The Zeroth Energy System

Benefitting from a low temperature network

Glen Dimplex
HEATING & VENTILATION

Residential Apartments: A need for a *new design*

Over recent years our city landscapes have changed as high rise, high density residential developments have increased. But recently, as Part L requirements have become increasingly stricter, building designers are progressively needing to seek alternatives to traditional HVAC strategies.

This is because the traditional solutions associated with these developments are becoming increasingly inefficient, when combined with the conditions caused by higher performing building envelopes required for Part L compliance. Accordingly, HVAC designs have not kept pace with changes envelope design, meaning that **in some cases, due to high distribution losses, system efficiency has been to be as low as 33%** according to some independent reports. With the approaching update to the Approved Document's Part L expected to further tighten the building envelope's performance requirements, the situation can only be exacerbated unless fundamental changes are made to HVAC design.

This is why we have worked with the industry to not only develop a solution for apartment buildings going forwards, but one that you can start benefitting from today: The Zeroth Energy System.

The Zeroth Energy System

The Zeroth Energy System provides heating, cooling and hot water services to residential spaces using a network of water-water heat pumps and hydronic emitters in the apartment.

The heat pumps are connected to a central energy loop, which is a water circuit maintained at 25°C, making it a low temperature (or ambient) solution.

This energy loop is then regulated within its operating parameters using any centralised heating or cooling plant. Adopting a low temperature solution leads to dramatic increases in system efficiencies.

We have designed this system with leading developers to ensure that it not only helps a building towards gaining compliance with increasingly stricter targets, but is also a financially and practically viable solution.

Creating the solution in this way means that there are many benefits to employing this technology, which is why we have designed this eBook to tell you what you need to know.

Flexibility for emitters and controls

The Zeroth Energy System uses hydronic emitters in each apartment and has been designed to allow you to choose the emitter you want for your apartment. These can be specified to provide heating only or heating and cooling, depending on the design requirements and the Zeroth unit specification.

This flexibility of approach has also been extended to the in-apartment controls, as the Zeroth unit has been designed to allow the designers to choose their preferred controls specification.

Emitter options:

- Wet radiators
- SmartRad
- Underfloor heating
- Chilled water fan coil units

The Zeroth unit: A heat pump a cylinder within each apartment

The Zeroth unit itself contains a 172L water cylinder and a heat pump module. It has been specifically designed to fit within a standard sized utility cupboard or kitchen unit and is suitable for prefabricated applications. This is to ensure that the solution is viable for designers to use without having to increase the service space currently allocated to traditional solutions.

Zeroth specification

- **4 and 6 kW Heating only**
- **4 and 6 kW Heating and Cooling**
- **172L unvented cylinder.**
- **550 x 560 x 2000mm (W/D/H)**

The Zeroth heat pump

The Zeroth heat pump can be specified to provide heating or heating and cooling, without an increase in the size of unit.

The units been designed so that all internal access is entirely from the front of the unit. The heat pump element is a removable module meaning absolute minimum disruption to the resident or the building during routine and maintenance.

The 172L water cylinder within the unit is unvented and is able to provide hot water up to 60°C. This size unit would typically be for a two to three bed apartment, although there are large unit sizes available for penthouses and apartments with a high-water demand.

A 2 kW immersion heater is also included within the cylinder for emergency back-up.

Why use a low temperature network?

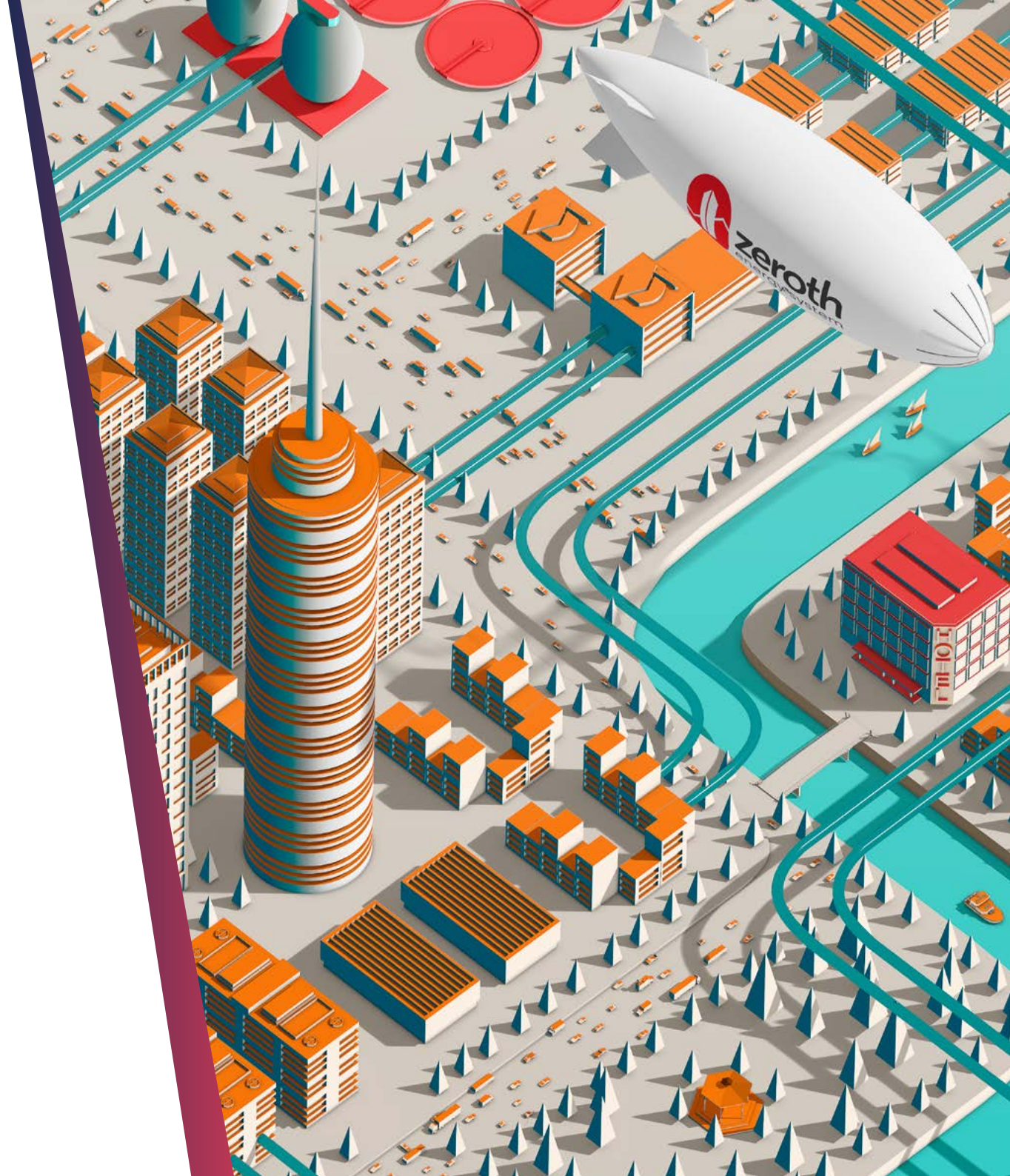
As the Building Regulations look set to dramatically increase efficiency and carbon targets within the UK, there has been an increased interest in low temperature networks (LTN) and wider recognition of the benefits they could bring to a communal design.

- Low temperature networks (otherwise known as ambient networks) are supported across the industry, including in the Clean Growth Strategy and the new London Plan.
- They have significantly lower distribution losses when compared to high temperature alternatives, leading to higher system efficiencies.
- These reduced losses help to mitigate the effects of overheating through less heat being trapped within the building envelope.
- The lower system temperatures often result in a smaller plant room, saving on cost and potentially increasing usable space.
- Low temperatures allow the easier integration of low carbon heating technologies such as air or ground source heat pumps as central plant.
- There is an opportunity to lower resident bills through increased energy efficiency.
- Due to the lower water temperatures, pipework insulation can be reduced compared to a high temperature alternative, saving on space and CAPEX.

A low temperature solution

It is these benefits of low temperature networks largely caused a rise in the specification of the Zeroth Energy System as an alternative HVAC solution for residential buildings.

With the 25°C energy loop being a water-based system, there is no requirement for refrigerant pipework or leak detection devices. The low temperature of the network also significantly improves the energy performance of the thermal network, with up to a 90% reduction in losses when compared to traditional CHP/ boiler designs with heat interface units.



In the plant room...

The flexibility of the Zeroth Energy System has been designed to extend to the plant room as well as the apartments, with the designers able to choose which plant technology they wish to use in their designs.

Due to the benefits of using a low temperature network, there can be a dramatic reduction in the plant room footprint, which can lead to space being reallocated elsewhere within the building. As low temperatures allow the easier integration of low carbon heating technologies such as air or ground source heat pumps as central plant, regulatory compliance is dramatically improved. Previously, we have found that when paired with air source heat pump as the plant technology within SAP 2012, the Zeroth Energy System was found to have an efficiency greater than 300% and contributed significantly to carbon reduction targets.

When designing your plant, we are on hand to help you towards gaining compliance whilst meeting your spatial and design requirements.

Add on comfort cooling, without the premium

One of the benefits behind the Zeroth Energy System heat pump is the technology's ability to provide comfort cooling through a two-pipe system, with only the addition of a reverse cycle valve and relevant emitters.

With our cities getting hotter year on year, and climate change set to add to this further, providing comfort cooling with this system can add a price premium to your apartments at a fraction of the cost of a separate cooling system.

This is because heat pumps transfer energy to work, effectively producing waste cooling when in heating mode and waste heat when in cooling mode. This can then be used to the designer's advantage to provide heating and cooling in one system, without the need for running refrigerants throughout the building.

When in cooling mode, the Zeroth unit is also able to make use of the waste heat by transferring the heat to the water cylinder, providing 'free' hot water for the apartment occupier. Should the water cylinder already be fully heated, this heat can be put back into the energy loop to be used by another apartment, reducing the operation of the main plant.

Installation and servicing

Installation

The Zeroth unit arrives pre-plumbed and pre-wired to simplify the installation process, and can be delivered fully fitted within a prefabricated service cupboard.

Service and maintenance

GDHV offer a 2 year guarantee on the Zeroth unit, when installed under the conditions above, with a maintenance offer available to either the facility manager to cover the units within every apartment or to the end users directly on an apartment to apartment basis, extending the guarantee to 5 years.

A solution for now and in the future

Due to the Zeroth Energy System's capability to provide such high efficiencies, it performs well within SAP2012, with the BRE providing an official document for inputting the system into the current SAP software. Moving forwards to SAP10, the Zeroth Energy System will be listed within the product database.

The system has been designed with the future in mind, as the industry sits on the edge of major changes to the UK's compliance system to meet tightening environmental targets. This is why the system is able to be connected to a future district heat network, an increasing requirement to build within cities, and allows for plant technologies to be updated in the future, without needing to retrofit the entire system.

All the benefits listed within this eBook are already being applied to projects across the UK. The increased take up of the Zeroth Energy System validates the benefits to all stakeholders and enables compliance with building regulations in a much more effective way.

The key benefits

of adopting the Zeroth Energy System can include:

- Easier regulatory compliance.
- Significantly reduced overheating risk of apartments.
- Significantly reduced corridor temperatures.
- Significantly improved energy performance, lower resident bills.
- Greater design flexibility for plant.
- Opportunities to increase usable space.
- Carbon tax saving opportunities.
- Cost saving opportunities.

To learn more about the Zeroth Energy System or to request our Low Temperature Network CPD, contact us on:

0330 0580 560

or email

maxwell.lawther@gdhvsolutions.co.uk
to be put in contact with your regional Business Development Manager.

Glen Dimplex
HEATING & VENTILATION