

BURITON'S CLIMATE PATHFINDER CASE STUDIES

It can be daunting trying to find your way around some of the new technologies and changes required for reducing your home's carbon footprint.

So having some neighbours who have been there and done it before you can be really helpful.

That's why Buriton Climate Care Group set up its **Climate Pathfinders** database - a list of people in the parish who have previously made climate-friendly changes and are willing to share their experiences with those thinking of taking similar steps.

The list includes people who have completed relatively low-cost measures like improving insulation through to those who have undertaken whole house retrofits or eco new builds.

The following case studies relate the experiences of some of our **Climate Pathfinders**.

If you would like to get in touch with one of our pathfinders to find out more about their experiences, please contact bernie.saunders@gmail.com.

Harnessing solar power, from David and Sue in Heatherfield

In December 2011 we had solar panels installed on our roof. We already had the usual energy-saving things in place - loft insulation, double glazing, cavity wall insulation - so it seemed like a logical next step to "go solar" and use some of the natural energy from the sun. This would reduce our reliance on mains electricity, mostly produced from fossil fuels and releasing carbon dioxide into the atmosphere.

We have a South-facing roof with a 30 degree slope which is nearly the ideal arrangement. The installation work was trouble-free and included the panels, wiring, a solar meter and an inverter.

Solar panels are used to convert the energy in natural daylight into electrical energy. The panels produce some electricity even on cloudy days but brighter light means more power, so the best results are on clear sunny days.

The electricity they produce is in the form of direct current, like that from a battery. It is passed through an inverter which converts it to alternating current, making it the same as mains electricity, so that it can be fed into the normal house wiring and to the mains supply system. The inverter is a wall-mounted box about the size of a small suitcase and is almost noiseless in operation.

As well as the environmental benefits, a government-sponsored scheme offers payments for the amount of electricity produced. These are tax free and increased yearly in line with the Consumer Prices Index. We take a reading from a dedicated solar meter every 3 months, send it in and payment is received soon after.

It was forecast these payments would equal the initial cost of the system in under 10 years. In our case it took seven years, since when all payments have been a net gain. Additionally, when the panels are producing electricity the amount that we take from the mains is reduced and so electricity bills are smaller.

Solar panels are expected to have a life of around 20 years. Inverters may need replacing before that, but ours is still going strong.

Retrofit on trial, from Bernie and Mary in Bones Lane

We didn't know it at the time but our journey towards changing our heating system to all electric began 10 years ago when we took advantage of Government grants to upgrade the fading insulation in our lofts.

Over the next couple of years we also replaced all our draughty old doors, our windows with double glazing and put solar panels on the roof. Heating bills dropped, comfort levels increased.

Then, two years ago, our energy supplier OVO, asked if we would join a Government-funded electrification of heat trial.

In short, get rid of our gas boiler and replace it with an electric-powered air source heat pump (ASHP) for free.

An ASHP works a bit like a fridge in reverse. Put simply, it takes the warmth from the outside air and compresses it, the process providing heat for the hot water and radiators. It can work effectively down to minus 20 degrees (they say!).

Our Edwardian brick semi was surveyed for suitability. Houses need to have low heat loss for ASHPs to work effectively and that's when we discovered those insulation and window replacements years earlier made our house suitable.

In June 2020, two fitters and two electricians fitted the new ASHP and hot water cylinder in just a few hours.

The people running the trial monitor our system for a year. They recently asked to extend that for another six months.

So, seven months on, what's the verdict?

- 1) We have plenty of hot water whenever we need it (and there was plenty even with six in the house over Christmas and New Year).
- 2) The heating has performed well on even the coldest days so far. The system is most efficient running 24/7 so the house is warm all the time.
- 3) The ASHP fan, outside, is quieter than the noise from our old gas boiler.
- 4) Costs are roughly comparable at the moment but we need to go through a full year cycle to know for sure. During the summer, heating the water was much less expensive than using gas. In winter, with electricity costing more than gas, unsurprisingly our overall energy costs are higher. (And energy prices are rising!)
- 5) Our household carbon footprint has dropped significantly, especially as we are on a green electricity plan.

It's been an interesting and fascinating journey to date.

ASHPs are not suitable for every home.

But our hope is that the data provided by our system, and the hundreds of others on the trial, will help convince the Government to provide grants and other incentives for the many, many thousands more that are needed across the country.

A climate friendly lifestyle, from Pippa in Bones Lane

We moved to our current property in 2010, which was the year of the 'Big Freeze' and unfortunately the building had been flooded due to freezing and thawing of the mains pipe.

We had previously retro-fitted our previous 1930s-style house with several energy saving features and we pretty much had to refit the 1970s bungalow from scratch due to water damage, so it made sense to invest in, and incorporate, as many eco-saving devices into the fabric of the house at the time.

Although there was a huge amount of damage, we tried to reuse and salvage anything we could such as the fitted wardrobes and units. The original wood floor was beyond saving, alas, so was replaced with a laminate made from compressed waste wood shavings - which is still going strong.

Some of the most energy saving features put in include triple glazing, Spacetherm insulation and an air-source heat pump. The latter replaced the old oil tank and literally sits neatly on the same pedestals but takes up less space. We don't have gas so this provides our central heating and tops up the hot water. We have a solar thermal panel which will heat the water up in the summer - with boost from the heat pump on grey days.

We have always chosen an energy provider which supplies from renewable sources so any energy needs which aren't met by our own solar PV array are ultimately provided by renewables feeding into the grid. Any excess solar that we make feeds back in to the grid and we get a payback via the Feed-In Tariff scheme.

On very cold days in winter, we have an energy efficient wood-burning stove to top up and we have often been able to make use of some free off-cuts of wood from various local sources and obviously there are plenty of local log merchants too.

We extended the property and were keen to optimise the insulation in walls and roof in the new wing. While extending, we had to do some landscaping in the garden so we made a decision to put in a rainwater harvesting system. This collects rainwater from our large roof surface and stores it in an underground tank which is then pumped up to supply water for our toilet flushing and also our washing machine. This, along with another few butts in the garden, also meets our watering needs for the veg patch in the garden and greenhouse.

This was perhaps one of the biggest features to put in - the ditch for the tank was about the size of a Mini Cooper - and we could only really have justified doing this as we had the diggers on site already. It saves a lot of water and will ultimately be saving on bills now that water is metered but this was not really put in with cost-savings in mind and, unlike with the solar panels, this would take a longer time to get any financial 'payback' for the water. It has very rarely ever run dry though and only did so in the extreme prolonged dry period in the summer of 2018.

In the garden we have measures to reduce waste and have multiple composting devices and wormeries and a 'hot bin'. Indeed we have zero food waste going into our domestic rubbish. We try to avoid packaging on food purchases and use the refill shops as much as we can.

Last year we finally had the decision to replace our car with an electric one made for us as our old diesels were no longer functional. Car journeys unfortunately are still something we have to make a lot of in our family as transport is limited in and out of the village and while some commutes can be done on a bike or bus, others can't. We decided to bite the bullet and got a second hand Leaf - which has a range of about 100 miles. It wouldn't make longer journeys practical but for all of the more local school runs and work journeys it is meeting all of our needs. We wouldn't look back to

having the diesel and having to fill up at the petrol station. It does mean having to plug in at home and so we had to have an EV charging point installed. But with solar panels supplying the electricity and off-road parking on the property, we didn't really have any excuse not to.

It is very complex trying to estimate how much money is being saved by all of the measures we have made - except to say that they are saving energy and we have been able to lower the thermostat so we are using less electricity and therefore must be spending less on it!

We were able to install things like the heat pump and the solar thermal system using grants such as the Renewable Heat Incentive and we are still getting payments for solar via the FITs scheme which is a significant saving. However, a lot of these things have become cheaper over time and so you'd be able to recover the cost of investing much more quickly these days.

Hopefully, by producing a lot of energy on site it will protect us from some of the fuel cost rises. We estimate that, allowing for the 'free energy' from solar, we are only spending about 35-40% of what we used to spend on running costs for the car. But most importantly we are significantly reducing carbon emissions and pollution.

Kicking the gas habit, from Greg in Bones Lane

When we moved into Grantchester House in 2013 - having not owned a house before and with another baby on the way - we didn't stop to think about heating or carbon emissions.

So I was shocked to learn later on that our two gas boilers and electricity usage were emitting up to nine tonnes of CO₂ a year (six from gas and three from electricity) - the equivalent of flying to the US and back every five weeks!

We decided to try to kick the gas habit when we got the roof replaced in 2020. Local roofer Tony Taylor added insulation wherever it was missing, including behind the hanging tiles outside our bathroom, and local builder Clive Thornton laid a foot-thick layer of sheeps wool insulation in the loft.

A Guildford-based firm, Green Square, installed a 16KW air source heat pump (leaving one of the gas boilers as a top-up), some bigger radiators and a new heating control system.

The heat pump cost £14k, of which we can get back up to £10k via the Renewable Heat Incentive. We bought a "Chimney Sheep" - a removable woollen plug for the fireplace that makes a difference out of all proportion to its £27.50 cost - and replaced some leaky windows and doors.

On the electricity side, we replaced halogen lightbulbs with LEDs and got Romsey-based firm AES to install a 2.8 kWp roof-integrated solar PV system, with red panels to match the roof tiles (Bisol Spectrum).

After a year, the house's energy use has fallen a third and CO₂ emissions are down to 4.3 tonnes from 6.6 tonnes the previous year. It's still higher than the national average of 2.9 but should fall to less than a tonne as the grid decarbonises in the years ahead.

Our 'Eco' home, from Kaaren in Dean Barn Lane

The features that define our house as being 'eco' are listed below.

Inevitably, some aspects of the 'eco' house work better than others in reducing our impact on the planet. We think good insulation is the most important in any building to minimise energy costs.

- Rammed earth chalk wall (materials locally sourced from the garden!) which acts as a good insulator and a thermal mass to help maintain a consistent heat throughout the house.
- Ground source heat pump for all the hot water and heating.
- A Sedum living roof.
- Extra insulation above the building regs standard.
- Good quality installation of window and doors that minimise heat loss.
- Simple but effective features include dual flush toilets and taps with reduced water flow options.
- Carefully balanced aerated sewage treatment plant.
- Rain water collection tank to water the garden.
- Wildlife garden with particular focus on pollinators.
- We even tried to up-cycle furniture where we could instead of buying new!

Eco living does not have to include lots of what we call, 'eco bling'.

Simple things like using less energy where you can, turning off lights, turning your heating down a degree, washing clothes less and at 30c.

The list is lengthy - anyone can make a difference with small changes!

Natural wool insulation, from Maggie and Ian at Tithe House

When we first moved to Buriton we had the opportunity to consider some small enhancements to the property to reduce our energy consumption.

Firstly, the house was constructed using the then state of the art insulation specifications.

Since then we have increased the specification in the double glazed windows and have introduced more insulation in the loft space. In particular, the loft insulation appeared to make a huge difference and although we have not tested 'before and after' we can see that the frost pattern on the roof is staying for longer and is much more evenly spread. We used natural wool and found it both very effective and easy to handle.

Secondly, we installed a large tank, 11,000 litres, underground which is connected to all the down pipes from the roof, thus giving us a really good supply of rainwater. We do have to pump the water out of the tank so this reduces the overall climate benefit but it still gives a very useful supply of water over the summer for the garden. In some very dry years we do empty the tank before the next downpours fill it once again!

We hope this gives some inspiration of things that can be done to both save your own pockets and the planet.

High-tech new build, from Darren in Bones Lane

Our motivation for turning to climate friendly technology with our new-build home was to inspire our children and support the local community by adding to the number of homes in the village already leading the way with renewable energies.

When we first applied to the planning authorities in 2016 we were told that we had to have a minimum of 10% renewable energies on any new-build property. I found this low level of 10% incredibly surprising and disappointing as surely, with all new homes, the aim should be to get as close to 100% renewable energy as practically possible.

Our new-build project took three years to design and around 18 months to build and we finally moved in at the start of November 2018.

Our renewable energy systems include an air source heat pump, recessed solar panels, an electric car charging point and LED sustainable lighting throughout the house. We also wanted to install an energy storing battery for our home, but due to budget constraints we have had to hold off on this so far.

We employed Pegasus Builders, a local building company, to build our home and manage the project. Based on their previous experience they appointed ECS, a local plumbing company, to install the air source heating. For the solar panels we found a company called C2 Renewable Solutions Solar, based in Southampton, who both supplied and installed the panels and we were recommended Mr Charger to install the car charging point.

The installation of the air source heat pump was very easy on the new build, with the fan at the rear of the house and the pump itself under the staircase. The outside air fan at the rear of the house does make a humming noise, which will increase or decrease in volume depending upon how much the system is being used. The noise tends to be more noticeable in the winter even with the windows closed, when the heating is running for longer periods but also occasionally in the summer, when the windows are more likely to be open.

The noise of the air source heat pump is something which has taken us time to get used to, however there may be more improvements we can make in the future, such as housing the fan to minimise the noise.

As we are in a conservation area, planning requirements suggested the use of wooden windows, which we have unfortunately found to be extremely inefficient with regards to heat and sound, as well as requiring greater maintenance, so this is one area of the house we are extremely disappointed with, as we feel it's working against our aims for energy optimisation and if we had the funds, we would replace them all with aluminium to match our bifold doors.

With regards to the solar panels, we were advised by planning not to have these as our plot was situated in the conservation area and panels could be aesthetically frowned upon. While the roof tiles were being laid however (to our south-facing, sun-trap roof) we decided to go back to the council to try to get permission.

The tiling was put on hold for eight weeks while we quickly submitted a planning application for the solar panels. As the area of roof in question had not yet been tiled, we were able to propose recessed solar panels, which would minimise the visual impact. Thankfully, common sense prevailed and planning permission for the panels was granted and we were able to re-commence the build. Personally I find it incomprehensible that not only could the local planners refuse any type of solar panel, but that their installation wasn't a mandatory requirement from the start.

All our home systems run on app-based 'smart home' technology, which has allowed us to configure zones and rooms with different temperatures and lighting set-ups, depending on their usage, time of day and time of year. The solar panels also run from an app where you can see exactly how many kW they are generating in real-time and the culmination of how much energy is generated a day, a month and a year. From our experience, we expect to generate a maximum of 24kW on a very sunny summer's day but on a winter's day between zero and 2kW.

The car charger recognises the car as soon as it is plugged in and is configured to charge at the most cost-effective time of day/night. We have found the use of an electric car to be extremely efficient. However, it is essential to plan longer journeys in advance, factoring in where and when stopping to charge the car might be needed.

Since moving into our smart home, with all this wonderful renewable technology, ironically our electricity bills have been much higher than we had anticipated and advised by the professionals. The air source heat pump seems to consume a high level of electricity, based on our house and usage. However, we've found it to be one of the best things about our home. The underfloor heating and radiators in the bedrooms are extremely consistent throughout the year and when combined with the latest technology in insulation and wall structures, result in a very warm, efficient home ... despite the disappointing windows!

The heating system including installation required a sizeable upfront cost and we've found the promoted government grants to be very complex and nowhere near as advantageous as originally anticipated.

The car charger obviously required an initial installation cost, but was supplemented with a very simple energy grant of around 30% of the costs.

The lighting system has been excellent and after three years we've yet to replace a bulb!

With regards to the solar panels, in hindsight we should have installed more panels as the current volume of electricity generated by the ones we have isn't comparable to our consumption. We also underestimated the size of hot water tank needed for our family of five.

The experience of sourcing all this technology is very interesting and it was great fun visiting all the exhibitions around the country seeing all the latest technologies but also very confusing, so you have to put your trust in the professionals.

We could have saved money by looking around more but we generally end up going with a supplier that we get on with and who had good customer skills, rather than the lowest price and that has worked very well for getting a good personal service. The installations went very well other than waiting for local planning for the solar. Living in the house with all this technology and renewable systems for three years now has been a bit disappointing with the lack of solar energy generated compared to our consumption, coupled with the high electricity cost to run the air source heating.

The paperwork for the government grant that we eventually claimed for the air source heating system was very confusing, difficult and time consuming to complete retrospectively. It took nine months to start claiming and we receive a small payment every quarter over the next seven years, so for anyone who doesn't have the funds available to do a renewable installation it is impossible.

Switching to an electric vehicle, from Michael on The Causeway

We've owned a Nissan Leaf, a medium-sized hatchback electric vehicle (EV) for 18 months and have found it to be a good fit for our family requirements.

Its 40kWh battery can achieve 150 miles on a full charge. However, this range can fall to 120 miles when driving at motorway speeds with the heat on.

We have installed a 6kW charger which makes for convenient and economic charging. I don't miss visiting the petrol station.

The EV is programmed to charge between 00.30 and 04.30am when the grid carbon intensity is at its lowest. This is due to a higher proportion of power generation from wind turbines and nuclear as gas turbines are ramped down to match low overnight demand. Our electricity tariff is reduced by two thirds during these hours, so night-time charging reduces the power bill.

The smooth and rapid acceleration provided by the electric motor makes for a good driving experience. Road tax is zero for an EV and when driving into central London there's no congestion charge to pay.

The UK has 28,663 public chargers. It's worth locating a fast charger and the app/website <https://www.zap-map.com> is a good resource. Having enough charge to proceed to the next charger is wise, in case the first is out of order or in use. Fortunately, I'm yet to be stranded with a flat battery.

Upfront costs are higher, but this is mitigated by lower running costs. Therefore EV ownership is suited to the driver with medium to high annual mileages. The same is true to offset the energy-intensive manufacture of the battery.

EVs produce zero tailpipe emissions, which reduces overall greenhouse gas emissions considerably in comparison to petrol or diesel and local air pollution is eliminated.

If you think your driving profile could suit an EV, I recommend further research and taking a test drive.