ennovus solutions

DECARBONISING THE COLD CHAIN

Simple solutions to support your sustainability strategy

THE NET ZERO BLUEPRINT:

Decarbonising Temperature Controlled Storage

Hi, I'm James Towell, one of Ennovus Solutions' Net Zero Project Engineers. Here at Ennovus we are working hard to support organisations on their drive for decarbonisation. For me, this isn't just a nine to five, but an investment in our future – helping UK businesses lower carbon emissions and stave off the worst impacts of climate change – one wind turbine or solar panel at a time.

With two degrees and almost a decade of calling myself an engineer (counting my studies), I'm a passionate technology geek and always thrilled to discover new ways to cut carbon in a financially viable way. My background is mostly in solar PV and wind turbine development, but I've never been one to shy away from out-of-the-box designs – I even once designed a wind turbine for a Mars rover. That same creative problem-solving is what drives my approach today.

The cold chain underpins food security, healthcare, and global trade, so decarbonising it isn't just an engineering challenge – it's a necessity. Thankfully the opportunity for economically viable decarbonisation is abundant: large warehouse sites, electrically driven cooling, and high-quality waste heat that can be harnessed rather than lost. By combining on-site renewables, refrigeration optimisation, smart controls, and heat recovery, the sector has the potential to slash costs, strengthen energy security, and really drive us towards a less energy intensive world. At Ennovus, my job is to prove that these options aren't just possible but practical.

Contents

James is a Net Zero Project Engineer at Ennovus Solutions, part of the Consultus Group. He holds an MSc in Engineering Management, where he explored community energy and battery storage business models, and a BEng in Mechanical Engineering, with research centred on wind turbine fluid dynamics and generation modelling. With four years of design engineering experience – two in the rail industry and two at Ennovus – James has worked on projects ranging from off-grid rail infrastructure powered by renewables to multi-megawatt feasibility studies for wind turbines and solar PV systems, including carport, rooftop, and ground-mounted arrays. He combines a strong technical foundation with a practical understanding of how to identify, evaluate, and deliver high-impact renewable energy projects. Passionate about decarbonising UK businesses, James brings a detail-driven yet creative approach to designing systems that are both technically sound and future-ready. He has also undertaken specialist training in heat pumps to further broaden his expertise in low-carbon solutions.

COLD FACTS:

Challenges for Temperature Controlled Storage

650 COLD STORES

across England, Scotland, Wales, and NI with a combined storage space of over 3.5 bn cubic meters

Source: Cold Chain Federation

60%

In the UK, more than 60% of our food is dependent on the cold-chain, and with high direct and indirect emissions, food refrigeration alone is estimated to be responsible for up to 4% of the UK's total greenhouse gas (GHG) emissions

Source: ior.org.uk

40%

In the Cold Chain Report 2023, 40% of respondents ranked the investment in new, low carbon equipment as the most important action

Source: Cold Chain Federation

28.6 TWh/a

Refrigeration in the food cold chain accounted for approximately 28.6 TWh/a of electrical energy consumption. Emissions caused by electricity generation, plus the emissions from transport refrigeration units, were between 6.9 and 7.9 MtCO2e. Emissions from the refrigerants within the refrigerated equipment were 5.4 MtCO2e

Source: UKERC

25%

In 2023, around 25% of UK cold storage sites were equipped with renewable energy technologies

Source: Cold Chain Federation

96%

In the UK alone, the cold storage industry consumes an estimated 5 TWh of energy annually, with the vast majority (96%) derived from electricity

Source: Star Refrigeration

46%

Energy costs within the cold storage sector **jumped 46% in 2023** compared to 2022

Source: Cold Chain Federation

SPOTLIGHT ON: THERMAL DECARBONISATION

COOL AND CARBON FREE...

The cold chain sector has a significant challenge when it comes to decarbonisation, with facilities requiring extensive and round the clock cooling, often to temperatures as low as -20°C. To put this into perspective, the emissions just from refrigeration accounts for 3.5% of the UK's total greenhouse gas emissions. It is clear to see that managing energy within the cold chain sector, by utilising smarter, greener, and optimised systems for cooling, is paramount to helping this sector decarbonise.

Decarbonising cooling, or the wider thermal load, will naturally be a combination of integrated technologies, to help reduce the thermal demand, recycle otherwise wasted thermal energy, and finally, generate renewable energy to help power the thermal load.

With the volume of energy required for cooling, decarbonisation of the sector cannot solely come from offsetting the electricity demand with on-site renewable generation or switching diesel vehicles over to HVO or electric. Instead, the challenge will be doing more with less, i.e. ensuring that the cold chain sector can continue to grow to support the UK's food and pharmaceutical requirements, whilst also reducing the energy requirements of these sites. Reducing the energy intensive cooling demand for these sites can be split into three buckets of cooling efficiency and optimisation, wasted heat recovery, and thermal generation for both direct and indirect cooling.

Tesco have been taking strides to tackle their own cooling load, and with the utilisation of smart energy efficient retrofit technologies they've been able

The benefits:

LOWER ENERGY USAGE

Investing in energy efficiency measures or optimising existing energy consumers will help to reduce the overall energy demand of the site. Why not take this a step further by investing in renewable generation assets to power your site, helping to further reduce the grid import requirements.

LOWER CARBON FOOTPRINT

Reducing the energy consumption of the site, through energy efficiency, optimisation, and renewable generation, will naturally have a direct positive impact on the site's carbon emissions. Significant improvements across both scope 1 & 2 emissions can be realised through sustainably driven assets.

LOWER OPERATIONAL COSTS

Reducing the energy requirements will help to reduce the overall energy spend. Sustainable investments can be positive for both the planet and bottom line, with financial savings allowing opportunities for reinvestment into other areas of the business or simply a more profitable year.

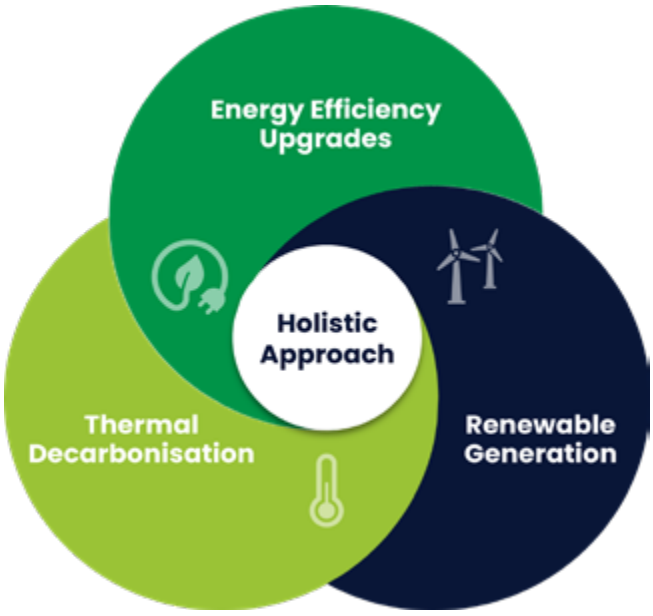
to save 4 GWh and 835 tonnes of CO2 annually. Not only are these figures impressive with regards to carbon emissions, but the energy savings will naturally translate into financial savings, support sustainability targets, and align with broader ESG goals, all whilst not disrupting the day-to-day operations of the sites.

Refrigeration Optimisation

The umbrella of HVAC, or heating, ventilation, and cooling, can commonly be retrofitted with smart optimisation controls to reduce the energy consumption by 20-30%, or sometimes even more. The technology works by optimising the compressor cycle and reducing the operational run time. Refrigeration, and HVAC work on the same vapour compression cycle. This means that the same technology can be retrofitted to deliver very similar results and efficiency savings. As the name suggests, cold chain requires a significant cooling thermal load. So, by reducing the energy consumption of refrigeration systems, the 20-30% energy savings for that area of the business will result in a very significant overall energy reduction for the site.

Thermal Storage

Cold thermal energy storage (CTES) is specifically designed for industries with high cooling demands and commonly utilises a technology called phase change materials (PCM) and advanced heat exchangers. Stored thermal energy can be used for loading shifting to reduce operational costs, for example discharging to meet the cooling demand during times of peak electricity. The thermal storage can be charged using surplus electrical energy from solar PV panels and wind turbines or via solar thermal technologies. Opting for a technology to meet a thermal load, as opposed to electrical load, helps to improve chiller efficiency (for further energy savings) and reduces the strain on the electrical infrastructure.



A Holistic Approach

It is no secret that the cold chain sector is energy intensive and that decarbonising the industry will take a well-engineered holistic approach of multiple integrated technologies. By developing a considered and holistic site decarbonisation strategy, a site can ensure that the solution of integrated technologies is truly fit for purpose and work best in tandem to deliver maximum cost and carbon savings. For example, a standalone solar array could be sized to the current electricity demand, but once the energy efficiency measures are implemented the solar array could be oversized and deliver a lower than expected ROI or reduced performance benefits.

DECARBONISING HOT SPOTS:

Popular Services for Temperature Controlled Storage

Waste Heat Recovery

Naturally cold chain businesses need large amounts of cooling refrigerant removing heat from warehousing spaces to keep goods at the right temperature. Traditionally the heat is extracted and dumped into the atmosphere, what a waste.

Waste Heat Recovery technologies work by tapping into this heat source, harnessing and storage it for on-site heating processes like space heating or hot water requirements.

Ennovus solutions can design and integrate these systems into existing site infrastructure to remove or lower gas heating needs and further decarbonise a site.

Solar PVT

Solar PVT combines the benefits of solar electricity and solar heating in one system. These panels generate power like standard solar PV, but they also capture heat, providing hot water for showers, kitchens, or heating.

By cooling the PV elements, the system even improves electricity production, making PVT a highly efficient solution. With the right mix of traditional solar PV and PVT panels, businesses can significantly reduce both energy costs and carbon emissions from their sites.

Wind

A great option for generating clean energy, wind turbines are one of the best solutions for grid resilience. It's no secret that the UK is a particularly windy place, so wind power can make a big difference to your business.

With a consistent generation profile, wind turbines can be a more reliable solution than solar, but for greater grid independence, a combination of solar and wind can provide a plethora of benefits.

Ennovus design and install commercial scale wind turbines as well as roof mounted wind solutions to ensure that every cold chain site can benefit from year-round on-site renewable generation.

Energy Audits

Understanding how your site uses energy is the first step towards reducing costs and cutting carbon.

Ennovus delivers structured, British Standards-aligned energy audits tailored to your needs, whether you have one site, or are a multi-site organisation.

Our experienced team doesn't just highlight savings opportunities, we support you through implementation too.

With options ranging from visual inspections to deep dives into high-energy systems, our three audit levels suit every stage of the journey, from early assessments to ESOS compliance and investment-grade analysis.

Solar PV

Often having large roof spaces, temperature controlled warehouses are perfect for solar panels. Solar is one of the best ways a business can reduce their scope 2 emissions and meet their net zero targets, all whilst making significant financial savings.

Our dedicated in-house teams of engineers and project managers provide a full turnkey service for roof, ground or carport mounted solar PV systems. From scoping to delivery Ennovus follow industry leading standards for insurance compliance, fire safety, ethical procurements and health and safety.

Smart Controls

Smart controls are an easy and effective way to cut energy waste and reduce your running costs.

Many buildings already use simple systems like motion sensors to switch lighting on and off automatically. But smart controls can go much further adjusting your heating, managing air conditioning, controlling plug sockets, and even opening or closing windows remotely.

With a well-designed system, you can monitor and control your building's energy use from your phone or computer, wherever you are. It's a simple step toward smarter, more sustainable facility management.

Solar Thermal

Solar thermal panels harness the sun's energy to produce hot water instead of electricity. This can be used for showers, kitchen facilities, space heating, or stored for later.

Even in the UK's cooler months, solar thermal systems provide a steady source of renewable heat, helping you reduce your reliance on gas and cut carbon emissions.

All you need is suitable roof space, and our team can design a system to match your site's specific needs.

Submetering & Virtual Energy Management

Sub-metering is the practice of installing additional meters beyond the main utility meter to measure usage in specific areas.

It's a great, cost-affective first step towards closer monitoring your energy consumption and identifying any areas for improvement. Paired with our Virtual Energy Management service, it can provide crucial insights into high-consuming areas and customised performance indicators against benchmarks.

With the Virtual Energy Management service, you will also receive alerts and triggers based on your typical usage, and commentary and analysis that can be used for reporting.

REMOVING BARRIERS

OUR FUNDING OPTIONS

Moving to green energy often requires significant capital, something that can be a barrier for many businesses within the thermal controlled storage industry. That's why we offer tailored funding solutions to remove financial roadblocks and get renewable energy projects moving.

Key Benefits at a Glance

- **Zero** upfront cost
- **Four** different models to choose from
- **Immediate** operational savings
- **Flexible** ownership models
- **Support** to hit sustainability targets
- **No disruption** to current operations

Go green without the upfront cost

Each funding mechanism follows a similar process from the initial engagement through to the end of the term. Ennovus Solutions will design, install, and commission the renewable generation or energy efficiency asset without any capital expenditure.

Power Purchase Agreement (PPA)

This is typically a long-term arrangement, whereby you pay for the units of energy produced via the generation asset.

Here's how it works:

Step 1: A renewable system (e.g. solar PV) is installed on-site
Step 2: Ennovus owns and maintains the system
Step 3: You buy the electricity generated, typically at a lower rate than your current tariff
Result: You save money from day one whilst moving towards your Net Zero goal!

Supply Contract Integration (SCI)

As part of the Consultus Group, we are in a unique position of offering Supply Contract Integration. If you purchase your energy through Consultus, we can add a small uplift onto your p/kWh import rate (typically ~ 1p/kWh) to repay the upfront investment cost.

Hire Purchase (HP)

A typical financing arrangement where you spread the asset costs across fixed monthly instalments. At the end of the term, you take ownership of the asset. You are responsible for the operation and maintenance costs from day one.

Energy as a Service (EaaS)

A very similar mechanism to HP; however, the asset is owned and operated by Ennovus Solutions during the term length and doesn't appear on your balance sheet.

Find out more about our funding solutions.

A FULL-CHAIN SOLUTION:
Our Sister Brands

consultus sustainability

CONSULTUS SUSTAINABILITY

Are you ready to start your Net Zero journey? Or looking for support with an existing strategy? We help businesses build holistic, achievable sustainability strategies – from setting Net Zero roadmaps and Scope 3 reporting to compliance with ESOS regulations and other frameworks. We believe in human-led consultancy, not generic AI tools, and aim to create long-term value, with realistic steps to success.

Service Highlight: Net Zero Pathway
We work with temperature controlled storage businesses to simplify sustainability. With a range of packages to choose from to suit your needs, we create Net Zero strategies that work.

www.consultus-sustainability.co.uk
0116 234 6164

connectus utilities

CONNECTUS UTILITIES

Managing utility infrastructure can often feel like a juggling act, especially across multiple sites. That's where our team steps in, handling all your utility connections including electricity, gas, water, telecoms, and sewerage, across industrial, commercial, and residential projects. From new connections, to sub-metering and G99/100 applications, we're here to help.

Service Highlight: Submetering
With so many energy-intensive facilities, managing energy costs in temperature controlled environments can be tricky. With submetering, you can easily track which areas of your business are consuming the most energy, and identify areas for improvement.

www.connectus-utilities.co.uk
0330 221 6565

consultus international

CONSULTUS INTERNATIONAL

As we transition to a low carbon economy, our experts ensure you can benefit from next-generation energy management to reduce risk, control costs and achieve demand reduction targets. From our electricity, gas and water procurement, to our full suite of bureau services and Cost Optimisation and Recovery Audits, we can help you save time, money and energy.

Service Highlight: Energy Procurement and Risk Management
Not ready to start with onsite generation just yet? Consultus International specialise in business energy procurement and risk management.

As huge energy consumers, we work with temperature controlled storage businesses to find utility solutions that save time, money, and provide long-term security.

www.consultus.com
0330 221 1000

assured energy

ASSURED ENERGY

For many SMEs, navigating the energy market can be overwhelming, especially when you're focused on running your business. Assured Energy simplifies procurement by helping organisations secure the best energy contracts tailored to their specific needs. Our experts scan the market for competitive tariffs, provide clear advice, and handle the switching process end-to-end, so you can focus on what matters most. We're independent, experienced, and always on your side.

Service Highlight: Fixed-Term Procurement
For smaller temperature controlled storage businesses looking for budget certainty, our fixed-term energy contracts offer stability in a volatile market. Lock in competitive rates and gain peace of mind with a procurement partner who understands your sector.

www.assured.energy
0330 221 9899

READY TO GET STARTED?
Contact Ennovus Solutions

ennovus solutions

Get in touch:

Call: +44 (0)116 234 6118 | **Email:** enquiries@ennovus.co.uk | **in**
Webform: www.ennovus.co.uk

Ennovus Solutions is a specialist, multi-disciplinary, net zero engineering, design, and build consultancy, helping Cold Storage businesses reduce energy costs, improve resilience, and lower carbon emissions. We deliver end-to-end support across energy audits, system optimisation, and the design and installation of technologies such as solar PV, battery storage, wind turbines, EV infrastructure, and heat recovery.

The Consultus Group supports thousands of businesses including: dunbia, Lineage, Sysco At the heart of food and service