How manufacturers can decarbonise heat

Technology mini guide three of three:

Renewable thermal

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Understand your options for decarbonisation technology

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“For industrial organisations, implementing decarbonisation technology is almost always the largest step to decarbonisation. It typically accounts for 50-70% of site emissions.

For most industries, there are an overwhelming number of solutions, possibilities and combinations to choose from on the path to decarbonisation.

Knowing what the options are is the first step and so we have created these mini guides to help you become more familiar with the potential solutions.”

Thanos Patsos, Associate Director, Head of Deliver for Zero, Corporates

Options overview

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In this guide we compare several key renewable thermal technologies and outline the key considerations, benefits and risks. Browse the other guides in this series to find out more about electrification of heat and low carbon fuels.

Electrification of heat

- Heat pumps
- Electric boilers

Low carbon fuels

- Hydrogen
- Biogas
- Biomass

Renewable thermal

- Deep geothermal
- Solar thermal

Deep geothermal energy

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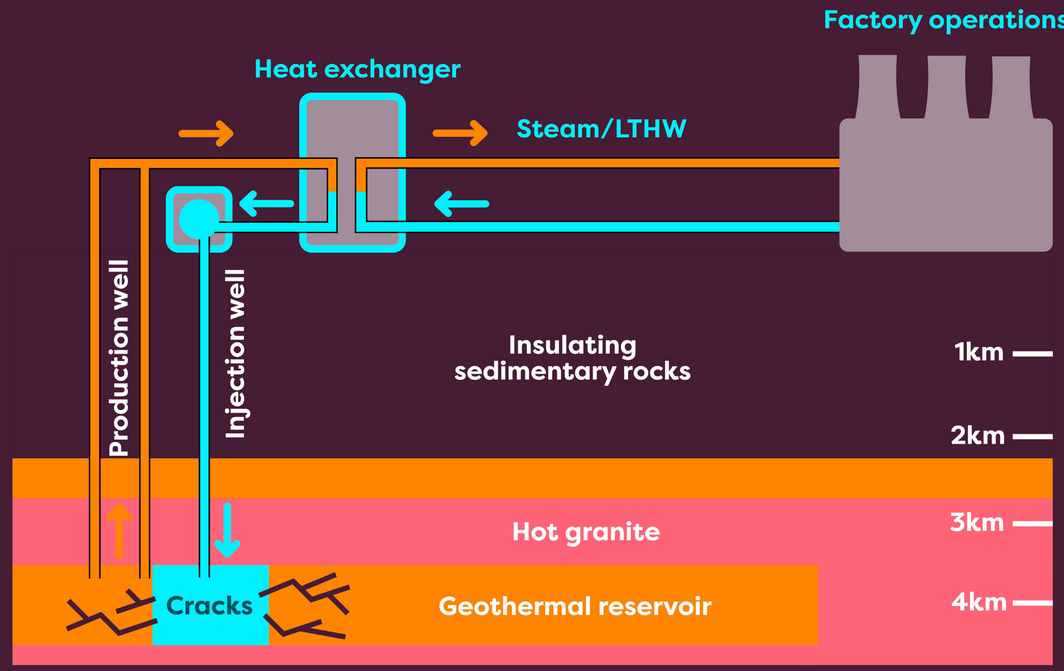
Geothermal energy is heat extracted from the earth. It has been used for thousands of years, e.g. in hot springs, and more recently has moved into industrial-scale projects for heating and electricity generation.



Deep geothermal heat is drilling wells of ~ 2,000–5,000m in depth into dry or wet rocks. Dry rock heat corresponds to areas of granite where water is injected into the first well, obtaining heat and being withdrawn through the production well (illustrated below). In wet rock conditions, the hot water (already present) is extracted, the heat is removed and the water is reinjected to heat up again. Deep geothermal heat can be obtained in a wide range of temperatures, from 20°C up to steam, but the grade of heat obtained is dependent on your location.

Technology maturity	Use of geothermal energy is very mature. Deep geothermal heat extraction is becoming more common.
Potential net zero carbon impact	Geothermal energy is a zero-carbon heat source.
Fuel availability	Geothermal heat is very abundant, but the grade of temperature varies.
Capex	High capital costs and risk, as confirmation of temperature is only possible through drilling the well.
Opex	Heat is free once the wells are drilled. Stable long term heat source, can last 100+ years.

Solar thermal panels

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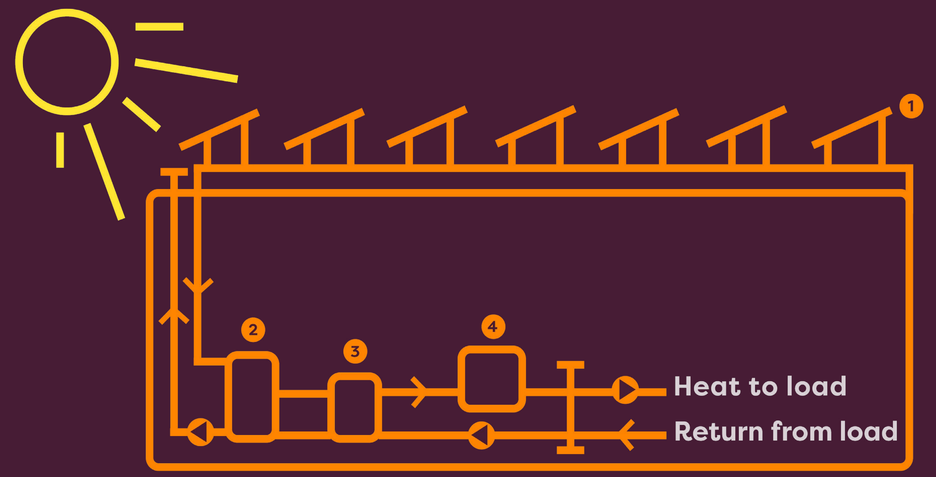
In solar thermal panels, fluid is circulated through solar collectors. Solar collectors can be flat plates or types of evacuated tube. Evacuated tube collectors offer higher efficiency and operating temperatures at higher cost.

The heat from these panels is generally used for domestic hot water production but can also be used in combination with other heat sources e.g. heat injection to boiler circuits.

Higher annual yields can be achieved at lower operating temperatures. The temperature output range is typically between 40°C and 70°C.



1. Solar collectors
2. Buffer vessel
3. Heat exchanger
4. Heat source e.g. boiler

Technology maturity	Mature technology. Adoption varies by country.
Potential net zero carbon impact	Carbon-free heat but availability limited by solar.
Fuel availability	Location and season dependent.
Capex	Good return but cannot replace existing plant.
Opex	Zero fuel costs.

Solar thermal concentrator

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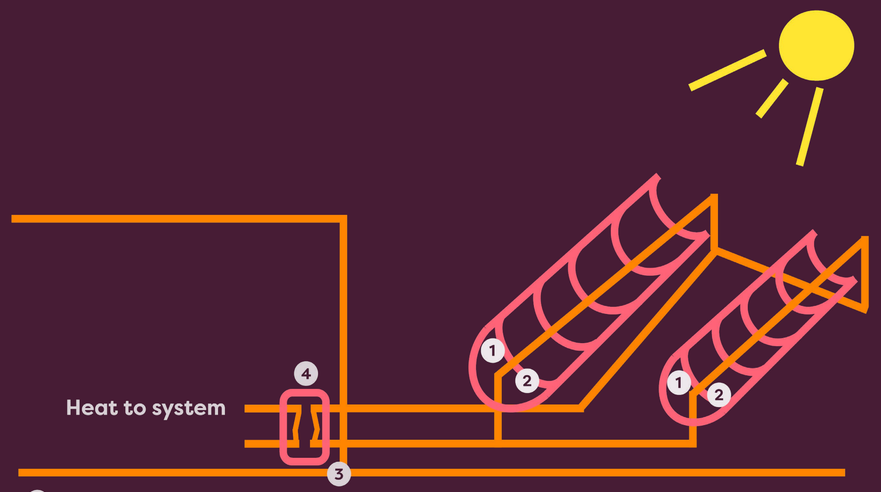
Large-scale solar thermal concentrators used to focus light onto towers are not the topic of this guide. Here we concentrate on the most common form of solar concentrator in industrial heating applications.



1. Parabolic trough mirrors
2. Receiver pipes
3. Thermal oil circulation
4. Heat exchanger to heat distribution network

Parabolic trough reflectors reflect sunlight into a receiver pipe at the focus of the mirror. Thermal oil in the receiver pipe is heated. Temperatures in excess of 300°C are possible, but temperatures up to 200°C are more typical for thermal applications. The thermal oil transfers heat to the heating system for steam, MTHW or thermal oil heat distribution. Applications are limited to sunny climates.

Technology maturity	Technology is in use but not widespread. Limited suppliers.
Potential net zero carbon impact	Carbon-free heat but availability limited by solar.
Fuel availability	Location and season dependent.
Capex	High installation costs. Alternative heat sources still required when solar energy is not available.
Opex	Zero fuel costs.

Renewable thermal comparison

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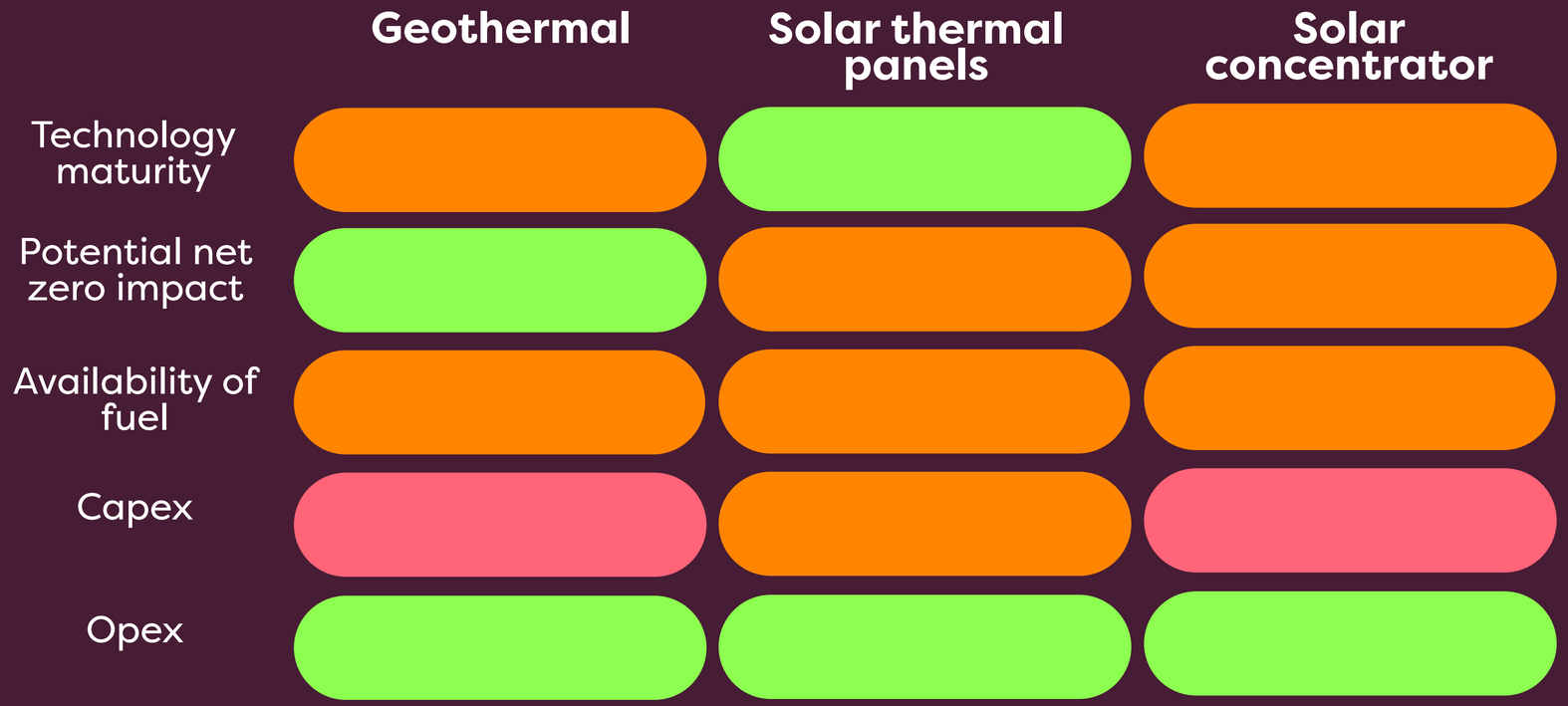

Expert overview

“Solar thermal and geothermal heat sources are becoming more widespread as part of a mix of heat sources to decarbonise heat production in industry. As with the application of heat pumps, it is essential to understand the temperature profile of the heat using processes. In sunny climates parabolic trough type collectors can deliver high grade heat in excess of 200°C but temperatures around 50°C are more common for plate type solar systems.

Where the underlying geology is favourable, geothermal heat is a potential source of carbon free heat with low operating costs. Temperatures will also vary widely from location to location. Engaging with specialist contractors is essential to understand the potential at your site.”

Matt Dickinson, Principal Consultant,
Deliver for Zero, Corporates

How we can help

Take a look at the other mini guides in this series:

Electrification of heat mini guide

Low carbon fuels mini guide

Low-Carbon Heat Investment Blueprint

This cost-effective service will provide you with:

- A tailored and evidence-backed assessment of viable heat decarbonisation solutions.
- Investment cost range, carbon and cost savings from each solution.
- A clear direction on progressing to a concept solution design or business case.

Browse the service document to find out more