

Gregor heating and renewable energy notes for 'We Care and Repair'

Intro me

Renewable degree in 2007-2011, employed within PV sector for 18 months during PV boom and then got a company accredited for heat pumps- did lots research on standards and product.

Intro Gregor heating

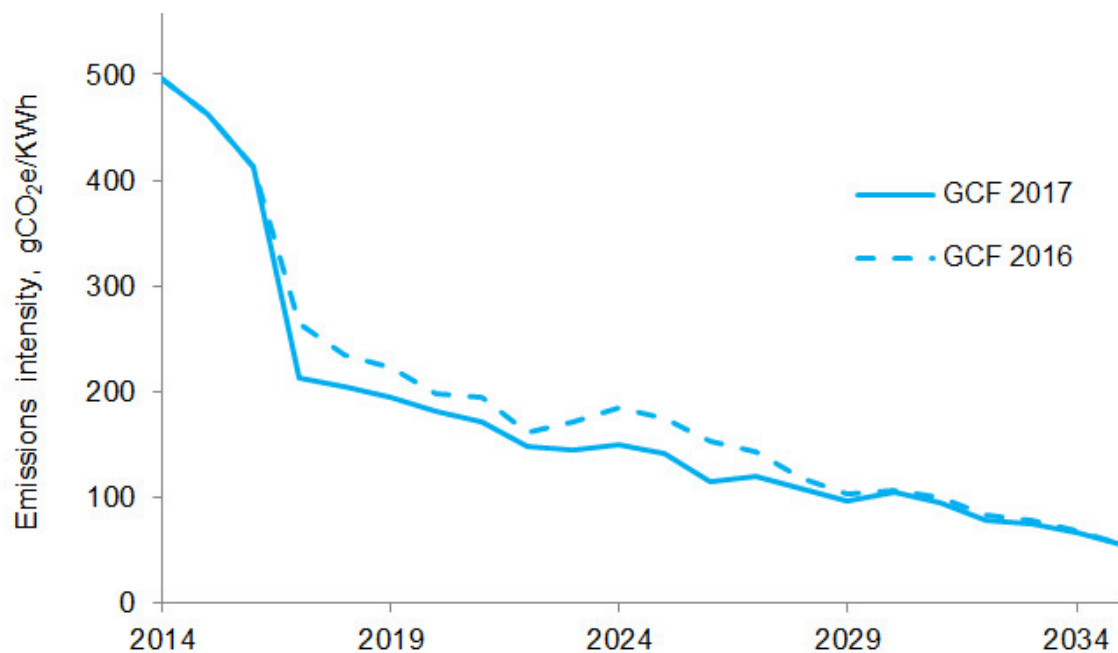
What is Renewable energy?

Energy created by naturally reoccurring resources all typically derived from solar energy. Challenges with renewable energy is intermittent and variability. Two types Renewable heat and renewable electricity. Renewable energy system needs to be well designed, good quality kit and installed properly (miss one of these and it wont work very well)- you also need to maintain it!

Renewable energy targets?

Tony Blair committed UK to EU binding targets 20/20- 20% from renewable energy and 20% drop in Carbon emissions based on 1990 levels. The renewable energy consisted of electricity, heat and transportation.

2019 UK produced around 54% of electricity from Low Carbon with approx. 37% from Renewable energy)(20% wind). The carbon content of electricity is now approx. 200gCO₂e/kwh (half the 2014 figure)



Grid Carbon Intensity falling steeply around 11 pm each night and remaining low until around 6 am each morning. This provides a major **Demand Side Response** opportunity for those using electric heating systems to raise the core temperature of buildings in the wee small hours because the lower carbon intensity is achieved when electricity demand is lowest and the Grid can agree lower prices when demand is low.

New targets in 2020

Changes to part L building regulations for new builds regarding energy efficiency and on site generation will be increased from current 10% to 20% onsite generation.

What is fuel poverty?

Until recently, the usual definition of fuel poverty was that a household was considered to be in fuel poverty when it needed to spend more than 10% of its income on fuel – or energy as it is often called.

This new definition states that a household is said to be in fuel poverty if:

They have required fuel costs that are above average (the national median level), and

Were they to spend that amount they would be left with a residual income below the official poverty line.

This also uses a fuel poverty gap - i.e. the difference between a household's 'modelled' (average) bill and what their bill would need to be for them to no longer be fuel poor.

Factors affecting fuel poverty:

The energy efficiency of the property (and therefore, the energy required to heat and power the home)

The cost of energy

Household income.

The number of households experiencing fuel poverty is rising at the moment for several reasons:

The cost of energy keeps increasing, which means we need to spend more of our income on paying these bills

Many of us live in draughty homes, from which lots of heat escapes, and rely on heating systems that are old and inefficient. And because we do not have much money to spare, it is difficult to make our homes more energy efficient, which would reduce our bills

The general cost of living is rising and this is also putting pressure on our finances so we have less money to go around.

What does Gregor heating install?

Solar PV system- This can generate electricity from solar cells mounted on a roof- from east through to west, approx. cost for 3-4kWp is £4000 which was around £15000 in 2011. The subsidies did what they were designed to do- create an industry and drive costs down. A solar PV system will generate around 800-900 kWh per kW peak per annum. Key design is shade analysis as all the panels are connected in series, shading one panel effects the whole string of panels that it is connected to. Sunpath diagrams should be created and modelling software used to calculate generation figures and savings. Minimal maintenance (clean twice a year) and system will last 20 years, slight degradation of 1% per year (varies by panel manufacturer)- performance guarantee states will have 80% performance in 20 years.

Solar Divertor systems- These work by diverting surplus PV energy into your domestic hot water cylinder via your electric immersion. We sell several units which cost around £400-£500. These measure your PV generation (example 3kW) and then subtract your consumption (example 1kW) and then divert the surplus (example 2kW)- this happens continuously and means your cylinder could be heated by free energy from March until September. No maintenance, last 5-10 years.

Solar thermal systems-This can generate up to 60% of your annual hot water demand but you need a good consistent demand- sports centres, hotels, camp sites- are ideal when the peak generation matches the peak demand. Cost for domestic system in region of £5k for collectors, controllers and new cylinder. Energy savings and Renewable Heat Incentive of up to £2500 and £2000 respectively over 7 years for a property with 4 occupants- this system ideally installed when re roofing work as access to roof would be available. Maintenance fluid change once every 5 years approx. £250.

Air Source heat pumps-Two main types Air to Water and Air to Air. Both can do heating and cooling and run from electricity. A heat pump works like a fridge in reverse, it moves energy from outside to inside. The energy in the air boils a liquid refrigerant and turns it into a gas- this gas is put through a compressor which raises the pressure and the temperature- this temperature is brought into the house through a heat exchanger. The gas is cooled and turns back into a liquid within the heat pump unit and the cycle continues. A heat pump uses electricity to make heat and typically produces 3 units of heat for 1 unit of electricity- this means it is around 300% efficient. This ratio is called Coefficient of Performance COP, and we now use a term called SCOP-Seasonal Coefficient of Performance.

We install two types of air to water heat pumps, **monobloc** which has all the heat pump components in a large cabinet outside your property (like an air conditioning unit) and **split** which have a remote evaporator unit which can be up to 20m from the house and then an indoor hydrobox unit. The outdoor unit and indoor unit are connected with two fridge pipes- one carrying gas and one carrying liquid refrigerant.

For a heat pump to work efficiently the flow temperature in the heating system should be around 45-50 degrees C and therefore the heat emitters for a retrofit system need to be upsized by around 2.5 times- this means longer or higher or wider radiators. The building should also have good levels of insulations, heat loss through windows and roof need to be dealt with.

Costs in region of £15k but subsidies available up to £9k for 4 bedroom property based on the Energy Performance Certificate which states the space heating kWh and domestic hot water kWh figures and capped at Heat load (20,000) x Tariff rate (11p/kWh) x SCOP (4). Maintenance annual service £200 and give the unit a clean.

We also install hybrid air to water systems which have a heat pump (8kW) and also an integrated combi boiler(27kW). These cost in the region of £8000, and the unit is programmed with gas and electric prices and the system knows the outdoor temp and the efficiency of the boiler and heat pump at different temperatures- when the COP of the heat pump falls below 2.8 the gas boiler runs alone- but sometimes both work together or the heat pump runs alone. You should save around 80% of the gas bill and can claim RHI by having a heat meter on the unit.

Sunamp thermal storage-This is a unique and innovative product using a complicated heat exchanger and a phase change material. It can be combined with renewable energy such as PV or Thermal and stored in a small compact unit- this can deliver heat to the building as well as hot water. Costs approx. £2500 for the smaller unit and reduces the need for G3 requirements for pressurised cylinders and annual servicing costs. No maintenance costs lasts 20 years or more no degradation.

Tesla battery-This can provide electricity storage powered from either solar or cheap rate electric. It can utilise future smart tariffs. It can store nearly 14kWh of electricity and can also provide back up power in the event of grid failure. Costs in region of £9k but prices falling for batteries rapidly. No maintenance lasts for 10 years or more- Tesla guarantee performance.

Car chargers-We install several types of car chargers one is called the myenergi zappi and it utilises spare solar energy if plugged in during the day when the PV array is generating- effectively powering the car from free energy. This costs in region of £1200 although a government grant can reclaim £500 if you have a qualifying vehicle. No maintenance required.

Available subsidies and grants

Renewable Heat Incentive- Domestic RHI ends next year April 2021- replaced we think by a scrappage scheme for fossil fuel boilers or maybe like France an Heat pump electricity tariff.

Solar PV smart export guarantee- 1pKWh -5.5kWh dependant on energy provider- need a smart meter.

OLEV vehicle charger grants for home and workplace