BISHOP'S CASTLE COMMUNITY HEAT & WIND PROJECT
AN INTRODUCTORY GUIDE

1, THE REASONS WHY

Why we need a renewable energy Heat Network for Bishop's Castle
Heating our homes with oil, coal and wood will soon become a thing of the past, because of pressure to move to renewable fuels in order to combat climate change. Over the coming decade, the government will make it increasingly difficult to buy replacement oil boilers for homes. Also, pollution from wood stoves causes air quality issues.
Electric heating is expensive, however it can be made more cost-effective by running a heat pump with electricity. Individual heat pumps (one per home) can work well, but they are expensive to install and do not suit many older properties typical to Bishop's Castle. They usually require replacing the radiators and associated piping and may only be viable with additional home insulation.

The Heat Network scheme is an alternative that is tailored specifically to the needs of Bishop's Castle.
It is designed for the types of homes typical in Bishop's Castle, and will be a valuable community asset. It will use centralised heat pumps powered by renewable energy, and will help to protect users from future price shocks and the inevitable price rise of oil-based heating. It will also give you confidence in the resilience of your heating supply. Large reductions to BC's very high carbon footprint will result from its use. As well as householders, the scheme will also support SpArC and the Community College plus several of the Town's businesses.
The network will include heat pumps, a wind turbine, solar panels, thermal storage and oil-fired back up boilers, see Section4 for full details.

There are many benefits to the Town's Householders, Businesses and the wider Community
Unless you're just burning wood, whichever form of heating you currently use you'll realise that somewhere along the line is a big corporation, probably multinational, making substantial profits from you: whether they are oil producers and refiners or electricity companies. This scheme is your chance to use a supplier that will be **owned by the local community and managed for its benefit.**

If this scheme progresses our Community would benefit through:-

a) **Consistent and predictable cost of heating over the coming years**
   - Costs per kWh similar to today's oil price, with savings growing over time as oil prices increase in the coming years: so you'll get protection from future fossil fuel price shocks

b) **A more reliable and simpler heating system for your home**
   - No more boiler services and breakdowns, just local maintenance support
   - The ability to do away with oil tanks and boilers
   - Better protection against frost damage
   - Hot Water cylinders and header tanks can be removed, freeing-up space
   - No need to find an alternative heating source when oil boilers become unavailable
   - Guidance on fitting energy efficiency measures.

c) **Massively reduced impact on our local environment and on climate change**
   - A huge reduction in the Town's very high carbon footprint. For those joining the network it **will reduce the heating component (the biggest culprit) of their footprint by around 85%**. That's roughly equivalent in size to **a saving of whole of the household's footprint due to car or van use .** This will be an important step in mitigating the climate and bio-diversity crisis, along with improved air quality for health.

d) **Improved community resilience and a stronger, more independent Bishop's Castle**
   - Reduced dependency on imported oil and LPG, and on national energy infrastructure
   - Support for local businesses, including the College and SpArC
   - Community control on re-investing any surpluses locally, and the opportunity for local people to invest in the Network's Community Benefit Society
   - Generation of lots of excellent publicity for the Town, in addition to the heat!

The BC heat network is a good example of a creative solution for sustainability.
We aim to build a powerful turbine to harvest energy from the wind that is strongest on exposed hilltops. The wind is strongest and most consistent in the winter, which is when we most need to heat our homes: this is unlike energy from PV solar panels, which is most feeble in the dark winter months. But the electricity that's generated by the wind turbine is still too expensive to turn into home heating. So, we need to be more creative by "multiplying" the electrical energy into about 3-4x as much heat energy using a "heat pump". (A fridge is a form of heat pump, though we use a fridge to create cooling, not heating.) The BC heat pump system, powered by the wind-generated energy, will suck (plentiful) heat energy out of the air, and push it into hot water that circulates into our homes to keep them warm. Our scheme is being seen as a model for sustainable home energy for rural areas off the gas grid.

This is your chance to be part of that highly creative, sustainable energy solution! We can keep our homes warm at a realistic cost, *without* destroying our grandchildren's futures through climate change.

2, COSTS TO USERS OF THE NETWORK

The cost of a unit of heat will be at least as cheap as now, and be protected from future oil-price rises.
The intention is for prices to be similar to current oil-heating prices, and to rise more slowly than oil prices. So, heating costs will be protected against energy price spikes caused by variations in the global price of oil. Owning our own Wind Turbine and solar panels gives us this protection, and it will also help with more predictable budgeting.

No installation charge to switch in to the system
There are no installation costs for those who join at the start, and they will benefit from no longer needing to pay for replacement or repair of their own boiler. If you decide to join, later, there is likely to be an installation charge, because we will need to do extra infrastructure work.

A pricing structure similar to most energy networks
The householder will pay a standing charge, plus a metered cost for heat usage: this is similar to those charges paid for electricity or gas systems. The standing charge will, over time, pay for the maintenance and replacement every 20 years of the heat interface unit (HIU) that connects the Heat Network to the network properties' existing heating and hot water system. It replaces the householder's present costs of maintaining and replacing their own heating system.

Low-cost, sustainable heat: but no need to change your radiators, no requirements to insulate your home in order to join, and a Network team that keeps your heating running.
The system will be designed to provide heat at high temperature, so you won't have to upgrade your existing radiators or piping (unlike for most current private heat pump systems). Your current boiler will be replaced free-of-charge by a similar-looking heat interface unit (HIU). Though we will be encouraging and helping people to improve their properties' thermal performance, it will not be a requirement of joining the network. The system will be maintained and serviced centrally and will have back-up systems. Any problems experienced in connected properties will be dealt with by the Heat Network's maintenance team. You will have heat on demand for hot water too, so you won't need a hot water cylinder either. And you can get rid of the large and unsightly oil tank!

3, WHO CAN JOIN THE NETWORK?

Most of the densely-housed areas of town will be eligible to have heat supplied by the network. (See Figure 2 for the Town's Heat Network boundary.) The key factor in determining where the network reaches will be the financial viability of a network branch. We need a lot of the buildings in any given street to join the network, to make pipework installation in that street worthwhile. 'Expressions of Interest' are being circulated to home & business owners in late 2024, and the responses will dictate where the network runs. We certainly plan to include listed buildings, since they are key targets for more sustainable heat, and planning permission will not be needed unless they require structural alterations. Businesses also will be able to join.
In practice the network will be able to pump hot water to any part of the town, though we are targeting the centre of the town initially. Much of the town's modern social housing already benefits from ground or air-source heat pumps, so that will not need to be part of the network.

HOW THE SYSTEM WORKS

The System brings together several different components to maximize the carbon reduction at the same time as minimizing costs to users.
(See Figure 3) The system's key components are**:-**

a) **A heat pump** (roughly 750 kW capability). Most suited to our system and budget is an Air-Source Heat Pump (ASHP). The heat pump will be housed in an Energy Centre located near SpArC. The heat pump cuts the cost of heat energy dramatically, compared to, for example direct electrical heating.

b) **A wind turbine (**roughly 1 MW maximum capacity**)** located to the South-East of town. The wind turbine provides electricity to drive the heat pump, avoiding the need for us to buy expensive grid electricity, and enabling us to keep a lid on electricity costs. The turbine will create very little noise or visual impact, and will be located over half a kilometre from the nearest property. We are, of course, taking all the precautions to avoid disturbing wildlife, or affecting local biodiversity and habitats. It is all subject to Planning controls.

c) **The pipe network delivering heat to homes.** This will be buried underground, and will be a significant undertaking (yes, roads will need to be dug up). The pipe size will depend on the heat load and will get smaller as it branches off to streets and homes. The hot water in the heat network pipes will be re-circulated, and will transfer its heat via a heat exchanger (HIU) located in each home so the water in your radiator system will be separate from the water in the main heat network. The HIU will be the size and at the location of a typical boiler, and deliver hot water to the home radiators in the same way.

d) **A photovoltaic (solar panel) array** of capacity 250-500 kW: this will help when the wind is not blowing. The location is not yet decided.

e) **A thermal store:** these are big insulated tanks of water which get hot, located near the heat pumps at the Energy Centre. When there is more wind or solar power than needed by the community demand, the excess energy is diverted into the thermal store. It can be stored there for several days, until when the incoming wind or solar power drops below demand: the demand gap can then be plugged by taking heat out of the thermal store. It enables us to keep running without resorting to expensive grid electricity.

Project timescales and size

Like all local renewable energy projects there are many hurdles to be cleared before work can begin. The project has been running since August 2021 and, in 2024, we are now in Stage 2, during which we are carrying out ecology and technical studies in order to submit a planning application in late 2024.
The earliest the project could commence would be late 2026.
We need a minimum of 100 homes to make the Network viable, but we are hoping the number will eventually be nearer 250. Because of economies of scale, more homes will make the cost for each participant lower. Of course, there will be some carbon cost of manufacturing and installing this big system, but we expect that to be "paid back" within the first 4 years.

5, HOW THE SYSTEM WILL BE FUNDED, AND WHO HAS CONTROL

The Network will be funded by a mixture of grants and private investment

The total capital cost is likely to be in the range of £10m. Capital funding for the network itself will come from a mixture of Government grants (e.g. the *Green Heat Network Fund),* institutional investors (such as a bank or pension fund) and a share offer. We don't know the mixture until the new Government's green energy policies are clearer. Investors will have their capital paid back slowly over a long timescale: in the meantime they will be paid a dividend on their outstanding investment of about 4% per year. It is likely that such payback terms will interest investors who have a personal interest or conviction in sustainability and energy transition.

Funding for the feasibility studies to date has been obtained by *Shropshire & Telford Community Energy* [STCE] from *the Community Energy Fund* run by the *Midlands Net Zero Hub*.

We are aiming for the system to be owned and run by a Community Benefit Society (CBS).

STCE have agreed to continue leading on the next stage of the project but will look to set up a separate company when we get to raising the capital required. The CBS will have significant support from others with considerable experience in Community Energy and heating, including *Sharenergy*, *Carbon Alternatives* and *STCE,* and will employ experienced contractors to install and maintain the network. Profits from the network, after costs and returns to investors, will be used for the benefit of the Bishop's Castle Community.
A CBS cannot be sold out to a private or public company: it must be retained in community control.

6, WHY ALL THE FUSS ABOUT SUSTAINABILITY, ANYWAY?

Why the world needs more sustainable energy: it's not just a passing trend, or fake news.

To understand why we need it, let's step back into pre-history, even before the dinosaurs!

Hundreds of millions of years ago the world was a very different place: there was nearly 20 times as much CO_2 in the atmosphere as now, causing the climate to be inhospitable to the way humans later evolved. Our part of the world was much hotter, covered in swamps and vegetation. The sun's energy

was absorbed by plants which they used to grow: during millions of years, huge quantities of solar energy were used by these plants to suck up atmospheric Co2 and build it into organic molecules, locked up into plant material. Over a period of about 60 million years, this process cut atmospheric CO2 to a quarter of its original level, allowing the planet to become cooler and closer to what it was like when we humans evolved.

The carbon and its solar-derived energy were buried in organic deposits, and these in time turned into coal and the soup of oil and gas that we drill for today and that we call "fossil fuels". The coal, oil and gas are rich in energy and convenient to burn for fuel. When we do so we are releasing millions of years of energy from the sun concentrated into these fossil fuels. Very handy!

But there are two big problems with fossil fuels. The first is an economic and practical one: because we are using them so fast, they are going to run out! If not in the next few decades, then probably in the next generation or two. We'll first see this as gradual price rises, due to decreasing stocks and increasing cost of extraction: and we expect to see this happening in the next decade or so. So, we need to find alternatives to fossil fuels and invest in them now to make them available to future generations.

The second problem is a side effect that is becoming more apparent every year: by burning these fossil fuels we also unlock the CO2 and throw it back into the atmosphere. We've been doing this for 150 years, and in this short time we've undone millions of years of the CO2 locking-up that was done for us by prehistoric plants. The atmospheric CO2 and other Green House Gasses (GHGs) such as Methane act like a 1-way mirror: they let the sun's energy in, but don't let much of it out. This causes more solar energy to be trapped in the atmosphere, warming the air.

This doesn't "just make slightly warmer days": we all know that the world has vast swirling weather systems that push wind, heat and water (in the form of clouds and rain) back and forth around the planet, driven by warmth in the air. So even 1°C of global warming is a huge amount of extra energy that can upset and re-direct global weather patterns: causing catastrophic climate change like sea-level rises, droughts, famines, plagues, violent storms, torrential downpours of rain or snow with resulting landslides mudslides and floods. You'll probably recognise these types of events from recent news. If we don't stop unpicking nature through burning these fossil fuels, we'll reshape our entire living planet to something very inhospitable.

To become more sustainable we need to reduce our greenhouse gas emissions, especially from heating which is our biggest personal contributor. Bishop's Castle in particular has a lot of very old buildings that are difficult to insulate further or retrofit with other new types of heat source. Our approach to this is to supply large quantities of *affordable* heat, through a system that requires minimal refit to these homes, while still being *sustainable* heat because of how we generate the energy.

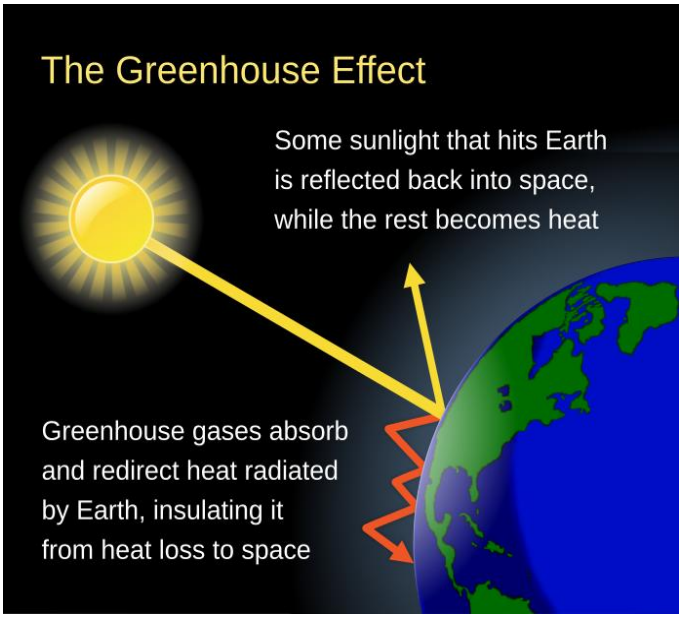

Figure 2: Heat Network Town Boundary

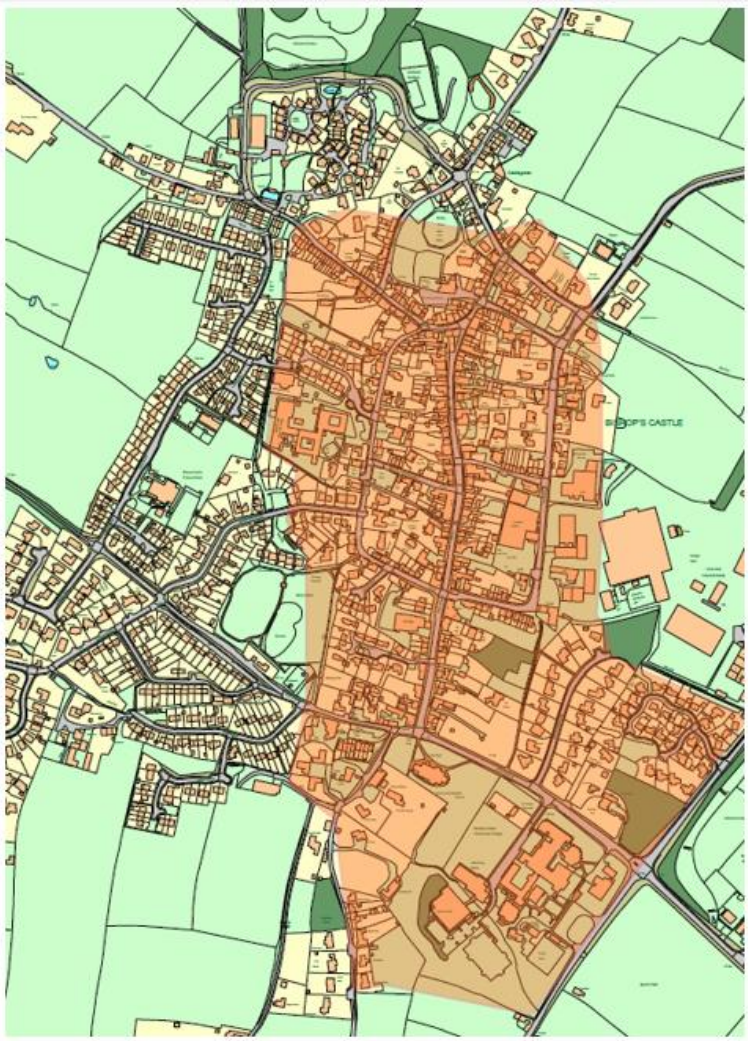

Figure 3: Heat Network Components