

15/10/2026



DECARBONATION IN SG: CHALLENGES FOR GLASS PRODUCERS



CONTENT



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**SAINT-GOBAIN
AND ITS CLIMATE
OBJECTIVES**

02

**FOCUS ON SG
GLASS ROAD TO
NET ZERO**

01

SAINT-GOBAIN AND ITS CLIMATE OBJECTIVES

**WORLDWIDE LEADER
IN LIGHT AND
SUSTAINABLE
CONSTRUCTION**



46.6

In euro billion / 2024 sales

161,000

employees

80

countries ^(a)



OUR MARKETS ARE AT THE HEART OF GLOBAL CHALLENGES



SAINT-GOBAIN SOLUTIONS

40%

of global CO₂ emissions
linked to construction

x3

increase in resource consumption
in the last 50 years

+2 billion

urban population in emerging markets
in the next 30 years



**Energy-efficient
renovation**



**Light
construction**



**Industry & Construction
decarbonization**

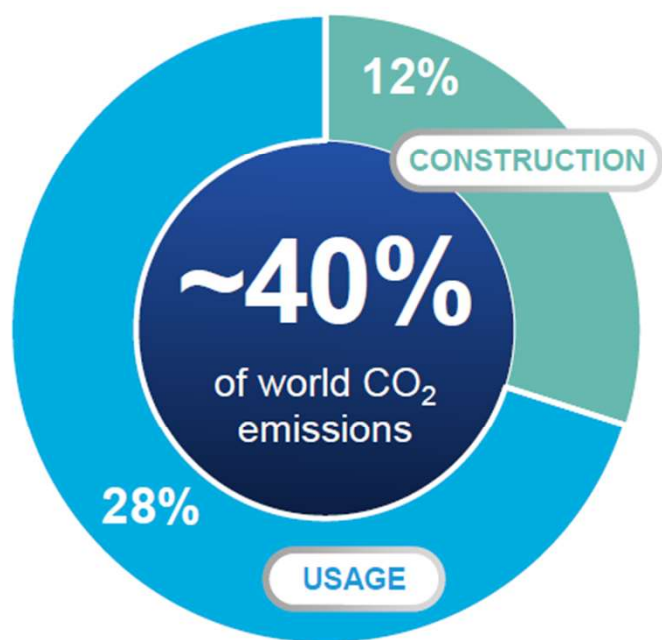
Sources: World Green Building Council, UNEP, CDP, Material Economics, ADEME



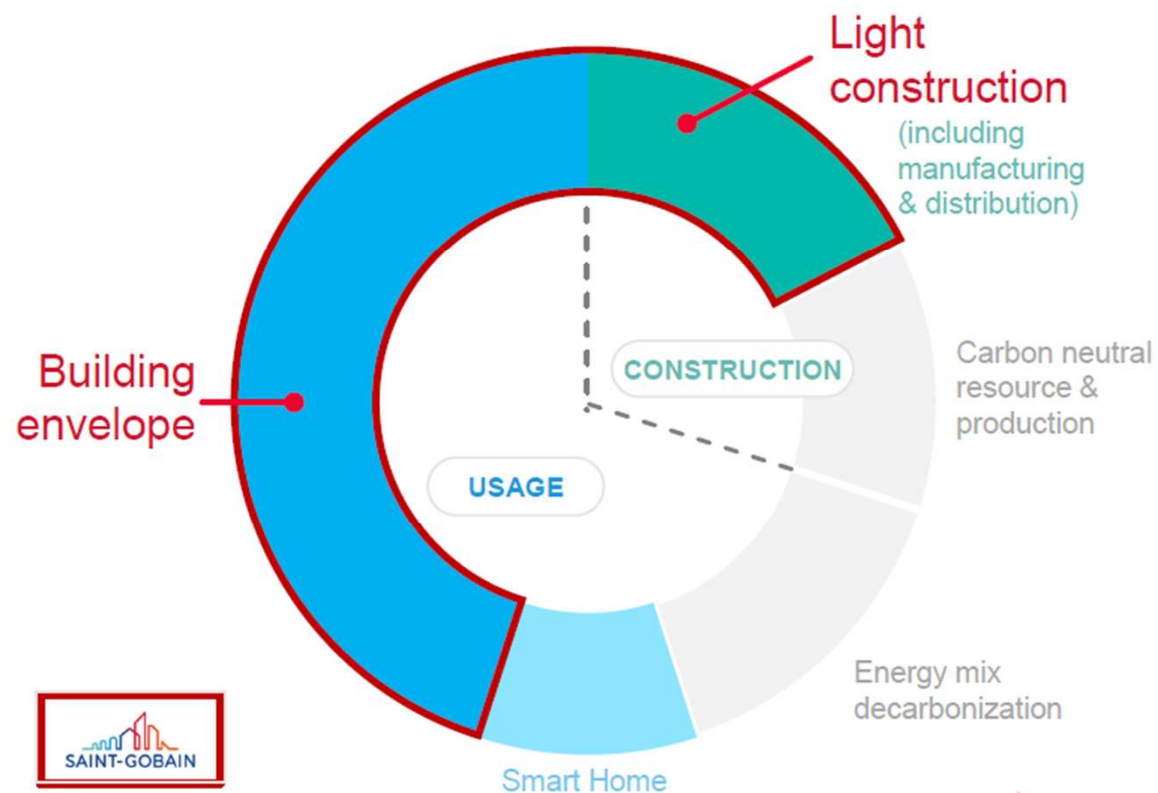
SAINT-GOBAIN SOLUTIONS CAN DECARBONIZE 2/3 OF BUILDING-RELATED EMISSIONS



Building-related CO₂ emissions



Available decarbonization levers



AND WE ARE WORKING TO MINIMIZE OUR FOOTPRINT



COMMITTED SINCE 2019 TO ACHIEVE
NET ZERO EMISSIONS BY 2050

Our objective
In absolute value vs 2017

2030

Scopes 1 and 2
(direct and indirect
emissions)

-33%

Our achievements
In absolute value vs 2017

2024

-34%

8.9Mt
Scopes 1 and 2

(direct and indirect emissions, pro
forma with 2024 acquisitions)

2050
NET ZERO CARBON



SCIENCE
BASED
TARGETS

DRIVING AMBITIOUS CORPORATE CLIMATE ACTION



Roadmap and targets aligned with a 1.5°C scenario

**CO₂ ROADMAP
SCOPES 1&2**

**Operational excellence
& product design**

**Decarbonated energies
in processes**

**Action plans for
zero carbon sites**

EXAMPLE OF THE GYPSUM ACTIVITY



3 net zero carbon (scope 1&2)
production sites for plasterboard

Norway (electricity)
Canada (electricity)
India (biomass)

Temperature needed not very high → no technical issue on switching energy source for a plasterboard plant

The roll out of those “net zero plants” is mainly driven by two factors

- Economical factors mainly on OPEX but also CAPEX
- Availability of green electricity or reliable biomass source



02

FOCUS ON SAINT-GOBAIN GLASS ROAD TO NET ZERO

GLASS MAKING IN SG



Flat Glass

For construction and automotive markets



Glass Wool and Stone Wool

For construction and technical insulation markets



Glass Veils and Technical textile

For construction and industry markets

GLASS MAKING IN SG



Flat Glass

For construction and automotive markets



Glass Wool and Stone Wool

For construction and technical insulation markets



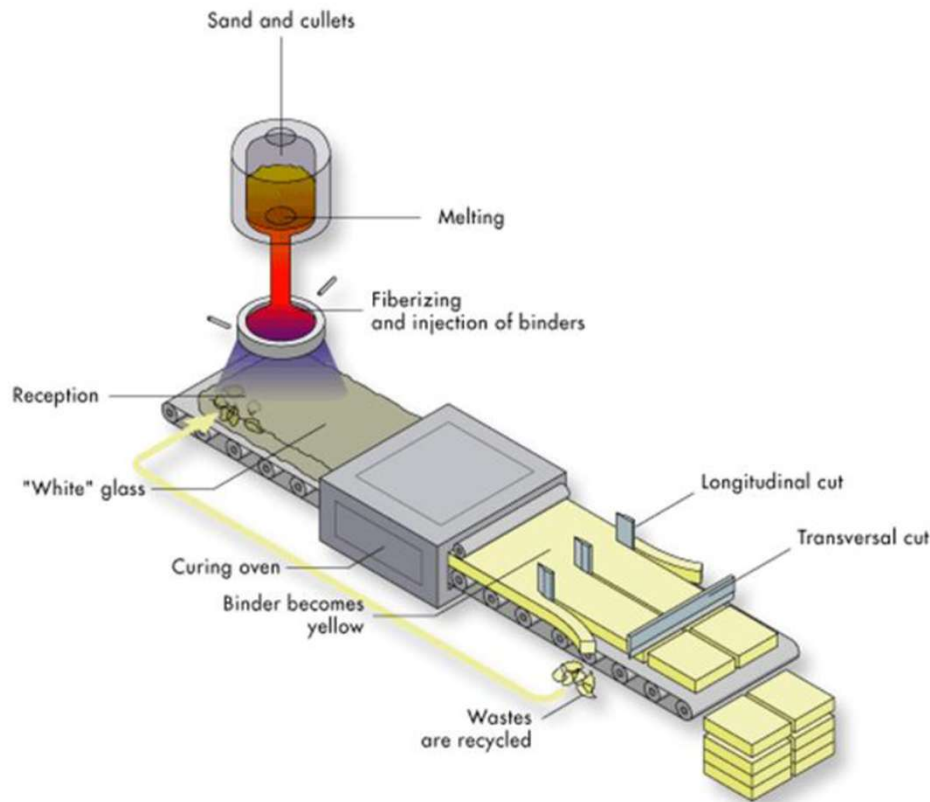
Glass Veils and Technical textile

For construction and industry markets

EASIER CANDIDATE: INSULATION BUSINESS



Glass wool production



Furnace melting can be done fully with electricity

Fiberizing process is not there yet but much smaller gas amount needed → possibility with fuel switch?

Focus on a more demanding process → Flat Glass

OUR LOCAL FOOTPRINT AND INTERNATIONAL NETWORK



Saint-Gobain Glass is the worldwide leader in flat glass for building applications, supported by **30** float production lines in **13** countries.



Manufacturing sites in
13
Countries



30
float production lines



Global sales operations in more than
100
countries



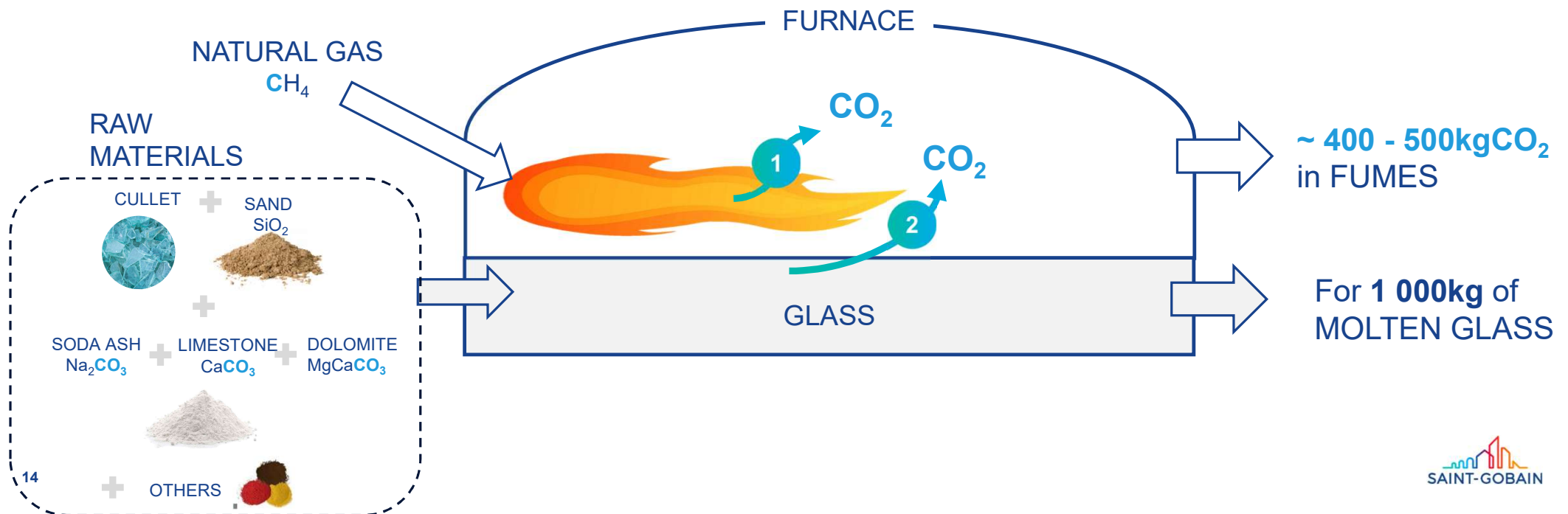
● Manufacturing sites



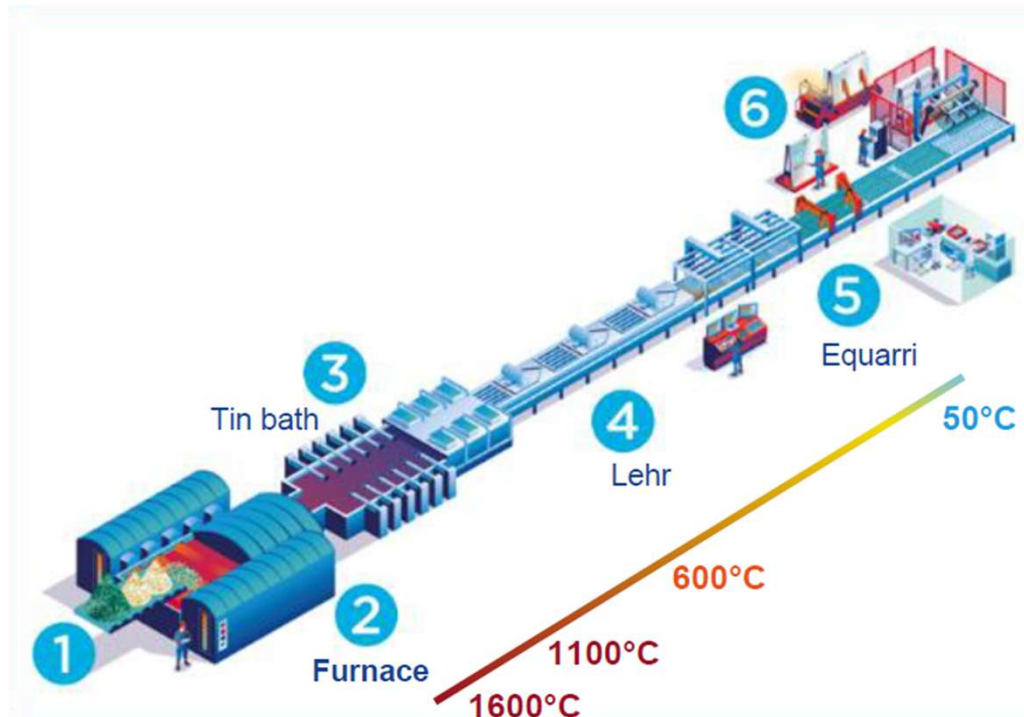
GLASS MAKING PROCESS

◆ TWO SOURCES OF CO₂ FROM GLASS MELTING (SCOPE 1)

- 1 COMBUSTION (2/3)
- 2 DECARBONATION OF RAW MATERIALS (1/3)

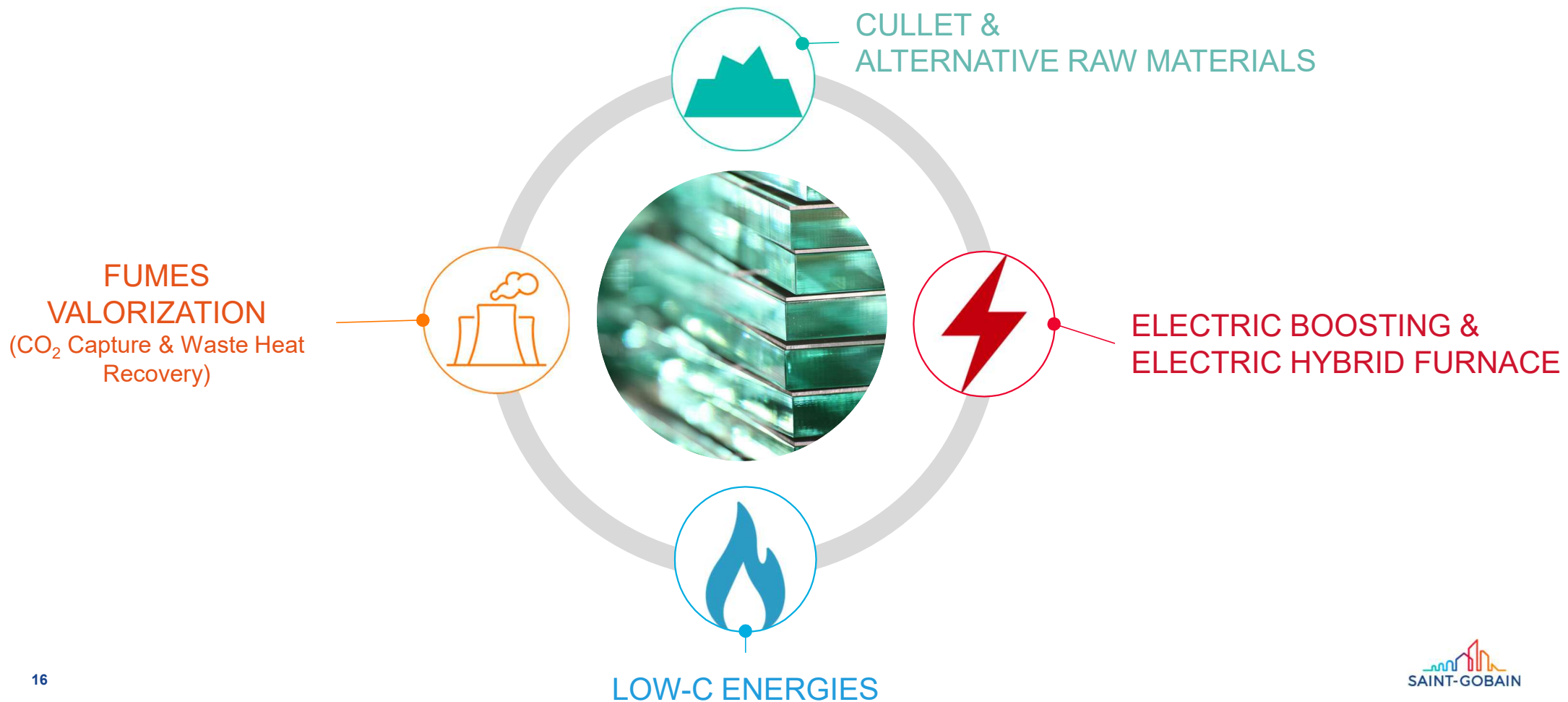


FLOAT GLASS PROCESS

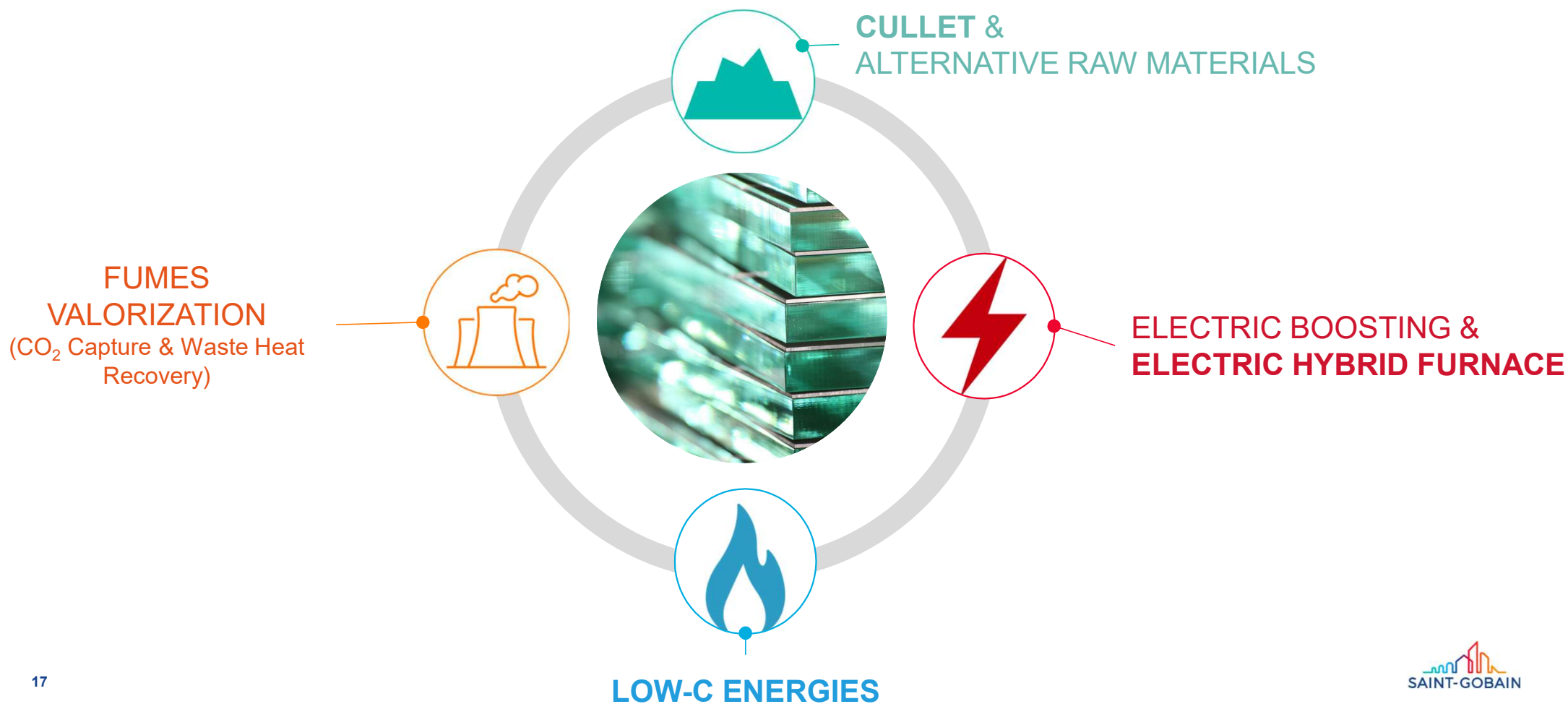


- Glass making is an energy intensive process
- A standard furnace needs ~40MW of gas power to melt but also reach 1600°C
- A flat glass line “only” emits 100kt/y of CO₂
- SG Glass represents ~1/3 of scope 1&2 emissions for SG

MAIN LEVERS FOR DECARBONATION (SCOPE 1 & 2)



MAIN LEVERS FOR DECARBONATION (SCOPE 1 & 2)





64%
**RECYCLED
CONTENT**

(High amount of
external cullet)

+

**RENEWABLE
ELECTRICITY**
throughout
the process

+

**SUBSTANTIAL
R&D EFFORT**

&

**EXCELLENT
INDUSTRIAL
TEAMS**



-42%

carbon footprint
of **ORAÉ®** vs
PLANICLEAR®



6.64kg

CO₂ eq./m² for 4mm
ORAÉ®

That means around

-30/40%

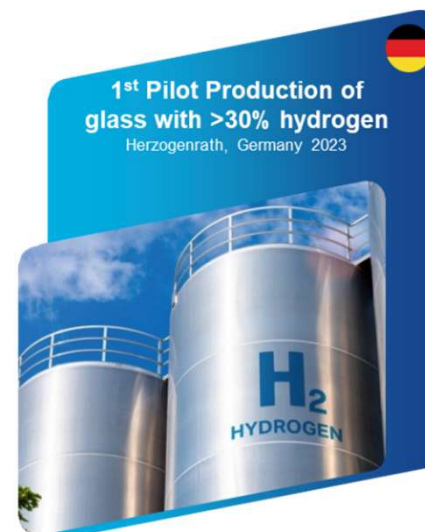
carbon footprint for
a glazing made
with **ORAÉ®** vs regular
glazing

LOW CARBON FUELS

2022 MILESTONE: ZERO CARBON GLASS (SCOPE 1&2)



2023 MILESTONE: H2 PLANT TRIALS



Questions on low carbon fuels:

- H2: is it available at a competitive cost? What about furnace compatibility?
- Biogas/biofuels: easiest technical options: what about availability and cost?
- Other: syngas? E-fuels?
- Limited options → what about electrification?

40+ YEARS OF ELECTRIC MELTING EXPERIENCE



Pyramide du Louvre

1982

1989

2012

Saint-Gobain (France)

Electric furnace producing
Pyramide du Louvre glass



ISOVER Orange

Largest electric melter in
the world



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MAIN PAIN POINTS



- Glass quality
- Furnace size
- Economic balance

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WHAT CHANGED?



40+ YEARS OF ELECTRIC MELTING EXPERIENCE



Joint Development Agreement SG-AGC

1982

1989

2012

2023

2025

Saint-Gobain (France)

Electric furnace producing
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Volta Project (Czechia)

Medium-scale pilot
Hybrid furnace



40+ YEARS OF ELECTRIC MELTING EXPERIENCE



Pyramide du Louvre



Joint Development Agreement SG-AGC



FurHy Project (Spain)
Large-scale Hybrid furnace



1982

1989

2012

2023

2025

2027

Saint-Gobain (France)
Electric furnace producing
Pyramide du Louvre glass



ISOVER Orange
Largest electric melter in
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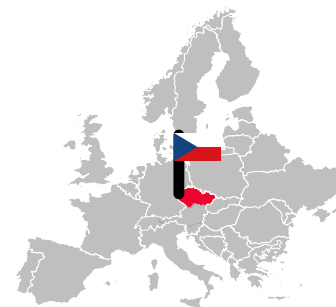


Volta Project (Czechia)
Medium-scale pilot
Hybrid furnace



VOLTA INDUSTRIAL PILOT LINE

JOINT DEVELOPMENT SAINT-GOBAIN/AGC



12 M€



Funded by the European Union
Emissions Trading System
Innovation Fund

VOLTA project is supported by
European Innovation Fund



**2023 : Joint development agreement
Saint-Gobain & AGC**

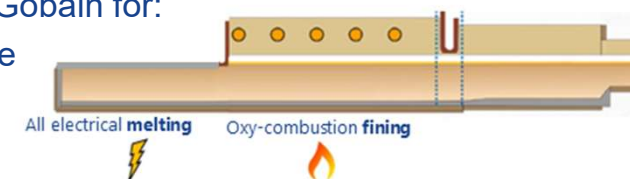
3 years collaboration

90t/day AGC pattern glass production line

New furnace design with 50% electricity:

Combining experience of AGC & Saint-Gobain for:

- Saint-Gobain electrical melting expertise
- AGC oxy-combustion expertise



Advantages:

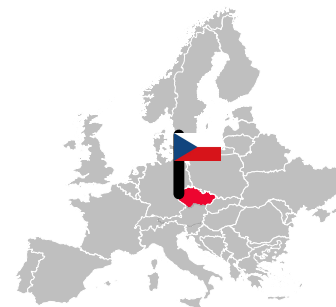
Production line → Lower R&D opex cost
Intermediate size → Lower technological gap
Pattern glass → Lower quality requirement
Two companies → Cross expert competencies & costs

Development objectives:

Validate concept & glass quality
Evaluate equipments
Build competencies

VOLTA INDUSTRIAL PILOT LINE

JOINT DEVELOPMENT SAINT-GOBAIN/AGC



2023 : Joint development agreement Saint-Gobain & AGC

3 years collaboration

90t/day AGC pattern glass production line



2024 : Engineering & cold repair

Full novel technology

Availability of electricity

Strong civil engineering

Complexity & duration are **challenge**



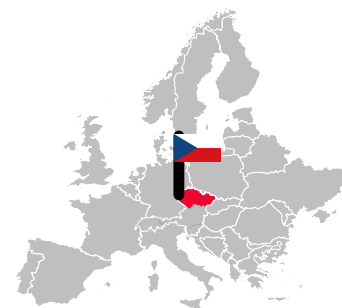
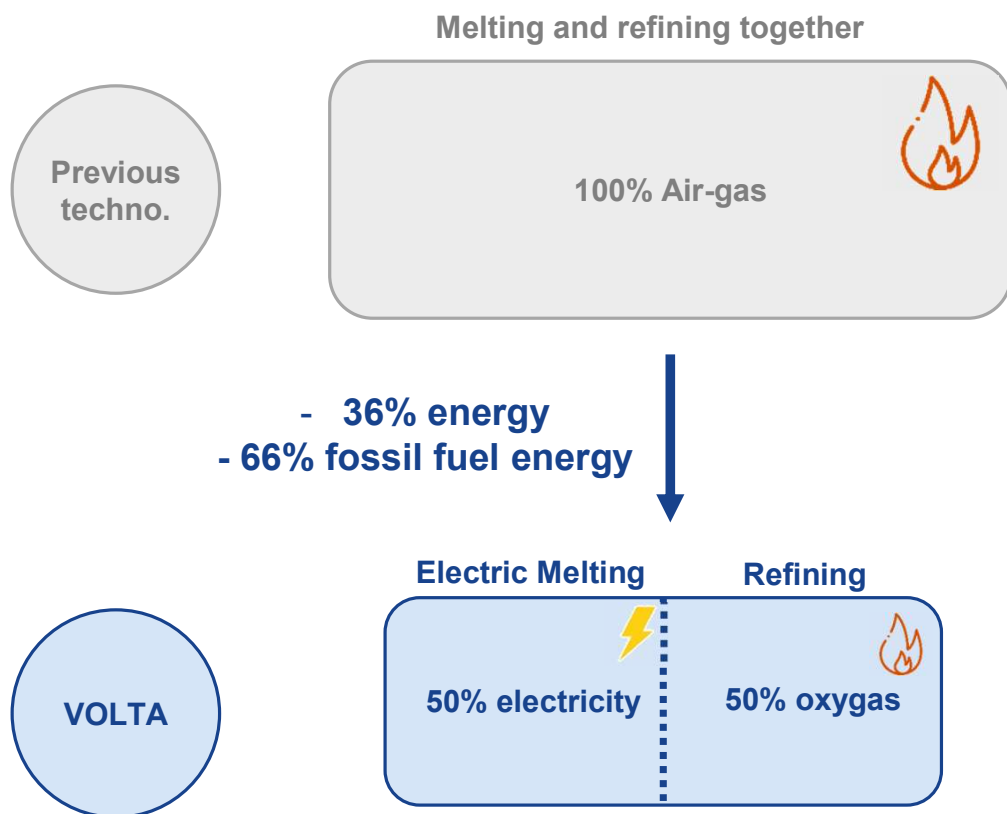
2025 : Start-up & trials

**More than one and half year
of continuous operation**

0% losses due to new technology
Robust and **trouble-free** performance

VOLTA INDUSTRIAL PILOT LINE

ENERGY & CO2



Energy & temperature in line with the design

Large range of operation

- Cullet : 15-90% cullet and short duration test @100% cullet
- Strong pull variation

Strong CO₂ emissions reduction

-53%

Scope 1 CO₂ emissions
At iso cullet (40%)

VOLTA INDUSTRIAL PILOT LINE

CHALLENGES

Change management for this new technology

With local authorities, EHS, experts, plant team



Learning from this disruptive technology

Challenge our habits, models and understanding of glass melting

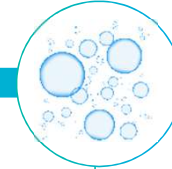


Evaluate glass quality

Find the correct method for bubble evaluation with pattern glass



Master finning and reach float-glass quality



Manage costs

The cost ratio electricity vs gas vs CO₂ is key



Validation of concept and float glass quality in terms of defaults
→ **Let's move to full scale: FURHY project**

FURHY PROJECT

THE RESULT OF A LONG R&D JOURNEY

Concept development & validation

- Strong history in electric melting (SG Glass & Isover)
- Lab-scale trials in Saint-Gobain Innovation Hub Europe (Aubervilliers)
- Joint Development with AGC with a pilot line in AGC Plant (Czechia)
- Numerical models in Saint-Gobain Conceptions Verrières (Aubervilliers)

→ **Extrapolation on an industrial float line**

Quality

- Validation in Volta pilot line
- Extrapolation using our models

→ **Produce low-carbon glass at the same glass quality**

Energy in hybrid technology

- **Increase electrification at 75%** thanks to extrapolation and increasing maturity
- Remaining combustion: air-gas or oxy-gas depending on industrial footprint and local balance

Further R&D will be essential to run this new line, optimize the design, develop the next generation



FURHY PROJECT

FIRST-OF-A-KIND HYBRID FURNACE FOR FLOAT GLASS

SAINT-GOBAIN AND AGC PARTNER TO INNOVATE
WITH LARGE-SCALE HIGHLY ELECTRIFIED FURNACE
TO CUT CO₂ EMISSIONS FROM FLAT GLASS
PRODUCTION

08/06/2026

KEY INSIGHTS AND TARGETS FOR FURHY

- Cold repair of Saint-Gobain float line in Avilès (Spain) in 2027
- Largest electric furnace ever built for flat glass
 - 75% of electrification
 - Renewable low-carbon energy
- Compare to a conventional gas furnace
 - 80% of natural gas consumption reduction
 - 50% CO₂ emissions reduction



42 M€



Funded by the European Union
Emissions Trading System
Innovation Fund

FurHy project is supported by
European Innovation Fund

“

This milestone shows
that technologies
capable of
decarbonizing flat
glass production
are now ready for
industrial-scale
deployment.

”

Claire Pedini

Senior VP, Human Resources
and Corporate Social
Responsibility



FURHY PROJECT AND AFTER? DEPLOYMENT WILL BE CHALLENGING

IT WILL HIGHLY DEPEND ON ECONOMICAL ASPECTS

CAPEX needed: cold repair for a hybrid furnace is more expensive than for a standard one

OPEX: linked to the (decarbonated) electricity price

Example in France

- Electricity ~80€/MWh (among countries with lowest price)
- Gas ~40€/MWh + CO2 internal price 100€/t (ETS lower) → 60€/MWh
- Increased electricity efficiency gives approximative equilibrium... for now

Difficult context in Europe for construction and automotive

CONCLUSION



◆ SG GLASS ROAD TO NET ZERO

SG Glass has recently reached two major milestones

- Pilot validation of 50% electrification level
- Investment decision on the full scale plant

But the path to net zero is not straight forward with technical and economical blocking points:

- Can we electrify the entire furnace and keep the current quality?
- What is the solution to reach 1600°C without combustion?
- What about raw materials?
- What about the impact of CAPEX/OPEX?

Thank you




SAINT-GOBAIN