THE GREEN BOOK

NORDIC CLIMATE GROUP

NORDIC CLIMATE GROUP THE GREEN BOOK

"

For a better climate became more than a slogan – it became a promise for how we build our business and develop the industry.

A vision for a better climate

/// Energy efficiency is one of the greatest challenges – and opportunities – in the energy transition. Cooling and heating account for a significant share of society's energy use. Through energy recovery and the right choice of refrigerant, we help our customers cut costs and reduce climate impact.

When we started Nordic Climate Group in 2021, our ambition was clear: to be a driving force in the transition. For a better climate became more than a slogan – it became a promise for how we build our business and develop the industry. Today, we have grown to more than a hundred local companies in seven countries, and our work continues with the same goal: to combine business value with climate value.

We design, install and service energy-efficient systems across society, from shops and homes to industry, healthcare, research and data centres. Our strength is the combination of local entrepreneurship and shared methods – close to customers, with the power of a large Group.

This book shows what that means in practice: case studies with measurable results, lessons from different sectors and examples of how energy efficiency can be realized in real-world installations.

1 October 2025

FREDRIK GREN
GROUP CEO

Contents

About Nordic Climate Group 7

Why your choices today determine cost, risk, and climate tomorrow 9

Case 17

Grocery/Retail 19

Logistics and Warehousing 25

Property and Offices 31

Public properties 37

Industry and Process 41

Data Centres 47

Facts and concepts 51

FACTS ABOUT NORDIC CLIMATE GROUP

FOUNDED

2021

LOCAL ESTABLISHMENTS

~100

COUNTRIES

Sweden, Norway, Denmark, Finland, the Netherlands, Belgium, the United Kingdom, and Ireland

EMPLOYEES

~2000

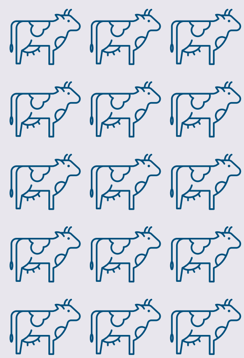
Why your choices today determine costs, risk, and climate in the future

It's not only about technology. The choice of refrigerant, the possibility of energy recover, and the ability to avoid lock-in, determine both climate impact and operating economics – now and over the long term. Here are the elements to review before you decide:

The choice of refrigerant has a major impact

- A facility using R404A that leaks 100 kg in a year must report ≈ 392 tonnes CO_2e.
- With the natural refrigerant carbon dioxide (CO_2, R744), the same leakage is reported as ≈ 100 kg CO_2e.

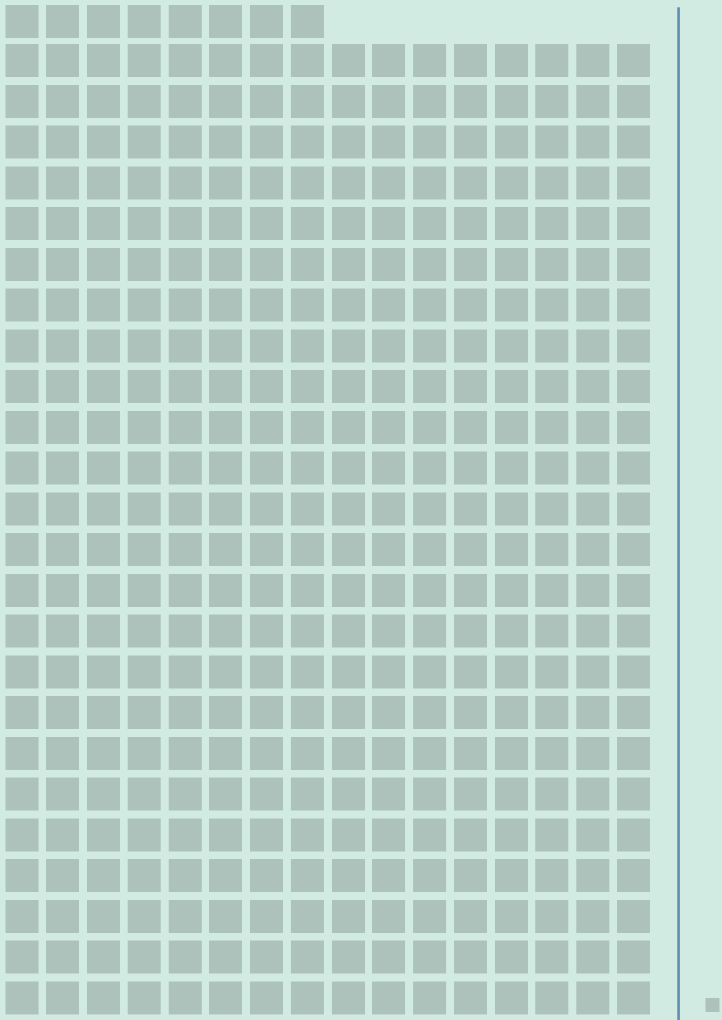
Difference: almost 4,000 times greater emissions that burden the company's sustainability reporting (Scope 1).



392 tonnes CO_2 is roughly equivalent to the climate impact from about 15 tonnes of beef.

x4 000

The right refrigerant can cut climate emissions by a factor of almost 4,000.



Leakage of 100 kg R404A ≈ 392 tonnes CO_2e

Leakage of 100 kg CO_2 R744 = 100 kg CO_2e

How emissions are reported (Scopes)

Under the Greenhouse Gas Protocol, all emissions must be reported annually under Scopes 1, 2 and 3.

SCOPE 1
Direct, material emissions from the company's own operations and equipment. Refrigerant leakage is always reported in Scope 1.

SCOPE 2
Indirect emissions from purchased energy used in own operations (e.g., electricity or district heating).

SCOPE 3
Upstream and downstream emissions across the value chain.

What is GWP?
Global Warming Potential (GWP) measures a gas's climate impact relative to carbon dioxide (CO_2 = 1).

- R404A ≈ 3 920 GWP
- CO_2 (R744) = 1 GWP

The higher the GWP, the larger the emissions reported at leakage – even at small amounts.

Recover the heat for lower costs and emissions

Previously, waste heat was lost. Today, the same systems can deliver both cooling and heating, cutting the need for purchased energy.

Reducing operating costs and lowering emissions in Scope 2.

EU requirements
tighten over time (timeline)

The timeline shows how regulation tightens over time and why decisions on energy efficiency cannot wait.

2024

New F-gas Regulation. Tougher requirements on HFCs and the start of phasing out high-GWP refrigerants.

What risks and opportunities arise from your choices?

Risks of synthetic refrigerants

- Phased out under the EU F-gas Regulation → supply is decreasing.
- Rising prices as availability declines.
- Risk of shorter lifetime and costly conversions when refrigerants are banned and systems must be replaced before their technical lifetime.

Refrigerant choice determines the technology

Different refrigerants require different systems – and most often the entire system must be replaced if the refrigerant is phased out.

Synthetic refrigerants may be a short-term choice with long-term costs.

Choosing a refrigerant at risk of phase-out can mean a full premature replacement.

2027

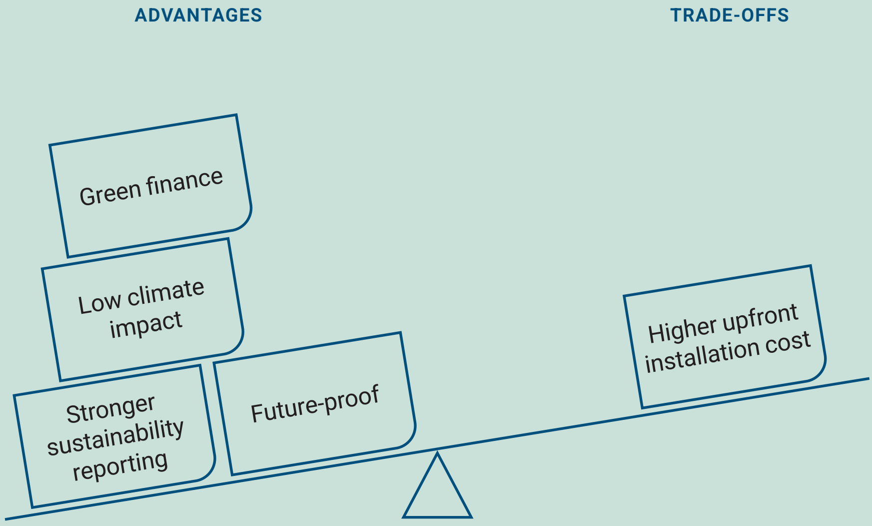
Sharp reduction in F-gases. Supply becomes significantly restricted → rising prices and more expensive maintenance of old systems. (Based on the 2024 revision).

2030

Stricter EU directives. Requirements on energy efficiency and sustainability reporting for most larger actors. (EED, EPBD and CSRD).

2050

Paris Agreement target: EU's building stock to be climate-neutral, aligned with net zero ambitions.



Natural refrigerants

Advantages and trade-offs

- Future-proof –no risk of bans or phase-out.
- Extremely low climate impact (e.g., CO_2 = GWP 1).
- Stronger sustainability reporting – lower Scope 1 emissions.
- Access to green finance and a clearer sustainability profile.
- Higher installation cost and, in some cases, more advanced service requirements.

More expensive to install – but advantageous for both economics and sustainability over time.

Carbon dioxide (CO_2) – a circular refrigerant

CO_2 (R744) used in refrigeration is often a by-product from industry and biogas. Instead of being released into the atmosphere, it is used again – a circular solution.

- GWP = 1 → virtually no climate impact.
- Re-use increases resource efficiency.

In refrigeration systems, CO_2 is not about emissions – it's about recovery.

Three building blocks for energy efficiency

CHOOSE THE RIGHT REFRIGERANT

Use natural refrigerants where they create most value; otherwise, the medium that best meets safety, efficiency, and life-cycle cost requirements.

RECOVER ENERGY

Use waste heat to warm premises, domestic hot water, or processes and reduce purchased energy.

SECURE EFFICIENCY WITH SMART OPERATION AND SERVICE

Demand control, monitoring and maintenance safeguard performance over time.

CASE:

Energy efficiency in practice

/// Cooling and heating installations are never off-the-shelf products – every solution is unique and shaped by the customer's needs. Projects differ in scale and conditions, but they share one thing: they're built on the same principles. The right choice of refrigerant, effective energy recovery and smart operation, deliver lower costs and a smaller CO_2 footprint.

By learning from others' experience, it becomes clear how cooling and heating can be used more intelligently. Sometimes you pay for one and benefit from the other.

The following pages present examples from grocery/retail, logistics, property, industry, healthcare, research and data centres – with measurable results and new ways of thinking about energy efficiency.


KÖTT & CH

Grocery/Retail

Grocery stores have high demands on cooling and energy-efficient operation. Here we present examples of how stores have reduced both cost and climate impact through modern systems with natural refrigerants and heat recovery.

ICA Kvantum, Uddevalla – energy savings pay off

/// Dahlmans Kylteknik rebuilt the store's refrigeration system, replacing the old system with carbon dioxide as the refrigerant. The solution delivered a 45% energy saving and reduced climate impact by 784 tonnes CO_2e per year. The investment is expected to pay back within five to six years. A clear example of a measure that is both sustainable and profitable.

CUSTOMER
ICA Kvantum, Uddevalla.

SUPPLIER
Dahlmans Kylteknik, Uddevalla.

PROJECT TYPE
Reconstruction.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1), previously R404A (GWP 3922).

SUSTAINABILITY BENEFIT
Annual climate impact reduced by 784 tonnes CO_2e/year. Energy use reduced by 1 million kWh/year (–45%).

Frys & Kylservice helps Coop Nord save energy with natural refrigerants

/// Frys & Kylservice installed CO_2 units, control systems, cold rooms and cabinets, and comfort cooling. CO_2 as the refrigerant delivers steadier operation and temperature, effective heat recovery, and lower energy costs. In the first year, 116,000 kWh was recovered, cutting climate impact and yielding substantial savings.

CUSTOMER
Coop Nord, Vemdalen.

SUPPLIER
Frys & Kylservice, Östersund.

PROJECT TYPE
New build.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1), previously R449A (GWP 1396), R134a (GWP 1430), R404A (GWP 3922).

SUSTAINABILITY BENEFIT
116,000 kWh of recovered energy in the first year of operation. Significantly lower operating costs and climate impact.

City Gross saves energy and reduces climate impact

/// LL:s Kylteknik handled planning and Kronobergs Kylteknik the installation of a new CO_2-based refrigeration system. Four older liquid chillers were replaced, reducing emissions by 112 tonnes CO_2e per year and delivering a modern installation with significant energy savings.

CUSTOMER
City Gross, Växjö.

SUPPLIER
Kronobergs Kylteknik, Växjö & LLs-Kylteknik, Kristianstad.

PROJECT TYPE
Refurbishment.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1).

SUSTAINABILITY BENEFIT
Climate impact reduced by 112 tonnes CO_2e/year. More energy-efficient operation and lower energy costs.

ICA Maxi, Växjö — halved energy use with new plant

/// Over several years, Kronobergs Kylteknik has improved energy performance at ICA Maxi Växjö in two stages. In the latest stage, three ventilation units were replaced with a larger unit featuring heat recovery, complemented by two circulation units that optimize the distribution of cooling and heating. The CO_2 units were also upgraded with additional variable-speed compressors. Combined with stage one (CO_2 units with heat recovery), the

measures nearly halved annual energy use from about 4 million kWh to 2.2 million kWh and reduced climate impact by just over 1,000 tonnes CO_2e.

CUSTOMER
ICA Maxi, Växjö.

SUPPLIER
Kronoberg Kylteknik, Växjö.

PROJECT TYPE
Refurbishment of ventilation units.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1), previously R404A (GWP 3922), R407C (GWP 1774), R410A (GWP 2088).

SUSTAINABILITY BENEFIT
Climate impact reduced by 1,054 tonnes CO_2e/year. Energy use reduced by 600 MWh electricity and 200 MWh district heating per year.

SA-AL Køleteknik builds the Smart Store of the future together with Danfoss

/// SA-AL Køleteknik has developed and installed the Smart Store concept together with Danfoss. The concept is a new generation of grocery stores where cooling, heating, ventilation and lighting are integrated into a single system based on natural refrigerants and digital control. Smart Store is designed to be future-proof, entirely free from F-gases and ready to meet forthcoming climate and energy-efficiency requirements. By using carbon dioxide as the refrigerant and recovering waste heat, the store can cut its purchased energy by up to 50 percent.

CUSTOMER
Danfoss, Nordborg.

SUPPLIER
SA-AL Køleteknik, Sønderborg.

PROJECT TYPE
New build, development of the Smart Store concept.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1).

SUSTAINABILITY BENEFIT
Up to 50% lower energy consumption through digital control, heat recovery and natural refrigerants. The system is F-gas-free and future-proofed in line with EU climate targets.

Logistics and warehouse

Chilled and frozen storage require large areas with stable temperatures and reliable operation. With energy-efficient CO_2 installations and recovered energy, logistics facilities can combine sustainability with operational reliability and lower costs.

Catena reduces its climate footprint with a new refrigeration plant

/// NKI-KYL delivered a carbon-dioxide-based installation for Catena's new chilled and frozen goods terminal in Sundsvall. The warehouse comprises 2,700 m² of chilled space for inbound and outbound loading, plus 900 m² of frozen storage. Offices and staff facilities on the upper floor are also heated by the system. Recovered heat is used for both the building and the ventilation, and to keep the ground beneath the freezer rooms free of frost. The result is a reliable installation with a low climate impact.

CUSTOMER
Catena, Sundsvall.

SUPPLIER
NKI-KYL, Örnsköldsvik.

PROJECT TYPE
New build of cold and freezer storage.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1).

SUSTAINABILITY BENEFIT
Low CO_2 footprint with a natural refrigerant. Energy-efficient operation through heat recovery.

HAVI lowers energy use and climate impact

/// LL:s Kylteknik installed a carbon-dioxide system with Ultra Low Super Heat technology at HAVI's new logistics warehouse. The technology raises the evaporation temperature and reduces energy consumption by 15% compared with a conventional CO_2 installation; combined with ejectors, a further 5% saving is achieved. In addition, recovered CO_2 from biogas production is used, which lowers the climate impact even more.

The facility comprises frozen storage (1,700 m²), chilled storage (1,700 m²) and dry storage (2,800 m²), plus a cold loading dock kept

constantly at +2 °C. Two parallel refrigeration units were installed; each covers 70% of the demand but can run the entire system if required. The result is an energy-efficient and reliable solution that supports HAVI's target of a 40% lower CO_2 footprint by 2030.

CUSTOMER
HAVI, Malmö.

SUPPLIER
LL:s Kylteknik, Kristianstad.

PROJECT TYPE
New build of cold and freezer storage.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1) with Ultra Low Super Heat technology.

SUSTAINABILITY BENEFIT
Up to 20% lower energy consumption compared with traditional systems. Recovered heat for heating the building and protection of the freezer store's foundations against frost heave.

Ammonia provides climate-neutral cooling and heating for Greenfood –recovers 11 million kWh/year

/// SLS delivered an ammonia-based refrigeration system to Greenfood's new logistics centre in Helsingborg. The installation provides both cooling and heating with minimal climate impact. The total heat recovery amounts to 1,300 kW, corresponding to approximately 11 million kWh per year.
Of the capacity, 300 kW goes to domestic hot water (+60 °C), 800 kW to the heating system (+50 °C) and 200 kW to low-temperature functions (+23–30 °C) such as under-floor heating and floor heating. The result is an energy-efficient and climate-neutral solution for long-term operation.

CUSTOMER
Greenfood and Skanska, Helsingborg.

SUPPLIER
SLS.

PROJECT TYPE
New build of logistics centre.

REFRIGERANT
Ammonia (NH_3, GWP = 0).

SUSTAINABILITY BENEFIT
Climate-neutral refrigerant. Heat recovery of 11 million kWh/year.

Logicor reduces energy use by 350,000 kWh per year

/// Labkyl modernised Logicor's logistics property in Årsta with four DLE units (Delta Lift Energy) –a technology that combines carbon dioxide as the refrigerant with advanced control to recover energy and deliver heating, domestic hot water and cooling in a climate-neutral way.

Three of the units are used primarily during the summer months when the cooling demand is greatest, while the fourth handles the base load during the colder months of the year. 100% of the energy is recovered and returned to the building as heating and domestic hot water. The result

is an annual energy saving of approximately 350,000 kWh, which gives both lower costs and reduced climate impact.

CUSTOMER
Logicor, Årsta.

SUPPLIER
Labkyl.

PROJECT TYPE
Refurbishment of logistics property.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1) with DLE technology.

SUSTAINABILITY BENEFIT
Energy saving of 350,000 kWh/year through heat recovery.

Property and offices

Properties and office buildings account for a large share of society's energy use. With geothermal energy, heat pumps and smart energy recovery, climate impact is reduced while the properties' value and attractiveness increase.

Energy-efficient geo-energy installation in central Stockholm

/// Labkyl installed central Stockholm's largest geothermal energy installation for Vasakronan. The solution is based on four heat pumps developed by Labkyl's own DLE technology. The system uses carbon dioxide as refrigerant and advanced control to recover energy and deliver heating, cooling and domestic hot water with very high efficiency.

For Vasakronan, this provides a future-proof energy solution that reduces the need for purchased energy by 78% –equivalent to 8.6 million kWh per year –and reduces the CO_2 footprint by 400 tonnes CO_2-equivalents.

WHAT IS DLE (DELTA LIFT ENERGY)?

DLE is a technology developed by Labkyl, part of Nordic Climate Group. It combines carbon dioxide as refrigerant with advanced control to recover energy and deliver heating, domestic hot water and cooling in buildings. The system uses recovered carbon dioxide instead of synthetic alternatives, which makes it both energy-efficient and climate-neutral.

CLIMATE-FRIENDLY
Based on recovered CO_2 and entirely free from PFAS and synthetic refrigerants.

ENERGY-EFFICIENT
Recovers energy from the property and can cover the entire energy demand.

COST-SAVING
Can halve energy costs.

FUTURE-PROOF
Flexible system for residential, office, logistics, hotel and other properties.

CUSTOMER
Vasakronan.

SUPPLIER
Labkyl.

PROJECT TYPE
Refurbishment, ground-source heat pumps.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1).

SUSTAINABILITY BENEFIT
Reduced CO_2 footprint by 400 tonnes CO_2e/year. Reduced purchased energy by 78% (≈ 8.6 million kWh/year). Cost saving of 9–12 MSEK/year depending on energy prices.

Västerviks bostadsbolag switches to carbon dioxide and becomes more energy-efficien

/// Kyl-Bergman replaced older air-source heat pumps with HFC refrigerants in the Kaptensgården residential area, owned by Bostadsbolaget Västervik. The measure is part of the company's participation in the public-housing Climate Initiative, where the goal is fossil-free operation by 2030 and 30% lower energy consumption.

For Bostadsbolaget, the change means an annual energy saving of approximately 30,000 kWh, while now meeting its stated targets for both energy efficiency and sustainability.

CUSTOMER
Bostadsbolaget Västervik.

SUPPLIER
Kyl-Bergman, Västervik.

PROJECT TYPE
Refurbishment to a fossil-free and more energy-efficient system.

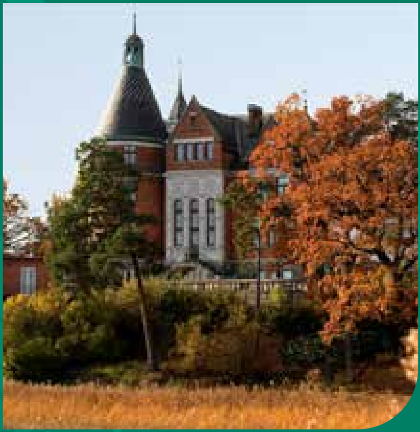
REFRIGERANT
Carbon dioxide (CO_2, GWP 1), previously R410A (GWP 2088).

SUSTAINABILITY BENEFIT
Energy saving of 30,000 kWh/year. Contributes to the goal of fossil-free operation by 2030 and 30% lower energy consumption.

Vår Gård saves 1.25 million SEK per year through fossil-free operation

/// Kyltjänst in Eskilstuna carried out an energy study and recommended a new system based on Labkyl's DLE technology (Delta Lift Energy). The technology makes it possible to recover the plant's own waste heat and use it for both heating and domestic hot water.

For Vår Gård, this meant that previous peak-load heating in the form of oil could be phased out entirely –a saving of approximately 70 cubic metres of oil per year, equivalent to 1.25 MSEK. The kitchen refrigeration was modernized at the same time, with a carbon-dioxide unit that supplies five cold rooms, one freezer room



and several display cabinets. The heat that would otherwise have been lost is returned to the property, making the installation entirely fossil-free.

CUSTOMER
Vår Gård, Saltsjöbaden.

SUPPLIER
Kyltjänst Eskilstuna, Labkyl, Kylmästarna.

PROJECT TYPE
Refurbishment to fossil-free heating and energy efficiency.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1).

SUSTAINABILITY BENEFIT
Reduced oil use by 70 m³/year (≈ 1.25 MSEK in costs). Reduced emissions by 185 tonnes CO_2-equivalents/year.

Climate-smart transition of cooling at Elite Stora Hotellet, Jönköping

/// BLM Kyl och Storkök replaced the hotel's outdated refrigeration and freezing installations with new systems based on carbon dioxide and propane. The new system consists of highly insulated cold and freezer rooms, variable-speed machines, low-energy fans and modern controls to minimize energy losses.

The result is an energy saving of around 67% and a reduction in emissions by 55 tonnes of CO_2-equivalents. The project shows how natural refrigerants can replace F-gases and create long-term sustainable solutions even in older properties.

CUSTOMER
Elite Stora Hotellet, Jönköping.

SUPPLIER
BLM Kyl och Storkök, Jönköping.

PROJECT TYPE
Refurbishment.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1) and propane (C_3H_8, GWP 3), previously R452A(GWP 2139), R404A (GWP 3922), R448A (GWP 1386).

SUSTAINABILITY BENEFIT
Emissions reduced by 55 tonnes CO_2-equivalents. Energy consumption reduced by around 67%.

Public properties

Schools, campuses and municipal properties often have large and varying energy needs. Through innovative solutions, operating costs can be reduced and sustainability targets achieved, to the benefit of both the operations and society.

The University of Borås saves 380,000 kWh per year with a heat pump between district heating and district cooling

/// Kyleffekt installed a heat pump using propane as the refrigerant between district heating and district cooling at the University of Borås. The aim was to reduce energy consumption in a way that was both efficient and environmentally friendly.

The solution enables Akademiska Hus to recover energy that would otherwise have been lost. The heat produced is used to heat 16,000 m², while the recovered cooling is used for a goods chiller and for process cooling for the university's server hall. The result is an annual energy saving of around 380,000 kWh.

CUSTOMER
Akademiska Hus, University of Borås.

SUPPLIER
Kyleffekt, Göteborg.

PROJECT TYPE
Addition of a heat pump.

REFRIGERANT
Propane (C_3H_8, GWP 3).

SUSTAINABILITY BENEFIT
Energy saving of 380,000 kWh/year

Eskilstuna: energy-efficient school kitchens with carbon dioxide and heat recovery

/// Kyltjänst in Eskilstuna modernized the refrigeration systems in three of the municipality's production kitchens. Each school kitchen received three new chillers with carbon dioxide as the refrigerant, serving chilling, freezing and blast-chilling.

Heat that would otherwise have been lost is recovered and used in the schools' heating systems and ventilation. The energy saving is substantial: Gökstensskolan saves 100,000 kWh/year, Rekarnegymnasiet 250,000 kWh/year and Fristadsskolan 100,000 kWh/year. In total, energy use is reduced by 450,000 kWh per year and the climate footprint by 340 tonnes of CO_2-equivalents.

CUSTOMER
Eskilstuna Kommunfastigheter (Kfast).

SUPPLIER
Kyltjänst in Eskilstuna.

PROJECT TYPE
Refurbishment of three school kitchens.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1), previously R404A (GWP 3922) and R452A (GWP 2139).

SUSTAINABILITY BENEFIT
Energy saving of 450,000 kWh/year.
Emissions reduced by 340 tonnes CO_2-equivalents/year.

Finnmark Hospital in Hammerfest cuts purchased energy using natural refrigerants and seawater

/// The new hospital in Hammerfest is heated and cooled using energy drawn from the sea, with ammonia and carbon dioxide as refrigerants. PTG Frionordica in Tromsø, in partnership with SLS in Norrköping, delivered a complete solution in which two large ammonia heat pumps and heat exchangers extract energy from seawater. The system supplies the 33,000 m² hospital with both heating and cooling and recovers waste heat internally for maximum efficiency. For the refrigeration and freezing plants, carbon dioxide is used as the refrigerant, delivering low climate impact and stable operation. The solution reduces total energy consumption by at least 40% and contributes to Helse Nord's goal of cutting CO_2 emissions by 40%. Helse Nord is the regional health enterprise that owns and operates hospital services in Northern Norway and has set clear climate targets for more sustainable operations.

CUSTOMER
Finnmarkssykehuset, Hammerfest.

SUPPLIER
PTG Frionordica, Tromsø, in partnership with SLS, Norrköping.

PROJECT TYPE
New build of hospital energy system.

REFRIGERANT
C Ammonia (NH_3, GWP 0) and carbon dioxide (CO_2, GWP 1).

SUSTAINABILITY BENEFIT
Around two-thirds of the hospital's energy demand is met by extracting energy from seawater (≈ 6-7 °C) with ammonia heat pumps. Energy consumption is reduced by at least 40%, significantly lowering the carbon footprint.

Foto: Ali Thulfiqar, Unsplash

Industry and process

Manufacturing industry and food production require cooling and heating that are directly integrated into production. Efficient solutions reduce climate impact, recover energy and secure operation in critical processes.

SAAB deep-freeze room: modern and reliable solution cuts nearly 400 tonnes CO_2e/year

/// GS-Kylservice and SLS replaced 23-year-old chillers with HFC refrigerants in SAAB's deep-freeze room. The solution was two carbon-dioxide machines mounted on the same frame, providing redundancy –if one stops, the other automatically takes over.

The new system delivers −43 °C in a 70 m² deep-freeze room and has been complemented with a new machinery room. The result is a modern and reliable solution that at the same time reduces the climate footprint by almost 400 tonnes of CO_2-equivalents per year.

CUSTOMER
SAAB, Linköping.

SUPPLIER
GS-Kylservice, Linköping, SLS.

PROJECT TYPE
Replacement of older installation.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1), previously R404A (GWP 3922).

SUSTAINABILITY BENEFIT
Emissions reduced by approximately 392 tonnes of CO_2-equivalents/year.

Orkla's factory in Kungshamn becomes environmentally friendly and energy-efficient

/// Dahlmans Kylteknik has, in two stages, modernized Orkla Foods' factory in Kungshamn. Old HFC units have been replaced by two carbon-dioxide-based installations that cover the factory's entire need for cooling and heating.

The system is based on Labkyl's DLE technology (Delta Lift Energy), which recovers heat from production and supplies both internal heating and hot water up to 80 °C.

After the first months of stage 1, 200,000 kWh had already been saved, and the full potential is estimated at around 6 million kWh per year. At the same time, emissions are reduced by around 300 tonnes of CO_2-equivalents.

CUSTOMER
Orkla Foods, Kungshamn.

SUPPLIER
Dahlmans Kylteknik, Uddevalla.

PROJECT TYPE
Refurbishment, stage 2 –towards a fossil-free production facility.

REFRIGERANT
Carbon dioxide (co_2, gwp 1).

SUSTAINABILITY BENEFIT
Emissions reduced by around 300 tonnes CO_2-equivalents/year. Heat recovery up to around 6 million kWh/year (stage 1 + 2).

Modern CO_2 technology delivers energy-efficient, climate-smart storage at Matti Tuomola Oy

/// Matti Tuomola Oy is a Finnish family-owned food producer that grows and supplies carrots and other vegetables to the retail trade. To meet rising demands for energy efficiency and sustainable food quality, the company chose to modernize climate control in its new storage facility. Kylmäkeskus Sami, a company within MV-Jäähdytys (Nordic Climate Group), installed a CO_2-based system that ensures precise temperature and humidity to maximize product shelf life and quality. The facility covers 330 m² of storage space (2,500 m³) and provides 120 kW of cooling capacity. Through heat recovery, surplus heat is used to warm the building, delivering significant energy savings and reducing the climate footprint compared with the previous HFC system.

CUSTOMER
Matti Tuomola Oy, Huittinen

SUPPLIER
Kylmäkeskus Sami (MV-Jäähdytys), Tampere

PROJECT TYPE
Refurbishment and modernization, switching from HFC to a CO_2-based climate system

REFRIGERANT
Carbon dioxide (CO_2, GWP 1), previously HFC

SUSTAINABILITY BENEFIT
Substantial emissions reduction by switching from HFC to a natural refrigerant. Energy-efficient operation with heat recovery, stable temperature control and extended product shelf life.

SinkabergHansen recovers energy equivalent to several hundred households per year

/// SinkabergHansen has built a new salmon processing facility on Marøya in Nærøysund, Trøndelag, with a floor area of approximately 17,000 m² and an annual capacity of 100,000 tonnes. PTG Frionordica, in partnership with Rørvik Kulde, delivered an integrated energy solution that combines cooling and heating with high efficiency.

The facility provides more than 3 MW of cooling capacity and a CO_2 heat pump that recovers heat from the refrigeration and freezing systems for both space heating and domestic hot water production – totalling approximately 90,000 litres per day up to 80 °C.

The recovered energy is used for cleaning, heating of offices and production areas, snow-melting and dehumidification. Laksefabirkken – the salmon plant, is the first of this size in Norway to use carbon dioxide as the refrigerant throughout the entire refrigeration system, except for an ammonia-based ice maker. The project is supported by Enova, the Norwegian state enterprise for energy and climate measures, and delivers lower energy use, reduced climate impact and improved operating economics.

CUSTOMER
SinkabergHansen, salmon processing facility, Marøya, Nærøysund.

SUPPLIER
PTG Frionordica, Tromsø.

PROJECT TYPE
New build of an energy plant for the salmon processing industry.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1) and ammonia (NH_3, GWP 0).

SUSTAINABILITY BENEFIT
Recovery of approximately 3 GWh of energy per year, equivalent to the energy needs of several hundred detached homes. All hot water (≈ 90,000 litres/day) is produced through recovery of waste heat.

Konepaja Litzen replaces oil with an energy-efficient heat-pump system

/// Konepaja Litzen Oy has replaced oil heating and an older HFC-based system with a modern heat-pump solution to cut energy use and climate impact. MV-Jäähdytys installed heat pumps tailored for industrial environments, with the system providing both heating and cooling for the production hall, warehouse and offices. The transition from oil to heat-pump technology delivers significant energy savings and reduces climate impact by eliminating oil use. The new system uses R32 as the refrigerant, which has a lower GWP than the previous HFC solution.

CUSTOMER
Konepaja Litzen Oy, Turku.

SUPPLIER
MV-Jäähdytys Oy, Turku.

PROJECT TYPE
Modernisation of heating and cooling systems in an industrial environment.

REFRIGERANT
R32 (GWP 675), previously oil heating and an air-source heat pump with R410A (GWP 2088).

SUSTAINABILITY BENEFIT
Elimination of oil use and a lower climate impact by switching to a heat-pump system with a lower-GWP refrigerant.

Huijbregts Koeltechniek drives the development of large-scale CO_2 technology for the food industry

/// Huijbregts Koeltechniek installed a CO_2-based refrigeration system for a new food production facility in Dronten (Flevoland), with continuous large-scale output of fresh meals. At the start of the project, CO_2 was not yet standard for larger industrial installations, but by choosing a natural refrigerant the client future-proofed operations and ensured energy-efficient, stable and sustainable performance. The project marked a breakthrough for CO_2 technology in food production and became the start of a long-term partnership with several subsequent facilities.

CUSTOMER
Dronten, Food producer, Flevoland.

SUPPLIER
Huijbregts Koeltechniek, Breda.

PROJECT TYPE
New refrigeration and climate-control system for food production.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1).

SUSTAINABILITY BENEFIT
Natural refrigerant with low climate impact. Energy-efficient operation and a future-proof solution free from F-gases.

Per i Viken becomes energy-efficient with carbon dioxide – towards self-sufficiency in heating and hot water

/// Termo Kyl installed a new carbon-dioxide unit that replaced several older systems at the Per i Viken charcuterie factory. The new solution supplies a large freezer room, six cold rooms, a climate room as well as smoking chambers and production areas.

Heat is recovered and used for heating and hot water, which makes the installation practically self-sufficient in heat. At the same time, energy demand has been reduced by at least 25% and climate impact has fallen through the phase-out of HFC/HFO-based refrigerants.

CUSTOMER
Per i Viken, Viken.

SUPPLIER
Termo Kyl, Helsingborg.

PROJECT TYPE
Replacement.

REFRIGERANT
Carbon dioxide (CO_2, GWP 1), previously R134a (GWP 1430), R448A (GWP 1386), R507 (GWP 3985), R404A (GWP 3922), R410A (GWP 2088).

SUSTAINABILITY BENEFIT
Reduced climate impact through the switch from HFC/HFO to carbon dioxide. Energy efficiency improved by at least 25% thanks to heat recovery.

Data centres

Data centres consume enormous amounts of energy for cooling. By recovering waste heat, surplus energy can be used to heat thousands of households. A win–win for both the climate and the energy system.

Major energy-saving project recovers 3 MW from a data centre

/// EK-Kyl delivered a complete solution for cooling and heat recovery at Interxion's data centre in Kista. The project was carried out as a turnkey contract and is an example of how data centres can become a resource in the energy system.

The recovered output of 3 MW corresponds to heat and hot water for around 2,500 households. In this way, energy-efficient operation is combined with a significant climate and societal benefit.

CUSTOMER
Interxion (Digital Realty), Kista.

SUPPLIER
EK-kyl, Eskilstuna.

PROJECT TYPE
Turnkey contract including design.

REFRIGERANT
R1234ze(E) (GWP 1,37).

SUSTAINABILITY BENEFIT
Heat recovery of 3 MW, corresponding to heat and hot water for about 2,500 households.

Ericsson's data centre heats 4,000 apartments through waste-heat recovery

/// Ericsson's data centre in Rosersberg is the world's largest installation for heat recovery from a data centre. Together with Stockholm Exergi, EK-Kyl has been responsible for rebuilding and adapting the plant so that around 5 MW of surplus heat can be recovered –enough to supply 4,000 apartments with heat and hot water. The project is an important proof of concept for Stockholm Exergi and Stockholm Data Parks, as no one had previously built a data centre of this scale with heat recovery.

A major technical challenge was to carry out the work in parallel with Ericsson's own expansion of

the data centre. Two phases were already in operation and were modified for heat recovery while a new phase was built – all without stopping operations. The next step is a further phase planned to increase full capacity with even more heat recovery.

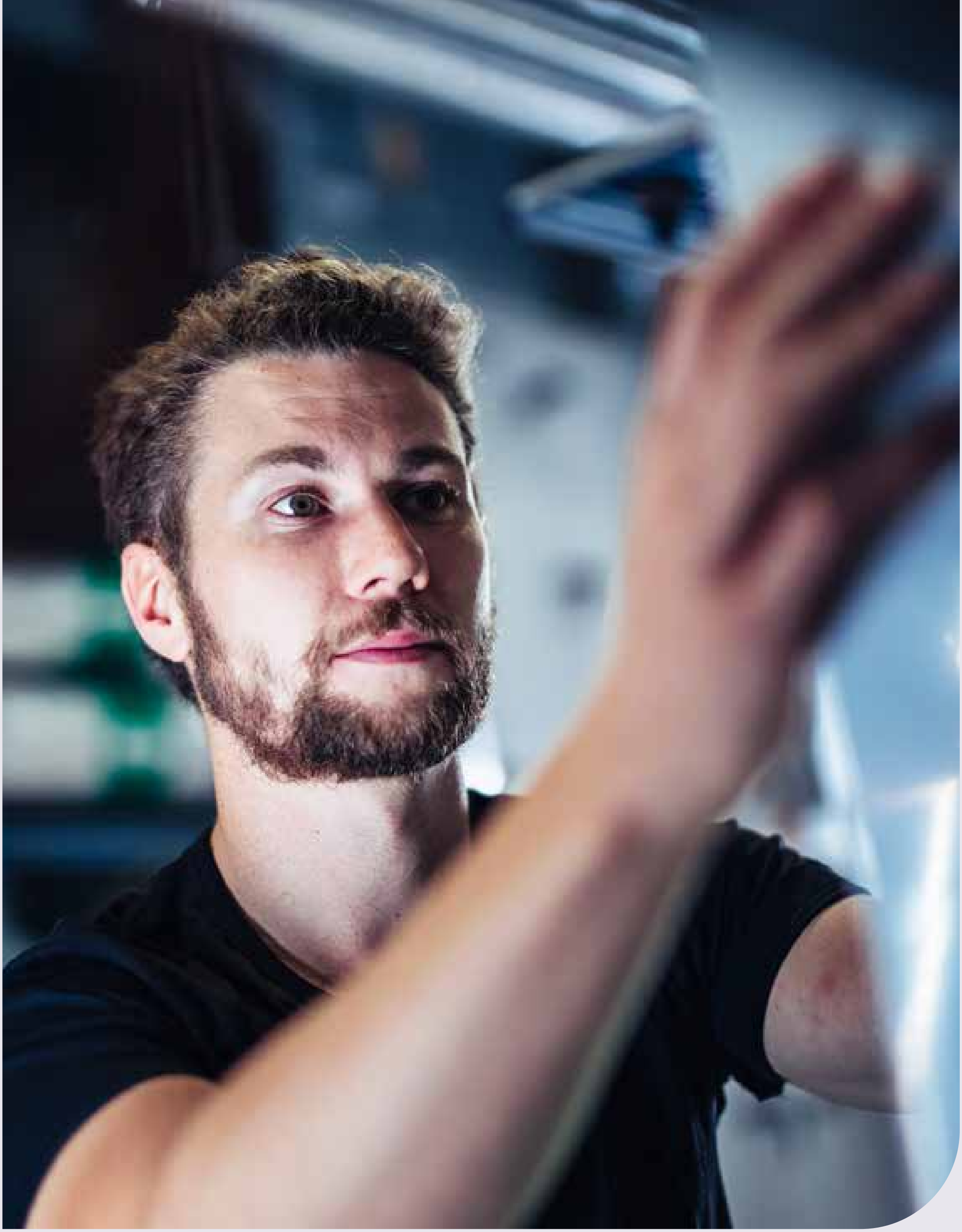
CUSTOMER
Stockholm Exergi (in collaboration with Ericsson).

SUPPLIER
EK-kyl, Eskilstuna.

PROJECT TYPE
Turnkey contract in several phases.

REFRIGERANT
R1234ze(E) (GWP 1,37).

SUSTAINABILITY BENEFIT
Heat recovery of approximately 5 MW, corresponding to heat and hot water for 4,000 apartments.



Facts and concepts

Our guidelines –For a better climate

Nordic Climate Group, together with its customers, drives the development towards sustainable solutions for cooling and heating. An installation is defined as sustainable when it delivers lower emissions, long service life, a high degree of energy recovery and low energy use. That is what we mean by For a better climate.
Here we explain the most common concepts and the regulatory frameworks behind energy efficiency.

Drivers of the transition

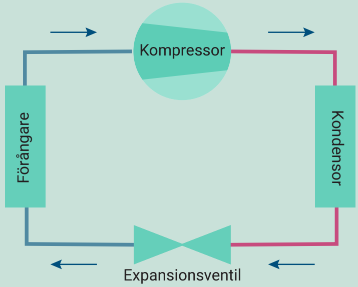
The development is driven by several factors:

- Political directives – the EU has tightened rules such as the F-gas Regulation, the Energy Efficiency Directive (EED) and the Energy Performance of Buildings Directive (EPBD).
- Customer requirements – property owners and companies demand solutions that reduce energy costs, meet legal requirements and enable heat recovery.
- Investors and the financial sector – sustainability reporting (CSRD) and the EU taxonomy steer capital towards green solutions and increase the pressure on energy-efficient properties.

HOW A REFRIGERATION SYSTEM WORKS

Refrigeration technology is based on thermodynamics – the movement of heat. A refrigeration machine does not create cold; it moves heat from one place to another. The refrigerant acts as the carrier of the heat.

In the past, the removed heat was often lost. Today, it can be recovered and used to heat premises or produce domestic hot water. In this way, cooling and heating are two sides of the same coin. If you have a need for cooling, you get heat in the bargain. Simple, economical and sustainable.



Simple schematic of the refrigeration cycle. The compressor, condenser, expansion valve and evaporator work together to move heat – this is how cooling is created and why heat can be recovered in the process.

Natural refrigerants – climate-smart and energy-efficient

Refrigerants are the gases that act as energy carriers in cooling and heating systems. Synthetic refrigerants have long been used: CFCs contributed to ozone depletion and F-gases to climate impact. They are still used in many existing – and some new – installations. With tighter regulations and growing sustainability requirements, a gradual transition to natural refrigerants is now under way –with very low or no climate impact (GWP 0–3) and no ozone depletion.

Phasing out F-gases and PFAS

The EU's F-gas Regulation means that the permitted volumes of F-gases will decrease sharply over the coming years. As early as 2027, availability is expected to be so limited that it will be both difficult and expensive to maintain plants based on these refrigerants.

At the same time, there is a phase-out of refrigerants in the HFO group (hydrofluoroolefins), which contain PFAS, often called 'forever chemicals'. PFAS do not break down in nature and can accumulate in humans, animals and plants. PFAS are therefore covered both by the F-gas Regulation and by the EU's chemicals legislation (REACH), which is currently being reviewed to further restrict their use.

Switching from a plant with F-gases to one with natural refrigerants significantly reduces climate impact and improves sustainability KPIs.

COMMON NATURAL REFRIGERANTS

CARBON DIOXIDE (CO_2, R744)
GWP = 1.
Non-toxic and non-flammable. Requires high pressures; dedicated systems are needed. Common in grocery stores, large refrigeration and freezing plants and heat pumps.

AMMONIA (NH_3, R717)
GWP = 0.
Highly energy-efficient, but toxic and somewhat flammable. Corrosive to certain metals (e.g., copper). Common in large industrial plants, the food industry, cold and freezer stores, ice rinks, breweries and large process-cooling systems.

HYDROCARBON (HC: PROPANE R290, ISOBUTANE R600A, PROPEN R1270)
GWP = 3.
Highly energy-efficient. Flammable – there are safety restrictions on quantity. Propane (R290): common in small and medium-sized refrigeration and freezing units and in heat pumps.

REFRIGERANT	GWP	TYPE	BAN/OUT-PHASING	STATUS
R32	675	HFC	Permitted with certain restrictions from 2027	Orange
R134a	1430	HFC	Ban in new equipment gradually 2027–2032	Red
R410A	2088	HFC blend	Ban in new equipment 2027–2029	Red
R404A	3922	HFC blend	Phasing out / prohibited in new equipment from 2026	Red
R407C	1774	HFC blend	Ban in new equipment 2027–2029	Red
R407F	1825	HFC blend	Phasing out successively	Red
R407A	2107	HFC blend	Phasing out successively	Red
R507A	3985	HFC blend	Phasing out / prohibited in new equipment from 2026	Red
R452A	2140	HFO/HFC-blend	Permitted with restrictions after 2030	Orange
R452B	698	HFO/HFC-blend	Restricted, phased out after 2030	Orange
R448A	1386	HFO/HFC-blend	Restricted, phased out after 2030	Red
R449A	1396	HFO/HFC-blend	Restricted, phased out after 2030	Red
R449B	1411	HFO/HFC-blend	Restricted, phased out after 2030	Red
R450A	601	HFO/HFC-blend	Permitted - GWP <750 *	White
R513A	630	HFO/HFC-blend	Permitted - GWP <750 *	White
R513B	594	HFO/HFC-blend	Permitted - GWP <750 *	White
R454A	237	HFO/HFC-blend	Permitted - GWP <750 *w	White
R454B	465	HFO/HFC-blend	Permitted - GWP <750 *	White
R454C	146	HFO/HFC-blend	Permitted - GWP <750 *	White
R455A	146	HFO/HFC-blend	Permitted - GWP <750 *	White
R471A	144	HFO/HFC-blend	Permitted - GWP <750 *	White
R1234yf	1	HFO	Permitted –GWP < 750, but PFAS discussion ongoing	Orange
R1234ze(E)	1	HFO	Permitted –GWP < 750, but PFAS discussion ongoing	Orange
HCFO-1233zd(E)	4	HCFO	Permitted - GWP <750	Green
Carbon dioxide R744 (CO_2)	1	Natural	Permitted, future-proof (not an F-gas)	Green
Ammonia R717 (NH_3)	1	Natural	Permitted, future-proof (not an F-gas)	Green
Propane (R290)	3,3	Natural	Permitted, future-proof (not an F-gas)	Green
Isobutane (R600a)	1	Natural	Permitted, future-proof (not an F-gas)	Green
Propylene (R1270)	1,8	Natural	Permitted, future-proof (not an F-gas)	Green

*No immediate risk, but future regulation cannot be ruled out.

Orange
Permitted but with limited / transitional choice

Red
Phasing out / prohibited

White
Permitted, low GWP. Used today without bans, but future regulation cannot be ruled out.

Green
Future-proof

Sustainability and business value

Sustainability is not only a climate issue; it affects the entire business:

- CSRD makes sustainability reporting as important as financial reporting.
- EU:s taxonomy defines which investments count as green and affects financing costs.
- Climate declarations in new construction affect property valuations.
- The right cooling and heating solution strengthens sustainability KPIs, attracts tenants, reduces vacancy risk and can increase the value of properties. At the same time, opportunities for green finance are created.

Energy efficiency now

Minimal energy consumption – maximum benefit. Energy efficiency is one of the largest untapped energy sources. Unlike new energy production, it can deliver results immediately.

- Heat recovery provides double benefit: cooling that also delivers heat.
- Service agreements and optimisation extend service life and secure efficient operation.
- Capacity charges make it particularly important to use energy at the right time.

With the right measures, both climate impact and energy costs can be reduced significantly; the savings often finance the investment.

The future

The energy transition is moving fast. By 2030–2035, many of the most important regulatory frameworks will tighten. At the same time, new opportunities are growing:

- Energy communities – properties and actors that share cooling and heating across networks, reducing costs and climate impact.
- Business models and financing – green loans, energy performance contracts and new financing solutions make it easier to invest in sustainable systems.
- New technology – smarter control, increased digitalisation and innovative solutions that utilise energy more efficiently.
- Natural refrigerants are gaining wider use across more applications.

Nordic Climate Group is at the forefront – and will continue to drive developments: For a better climate.

INDUSTRY	CUSTOMER	SUPPLIER
Grocery / Retail	ICA Kvantum, grocery store, Uddevalla	Dahlmans Kylteknik, Uddevalla
Grocery / Retail	Coop Nord, grocery store, Vemdalen	Frys & Kylservice, Östersund
Grocery / Retail	City Gross, grocery store, Växjö	Kronobergs Kylteknik, Växjö and LL:s Kylteknik, Kristianstad
Grocery / Retail	ICA Maxi, grocery store, Växjö	Kronobergs Kylteknik, Växjö
Grocery / Retail	Danfoss Smart Store, Nordborg	SA-AL Køleteknik, Sønderborg
Logistics / warehouse	Catena, chilled and frozen goods terminal, Sundsvall	NKI-Kyl, Örnsköldsvik
Logistics / warehouse	HAVI, logistics warehouse, Malmö	LL:s Kylteknik, Kristianstad
Logistics / warehouse	Greenfood, logistics centre, Helsingborg	SLS, Norrköping
Logistics / warehouse	Logicor, logistics property, Årsta	Labkyl, Stockholm
Property / offices	Geo-energy installation, Vasakronan	Labkyl, Stockholm
Property / offices	Bostadsbolaget Västervik, residential area, Västervik	Kyl-Bergman, Västervik
Property / offices	Vår Gård, conference facility, Saltsjöbaden	Kyltjänst in Eskilstuna, Labkyl and Kylmästarna in Stockholm
Property / offices	Elite Stora Hotellet, Jönköping	BLM Kyl & Storkök, Jönköping
Public properties	Akademiska Hus, University of Borås	Kyleffekt, Göteborg
Public properties	School kitchen, Eskilstuna kommun	Kyltjänst, Eskilstuna
Public properties	Finnmarkssykehuset, Hammerfest	PTG Frionordica, Tromsø and SLS, Norrköping
Industry / process	Saab, deep-freeze room, Linköping	GS-Kylservice Linköping and SLS, Norrköping
Industry / process	Orkla, food factory, Kungshamn	Dahlmans Kylteknik, Uddevalla
Industry / process	Matti Tuomola Oy, Huittinen	Kylmäkeskus Sami (MV-Jäähdytys), Tampere
Industry / process	SinkabergHansen, salmon processing facility, Marøya Nærøysund	PTG Frionordica, Tromsø
Industry / process	Konepaja Litzen, Åbo	MV-Jäähdytys, Åbo
Industry / process	Dronten, food producer, Flevoland	Huijbregts Koeltechniek, Breda
Industry / process	Per i Viken, charcuterie factory, Viken	Termo Kyl, Helsingborg
Data centres	Interxion, Kista	EK-Kyl, Eskilstuna
Data centres	Stockholm Exergi (in collaboration with Ericsson), Rosersberg	EK-Kyl, Eskilstuna

REFRIGERANT	SUSTAINABILITY BENEFIT
Carbon dioxide (previously: R404A)	Climate footprint: -784 tonnes CO_2e/year. Energy use: -1,000,000 kWh/year (−45%).
Carbon dioxide (previously: R449A, R134a, R404A)	Energy efficiency: 116,000 kWh recovered energy/year.
Carbon dioxide	Climate footprint: -112 tonnes CO_2e/year.
Carbon dioxide (previously: R404A, R407C, R410A)	Climate footprint: -1,054 tonnes CO_2e/year. Energy use: -800,000 kWh/year (of which 600,000 kWh electricity and 200,000 kWh district heating).
Carbon dioxide	Energy efficiency: up to 50% lower energy consumption through digital control, heat recovery and the use of natural refrigerants.
Carbon dioxide	Energy-efficient operation with heat recovery.
Carbon dioxide (Ultra Low Superheat technology)	Energy use: -20%/year.
Ammonia	Energy efficiency: 11 million kWh recovered energy/year.
Carbon dioxide (DLE technology)	Energy efficiency: 350,000 kWh recovered energy/year.
Carbon dioxide (DLE technology)	Climate footprint: -400 tonnes CO_2e/year. Energy efficiency: 8.6 million kWh recovered energy/year.
Carbon dioxide (previously: R410A)	Energy use: -30,000 kWh/year
Carbon dioxide	Climate footprint: -185 tonnes CO_2e/year. Oil use: -70 m^3/year.
Carbon dioxide and propane (previously: R452A, R404A, R448A)	Climate footprint: -55 tonnes CO_2e/year. Energy use: -67%/year
Propane	Energy efficiency: 380,000 kWh recovered energy/year
Carbon dioxide (previously: R404A, R452A)	Climate footprint: -340 tonnes CO_2e/year. Energy efficiency: 450,000 kWh recovered energy/year.
Carbon dioxide and Ammonia	Energy efficiency: at least 40%. Approx. two-thirds of the hospital's energy needs are met by energy extraction from seawater.
Carbon dioxide (previously R404A)	Climate footprint: -392 tonnes CO_2e/year.
Carbon dioxide	Climate footprint: -300 tons CO_2e/year Energy efficiency: approx. 6 million kWh of recycled energy/year.
Carbon dioxide (previously HFC)	Energy efficiency with natural refrigerant, greatly reduced climate impact.
Carbon dioxide and Ammonia	Energy efficiency: approx. 3 GWh of recovered energy/year through heat recovery, equivalent to the energy needs of several hundred private households.
R32 (previously oil and R410A)	Lower climate impact by switching from oil and high-GWP HFCs to heat pumps with lower GWP.
Carbon dioxide	Natural refrigerant with low climate impact that is energy efficient with future-proof operation.
Carbon dioxide (previously: R134a, R448A, R507, R404A, R410A)	Energy efficiency: -25% energy use due to heat recovery; lower climate footprint after the phase-out of HFC/HFO-based refrigerants.
R1234ze(E)	Energy efficiency: 3 MW through heat recovery/year, corresponding to heat and hot water for approx. 2,500 households
R1234ze(E)	Energy efficiency: 5 MW through heat recovery/year, corresponding to heat and hot water for approx. 4,000 households

Contact and next steps

Switching to energy-efficient solutions for cooling and heating is both a necessity and an opportunity. Through the examples collected in The Green Book we hope to have shown how companies and property owners can reduce costs, increase the value of their properties and at the same time contribute to climate targets.

Would you like to know more about how solutions with natural refrigerants, energy recovery and smart operation can be applied in your operations? Our companies will assist you from idea and design to installation and service.

Contact us

Visit: nordicclimategroup.com

Email: info@nordicclimategroup.com

Follow us on LinkedIn: Nordic Climate Group

Design: Pushing Buttons, pushingbuttons.se
Print: Åtta45, Stockholm 2025
Photo: Nordic Climate Group
unless otherwise stated.

For a better climate – together we are paving the way to a more energy-efficient future

The cases in this book demonstrate:

- 31.6 million kWh in annual energy savings — as much as 1,580 households consume in a year.
- 3,620 tonnes CO_2e — the same climate impact as 1,450 long-haul trips to Thailand.
- Enough energy to drive over 440 laps around the globe in an electric car.

And this is still only a fraction of everything we do.

Contact
Visit us: nordicclimategroup.com
E-mail: info@nordicclimategroup.com
Follow us at LinkedIn: Nordic Climate Group

NORDIC CLIMATE GROUP