



# Decarbonisation for a sustainable future

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# Agenda



1. Importance of Net Zero
2. Fuel Switching - clean fuels for industrial heating and transport
3. Efficiency, productivity, monitoring and control – examples of new technologies

# Climate Change Mitigation

## Limiting Global Warming to Below 2°C

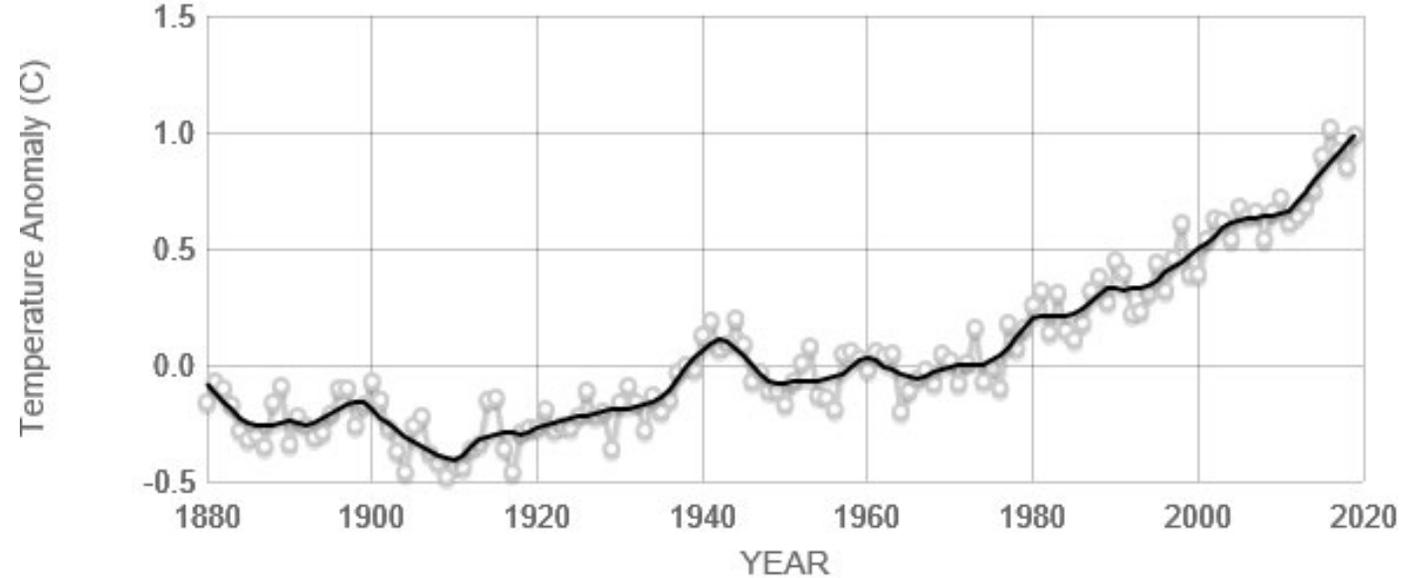


### Decarbonization as part of the solution for climate change

According to the European Commission, scientists warn that without urgent action, global warming is likely to exceed 2°C above pre-industrial levels by 2060.

Such rise in temperatures will have devastating effects on our planet's ecosystems and cause irreversible damage.

### Global Land-Ocean Temperature Index



Source: [climate.nasa.gov](https://climate.nasa.gov)

## Why is Net Zero Important?

- Net zero means that the UK's total greenhouse gas (GHG) emissions would be equal to or less than the emissions the UK removed from the environment
- This can be achieved by a combination of emission reduction and emission removal
- **Legally binding target** by 2050
- Future source of competitive advantage



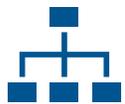
“Companies and industries that are not moving towards zero-carbon emissions will be punished by investors and **go bankrupt**”

Mark Carney, Governor of the Bank of England

# Food and Beverage has a Significant Carbon Footprint in UK and Globally



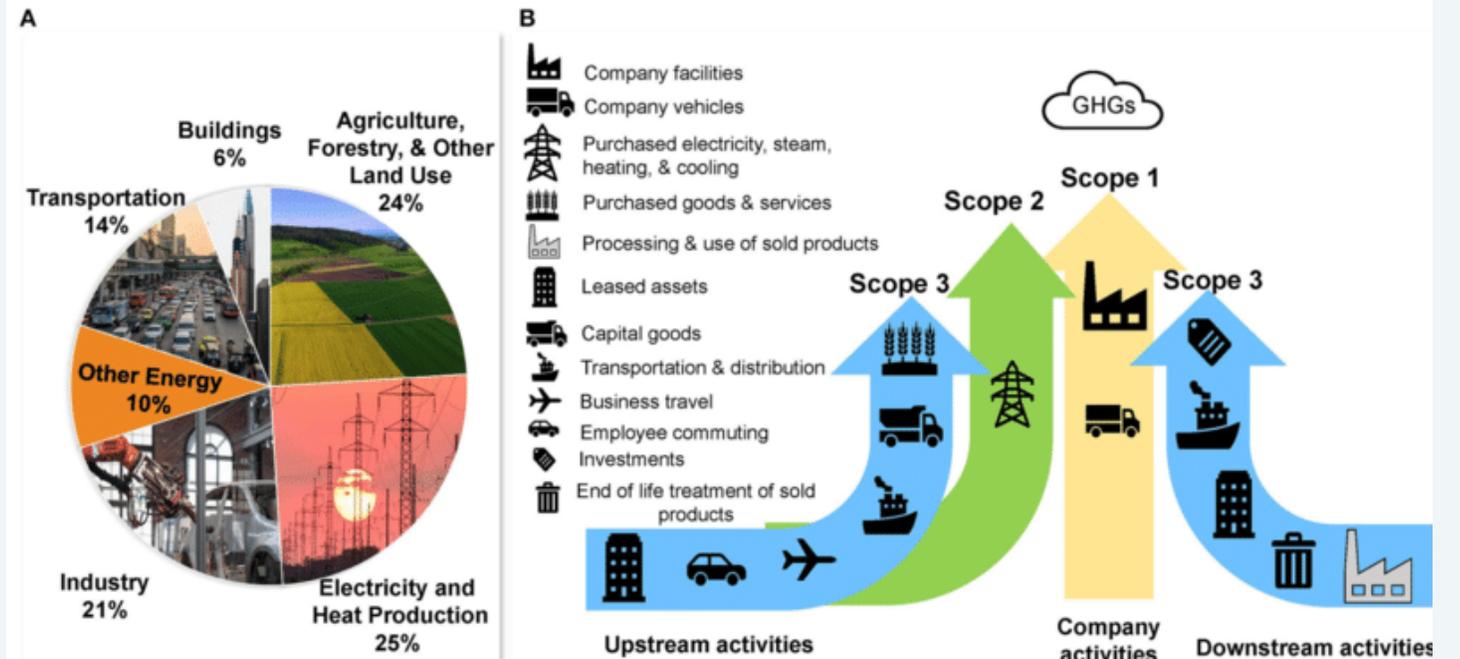
Total emissions from UK food and drink consumption 165 million tonnes Co2e in 2019. **21% of UK total.**



Emissions mainly in Scope 3 (supply chains) for some F&B companies  
Can be 85% in Scope 3.



For F&B companies achieving climate change goals for the **whole value chain** is important.



A = Breakdown of different anthropogenic greenhouse gas (GHG) emission sources [2010 emissions sources data from IPCC (2014)]

B = Conceptual map of different activities included in scope 1 (yellow arrow), 2 (green arrow) and 3 (blue arrows) greenhouse gas (GHG) emissions.

## What this Means...



### Renewable energy

- Renewable electricity
- Hydrogen, bio-LNG,



### Efficiency

- Improving efficiency of processes (use less)



### Productivity

- Getting more from less



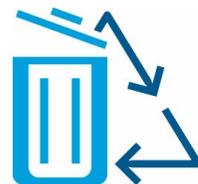
### Extending equipment life

- Re-lifeing/improving existing equipment



### End of life considerations

- For example recycling, and reusing for a circular economy rather than a linear one.



### Generating less waste

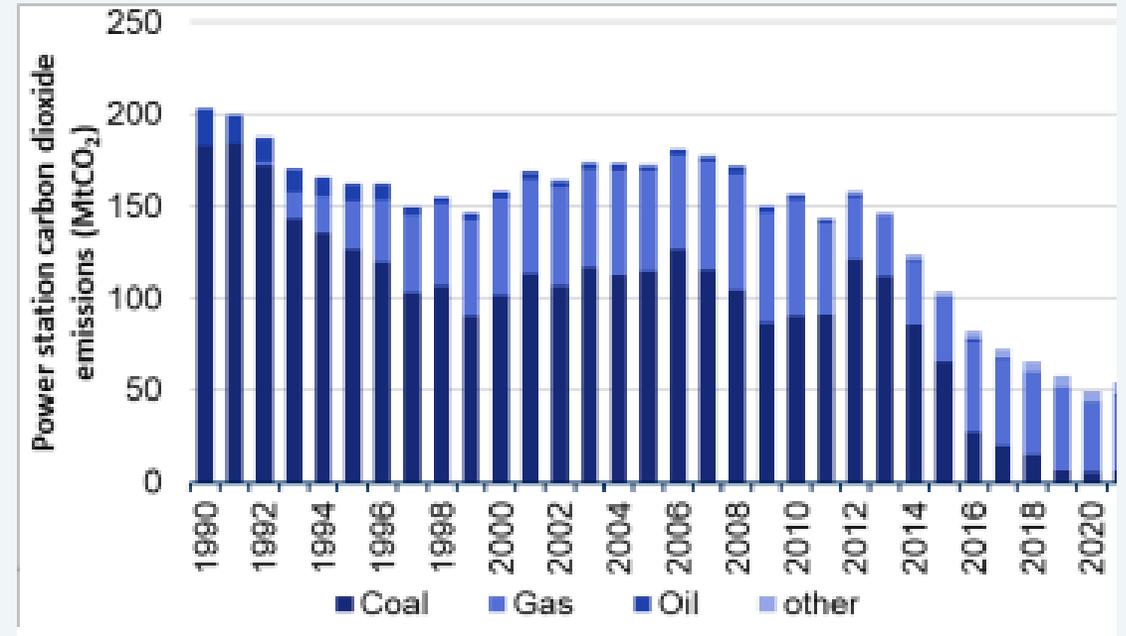
- **Renewable electricity**

- Wind
- Solar
- Biomass

- UK has been **successful in decarbonising** the electricity grid.

- But traditionally electricity has been around 4 times more expensive than gas

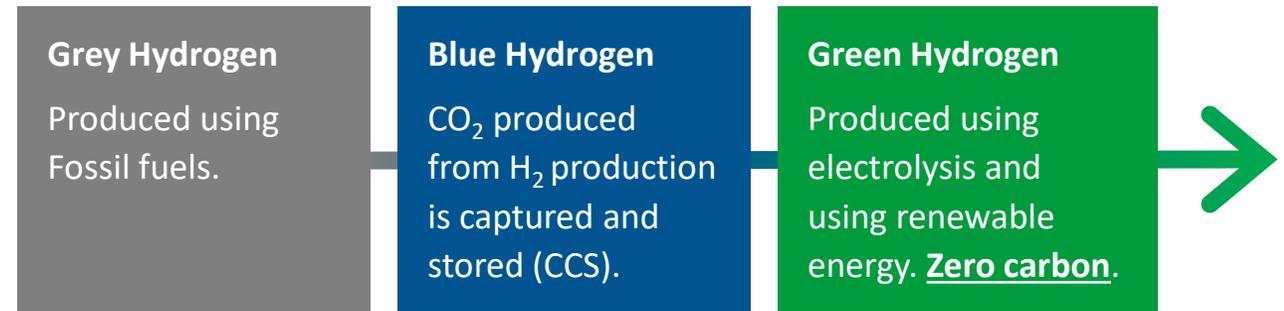
- **Heating** is much more difficult to decarbonise.



The largest driver of the long term falling UK emissions has been the decrease of emissions from power stations away from using coal and electricity generation towards gas and renewables.

Source: 2021 UK Provisional Greenhouse Gas Emissions ([publishing.service.gov.uk](https://publishing.service.gov.uk))

- Green hydrogen is produced using **renewable** electricity e.g wind and solar
- Gas produced is effectively **storing** the (renewable) energy (like a battery)
- Can be **used at any time**
- Stores energy and effectively **decouples** from the grid
- UK Government is targeting **5GW** of green H2 **by 2030**



# Green Hydrogen - ITM Linde Electrolysis Joint Venture



- Focus on providing **global green gas solutions**
- ITM Power's **modular PEM electrolyser technology**
- Linde's world class **EPC expertise** to deliver turnkey solutions to customers



Source: ITM Power

# Green Hydrogen for Transport

- Green hydrogen used as transport fuel
- 1kg of H<sub>2</sub> is equivalent to 1 gallon diesel
- 350barg for HGVs
- 700barg for cars
- H<sub>2</sub> can be used for buses, gritters, refuse collection, trains etc.

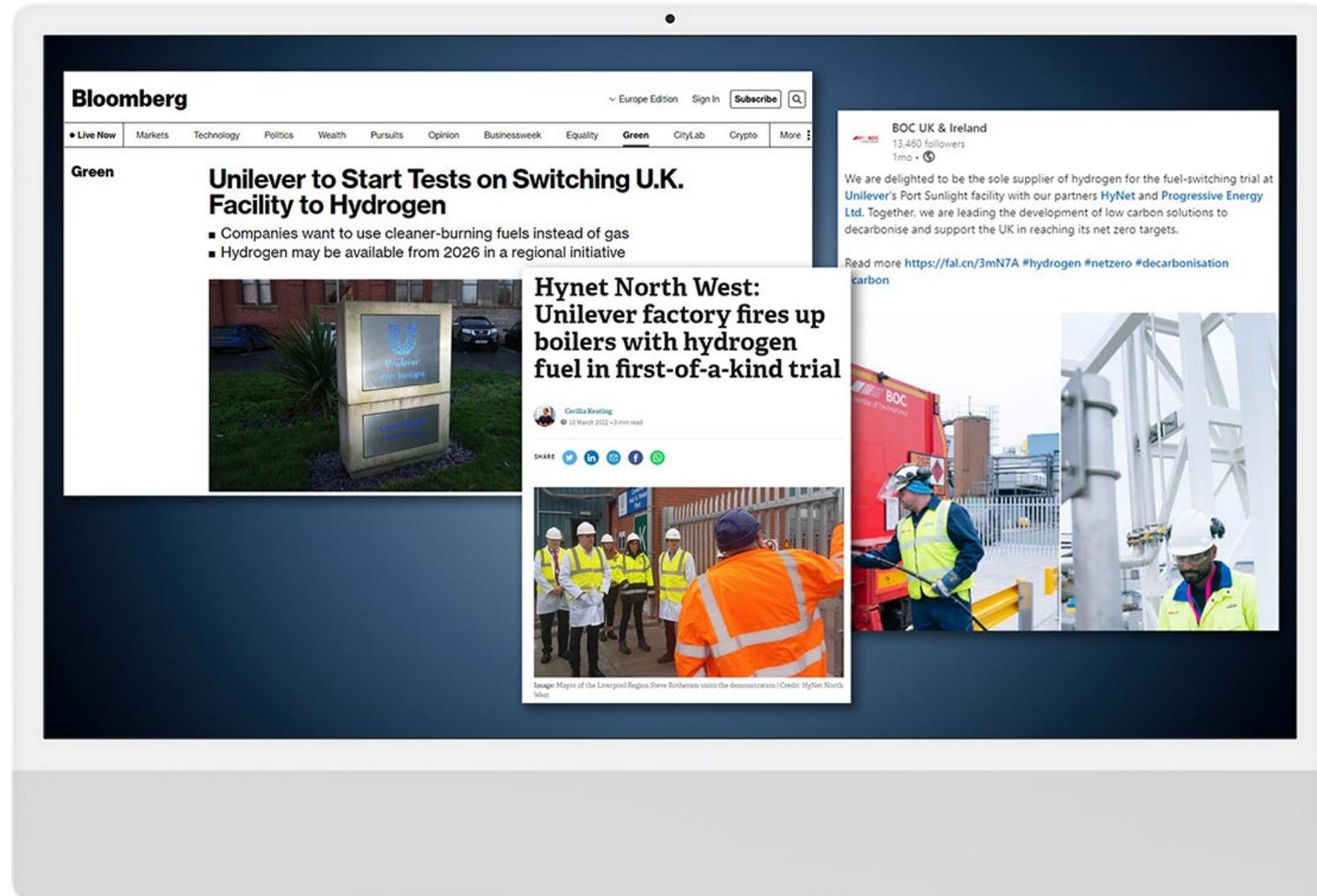


## Case study: Kittybrewser, Aberdeen

- One of Europe and UK's largest hydrogen refuelling station owned and operated by BOC
- 99.5% reliability and no failed refuels
- Produces 360kg of hydrogen daily
- Green hydrogen on site via electrolysis powered by renewable energy
- Recently upgraded to include 350bar van and 700bar car refuelling

# Hydrogen for Industrial Heating

- BOC is providing hydrogen gas and hydrogen control equipment for the Government sponsored H<sub>2</sub> switching trials for heating
- Energy Intensive industries e.g chemicals, glass, lime, cement



# Hydrogen for the Gas Grid

- UK Government has a plan to **add 20% H2 to the gas grid** to decarbonise the grid
- This is like town's gas (that was around before North Sea Gas) and had a **higher H2 content**
- Existing boilers can operate with only **minor adjustment**
- Over time National Grid could decarbonise gas grid using **100% H2** - or perhaps a combination a synthetic biogas produced from waste sources. (the carbon produced is offset by the growing of the plants initially or by recovering energy from waste).

Source: <https://www.nationalgrid.com/uk/stories/journey-to-net-zero/high-hopes-hydrogen>



# Biomethane

- Using biomethane from landfills and anaerobic digestors to produce **bio-LNG**.
- **500+ landfills** in the UK.
- Opportunity to **clean up**, liquefy and use for transport and heating.

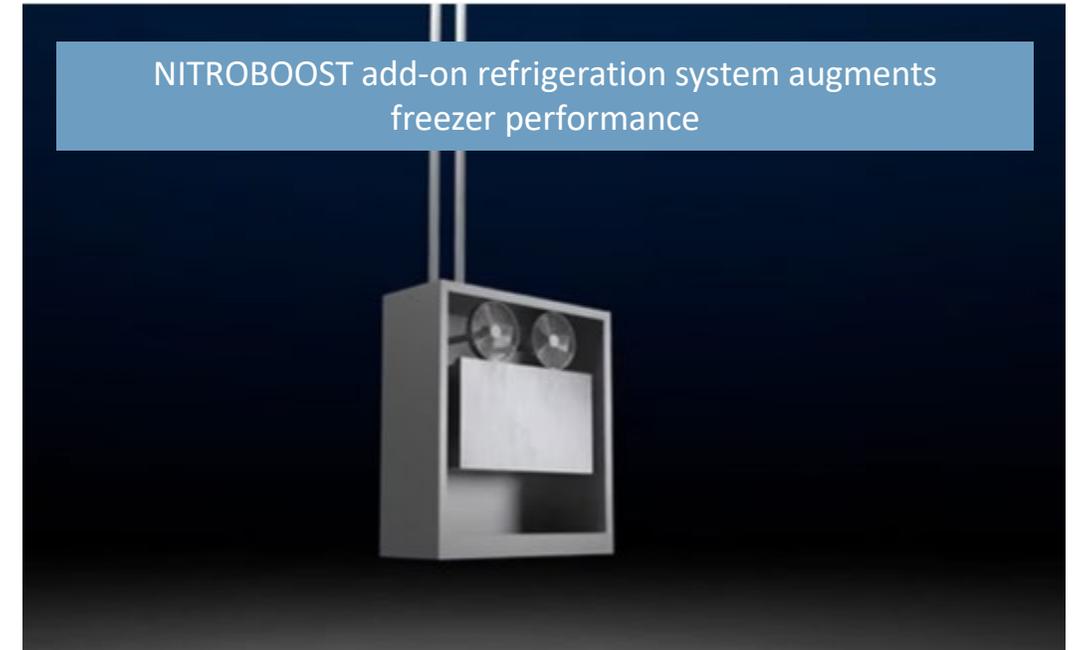


- As well as moving to renewable, low-carbon energy we need to **increase efficiency** of processes and produce **less waste**
- Move **towards in-line, automated, continuous** processing rather than batch
- Use equipment/processes that are **SMART, efficient** and **flexible**.

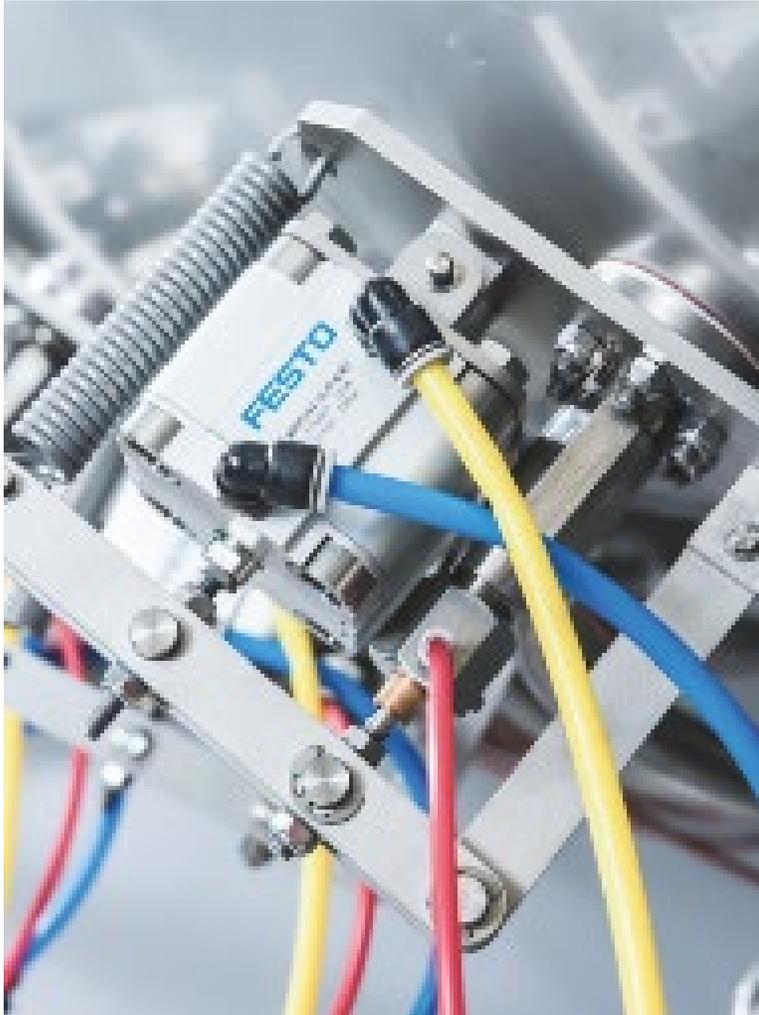


## NitroBoost Add-on Refrigeration Technology

- NitroBoost for **uprating** and **extending the life** of existing mechanical freezing and chilling equipment
- Uprating of existing **blast chillers** or **spiral freezers** with **liquid nitrogen**
- **10-20% increase** in throughput.



## Accu-Chill LX Cryogenic Chilling



- **Accurately and hygienically** dispenses liquid nitrogen or liquid Co2 into blenders, tumblers, cooking vessels, or other mixing vessels to **reduce temperature**
- Used in:
  - **Forming operations** for patties or nuggets
  - **Chilling** of fluids: soups and sauces

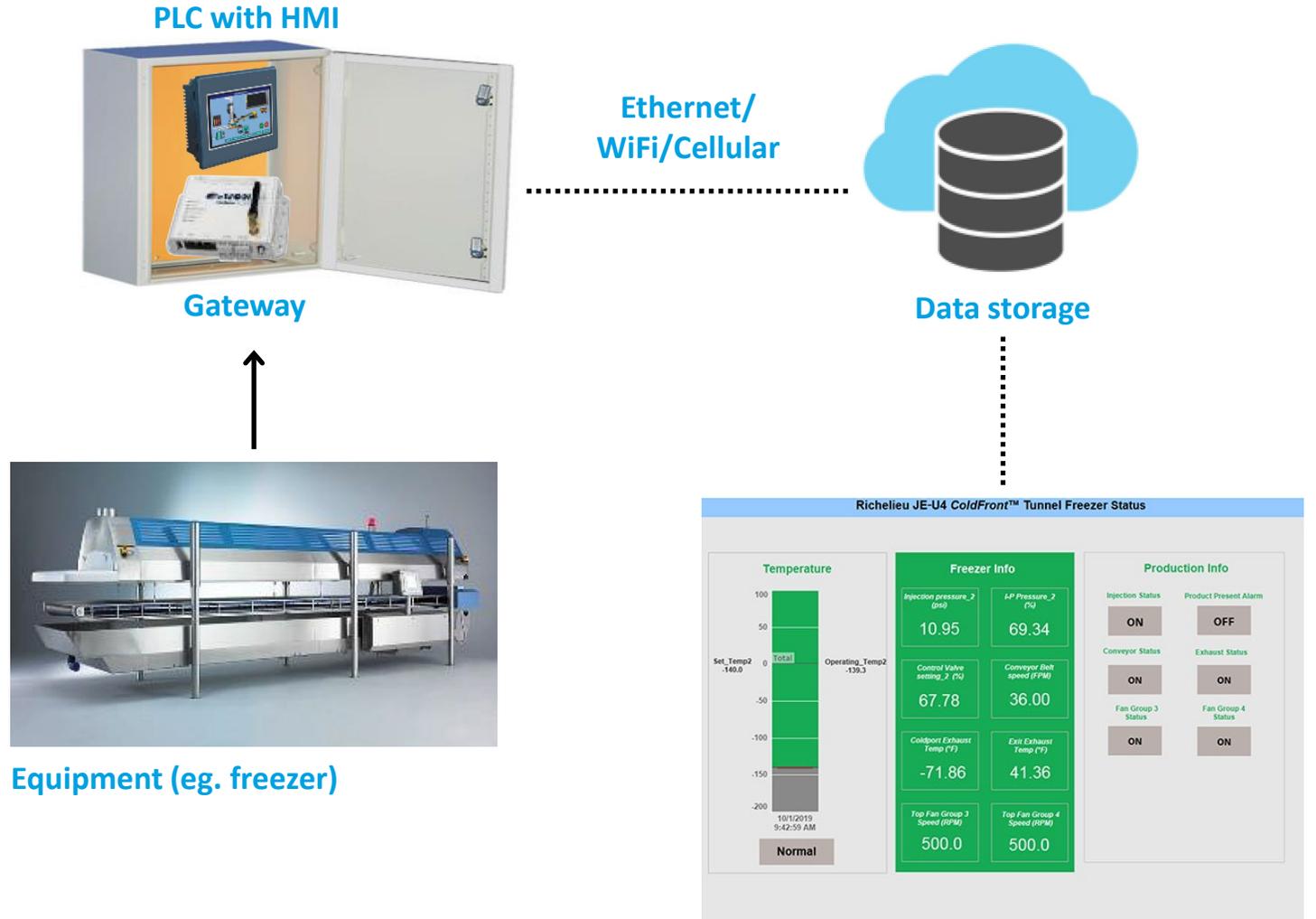
## Cryoline CW - IQF Specialist Fast Freezing

- **Multi-purpose IQF freezer**
- Combines **high efficiency** with an adjustable **IQF wave-action** technology called **CRYOWAVE**.
- **Hygienic design**



# Remote Monitoring

- Ability to **customise** and **visualise** data
- Obtain **alarm** notifications
- Easy **status** dashboards
- Maintenance **reminders**
- Historical **trending** and **analysis**



- Building a sustainable low carbon future will be **challenging**
- It will require **widespread changes** in policies and investment – that will involve all of us
- Technology **exists and new technology is being developed and scaled** to achieve the Net-Zero target





**Thank you for your attention**

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