A CASE FOR GEOTHERMAL HEATING AND COOLING:
Digging Deeper to Slash Energy Bills and Carbon Emissions

Executive summary

Every modern business is looking for the same thing: long-term return on every investment, especially the big ones. Whether it's upgrading a store, scaling operations, or reducing energy use, leaders are expected to future-proof infrastructure while keeping costs down. But as energy demands rise it has become more complex than ever.

Geothermal heating and cooling, while highly efficient, isn't always the first energy technology retailers turn to. But for one major UK food retailer, the reality proved very different.

In 2013, the retailer upgraded two of its supermarket locations—one in Edinburgh, Scotland, and one in Surrey, England—and made an unconventional choice: instead of traditional HVAC systems, they opted for a new kind of geothermal energy solution from Erda Energy.

Choosing a geothermal heating and cooling system is a strategy for boosting ROI and cutting waste.

What happened next is a story of savings and smart design thinking. Ten years on, both stores are delivering impressive business and environmental outcomes, including:

- **Total cost savings:** over $5M USD over 10 years
- **Energy use reduction:** up to 63%
- **Carbon emissions reduction:** up to 72%

These two very different projects proved one powerful idea that applies to any business with high energy demands: choosing a geothermal heating and cooling system isn't just an investment in sustainability—it's a strategy for boosting ROI and cutting waste.

Groundbreaking lessons from the grocery sector

Not all buildings face the same energy demands. Factors like external climate, internal energy loads, and site layout all drive that demand.

With constant year-round refrigeration and heating demands, open-door traffic, and extended operating hours, supermarkets are HVAC-intensive environments—making them an ideal proving ground for energy innovation.

Case in point: As one of the largest supermarket chains in the UK prepared for a major storm upgrade and expansion program, it faced opposite HVAC challenges. Its Edinburgh stores needed heating help, and its Surrey stores were looking for cooling solutions. What did they have in common? Both needed to remain fully operational throughout construction—and in Edinburgh, a particularly tight site footprint posed added complexity. They also shared the company's bold goal: achieve net-zero emissions across operations by 2035.

The case for geothermal heating and cooling

The retailer turned to geothermal heating and cooling for one key reason: To make better use of energy already moving through the building. Geothermal heating and cooling has long held promise as a low-carbon way to regulate building temperature by storing excess heat underground and retrieving it when needed. The concept is proven, but until recently, it has mainly been deployed in residential developments, and without critical innovations that maximize efficiency and savings.

That's where Erda Energy came in. With Erda | deep technology and smart t thermal controls, Erda made it possible to deploy geothermal heating and cooling technology at scale—even in space-constrained, operational supermarkets. Their system not only minimized disruption during installation, but also integrated with the store's existing CO_2 refrigeration equipment to capture and reuse waste heat—treating the ground like a rechargeable thermal battery.

With space-saving directional boreholes and smart thermal controls, Erda's proprietary system overcame the usual challenges of space and operating time, making it possible to retrofit geothermal heating and cooling into live supermarket sites.

By designing the system to balance heating and cooling throughout the year, Erda helped ensure the solution wasn't just green—it was cost-effective.

Discovering a solution: Why geothermal heating and cooling is more accessible than you think

For many commercial operators, geothermal heating and cooling sounds like a great idea—in theory. But myths about cost, complexity, and feasibility often stand in the way.

This project challenged those assumptions head-on:

"Geothermal is only for new buildings."

Both stores were retrofit installations, completed while the supermarkets remained open to customers.

"It requires too much space."

One of the sets of boreholes—at the Surrey store—were drilled in the parking lot and beneath parts of the buildings themselves, making it viable even in dense, urban plots.

"It's too expensive to justify."

Thanks to performance leasing and incentives, both systems delivered net savings from year one and achieved gross payback in under four years.

"It won't work for high-demand environments like supermarkets."

The opposite proved true. Supermarkets—with their high, year-round heating and cooling loads—are actually ideal candidates. The system even harnesses waste heat from the refrigeration process.

PLANNING THE PROJECT:

From concept to construction

Every geothermal heating and cooling installation begins with a detailed energy assessment. For these sites, that meant analyzing a mix of metered data, building models, and sector benchmarks to understand year-round HVAC demands. The Edinburgh site, for example, showed a heating-dominant energy load; Surrey leaned toward cooling. Both had substantial domestic hot water needs.

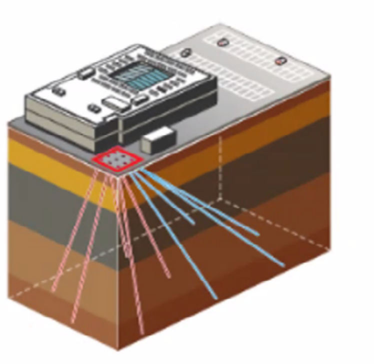
Armed with this data, Erda used its Erda | sim modelling tool to model thermal loads and design a custom layout. Each site required 12 directional Erda | deep boreholes drilled to 705 feet—fewer than typically expected for systems of this scale, thanks to Erda's optimized design. Pipework, controls, and pre-fabricated plantrooms were customized to match store layouts and operating patterns.

How Erda Removes the Upfront Barrier

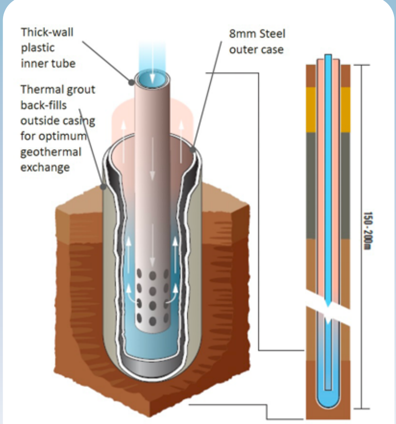
Flexibility in financing—including lease, Energy-as-a-Service, or Capex models—can make geothermal not only viable but immediately beneficial.

Importantly, **the retailer didn't pay up front**. Instead, they selected a 25-year performance lease. Erda financed, built, and now maintains the system—earning returns through a **shared-savings model**. For readers exploring geothermal heating and cooling, this illustrates a key insight: Choosing the right provider can make or break project success. A tailored financial arrangement can align with business goals and unlock access to advanced infrastructure.

Erda's minimal borehole footprint in the supermarket parking lot.



Geo-exchange inclined drilling



Erda | deep typical depth : 150m – 250m

INSTALLATION:

Delivering without disruption

Installing geothermal in a busy supermarket is no small feat. In this case, tight construction windows, live retail traffic, and limited service yard space made logistics critical. Here's how it was done:

- A 500m² (1,640ft²) area was cordoned off, with borehole drilling confined to just 150m² (492ft²).
- Boreholes were angled beneath buildings to maximize space.
- A 45-tonne (49 ton) drill rig completed work in 12 weeks, while a 12m x 4m (39ft x 13ft) energy plantroom was fabricated offsite and delivered by crane.
- Coordination with store delivery teams ensured business continued uninterrupted.

The result? Both systems went live on time and on budget.

PERFORMANCE & RESULTS:

Clear savings through flexible financing

Cost savings: Performance that pays back

From day one, the systems delivered real operating cost reductions in Edinburgh and Surrey. Key drivers include reduced electricity usage, elimination of gas heating, and lower maintenance costs due to fewer mechanical systems.

Tracking performance with intelligence

Delivering a high-performance geothermal heating and cooling system is only part of the equation. Maintaining and optimizing performance over time requires continuous monitoring, adaptive controls, and the ability to respond to changing building demands.

From the start, Erda equipped both supermarket sites with its cloud-connected Erda | smart monitoring and controls system. This digital backbone tracks 200+ system variables in real time and adjusts operation or control automatically based on store operations, weather conditions, and seasonal load patterns.

This proactive monitoring enabled Erda and the retailer to optimize performance year after year, far beyond static ROI estimates.

Carbon emissions: Clearing up year by year

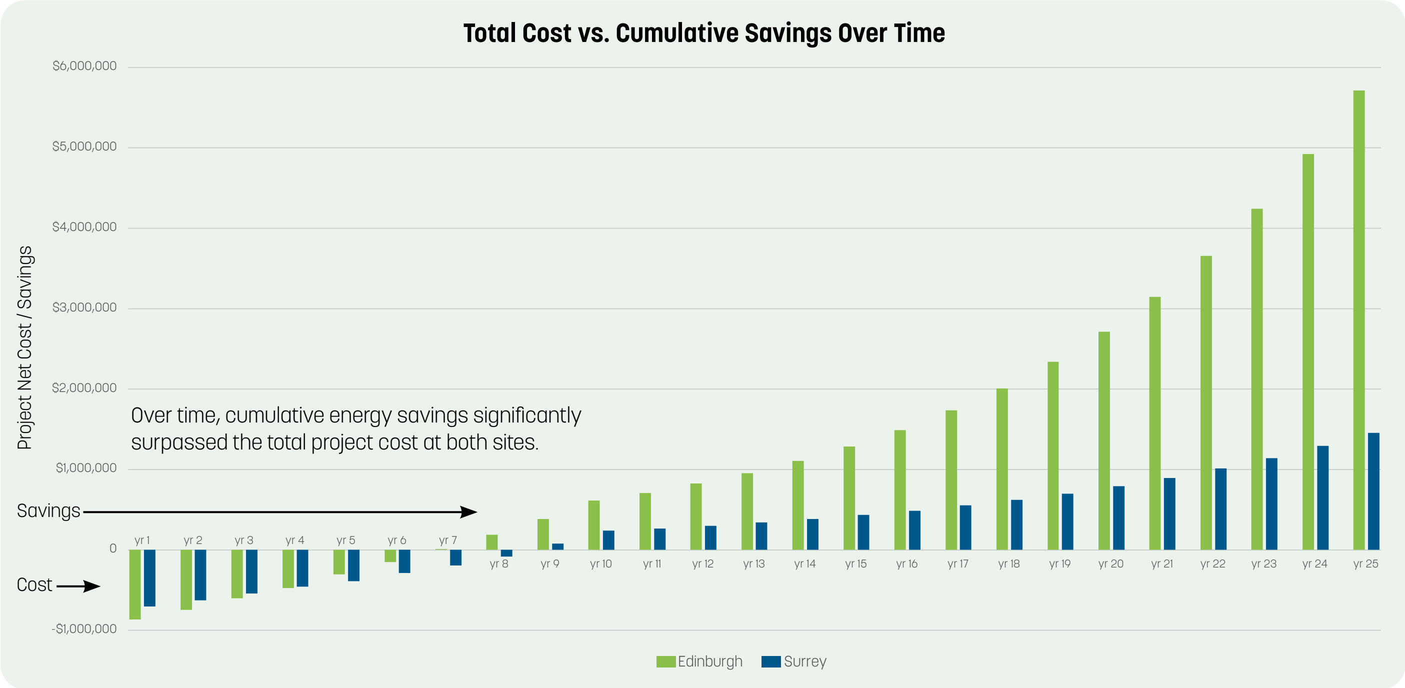
Because the Erda system is powered by electricity it delivers even greater carbon savings. By switching from gas heating to electrified heat pumps and lowering electricity demand for cooling, the supermarket achieved steep CO_2 reductions that improved annually.

Energy use: Sustained reductions over time

Thanks to Erda's reliable uptime rate of greater than 99%, ten years after installation, both sites have consistently delivered major energy savings—based on store demand, weather conditions, and seasonal changes. Even with expanded retail space and added refrigeration loads, the sites are using dramatically less energy overall.

63%
Carbon Reductions at the Edinburgh site

53%
Carbon Reductions at the Surrey site

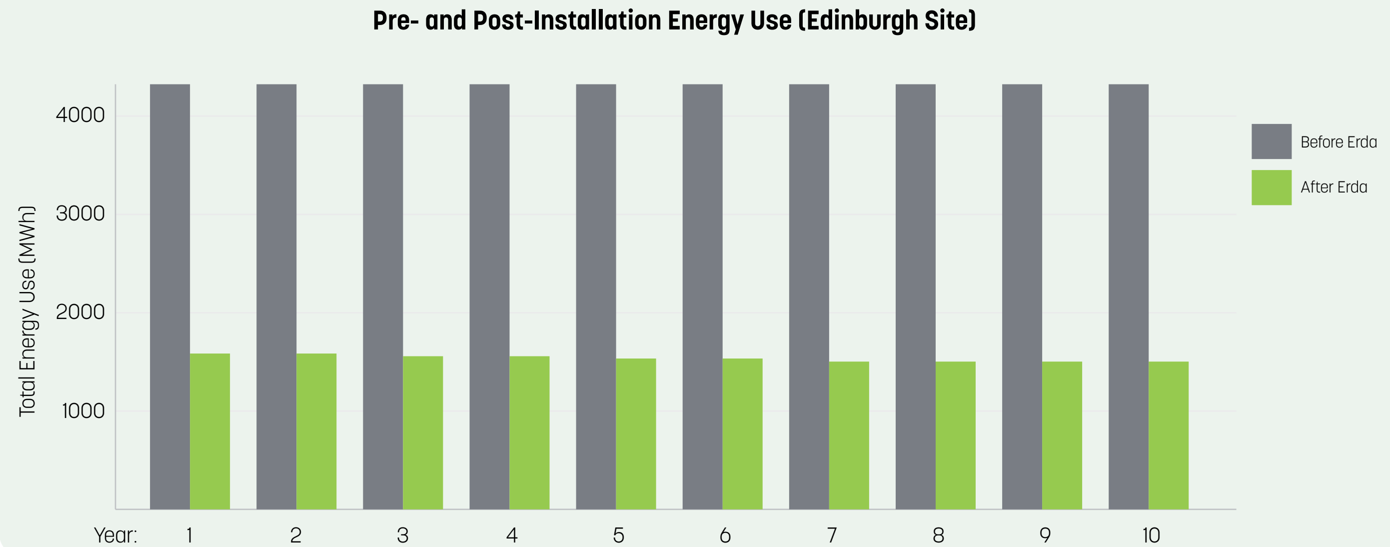


PERFORMANCE & RESULTS:

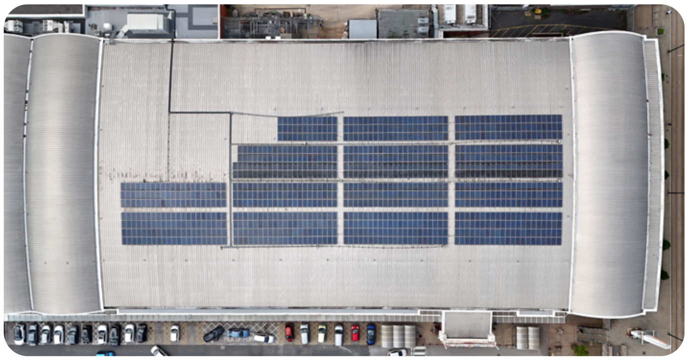
A decade of data-backed impact

Location	Baseline Carbon (kg CO_2)	Year 5 Carbon	% Carbon Reductions
Edinburgh	1,355,907 kg	375,377 kg	72%
Surrey	1,082,161 kg	367,270 kg	66%

Unlike conventional HVAC systems that degrade or become obsolete, geothermal heating and cooling systems can actually improve their environmental performance.



Location	Pre-Erda Energy Use (Gas + Elec)	Post-Erda Energy Use	% Carbon Reductions
Edinburgh Site	4.31M kWh	1.58M kWh	63%
Surrey Site	3.15M kWh	1.49M kWh	53%



TAKING ACTION:

Your path to a more resilient future

If you're looking to turn one of your biggest operating expenses into a strategic advantage, it's time to look underground.

Here's how to get started:

1. Choose the right partner

Not all geothermal heating and cooling systems—or providers—are created equal. In the US today, only Erda Energy can offer all of the following:

- Proven commercial installations
- Vertically integrated design-build-monitor expertise
- Flexibility in financing (lease, Energy-as-a-Service, or capex models)
- A commitment to long-term performance, not just one-time installs

2. Understand your savings potential

Every location is different. A feasibility study—like the ones Erda Energy provides—can assess your thermal energy profile, available space, and retrofit options, often revealing more opportunity than expected.

3. Frame the business case internally

Bring energy, operations, finance, and ESG teams together. A geothermal heating and cooling project can advance goals across all four, with the potential for payback faster than you might think.

About Erda Energy

Erda Energy delivers turnkey geothermal heating and cooling systems that eliminate wasted energy and convert it into long-term value. With patented borehole designs, advanced controls, and a proven commercial track record, we make geothermal heating and cooling work where others can't—and we do it without disruption.

Ready to dig deeper? Click here.