate change through local and regional commitments. Corresponding opportunities will be evaluated as part of the next steps.



SCHOTT will compensate for 15,000 tons of CO₂ with this and another project in Colombia in 2021.
Photo: South Pole



Ideas from employees also needed

On the way to achieving climate neutrality, SCHOTT also wants to get its employees excited about this important strategic goal and convince them to provide active support. For this reason, the company has announced a worldwide ideas competition in which employees or teams can submit suggestions using their personal expertise to avoid or reduce CO₂ emissions. The ideas can relate to the employee's own working environment as well as business trips or commuting.

The best ideas will be rewarded with tree sponsorships and attractive cash prizes at all production sites and sales offices. An initial interim assessment shows that the climate protection issue has created a large amount of interest among employees and many useful ideas have already been submitted.



SCHOTT relies on team spirit since diversity leads to great ideas.

Sustainability Board coordinates efforts and steers

The goal of being “climate neutral by 2030” has been set. The task now is to plan and implement the necessary measures to actually achieve this ambitious goal. SCHOTT's Board of Management has established a Sustainability Board as a central steering body in order to bundle and prioritize all relevant topics and coordinate the action plan. In addition to a member of the Board of Management, the heads of selected Corporate Functions and Business Units as well as technical experts, are members of this Board. This means that the Business Units with the highest CO₂ emissions, as well as the Corporate Functions Research & Development, Environment, Purchasing, Human Resources, Legal, and Communication are represented on the Sustainability Board.

In addition to the Sustainability Board, an organizational structure with sustainability experts is also being established in all Business Units.

The glass industry's needs from policymakers

The transformation process toward climate neutrality can only succeed with ground-breaking technological innovations and a high level of development and investment. The aim is to secure the competitiveness of specialty glass manufacturers who face global competition and are committed to the goal of climate neutrality, but are confronted with gigantic challenges and immense additional costs for technological change.

Such a tour de force can only succeed with the support of policymakers. The current EU emissions trading system must be supplemented without delay to include a targeted mix of instruments comprising incentives, support mechanisms and regulatory law. Companies committed to climate neutral industrial production need reliable framework conditions for this, especially for the success factors that lie outside their sphere of influence. These are the required framework conditions:

-  Well-funded research support for the development of new, climate friendly technologies. The glass industry is focusing in particular on the electrification of glass melting tanks, hydrogen technology and the use of hydrocarbons as fuel.
-  A massive expansion of renewable energy generation, much stronger and faster than currently planned. This also includes efficient transmission and distribution networks. After all, electricity from renewable sources plays a crucial role in all technological approaches to CO₂-free glass production.
-  Promoting the rapid development of industrial production for green hydrogen and the associated supply infrastructure.
-  A legal framework that ensures the availability of electricity from renewable energy sources and hydrogen at internationally competitive costs.
-  Investment subsidies for the construction of production facilities using new, climate friendly technologies.
-  Carbon Contracts for Difference that compensate for the additional costs of developing and introducing new, climate friendly technologies and support their economic establishment.

Targeted cooperation between the glass industry and policymakers is imperative in shaping the transformation process in terms of sustainable climate protection, especially because the German and European glass industry is in global competition, in some cases with companies from regions of the world where climate protection has a much lower priority. The companies that want to make their production and value chains more climate friendly need financial incentives and support, as well as long-term planning security.



Outlook

SCHOTT has set itself the clear goal of becoming climate neutral by 2030. This strategic goal fits very well with our special spirit as a foundation company, which is characterized by a pioneering spirit, long-term thinking and responsible action. SCHOTT is ready to assume its share of responsibility and make a contribution to stopping climate change.



“We have embarked on the arduous journey towards climate neutrality with a clear goal in mind. However, we do not yet know all the possible solutions. In any case, we are working with great passion to achieve this ambitious goal.”

Dr. Jens Schulte, member of the Board of Management

If we take a look into the future today, the scenario at SCHOTT in 2030 could look like this: Electricity purchases have long since been completely switched to renewable energies. Measures to increase efficiency continue to contribute to energy savings and reducing CO₂ emissions on a smaller scale year after year. The foundations in research and development for the technology shift have been laid over the past decade and the first glass melting units have already been converted to largely climate neutral production. However, the widespread use of the new technologies will take much longer because the service life of the glass melting tanks and the investment cycles require this time. The remaining greenhouse gas emissions from the company's own production, which SCHOTT will not yet be able to avoid technologically in 2030, will be 100 percent compensated for.

The biggest hurdle for technology change in the glass industry is formed by external factors: the sufficient availability of green electricity and green hydrogen at competitive costs. If these conditions can be met, then the glass industry can ideally replace fossil energy sources with green electricity, green hydrogen or bioenergy in the long term and thus completely avoid CO₂ emissions in its own production.



“The transformation to a climate neutral company is not only an enormous challenge. We also see it as a great opportunity to secure our future viability. We are convinced that, in the long term, only truly sustainable companies that reconcile economic, ecological and social responsibility will be successful on the market.”

Dr. Frank Heinrich, Chairman of the Board of Management

Contact for technical experts

SCHOTT AG

Anja Schlosser

Sustainability Manager

anja.schlosser@schott.com

Phone +49 (0)6131/66-8906

Contact for the media

SCHOTT AG

Dr. Jürgen Steiner

Manager Corporate Communication

juergen.steiner@schott.com

Phone +49 (0)6131/66-4335