



ENERGY & CLIMATE CHANGE SERIES

FUTURE PROOF YOUR BUSINESS WITH RENEWABLE ENERGY

An expert guide to choosing and using
renewable power for cold chain businesses



1 / THE GUIDE TO CHOOSING, USING AND BENEFITTING FROM RENEWABLE ENERGY /

A joint production from the Cold Chain Federation and renewable energy experts Olympus Power

WHAT IS THIS GUIDE ABOUT?

This is a guide to renewable energy for cold storage businesses. It is for anyone interested in learning more about renewables. It will help you understand why you need it, how to pay for it, what technology will work for you and how to operate and maintain it. It's a practical guide to making renewable energy work for your business, but it also explains why renewables are particularly important and relevant to the cold chain.

We hope that when you've finished reading it, you will feel more confident about adopting renewable energy.

WHO ARE THE COLD CHAIN FEDERATION AND OLYMPUS POWER?

The Cold Chain Federation is the voice of the temperature-controlled supply chain in the UK. Our around 300 members are made up of businesses who operate, maintain or procure frozen and chilled storage and/or refrigerated transport, including shipping and road freight. The sectors we support include food, pharmaceuticals, horticulture and other perishable products.

The cold chain is critical infrastructure, and our mission is to educate and influence the government and industry about the importance of the cold chain and provide unique events, advice and guidance aimed at supporting our members to adapt and thrive in a rapidly changing world.

Olympus Power are commercial renewable energy specialists. We develop new ways for businesses to benefit from cheaper, sustainable energy, and help them achieve their long-term zero-carbon goals. We're working with the Cold Chain Federation to help its members get more from renewables, and we've helped hundreds of businesses like yours cut costs, reduce emissions and increase profits.

Our roots are in rooftop solar installations, but today we're involved in all forms of renewable and off-grid energy. We build bespoke packages of energy technology, designed to help businesses get the most from renewables.

WHY COLD STORES CAN'T AFFORD TO IGNORE RENEWABLES

Renewable energy is the answer to many of the pricing, supply and energy security issues facing cold chain businesses. Solar and wind are the cheapest form of energy, and the price of renewables is set to keep falling. The price of fossil fuels is unlikely to drop as low. Cold stores use a lot of energy, so anything that will cut the cost of energy can only help. And if you're not spending money on energy, you can spend it on your business.

Generating your own energy on site gives you independence from price rises and supply issues. Renewables effectively insulate you from price shocks caused by global events, and from the prospect of rolling blackouts, power cuts and interruptions to supply caused by the UK's creaking national grid.

Renewables also help us meet our Climate Change Agreement targets, the government backed scheme administered by the CCF which provides energy bill discounts to cold storage operators for reductions in carbon emissions.

They also generate income, whether that's from selling power back to the grid or being paid to operate as a power store to help balance the grid.





2 / THE FUTURE OF COLD STORAGE? RENEWABLE ENERGY /

The cold chain industry is ready to play a crucial part in Britain's drive towards net zero. But we can't do it alone; we want to work with government and the energy industry to make renewable power an everyday part of our businesses

It would be impossible for modern life to exist without the cold chain. Refrigeration has changed the way we live, how long we live and what we eat. Human lives are saved by blood transfusions and drugs that rely on chilled storage. Our diets have been influenced by developments such as the iceberg lettuce, bred specifically to withstand refrigeration during long-distance shipping from California. Electric refrigeration is one of the most important developments of the 20th century. It is embedded into our society and civilisation.

Today, the industry faces a very 21st century challenge: the need to meet increasing demand for our services while cutting emissions from energy use. The cold chain uses a lot of electricity. But it's also embraced the need to meet climate change targets, continually improving energy efficiency every year since 2013.

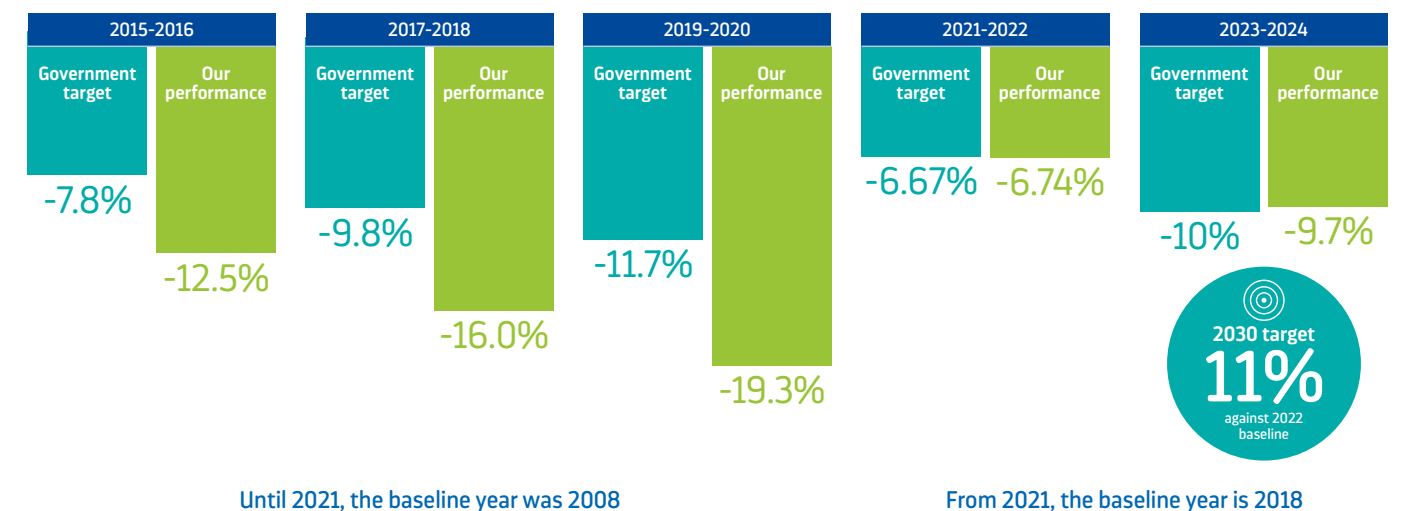
Increasingly efficient machinery and buildings will continue to reduce electricity use but demand is going to increase. Electricity has the potential to be the cleanest form of power. It will displace

gas. It will power our vehicles, from forklifts to 38-tonne HGVs and generate our heating and cooling.

So while cold store operators can and will make changes to their premises and the way they use energy, no matter how efficient freezers get or how effective insulation becomes, we will need more electricity. The question is, where does it come from? And how do we make sure we have enough of it?

Renewables provide the answer. But to realise a future with clean, abundant power generated at source, we need to meet the challenges and solve the problems which stop our members from investing in renewables. While we as an industry will do everything we can, many of these issues require government intervention. This is what we want to see changed.

Cold chain performance in meeting government energy reduction targets



Data: Sample of 450 UK cold stores.

MAKE CONNECTING TO THE GRID FASTER

Connecting to the grid is one of the biggest issues facing anyone who wants to adopt renewable power. There are too many projects taking too long to be connected, a problem exacerbated by a practice called grid banking.

In the same way property developers create land banks, some energy developers create grid connection banks. For instance, a wind farm which hasn't yet been built receives a 90MW grid connection. The value of the land increases, despite the developers not having planning permission or even owning the site. But two years later the development hasn't started. The developer has effectively banked 90MW of grid capacity, blocking anyone else from using it. When another project, which is ready to be built, applies for a grid connection for its renewable tech, it's turned down because the wind farm has taken all the available capacity.

This problem slows down the adoption of renewable technology, not just by cold stores but any business. The government says it wants to replace the queue to connect with a system prioritising businesses that are ready to connect, and has started to make changes to how connections are assigned.

But there is still the potential for developers to meet the new criteria, get a connection and then sit on it. We'd argue more enforcement is needed; a connection that's not turned on within a set time will incur a charge, and when the connection is made it will cost considerably more than one operating within the time limit.

Extend this principle to a use-it-or-lose-it approach, which would remove connection consent altogether, and the connection queue would be cleared out without the need for significant investment.

PRICE IT IN REAL TIME

Energy intensive industries such as cold storage are used to the concept of ever-changing prices for our energy. We can respond in real time to the price changes, reducing our use when the cost of electricity increases by raising store temperatures and switching to gas power, or batteries.

Dynamic electricity pricing, with rates changing according to demand and supply, would enable us to adjust our use to match the best rates, calculated on a half-hourly basis to match the half-hourly data used to predict our energy use. It's being introduced for domestic customers, so why not for commercial users?

It would be much better than the zonal pricing abandoned by the Government in July 2025, which would have reduced prices in areas with an oversupply of renewables such as Scotland and Cornwall, in the expectation businesses would relocate there. For heavy industry with huge infrastructure investments, moving would be impossible – you can't pick up and move a cold store the size of Magnavale's 26,000 sqm Easton site.



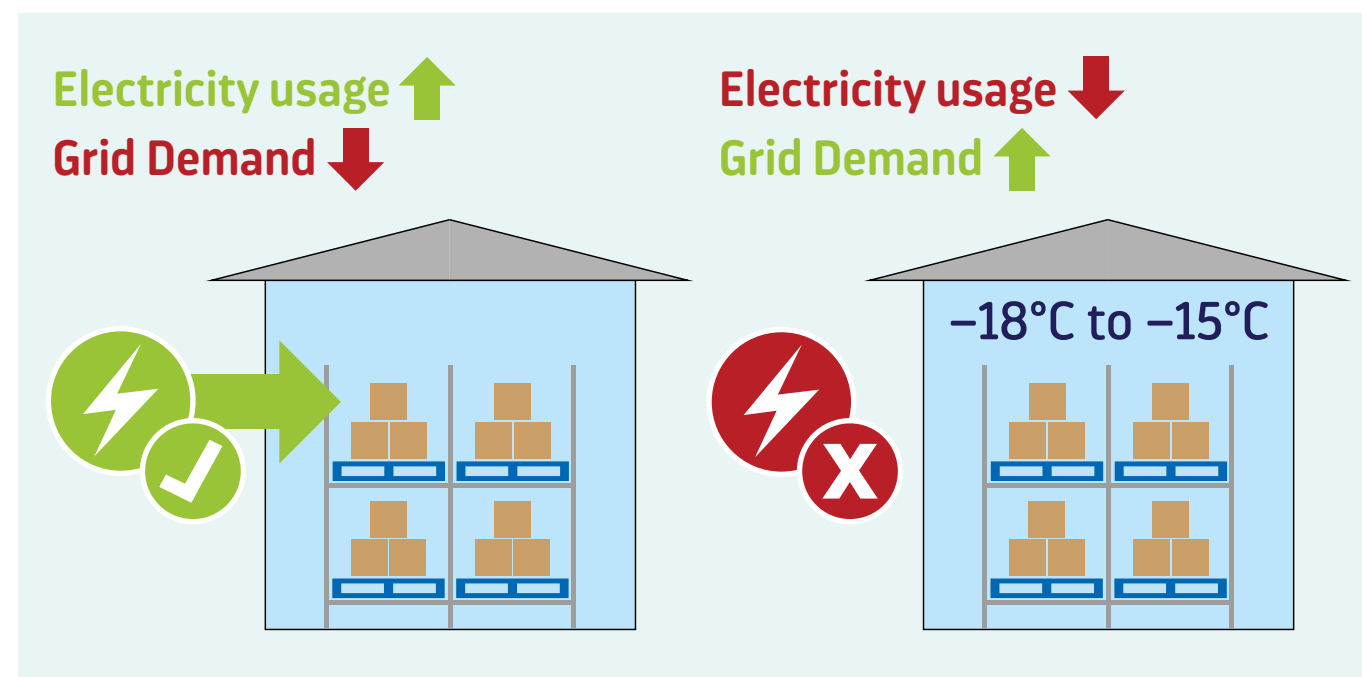
USE OUR SUPERPOWER

The cold chain doesn't use as much energy as, for instance, the steel industry. But we have a unique ability, a superpower to keep the UK's electricity flowing through the grid. Unlike most other businesses, cold stores can reduce electricity use without shutting down or compromising operations. And that means we're able to play an important part in balancing the grid, the crucial task of matching supply to demand and making sure the grid stays at a frequency of 50Hz.

In a cold store, the temperature can be safely increased within a certain range. By keeping the temperature at -18C, there's leeway to increase it to, for example, -15C for a set period, without harming the contents. Increasing the temperature uses less energy, allowing

the cold store to cut energy use when grid demand is high. It's acting like a giant battery, storing electricity as cold air when there's an oversupply. When there's a need to reduce demand, the cold store can safely raise the temperature.

This is what gives the cold chain its ability to help balance the grid without needing to close down operations or suspend production. Unlike some other industries, we aren't negatively affected by reducing electricity use, and the industry's global Move to -15C campaign has proven the reduction to be safe. The energy industry calls changing the amount of electricity you use demand side response. We call it our industry's superpower.



INVEST IN MICROGRIDS

Relying on the grid for power is not a solution. The future of electricity generation and use is decentralised – power is no longer generated and distributed by a handful of large companies, but by the end user, from on-site renewables. The relationship between end user, transmission networks and energy suppliers is no longer the traditional one-way set up, in which the end user is a paying customer. They become generators, suppliers and balancers, selling power to the grid and being paid to decrease (or increase) their power demand.

This equitable future relies on many things, but one of the most crucial will be the adoption of microgrids. A microgrid is a self-sufficient energy generation and transmission network. Typically it's on a single site to which it supplies power, but it's possible for microgrids to be a series of connected sites.

Microgrids give the end user independence, stability and security. Pricing won't change, because you're the generator and supplier. You won't be subject to power cuts, higher charges during peak demand periods or rolling blackouts, because you control your own power supply.

And yet there is little talk of microgrids from government and policy makers. Government focuses on big projects such as floating offshore wind in the Celtic Sea, or the construction of nuclear reactors. Microgrids may not generate headlines but they're significantly easier to achieve. And when the headlines generated by projects like Hinckley C focus on the overspend and overrun, it might be better to avoid the headlines altogether.

To look to the future matters. Cold stores can be built for a lifespan of up to 60 years. Designed to be serviced, upgraded and modernised, they will be able to accommodate changes in the way we generate, store and use energy. As an industry, we understand the long-term commitment needed to ensure not only a cleaner future, but to insulate our businesses from the volatility of pricing. Now it's time for the institutions who deliver policy and the services we rely on to help us achieve this.

IT'S TIME WE CHANGED HOW INSURANCE WORKS

The UK has a problem with insuring renewable power installations, especially solar panels. The lack of an insurer-approved national accreditation scheme for installations means every installation needs to be assessed by the building's insurer. And some businesses may not tell their insurer about a solar install, or unwittingly pay for a poor quality installation that could cause a fire.

There needs to be an insurance backed standard for solar. Meet this and your installation will be covered, without the need to get individual designs approved. It would speed up installation, reduce incidents caused by poor workmanship and cut claims. An annual safety check and test, like those required by insurers for pressure vessels, would be necessary.

Who should take responsibility? The insurance industry has been pushing government to act, but nothing has happened. That means it might be time for businesses to step up and sort the situation.





3 / WILL RENEWABLE POWER WORK FOR ME? /

Everything you need to start your journey towards renewable energy

There's a lot to think about when you're considering renewable power. Do I need batteries? What exactly is a voltage optimiser? How will my insurance be affected? Together with the experts from Olympus Power we'll help you understand what's possible, what you need to look at and which technology is right for your business.

WILL I BENEFIT FROM RENEWABLE POWER?

Yes, almost certainly. Cold stores use a lot of electricity, so anything that reduces costs and cuts emissions is going to help your business.

There are two primary uses for renewable power: generating power for your business, and generating an income, by selling surplus to the grid or being paid to store electricity when the grid needs to shed power. Within those two uses are multiple benefits. Generating and storing your own power means you can use it when grid prices are high. Reducing the power you take from the grid cuts the costs charged for the transmission and distribution of power.

A cold store is likely to use most of the power it generates. But this doesn't mean you can't have a system that also generates income. How the system is designed and what it does depends on your needs, and how the financial benefits stack up.

Find out how the finances of renewables work on page 16.

WHAT DO I NEED TO THINK ABOUT?

The site

Commercial buildings are often well suited to the installation of renewable technology. Large, unshaded roof spaces mean solar will work at it best, good road access makes it easy to bring equipment in and plenty of space around the building allows for the installation of batteries and plant.

Space

Where are you going to put the kit? Batteries are big; a 5MW battery is the size of two shipping containers. Combined heat and power plants are a similar size. Control rooms need space inside the building. Most roofs are suitable for solar panels but some aren't, or don't have the space for the panels you need.

The roof

The condition and structure of a roof is going to decide if you can put solar panels on it. Many commercial building roofs are perfect for panels; they're often made of metal, which is the best material as it's non-combustible (to satisfy insurers) and can provide the necessary strength.

Other roof coverings will work just as well. But if it contains asbestos, you're going to have to tackle it as solar installers won't work on asbestos roofs without expensive remediation works first. Asbestos can be boarded over but if your roof needs work, the installation of solar should be the prompt needed to do it.

The structure of the roof also matters. Inverters, the kit that turns the panel's DC power into AC power, are heavy and need a strong, stable platform to support them. Each panel weighs between 20-30kg; a 2000-panel system will add 40 tonnes in panel weight alone to the roof. The need to include snow load – the ability of a roof to withstand heavy snow fall – will also influence how much weight the roof can take.

Access

Most cold stores have good access. But if you're thinking about installing renewables on ancillary land, such as agricultural land, a quarry or a brownfield site, you might run into problems. Agricultural land isn't always easy to reach and even if there is road access, it's often via narrow country lanes, which do not suit construction traffic and HGVs. And building a road to get to it will increase the cost. Brownfield sites, which are often better suited to solar than development, often have roads suitable for large vehicles, which makes the process a lot easier.

Where's the grid connection?

The proximity of a site to the grid connection can dictate if the project is viable. It's unlikely to be an issue with most existing commercial buildings, but if you're thinking of a ground-mounted solar array in a field, the cost of running cables to the grid can sink the project before it's started.





Photo: Magnavale Ltd



“ A grid connection has to be the right size to allow for expanding power generation and the income it provides ”

INSURANCE

Talking to your insurers about installing renewables is as important as talking to the people designing the system. In fact, once you've got a grid connection offer, which dictates the size of the system you'll build, talking to your insurer should be the first thing you do. What they will and won't allow determines the system you can fit.

Insurance underwriters want greater regulation of the renewables industry, and many will want a system to meet specific conditions. An increase in fires and explosions caused by bad solar installations has made the insurance industry more aware of the risk, and underwriters such as Zurich are calling for a single accreditation scheme for commercial solar.

This would make it considerably easier for anyone wanting to get an insurance-approved installation. The renewables industry has an issue with businesses offering cheap installations, made possible by poor quality designs that don't allow for fire prevention.

For instance, cold stores are packed with insulation, which burns. A properly designed system will use trunking to keep cabling away from the insulation, but if your installer is more concerned with providing the cheapest quote, they could leave out the trunking.

An optimised system, which monitors the performance of individual panels and spots issues that could cause fires, such as damaged cables, is the gold standard for solar. It's going to be more expensive, but as most insurers require it, it's also entirely necessary. While the lowest cost looks good on paper, if it causes a fire it's not going to seem like such a good deal.

A countrywide, insurer-backed accreditation scheme would freeze out the less than scrupulous installers and give customers confidence. Until that happens, getting your insurers involved at the start will save a lot of effort later on, and avoid a potential disaster.

CONNECTING TO THE GRID

A renewable energy installation is nearly always connected to the grid, and the most important part of any grid connection is its size. Connections are measured in the amount of power flowing between the grid and user. If you have a 1MW connection, that's the maximum you can export to the grid. Adding more generation capacity isn't going to mean you can export more power unless you increase the connection size.

Your connection has to be sized to the power you're exporting. This is less of an issue if you're going to use most of the power you generate. But it won't allow for expansion and the income it has the potential to provide.

Getting a grid connection can be time consuming. Smaller connections (under 132kW) go through the Distribution Network Operator – that's the company responsible for sending the power

from substations to homes and businesses – and are quicker than applying to National Grid, which deals with anything larger.

There's a queue for connections and it's oversubscribed, made worse by the practice of banking connections, in which developers apply for a connection for a project that they have little intention of building.

Your renewables installer will handle all of this for you. A good one will liaise with the DNO or National Grid to make sure you get the connection size you need, a process that can involve revisiting the initial offer. It's worth bearing in mind the time it takes to get a connection approved – 65 days – affects the whole project, especially if you need to negotiate the offer, although this is also likely to change under the Government's reform of the grid connection process.

Turn over to page 12 where Olympus Power's experts explain how the technology works.

4 / THE TECHNOLOGY /

Now we know renewable power will work on your site and benefit your business, let's look at the renewable technology and how it works

BATTERIES

In a renewable energy set up batteries help even out the peaks and troughs in production created by the weather, storing power when energy is produced to be used when generation drops.

Do I need batteries?

Cold stores, with their always on, constant demand for power are good use cases for batteries. They add an element of flexibility to a cold store's energy consumption, especially if you're producing renewable power. When grid prices are low or there's a lot of solar and wind production, fill up the batteries. Then, when prices are high, use this cheaper energy instead.

Your electricity tariff matters. A fixed rate with little difference between day and night prices makes batteries less useful because you can't buy cheap and use it when prices are higher.

You can also be paid to balance the grid. The grid has to operate at a fixed frequency, normally around 50Hz. Too much demand or an oversupply of power will lower or raise the frequency, which can damage machines or, at its worst, cause major blackouts. Batteries are used to compensate, either by storing excess energy or releasing power to cater for demand. Battery owners are paid to discharge or store electricity to reduce the frequency.

What type of battery do I need?

If you want to export to the grid, then you'll be looking for an AC battery. AC batteries are fitted on the grid side of the meter, and they release power to the grid, which you get paid for.

If you want to use the power you generate, and create a microgrid, you need a DC battery. DC batteries sit on your side of the meter, so they supply you with the power you produce. They're more efficient as they don't require an inverter to convert DC power to the AC power used in building systems, which causes losses of around 10-15%.

What size batteries do I need?

It depends on the power you generate and your grid connection. If you produce 1MW a 5MW battery is pointless as you can never fully charge it. Likewise, if your grid connection is for 1MW, and you want to export most of your power, that 5MW battery isn't going to be much use as you can only ever discharge a tenth of its capacity.

The more energy you need, the bigger the battery. The only sure way to size a battery is to assess how much power you use, what you use it for and how much you generate. This is a job for a renewables specialist, who will take half-hourly electricity use data and create a detailed picture of a business's electricity consumption.

How long do they last?

Most batteries have a 10-12-year warranty. They may last longer than this, but their charging capacity will be seriously reduced after a decade of constant use. This isn't as long as solar panels, which

have a 25-year performance warranty and a life of 40 years, so over the lifespan of a solar installation it's likely the batteries will be replaced more than once. If your setup is funded by a power purchase agreement – in which the installer pays for and owns the equipment – this will be done for free.

What happens if I want to add more battery capacity?

It's not as easy as just bolting on another battery. Many battery energy storage systems are not designed to be extended; connecting them together is not possible, and the cabling between them and the buildings would need uprating. Some systems have a modular design that does allow for expansion.

EXPERT'S VIEW

“How you manage your battery system is as important as the batteries themselves”



Archie Walton is Olympus Power's battery specialist

Smart monitoring of battery storage means you don't have to think about what it's doing. You tell it what to do and it runs the system for you. That could be for maximum profit – to charge when grid prices are low and sell back when they're high – or maximum savings, charging when renewable production is high.

The system will look at weather forecasts and predicted energy prices, work out when the sun is likely to be shining and tell the batteries to charge. If the weather's poor then it will schedule charging at night and use the power during the day.

It will manage the charging cycles to maximise the batteries' lifespan, working out the best charging profile for each unit. You can see everything it's doing on a dashboard, and create reports, which are useful for demonstrating the efficiency and effects of your system to decision makers in your business.

SOLAR PANELS

Solar panels use the energy in sunlight to move electrons between two layers of silicon. As they move, they create a DC current which is conducted to an inverter, which turns it into the AC current used by machinery, appliances and circuits.

Will it work for me?

If you have the space, solar will work for you. There are very few sites where solar can't contribute to the energy mix and reduce bills. Even north-facing roofs can be made to work with solar – it may not be as efficient as a south-facing installation, but it will still generate electricity.

How many will I need?

Depends on the area you have available and what you want them to do. Most cold stores use too much electricity to replace grid power with solar, so the panels will reduce reliance on grid prices. If you can use the power they generate, fit as many panels as you can. But bear in mind the size of your grid connection limits the amount of electricity you can export to the grid. Producing a surplus of 500kW is not much use if your connection can't handle it.

Should I put them on the roof or on the ground?

Roof-mounted panels are almost always easier, faster and cheaper to install. They also generate the power where it's needed, which means less cabling and reduced transmission losses, where electricity leaks from the cables over a distance. If a roof is strong enough and in good condition, it can take panels.

Ground-mounted panels are used when a site is being turned over to power generation, often a field or a brownfield, such as a landfill or a quarry. If your business owns brownfield land, solar is a good way of turning it into a money maker. If that land is close enough to a site that uses power, it is possible to connect the two together with what's called a private or direct wire.

There are other places for panels. Covering car parks with them is an efficient use of space, and adding EV chargers is a smart way to connect power generation and use. But bear in mind the steel panel supports mean it costs more than a roof mounted system.



EXPERT'S VIEW

“There's a problem with solar installations in the UK. And it's not the weather”



Nick Cape is one of Olympus Power's business development managers

Who designs and fits your system matters as much as the number of panels you get and the size of the grid connection. The UK's renewables industry, especially solar, has suffered from fit-and-forget cowboy installers, who have tainted the image of solar.

The technology is robust, proven and getting more efficient all the time. The question you need to answer is, are the people selling it to me any good?

Cheap solar installers are cheap for a reason, and it's not because they want to save you money. The problems might start at the consultation phase. It could be that renewables aren't the right solution for your business. A competent, trustworthy supplier will analyse your business – how it works, what it needs, how it spends money – and figure out if renewables are appropriate. A cowboy will sell you what you want to hear and what they make money from.

A competent supplier will go through your half-hourly electricity use and figure out when you use power and how much you use, to properly size the system. A cowboy will fill the roof with panels, regardless of how much power you actually need.

And a competent supplier will tell you how much money you'll make, how long the payback period is and what your return on investment will be. A cowboy might supply figures, but some renewable firms will take any job for the money, even if it won't save you any.

Avoid them. Renewable technology is a sizeable, long-term investment with the potential to transform your business's entire way of operating. A trustworthy supplier will want a long-term relationship with you, one that could last decades. A cowboy will walk away after the job's done, and may disappear altogether. That cheap installation won't seem so cheap when the system fails due to poor workmanship, and the installer has gone bust.

COMBINED HEAT AND POWER

Combined heat and power (CHP) is a means of generating power and recovering the heat produced by the process for use elsewhere. It is also known as cogeneration.

How does it work?

A CHP plant is an engine or turbine, commonly powered by gas, which drives an electricity generator. That's the power component. The heat part of the system recovers the heat produced by the power generation, using it to heat water or air.

Why would I want one?

They're around twice as efficient as a generator providing just electricity: instead of wasting nearly half the energy consumed as heat, the CHP plant will recover it. A typical CHP plant converts 88% of the fuel used to useful energy – 42% as electricity and 46% as heat. In a cold store CHP can become a trigenerator, using the heat to power absorption chillers.

What other fuels can they use?

It depends on the engine, and some CHP units use steam-driven turbines. Gas is the most popular fuel, often natural gas or methane from biodigesters. But the next generation of CHP systems is likely to use hydrogen, which emits nothing but water when it's burnt. In fact hydrogen CHPs exist today, and are used in commercial settings. The issue is not the technology, which is proven and reliable, but the fuel supply. Hydrogen is difficult to transport and store, because unless it's compressed – which uses a lot of energy and requires pressurised storage – its energy density is poor, so it requires a lot of space.

The good news is gas engines can be easily converted to hydrogen and some of them on sale today have been designed for this exact purpose.

VOLTAGE OPTIMISATION

Voltage optimisation involves reducing the voltage from the grid supply to match the exact demands of machinery and appliances. It's not renewable power but it is a cost-effective and easy way to improve efficiency.

What is it?

A voltage optimiser (VO) is a large box – the size depends on the amount of work it has to do – which reduces the voltage supplied to equipment running on electricity. They can be used to control the power supply for an entire site or fitted to specific machines.

How does it work?

Most electrical equipment can run on a fluctuating voltage, which in the UK can range from 216-253v on a single phase supply. Anything more than voltage required to run the equipment is consumed, but as it isn't needed to power the machine, it's wasted as heat and vibration. Some machinery will be damaged by excess voltage, suffering motor burnouts and premature wear.

The VO reduces the incoming voltage to 220v or 400v, so the equipment is using only what it needs, rather than consuming the excess voltage.

Why do I need it?

Two reasons. One, it saves money, because you're not using as much power. Two, it can extend the lifespan of your equipment because it's not being stressed by the extra volts, which can cause wear and damage.

The savings are relatively modest – between 6% and 12% of your annual bill – but for cold stores, with their high electricity consumption this could represent a significant sum. Longer term, equipment will last longer and need less maintenance.

How long does it take to pay for itself?

Depending on the size of the unit, its cost and how much power you use, the payback period will be between nine months and two years. The more electricity you use, the more you'll save, and the payback period will be faster.

EXPERT'S VIEW

"We're trialling voltage optimisers built for blast freezing"



Clare Horler is Olympus Power's voltage optimisation expert

Installing a VO is an easy win for most businesses. You don't need permission from the grid or your network operator, and it will start working immediately. We'd recommend getting a VO fitted to the supply for specific machines and equipment, as they're more effective. VOs can go on lots of different types of equipment, anywhere there's space to fit one – they can get quite big, so you have to think about where to put it. We analyse your electricity use by data logging it, calculate the size of VO you need and work out the savings. You decide if it's worth investing in.

Right now we're trialling a VO built specifically to work with mobile blast freezers, which use thousands of kilowatts in a single day. A VO offering an 8% reduction in energy use on 1200kW per day will save £2,800 a week.

FOUR WAYS TO PLAN A SUCCESSFUL RENEWABLE POWER RETROFIT

- 1 Involve your people from the start. Talk to engineering, facilities, logistics – anyone who might be affected by the work – before making a commitment. Don't present an installation as a done deal. Get their input and opinions; ask them about the best way of doing the work and how to incorporate it into daily operations without too much disruption. For instance, cold stores have a lot of traffic – how can you keep it flowing during the work?
- 2 Combining refit operations is more efficient, so think about adding renewables at the same time as another major upgrade, such as new refrigeration units. And fitting solar is an excellent reason to replace that leaky roof.
- 3 What's access to your roof like? And how safe is it? Solar needs maintenance, and if every time someone goes up there they have to install temporary edge protection, it's going to cost money and take time. It can be better to get permanent edge protection fitted.
- 4 Scrutinise your installer's track record. How many projects they done? Look for big names and finished projects. What happens when they're finished – how long are the warranties and what do they look like? You're looking for an operations and maintenance package to match the lifespan of the equipment. For instance, solar panels are guaranteed for 25 years, so you want the after care to last the same amount of time.



THE ENERGY OF THE FUTURE IS ON YOUR DOORSTEP

The best way to cut your ties to ever-increasing energy prices? Build a microgrid.

A microgrid is like a miniature power station. It uses a combination of different types of energy generation to provide power for the site it's built on. Those can be renewables, fossil-fuels or low-carbon gas, but its energy source is independent from the grid, although the site is still connected.

Microgrids are what's known as decentralised energy generation. They take energy production away from the huge power stations and put it where it's needed, effectively creating a power supply independent of the entire energy generation and distribution network. The aim of a microgrid is to supply enough power to allow a site to run off grid.

Using microgrids to power commercial premises is in its infancy, but the numbers are increasing, especially in the US. Costco has installed several at warehouse sites. JFK Airport is adding a microgrid to one of its terminals as part of the site's enormous rebuild. Data centres are building microgrids to guarantee electricity supply in the event of the grid failing to provide enough power.

In the UK there are a handful of microgrids, and they're mostly connected to communities, not individual businesses. The Isles of Scilly replaced diesel back-up generators, used when the power

supply from the mainland was cut, with a microgrid powered by renewables. A housing development in Longbridge has been built with a microgrid, connecting the houses with a community battery storage system.

In the UK microgrids in commercial settings are rare. There are many reasons for this; there aren't many financing options, the entire concept isn't well understood, and government hasn't prioritised decentralised power generation, preferring to focus on mega-projects such as nuclear power stations. But that doesn't mean microgrids don't have a future – far from it.

Decentralised power generation is particularly suited to commercial and industrial users, where consumption is high and there's space to build. And as our grid infrastructure comes under increasing pressure from increasing demand, they may even become a necessity to avoid blackouts.

Explore the Cold Store Microgrid of 2050 – turn to page 24.



5 / HOW DO I PAY FOR IT? /

There are three ways to fund renewable energy technology. Borrow the money using financing specifically for renewables. Pay for it yourself as capital expenditure, with the potential for government incentives to cover some of the costs. Or get someone else to pay for it

We're going to look at capital expenditure and getting someone else to pay for it, as dealing with finance options falls outside the scope of this guide. Which one of these is best depends on your financial circumstances and your long-term approach to investment. Each has advantages and disadvantages that should be considered in relation to your business's situation.



GET SOMEONE ELSE TO PAY FOR IT: THE POWER PURCHASE AGREEMENT

Best for: businesses that don't want the upfront cost of purchase and installation and ongoing maintenance costs, or the commitment of owning the equipment.

What is a power purchase agreement?

It's a contract between you and the installer and owner of the equipment to buy the power it generates from them. They retain ownership of the equipment, they're responsible for looking after it and when the agreement expires, they remove it or give it to you. They sell you energy at below grid rates for a fixed term, at a rate linked to inflation or at a specific interest rate. The rate can incorporate upper and lower limits, known as a cap and collar.

What equipment does it cover?

It's often used for solar panels, and these PPAs can include batteries to work with the panels. PPAs are also used to fund combined heat and power plants and wind turbines.

Why should I consider a PPA?

It's the only finance option that avoids any capital expenditure. If you want solar, but you don't have the budget, a PPA will get it on your roof without the need to spend anything. Because the price

you pay is linked to inflation, a PPA adds an element of predictability to budgeting. It's a hedge against rising energy costs, and although it's possible prices could drop, paying for your grid supply means you're paying the non-commodity costs that make up 60% of a bill.

For a cold store, the potential savings will be easy to demonstrate, as forecasting your electricity consumption is relatively straightforward. And if you can predict the price for two decades, you can invest in other things without worrying about rising energy costs.

How long does the contract last?

Traditionally PPAs have been for decades, up to the 25-year lifespan of the panels. But many businesses don't want to commit to a long-term agreement, so PPAs for as little as three years are now available. The length of the term dictates the unit cost of electricity; shorter contracts mean higher prices than longer ones. A shorter contract also loses the certainty of a fixed energy price over a long period; in reality, most businesses choose a 25-30 year agreement.

ROOF GONE? GET A PPA TO PAY FOR IT

A failing roof is a great opportunity to get solar panels and a new roof by adding the cost of reroofing to a PPA.

It's common for solar installations to expose a failing roof that might otherwise go unnoticed. Every proposal includes a roof survey, which isn't necessarily something a business will carry out on its own, and that's when you find out your roof needs replacing.

It's a big cost, but the outlay can be mitigated by adding the finance to the PPA. Solar installers offer roof replacement as part of the job, and you're effectively spreading the cost over the term of the contract.

It will increase the amount you pay for electricity, as that's how you pay for the installation, but it's a great way to tackle major infrastructure projects without spending a huge amount upfront.

PAY FOR IT YOURSELF: THE CAPITAL EXPENDITURE ROUTE

Best for: businesses with the money to pay for the installation and the long-term commitment to maintenance and ownership.

What are the benefits of spending your own money?

If your motivation is to cut your energy bill as much as possible, and you have the appetite to own and maintain the equipment, paying for the kit and the installation will give you the lowest possible energy costs.

With a PPA the installer makes a profit from charging you for the energy generated. If you own the system, you do what you want with the energy: use it on site or sell it to the grid, and the accompanying savings and profit are all yours. And you're not tied to a contract so you can sell or upgrade the equipment as required.

What are the financial implications?

Most of the total cost is in the planning, purchase and installation; ongoing maintenance costs are relatively low. But you are committed to owning and maintaining the equipment for as long as you need it. If it breaks, you pay for it. You have to look after it, clean it, fix it and upgrade it. Batteries last about half as long as solar panels so if you have a battery storage system, budget for replacing them after ten years.

On the plus side, you'll get the full benefit of the Government's 50% tax relief on the purchase and installation of solar panels. Having said that, there aren't many other tax incentives applicable to renewables. A business rate exemption applies to some equipment, although not solar panels.



EXPERT'S VIEW

"This guarantees your electricity will be cheaper than the grid for 20 years"



Vanessa Zalman is Olympus Power's general manager

We're repeatedly hearing the same concern from prospective customers: what happens if electricity prices fall below the price you've quoted for a PPA? Given the increasing proportion of grid power generated by renewables, which are the cheapest form of energy, it's a possibility. And one that would leave them paying more for their own power than if they got it from the grid.

The solution is similar to a PPA, but with a significant difference: the price you pay for power will never be more than the grid price. We've developed a finance model guaranteeing the price per unit of power will drop if grid prices fall. It's called Olympus One, and it's designed to offer a new level of security for business.

By removing the uncertainty of future energy pricing, renewable power becomes risk-free. You know what your electricity will cost for the next 20 years. You also know you'll always pay less than the grid charges. And the more you use of the power you generate, the less you'll pay in non-commodity charges, the fixed costs of distributing the energy through the grid.

Our model for Olympus One typically involves roof-top solar and a battery, which gives you the ability to trade energy and use the solar when you need it, not just when the sun is shining. It is not a one-size fits all solution; like a PPA, the rate will vary according to the project, and it won't suit every business. But for those with a long-term outlook, and who welcome the security of knowing your energy prices will never rise, Olympus One offers a new way to get into renewable power.



WHAT ABOUT BEING PAID FOR ELECTRICITY?

If your renewable installation is likely to generate a surplus, or you want to use it to generate income, you'll be able to sell electricity to the grid.

This is done through the Smart Export Guarantee, an agreement between you and an electricity provider, which can be any of the 16 companies signed up to the scheme. Each of the 16 sets its own rates and conditions, and you can choose which you'd like to sell to.

To be eligible, you need to be using solar, wind, hydro, or anaerobic digestion with a 5MW maximum output, or micro combined heat and power, which has to be under 50kW.

How much you can export will be determined by the size of the grid connection you're offered. Export limits are set to protect the grid from being overloaded – it wasn't designed to accommodate lots of small generators – and are maintained by limitation devices to reduce the power output of the system.

EXPERT'S VIEW

"Most renewable projects fail at board level. This is how to convince them to say yes"



Dave Middleton is Olympus Power's finance director

Financial savings are the number one priority for most company boards. Given that renewable power has the capacity to save money, committing to it would seem to be an easy decision.

But it's when a commitment needs to be made we find most renewables projects stall, whether it's to spending the money if the customer is self-financing or to the contract if they're getting us to pay for it under a PPA. And it's often due to the decision makers lacking the information they need to say yes.

It's entirely avoidable because the facts about investing in renewables are indisputable. Renewables are the cheapest form of power, and they're getting cheaper. A business that uses a lot of energy will benefit financially from using renewables. And the less energy you buy from the grid, the more you save on the non-commodity charges, the part of your bill that pays for the transmission and distribution of energy.

It's a simple equation but one that's often lost in the day-to-day running of a business, especially if the payback period is measured in years rather than months. Convincing a board requires detailed information presented in a clear manner. What are the costs? What are the savings? How long will it take to start making those savings?

In addition to the core financials, consider the risks you're trying to avoid and the benefits you're looking for. Do you want the highest financial return possible, the lowest unit price or the biggest environmental impact? Renewable systems can do all of these but if one matches a business's strategy more than the others, use it as the basis of your argument.

Our customers are often the people doing the convincing. We help them shape the case for renewable energy with the financial data and emissions information they need to get the project approved. Renewables should be a no-brainer, but you still need a solid case to prove it.

6 / HOW DO I LOOK AFTER IT? /

Once you've got your renewable power system installed, you'll need to look after it to keep it generating properly

MAINTENANCE

Renewable energy technology doesn't need a huge amount of maintenance. Solar panels and batteries are durable and tough. CHP plants have plenty of moving parts but they're designed to run for thousands of hours at a time, and simple regular maintenance will keep them going.

Keeping an eye on the equipment is no different to using an app; in fact, most monitoring systems are apps, and they're powerful tools, capable of flagging potential problems before they become an issue.

Normally, repairs and maintenance are carried out by specialist contractors. If you have a power purchase agreement, you're not responsible for looking after the system – it will be done by the installer.



1 DIRT

To work properly, solar panels need to be clean. Dirt blocks sunlight from passing through the glass into the silicon layer; researchers at Massachusetts Institute of Technology found dust can cause an efficiency reduction of up 30%, so regular cleaning is a crucial part of the maintenance schedule.

How often they need cleaning depends on the location and the angle of the panels. For instance, lower angle panels will need more cleaning and coastal sites require yearly cleaning, as opposed to every two years in a less exposed location.

Cleaning isn't particularly expensive. A 200kW, 700 panel installation will cost around £3,000 to clean.

2 ANIMALS

Solar panels provide shelter for animals, most commonly birds and rodents. Birds nest underneath and on top of panels, causing hotspots where nest material builds up on the panel surface. Rodents chew cables, causing shorts and failures, which can lead to fires. Animal nests under the panels obstruct the airflow needed for cooling. Solutions include mesh guards around the base of the panels and bird scarers.



3 TREES

Shading from trees is a problem you may not even notice. When the system's installed it will be designed to avoid shading, but of course trees grow. It's easy to miss such slow changes over time, and you might not be aware that a tree that didn't initially cause a problem could now be big enough to shade the panels and reduce efficiency.



4 INSPECTION

Insurance requirements and the need to keep on top of electrical issues have changed the rate of routine inspections. They used to be every year but now they're carried out every six months.



5 DRONE INSPECTIONS

Much easier than sending people onto the roof, a drone carrying a thermal imaging camera will find hotspots – where cables or components are overheating – far faster and more efficiently than a human.

6 BATTERIES

Batteries require little active maintenance, but they do need to be monitored. Lithium-ion batteries can overheat; at best this means they won't work properly, at worst it can result in a fire. Getting too cold is also a problem, with low temperatures affecting a battery's ability to properly charge and discharge.

A battery management system looks after your batteries, managing their internal temperature, charging cycles and external cooling. It works with the electricity source to create a charging and discharging schedule that prolongs the batteries' life.



7 CHP

Like solar and batteries CHP systems don't need operating – they're normally set up to fire up and shut down automatically. You can monitor the fuel level, temperature, coolant, lubricant and how much power it's producing, but you shouldn't need anyone to operate it.

Because a CHP system uses an engine, it needs maintaining like an engine; regular oil and coolant changes, filters, plugs, valve adjustments and so on.

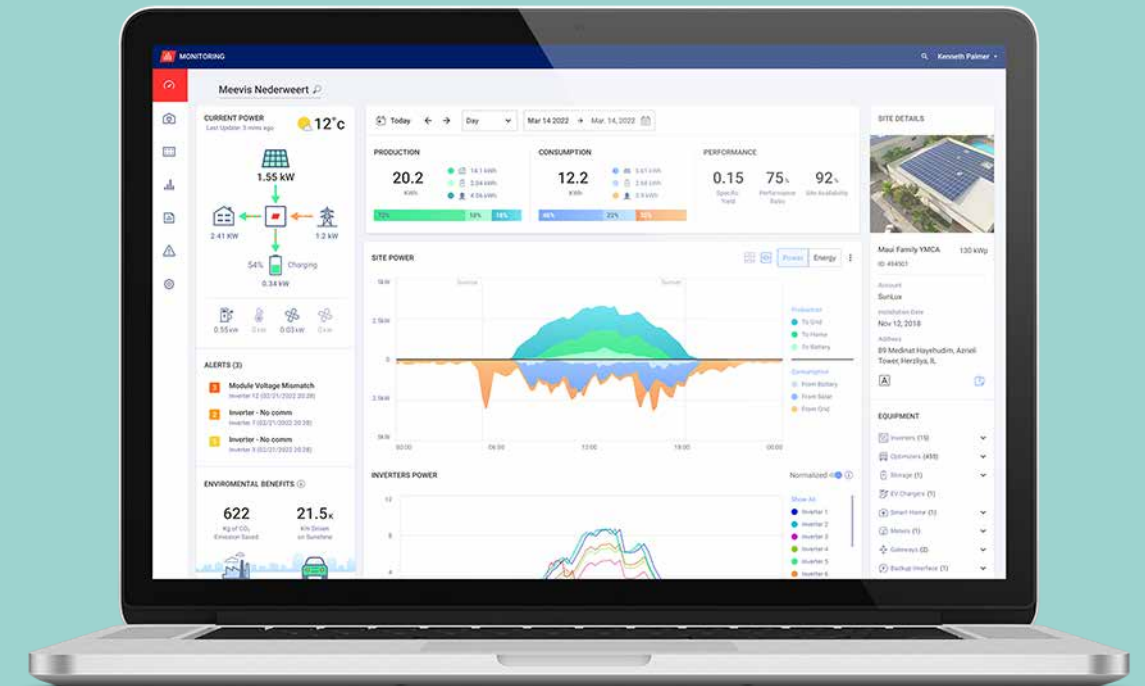


HOW DO I KEEP IT WORKING PROPERLY?

Clean: Keep solar panels clean and they'll keep working properly. It's not expensive or difficult, and regular cleaning maintains efficiency.

Inspect: Renewable tech is reliable and when it's working, often quiet and unobtrusive. Keep it that way with six-monthly inspections.

Monitor: Don't fit and forget. Monitoring systems are sophisticated, easy to use and provide a huge amount of useful information.



MONITORING

Most renewable technologies come with some form of digital monitoring, often in the form of a dashboard and an app. The quality varies; you're looking for one that not only displays the most information but is also easy to use. Olympus Power reckons the SolarEdge system is one of the best, for the way it combines enormous volumes of data with an intuitive interface. SolarEdge is also about to launch a platform capable of handling multiple types of renewable energy.

SolarEdge's dashboard gives you access to a digital twin of your site, showing the physical and electrical layout with every component visible in fine detail, right down to each panel's serial number. You can see how individual components are performing in real time, as well as the entire system. It manages EV charging, battery storage and monitors how your building uses the power.

It also makes reporting easy; you can turn just about any data into a chart, from a weekly report to one covering years.

UPGRADING AND REPLACING

The longest-lived components of a solar installation are the panels, which have a 25-year warranty and can last up to 40 years. Inverters, the parts that control the flow of power from the panels, come with a 15-year warranty, while batteries are more like a decade. So it's possible you'll need to replace the inverters and batteries. If you have a PPA, then you'll get upgraded as part of the contract, which will improve the system's performance.

But while inverters are getting more efficient and longer lived, and suffer less performance loss over time, a new one won't increase your power output. The only way to do that is add more generation.

EXPERT'S VIEW

"It's my job to sort out any problems"



Michael Carvey is Olympus Power's operations and maintenance manager

I'm the analyst for our PPA systems – the ones we own and maintain for the customer – so it's my job to keep an eye on how the installations are performing and to sort out any problems.

I'm looking to maintain maximum efficiency; we're comparing the yield to expectations, because underperformance indicates an issue. That could just be the weather, but the sophistication of the systems we use can find issues with individual panels.

I get an alert if there any problems. The most common issues are overheating, loose cables and connections and water ingress. Sometimes we can solve it, but if we need an engineer to deal with it we can respond within hours. It depends on the severity of the problem. We can isolate individual panels, which means we can shut down problematic areas and keep the system going.

7 / THE COLD STORE MICROGRID OF 2050 /

Generating its own power and selling a surplus to the grid, the cold store of 2050 is energy self-sufficient, generates an income and produces virtually no carbon – or emissions of any kind.

1 DARK WAREHOUSES

The robots which stack and pick inside the cold store can operate in darkness so there's no need for internal lighting, reducing energy use.

2 SOLID STATE BATTERIES

The commercialisation of solid-state batteries in the 2030s has made batteries smaller with a much higher capacity and a longer life. They're also cheaper and more reliable.

3 FUEL CELLS

Powered by hydrogen, fuel cells generate electricity and emit nothing but water. But their lack of efficiency means the cold store uses them as a back-up power source should another source fail.

4 COMBINED HEAT AND POWER

In 2050 CHP plants run on hydrogen instead of today's predominantly gas-powered units. Hydrogen burns more efficiently than gas and with no CO₂ emissions it's cleaner, too.

5 AMMONIA TO HYDROGEN CRACKER

Energy self-sufficiency extends to making the hydrogen needed to run the fuel cells and the CHP plant. Ammonia is converted to hydrogen on site by a cracker, which breaks it down into hydrogen and nitrogen.

12 ENERGY EFFICIENT CONSTRUCTION

Commercial buildings in 2050 are subject to building regulations modelled on a Passivhaus. They need little heating or cooling, instead using ventilation and shading to regulate internal temperature.

11 BLADELESS WIND TURBINES

Because they're smaller, quieter and cheaper than today's bladed turbines, these towers are easier to install on a busy commercial premises. They generate power by gently vibrating in the wind.

10 SOLAR PV

By 2050 legislation requires all commercial buildings to incorporate a ratio of solar panels to the size of the building. Here, they're fitted to the roof and the car park, where they also provide shade.

9 HEAT PUMP

Air-source heat pumps are now even more efficient and capable of operating in lower temperatures. This one uses waste heat from the store's refrigeration to extract energy, which it heats water with.

8 EV CHARGING POINT

With every vehicle on the fleet powered by electricity, the cold store's charging facilities can handle multiple HGVs, cars and forklifts. It also offers charging to visitors and the public.

7 GRID CONNECTION

The decentralisation of energy generation has changed the relationship between the grid and those connected to it; power now flows between them, rather than from supplier to user as it used to.

6 ENERGY MANAGEMENT SYSTEMS

Running on predictive AI, the management systems are able to accurately forecast energy use, which is crucial to making the microgrid work properly and efficiently.

8 / THE COLD STORE MICROGRID OF 2050 – IN DETAIL /

By 2050, many commercial buildings will be constructed to run as microgrids. Our cold store of the future is one of these buildings. Built in 2048, it was designed from the ground up to incorporate renewable energy sources. It functions as a mini power station, with the ability to generate, store and distribute its own power.

It uses multiple ways to generate energy, from wind turbines to fuel cells. Each contributes a little, but together they produce most of what the site needs. And the site is easily capable of using all that it produces, making the investment payback quick. By 2050, two years after completion, the building has saved its owners 75% of the cost of installing the renewable technology.

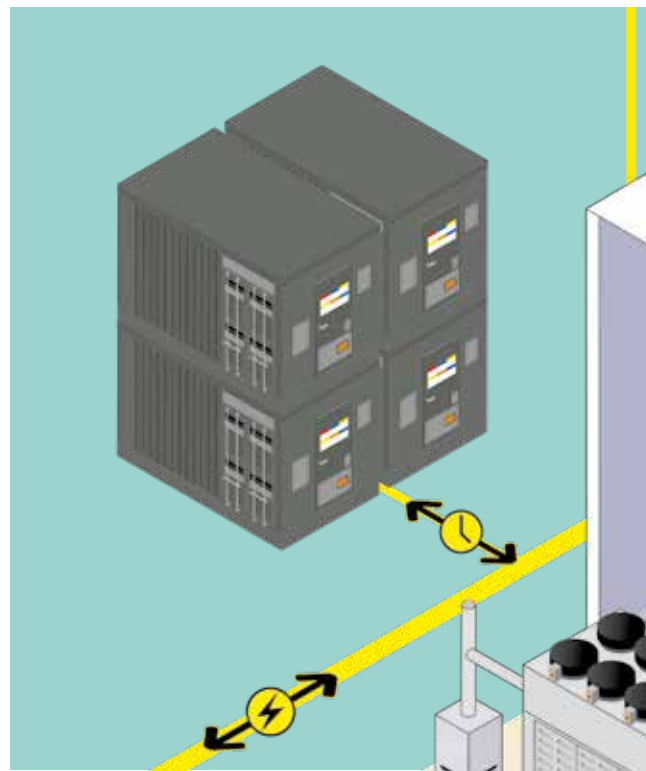
This is not crystal ball gazing. The technology we're looking at here already exists. Some of it you can buy today, some of it is in development, but it's all feasible. So let's fast forward 25 years for an in-depth tour of the cold store of the future.



1 DARK WAREHOUSES

Dark warehouses – their technical name is automated storage and retrieval systems – came about as a result of increasing automation, but they also have helped reduce energy use. A dark warehouse is one in which all the handling of goods is carried out by machines, usually robots.

This is particularly useful in a cold store because robots don't feel the cold like humans do. Robots do not need lights to operate, so the areas in which they work can be kept dark, cutting energy use. And because people aren't constantly going in and out through doors, it's easier to maintain the store's temperature, which in turn uses less energy.

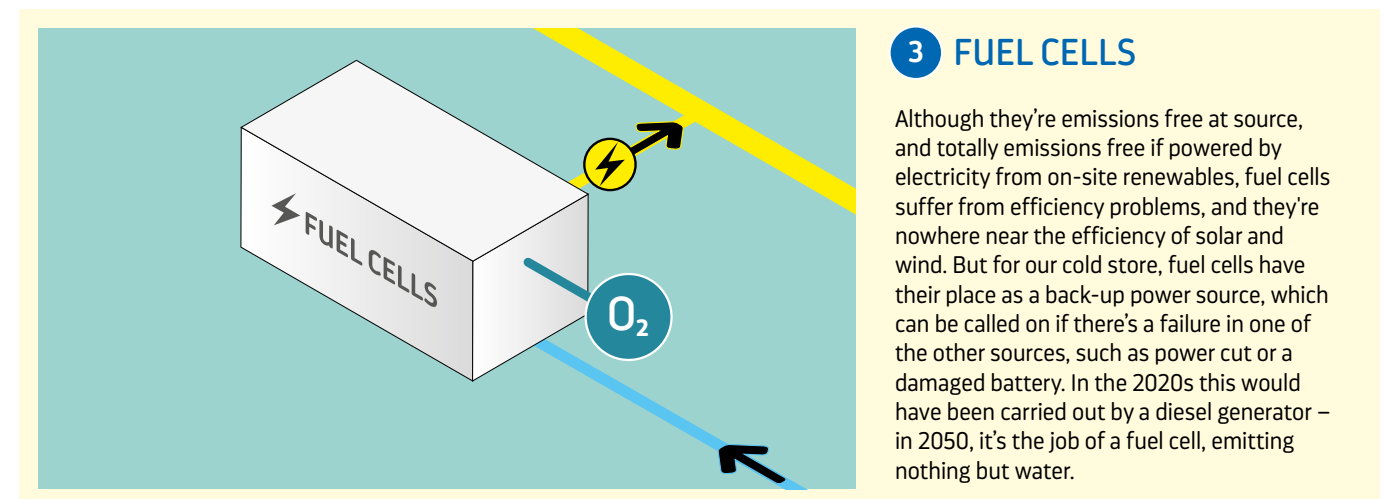


2 SOLID STATE BATTERIES

In the 2030s solid-state batteries begin to replace the liquid electrolyte type used since the invention of batteries in the early 1800s. They use a solid electrolyte, made of glass, ceramic or chemicals such as sodium and sulphur.

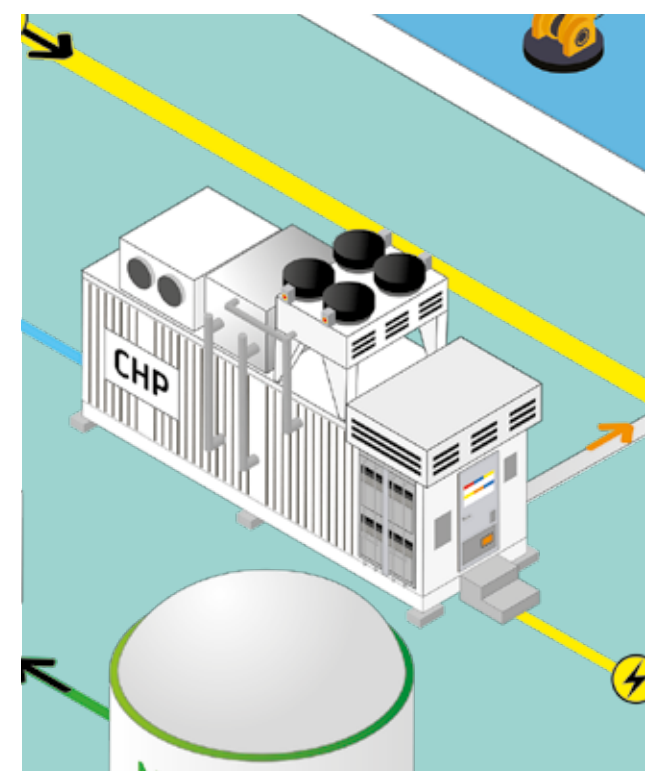
Solid electrolyte batteries are longer lived, more reliable and charge faster than liquid ones. They have a higher energy density, so a smaller battery holds more power than its liquid-filled equivalent. That makes them lighter, too, and easier to incorporate into building designs.

They charge faster and don't slow down in the final 20% of charging, a characteristic of lithium-ion batteries. They're also less prone to catching fire or exploding, as the solid electrolyte reduces the chances of a short circuit or overheating.



3 FUEL CELLS

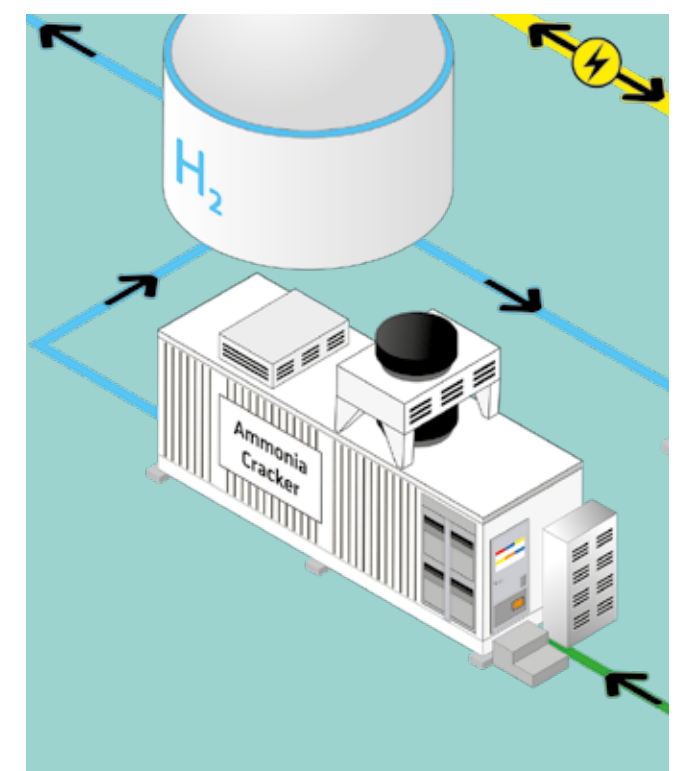
Although they're emissions free at source, and totally emissions free if powered by electricity from on-site renewables, fuel cells suffer from efficiency problems, and they're nowhere near the efficiency of solar and wind. But for our cold store, fuel cells have their place as a back-up power source, which can be called on if there's a failure in one of the other sources, such as power cut or a damaged battery. In the 2020s this would have been carried out by a diesel generator – in 2050, it's the job of a fuel cell, emitting nothing but water.



4 COMBINED HEAT AND POWER

By 2050 hydrogen has replaced natural gas as the power source of choice for plant such as combined heat and power units (CHPs). A CHP uses a hydrogen-powered engine to generate electricity, and its only emission is water vapour. Generating power on-site with a CHP means less is lost in transmission.

The CHP can provide cooling as well as heat. An absorption chiller, which cools by using heat rather than a compressor, forms part of the system to provide air conditioning for the building.



5 AMMONIA TO HYDROGEN CRACKER

In 25 years the introduction of hydrogen infrastructure still hasn't materialised, but businesses want the benefits of hydrogen's clean burning and its ability to act as a stable, long-term energy store.

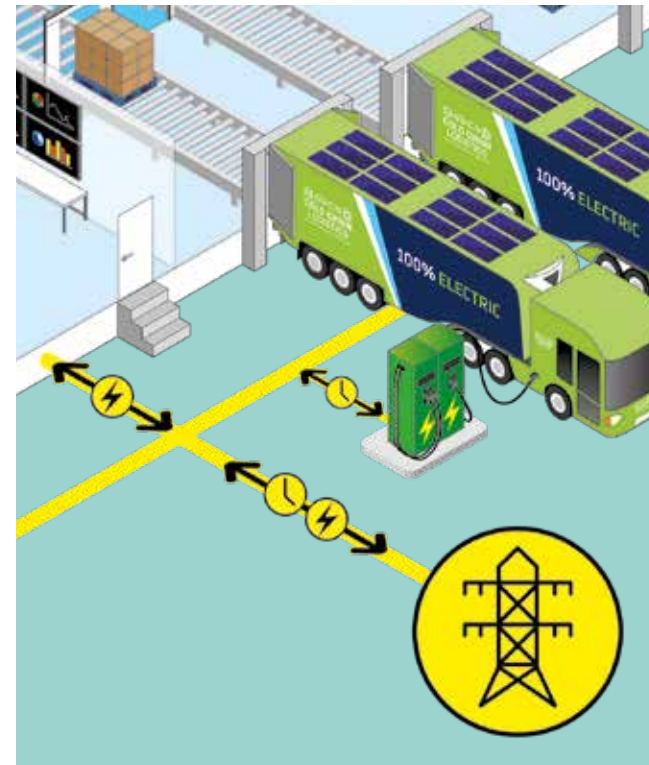
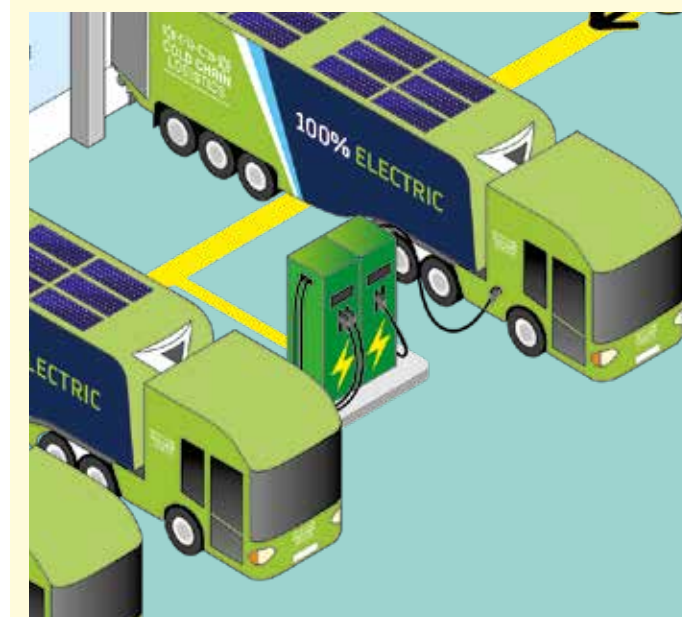
This cracker splits ammonia – which is easier to transport and store than hydrogen – into hydrogen and nitrogen, which is used to power on-site plant such as the CHP facility and the fuel cell. The cracking process heats ammonia to split hydrogen from nitrogen, in a CO₂ free process. The two gases are then separated, with the nitrogen used to fuel the cracker's burner.



6 ENERGY MANAGEMENT SYSTEMS

The way our futuristic cold store manages its energy use is as important as its ability to produce the power in the first place. Predictive artificial intelligence models the store's energy consumption for a year ahead, and then programmes the microgrid to meet that demand.

It helps keep the equipment frost free so there's less need for defrosting and, when defrosting is necessary, it can predict when and make sure there's enough energy stored in the batteries to carry it out. It's also really easy for managers to see how energy is being used, and use historical data to analyse how to improve.



7 GRID CONNECTION

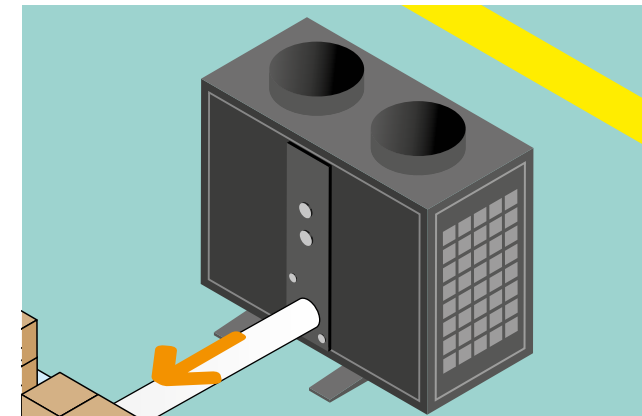
The late 2020s reforms to the way grid connections are allocated makes it easier for businesses with a long-term renewable strategy to get the right kind of connection, when they need it. National Grid's upgrade of the grid during the 2030s helps create a network better suited to the needs of decentralised energy generation; most notably the ability to receive power as well as supply it.

It also helps replace some of the country's reliance on fossil-fuelled balancing and back up with energy from battery storage systems. Now microgrids such as our cold store's can make a meaningful contribution to the national power supply.

8 EV CHARGING

With the advent of lighter, smaller batteries with greater ranges, electric heavy goods vehicles have become a reality. This, of course, means the site's charging facilities need to handle multiple HGVs, as well as its vans, cars and forklifts. Some small machines like forklifts are now powered by fuel cells, which handle low temperatures better than batteries, but road transport is mostly electric.

The site also offers charging for visitors and the public, as a way to sell surplus power. Power is stored in the batteries when grid prices are low and then sold for a profit when prices increase.



9 HEAT PUMP

For decades the heat generated by refrigeration plant was seen as a waste product – something to be got rid of, often just pumped out of the building. But the realisation it could and should be used to heat water and buildings meant businesses now benefit from a free energy source.

In our cold store, heat from the chillers is captured and piped to the heat pump. It recovers the energy from the heat, and uses that to heat the building's water.



10 SOLAR PV

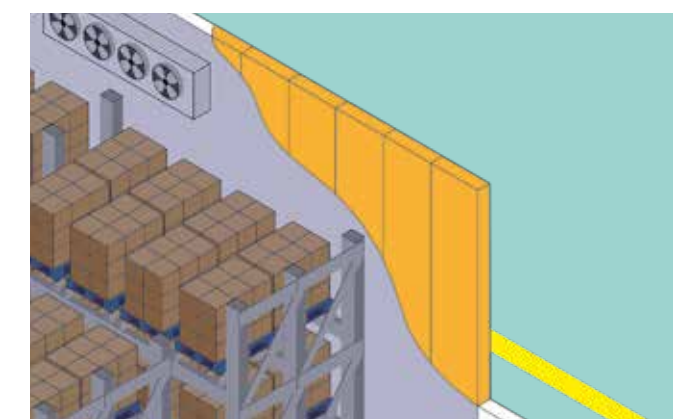
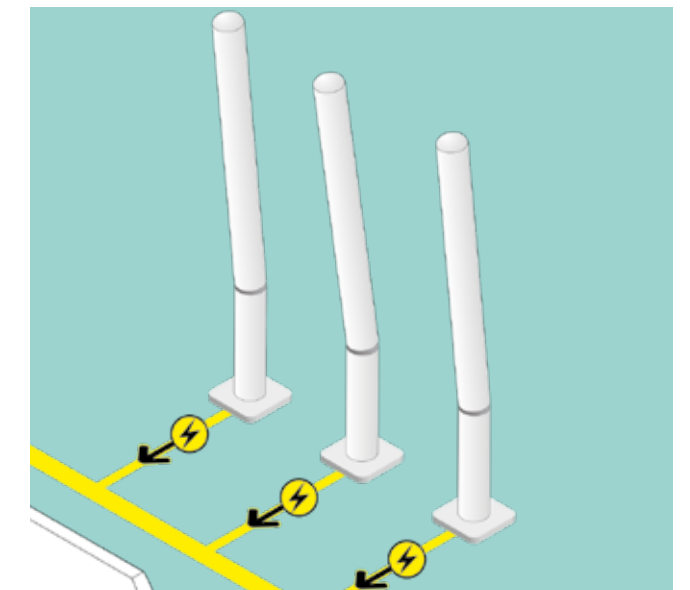
Major breakthroughs in materials during the later 2020s increase the efficiency of solar panels. The commercialisation of perovskite, a mineral that replaces silicon as the light capturing layer in a panel, makes panels better at converting sunlight into electricity, and they can use a wider range of the light spectrum than silicon panels. Perovskite becomes cheaper to make than silicon, helping to reduce the price of panels further and as the efficiency increases, the payback time drops even further.

By 2050 legislation requires all commercial buildings to incorporate a ratio of solar panels to the size of the building. And by using them to cover the car park, they also provide shade for parked vehicles and a visible reminder of the cold store's renewable power sources.

11 BLADELESS WIND TURBINES

The wind turbines of 2050 are no longer the giant windmills of 2025. The quest for ever bigger turbines is replaced by the development of smaller units designed to go on rooftops and around the edges of buildings.

These towers, which are about 6m high, generate power by gently vibrating in the wind. They're smaller, quieter and cheaper than the giant bladed turbines of the past, making them easier to install on a busy commercial premises. Other types of small turbines include rooftop-mounted units that look like a giant desktop fan and pole-mounted spinning balls.



12 ENERGY EFFICIENT CONSTRUCTION

By the middle of the century commercial buildings are subject to building regulations modelled on the efficiency of a Passivhaus. They need little heating or cooling, instead using ventilation and shading to regulate internal temperature. Passive cooling, which uses the design of the building, its orientation and the materials it's constructed with to help reduce the internal temperature, is a crucial part of the cold store's design. And natural ventilation draws in cool, dry air to replace warm, moist air.



Phil Pluck is the Cold Chain Federation's chief executive

The cold chain underpins a healthy society. To keep it that way we need Government support and recognition

To store and deliver the nation's food and life-saving medicines, our industry needs a secure, stable energy supply that mitigates threats to the grid

A growing body of academic research has clearly identified multiple threats to the UK over the coming decades. They will pose a significant challenge to food and pharmaceutical storage and supply.

Climate change, UK food productivity, geopolitical instability, disrupted shipping routes, cyber-attacks from criminal elements, threats from foreign bad actors to the grid, grid demand from emerging industries; they all add increasing instability to the production, storage and supply of food and pharmaceuticals.

We know that if UK citizens are denied vital medicines they die. If they are denied reliable food supplies civil unrest is likely, followed by civil disorder. And a secondary consequence of food supply disruption is food inflation, which affects the most vulnerable people in our society first.

We have already suffered power outages, pandemic-induced empty shelves and cyber-attacks. The threats are here, they are real, and they are growing.

The grid has sustained our nation and industry, but it cannot be relied on as the only energy source. It must now be classed as a potential risk to food and pharma storage and supply, not an always-on given.

We need to build resilience in our storage and distribution facilities. Adopting renewable, secure energy sources helps us achieve this by moving us as far away from the grid as possible.

This guide is about more than choosing the right renewable set up for your business. It's about the future of our industry, and how we future proof it.

At the beginning of this guide, we said we can't do this alone, and what I've said here proves we shouldn't have to. We've called for a minister to have clear responsibility for cold chain resilience and for the sector to be recognised as Critical National Infrastructure. We want to work with government to create that resilience, and that means helping us invest in renewable energy.

There's too much at stake for us not to.

How the cold chain can store energy as well as food

Britain's cold stores are a crucial part of the country's infrastructure. But they will also play an important part in the future of renewable energy

We get to work with all sorts of businesses in this job. In fact, we get to work with pretty much every type of business, because every business uses energy, so every business can use renewables. I meet so many different customers in so many different industries, all benefitting from the renewable power systems we've designed and built for them.

But most don't have the cold chain's potential to help renewable power replace fossil fuels. And the potential to be a significant player in how the country's energy is used, stored, delivered and managed.

Because replacing fossil fuels with renewables requires energy storage. The intermittent nature of renewable generation means it's always going to be necessary to store the power it produces. There are dozens of ways to do this, some of which are in widespread use and some of which are still on the drawing board. Batteries are obvious, but the energy doesn't have to be stored as electricity.

Pumped hydro, one of the most widespread means of storing energy, illustrates how this works. Electricity is used to pump water up a hill into a dam, where it's stored. When the energy is needed the water flows downhill to power turbines. The energy in the electricity is being stored in the form of water at the top of a hill. Then there's thermal storage, which uses heat retaining materials such as concrete and ceramics to store energy.

But all of these require building new facilities, and I'm one of those people who wants to do more with what we already have. When I see a large commercial roof,

I think: we could fit a lot of solar panels on there. What I love about the idea of using cold stores as energy stores is that they already exist. And they've perfected the act of raising temperatures when electricity is expensive and lowering them when it's cheap. This is what makes the cold chain such a unique and useful asset in the transition to renewables; it's a ready-made energy storage network all over the country.

In Germany, the government is funding trials of a system that could make this happen. This AI-powered software helps cold stores use energy when it's cheap and predominantly generated by renewables. When prices rise, and renewable power is less abundant, the chillers are turned down to temporarily reduce energy consumption. It could be used to coordinate the country's 750 cold stores, so they work together as a giant battery.

Imagine such a system in the UK, with government backing and funding. Imagine the cold chain's importance to the country's energy security recognised, as it should be, in direct relation to its importance to the country's food security. The Cold Chain Federation wants cold stores to be designated as Protected Sites, a status given to critical infrastructure that stops them from being disconnected from the grid in a power cut. Add to this the industry's potential to increase our use of renewable power by providing energy storage, and I'd argue that's doubly justified.



Simon Nicholls is Olympus Power's chief executive

The cold chain's importance to energy security should be recognised in direct relation to its importance to food security

The grid has sustained our nation and industry, but it can no longer be relied on as the only energy source



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