

CHURCH
HEATING

7

OPTIONS
APPRAISALS
AND GETTING
ADVICE



CHURCH HEATING

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This guidance is issued by the Cathedrals Fabric Commission for England pursuant to its powers under section 3(3)(a) of the Care of Cathedrals Measure 2011, and/or by the Church Buildings Council pursuant to its powers under section 55(1)(d) of the Dioceses, Mission and Pastoral Measure 2007. As it is statutory guidance, it must be considered with great care. The standards of good practice set out in the guidance should not be departed from unless the departure is justified by reasons that are spelled out clearly, logically and convincingly.

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Issued by the Cathedral and Church Buildings Division, August 2021 © Archbishops' Council



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7a Introduction

Assessing the options open to you is key to any heating project.

First, you need to work out what you need your heating to do for you; the checklist in Section 5 should have helped with this. It may seem obvious, but thinking through where and when you need warmth is vital. We suggest you read the earlier sections of the guidance and complete the checklist, before starting your options appraisal.

The next step is to narrow down the range of available options to create a shortlist, by eliminating the ones that are not feasible.

Then you assess the remaining options to see how well they meet your needs (now and in the future), their environmental impact, their cost both now (installing the heating) and over time (the cost to maintain and run the heating), plus how long the system can be expected to last.

For some projects, you will need expert advice and detailed reports. For some projects, two sides of A4 may be enough. Knowing when to get expert input, and from whom, is vital.

7b Start with the 5 W's

Once you have completed and shared your heating checklist (section 5), gather a group of people from the church such as your church warden, youth worker, clergy, eco church rep, and treasurer.

Together, describe what you need your heating to *do* for you, using the 5Ws:

- Who are you heating (types of people, old, young)?
- What type of event (general visiting, sitting for a **service, children's play group**)?
- When you heating them (when and how long for)?
- Where are you heating them (which part of the building)?
- Which parts of the building fabric, interiors, or objects need special care?

Get a plan of the church building(s), either printed out at a large size or drawn on a flip chart. Mark up the plan with coloured pens and define what you need your heating to do, in each part of the building.

Answering the 5W questions above will – later on – help you decide what type of heating and what temperature you need, where and when. Do not start thinking about **boilers, radiators, or any other heating 'kit'** until you are clear in your minds what the heating needs to achieve.

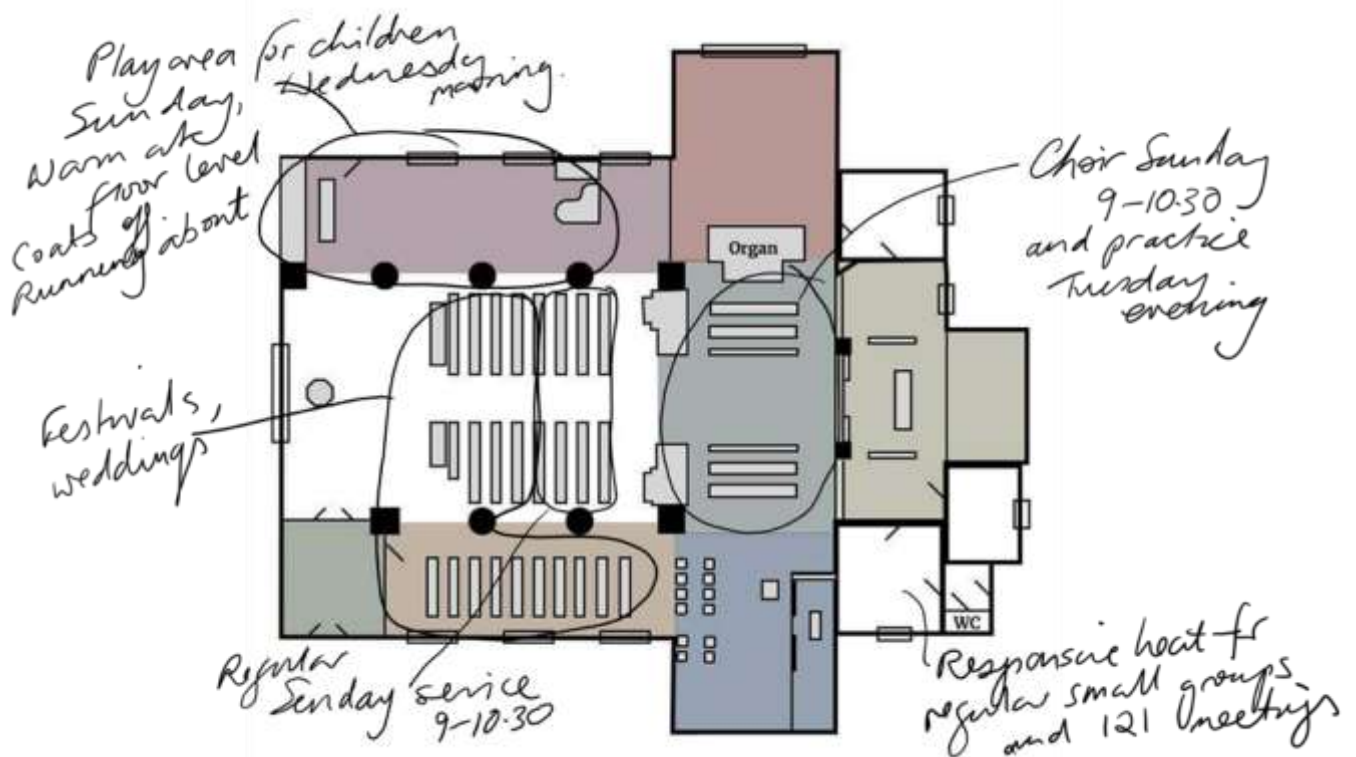
This is generally referred to as the project brief.





































7c List all the options – and then rule out the impossible ones

In Section 3 of this guidance you can find all the different heating approaches. Remember that different emitters produce heating with different effects, and that energy sources limit the type of emitter you can use.

The main options are shown in the table on the next page. There are choices to be made about where you get your energy from (oil, gas, electricity) and what emits the heat (radiators, panels heaters, underfloor heating, and so on).

Below: A simple example of a plan showing the 5Ws: Who, What, When, Where, Which.



Energy source 	Oil boiler	Gas boiler	Electricity (Grid and/or solar PV)	Heat pumps	Biomass boiler
Emitter 					
'Wet' radiators – water filled			 can be converted or run from electric boiler	 but at a lower temp > larger radiators	
Oil filled electric radiators					
Electric radiators / convectors					
Trench heaters					
Pew heater	 'wet'	 'wet'	 electric	 'wet'	 'wet'
Panel heaters	 'wet'	 'wet'	 electric	 'wet'	 'wet'
Portable heaters			 (but take care with cables etc)		
Suspended heaters					
Underfloor heating	 'wet'	 'wet'	 electric	 'wet'	 'wet'
Air blowers (including curtain heaters)				 'air to air'	

Above: A summary of the main heating options

For your church, some of these options can probably be dismissed quite quickly.

- If you do not have pews, for example, you can rule out the row for pew heaters.
- If you are not on the gas grid, and there is no prospect of being connected, then you can rule out the column for gas.
- If you do not have a reliable, three-phase electrical supply then the additional electrical load from electric heating may not be feasible without improvements. This is worth checking early on.
- Ground source heat pumps will only be possible in a relatively small proportion of locations; you need sufficient ground near the church without burials, where you can either sink boreholes or run underground horizontal pipework. You will also need to dig a trench from the boreholes to the plant room within the church.

- Heat pumps will require to be attached to either underfloor heating or larger than standard radiators, so if you want to retain your current radiators, heat pumps may not be viable, or will need supplementing with a secondary approach.
- Biomass boilers are not allowed in Air Quality Management Areas, and require someone able to carry out regular maintenance. You need space and access for the pellets/chips to be delivered and stored.

After ruling out the non-feasible options, you should be left with a short list of feasible options.

7d Common shortlists in different circumstances

Every church is different, and it is always case-by-case. There will be lots of churches that do not fit neatly into any classification and/or where a combination of solutions may be appropriate.

There are some fairly typical combinations of feasible options, which are set out below.

The table below assumes your church is currently on either oil or gas, and that it has either radiators or some other form of fairly standard emitter, such as trench heaters.

Remember: if your church contains sensitive monuments and artefacts, then sudden changes to air temperature in the whole church can be damaging. This may well cause you to rule out some options.

Typical situation typical options to consider
Church with pews, intermittent or low use (a few hours per week)	<p>Low carbon options (assumes 100% renewable electricity, from a 'green tariff' and/or solar panels)</p> <ul style="list-style-type: none"> • Make what you already have last longer +/- or be more efficient/effective e.g. by adding/using controls. Reduce the heat needed by reducing heat loss and draughts. • Direct replacement of gas boiler with electric • Electric boiler with system improvements • Under pew electric radiant or convective heaters • Wall mounted or ceiling hung radiant heaters • Other electric radiators / heaters • Air-to-air heat pumps for smaller buildings <p>Lower-carbon options</p> <ul style="list-style-type: none"> • A hybrid solution e.g. retaining gas/oil heating for coldest days and occasional events, with a smaller number of pew heaters in the commonly-used areas for standard services <p>Fossil fuel options *</p> <ul style="list-style-type: none"> • Direct replacement boiler (oil-for-oil or gas-for-gas) • Replacing oil with gas
Church with pews, regularly used throughout the week (perhaps 5 days per week, for more than 3 hours or more)	<p>Low carbon options (assumes 100% renewable electricity)</p> <ul style="list-style-type: none"> • Make what you already have last longer/be efficient/effective and reduce the heat needed • Direct replacement of gas boiler with electric • Electric boiler with system improvements • Air source heat pump (ASHP) with radiators • Ground source heat pump (GSHP) with radiators • If lifting the floor or reordering anyway: air or ground source heat pump with underfloor heating [§] <p>Lower-carbon options</p> <ul style="list-style-type: none"> • Hybrid air- or ground-source heat pump combined with an existing or new gas boiler used for peak loads on coldest days <p>Fossil fuel options *</p> <ul style="list-style-type: none"> • Direct replacement boiler (oil-for-oil or gas-for-gas) • Replacing oil with gas

Typical situation typical options to consider
Church with chairs, intermittent or low use	<p>Low carbon options (assumes 100% renewable electricity)</p> <ul style="list-style-type: none"> • Make what you already have last longer/be efficient/effective and reduce the heat needed • Direct replacement of gas boiler with electric • Electric boiler with system improvements • Wall mounted or ceiling hung radiant heaters • Other electric radiators / heaters • Air-to-air heat pumps for smaller buildings <p>Lower-carbon options</p> <ul style="list-style-type: none"> • A hybrid solution e.g. retaining gas/oil heating for coldest days and occasional events, with wall-mounted or ceiling-hung radiant heaters for standard services <p>Fossil fuel options *</p> <ul style="list-style-type: none"> • Direct replacement boiler (oil for oil or gas for gas) • Replacing oil with gas
Church with chairs, regular use	<p>Low carbon options (assumes 100% renewable electricity)</p> <ul style="list-style-type: none"> • Make what you already have last longer/be efficient/effective and reduce the heat needed • Direct replacement of gas boiler with electric • Electric boiler with system improvements • Air source heat pump with radiators • Ground source heat pump with radiators • If lifting the floor or reordering anyway: air or ground source heat pump with underfloor heating [§] <p>Lower-carbon options</p> <ul style="list-style-type: none"> • Hybrid air- or ground-source heat pump combined with an existing or new gas boiler used for peak loads on coldest days <p>Fossil fuel options *</p> <ul style="list-style-type: none"> • Direct replacement boiler (oil for oil or gas for gas) • Replacing oil with gas
Rural church, off the gas grid, poor electricity supply, currently on oil.	<p>Low carbon options (assumes 100% renewable tariff or solar PV)</p> <ul style="list-style-type: none"> • Make what you already have last longer/be efficient/effective and reduce the heat needed • Biomass boiler with radiators – in some circumstances (see separate guidance on biomass boilers) • Upgrade electrical supply, and install electric heating <p>Fossil fuel options</p> <ul style="list-style-type: none"> • Direct replacement boiler (oil-for-oil)
<p><i>*It is possible to switch from gas to low-carbon bio-gas, but the price difference is high. In the future, it is possible that the proportion of ‘green’ hydrogen in the gas grid may increase, reducing somewhat the carbon impact of grid gas. See Section 4 on the future of heat. As things stand today, though, replacing gas-with-gas is not a low-carbon option.</i></p> <p><i>[§] Laying new underfloor heating has a high ‘embodied carbon’ because of all the materials required, and so is only recommended if the floor needs major work anyway, and only for churches used very regularly throughout the week.</i></p>	

Remember, the right answer for your church might be a combination of different approaches.

For example, in our [case study of Chalgrove](#), the church has ceiling-mounted far-infra-red radiant heaters in the nave and then pew heaters in the chancel, giving responsive heat without damaging the wall paintings.

7e Assessing your shortlist

By now, you have a short list of feasible options.

For each option remaining, you will want to consider a variety of factors:

- How well does it meet your needs, now and in the future (the 5Ws, from earlier)?
- **How much will it cost, and what is the ‘return on investment’? This should consider:**
 - * installation costs
 - * operating costs
 - * maintenance costs over its lifetime
 - * removal and replacement costs at the end of its life, and how long this lifetime is.
- Carbon footprint
 - * operational carbon – the electricity, gas or oil used to run it. Savings vs. current system.
 - * embodied carbon – the materials that go into the creating the system and installing it.
- Ease of maintenance – are there sufficient firms locally to maintain it?

The correct answer for your church will always be on a case-by-case basis. However, reading [case studies](#) can help.

7f Do you need advice?

There are times when advice is needed, particularly if:

- You are considering something very different from what you have now, and are unsure about it,
- You are considering a sizable investment (several thousands of pounds or more), or
- You have historic fabric, interiors, or objects.

However, for some churches, the options are simple and they can carry out the required analysis themselves, having gained some quotes from local installers.

7g Where do you get advice from?

The key expert you are likely to need is a Building Services Engineer, who can report to you on the feasible options and their pros and cons. They are independent, and can assess a range of options. [CIBSE](#) has a directory of specialist.

For most church projects, the advice will need to be from someone with experience of large, heritage buildings, not domestic or commercial projects. When looking for an external heating designer, always ask about their experience with church buildings. Try to find examples of their work which you can visit, and discuss their work with the other church clients.

The [CIBSE heritage group](#) can advise on the significance of existing systems and give a general direction of thought about a project:

Whilst most DAC's have a heating or buildings services advisor, who may be able to offer a degree of free input at key points, it is not their role to design the system. It is, however, very much recommended that you [consult the DAC](#) early on in your project to see what help is available in your diocese, and then again before committing to a particular approach.

Your church architect may be able to give general advice, but they are not heating specialists.

Your local plumber or electrician is very unlikely to understand the full range of options.

The Historic England Buildings Services Team can offer advice on listed buildings, in certain circumstances. Contact your local [authority conservation officer](#) and ask them what advice is available.

Parish Buying offers [energy audits](#), as do some dioceses, which can set the heating work in a wider context.

7h The format of the options appraisal

The end result for a large, complex heating project, where you are engaging specialists, may be a multi-page document, with a detailed analysis.

If you commission such an options appraisal, then it is recommended that you provide your advisors with:

- The project brief: a summary of what you need, focussing on the 5Ws from earlier in this document: who, what, when, why, and which.
- A completed Heating Checklist (Section 5 of the heating guidance),
- Copies of your energy bills from the last year along with the results of the Energy Footprint Tool.

This will focus your advisors quickly on the key points you need their help with and – hopefully – save the church both time and money.

Whilst most projects need external advice of some kind, not all do, and the options appraisal need not be complex.

Attached at the end of this guidance is a perfectly effective two-page options appraisal prepared by the church itself. It was supplied as part of the Statements of Needs for a recent heating application to the Church Buildings Council. For this particular church, they had a **fairly clear 'best option', because they have pews and a good electricity supply.** This short document covered enough to show the church had thought carefully and broadly about their options when reaching their conclusions.

Your options appraisal should be fit for your needs. Working on it will hopefully achieve three things:

1. Help your church community think, together, about the best solution for your circumstances.
2. Help you get cost-effective advice only on those questions where it was really needed, saving you time and money.
3. Help you prepare your case for a future faculty application (if needed).

The next section of our guidance looks further at this last point; the permission your project will need and the regulations covering church heating.

7i Example of a simple options appraisal

Excerpt from a recent statement of needs applying for electric heating.

Section 4. Why do you need it and why do you need it now?	
<p>Having new, more efficient heating will also help us further reduce our carbon footprint, and it will also help our financial situation and contribute towards environmental sustainability. We already buy all of our electricity from renewable sources.</p> <p>Our proposal includes zoning the heating system, so that we only ever heat the areas of the church that we need to, which would further reduce our carbon footprint.</p> <p>We have investigated all of the alternative forms of heating that are open to us, and our reasoning for rejecting / selecting them are briefly detailed below:</p>	
Heat Energy Source:	
Oil: (Rejected)	Invasive to install oil fired heating system and banded storage Not renewable
Natural Gas: (Rejected)	No nearby gas main Invasive to install gas fired heating system Not renewable
LPG: (Rejected)	Invasive to install LPG fired heating system and storage Not renewable
Biomass: (Rejected)	Invasive to install biomass powered heating system Labour intensive to run, as it would need attention every couple of days
Ground Source Heat Pump: (Rejected)	Invasive to install the requisite underground pipes in the churchyard Invasive to install a ground source heat pump powered system. Works best with under-floor heating in an insulated building, which would be an invasive and an expensive system to install
Air Source Heat Pump: (Rejected)	Invasive to install the pump in the wall of the church Works best with under-floor heating in an insulated building, which would be an invasive and an expensive system to install Noisy to run
Solar Panels: (Rejected)	Invasive to install Would be highly unlikely to obtain planning permission to install them on the roof of our Grade I listed church
Electricity: (Selected Option)	Tried and tested system which could work adequately in our small, rural church, if we fit an adequate number of efficient heaters. Renewable, since we only buy electricity from renewable sources

Contd.

Heat System:

Under-floor heating: Expensive to install
(Rejected) Invasive to install
Difficult to access for repairs

Wet radiator system: Expensive to install
(Rejected) Invasive to install

Heated pipes: Invasive to install and there are none present currently
(Rejected) Do not really lend themselves to occasional heating

High up wall heaters: Unsightly
(Rejected) Invasive to install
Do not really provide heat where we need it
Can cause headaches when on, due to their position

Storage heaters: Difficult to control or run effectively
(Rejected)

Heated curtain: Expensive to run
(Rejected) Too short a working life

Portable heaters: Are not a long term solution
(Rejected) Have health and safety implications (trip hazard)

Local electric heaters: Provide heat where we need it, in the pews and on the walls where there are
(Selected Option) no pews
Can be easily zoned to reduce carbon footprint
Tried and tested solution, as we already have pew heaters, which provide heat in the right place, when they work
Recognised as a good solution for small rural churches, such as ours