GOD'S NORTHERN POWERHOUSE CONFERENCE

PROVIDING A WARM WELCOME

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1.SPLASH

2.CLIMATE CHANGE AND CHURCH

We're all here today because we care about the same things: reducing our impact on this poor old planet; *and* our wonderful heritage of church buildings.

Sometimes it can be presented as if the conservation of the environment, and the conservation of buildings, and the use of those buildings, are all in conflict with each other; but I'm here to give you some really good news: they are actually entirely complementary! And I hope I'll be able to show you HOW, in this short introduction into the thermal comfort side of things.

3.BUILDINGS AND ENERGY (ENERGY CIRCLE)

The first thing to be clear about is that buildings themselves don't use energy, except when they are being constructed or maintained or demolished.

4. ELEPHANT IN ROOM

The elephant in this room is that it's the people inside the buildings that use the energy; and we're doing that in ever greater quantities! Since the Industrial Revolution brought down energy prices – and they really are still *very* low, next to how they were historically – we've had pretty continual "mission creep" on this front...

5.ENERGY-USING THINGS IN CHURCHES

Which isn't to say that it's somehow evil to use energy in buildings: of course it's not! Most everyone spends just about every minute of their lives in a building; we work, eat and sleep as well as worship in them, and these are all things that are worth doing, and therefore worth spending some resources on!

What we *don't* want to do is WASTE energy, and we're currently guilty of that on a massive scale. So, the question is, how can we cut out the waste?

As I've already intimated, when we look at it this way, we get to some really magical answers, where cutting energy waste actually *increases* our ability to use our buildings well, and protects them from damage too.

6.MEDIEVAL CHURCH INSIDE AND OUT

I'm going to focus on what everyone seems to assume to be the worst case – although I think you'll see that that's quite unfair – which is a medieval church in the countryside, with a tiny congregation and the occasional visitor, but with some really important and much-loved architecture and artifacts: wall paintings, stained glass, brasses, old wooden pews....

First thing to remember is that it's lasted for hundreds and hundreds of years, so it has already given great value from the energy originally put into its construction.

I'm often called into churches like this with the same question: "how do I heat my church?"

7.HOW DO I HEAT?

To that I always give the same answer…

8.CROSSED OUT!

…it's the wrong question to ask!

9.CROSSED OUT + HOW DO I GET THE CONDITIONS I NEED TO USE MY BUILDING WELL

What the PCC really WANTS to know is how they can make it possible to get better use out of their church?

That might be more people at Sunday worship, or being able to use the building for village festivals, or for a weekday morning creche or an afternoon seniors' tea group...

10.CHURCH USES + STEP 1: WORK OUT WHAT YOU"RE TRYING TO ACHIEVE

The first step is to understand what happens in all those uses, work out what is making things uncomfortable for the users; because the thing to aim for isn't actually "comfort" – everyone has a different idea about that anyway! – but getting rid of discomfort.

11.DISCOMFORT: THERMAL, LIGHT

You'll all know from modern heated spaces that you can have a high air temperature, but if you have a draught up the back of your neck, it is HORRID.

So this is where the users of the church hold the key. Not only do they know what they are doing, or want to do, in there; they also know what it FEELS like when they do it!

12. WHY DO WE FEEL THERMAL DISCOMFORT?

Where they might need some guidance, though, is in understanding exactly why they're feeling uncomfortable; because since we introduced central heating and electric light, and worst of all THERMOMETERS, we've become more and more divorced from how our bodies actually interact with the world around us.

13. CAUSES OF DISCOMFORT

Causes of discomfort that were obvious to our ancestors we've just forgotten about: and the biggest example of this is the understanding of why we feel cold when we stand on a stone floor, or sit next to a massive stone wall.

14. RADIANT HEAT LOSS

Even some heating engineers these days seem to think that, because we feel so cold, the room heat must somehow be going through the solid stone wall, but of course it's not that at all. It's just basic physics: we're warm and radiate a lot of heat; stone and brick and cement tend to absorb that heat from us. We're coming into equilibrium with each other, but the wall is MUCH more massive than we are, so we heat it up a little, and it cools us down a LOT.

15. HOOKS AND TAPESTRY

They knew all about this in the past: when I was studying wall-painting conservation, I was puzzled about why we'd find fictive tapestries painted on the wall, but on the same wall, hooks for real tapestries; and since the paint continued over the hooks, they seemed to be exactly the same age! Well, the answer's of course that the fabric acts as a barrier between you and the wall, stopping you losing your body heat.

16. BOLSOVER TAPESTRIES

In winter, the palaces put up tapestries, which they also used to cut draughts through doors; in summer, when they didn't need them, and the tapestries were at risk of condensation – and when a little radiant cooling might even be welcome! – they took them down and packed them away until autumn. And we know they did this from house records.

17. SHAKESPEARE AND PAINTED CLOTH

It wasn't just the palaces thinking about radiant heat loss, though, by any means. Tapestries were well beyond the reach of everyone but the extremely rich, but everybody else – and I do mean *everybody* – had painted cloths that served the same purpose. That's why one of the most powerful guilds in London was the "painted cloth makers". In fact, painted cloths only began to disappear as fireplaces started to come into houses. This is much later than people generally think: really only the second half of the 17th century.

18.WOOD PANELLING

Wooden panels were used for much the same reason: wood doesn't transfer heat much at all.

19. BOX PEWS

So the box pews that they started taking out in the Victorian period, when they were adding coke stoves to churches, actually didn't just cut draughts: they also kept you from losing your body heat into the floor and walls.

They also gave some partitioning to the space, so you didn't need to try to make the whole building "comfortable".

20. GLASS SCREENS IN CHURCHES

It's currently very fashionable to think of partitioning with glass screens, and they can really help in some cases: but you do have to be aware that glass isn't like cloth or wood! It transfers heat instantly, and is very smooth; and those things together mean glass partitions can sometimes *increase* local draughts. You have to approach it cautiously, and you

might even want to do some tests and mock-ups of partitions with something like cardboard before committing yourselves to any serious building work.

21. CURTAINS

The traditional approach was to partition with curtains, and that does work pretty well; and it has the added benefit of being flexible. It's what bed curtains were all about, too, of course. Red velvet can also make people feel psychologically warmer than glass, which is not to be sneezed at! Quartz heaters give off just as much heat if they are white, but people FEEL warmer if they are red! There's a lot of new radiant panels coming on to the market that are disguised as mirrors or photographs; but perhaps it needs to be a photograph of a fireplace to get the maximum impact!

22. CLOTHING

Clothing's also a help, of course: we shouldn't expect our big buildings to be as comfortable as our little cars, and expect to dress in t-shirts in the middle of winter. That's *really* wasteful!

23. HEATING SYSTEMS

So, onto actual heating systems, which are very much the main user of energy in churches. How can we make the heating work FOR us, instead of AGAINST us? Because if you get it wrong, you can cause all sorts of problems like condensation, which can play merry havoc with your fabric and fittings, and can even cause wetting of walls under windows, or corrosion of lead roofs.

24. WINDOW CONDENSATION, LEAD CORROSION

25. THERMAL IMAGE OF WET WALL

This is important for heat loss, too: because the only time a thick solid wall is going to transfer heat is when it's wet!

26.***STEP 2: MAINTAIN THE FABRIC***

So there's the next step towards not wasting energy: fix the leaks!

27. PEterborough IR

Stoves never did what people hoped they would in churches, and we still have this problem with our heating systems. Hot air rises, so the moment you get the stove or the radiator going, you pull the cold air under the door, and you can get really howling gales – upon which people turn the heat up further, and make it worse!

28. EAST WINDOW (NOT THE CHURCH IN THE ANECDOTE!)

My favourite story comes from the wonderful Bill Bordass. A parish called him up to say that their new heating system was failing, and always about ½ hour into the service. Bill found the heating was working perfectly well, but they'd installed a radiator under the great east window to keep the vicar warm during the service. When they started the system going on Sunday morning, the heat from this pushed up the chilled air in front of window, causing an inversion layer that drifted out across the church, until after a couple of hours turbulence finally broke it up, casting the cold air down on the heads of the congregation!

So, you can see you have to approach heating with caution: what do you really *need* it to do?

It might be quite a number of different things at different times, in which case it's important that whatever system you use is flexible.

29. ***STEP 3: HEAT THE PEOPLE***

The great rule here is *"heat the people, not the fabric."*

I think that's true for ANY kind of building, but it's particularly true if you're dealing with a building in which you could never get the air temperature up, except by bunging in continual energy in high quantities... and that's bad for our churches as well as for our environment.

What works will depend on the specific church: on the space you're using, and the type and condition of the fabric, and the location, and where the people are in the building, and so on:

30. BUILDING PERFORMANCE TRIANGLE

If you want to get it right, you have to think holistically, of the "building performance triangle".

31. BPT TRIPOD 1

You can't think of any one part of this in isolation from the others: it's probably a tripod rather than a triangle, in other words! If the legs aren't even, it falls over.

32. BPT TRIPOD 2

You can pick up ideas from other buildings, but if your conditions aren't the same, they might do more harm than good: it's really specific. So, for instance, underfloor heating can be really effective in a cathedral or a large Victorian church, where it stops you losing your heat into the vast expanse of floor all around you, but it won't work in a small parish church, where that's not the problem. There, you might be looking at something much more direct and localised, like under-pew heating or heated mats.

33. ***STEP 4: THINK LOCALISED, FLEXIBLE SOLUTIONS***

34. MANCHESTER CATHEDRAL

It's interesting, by the way, that if you talk to your average heating engineer, they'll tend to not encourage underfloor heating even for cathedrals, because they say it's not strong enough to heat the air: but of course that's not what we're trying to DO!

If we turn for a moment back to the other use of energy, lighting, the same is true: you need to think through what you really need the lighting to DO, and then do exactly what makes that possible – not more!

35. HEATING THE PEOPLE

And it's really important not to think just about the mechanics, but about *how* the heating is run. If you just space heat on Sunday morning, then you'll pull water out from the fabric and fittings, and as soon as you turn the heating off again all that extra water is going to condense onto your windows and brasses and the underside of your roof.

But very few churches can or should run their heating all the time; again, it's about how you heat the *people*, instead of trying to heat the air.

We do have a helping hand with the pre-Victorian buildings, which were constructed to work when energy was expensive.

If you take the time to look at the advantages as well as disadvantages of *any* building, what you find might surprise you!

36. ***STEPS TOGETHER***

So, how do you go about bringing all these steps together?

It obviously takes a lot of collaboration between the PCC and the vicar and the other users, and the architect or surveyor, and the heating engineer, and the heating installer.

37. ASK QUESTIONS!

You've got to be questioning clients; first questioning *yourself* about what exactly what it is you're trying to do, and then asking the technical people exactly what *they're* planning to do to achieve that.

38. RADIANT HEATER & HEXHAM HABIT

Energy matters, so don't be afraid to hunt laterally for solutions. Perhaps for play group, special clothing, or maybe an electric carpet! The picture shows the "Hexham Habit", developed for school visitors. It proved so popular that they started selling them in the gift shop; and eventually by popular demand they had to start making adult sizes. It's clear that medieval monks knew a thing or two about comfort…

If you're just heating on Sunday, it's really localised heating and flexibility that you will want to be looking at. Electrical heating – which you'd be avoiding for energy reasons if it were your home – may actually be quite a good choice, especially if you have the chance to connect it to solar PV; even something like a radiant heater on a pole which you could wheel to the ends of just those pews where people are sitting to top off some under-pew heating. It may even be possible to take this further, and combine electrical heating with PV.

39. BUILDING PERFORMANCE TRIANGLE AGAIN

Every building will have its own set of possibilities as well as its own problems to solve. A church won't be the same as a home, but that doesn't mean that you can't use the same holistic approach in your houses too. It works everywhere! To make good energy decisions, you need to consider not just the up-front energy costs of anything you do, but the long-term energy input it would take. If you are thinking of making an alteration to the building, or adding in equipment, how

many years will it be before it requires replacement? How much repair and maintenance will be needed? Will it really save energy over the longer term?

40. TRIAGE (STOP LIGHT)

Good decision-making doesn't need great accuracy. It's usually enough to weigh energy costs in terms of a triage, when green are the "no-brainer" actions that use little or no energy. Many of these are behavioural, like wearing the right cloths for the season. Red are actions that use a great deal of energy to install or maintain, or risk damaging the building (problems like underside lead corrosion waste a lot of energy, and cost more energy to repair). Amber actions are less obvious, and may need you to look a little more closely at the numbers before you come to a decision.

41. TRIAGE (GREEN LIGHT)

Look closely at where you're using energy, and especially try to understand where it's being wasted. Decide what you NEED energy to do for you.

Then do the "green" things. Bring in the improvements that cut energy use without costing any energy to do, like somehow bringing people closer together in fewer pews, and away from the walls instead of spreading right across the church (it's really odd how people don't want to sit together in services)...

If you're thinking of reorganising to make the space more flexible, I would suggest you think long and hard before you get rid of ALL your pews; it's so much harder to make people comfortable in loose chairs, especially for services. Maybe you might want to keep just enough pew space at the front to handle your day-to-day worship.

42. TRIAGE (AMBER LIGHT)

When you'd completed your "greens", you can consider some "amber" actions: things that might take some energy to do, but aren't risky and could pay great returns (like adding demountable draught screens).

43. TRIAGE (RED LIGHT)

And then, but ONLY if you can't still get close to where you need to be in terms of energy use, you can start thinking about the "red" things: for example insulating the roof.

44. TABLE OF GREEN, AMBER OPTIONS

There's a whole bag of tricks out there to use, some still very familiar and some that we have almost forgotten. Every building is different.

45. MR WOODHOUSE

As a final comment: do think of all the ways of reducing the discomfort you've identified, before you think of redesigning your heating system. If you've dealt with the sources of discomfort first, the heating won't have to do so much heavy lifting, which means the systems can be smaller and much more efficient. You will also have a much better idea of how to make your church work for its users. The best "eco" church will be one that is much used and much loved: a warm welcome indeed!