

The Engineering Road To A Net Zero Cold Chain

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Star Refrigeration Ltd

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About Us

- Founded in 1970
- UK's leading independent industrial refrigeration engineering company
- >350 employees
- £50M turnover
- Pioneers in innovative natural refrigeration and heating technology
- Total solutions provider
- UK-wide coverage (and beyond)
- ISO 9001:2015 & 45001 certified



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Net Zero – A Daunting Task



“It always seems impossible until it is done” - Nelson Mandela

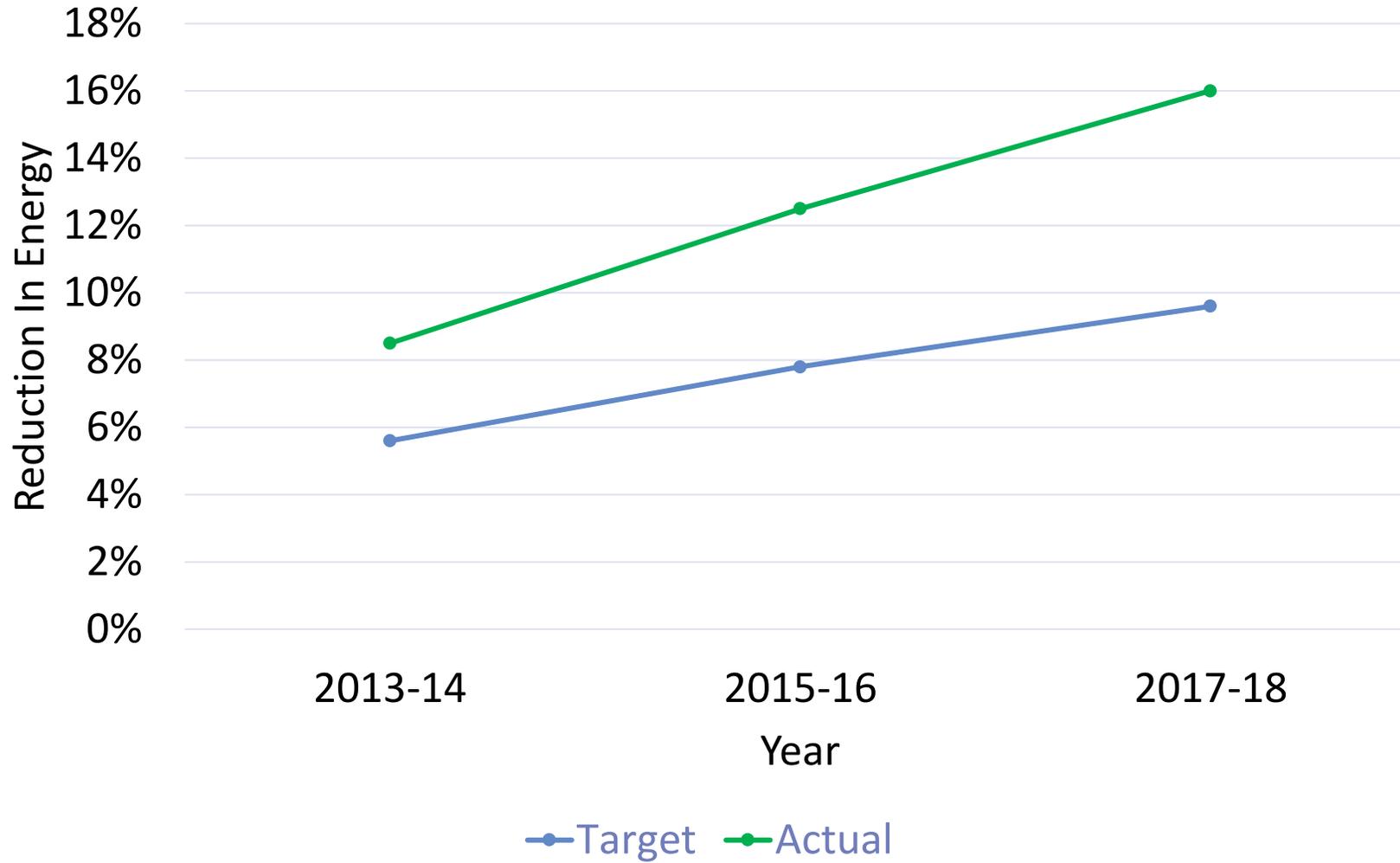
How Do We Get There?

Three key areas of focus for industrial refrigeration:

1. Reducing the energy demand
2. Efficient operation
3. Use of renewable energy

An Encouraging Start

Industry Target Vs Actual Performance (CCA)



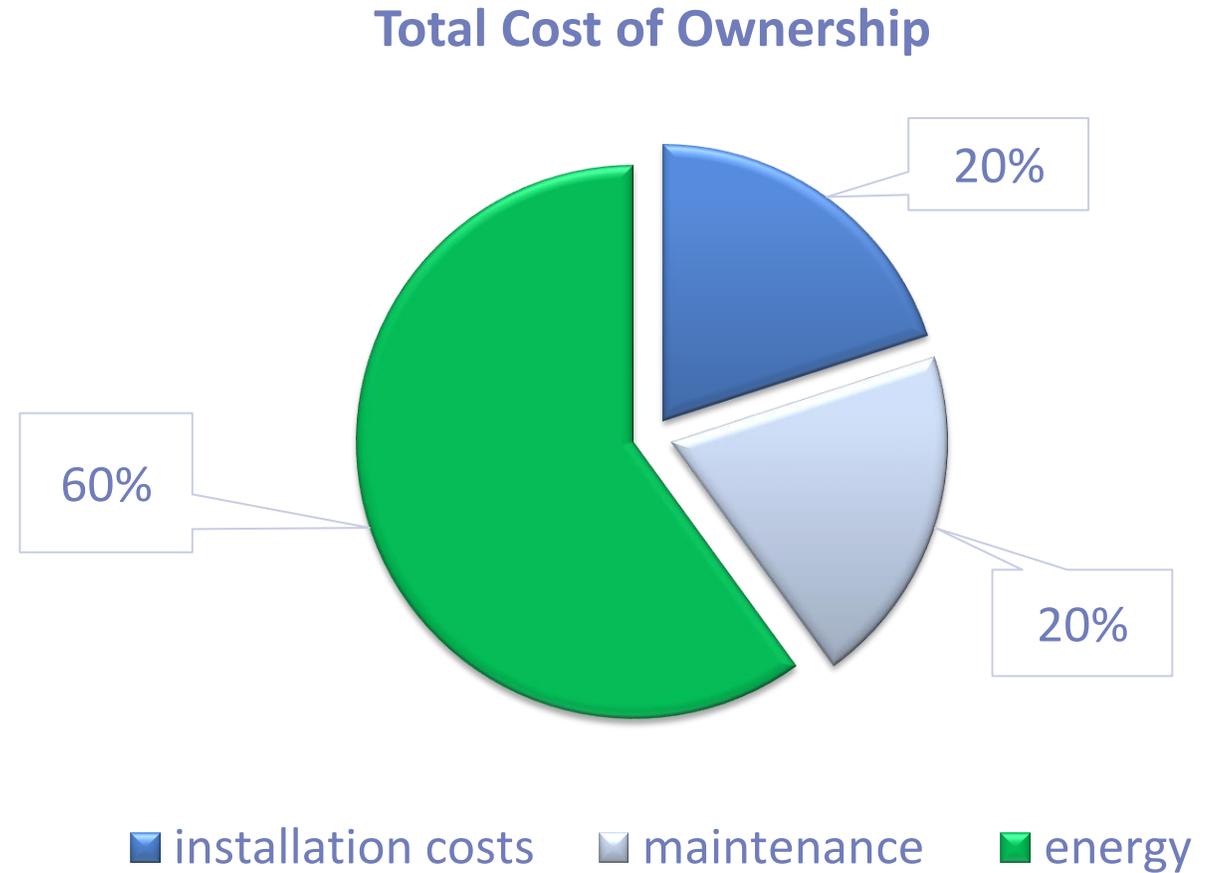
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How Have We Got There?

Focus on total cost of ownership

- Capital cost is only part of the story
- Energy the major cost
- Measuring running Costs
- Better maintenance



Improved Refrigeration Efficiency

Efficient control

Brings energy saving technology together to ensure savings all year around



Floating Condensing Pressure

Reduces power in lower ambient conditions

Variable speed fans

EC fans for low fan power

Varying Evaporating Pressure

Energy consumption reduces at low load

Drive motor

VSD for better part load efficiency

Compressor Type

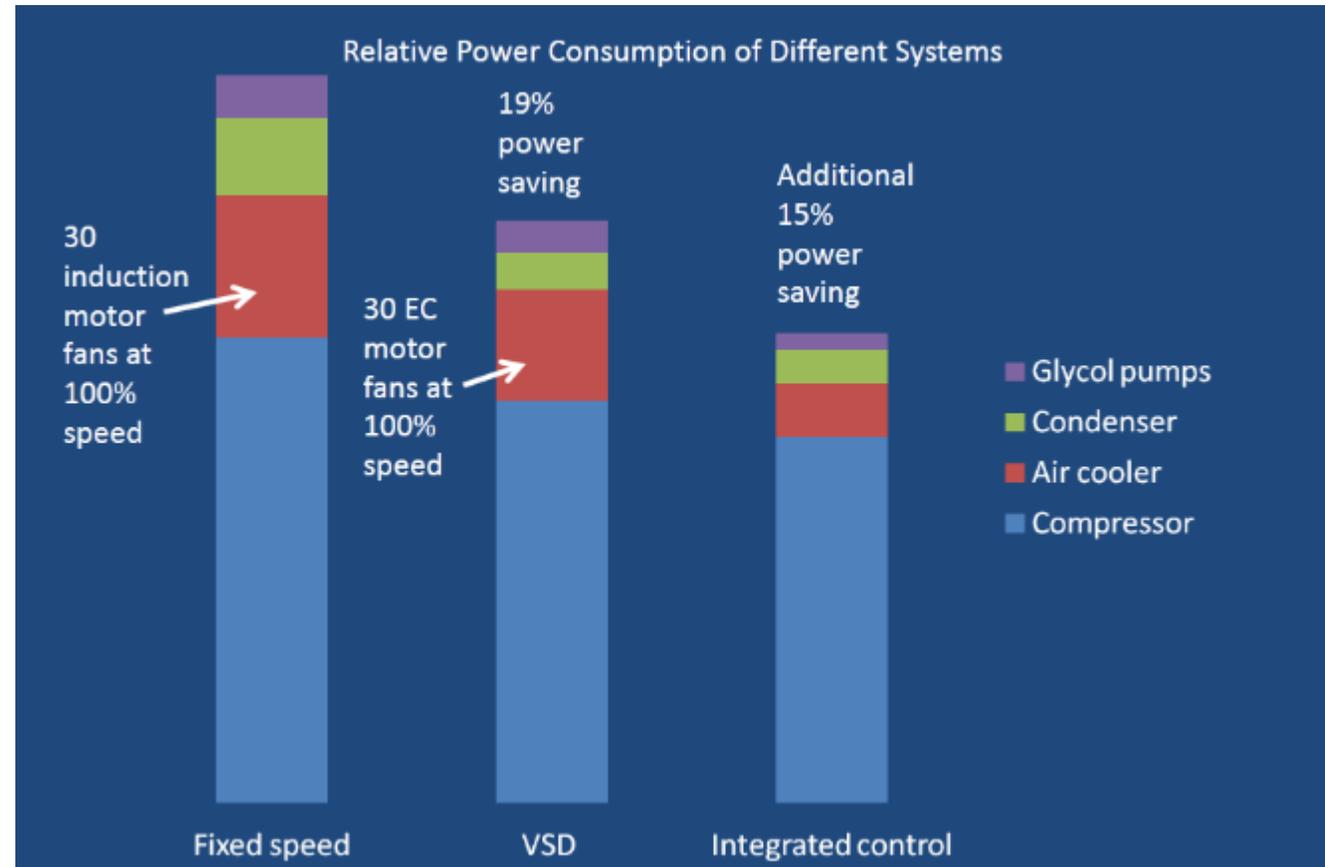
Selection based on application and load profile



Improved System Efficiency

Three Steps to optimum energy efficiency:

1. Efficient equipment
2. Efficient operation
3. Efficient control



Increasing Room Temperatures



Increasing store temperature

1K = 2% to 3% saving

Historical design temperature -25°C

Increase to -20°C saves 10% to 15%

!Reduces temperature buffer!

!Need to account for demand response!

Operational Improvements – Doors

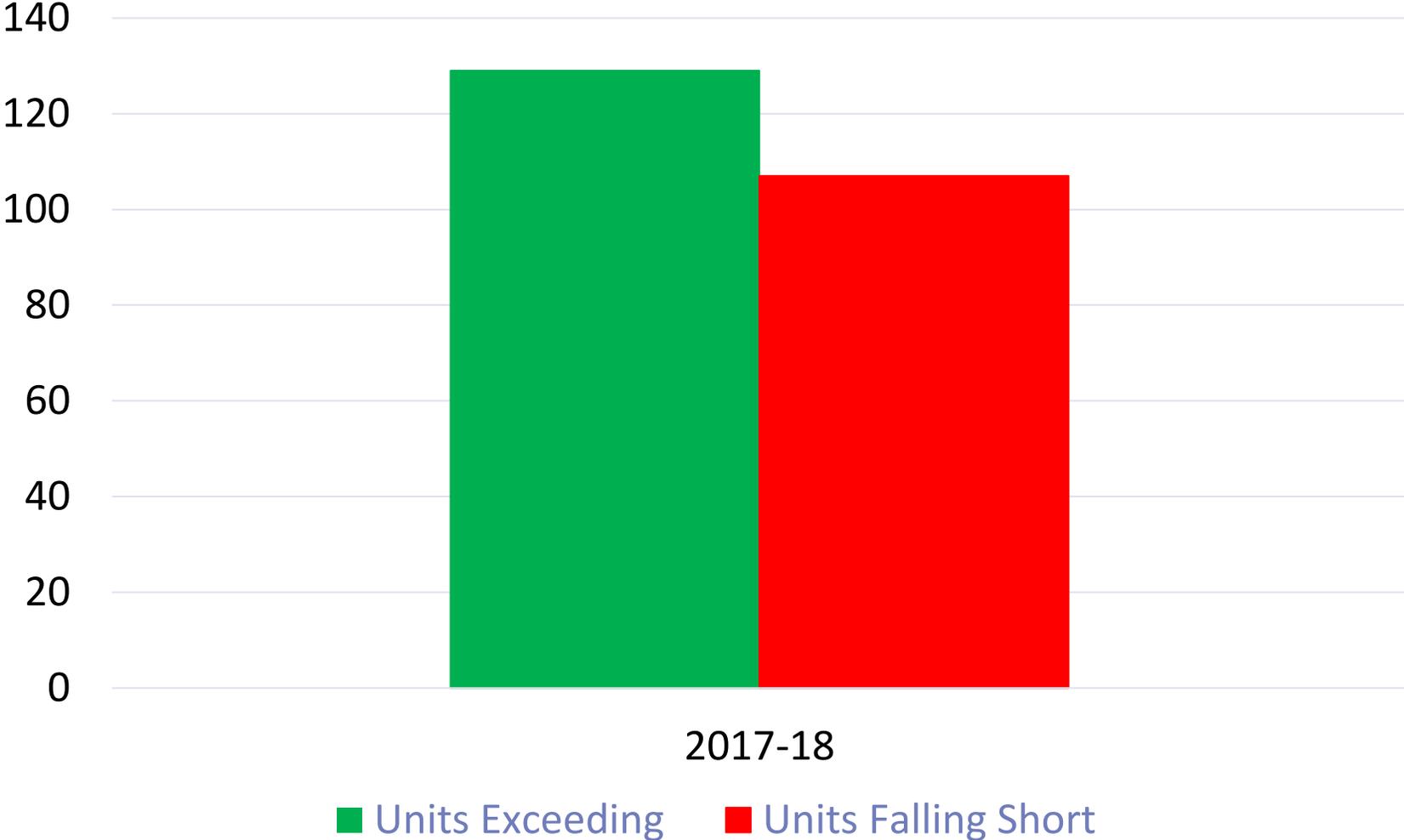


1m³/s air ingress =

100,000 kWhr/yr Chill
140,000 kWhr/yr Frozen

Plenty Of Room For Improvement

Industry Target Vs Actual Performance (CCA)



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Current Opportunities - Energy Reduction Strategy

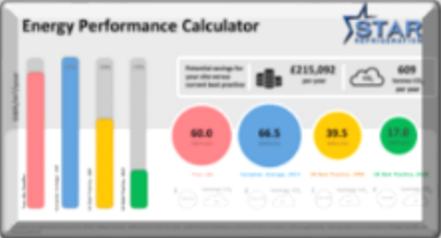


Specific Energy Consumption Benchmarking

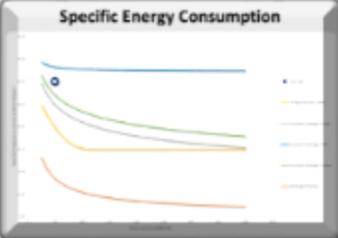
STAR
REFRIGERATION

USER INPUTS *(complete yellow cells)*

Company:	Test Company
Site:	London
Installation Year:	2000
Application:	Cold
Store volume (m ³):	100000
Energy consumption (kWh/year):	3,050,000
Electricity cost (£/kWh):	0.13
% of stated consumption relating to refrigeration	80%



View Comparison

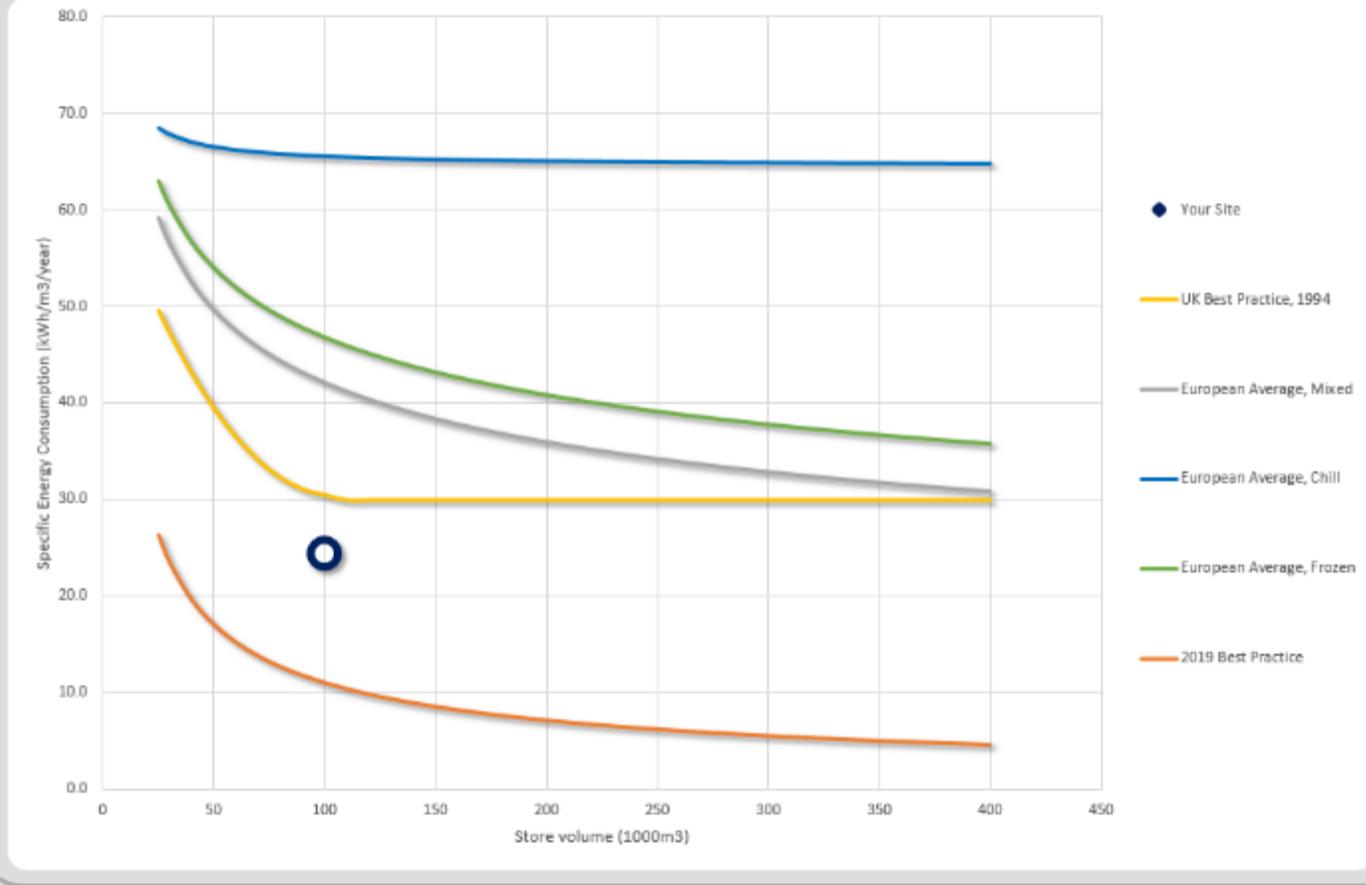


View SEC Chart



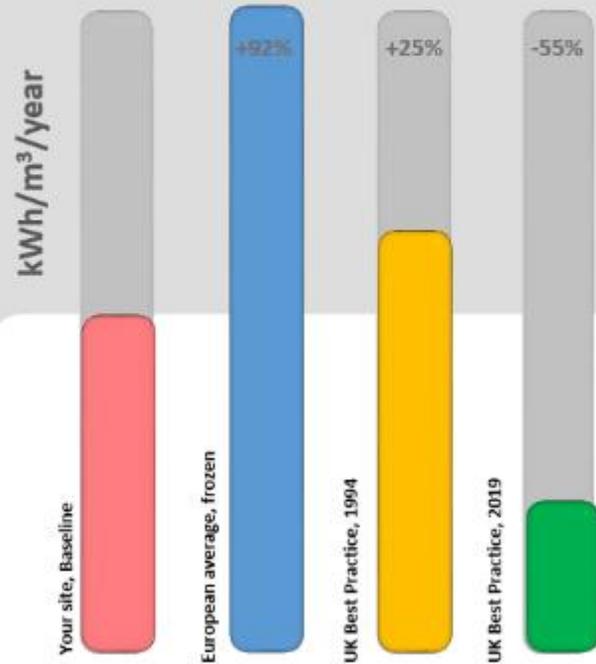
Send Results

Specific Energy Consumption



Specific Energy Consumption Benchmarking

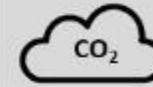
Energy Performance Calculator



Potential savings for your site versus current best practice:



£174,549
per year



380
tonnes CO₂
per year



* European Average based on Evans et al. (2013). 'UK Best Practice' 1994 based on ETSU UK (1994). UK Best Practice 2019 based on Pearson (2019) for a modern, well managed facility. CO2 equivalent conversion factor 0.2831kgCO₂e/kWh, per UK gov guidelines.



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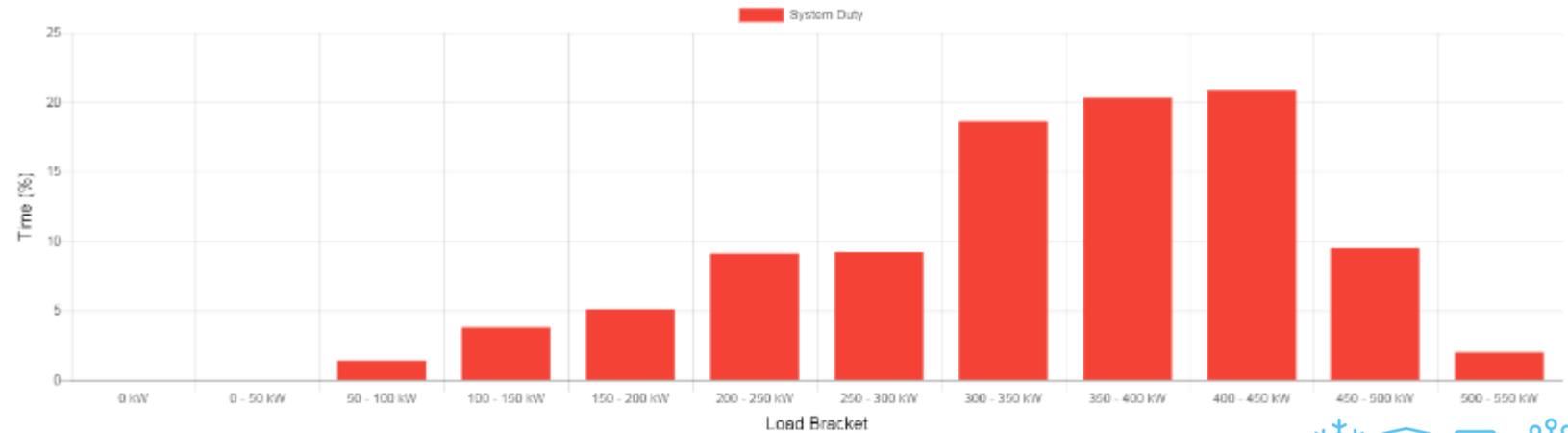
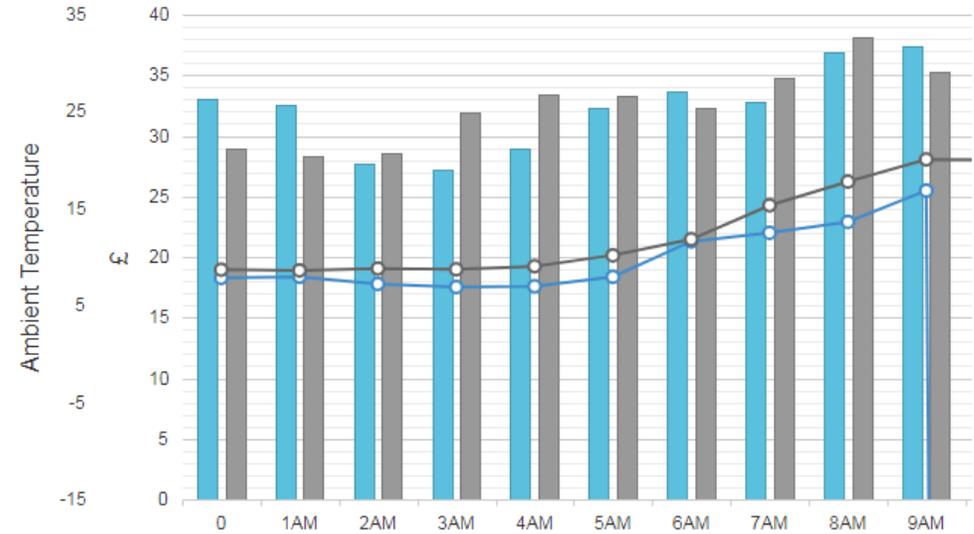


Taking Control - Real Time Plant Performance Monitoring

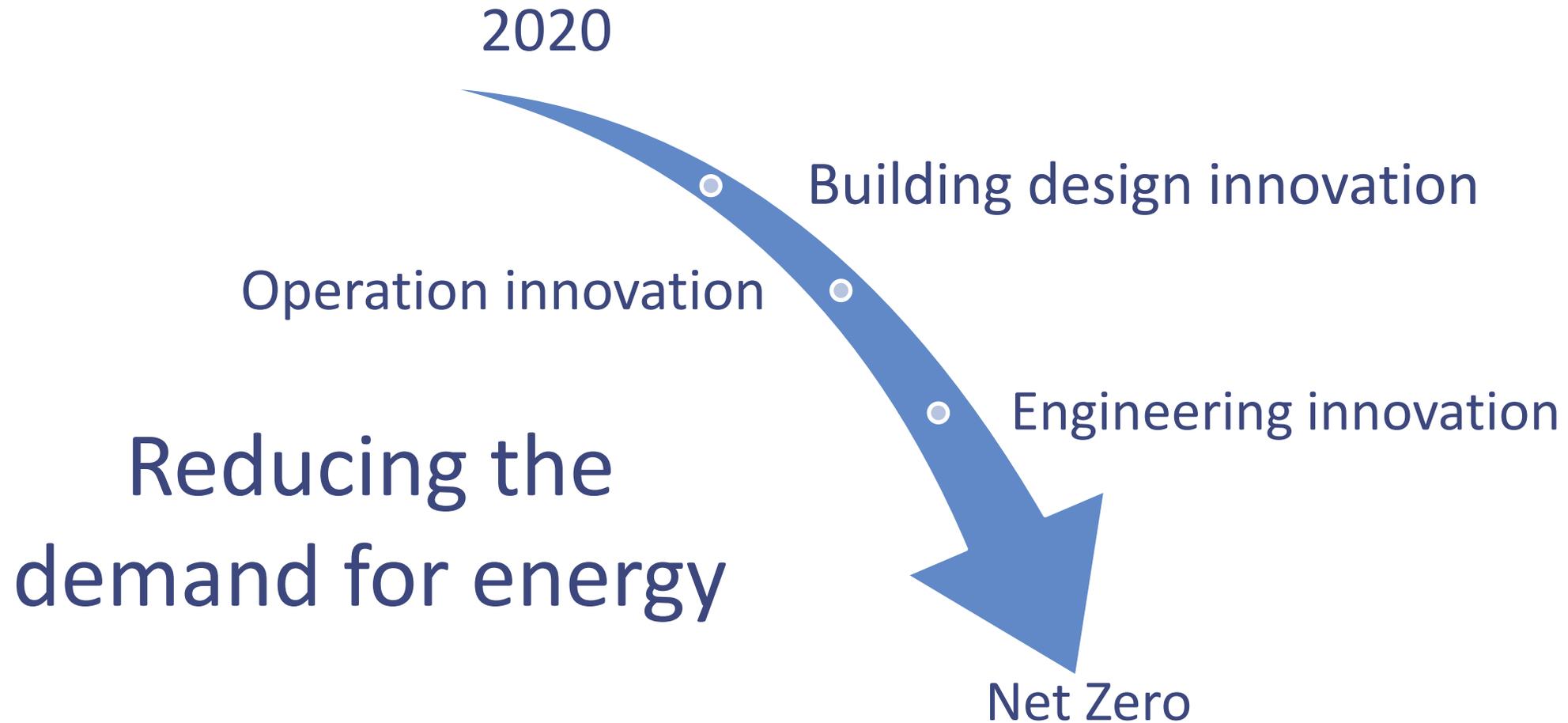


Taking Control - Real Time System Optimisation

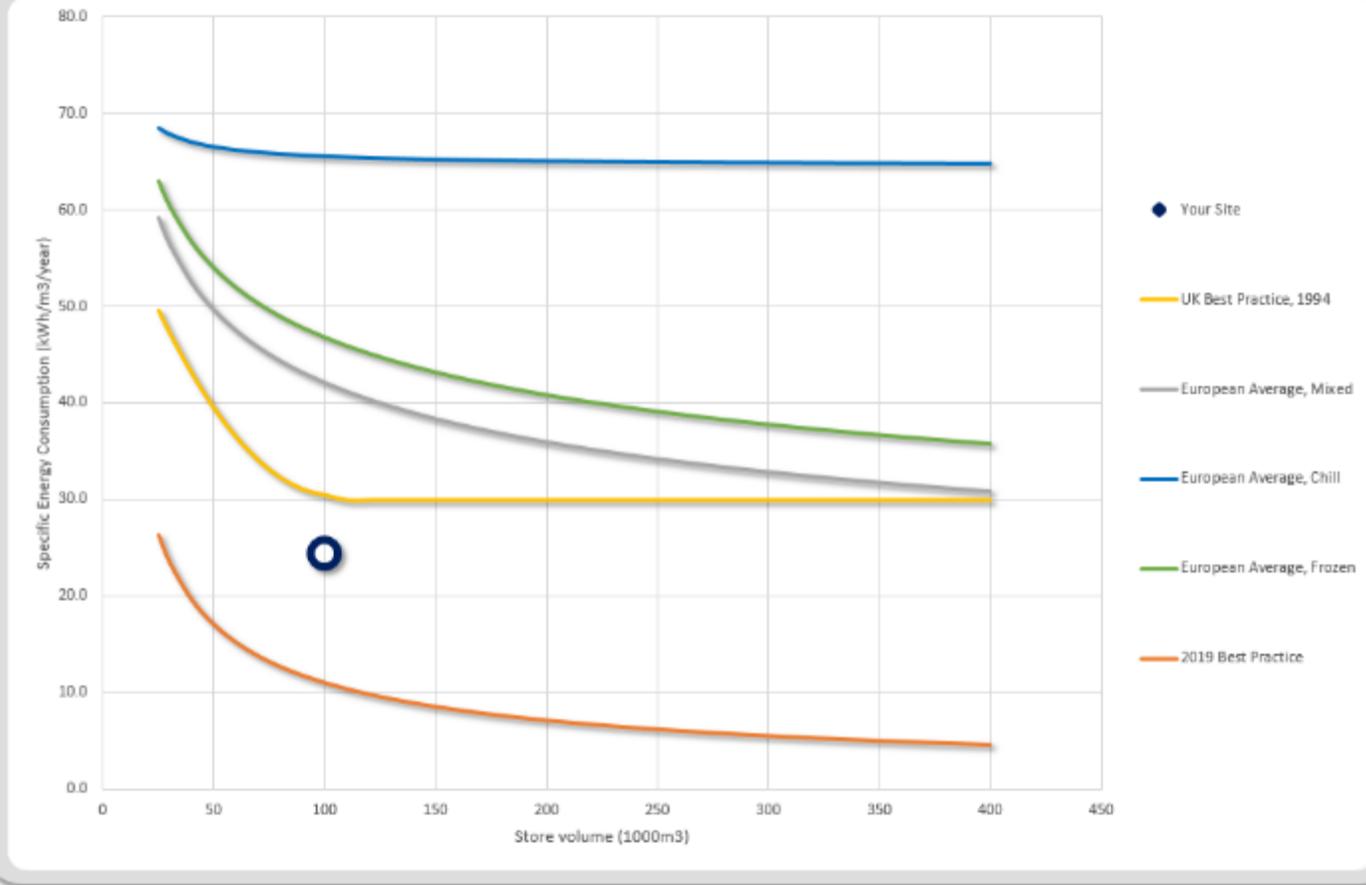
- Check whether operation is in line with design
- Identify underperforming equipment
- Adjustment operating parameters
- Improve controls
- Energy analysis vs ambient/previous
- Justification for CAPEX spend
- Understand load profile



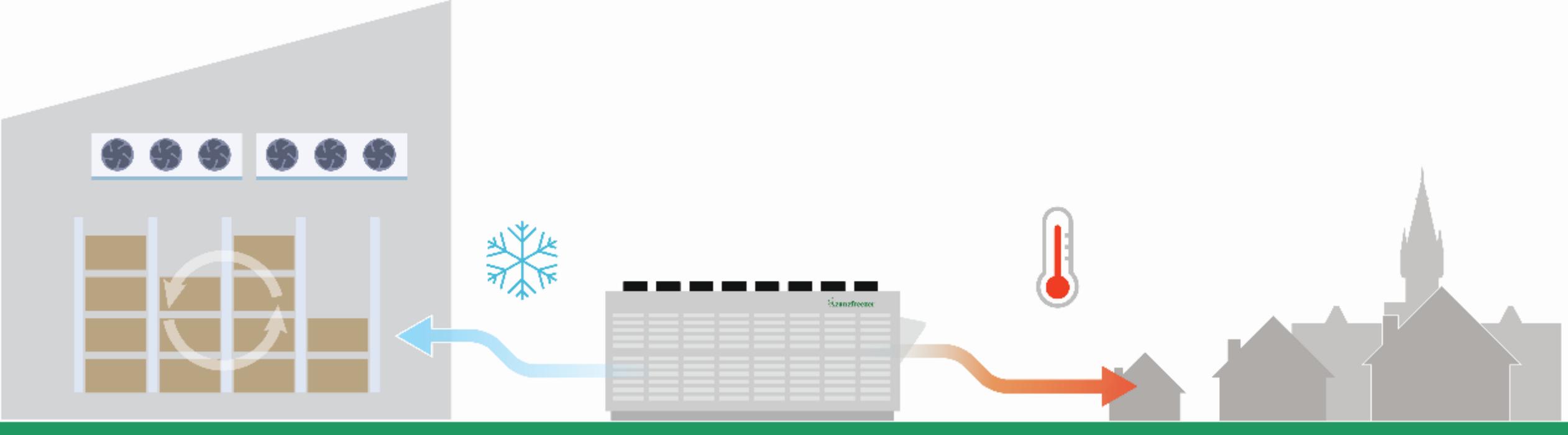
What Does The Future Have In Store?



Specific Energy Consumption



Combining Heating And Cooling



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- So far...
 - Good progress made against CCA targets
 - Improvements made to existing equipment
 - Greater focus on long term efficiency
- Right now...
 - Develop a net zero strategy
 - Benchmark your existing performance
 - Use 'big data' for further optimisation
- In the future
 - Set challenging targets
 - Reduce demand for energy through building, operation and engineering innovation
 - Use renewable energy
 - Think outside of your facility and recycle waste energy into useful energy for others

Thank You!

Thanks you for listening

To discuss further please contact me:

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