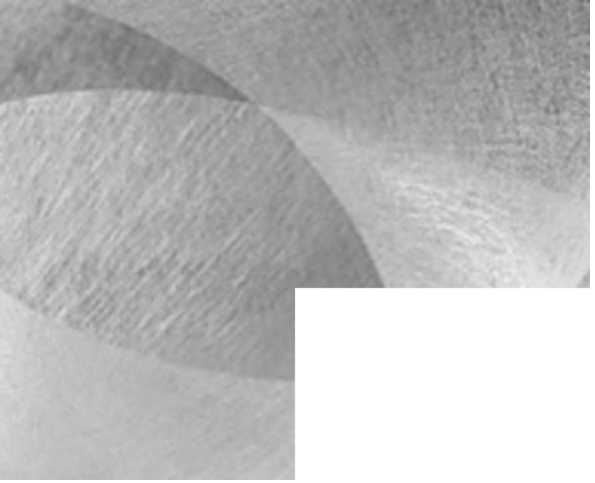
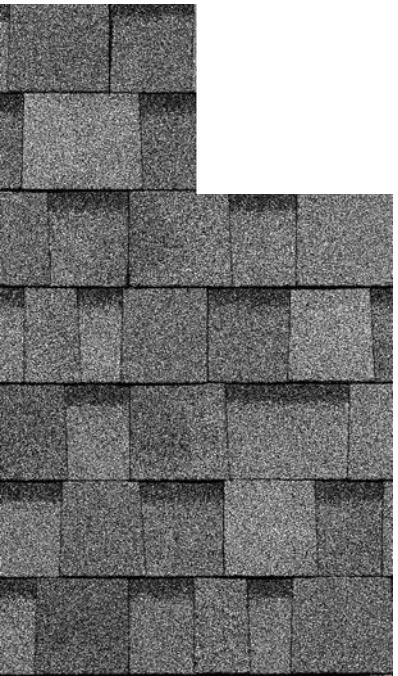




TM © 2022 MGM.

OWENS CORNING DECARBONIZATION ROADMAP APPLIED TO GLASS FIBER

Anne Berthereau

VP Sustainability, Owens Corning

ICG, Glass for a sustainable Future Conference

April 29, 2024

Presented by Eric Dallies

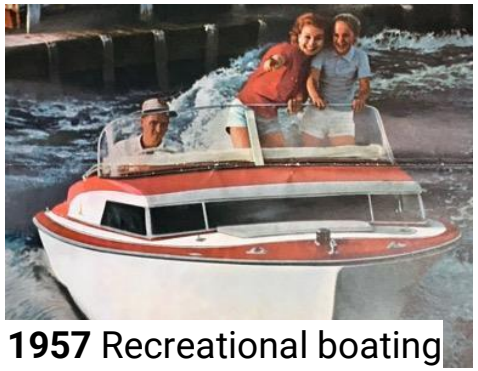
WHO IS OWENS CORNING?

1938 First Board of Directors

1939 World's Fair

1953 Chevrolet Corvette

1956 The color PINK



1957 Recreational boating

1969 Space suits

1975 Trans-Alaska Pipeline

1980 The Pink Panther™

1981 Hajj airport terminal

2005 Wind H glass

2008 Bird stadium

2018 PAROC

2022 OC Lumber

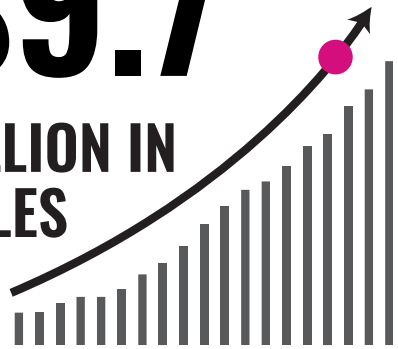
OWENS CORNING AT A GLANCE

69

CONSECUTIVE YEARS AS A FORTUNE® 500 COMPANY

$9.7

BILLION IN SALES



***2023 REVENUE**

18,000

EMPLOYEES PLUS 1 PINK PANTHER

30

COUNTRIES WHERE WE OPERATE

Serving residential, commercial, and industrial markets

ROOFING | INSULATION | COMPOSITES

GLASS FIBER MANUFACTURING

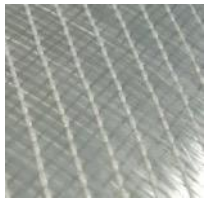
GLASS FABRIC TECHNOLOGIES

WHAT WE MAKE

Owens Corning products & applications

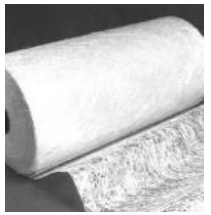
WearDeck™ Decking
Commercial decking application and structural lumber for use in construction applications

Ultraspar™ Pultrusions
High performance pultrusions for the wind energy market to enable longer blades

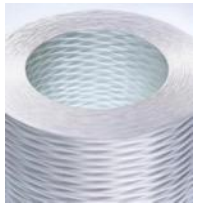


Knitted or woven fabrics
Wind, pipe, thermoplastic composites, industrial, recreational

Nonwoven veil
Construction, industrial, automotive, road paving



Chopped strand mat and continuous filament mat
Marine, transportation, recreation, corrosion resistance, construction



Continuous Fiber Type 30® single end roving
Chemical and sewage, oil, water processing (pipe and tanks), industrial (high-pressure vessels, pultruded items), wind energy, aerospace, ballistics, transportation (muffler filling), electrical (optical cable)

Continuous fiber multi-end roving
Construction (panels and translucent panels), corrosion resistant pipe and tanks, consumer (sanitary, recreational vehicles), transportation (headliner, body parts, semi-structural parts)

Chopped strand, wet-use
Building products (roofing and gypsum), industrial specialties

WHERE WE LIVE

WHERE WE WORK

HOW WE MOVE

HOW WE POWER OUR LIVES

WHAT WE DO

DECARBONIZE GLASS FIBER OPERATIONS AT OWENS CORNING

COMBATING CLIMATE CHANGE – WHAT ARE OUR GOALS

2030 Owens Corning GOALS

A 50% reduction in absolute Scope 1 and Scope 2 market-based GHG emissions from the base year of 2018.

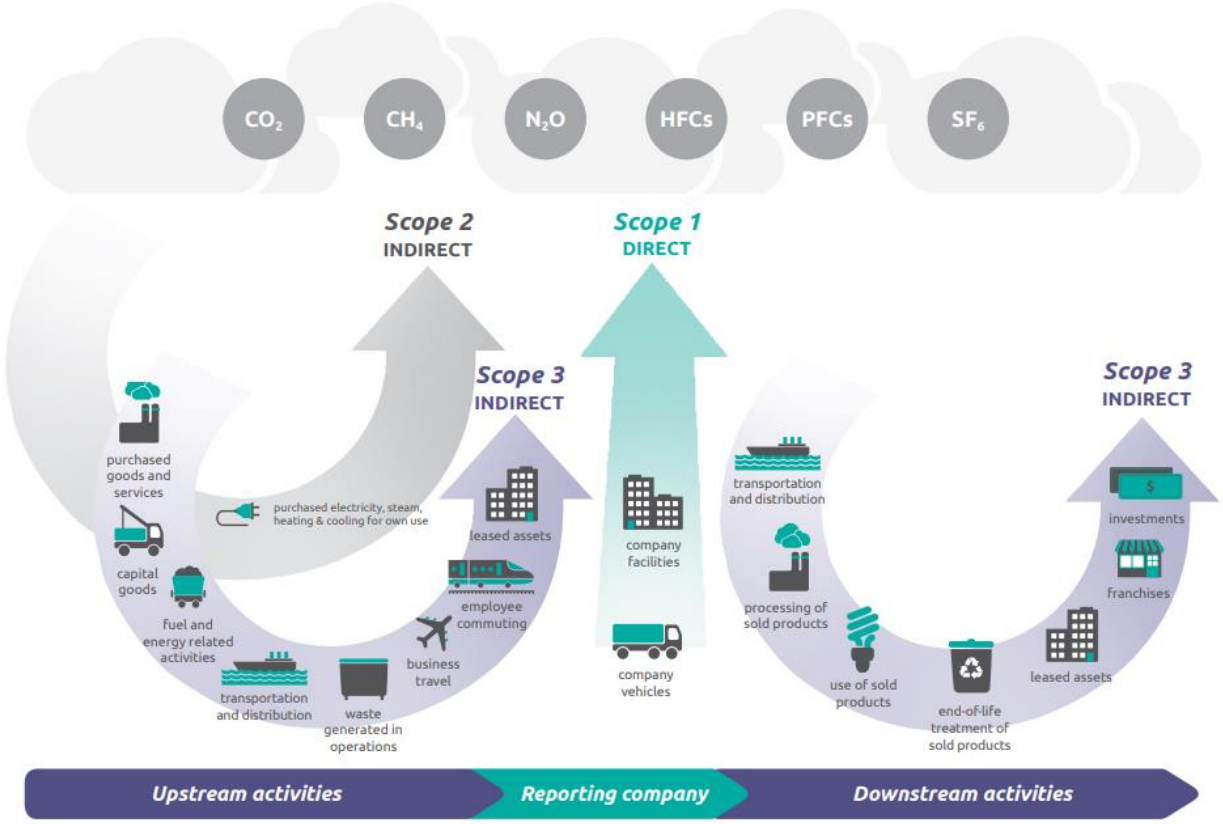
- Scope 1 include the direct emissions from our own manufacturing operations.
- Scope 2 include indirect emissions from the generation of purchased energy.

A 30% reduction in absolute Scope 3 emissions, compared to the base year of 2018.

- Scope 3 refers to other indirect emissions, primarily those from our supply chain.

Scope 1, 2 and 3 as reported by Owens Corning

Figure [1.1] Overview of GHG Protocol scopes and emissions across the value chain



Source: WRI and WBCSD Corporate Value Chain (Scope 3) Accounting and Reporting Standard

HOW TO WIN – DEFINE 3 HORIZON ROADMAP

3 HORIZONS ROADMAP

HORIZON 1
ENERGY OPTIMIZATION

MAX **25%** CO_2 REDUCTION BY 2030

HORIZON 2
ENERGY REDUCTION THROUGH EQUIPMENT INVESTMENT

ADDITIONAL **10%** CO_2 REDUCTION BY 2030

HORIZON 3
TECHNOLOGY INNOVATION

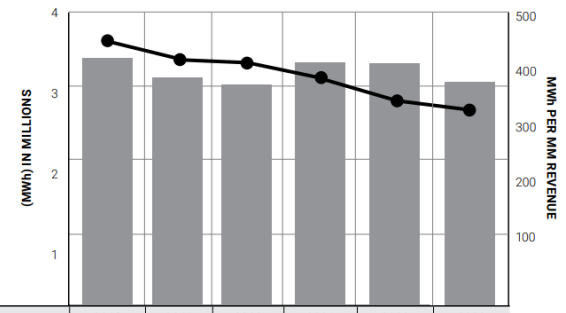
PATH TO BRIDGE FOR **15%** 2030 GOALS AND FURTHER

Risk Owner:	Low Operations	Low (Capex) Operations/ Cap Delivery	New to OC Technologies R&D

DESCRIPTION OF ACTIVITY
Waste heat recovery projects
Efficient lighting projects
Compressed air efficiency projects
Energy efficiency projects of various types including pump upgrades, motor upgrades, and other infrastructure
Projects impacting our processes, resulting in improved energy efficiency, including right-sizing of systems, efficient coating systems, and other process optimizations
HVAC efficiency projects
Replacing equipment with more energy-efficient technologies

Normalized Electric Power

■ Electricity (MWh) in millions ● Normalized Value (MWh per MM Revenue)



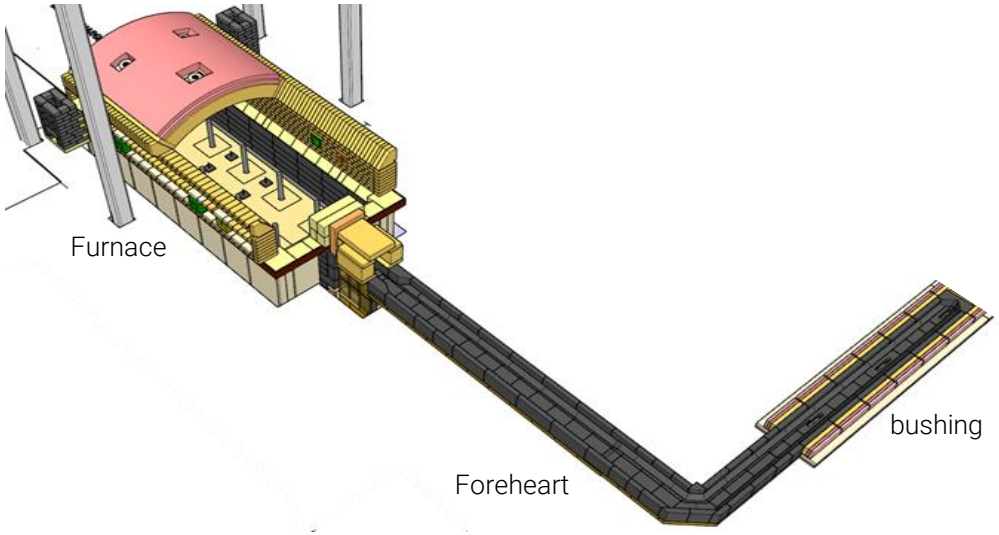
	2018	2019	2020	2021	2022	2023
Electricity (MWh) in millions	3,411,069	3,135,655	3,038,256	3,347,084	3,327,236	3,081,364
Normalized Value (MWh per MM Revenue)	476	433	425	388	339	318

Source: 2023 OC Sustainability page 248

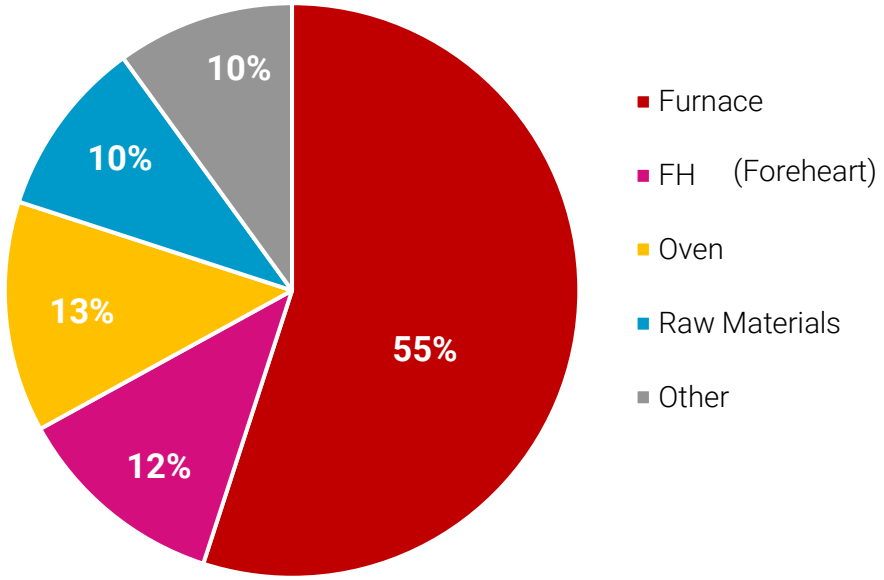
WHERE DO $CO2_{EQ}$ EMISSIONS COME FROM ?

Usual Glass Fiber manufacturing footprint

- Hybrid furnace design (combustion / e-boost)
- Furnace combustion (oxy/gas or oxy/fuel)
- Downstream hot air equipment
- Raw Materials (carbonated or decarbonated)



Scope 1 Breakdown – reference Reinforcement Glass Fiber plant



Furnace - the biggest CO_2 emission contributor

TECHNOLOGY OPTIONS FOR HORIZON 3

Technology Capabilities

Tech A: Furnace electrification

- **Switch to 100 % Renewable Electricity**
- **Run Hybrid furnace & maximize e-boost**

Tech B: Alternative to Oxy-gas flame

Melting process

- **Hydrogen tech**
- **Bio gas tech**

Tech C: Alternative to Oxy-gas oven

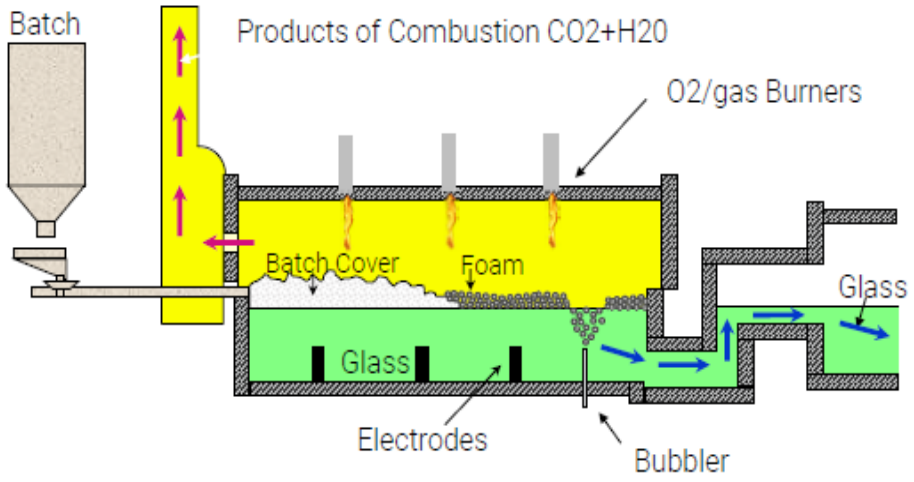
- **E- powered oven**

Tech D : Increase cullet usage

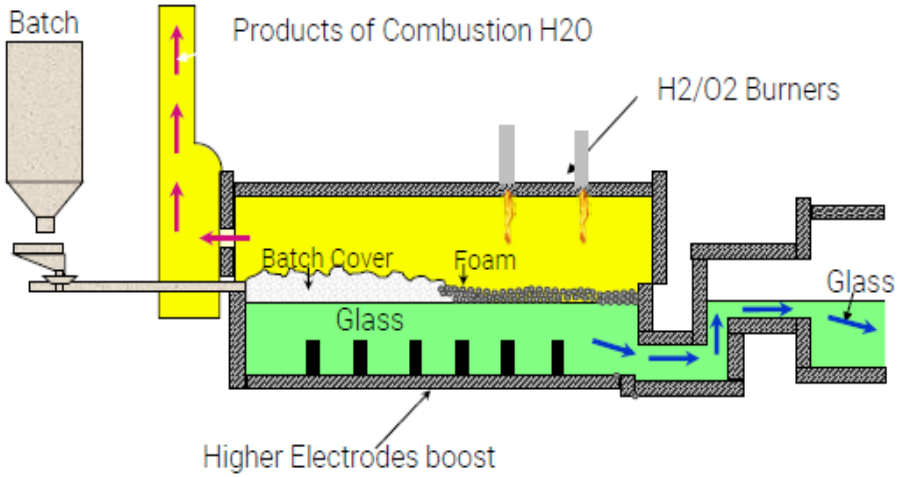
https://h2-glass.eu/

PATH TO ZERO CO2 IN GLASS FURNACE

Initial state



Carbon Neutral - Future state

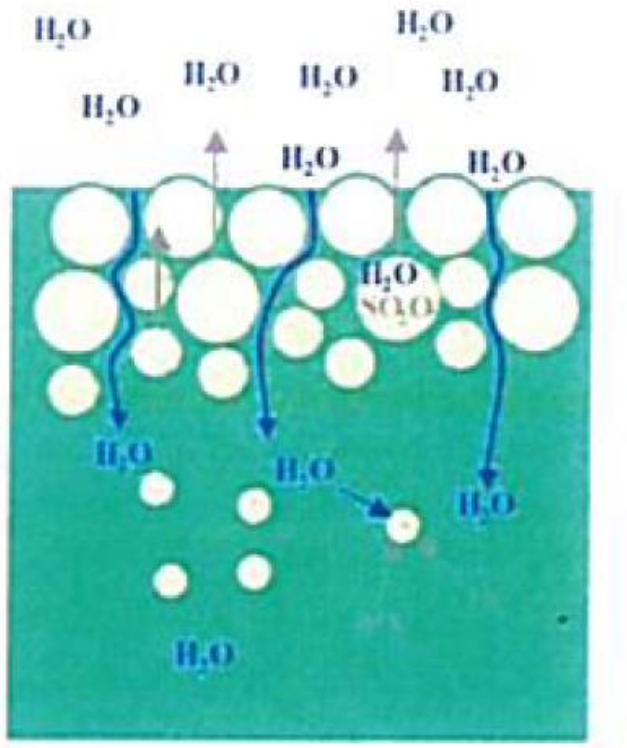


STEP 1: R&D FUNDAMENTALS GLASS/REFRACTORIES/HYDROGEN

Impact of Hydrogen combustion on

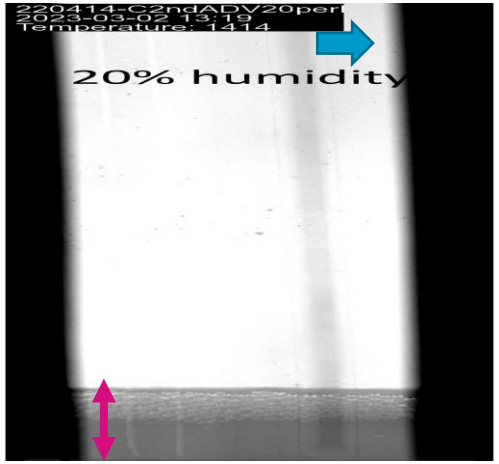
- Glass melting quality
- Refractories

IMPACT OF HYDROGEN COMBUSTION ON GLASS FOAMING/BUBBLE RATE (1/2)

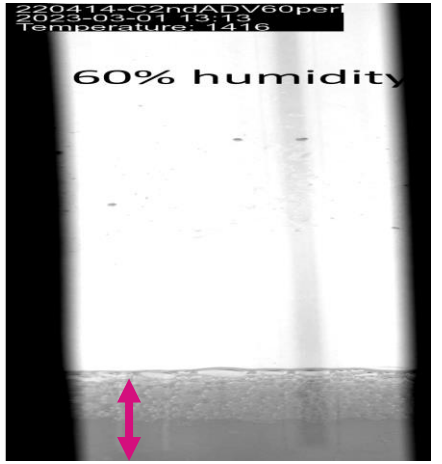


ASSUMPTION: With Hydrogen combustion, Water partial pressure above glass batch will significantly increase

Air-Gas

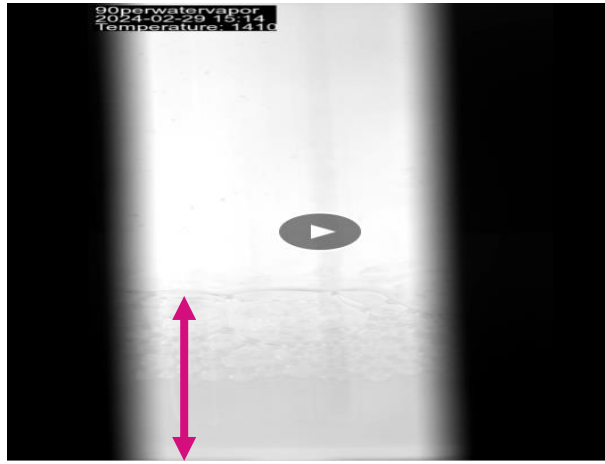


O2-Gas



90% humidity

90% water vapor



Advantex Glass* alkali R_20 < 1 % wt; 0 added sulfate

RESULTS

- Glass foam increases with increasing partial water pressure
- Operational risk on higher bubble rate and so BBH impact

* ASTM D578:2000

IMPACT OF HYDROGEN COMBUSTION ON FURNACE REFRACTORIES (2/2)

1) No impact on Silica refractory

- Thermodynamic calculations strategy

1. Simulation of the formation of volatile gas species by reaction of glass melt components with water in combustion atmosphere
2. Simulation of chemical interaction between volatile gas species and the refractory material

- Reactions

$$Na_2O\ (melt) + H_2O\ (g) \rightarrow 2\ NaOH\ (g)$$

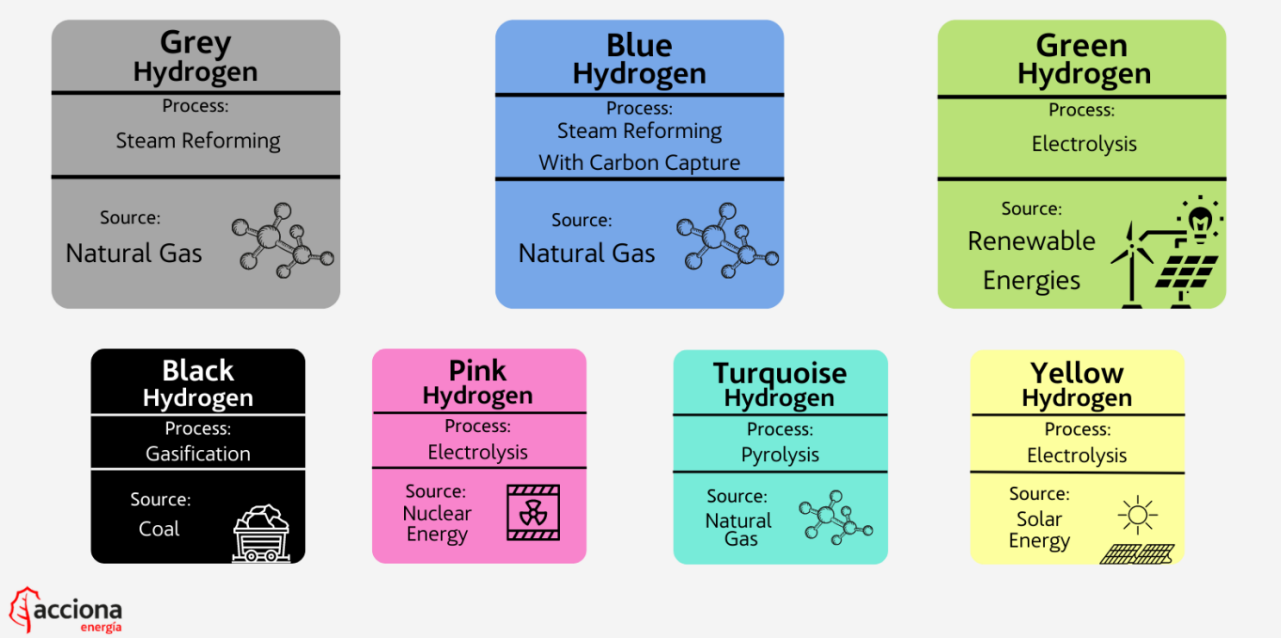
$$2\ NaOH + SiO_2 \rightarrow SiO_2{\cdot}2Na_2O\ (slag) + H_2O$$

- **Result:** no alkali in Advantex glass, so partial pressure of NaOH will be too low in the atmosphere to react with silica refractories

2) Mullite – Thermodynamic calculations not possible; lab tests on going

STEP 2: EVALUATE INDUSTRIAL READINESS AND BUSINESS CASE

1) Source Blue, Green, Pink or Yellow Hydrogen is needed

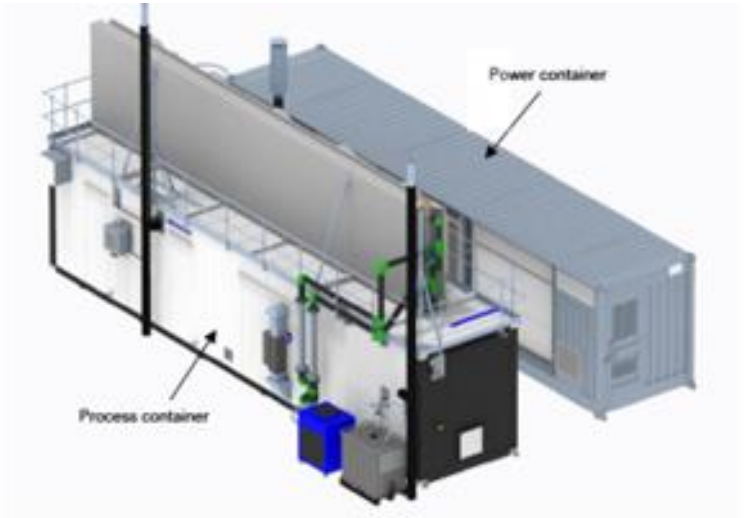


Source: Acciona web site

2) Run trials in normal industrial conditions (Q4 2024)

Capture learnings on furnace thermal profiles, glass quality and Operational efficiencies.

H2 supply option: trucks or electrolyser



RELEVANT LITERATURE

Hazards 33 SYMPOSIUM SERIES No.170 HAZARDS 33

Risk-Based Maintenance models for hydrogen systems: a review for the glass and aluminium industry

Giulia Collina, Ph.D. Candidate,[1]

Paul Kengfai Wan, Research Scientist,[3]

Nicola Paltrinieri, Full Professor,[1]

Marta Bucelli, Research Scientist,[2]

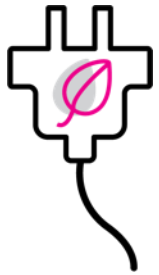
1 Department of Mechanical and Industrial Engineering, Norwegian University of Science and Technology NTNU, Richard Birkelands vei 2b, Trondheim, 7034, Norway

2 SINTEF Energy Research, Kolbjørn Hejes vei 1 A, Trondheim, 7034, Norway

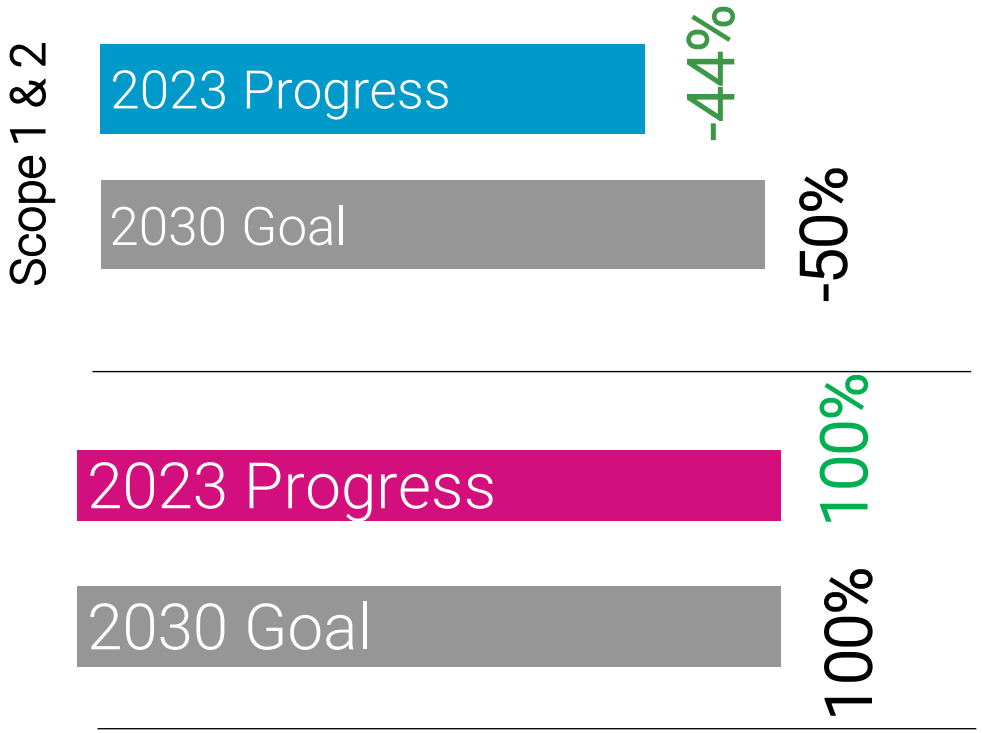
3 SINTEF Manufacturing AS, Grøndalsvegen 2, 2830 Raufoss, Norway

EU PROGRESS END 2023 TOWARDS CLIMATE ACTION (SCOPE 1+2)

Reduce greenhouse gas emissions
from our operations by 50% (Scope 1 & 2) from our 2018 baseline



Switch to 100% renewable electricity.
Purchase electricity only from renewable



Our greenhouse gas emission reduction goals are in line with the Intergovernmental Panel on Climate Change's standards, which urge that global temperatures cannot increase above 1.5° C vs. pre-industrial levels.

Our 2030 goals to combat climate change are approved by the Science Based Targets Initiative as meeting these standards.

For more information:
JEC 2024 – OC booth communication

2030 ROADMAP TO GHG REDUCTION (SCOPE 1 & SCOPE 2)

Our plan to reduce Scope 1 and Scope 2 GHG emissions includes the following strategies:

SHORT-TERM STRATEGIES

- **Continue converting our network to renewable sources of energy** via power purchase agreements (PPAs), virtual power purchase agreements (VPPAs), and other contractual instruments, which will impact Scope 2 emissions. Learn more about our approach to PPAs and VPPAs on page 244.
- **Explore circular economy business models** that would reduce overall GHG emissions. Learn more in the Circular Economy chapter of this report.
- **Energy optimization:** Following energy intensity strategies we have established for energy reduction and energy recovery, discussed in detail beginning on page 242.*
- **Adjust operating process conditions** by increasing renewable energy ratio in hot processes such as electricity boosting (e-boosting) to reduce use of natural gas.

MEDIUM-TERM STRATEGIES

- **Ensure systematic knowledge sharing** across our network of facilities.
- **Consider additional renewable energy opportunities** on a global basis, including longer-term agreements.
- **Continue maximizing opportunities for usage of renewable energy in our glass melting**, through processes such as e-boosting, while switching to 100% renewable energy.
- **Energy reduction through equipment investment:** Reduce fossil fuels by electrifying our natural gas processes (for example, converting to electric melters and dryers in nonwovens production) and supplying them with renewable electricity or by using other innovative technologies such as hydrogen or biomethane, which could provide benefits across all three of our businesses.*
- **Use Total Productive Maintenance and improvements to our production processes** to reduce our energy use by 20% by 2030, compared to

LONG-TERM STRATEGIES

- **Technology innovation:** Drive innovation in manufacturing technologies to evaluate alternatives to gas melting and curing, such as increasing electrification, hydrogen combustion, or biomethane options.

Source: 2023 OC Sustainability report page 256

A 3 horizon RoadMap requiring day to day Ops focus and long term R&D

https://www.owenscorning.com/en-us/corporate/sustainability/docs/2024/2023-Owens-Corning-Sustainability-Report.pdf