



Q: What is a shared ambient loop network?

A shared ambient loop network is formed by a series of connected boreholes distributing water at ground temperature to individual ground source heat pumps in a cluster of homes.

A typical ambient loop network could serve between 5 – 15 houses and may include between 3 and 12 boreholes. The pipework within the ambient loop is formed by robust plastic pipe, buried in the ground. The ambient loop has no moving parts other than the pumps required to pump the water around the system.

With no moving parts, the ambient loops will have an operating life of 60+ years, which can help with funding the project.

Q: What is a heat pump?

A heat pump works like a fridge or freezer in reverse, by transferring heat from one location to another and concentrating that heat. Like a domestic fridge or freezer, heat pumps can still extract heat from a zone or heat source when the temperature is well below freezing.

Heat pumps can collect heat from the air (an air source heat pump), from the ground (a ground source heat pump), or from a pond or river (water source heat pump).

In this case the ground source heat pump will take heat from the shared ambient loop at ground temperature, and will concentrate this heat, increasing the temperature to the level required within the dwelling.

Whilst heat pumps can work when the outside temperature is below freezing, they are more efficient if the outside temperature is warmer, because they don't have to work as hard.

A ground source heat pump has a typical working life of approximately 20-years and needs less maintenance than a gas or oil boiler.

The technology is well developed and widely used both in the UK and abroad.

Q: How efficient are heat pumps?

Because a heat pump is transferring and concentrating heat from an outside source to the dwelling and is not directly heating water like a kettle or boiler, the heat pump is very efficient. Typically, modern heat pumps can deliver 2.5 – 3.5 units (or kWh's) of heat for the home from every unit (or kWh) of electricity used to power the heat pump. Another way of looking at this is that the heat pump is operating at between 250% and 350% efficiency.

By comparison, oil or gas boilers typically operate at between 85% and 90% efficiency, as not all the energy from the gas can be captured by the gas boiler.



Q: What are the advantages of a shared ambient loop over an air source heat pump

Shared ambient loop systems offer a number of advantages over air source heat pumps. As heat pumps are more efficient when the external heat source is warmer (because the heat pump doesn't have to work as hard to get the same amount of energy), the shared ambient loop will allow the heat pumps to operate more efficiently on the coldest days, when a heating system needs the most energy, because the ground temperature will be warmer than the air temperature on those coldest days.

Because ground source heat pumps get their energy from water as opposed to the air, the heat pumps themselves are typically smaller and quieter than air source heat pumps. It is also easier to fully enclose them to further reduce noise levels if needs be. This isn't possible for air source heat pumps as they need unrestricted access to the surrounding air.

It is also possible to combine shared ambient loops with solar thermal panels to improve the system efficiency. Where possible and practical to do so, the shared ambient loop can be connected to, and supported by, on-site generation from solar thermal panels and or solar PV panels. The two technologies have been shown to work very well together. For example, the shared ambient loop enables the system to capture and benefit from all the available solar thermal energy over the summer by using all the available energy to recharge the ground temperature and increase the average temperature of the of the rock surrounding the shared ambient loop over the whole year.

Increasing the average ground temperature over the year will increase the efficiency of the heat pump and reduce annual operating costs for heating as well as hot water because the heat pump doesn't have to work as hard to heat properties.

Q: What are the advantages of a shared ambient loop over traditional district heating systems?

Shared ambient loop systems offer a number of advantages over traditional district heating systems, including:

Lower costs

By sharing boreholes in a local area immediately around the cluster of homes, localised ambient loop systems typically cost less to build than traditional district heating schemes which require a central energy centre and an extensive network of insulated pipework. Reducing the temperature of the heat network to ground temperature also helps to reduce the energy loss from the system, helping to reduce operating costs.

Less disruption for the community

As the shared ambient loop only requires small, clustered networks as opposed to a village-wide heat network, the level of disruption to the local community is reduced.

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Lower development risks

As each shared ambient loop is very localised, with the heat pumps themselves being installed in the garden or house for each dwelling connected, there is no need for a new central energy centre. This removes the need to find and secure a suitable plot of land near the village for the energy centre and the planning risks associated with developing an energy centre.

Enhanced efficiency through integration with on-site renewable generation

As described in the advantages of shared ambient loop section above.

Q: Do heat pumps work in older buildings that aren't insulated as well?

Heat pumps work most efficiently by distributing heat at a lower temperature than a traditional gas or oil-fired boiler system, which means that the heat pump based systems typically work best in more modern properties that are well insulated and potentially have underfloor heating.

However, heat pumps can work in older buildings but those buildings will need new radiators that can work effectively at lower temperatures. These radiators can either be oversized standard double panel convector radiators, or special low temperature radiators that may also have forced air convection. With low temperature radiators, heat pumps can effectively heat many older buildings.

Part of the work being completed by Prospus Group will be to undertake energy surveys on 20 properties in Chipping to get a better sense what the practical issues are for the houses of Chipping to convert to a heat pump based heating system. If you are interested in having an energy survey, please register interest and complete the energy survey by [clicking here](#).

Q: Why does a shared ambient loop system need boreholes, and what do the boreholes do?

To ensure that there is a sufficiently large volume of ground mass to extract heat from in a built-up area it is necessary to use boreholes to access heat within the rock below the surface. The Chipping project is looking at a closed loop system where boreholes will be drilled to depths of up to 200m and have a pipe loop inserted all the way to the bottom and back up again. Once the pipework is installed in the borehole, the gap between the pipe and the rock is then filled and sealed with a special inert material along the whole length to protect the pipe, to stop water flowing up or down through the borehole, and to maximise the efficiency of the heat transfer between the pipe and the surrounding rock.

As the heat pump extracts heat from the water in the shared ambient loop, it cools the water in the pipework down to below the temperature of the ground. As that water then flows through the shared ambient loop, it is warmed by the surrounding rock, back up to ground temperature, before it goes back to the heat pump.



Q: What will be the cost of joining and buying heat from the ambient loop?

The survey work being undertaken by the team will look at developing a conceptual design for the system, a high-level cost for the system, the business case for the system, and how best to finance and operate the system. These will all have impacts on the cost of energy and so it is not yet possible to say what the annual energy costs will be for the new system.

The advantage of a community controlled and developed ground ambient loop based heat pump system is that the project will focus on reducing the carbon and energy costs associated with the system for the benefit of the community.

Whilst it remains challenging to reduce energy costs, evidence from other projects shows that by developing community-based systems, by using on-site renewable energy generation where possible, and by getting support from local stakeholders and the UK Government, that it is possible to reduce the cost and carbon content of energy for homeowners.

Q: How do heat pumps reduce air pollution and carbon dioxide emissions?

Gas, oil, and LPG boilers all generate exhaust gases when they operate, which in turn generates carbon dioxide and other forms of air pollution. Heat pumps use electricity and do not produce any emissions in the house. Because heat pumps typically generate between 2.5 and 3.5 units of heat for every unit of electricity they also reduce the carbon dioxide emissions.

The level of carbon dioxide savings is forecast to continue to increase as the UK electrical grid continues to use more renewable and low carbon energy.

Q: What is an Energy Performance certificate (EPC)?

EPCs provide an assessment of a building's energy efficiency on a coloured scale of A (green: most efficient with lowest running costs) to G (red: least efficient and highest running costs).

Its main focus is on the potential costs and savings that could be made by a consumer making some or all of recommended improvements to their property's energy efficiency suggested in the EPC, which could considerably reduce their fuel bills. The average energy efficiency rating for a dwelling in England and Wales is band D.

A central register of EPCs for all properties is maintained and, once assessed, an EPC lasts for 10 years. All dwellings are required to have an EPC when they are sold and rented dwellings need to be in band E or above, although there are plans by Government to raise that threshold in the future.