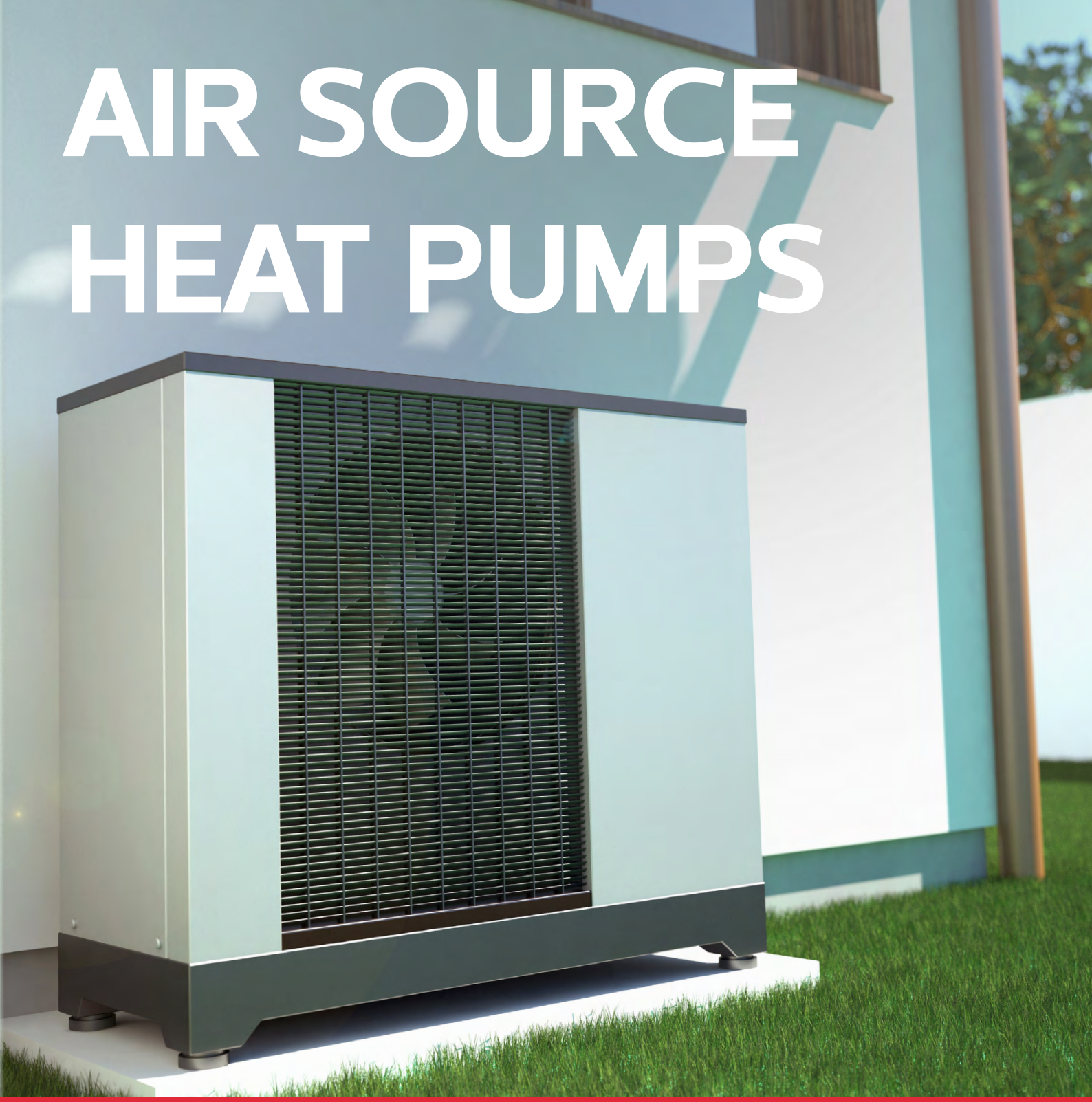
AIR SOURCE HEAT PUMPS



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Air source heat pumps

WHY?

Air source heat pumps (ASHPs) are an eco-friendly alternative to conventional heating solutions. ASHPs do not generate electricity themselves but are considered low carbon as they take electricity from other sources such as solar PVs or the grid (100% renewable can be purchased) and improve their efficiency by generating between two and half to three and a half times more energy than was input.

Heat pumps work like fridges in reverse. Absorbing energy from the air, they can extract heat from air as low as -20°C without a dramatic drop in performance, using vapour compression to transfer heat from outside air into a heating system. A heat pump's Coefficient of Performance (CoP) is measured in terms of useful heat extracted per unit of electricity used – ASHPs typically extract between 2.5kWh and 3.5kWh of heat for each kWh of electricity input: https://energysavingtrust.org.uk/advice/air-source-heat-pumps/

BEFORE YOU START

Air source is just one of many low carbon heating solutions. It is important to manage the heating needs of your church before exploring heat pump solutions. Our papers on 'Quick wins', 'Insulation, double glazing and draught-proofing' and 'Lower carbon and renewable energy options' offer useful guidance.

HOW?

EARLY PLANNING AND RULES OF THUMB

The major factor affecting the efficiency of heat pumps is the difference in temperature between the heating system and outside: the bigger the difference, the harder the pump has to work. The heating system might be either radiators or underfloor heating. Heat pumps perform best when the water temperature generated is limited to 50°C. This ideally suits underfloor heating, but if radiators are the only option, they will need to be bigger than in systems using oil or gas boilers where water temperatures are up to 80°C. Higher temperatures can be achieved with heat pumps, but at the expense of efficiency.

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A practical implication is that it will take longer to bring a church up to temperature than a gas or oil boiler. This is an important part of the design process, and air source heat pumps are therefore best suited to buildings which are in regular use, rather than just once a week, or which require a low level of background heating for heritage reasons.

For a small church, with a heat requirement of less than 40kW, an array of single-phase monobloc heat pumps may be sufficient. They could be accommodated within the capacity of a single-phase electricity supply, although this should be assessed alongside the wider needs of the church such as kitchens, water heating, etc.

Larger churches are likely to require a three-phase heat pump unit. These typically come in single blocks of up to 50kW each and may necessitate an upgrade to the electricity supply.

Heat pump units need to sit outside, as close as possible to the church, with space around each unit for both maintenance and air flow.

It is a common belief that heat pumps are noisy. In most settings, the volume is less of an issue than the nature of the noise in an otherwise quiet environment. Noise is generated when the heat pumps go into a defrost cycle, and this can happen at any time so may be a nuisance at night. An acoustic assessment should be carried out, although in most instances, a sensible location and a simple timber fence will offer sufficient attenuation, and will also provide security and aesthetic screening.

A buffer vessel may be necessary. This provides a volume of water to dampen large, sudden swings in heat demand and makes the heat pumps operate more efficiently.

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LONGER READS & OTHER RESOURCES

The Church of England has some recorded webinars on '*The Basics of Heat Pumps*' here: https://www.churchofengland.org/about/environment-and-climate-change/webinars-getting-net-zero-carbon

This 2020 *Which?* article includes some useful pictures to help you envisage what heat pumps might look like: https://www.which.co.uk/reviews/ground-and-air-source-heat-pumps/article/air-source-heat-pumps-explained-al5MC4f773Zq

This couple from 'My Home Farm' have posted a number of videos explaining their air source heat pump installation and experience. Here is the first: https://www.youtube.com/watch?v=P8cBKBTTLBw

CASE STUDIES

All Saints Church, Hethel, installed air source heat pumps in 2018 and explain their rationale here: https://www.achurchnearyou.com/church/10125/page/43744/view/

STRATEGIC DEVELOPMENT GOALS

Taking action on this topic will contribute to these UN Strategic Development Goals: