

Industrial Energy Transformation Fund Technology Showcase: Phase 2

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Housekeeping

- You will be muted during the event so please use the [Q&A box](#) to ask questions
- Introduce yourselves using the [Chat box](#), network virtually.
- The event is being recorded and you will be sent a link to the recording and slides after the event to share with colleagues.

Agenda

- 10.00 Welcome
- 10.05 IETF Phase 1 & 2, what have we achieved?
- 10.15 Session 1: Magnavale Deployment
- 10.35 Session 1: Lyondell Basell Deployment
- 10.55 Q&A
- 11.05 Session 2: Pioneer Foods Engineering study
- 11.25 Session 2: Macrete Engineering study
- 11.45 IETF Phase 3 update
- 11.55 Q&A
- 12.00 Close



Department for
Energy Security
& Net Zero



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Industrial Energy Transformation Fund



Knowledge Dissemination Workshop

Department for
Energy Security
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Industrial Energy Transformation Fund

IETF targets existing **industrial processes**, helping industry to:

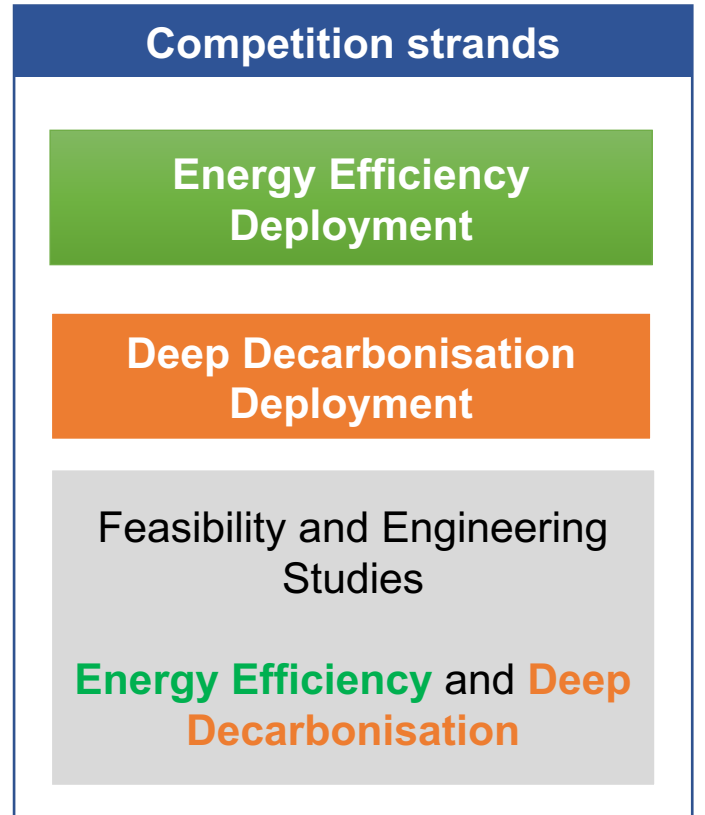


Reduce energy bills by investing in more efficient technologies

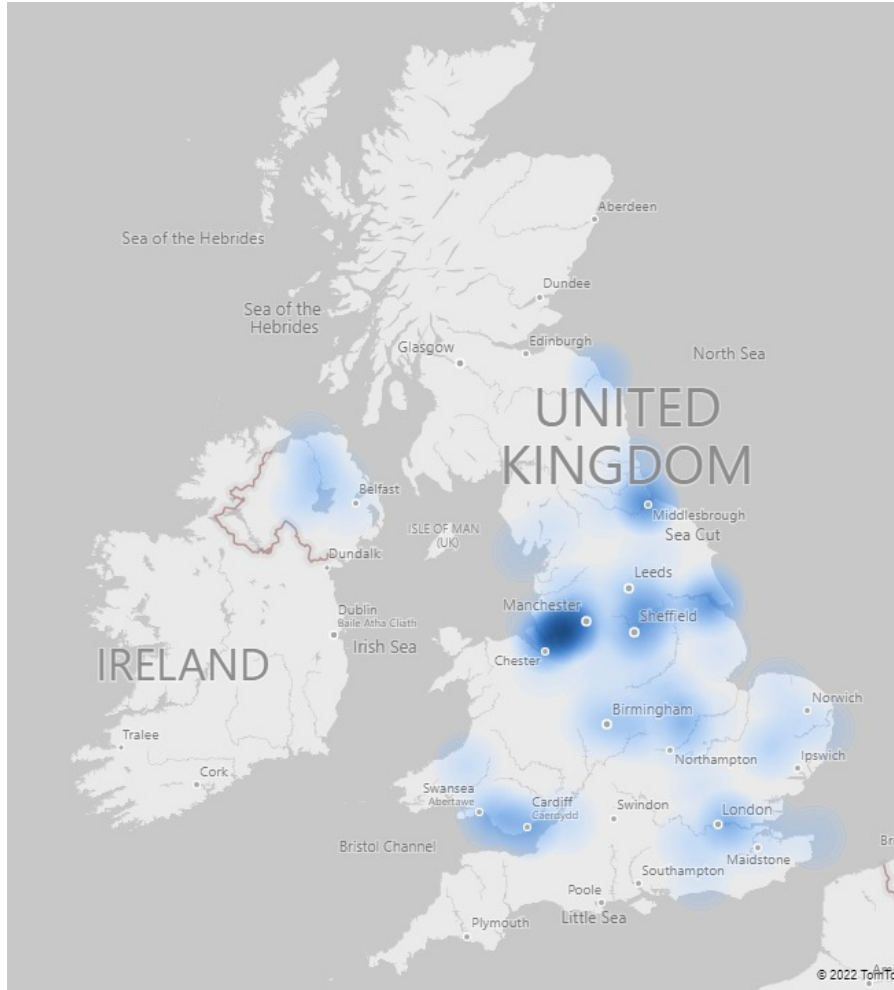


Reduce emissions by bringing down the costs and risks associated with investing in deep decarbonisation technologies.

- Open to businesses registered in England, Wales or Northern Ireland.



Funded Projects



- So far we have run 6 competition windows in two Phases (Phase 1 and 2).
- Funding allocated to **over 130 projects**
- Winners from across England, Wales and NI, from both within and outside industrial clusters.
- Good representation across eligible sectors, from small food processing companies to large chemicals and metals manufacturers.
- Case studies of the past winners are published on [Gov.uk](https://www.gov.uk)

Phase 2 funded projects





MAGNAVALE

Specialists in Temperature-Controlled Storage & Value-Added Services to Europe's largest food manufacturers & distributors



About us

Magnavale is a **temperature-controlled warehousing** and **added value services provider**.

We work with food manufacturers and retailers across the UK and abroad to provide services that facilitate the efficient operation of **food supply chains**.

We specialise in complete solutions **that reduce the length and complexity** of those supply chains by incorporating added value services such as blast freezing, tempering, picking, packing and labelling in addition to our core service offering.



195,000+ Pallet Positions
Across 4 UK Cold Storage
Facilities



Largest Portfolio of Cold
Chain Services in the UK

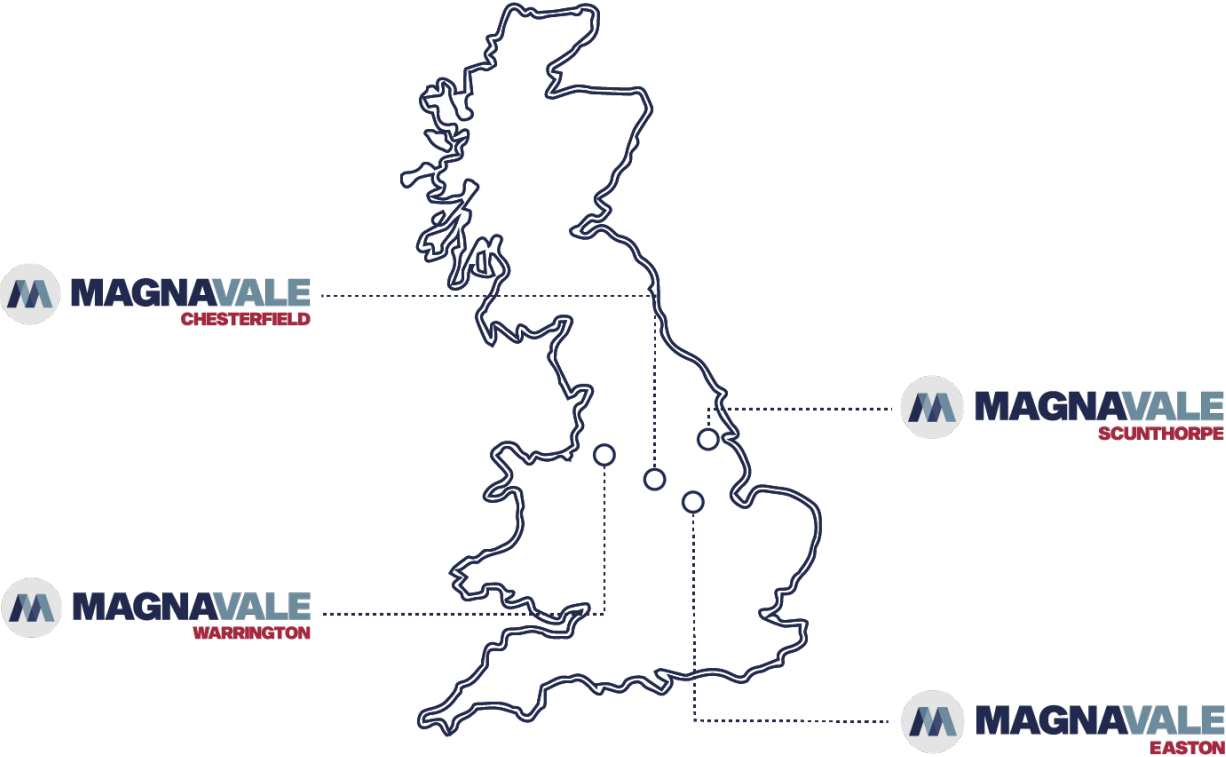


Partnered and trusted by
Europe's largest food
manufacturers and distributors



Our Cold Storage Network

Over 200,000 pallet positions across 4 centralised UK locations.



Our Network

Magnavale Scunthorpe

- Ambient, Chilled & Frozen

62,000 pallet positions across ambient, chilled & frozen temperature regimes. Similar to our other cold stores, Scunthorpe has attained BRCGS AA status.

- Location

Perfectly positioned for food manufacturers and distributors utilising the ports of Grimsby and Hull. Magnavale Scunthorpe is located in an area renowned for growing some of the best produce in the country, making it an ideal location to freeze and store fruit and vegetables.

- Value-Added Solutions

In addition to its storage facilities, Magnavale Scunthorpe has **extensive contract packing** solutions and export-related services.



Over 60,000 Pallet Positions



Efficient Access to M62



Blast Freezing & Export Related Services



BRC-Certified Ambient, Chilled & Frozen Storage

MAGNAVALE



Scunthorpe Compressors

Installed – Q3 2021

The installation of 5 x WR-W2655S-28(691kw) Compressors at our Scunthorpe facility replaced an outdated Sabroe 202LF system and delivered significant benefits to the site in terms of cost, emissions and equipment performance.



Scunthorpe Upgrade How did we select a supplier?

Details

Each subcontractor was chosen for the full term of the project.

GEA UK (Utilities) Compressor upgrades.

GEA was established in 1881 and started to deliver industrial refrigeration solutions in 1962. GEA Heating & Refrigeration Technologies is a global specialist in industrial refrigeration, heating and sustainable engineering solutions for a wide array of industries including, food, beverage, dairy and oil & gas. Our proven technologies provide our customers with what they value most — reliability, operating efficiency, sustainability and long equipment life cycles that reduce their total cost of ownership.

GEA provides turnkey cooling and heating installations, custom-engineered systems, compressors & compressor packages, chillers, controls and heat pumps to meet precise temperature requirements. And comprehensive service programs support our customers throughout the full life cycle of their plant and equipment to ensure peak performance.

H F Refrigeration (HFR). Condenser Fans and SCADA .

HFR were incorporated in 2008 and have a core team of 8 employees with a wealth of experience from senior roles previously held at GEA and Johnson Controls. HF have developed a longstanding relationship with Magnavale and are an embedded contractor. They also have longstanding relationships with leading manufacturers such as Grasso, Sabroe UK, Danfoss and Omron and have successfully carried out leading plant installations for large companies such as Eddie Stobart, Lineage Logistics and HSH Coldstore Ltd.



Scunthorpe Upgrade Condensers

Details

Another key item of equipment within each of the refrigeration systems previously mentioned is the Evaporative Condensers. The purpose of these units is to reject the heat that the cooling process has absorbed. As the compressors operate they compress the ammonia refrigerant which results in high pressure gases. This refrigerant gas must be condensed for its use again within the system. They also aid to reduce the high pressure (Discharge Pressure) that the compressors produce. This is done by way of water spray and large air circulation fans which are operated currently by two speed motors (low and High Speed).

- 1 The original systems discharge pressure had a control window of between 7.5 and 10.0 bar G.
- 2 Within this boundary the fans can be running on either speed depending on pressure at that time but quite often it is seen that these fans may stop and start frequently.
- 3 Because these fans are belt driven by the motor this puts strain on moving parts which results in frequent replacement of belts, excessive wear on the bearings, motors and pulley assemblies.
- 4 A tighter control of the discharge pressure would reduce the wear and tear on moving parts plus reduce wide varying loads of current on the compressor motors.
- 5 This was achieved by installing inverters onto the condenser fan motors and controlling the discharge pressure in a much smaller window i.e. 7.5 to 8.0 bar G (floating head pressure).
- 6 It also provides a more balanced flow of refrigerant through the condensers when multiple condensers are in circuit on the system.



Scunthorpe Upgrade SCADA

The automation and control of each of the phases is by way of Programmable Logic Controllers (PLC`s). The Plc`s gather certain information from the refrigeration systems by way of temperatures and pressures and through programming control the whole refrigeration system. Although this information could be seen by on site engineer`s with the correct software, it could not be shared or interrogated outside of the refrigeration area.

By way of installing a networked Scada system complete with Hmi, not only was all information and live data seen remotely it will also provide instant access on site engineers.

It will provide multiple functions including:

- Remote control of fans, pumps and valves.
- Remote temperature setpoints of the store including defrost times and intervals.
- Data logging of running hours, temperatures, and pressures.
- Alarm dial out functions in tier levels (low, medium, high)
- Compliance with governing bodies such as BRC etc
- Data exporting for analysis and costing calculations.



Scunthorpe Upgrade

What would we have done without IETF

The existing equipment had around 6 to 7 years of continued use left before a full service would need to be carried out. Parts and replacement compressor blocks will be readily available for at least the next ten years but unfortunately this type of compressor can not be retrofitted onto inverter control. This can be seen in the above tables showing no change in COP values.



Part load(%)	evap. Qe (kW)	N (kW)	cond. Qc (kW)	COP
100.0	632.8	324.5	957.2	1.95
90.0	570.7	304.1	874.8	1.88
80.0	508.6	281.8	790.4	1.80

Part load(%)	evap. Qe (kW)	N (kW)	cond. Qc (kW)	COP
100.0	632.8	324.5	957.2	1.95
90.0	570.7	304.1	874.8	1.88
80.0	508.6	281.8	790.4	1.80



Scunthorpe Upgrade

The Results So Far...

Below is the year on year taken from the M&V plan submitted in the last reporting quarter.

Year	January	February	March	April	May	June	July	August	September	October	November	December	Total
2017	761102	758867	893667	884365	1097173	887491	1236326	1004498	830501	1272884	865206	940246	11434343
2018	840770	761278	832196	1095732	888953	934716	1392918	1174222	1123694	1407206	1061822	1273811	12789336
2019	956306	1033217	1078666	1183467	835298	940526	1498318	1282209	1323924	1179789	1085797	1387348	13786884
2020	977549	1001259	1148926	952281	1055628	1334572	980663	1485401	1177515	1102753	1357699	1031162	13607428
2021	906168	935498	1179518	886007	1332701	1241312	1370850	1511709	985301	946097	1239263	966395	13502840
2022	1119548	970338	1024050	981983	1152604	980801	1222125	1007929	1035186	1246948	0	0	10743534



Chesterfield

Energy Efficient Design

The requirement for efficient operation is addressed through the selection of equipment – some covered by the Enhanced Capital Allowance Scheme - and design of system and the control of the plants operation. These include:

- COP boost function. Suction & discharge pressure control “floats” relative to system demand and ambient, significantly improving COP.
- GEA Piston compressors – the world’s most efficient refrigeration compressor
- VSDs installed on compressors to maximise part load efficiency.
- Automatic oil return– prevention of oil logging, efficiency improvement
- Hybrid condenser – to take advantage of cooler ambient “dry bulb” temperatures
- Screw compressor with automatic VI
- Air coolers with EC fan technology
- Air coolers with fan shut up socks and air on side motorised louvres for faster defrosting, reduced heat ingress into Coldstore and reduced ice formation around cooler.
- Logistor pipework for maximised protection and lifespan of pipework lagging.
- Annual energy saving: 3499 MWh 25-year carbon saving: 9369 tCO₂e



Annual energy saving:

3499 MWh 25-year
carbon saving: 9369
tCO₂e



The Future

Magnavale has **ambitious energy plans** and a ESG mission statement that lays out a development path towards cold storage infrastructure that delivers greater food security for the UK and Europe, while enabling a **NETZERO future.**



High Side Frequency Response



Load following for onsite generation



Our Network

Magnavale Easton – Phase I

Chilled & Frozen

Magnavale Easton features **44,000 pallet positions** across chilled and frozen temperatures.

Value-Added Services

Our Easton facility features a large **contract packing** area, equipped to handle both exposed and sealed food products.

Connections

Efficient route onto the A1 with access to both the north and south of the UK.



44,000 Pallet Positions



Extensive Contract Packing
Solutions & New Blast Freezing
Services



Positioned on the A1 between
Grantham & Peterborough



Significant development
into onsite services



Our Network

Magnavale Easton – Phase II



101,000 Pallet Positions



Best in Class & Design



Run Entirely on Renewables



Fully-Automated



For further information, contact:



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Director

jonathan.gagg@sadelgroup.com



LYB Carrington IETF Projects

Name: David Royle

Date: 15th May 2023

Agenda

- **Cooling Tower VFDs**
- **Heat Integration**

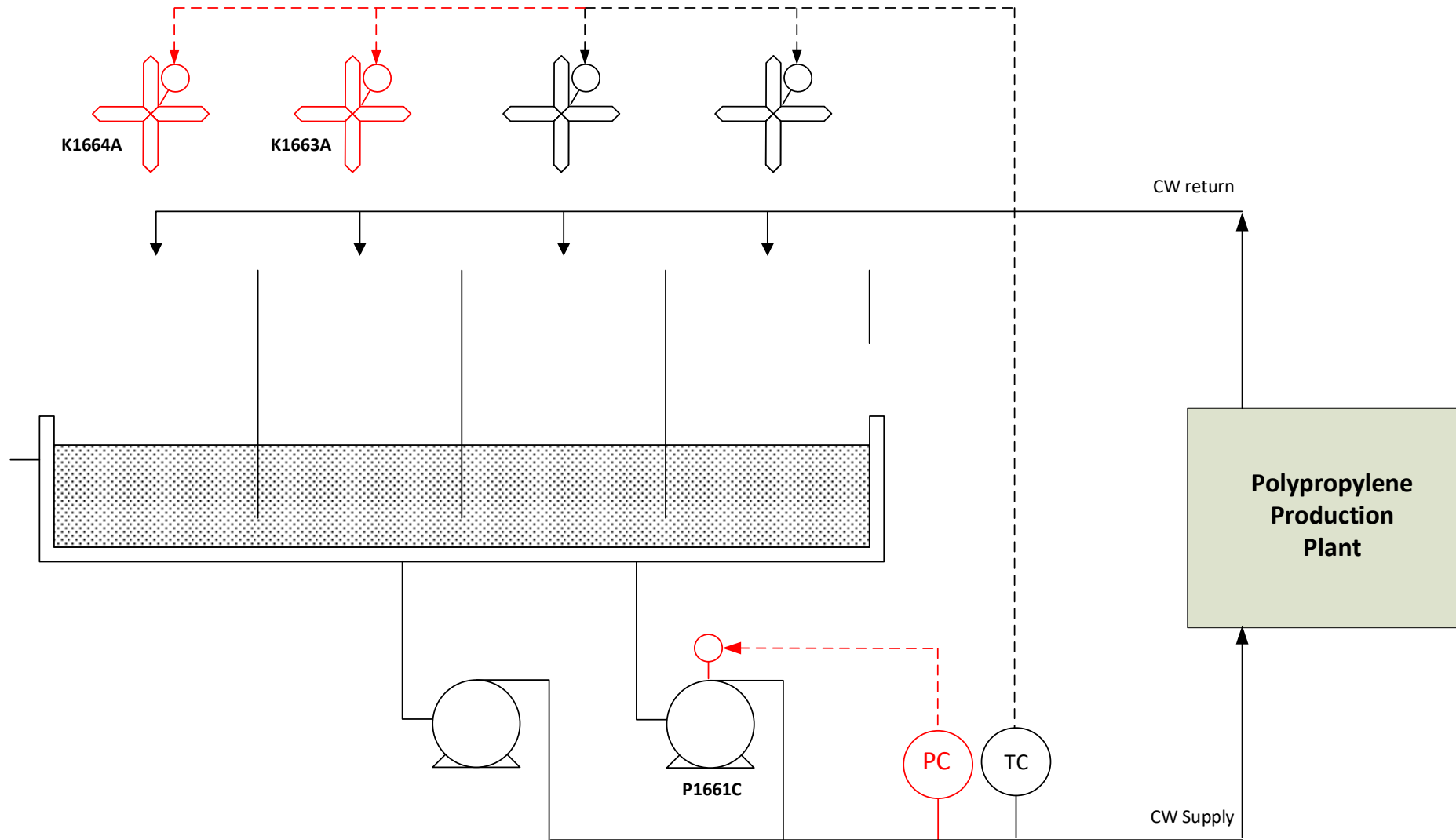
Cooling Tower Variable Frequency Drives

- 8 Fans each 90kW
 - 2 Fans with existing VFDs
 - 2 – 8 Fans on-line
-
- 4 Pumps each 350 kW
 - 2 Pumps on-line for reliability
-
- Project developed for additional 2 Fan VFDs (415V) and 1 Pump VFD (3.3kV).
 - Projected electricity savings 928 MWh/a
 - Projected CO2 savings 400 t/a.



Source: LyondellBasell

Cooling Tower Variable Frequency Drives



Cooling Tower Variable Frequency Drives

- 2 Fans provided with VFDs in 2015.
- Scouting study / Feasibility study completed in-house in 2018. Economics reasonable.
- FEED package and +/-10% estimate carried out in-house in 2020. Project economics marginal.
- Application made under IETF in 2021 for detailed design and project installation. Site was successful in obtaining a grant under IETF. Project approved in 2022 for remaining internal funding and installation works are currently being undertaken.



Project would probably not have been approved internally without IETF grant

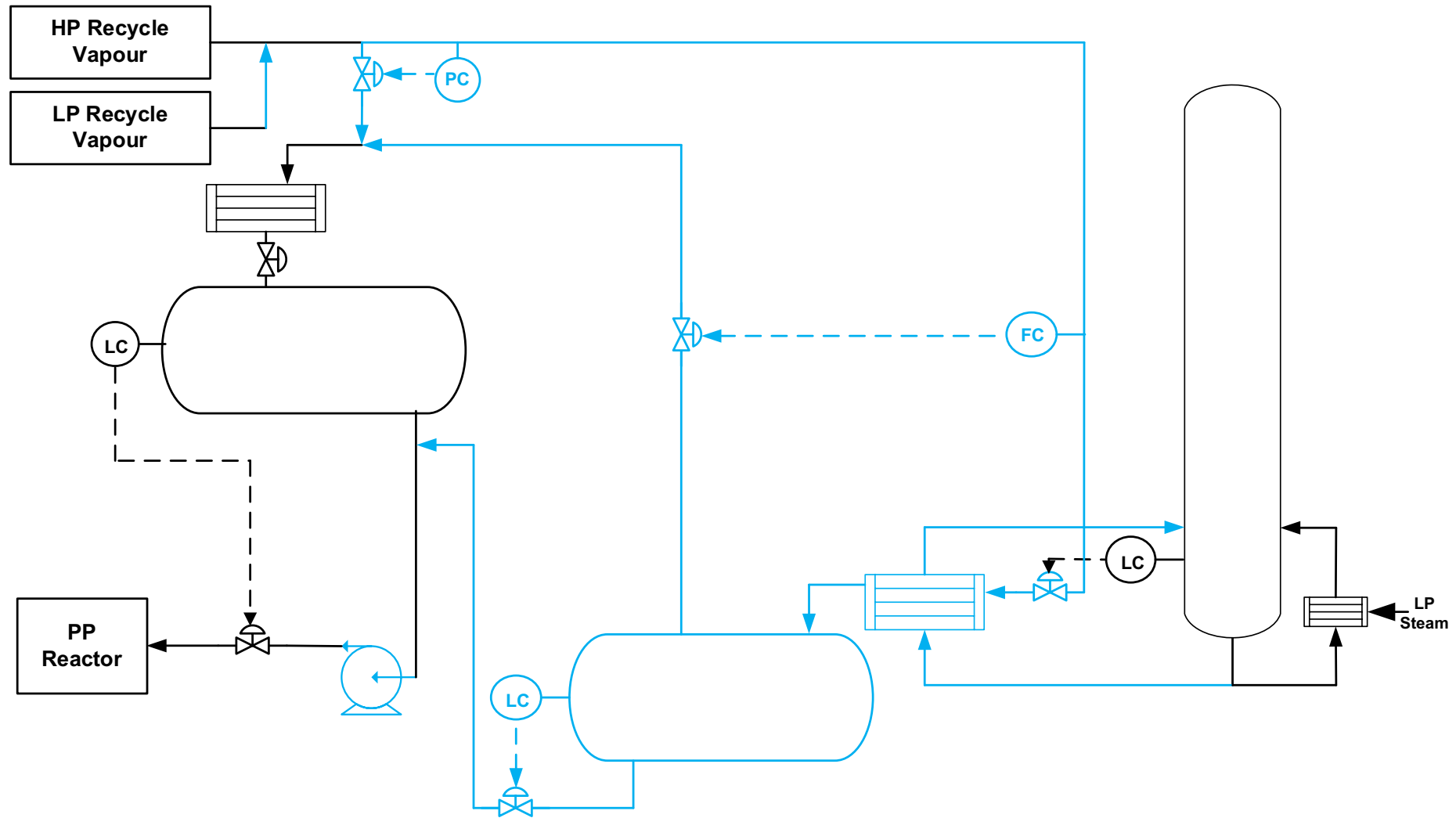
Heat Integration

- Propylene vaporiser is largest steam consumer on site (2.6 MW)
- Column reboiler is 2nd largest steam consumer on site (2.0 MW)
- Project developed to use propylene vapour from plant to provide reboil heat for column
- Projected nat gas savings 22 MWh/a
- Projected CO2 savings 4,100 t/a





Source: LyondellBasell

Heat Integration



Heat Integration

- Scouting study completed in-house. No pinch study carried out.
- Feasibility study carried out in 2017 using local design contractor. Economics marginal.
- Application made under Industrial Heat Recovery Scheme (IHRS) to develop FEED package and +/-10% estimate which was successful. Local design contractor completed +/-10% estimate in 2019. Project economics not attractive enough and project put on HOLD. 
- Project estimate updated in 2022 to confirm escalation and review economics based on higher cost / greater savings. Project marginal.
- Application made under IETF in 2022 for detailed design and project installation. Site was successful in obtaining a grant under IETF. Project recently approved for remaining internal funding and tendering currently being completed prior to awarding contract for the works. 

Project would almost certainly not have been approved internally without IETF grant

Disclaimer

All information (“Information”) contained herein is provided without compensation and is intended to be general in nature. You should not rely on it in making any decision. LyondellBasell accepts no responsibility for results obtained by the application of this Information, and disclaims liability for all damages, including without limitation, direct, indirect, incidental, consequential, special, exemplary or punitive damages, alleged to have been caused by or in connection with the use of this Information. LyondellBasell disclaims all warranties, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, that might arise in connection with this information.

Any Questions?



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Phase 2 funded projects





**PIONEER
FOODS**



IETF Technology Showcase
Energy Reduction Programme
May 2023



Engineered Energy Solutions

www.envirya.com





Envirya are an Energy Management company specialising in the identification and implementation of **energy efficiency** and **decarbonisation** projects

Envirya have successfully been awarded multiple **studies** and **deployment grants** over the past three years, working in partnership with numerous industrial companies

Energy Efficiency technologies;

- ❖ Process optimisation
- ❖ Equipment upgrade
- ❖ Heat / energy recovery & heat pumps
- ❖ Resource efficiency measures

Decarbonisation technologies;

- ❖ Fuel switching
- ❖ Carbon capture

Envirya help companies identify, calculate and apply for potential energy efficiency or decarbonisation Projects and undertake the awarded grant execution



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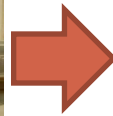


PIONEER FOODS - PROCESS OVERVIEW

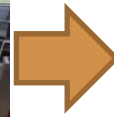


- ❖ Pioneer Foods (UK) Ltd is one of the leading cereal product manufacturers in the UK and operates from three food manufacturing sites
- ❖ The facility at Wellingborough manufactures wheat style biscuits through two processing lines
- ❖ Milling and Transportation to the Mills accounts for 74% of Wellingborough's electricity consumption

Steam Cooking



Milling



Shaping & Baking





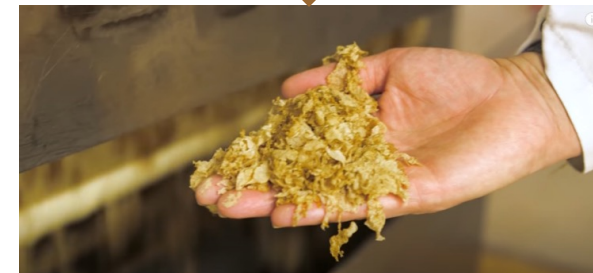
Milling Process

- ❖ Two blowers used to transport wheat to seven Milling machines
- ❖ Milling machines consist of two cylindrical rollers positioned closely together
- ❖ Wheat delivered to the top of the mill and as they pass through the mill the wheat is flattened into flakes
- ❖ Flakes are then conveyed to the biscuit shaping machine

Process Optimisation

- ❖ Reducing energy associated to wheat transportation - conveyor / blower control ensuring suitable distribution
- ❖ Improving milling efficiency with increased motor and gear control – VSD for speed and torque control, High Efficiency Motors & direct drive to minimise losses
- ❖ Interlinking transportation and mills controls for overall process optimisation

Estimated Energy Saving (477 MWh) per year
Equivalent Carbon Saving: 101 tCO₂e per year





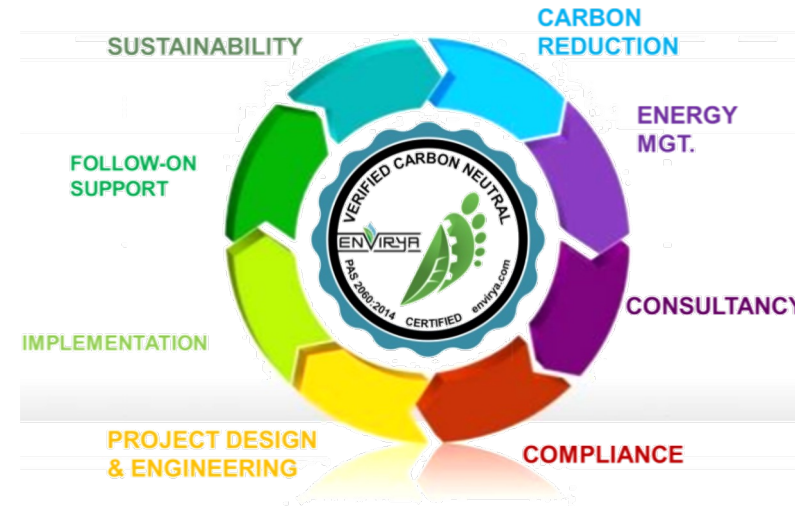
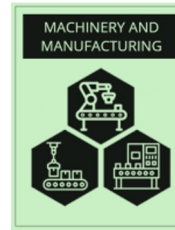
PROJECT & TECHNOLOGY DISSEMINATION



Department for
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PIONEER FOODS





IETF FUNDING

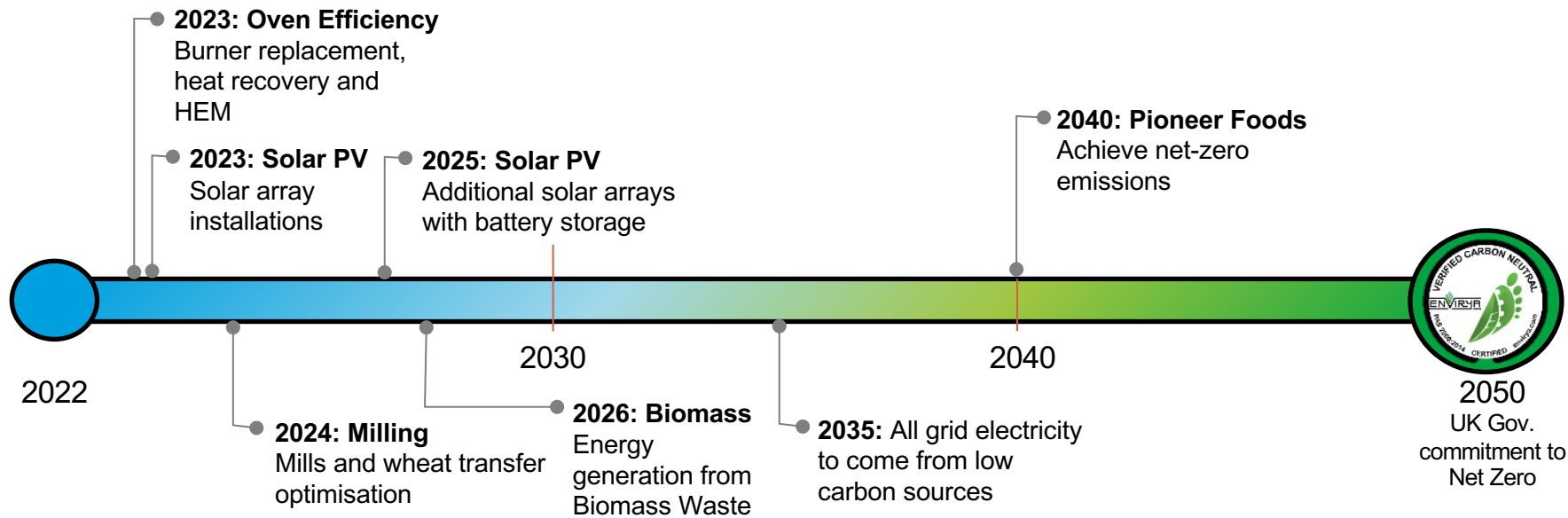


GRANT OPPORTUNITIES - IETF provides periodic releases of potential projects for application to encourage innovation within the UK across multiple business and industry sectors.

FEASIBILITY STUDIES - Feasibility grants are available for enabling studies thus determining energy saving project viability.

PROJECT IMPLEMENTATION - Post viability, grants are also available for execution funding towards energy and carbon reduction projects.

OUTCOME & BENEFITS - Without appropriate funding and grants the likelihood of implementing viable energy reduction projects could be limited for companies who strive to achieve net zero.





IETF GRANT Partnering - Projects Contacts



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Pioneer Foods

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Introduction to the Project
**‘Digital-Scale Microwave System for Energy-
efficient and Low-carbon Precast Concrete
Production’**



Professors Ken Grattan & Yun Bai

**On behalf of the Project Consortium led by
Macrete Ireland Ltd**



- Project led by Macrete Ireland Ltd
 - a specialist in precast solutions for the sea defence, civil engineering, railway infrastructure, sports stadia and water and utility sectors
- Founded in 1979, Macrete Ireland Ltd is at the forefront of the precast concrete engineering industry
- It supplies materials and expertise to UK blue chip construction companies



is committed to sustainability on our site in Northern Ireland

Our Resources

State of the art manufacturing plant and systems

Modern batching plants

Modern concrete testing laboratory

ISO 9001 Quality Management System

ISO 14001 Environmental Management System

ISO 45001 Occupational H&S Management System

Advanced mould workshops and casting facilities

Ample space for trial builds and storage



Up to 50% of our power is now from renewable sources.

Macrete will use a 45-acre site in Northern Ireland – manufacturing facilities there include

- State of the art manufacturing machines and systems
- Modern batching plants with waste management
- Testing laboratory where thorough concrete strength analysis is carried out
- Moulding workshops and casting workshops with contemporary equipment
- 250KW wind turbine, which is used to supply the factory – excess power being exported to the grid
- 50KW solar PV array, which is used to supply the factory – excess power being exported to the grid
- Facilities to allow for full trial builds of structures and for storage purposes
- **Macrete provides employment for in excess of 130 people in Northern Ireland**



Macrete Ltd – our site in Northern Ireland that will benefit from this work



Our Mission

To be recognised as a major provider of precast concrete technology, products, services and solutions and to serve our customers regionally, nationally and internationally

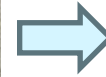
The focus of the project

- To add value to and improve competitiveness in UK industry and thus...
 - To promote greater energy efficiency and enhance decarbonisation in industry, benefitting both society and industry in the UK and its export potential.
 - To do so, demonstrate how a synergy of energy efficiency technologies
 - Coupling this to an effective deep decarbonisation strategy which can be achieved for the UK precast concrete industry
 - through adopting low-carbon curing techniques and low-carbon concretes.

Enhanced decarbonization is needed for precast concrete



Mineral resources



Grinding of raw materials



Cement

The emission of CO₂
830kg/t cement



Calcination/Clinkerisation



Grinding of clinker

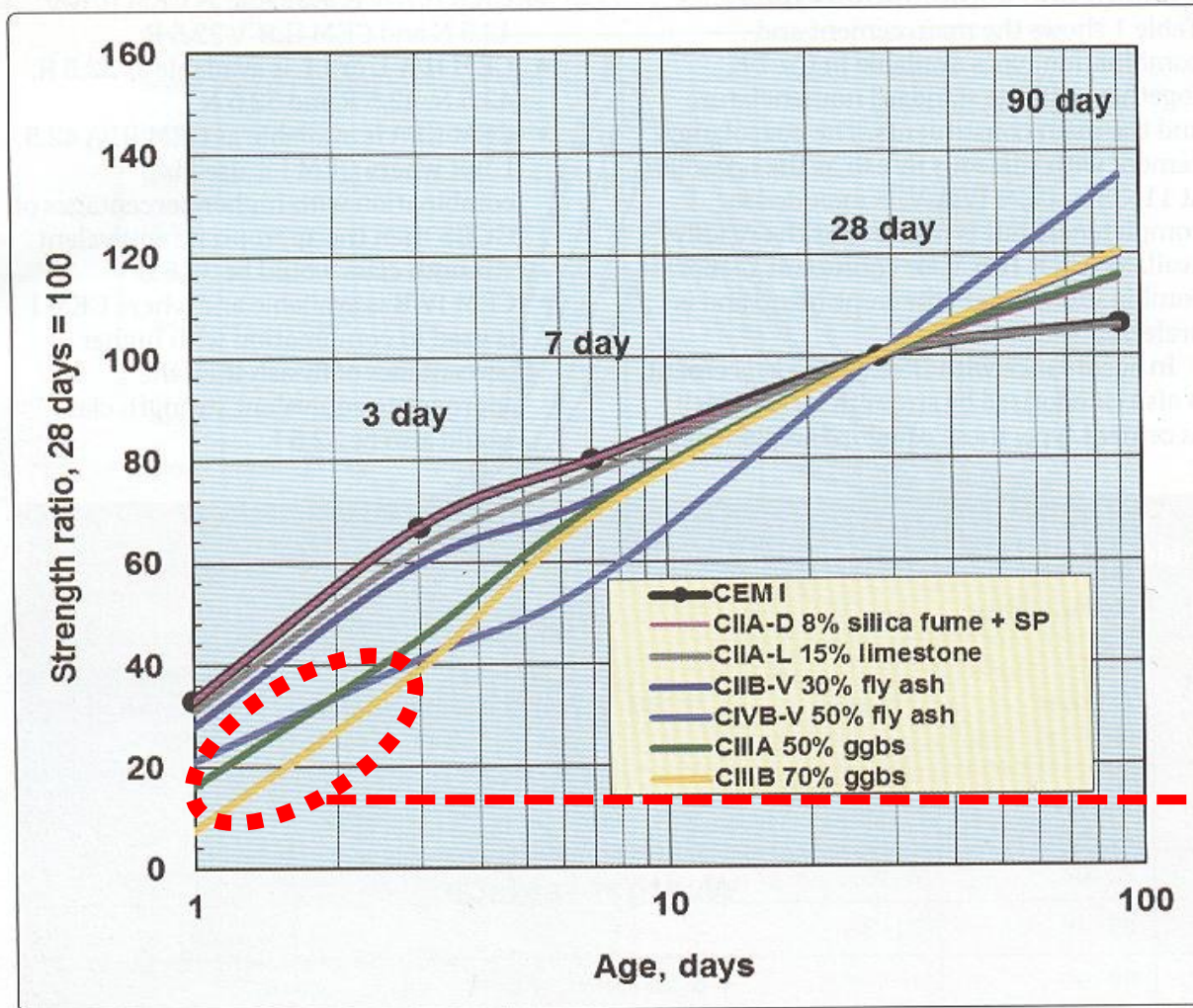


Product	Embodied Carbon Dioxide (ECO₂)
Portland Cement	830 kgCO ₂ /t
Fly Ash	10 kgCO ₂ /t
GGBS	52 kgCO ₂ /t



Increasing addition level can obtain maximum environmental, economic and social benefits.

Strength development of different concretes at 20°C water curing



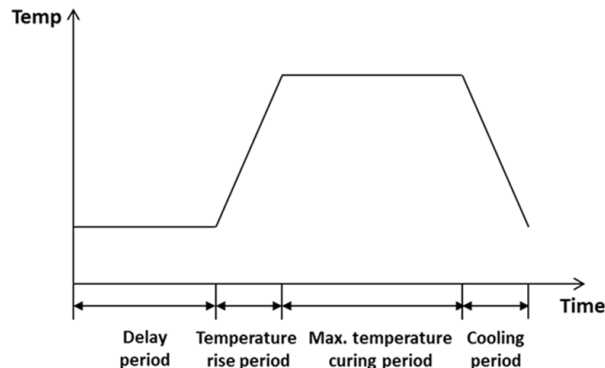
- Low early strength with high addition levels;
- Thermal curing is needed – increases ECO_2 !

Improved energy efficiency is essential for precast concrete to address the issues



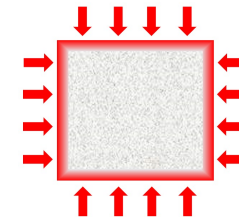
Advantages of precast construction:

- Improved quality
- Lowered costs
- Shortened construction time



Issues with precast concrete

- High temperature gradient
- Long production cycle
- Low energy efficiency

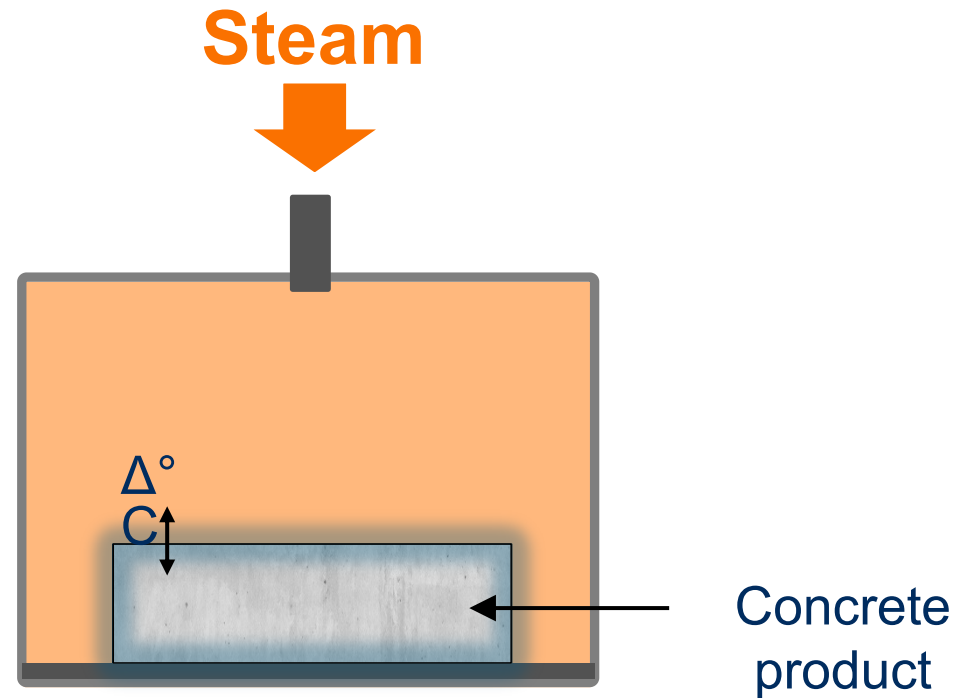


The partnership to create the solutions needed has diverse skills and expertise

- Macrete Ireland Limited is one of the well-known Precast companies in the UK with a turnover of more than £14M a year, employing 130 staff
- Mineral Products Association Limited (MPA) is the industry trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries
- Central Tanker Services Ltd – manufacturing services which will specialize in the microwave equipment design and production
- University College London (UCL)
- City, University of London

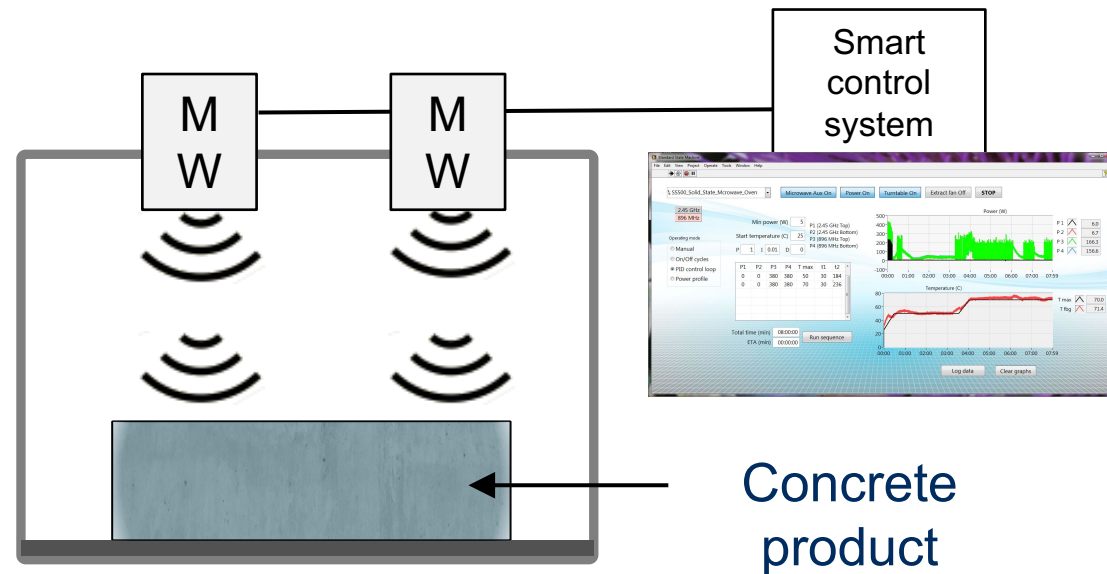
Issues with conventional accelerated curing

- Heating occurs from “outside – in” (poor efficiency)
- Temperature gradients can cause product quality issues



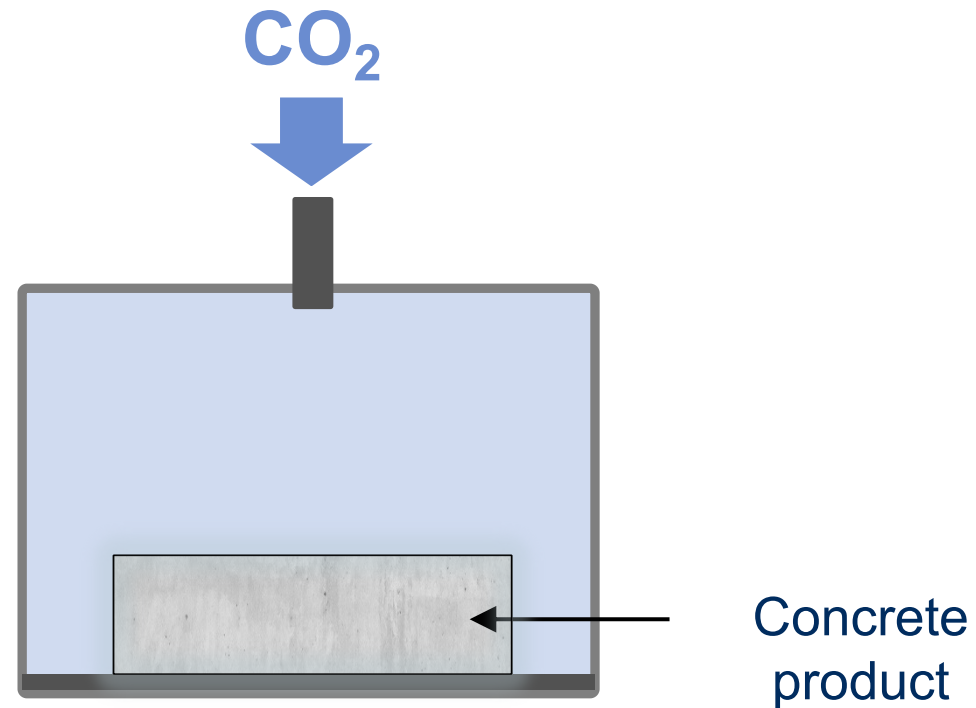
Proposed Solution 1: Microwave Curing

- Heating occurs from inside (volumetric)
- Smart control system avoids temperature gradients
- Faster, lower carbon



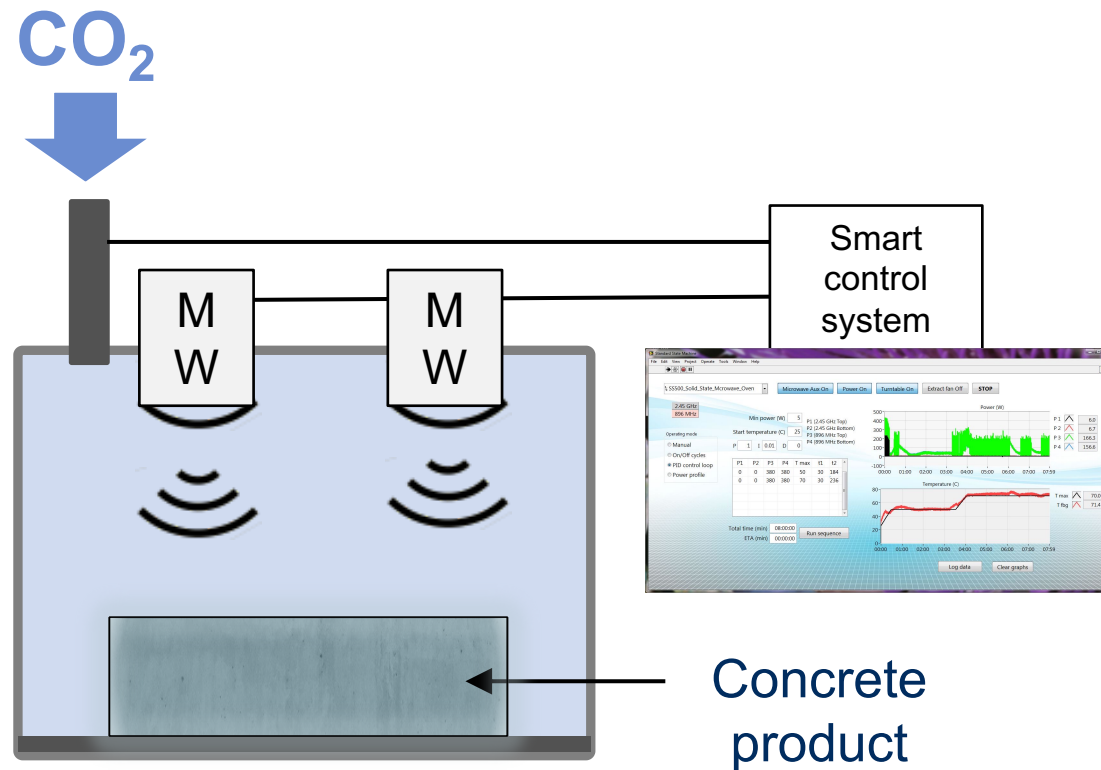
Proposed Solution 2: CO₂ Curing

- Curing in the presence of CO₂ enhances early strength
- CO₂ is sequestered into the product



Proposed Solution 3: Microwave-assisted CO₂ Curing

- CO₂ uptake is increased when product is heated
- Speed of curing is accelerated further



Potential energy/carbon savings to be achieved by Macrete using this approach

- ❑ Using microwave curing alone: 50% carbon saving can be achieved → 8,250 tonnes/year for Macrete; 97,000 tonnes/year for UK precast concrete industry.
- ❑ Using carbonation curing alone: 60% carbon saving can be achieved → 9,900 tonnes/year for Macrete; 116,000 tonnes/year for UK precast concrete industry.
- ❑ Using microwave-assisted carbonation curing: 70% carbon saving can be achieved → 11,550 tonnes/year for Macrete; 136,000 tonnes/year for UK precast concrete industry.

How Macrete went about finding the right solution for their site?

- ❑ Macrete recognized that a new, integrated technological solution was needed and brought together an interdisciplinary team with a breadth of skills to tackle the problem
- ❑ Macrete built on previously working successfully with many of the partners to create new solutions
- ❑ Macrete saw an opportunity in this way to be highly competitive in the industry and thus to create a technological – and thus commercial advantage – for the UK
- ❑ Macrete saw this as an ideal way to respond to the Call for Proposals and supports the UK's Net Zero targets

What would we have done without IETF?

- The study would not have been able to be proposed with the potential for IETF support as:
 - **the project is built around the synergy of the skills of the partnership**
 - **the Universities bring** key expertise in low carbon cements, the use of microwave systems in curing, innovative sensors systems for installation in the curing precast products and in advanced IT and interface technology
 - **the Industries involved** provide the key industrial context for the work and provide the site for the demonstrator proposed would not be able to access the advanced technologies needed for funding fully from their own resources this work planned
 - **the Steering Committee** of other outside bodies would not be freely available to advise the project without the IETF funding

Whether Macrete intends to deploy the solution at other sites after this project ends?

- ❑ Macrete will deploy the new system developed at its site in Northern Ireland, as soon as possible
- ❑ Macrete recognized MPA's involvement in the project will facilitate wide dissemination to over 60 precast concrete manufacturers in the UK

Macrete will then discuss licencing the technology and sharing the knowhow with other manufacturers in the UK to allow them to deploy the technology more widely



Pilot industry scale system designed and built for this work



Pilot microwave-based carbonation system with tailored features



Industrial Energy Transformation Fund

Knowledge Dissemination Workshop

Department for
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Phase 3 is coming

- On the 30 March an extension to the Fund was announced, increasing total grant funding by £185m.
- Subject to business case approval, Phase 3 of the IETF will open for new applications in early 2024.
- Further information regarding stakeholder events, competition window timelines, eligibility criteria, application processes etc, will be announced in due course.
- For queries about the IETF, or to be added to IETF mailing lists, please contact IETF@beis.gov.uk

Any Final Questions?



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Post event information

- Link to the IETF networking platform
- Link to the IETF Technology Marketplace
- Link to the recording from today's event
- Link to the Phase 1 and 2 IETF funded projects

<https://www.gov.uk/government/publications/industrial-energy-transformation-fund-ietf-competition-winners>

Consultation opening soon – help us make Phase 3 a success



Department for
Energy Security
& Net Zero



InnovateUK
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Thank you

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