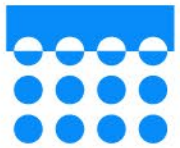
Glass Futures: A Research and Collaboration Platform for Glass Industry Decarbonisation

Dr Habib Khosroshahi
Projects Team Manager

14th May 2025

SMALL IMPROVEMENTS ARE NOT ENOUGH.
WE NEED DISRUPTION.

Alternative fuels



Carbon Capture

Increased recycled content, and industrial symbiosis

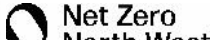
Waste-heat recovery

Industry 4.0, digital technologies, sensors and automation

New Raw materials and batch compositions

MEMBERSHIP

Glass Futures



GLOBAL CENTRE OF EXCELLENCE ST HELENS, UK

THE PILOT LINE

At scale.

Continuous melting.

For research.


TSV

THE BATCH PLANT

At the heart of a stable melting process is a stable batching process.

This is why we have invested over £4m in a state-of-the-art batch plant – to deliver high quality, consistent, accurate batched materials 24/7 to the pilot line.

Key Features

- 13 silos – 8 scales – full batch recipe control
- Gathering conveyor to 500l mixer
- System is cold commissioned
- Final control system build currently on-going

THE FURNACE & FLUE

Designed by the industry, for the industry

Unique opportunity for global glass industry

Flue has flexibility for testing, e.g. waste heat recovery, carbon capture, sensor development, new refractory materials

Key Features

- 30tpd nominal pull
- 20m^2 melting tank
- Glass depth 1.3m
- Oxy-fired (Natural Gas, H_2, liquid fuels, blends)
- Bottom/Sidewall boost and bubblers
- Glass contact refractories: Fused Cast AZS
- Crown: Low-Lime Silica
- Full width doghouse, two batch chargers

THE FOREHEARTH

Core to our research is producing a consistent product for experimental validation.

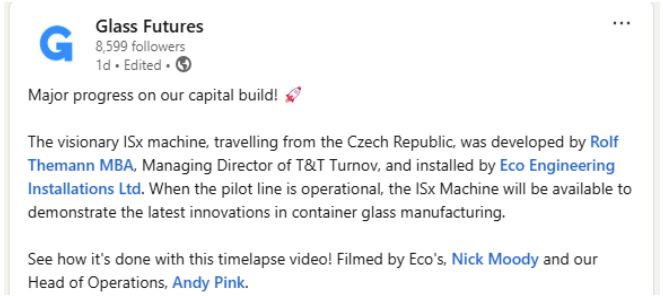
We can offer the capability to replicate real-world manufacturing processes for a complete 1:1 scale pilot facility, to produce both flat glass or glass containers.

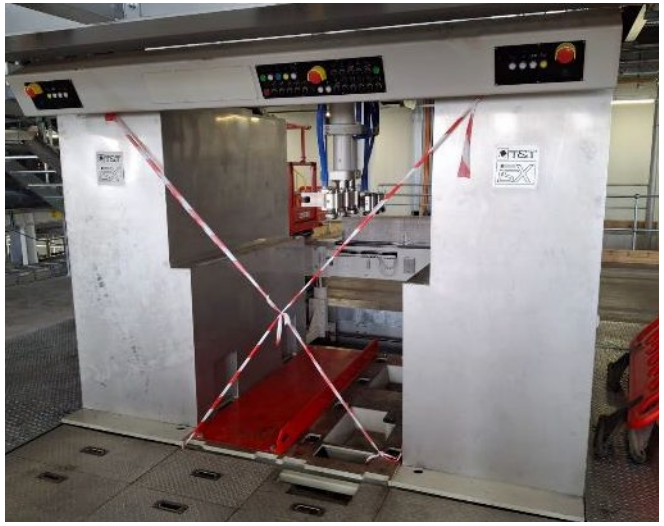
Key Features

- Centreline forehearth feeding a rolled plate machine
- Start-up on the rolled plate line
- 2nd line serving an IS machine
- Pre-mixed pencil burners in forehearth
- Currently scoping hydrogen firing forehearth capabilities
- Space to install colourant frit cells

THE IS MACHINE

- Cutting-edge ISx machine
- Increased flexibility over existing commercially available machines
- Wide range of container sizes





THE ROLLED PLATE MACHINE

Taking a known technology, supplied by F&W, able to provide high quality sampling for glass quality testing

- 600mm wide ribbon
- 2mm – 8mm glass ribbon thickness
- 6mm standard thickness

A SINGLE DIGITAL PLATFORM

We are building a control system that unifies every single system on site.

PCS Neo is Siemens latest DCS and **we are integrating this system…across the entire plant.**

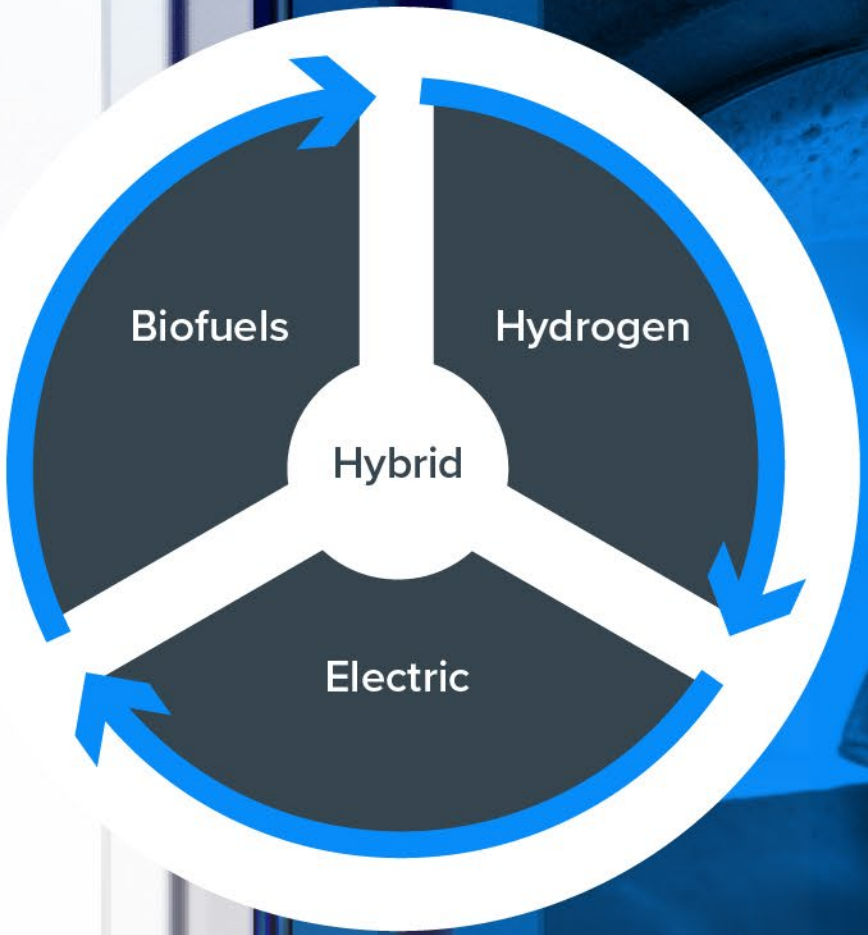
This will give us unparalleled data accuracy and end-to-end insights into glass manufacturing processes – enabling us to maximise the impact from our research.

THE FUTURE OF GLASS IS COLLABORATION

A closer look at alternative fuels and industrial trials.

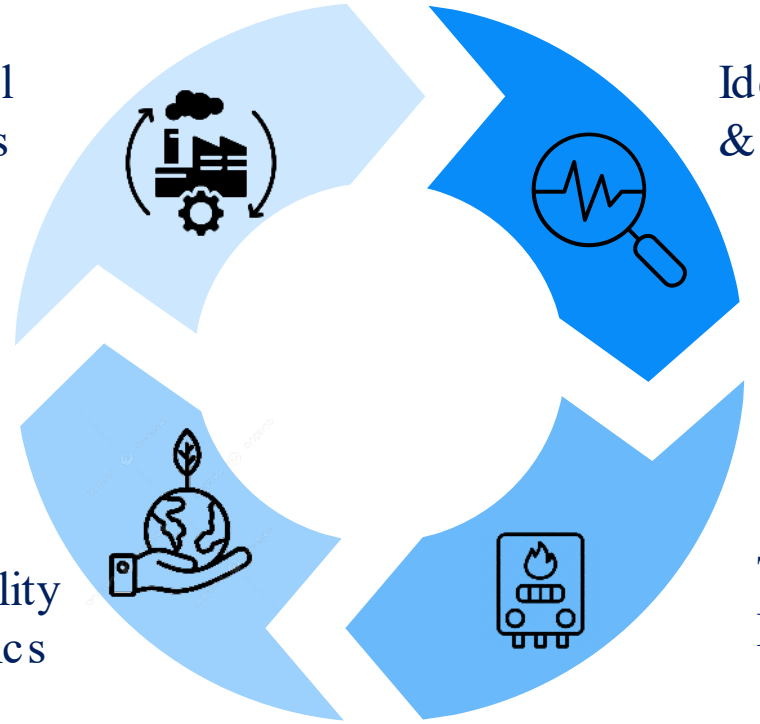
ALTERNATIVE FUELS FOR INDUSTRIAL FURNACES

- We have secured more than **£32 million in funding** to date across 12 projects
- Partners from industry, supply-chain and academia, brands, across the glass, steel and ceramics sectors
- Funding primarily from UK DESNZ



Department for Energy Security & Net Zero

ALTERNATIVE FUELS: BIOFUELS



ALTERNATIVE FUELS: BIOFUELS

Previous Phase:

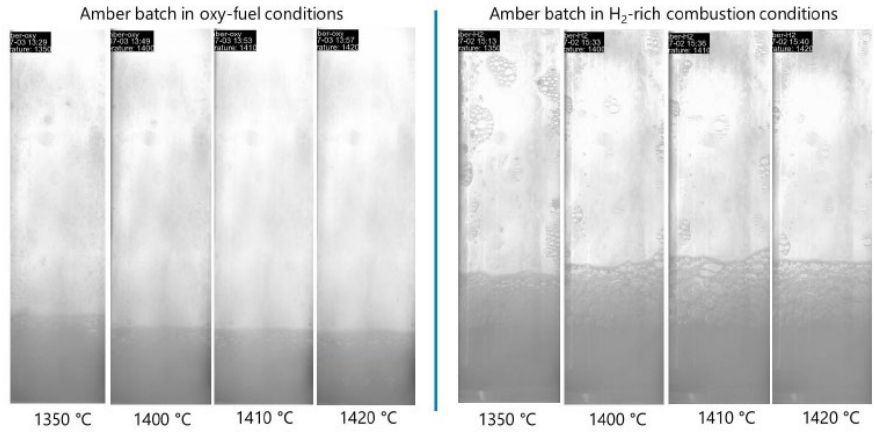
- Successful industrial biodiesel trials at Encirc, Derrylin (Jan 2021) & Pilkington UK, St Helens (Feb 2022)
- Screened a range of sustainable, low-carbon biofuels on Combustion Test Bed
- Partner with Supergen Bio-Energy Hub

Current Phase:

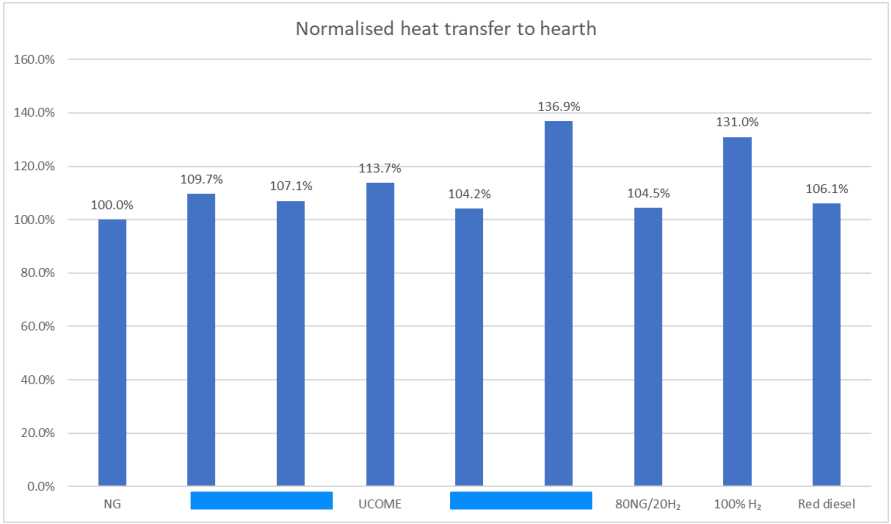
- Successful industrial biofuel trials at Pilkington UK, St Helens (Oct 2024); Ardagh, Knottingley (Jan 2025); DSF, Buxton (Jan 2025); Encirc, Derrylin (Feb 2025); O-I, Harlow (Feb 2025)
- Pilot line trials Summer 2025
- Sustainability and affordability are key topics of investigation

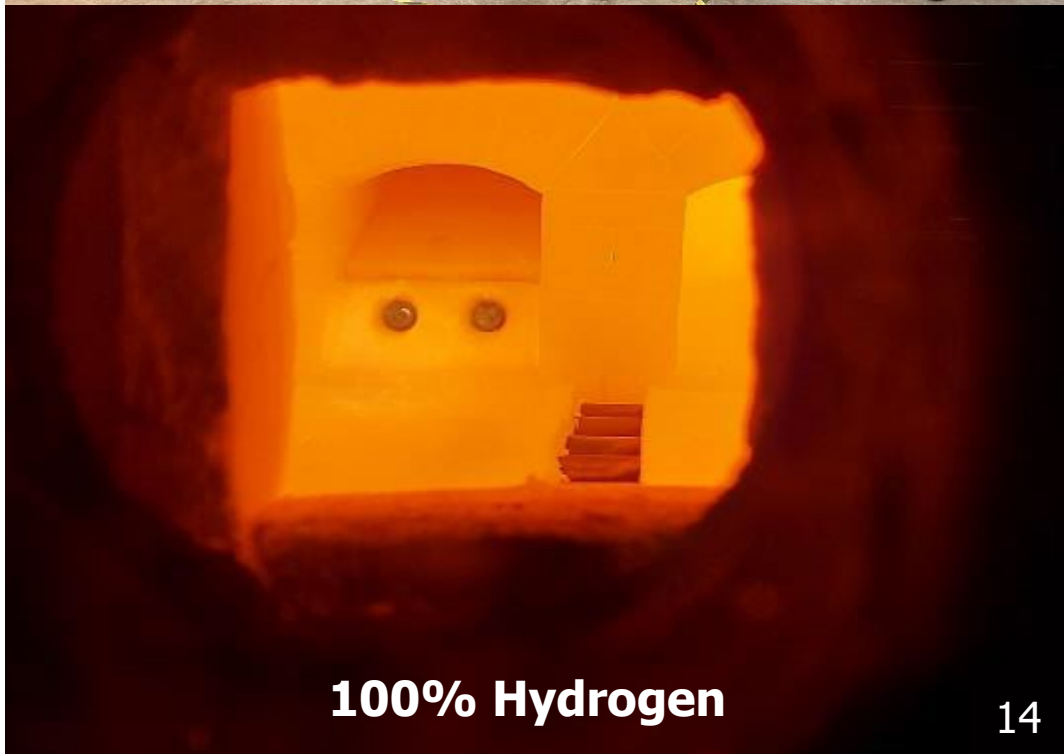
ALTERNATIVE FUELS: HYDROGEN

- Lab-scale melting trials:



- Small Pilot scale trials:





ALTERNATIVE FUELS: HYDROGEN

- Next Phase: Hydrogen trials on St Helens pilot line:
  - Furnace
  - Forehearth
- Supporting members to explore industrial-scale hydrogen trials
- Participation in wider UK initiatives:

Hydrogen Innovation Initiative

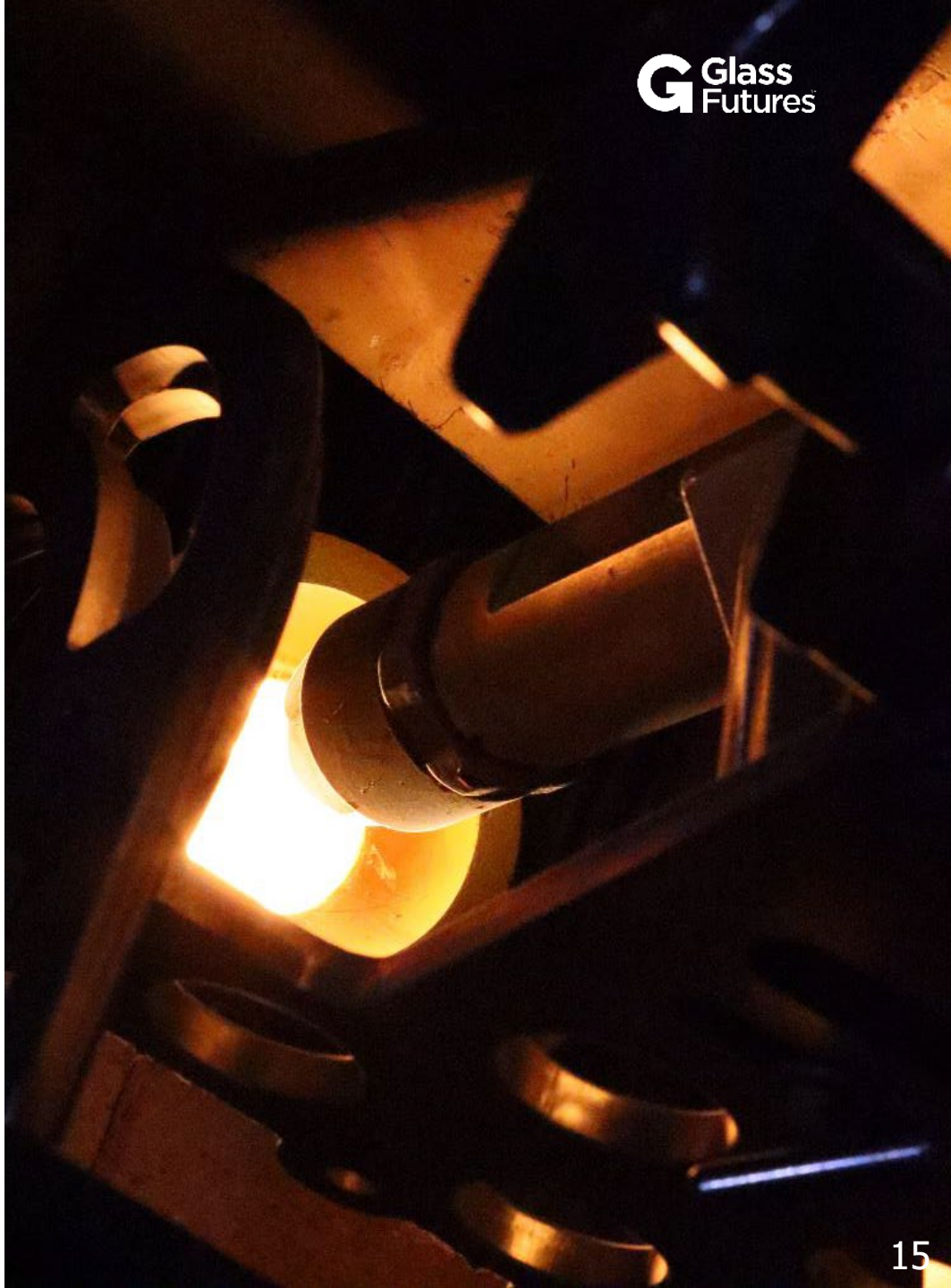
North West Hydrogen Alliance

IFRF

HyNet North West

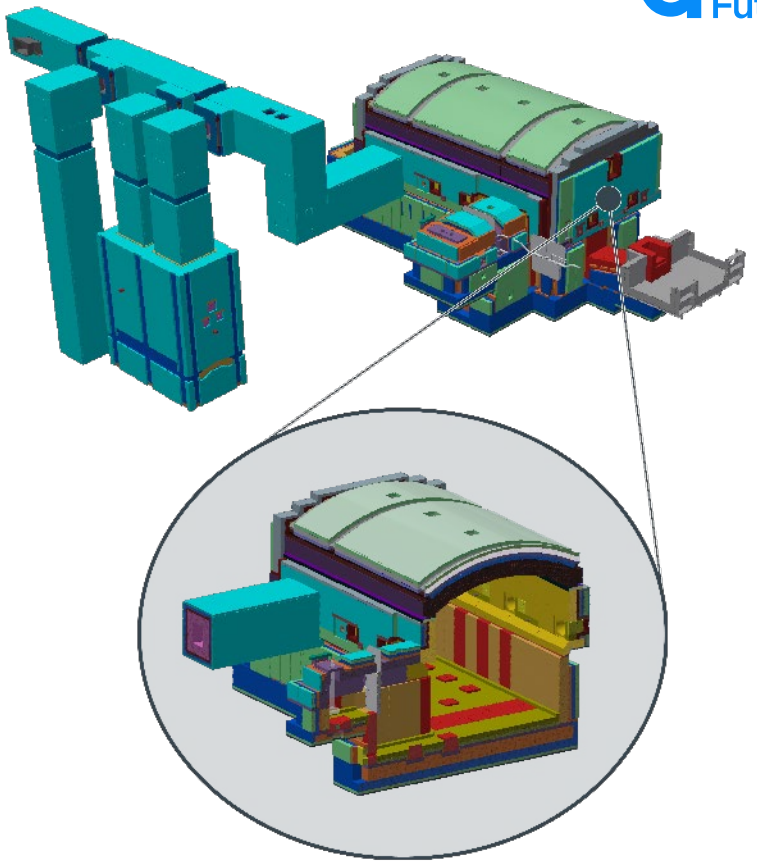
Supergen Bioenergy

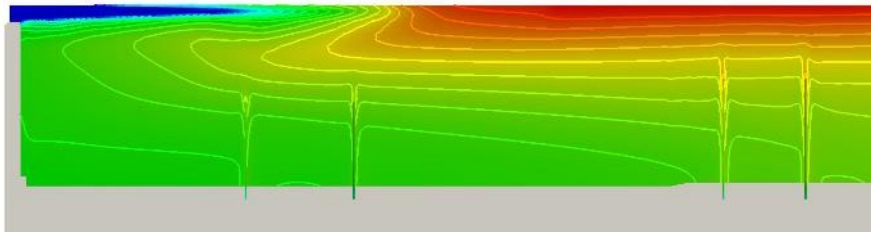
SUSTAINABLE BIOENERGY SYSTEMS FOR OUR LOW-CARBON FUTURE



ALTERNATIVE FUELS: HYBRID/ELECTRIC-MELTING

- Industrial Fuel Switching project: RaD-Electric
  - Project partners: Guardian Glass, Encirc
  - Installation of electric 'super-boost' on St Helens Pilot facility by FIC UK (specified up to 60% boost)
  - Explore hybrid fuel scenarios
  - Working with industrial members to explore routes for:
    - — Maximising electric-boost on existing industrial lines
    - — Techniques to rapidly switch between combustion/electric fuels
- Other electric heating technologies being investigated:
  - Plasma torches
  - Electrically conducting refractory bricks
  - Microwave heating





Pilot Line E-Boost System

Electrodes:

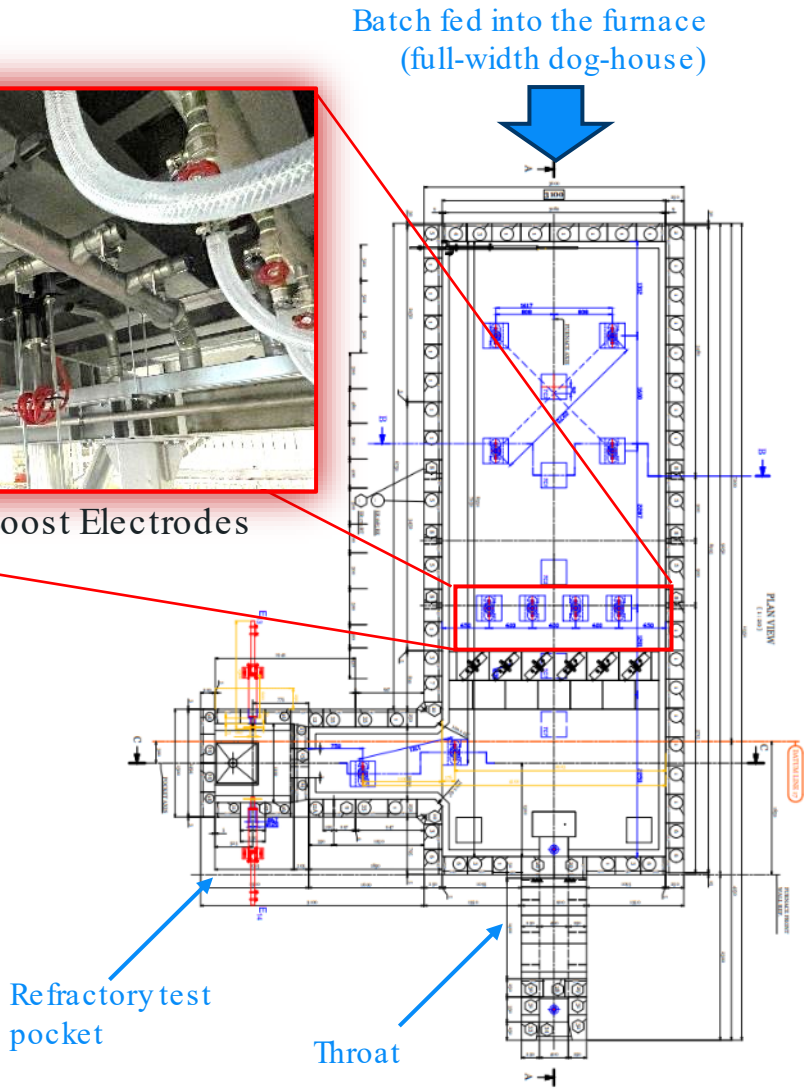
- Glass melting electrodes – 50mm diameter
- Plate electrodes (test pocket shallow) – 10mm thi plates (250mm x 250mm) connected to a 50mm diameter rod electrodes

Transformers:

- Zone 1 – Melting area – 600kW electrical power
- Zone 2 – Barrier – 600kW electrical power
- Zone 3 & 4 – Throat and test pocket

Barrier Boost Electrodes

Water Cooling system



Glass Futures' Pilot line programme

Phase 1: Alternative fuels

Phase 2: Raw materials & cullet trials

More than a facility

A platform for

Innovation

Collaboration

Transformation