St Andrew's Eco-Church Buildings and Net Zero Carbon Management Plan

April 2025

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OUR VISION:

That our church buildings demonstrate our commitment to caring for God's Creation and God's Church and reveal our engagement in the National Church aspiration to achieve Net Zero Carbon by 2030 for the carbon footprint of church buildings and church transport. That our congregation and visitors feel comfortable and safe in the buildings, and will be encouraged to engage in Eco-friendly activities in their own lives.

To achieve this through developing and implementing a building management plan aimed at reducing our overall energy consumption. Reducing our dependency on fossil fuel derived gas, oil, petrol, diesel, and the use of non-recyclables. Increasing carbon storage, use of renewable energy and recycled products. Promoting an environmentally friendly and ethically responsible action within our community while supporting the needs of our stakeholders.

PLAN SUMMARY:

Aims:

To develop a plan that achieves our vision within the resources available to us.
To be informed by experts in the field.
To consult at all stages our stakeholders and governing bodies.
For the plan to be enacted in harmony with and alongside all the domains of Eco-Church; including land management, worship & teaching, community & global engagement, and lifestyle modifications.
In any future building work to consider its carbon cost and where possible use building materials that represent a carbon sink.

Objectives:

To implement a three-phase plan, similar to that suggested by ESOS-Energy and adapted after consultations.
To obtain and consider professional reports, advice of potential suppliers of heating options, and diocesan advisers.
To site visit churches that have already installed non-fossil fuel, low carbon footprint heating solutions to discover the benefits, drawbacks, and installation process they have experienced along with how their congregation have received the changes.
To engage our congregation in the process and continually liaise with the DAC during plan development.
To reduce overall energy use of the current installations, improve heat loss through insulation without creating further damp problems, to replace fossil fuel burning heating systems with non-fossil fuel, low carbon footprint heating solutions.
To consider the building as having six zones, each zone having a different need owing to its type of use, duration of use, and frequency of use. Thereby introducing heating systems that permit the flexible to heat single or multiple zones.
In the zones only used for one to two hours, once or twice a week, to first consider heating systems that warm people rather than the building.
To develop a plan for a single Faculty Application to give the DAC an overall view of the total project, though the application may be divided into phases.
In future building work try to use products that represent a carbon sink, like wood.

1. PAROCHIAL CHURCH COUNCIL POLICY and CONSTRAINTS:

In January 2023 the PCC approved a three-phase pathway towards a NZC, environmentally friendly and ethically responsible church, and agreed the finance to implement Phase One.

Details of the three-phase plan are given below and the costings/savings are those estimated in the ESOS-ENERGY Energy Efficiency and Zero Carbon Advice (09/11/2022) in Appendix 1.

Three-Phase Plan as part of the PCC Eco-Church Policy:

Phase One: Short Term – January 2023 to January 2024.

1. Upgrade of all church, hall & outside lighting to LED, sensors to some lighting circuits (giving enhanced security), LED flood lights operate dusk to 10pm (reduce light pollution). Approximate capital cost £3K, Annual savings £1.5K, 5,000kWh and 1.05 CO_2 e-tonnes – being a 10.2% reduction in our CO_2 emission footprint.

2. The church leadership team (Ministry Team, PCC & it's Panels, and Wardens) to formally commit to improving the environmental credentials of the church – through prayer, teaching, worship, church communications and work with youth.

3. The church is very fortunate that so many volunteers donate cleaning materials and refreshments. Over the year to work with these volunteers to see how the church may use more *Fairtrade* and environmentally friendly products, this may require some sort of central buying once current stocks get used up.

4. For the church, in tandem with the Parish and District Council tree planting scheme, identify, gain consent, and plant additional trees on our lands.

Phase Two: Medium Term – February 2024 to December 2025.

1. Renew draught seals to doors and windows, additional pipe insulation with fitting VSD to pumps. Approximate capital cost £2.1K, Annual savings £0.36K and 0.55 CO_2 e-tonnes – being a further 5.8% reduction in our CO_2 emission footprint.

2. The PCC to develop and plan fundraising, grant applications and permissions for Phase Three.

3. The leadership team to involve the whole congregation with the 'Community and Global Engagement', and 'Lifestyle' aspects of the *Eco-Church* initiative aiming to achieve a Gold Award.

Phase Three: Long Term – 2025 to 2030.

1. Replace oil and gas heating systems with electric heating solutions and a roof mounted solar PV system with battery. Approximate capital cost £54K. Annual savings £1.5K and 5.16 CO_2 e-tonnes.

2. The leadership team to develop a strategy as to how to maintain and further enhance the church and individual *Eco-Church* achievements into the future.

The PCC have an Eco-Church and NZC rolling agenda item for reporting of progress, review/amendment, and to agree details of implementation. With regard to the church heating system, they have asked the Eco-Group to first investigate zone heating of the buildings and warming people rather than heating the whole building.

Constraints:

Changes in the church buildings are constrained primarily by their construction features, the faculty system, and consultation with: the DAC and our inspecting church architect, Historic England, the Church Buildings Council, the Victorian Society, and the 20th Century Society. In consideration of the Pevsner description of the George Pace designed new end of our church and the successful case the 20th Century Society brought against Christ Church Fulwood in 2019, changes will need to be backed with a strong statement of need. Some changes may also require Local Authority planning consent.

Some of the proposed changes will require a considerable capital outlay and the availability of PCC funds, fund raising and availability of grant support will need to be considered.

Many parishioners and members of the congregation may have strong preferences and a process of consultation will be important if proposals will alter the aesthetics of the building or the method they are warmed by.

2. DESCRIPTION

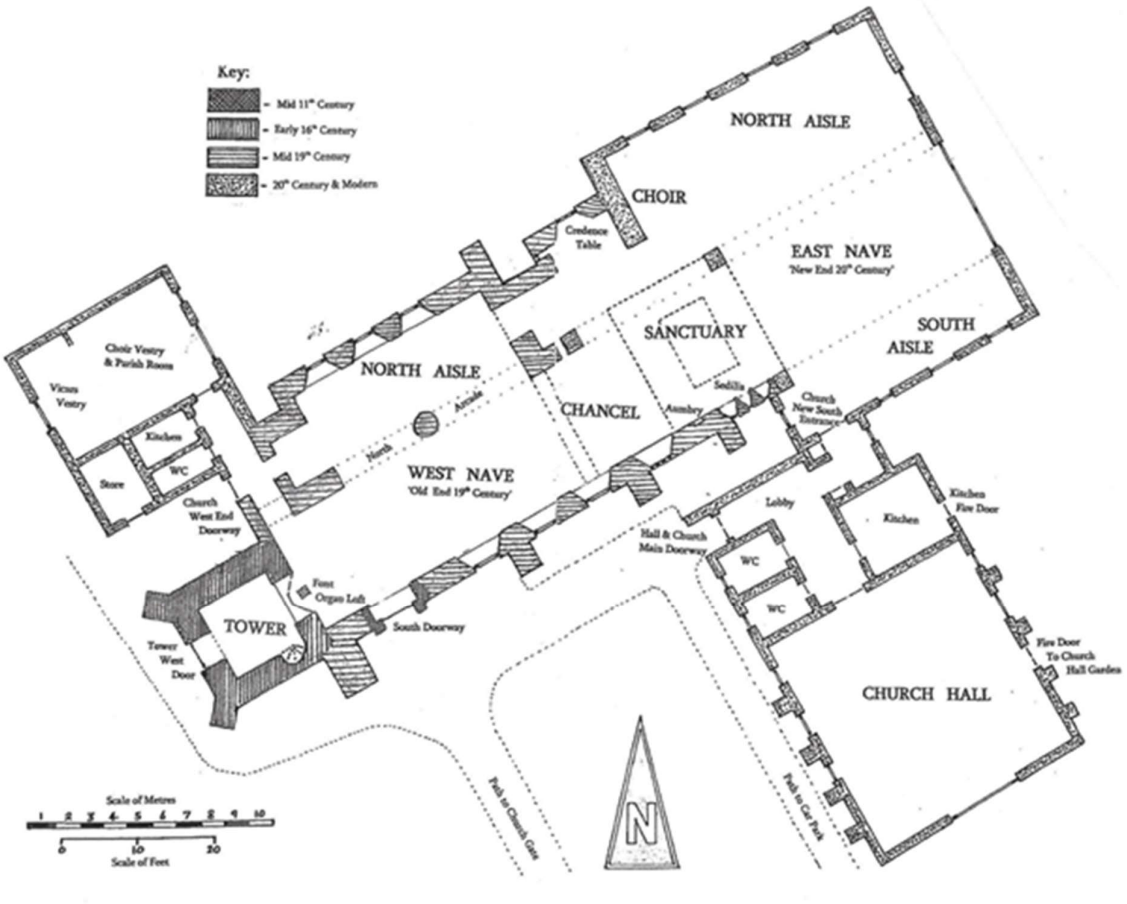
Location:

Church Grid Ref: TM 196 460,

Postal Address: St Andrew's Church,
The Street, Rushmere St Andrew,
Ipswich,
Suffolk,
IP5 1DH.

The church sits on the eastern fringe of Ipswich in the village of Rushmere St Andrew in the middle of a historic churchyard, at 43 metres above mean sea level.

The main church consists of an 'old end' (mainly 1861 designed by Edward Hakewill with some Norman and Medieval elements including the tower) and a 'new end' (1968 designed by George Pace). Connected to the main body of the church is a Church Hall, kitchen, and toilets (1987 designed by Anderson and Earwaker) and a linked vestry block, parish room, small kitchen and toilet (1968 designed by George Pace).

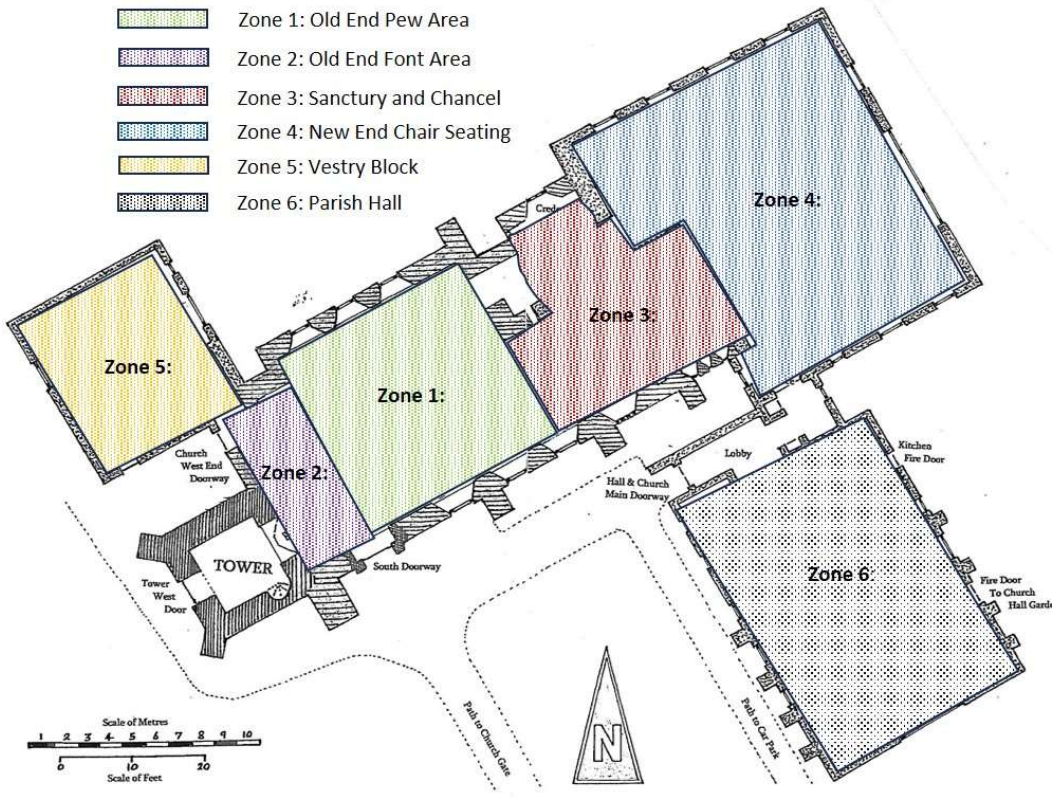


Plan 1: *Block Plan of St Andrew's Church indicating the west end nave and aisle 'Old End', the east end nave and aisles 'New End', the tower, the church hall and facilities 'Parish Hall', and the parish room and facilities 'Vestry Block'.*

Zones of the Church:

Owing to the different construction, type of use, frequency of use and if seating is in pews or on chairs, for the purpose of this plan it has been divided into six zones:

1: Old End pew area
2: Old End font open area
3: Sanctury and chancel area
4: New End chair seating area
5: Vestry Block
6: Parish Hall/Church Hall



Plan 2: *Zones 1 to 6 for the church building related to method of construction, type and frequency of use and insulation ratings.*

Zone 1: The Old End Pew Area.

Walls: flint, stone and rubble bonded with lime mix mortar; no damp course. Windows: leaded stained glass in stone mullions; single glazed. Floor: earth, sand, Victorian tiles with pews set on a raised wood bordered platform; an insulation air gap below pews. Roof: hammer and tie oak beams, wood tongue & groove boarding, lathe & plaster between roof rafters, overlaid with mineral felt, battens and plain tiles; no insulation.

Photo1: *View through old end to the new end.*

Used for regular one-hour services at 8am on Sundays and 10am on Thursdays; attendance between 10-20 people. Also, the occasional offices of funeral and marriage; 1-2 a month with attendance between 20-80 people. Both ends used for large/festival services and special events.

High loss of heated air through the west arch behind the organ into the tower, through the often-opened large door in the south Norman arch doorway, and the un-insulated roof. Also, the cooling effect of the walls and floor.

Lighting: ceiling mounted or roof suspended fittings that were fitted with a mix of incandescent, halogen and fluorescent bulbs and welcome lights (see Phase 1 changes).

Heating: hot water flowing through cast iron radiators from a common oil-fired boiler. Main heating circuit for the old end of church is of 4" steel black pipe.

Zone 2: Old End Font Open Area.

Construction, insulation, lighting, and heating is the same as for Zone1.

Use: an area through which people flow for the services as mentioned in Zone 1. It is further used for displays, exhibitions, and information. For over half the year our free café, The Open Door which attracts over 2,000 visits a year, is set up in this area. There are three exits from this area that mitigates safeguarding concerns for our volunteers.

Zone 3: Sanctury and Chancel area.

Mainly sits in the old end of church with wall and roof of similar construction to zones 1 & 2 with stained-glass windows. The floor is earth/old graves, sand, base concrete, damp-proof layer overlaid with York stone slabs with some carpet where the minister stands. Heating is by two hot water 'Fan-coil convector' heaters supplied from the common oil-fired boiler, as the area is open, heat quickly dissipates from this area.

Use: for ministers when taking services in either the old or new ends as the communion table is central.

Zone 4: New End of Church.

Walls: solid brick construction with mineral felt damp course and a reinforced concrete supporting ring beam.

Windows: Large single glassed windows of leaded clear glass in limed oak frames with small slit opening sections (classic George Pace design). The opening windows have insulation round their steel frames.

Photo 2: *View through new end to old end.*

Roof: wood construction, high vaulted with collar ties, fibre insulation board, mineral felt, battens and plain tiles.

Floor: base concrete overlaid with herringbone parquet solid wood block flooring. It is unknown if the sub-floor contains any insulation.

Lighting: same as for Zones 1-3.

Heating: 'Finned-tube Base-boards' on north, east and south walls with two 'Fan-coil convector' heaters on the south wall with hot water supplied by the common oil-fired boiler. This heating circuit is of 28mm copper tube.

Heat loss: mainly the cooling effect of the solid brick walls and windows, and diffusion of warm air into the sanctuary area and old end, and some loss through the roof. The main entrance is through double doors into a lobby to the main exit doors that have an above door heater to provide a 'heat curtain'.

Usage: for the regular 1 to 1½ hour main Sunday service with 60-80 people seated on chairs and on Wednesday evenings for 2 hours the youth group use the space for games. This space is occasionally used for concerts, festival exhibitions, parish meals, and other large events.

Zone 5: Vestry Block.

Walls, windows and floor are of similar construction as that of Zone 4 (the new End) except the floor surface is of vinyl floor tiles and the roof is flat, suspended ceiling, wood joists, minimal insulation, decking and mineral felt covering.

Lighting: was by florescent strip lighting (see Phase 1 changes).

Heating: was only by two steel radiators connected to the main boiler (see Phase 1 changes).

Hot Water: the vestry and toilet sinks have above sink instant electric water heaters.

Heat loss: mainly through the east and west solid brick walls and the ceiling/roof. A single standard width solid door is often wedged open for ease of passage and visibility as this is the only exit from this area (see Phase 1 changes).

Usage: The vestry block is used every weekday morning by the volunteers running The Open Door café and in the cooler months the café is set up in the parish room that doubles as a 'Warm Space' with refreshments. Used by the ministers and choir before/after services, the youth Alpha group on Sunday mornings. It is regularly used for meetings of the various church panels, teams, and groups as well as by the vicar to meet funeral families and wedding couples.

Zone 6: The Parish Hall.

Construction: exterior brick walls and block with cavity filled with mineral wool insulation. Sub-floor insulation with parquet floor on concrete scree. Timber vaulted roof with steel tension ties, insulation board, felt, battens and plain tiles. Windows have double glazed units set in wood frames, some with slit opening panels.

Lighting: was by florescent strip lighting (see Phase 1 changes).

Heating: two thermostatically controlled gas-fired fan assisted convector heaters.

Hot water: is supplied to the toilets and kitchen from a modern lagged cylinder with electric double immersion heater.

Heat loss: minimal, mainly through opening of doors.

Usage: Every day by groups for 2–4-hour sessions, often two or three groups in a day. Group size varies from 10 to 60 people. Used by church and community groups as well as private bookings and concert rehearsals.

Building utilities and services:

Gas: There is a mains gas supply to the hall heaters with a meter cabinet in the hall garden. Currently this is on a fixed tariff, the intention is to change to 'green gas' once the fixed tariff period is finished.
Water: There is mains water supply to Parish Hall, Boiler Room, Vestry Block, and an outside tap for use of working party and churchyard visitors. The water meter is situated in the front car park.
Rain water and foul water drainage: The rain water goods on the old end, new end, parish hall, and east side of vestry block drain to a number of soakaways situated within the church grounds (see Phase 2 changes). Sinks and toilet sewage, and rainwater from west side of vestry block flow into the mains sewer.
Electricity: An underground Three-Phase supply to the main distribution board in the base of the tower with a two-tariff meter. This supplies a distribution board in the old end lobby and another in the parish hall lobby. The electricity supply is currently on a 'green tariff.'
Oil: The steel oil tank is in a locked stockade situated to the north of the new end with a below ground gravity feed supply to the oil-fired boiler in the boiler house situated below the church. The boiler flow manifold has three open branches feeding the new end, the old end, with the third to the vestry block and a single pre-manifold common circulating pump. (Thus, the three heating circuits cannot be individually controlled.) The boiler has a 7-day multi-setting timer.

Physical Environment:

Climate: For Ipswich the annual rainfall is currently 600mm (24") and is fairly evenly distributed throughout the year. The average wind speed is 7mph with the strongest recorded in Jan 2025 at SW 31mph. The average temperature is 10°C (50°F) with a min of -5°C and max of 30°C (10 years ago a min of -15°C and max of 27°C). Climate change is expected to lead to warmer summers, wetter winters with water runoff to exceed local drainage. Ground shrink-swell effect on foundations for this site is improbable, becoming possible by 2080s. (Data acquired: www.bgs.ac.uk/ on 24.03.2025.) The risk factors inherent in climate change will need to be considered and mitigated in any future changes to the church buildings.

Cultural:

The church contains objects that are of historical, cultural, and aesthetic significance to members of the congregation, parishioners, and the wider community. The WW2 memorial (maintained by the Parish Council), a number of floor grave tablets and wall mounted memorials, furnishings in memory of loved ones, stonework from our now redundant daughter church on the Rushmere estate, and the open vista of the nave – six strides longer than the Mayflower pilgrim ship.

Access: The church is open during the hours of daylight with toilet facilities and access to mains tap water. All zones have level access via the west, south and hall lobby entrance; the south and lobby doorways being wider than that required for wheelchair access. There are two steps from the old end to the chancel, a movable slop is planned for this obstacle.

3. EVALUATION

Reports and consultations:

The consultants **ESOS-ENERGY** performed an Energy efficiency and zero carbon advice report in November 2022 (see appendix 1). This gave us a detailed analysis of our energy use carbon footprint, the viability of various decarbonised heating and lighting options, and proposed a route to NZC.

The **Energy Footprint Tool** provides a year-by-year estimate of our CO_2 emissions (see appendix 2 and summary data in the charts below).

Chart 1: (left)
Data extracted from the diocesan Energy Footprint Tool.

Pie Charts cover 2023 & 2024 emissions source.

Interval data graph covers 2021 to 2024 net CO_2 for gas, oil & electricity used in our church buildings.

Block bar chart indicates the proportion of gas, oil or electricity used in the church and in the church hall for 2024.

To render this data useful in guiding decision-making requires interpretation that reflects the unusual contexts for this period. It includes the March 2020-2022 covid years (church closed, then a period social distancing when main church heating was not fully used), the covid 'rebound' year 2023 (with a higher than usual number of weddings, many delayed from the covid era, and memorial services for people who only had very small funerals during covid), and a more usual year 2024.

On the interval data graph, the main effect of this context is seen in the oil net CO_2 from church heating (green line) – very dependent on the number of days the heating is turned on in the main church rather than the number of people in the congregation; even if our congregation numbers doubled over the years that would not change oil usage. However, the oil-fired boiler is, by far, the greatest emitter of CO_2 and represents a priority.

Gas net CO_2 from hall heating (blue line) indicates the return of community and church groups using the hall during 2022, considering the high usage of the hall by numerous groups (see section 2: Zone 6 above) this heating system represents a low priority, especially if we can switch to a green tariff at the end of our current fixed tariff period.

Electricity net CO_2 is primarily from lighting and heating the vestry block/parish room (red line) – the reduction owing to the introduction of LED lighting in 2021 being absorbed by the increased use of the electric heating of the vestry block in 2022 (see section 2: Zone 5 above). Electricity emissions are stable, at a low level and we are fixed into a green tariff.

Report by the **Diocesan NZC officer**, James Rolls, following his site visit and a follow-up email in June 2024 (see appendix 3 & 4). A useful review of progress, suggested we seek our architect's advice on heat loss before embarking on insulation, recommended we develop a resilience plan in case the main heating system failed with a priority to replace the old oil-fired boiler, and to concentrate on reducing energy use before considering energy generating technology.

Notes to PCC including a report of conversation with **DAC Heating Adviser**, Oliver Clarke, in July 2024 (see appendix 5). His main advice is to consider heating people rather than the building, obtain a schema from a company for under pew heaters in zone 1, obtain a schema from a company for zone-controlled IR heating for zones 1, 2, 3, & 4, and obtain a schema from a company for air or ground heat source air heating for zone 6 and zones 3 & 4. He, like others, is concerned that without adequate ventilation IR & pew heating may introduce condensation issues.

Report by the DAC Secretary, Edmund Harris, following a **site visit by members of the DAC,** in September 2024 (see appendix 6). They reviewed a number of possible projects: reducing heat loss by introducing a glass door in the south doorway, renovation of the vestry block roof & upgrading its insulation, and the various heating options proposed by ESOS-Energy and the diocesan heating adviser. They foresaw several objections to a glass door unless a strong case for need was given, they saw few objections to renovation of the vestry block flat roof with high level of insulation, they saw the introduction of pew heaters as a sound proposal, they were sensitive to retaining the clear, uncluttered view along the nave that may be affected if ceiling suspended IR heaters were introduced, and seemed favourably disposed to either air or bore-hole heat source pump(s).

Site visits by Eco-group members to other church who have installed decarbonised heating systems (see appendix 7). Mainly IR and/or pew heating systems. Though the electrical control panels seem complicated they do give the ability to zone heat and the systems do heat people rather than the building. So far, the IR systems give the classic warm face effect but in winter some congregations still feel cold, though the pew heaters seem effective and comfortable. Site visits continue and we encourage more members of our congregation to visit churches and experience these systems.

4. OPTIONS, PROCESS and OBJECTIVES

Lighting: the agreed best option is to convert all lighting to LED, introduce area sensor lights, and reduce the duration and light pollution from the flood lights.

Insulation and draft proofing: In zones 5 & 6 this was generally encouraged. Owing to rising damp and the potential issue of condensation, with some of the heating options, hermetically sealing zones 1-4 (main church) needs very carful consideration and professional advice. Heat curtains from over door heaters seems a good option.

Decarbonised heating systems:

For zone 5 (vestry block) continue with the electric heating system as the system is modern, efficient, and very controllable and if the roof is well insulated with a glassed door to reduce drafts heat loss will be greatly reduced.

For zone 6 (hall) best option seems to be a form of heat source pump. This is a very well insulated building and the electric booster fans would heat the people in the room quickly. A cold weather electric booster could be added to the pump to further reduce the time needed to reach a comfortable temperature.

For zone 1 (old end pews) pew heaters seem the most controllable, comfortable, and preferable to the over-head IR heater option.

For zone 3 & 4 (chancel & new end) the two main options are over-head IR heaters or separating the copper tube new end heating circuit from the old all-in-one heating circuit, using this with a heat source pump fitted with a cold weather electric booster and new low-noise powerful heat destratification fans.

Process & Objectives:

Fulfil the objectives of Phase One and Phase Two, bearing in mind the advice regarding ventilation and condensation.
Continue to gain more information from site visits, professionals, and heating companies to enable the PCC to make an informed decision regarding a decarbonised heating solution.
To consult with the DAC in order to work-up a full Faculty Application Phase Three heating solution and once permissions and quotations received seek grant funding, fund-raising, and allocation of PCC funds.

5. ACTION PLAN: Work achieved, in process and planned regarding reduction of energy use and heat loss, and a heating solution in church buildings.

5.1. Phase One

Objective:
Change the form of lighting in the church to LED lighting.

Rationale:
LEDs use considerably less wattage and have a lower CO_2 emission footprint. Using movement sensors on some circuits and reducing the hours the church is floodlit will lower the footprint of these lighting circuits and floodlights.

Implementation:
A phased LED replacement of all church lighting has been completed: nave suspended lights in early 2022, the rest of the internal church lights in mid-2022, the hall lights in 2023. The two high-pressure sodium church flood lights have been replaced with LEDs of a similar frequency of light emitted and turn off earlier. All external lights have been

replaced with movement sensor nighttime operated LED units as well as the internal south entrance welcome lights now LED movement sensor lights.

Owing to the PCC wish for the church to provide a 'Warm Space' doubled up with our daily 'The Open Door' café the change in zone 5 (vestry block) heating was brought forward. This zone now has independent heating provided by two wall-mounted Rointi high efficiency electric heaters on timers.

5.2. Phase Two

Objective:
To retain generated heat through insulation and prevent heat loss through draught exclusion.

Rational:
Insulation and draught exclusion will reduce the CO_2 emission footprint for generated heat absorbed to building surfaces and lost through draughts.
The two most frequently used and for longest periods are zones 5 & 6 (vestry block and hall) these were seen as priorities as well as boiler room pipe insulation.
Architects' advice is that sealing up drafts in the main church should only be considered once a decision on heating type has been made as the potential for condensation would need to be considered by them.
A decision about the south entrance as to a glazed door or heat curtain from an over-door heater has been deferred to Phase Three.

Implementation:
Renewal of pipe insulation in the boiler room was carried at the same time as a new boiler manifold and efficient pump were installed.
The hall insulation is of a high standard with main heat loss through the doors and users are now encouraged to use the over-door heater to provide a heat curtain.
In the vestry block a transparent door has been introduced to the parish room so that volunteers running the café may see who is arriving while retaining heat rather than having to leave the door open. The architect has been instructed and the replacement of the vestry block roof is planned for 2025 with greatly upgraded insulation.

5.3. Phase Three

Objective:
To continue our fact-finding site visits to other churches and in parallel seek heating schemas from IR, pew heater, and heat source pump firms.
Pre-faculty consultation with DAC and for PCC to agree to a faculty application that covers all Phase Three plans.
Seek funding, grants, fund-raising and PCC allocation of funds.
Replacement of the oil-fired boiler with heating system(s) that permits independent zone heating.
Resolve heat loss issues through the south doorway.

Rationale:
Our parish emissions data clearly demonstrate that heating the least frequently used zones makes up, by far, the largest part of our CO_2 footprint and it is a priority to replace the oil-fired boiler. A lower priority is to replace the hall gas heaters and provide some independent heating for zone 2 (font area). That any replacement system will give the capability to heat each zone independently. South doorway heat loss is costly and the issue of a heat curtain/secondary glazed door will require further investigation and negotiation with the DAC.

Implementation:
We have already completed an initial consultation process.
Site visits to review their experience of changing their heating system have been undertaken: Beccles, Bulmer, in discussion with Hadleigh, and planned visits for Great Eversden, Sudbury, Orford & Ely.
Request schemas of possible solutions from various heating companies.
Work-up a detailed proposal for the PCC, then obtain quotations, to further consult with the DAC, start the process of faculty application, and grant application.

6. FURTHER CONSIDERATIONS.

Solar PV:
Though the ESOS-Energy report suggested the installation of energy generation and storage technology the advice from the DAC and the diocesan heating adviser is to focus on decarbonising our heating and lighting system first and consider generation and storage at a later date. It has thus been dropped from Phase Three plans.

Resilience Planning:
The hall has two independent gas heaters and it is extremely unlikely that both would fail and one is sufficient, though it would take longer to bring the hall up to temperature. However, the hall is well insulated in that if both did fail off-the-shelf electric convector heaters would be effective as alternative heating. The hall electrical circuits have enough capacity to take the extra load.
The Vestry block has new electric convertor heaters that could quickly be replaced in the case of failure.
If the main church oil-fired boiler failed but our heating engineers were confident that a repair is possible, we have a supply of blankets (left over from covid days) that the congregation would be offered. If the failure is terminal the plan would be to temporally fit five plus five off-the-shelf pew heaters in the old end, which is close to the distribution board facilitating the installation of a heating circuit. We have a three-phase supply so the extra load would not be a problem. In the boiler room separate the new end copper tube heating circuit from the other two circuits and connect the new end circuit to an off-the-shelf large domestic oil-fired boiler. However, if we are some way down the path of changing our heating system, have faculty approval, then try and advance the fitting of the IR or heat pump systems (which ever has been agreed).

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The PCC adopted this Buildings management policy document at the May 2025 PCC meeting.

The Buildings Management Plan
Compiled by: Tim Oxbrow & Jim Ainslie