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Renewable Heating Systems
An Introduction to Heating Systems
Cernunnos Homes
Version 1.0

The set of documents under the "Renewable Heating Systems" header are intended to be an "A to Z" educational set of brochures to help you choose your heating system. Some parts may be outside of what you need and some details too technical, but you should find everything you need within these documents. They have been split into separate documents due to their size and range of topics covered.

We start by looking at how you measure and design heating systems suitable for your property. We then move onto traditional boiler systems that currently exist in the UK. Finally, and only then, do we start to look at renewable heating systems and how they can be integrated into your property. As ever at Cernunnos we have a very technical and financial viewpoint, and want to explain all the options through facts and figures rather than "heresy".

If you have further questions after reading this, then why not contact Cernunnos Homes on 0845 680 2183 or via info@cernunnos-homes.co.uk, and we will be more than happy to help. Alternatively you could arrange a free, no-obligation site survey. We don't have pushy sales people that turn up at your house. We have qualified technicians who are on hand to answer your questions and help you chose the right system for you.

Documents in this section include:

1. **Renewable Heating Systems: An Introduction to Heating Systems**
2. Renewable Heating Systems: Solar Thermal Systems
3. Renewable Heating Systems: Ground Source Heat Pumps
4. Renewable Heating Systems: Air Source Heat Pumps
5. Renewable Heating Systems: Biomass boilers and Log burners
6. Renewable Heating Systems: The next generation – Solar Thermal with ASHP
7. Renewable Heating Systems: The Renewable Heat Incentive
8. Renewable Heating Systems: Commercial Heating Systems
9. Renewable Heating Systems: Community Heating Systems
10. Renewable Heating Systems: Swimming Pools

Introduction:

Renewable Electricity systems, such as Solar PV, are much simpler compared to heating systems. For example, heating systems must be designed specifically for the property it is to be installed within, whereas with electrical systems you can easily over generate power and simply supply this excess power to the grid who then distributes it to those that have excess electricity demand (and vice versa, if you don't generate enough power you can simply pull extra in from the grid). This cannot be done for heating as it cannot be transported, and thus excess heat must be "dumped" (i.e. the building is cooled by simply opening the window etc). Heat dumping can be a very serious matter as an incentive scheme such as the FiT, can and would incentivize consumers to pursue this action. Additionally, you do not want a heating system that is too small for your property as then you would be very cold and cannot easily import heat from another source.

Correctly sized boilers/heating systems are extremely important as they run more efficiently and are cheaper to install. A boiler or heating system that is too small will have to work overtime to get the property to the desired temperature. This will be very costly to run as the efficiency of the boiler is decreased. Meanwhile, a boiler that is oversized will be more expensive to purchase and install compared to a correctly sized boiler. Additionally, a boiler working at only 70 or 80% of capacity will be running below peak efficiency levels.

Before we start to look at Renewable Heating Systems, we must first learn about how traditional heating systems work.

1. Defining Heat

We all know what heat is, but for properties we have two very different types of heat:

- <u>Space heating</u>: the heat that is generated to make us/a property feel warm
- <u>Domestic Hot Water (DHW) heating</u>: heating required to give us hot water

Both are very different types of heating requirement. However, as you will learn they both can come from the same source. The one that requires the most energy to satisfy the heating demand is "Space Heating" and this is what we shall look at first.

2. Space Heating

The Space Heating requirements for a room/property should match the "Heat Loss" from the room or property. That is, the heat requirement of a room/property is simply how much heat escapes from that room or property. Once you know the Heat Loss you can then use this figure to decide what boiler size you need.

There are two types of Heat Loss from a room:

a. Fabric Heat Loss: Where a temperature difference occurs between two separated areas, heat will naturally flow from the hotter area to the cooler area. These heat flow losses will occur naturally through floors, walls, windows, roofs and even between two rooms that have differing temperatures. For ease of calculation, these heat flow losses are assumed to be at a uniform rate through each surface, and are calculated by:

   Fabric Heat Loss = Surface Area (m2) * Temperature Difference (Celsius) * U Value

   The U value is the "heat transfer co-efficient" of a specific material and is measured in watts per square meter (Wm2). It basically measures how quickly heat escapes through a specific material. The calculations of the U value are quite complex, and outside of the scope of this document. Most U values are given on manufacturer's websites or tables from the Energy Savings Trust.

b. Ventilation Heat Loss: this is heat loss caused by air flowing through the room or building. They are quoted in "air changes per hour", i.e. the volume of air flowing through the room in one hour, divided by the volume of the room itself and the Ventilation heat loss is calculated by:

Ventilation Heat Loss =

Room Volume (m3) * Air Change Rate * Temperature Diff * Ventilation Factor (w/m3 oC)

The Ventilation Factor is taken as the specific heat factor for air, and is a constant factor of 0.33. It can be calculated as:

Vent Factor =

[Specific Heat Capacity of Air * 1000 (to convert from kJ to Joules) * Air density]

/

3600 (to convert from hours to seconds)

Vent Factor = (1.01 * 1000 * 1.2)/(3600)

Vent Factor = 0.34

Thus, the 3 considerations when thinking about Heat Loss are:

- The desired room temperature
- The outside temperature (at its worst case)
- The Ventilation rate of the room

The minimum design temperatures and air change rates required by BS 5449 are given for each room as being:

Room	Temperature (Celsius)	Air Change
Lounge Room	21	1.50
Living Room	21	1.50
Dining Room	21	1.50
Kitchen	18	2.00
Breakfast Room	21	2.00
Kitchen/Breakfast Room	21	2.00
Hall	18	2.00
Cloakroom	18	2.00
Toilet	18	2.00
Utility Room	18	1.50
Study	21	1.50
Games Room	21	1.50
Bedroom	18	1.00
Bedroom/en Suite	18	2.00
Bedsitting	21	1.50
Bedroom/Study	21	1.50
Landing	18	2.00
Bathroom	22	2.00
Dressing Room	21	1.50
Storeroom	16	1.00

Here, you can see that rooms are generally required to be heated to a level between 18 and 21 degrees Celsius, depending on their usage. The Air Flow figures are for modern buildings and when designing for older properties should be adjusted to take into account poor insulation of windows, floors and walls etc. Similarly, if there is an extractor fan in any of the rooms then (such as in a bathroom), then the air flow should be adjusted higher to compensate for this.

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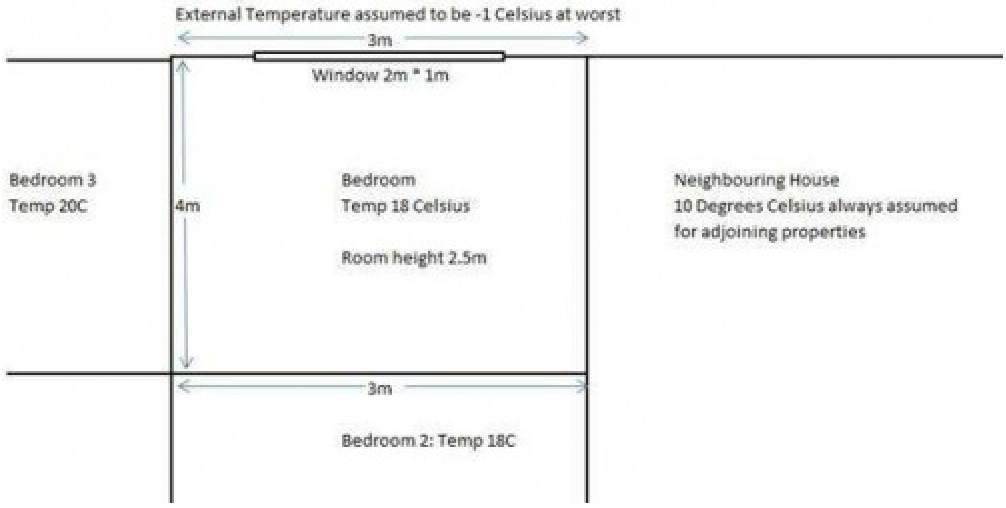
2.1 Calculating the Heat requirement for a single room:

Now, let's take a look at a working example for a bedroom in a house:



We are assuming that :

- the temperature of the room above (i.e. the roof) is -1 degree Celsius (as assumed for the outside temperature;
- the temperature of the room below is 21 degrees Celsius.

We can now get the heat loss for this room as being:

Fabric Heat Loss		Area m2		Temp Diff oC		U Value w/m2 oC		Heat Loss Watts
External Wall		5.50	*	19.00	*	0.92	=	96.14
Window		2.00	*	19.00	*	5.00	=	190.00
Neighbours Wall		10.00	*	8.00	*	2.10	=	168.00
Internal Wall 1		7.50	*	0.00	*	1.70	=	0.00
Internal Wall 2		10.00	*	-2.00	*	1.70	=	-34.00
Floor		12.00	*	-3.00	*	1.36	=	-48.96
Ceiling		12.00	*	19.00	*	0.34	=	77.52
								448.70
Ventilation Heat Loss								
Air Changes		Room Volume (m3)		Temp Diff (oC)		Vent Factor (W/m3 oC)		Heat Loss (Watts)
2.00	*	30.00	*	19.00	*	0.34	=	**387.60**

Thus, the total heat loss for the room would be 448.7 + 387.6 = 836.3 Watts. However, additional heating capacity will be needed in both the heating system and the boiler system to allow for extra demands for heating and to allow for heating up periods. This is usually taken as a 10% adjustment (upwards), although can be as much as 30% should a shorter "heat-up" period be required. Thus for this room, the heating system would be required to be a minimum of 919.93 Watts.

2.2 Calculating the heat requirement for a whole property

If we were to repeat the above process for the rest of the building, obtaining heat loss values for every single room of the house, we would get:

Room	Heat Loss	Adjustment 10%	Required Heating System Size per room
Lounge Room	2015	2217	2217
Living Room	2150	2365	2365
Dining Room	1050	1155	1155
Kitchen	400	440	440
Hall	1150	1265	1265
Cloakroom	150	165	165
Toilet	200	220	220
Utility Room	250	275	275
Study	400	440	440
Bedroom 1	919	1011	1011
Bedroom 2	873	960	960
Bedroom 3	745	820	820
Bedroom/en Suite	1346	1481	1481
Landing	950	1045	1045
Bathroom	278	306	306

Here we get a total heating requirement of 14,164 Watts and thus for this house we would need to choose the next largest boiler size up from this for the space heating requirements, i.e. 15kWp.

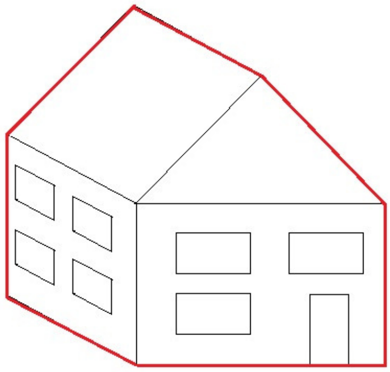
However, for a property we tend to use a more simple process that looks at the bigger picture. In the heating world, radiators are sized per room whilst boilers tend to be sized to the house!

One such method is the "The Whole House Boiler Sizing Method" from the Energy Saving Trust. This is a simple and easy way to correctly size a boiler for a house. This method should not be used for combi-boilers, and the U values used are generalised for the UK, meaning that older houses will need to use a more detailed calculation, as expressed above.

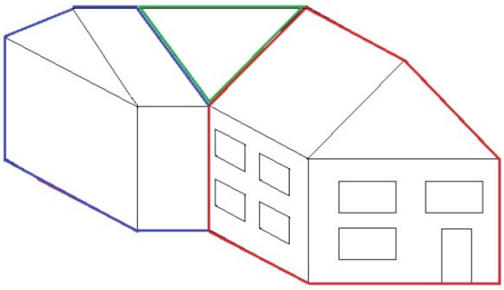
The assumptions used are:

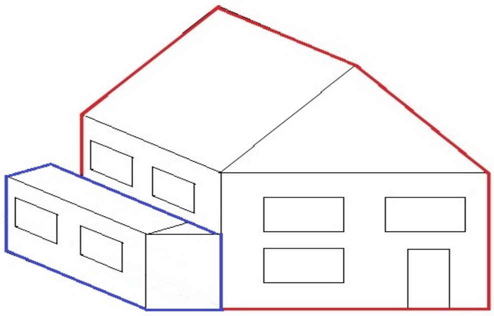
- 19.2 degrees Celsius is required for the internal temperature
- External temperatures depend on the property location and factored to reflect as such
- 10% allowance for intermittent heating (included in the location factor)
- 5% allowance for pipe losses (included in the location factor)
- Ventilation rate of 0.76 air changes per hour

In this method we split a property into rectangles and measure the external wall lengths. For a simple property such as the one below this can be very straight forward:



For more complicated structures we must separate the building into rectangles and create a calculation for each (similarly for extensions and conservatories we separate them and do a separate calculation):





Once we have the measurements we then determine what type of property we are dealing with (detached house, semi-detached, mid terrace or flat); the properties location in the UK; the Window type; the floor type; the wall insulation levels and finally the roof insulation levels. Given this data we can then get a very accurate measurement of a properties space heating requirement.

Luckily, Cernunnos Homes has a spreadsheet calculator that will do this for you!

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House Type	Detached
Location	South East & Wales
Window Type	Double Glazed wood/plastic fitted before 2002
Floor Type	Suspended / 25mm (1") or less
Wall Insulation	Filled Cavity Wall
Roof Type	Pitched / 50mm (2")

External Wall Area

Length of External Walls	10	meters
Width of External Walls	10	meters
Room Height	5	meters
No Floors (exc Loft Conversions)	2	
No Open Chimneys	1	count 0.5 for open gas fires, flues or closed chimneys

Number of External Walls

No of External Walls: Length	2	
No of External Walls: Width	2	
No of Party Walls: Length	1	
No of Party Walls: Width	1	
Roof	1	0 for flats not on top floor
Floor	1	0 for flats not on bottom floor

Count the number of 'length' external walls along the length measurement and the number of 'width' walls along the width measurement; e.g. a semi-detached will have only one external wall along its length but two along its width. The wall is not regarded as external where any extensions join the main dwelling. Where there is a single-storey extension on a two-storey house then take half the wall area as external. The whole wall is still regarded as external when it is attached to an unheated garage. Walls that are not counted as External are counted as Party Walls

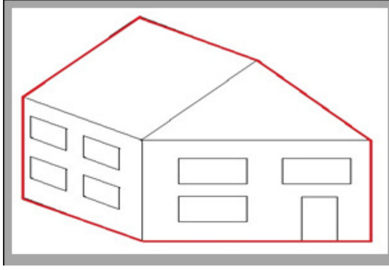
For unusual shaped houses, the area should be divided as much as possible into simple rectangles and a calculation sheet completed for each part. Similarly, a separate calculation sheet should be completed for extensions or conservatories (with a Higher Window area for conservatories)

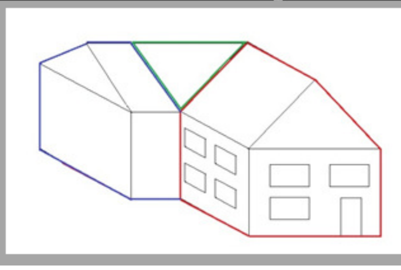
Output

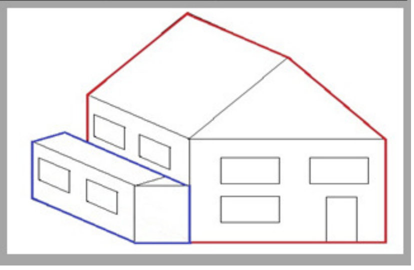
External Wall Area	400	sq meter	
Window Area	33.6	sq meter	
Total Floor Area	100	sq meter	
Wall Heat Loss	219.84	W	
Window Heat Loss	104.16	W	
Roof Heat Loss	150.00	W	
Floor Heat Loss	84.00	W	
Ventilation Heat Loss	264.00	W	
External Heat Loss	22194.00	W	Include?
Party Heat Loss	2819.60	W	Y
DHW Needs	2000.00	W	

A Domestic Hot Water power requirement of 2000 should be chosen. 2000 is for a typical UK household with 5 people living there. 3000 should be chosen for very large properties. Over 3000 is only for commercial purposes or extreme cases.

Minimum Boiler Output	25.41	kWp
Recommended Boiler Output	28.00	kWp







3. Domestic Hot Water Heating (DHW)

Once the Space Heating requirement is calculated we then need to calculate the requirement to provide heating for Domestic Hot Water. Above this was assumed to be 2kW or 3kW (the DHW requirements for a typical UK household). However, to create a more accurate measurement we need to add in the amount of energy required to heat the water in the hot water tank whilst not disrupting the hot water for the central heating system (note that this does not apply for combi-boilers which have no hot water tank needs).

The first consideration is the size of the hot water tank. Obviously larger houses will have larger tanks. When selecting the size of the hot water tank, a simple rule of thumb is that for a typical domestic household, you should allow between 35 and 45 litres for every occupant. Obviously, if you have a young household, or use the bath more than shower, you should allow 45 litres per occupant. If you are older and use showers, you should allow 35 litres of capacity. However, it must be noted that personal habits also play a big part in total hot water use. Two households of the same size can use completely different amounts of hot water, with one of them being as much as twice as the other! In determining how much hot water you require you should consider the following:

- A bath uses 100 litres of hot water (@ 40 degrees Celsius)
- Showers use 35 litres of hot water (@ 40 degrees Celsius)
- Kitchen sinks use 0.2 litres of hot water per second at 60 degrees
- Hand basins use 0.15 litres of hot water per second at 40 degrees
- Cleaning requires 3 litres of hot water per person per day
- Cooking requires 2 litres of hot water per person per day
- Dishwashing requires 20 litres of hot water
- Washing machines require 30 litres of hot water

The following average consumption values can be used as a general rule (hot water requirements per person per day):

Low Consumption	=	20 – 30 litres
Average Consumption	=	30 – 50 litres
High Consumption	=	50 – 70 litres

Let us assume that a 4 person household has decided they have Average Consumption values of 50 litres of hot water per person per day. They also say that they use the dishwasher and washing machine twice a week and the temperature of the hot water needs to be 45 degrees Celsius. Therefore we can calculate that their Hot Water Requirement is:

DHW Requirement (DHWr) = 4 persons x 50 litres (@ 45 degrees) + 16 litres (@ 45 degrees)

DHW Requirement (DHWr) = 216 litres (@ 45 degrees) per day

This means your water tank should be able to hold <u>at least</u> 216 litres.

From this, we can use the following equation to get the Hot Water Power Requirement (DHWpr):

$$DHWpr = DHWr \times C \times T$$

Where C = the specific heat capacity of water = 1.16 Wh/kgK

T = the temperature difference between hot and cold water (K)

We always assume the cold water to be supplied 4 degrees Celsius and we want the temperature of the water to reach 45 degrees Celsius. Therefore, the power requirement is:

DHWpr = 216 x 1.16 x (45-4)

DHWpr = 10272Wh per day

DHWpr = 10.3kWh per day

However, note that in the UK the water temperature is required to be 60 degrees Celsius. In this case, for the homeowner to get the 45 degrees they require, they will mix 60 degrees hot water at the tap with some cold water. This means that a smaller amount of hot water at 60 degrees is required, albeit it will require the same energy content for the smaller amount of water to reach 60 degrees as it does for the larger amount of water at 45 degrees. In this case the following formula can be used:

V2 = [(T1 – Tc) / (T2 – Tc)] x V1

Where: T1 = old temperature
T2 = new temperature
Tc = cold water temperature

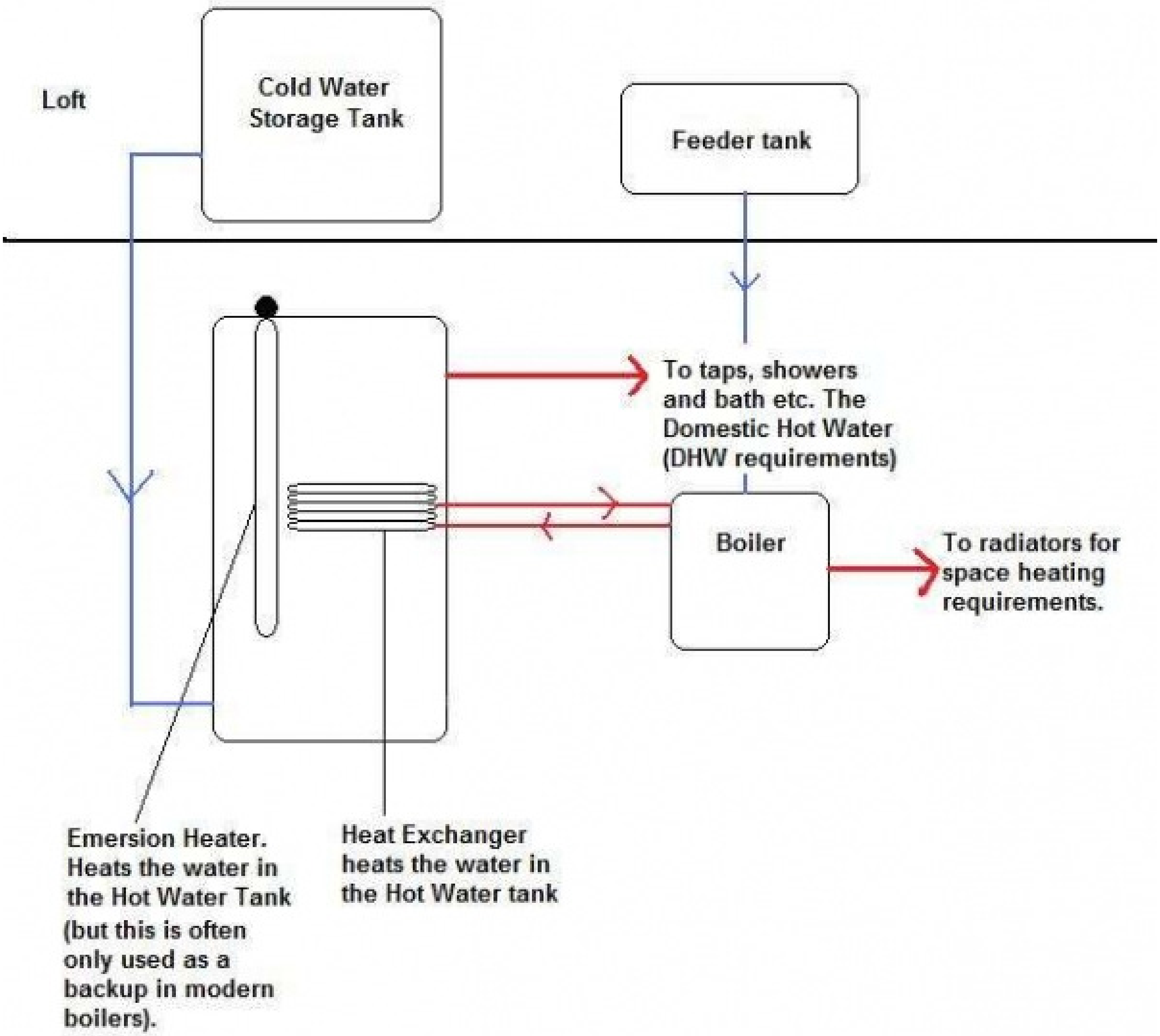
V2 = [(45 – 4) / (60 – 4)] x 216 = 158 litres

You can have a water tank designed however you want it to be. They can be made to measure, with the required heating and volume specifications set to your needs. In the above example you would want a hot water tank in the region of 150 to 200 litres. The more standard water tanks (so called "off the shelf") are Single Coil Tank's (we will get onto other types of tanks later on in the document). This is the more traditional system installed in UK homes where renewable energy systems are not used. The water in the tank is heated by an internal coil which is fed by the boiler. The tank is fed from a cold water storage cistern, contained in the loft, with a capacity equal to or greater than it.

A conventional system has two water tanks in the loft:

1. A large cold water storage tank: draws cold water from the mains to refill and itself feeds the hot water tank.
2. A smaller feed and expansion tank: this acts as a feed and expansion vessel for the boiler circuit and space heating system.

The boiler heats the water directly for the space heating requirements and passes this through the hot water tank coil (also known as a heat exchanger), which then heats the water in the tank for DHW use. The water from the boiler is then passed around the central heating system and finally back into the boiler. The water tank stores the hot water for DHW use and is refilled by the cistern in the loft (which gets water from the mains). The Feed and Expansion tank feeds the boiler system, which in itself feeds the radiators or under-floor heating system for space heating requirements. Thus the DHW and space heating water are kept separate, avoiding problems of scaling or corrosion.



This type of system is called a "vented system", whereby the feed pipe is open to atmospheric pressure (i.e. the tank in the roof uses gravity to create the pressure in the water system). The pressure created isn't as good as it could be and sometimes pumps are needed to increase the water pressure.

In 1989 "un-vented systems" were introduced and these operate purely from the mains water. The principles of the system are the same, although as the system is fed from the mains, there is no need for a cold water storage tank in the loft. The water pressure tends to be a lot higher, and because of this there are many safety features built in to the system.

Back to calculating the heating requirement for properties DHW needs: Let us assume you have a 120 litre hot water tank. We then calculate how much energy it would take to heat the water in the tank as if it had been emptied and needed a complete heating.

We know that UK mains water is provided at 4 degrees Celsius and that we have to heat the water to at least 60 degrees Celsius (this is a requirement by UK Health and Safety to kill off any legionnaire's bacteria). Thus we need to heat the water by at least 56 degrees in the tank.

We also know that 1 litre of water requires 1.16 watts of energy to heat it by 1 degree Celsius in an hour. Thus, the total amount of energy required to heat the tank would be:

(120 * 1.16 * 56) = 7,600 watts hours = 7.6 kWh

Thus, we would need a boiler off at least 8kWp (excluding any space heating requirements).

Next we will start to look at the actual boiler system itself and how it provides space heating and DHW heating.

The importance of thermal insulation:

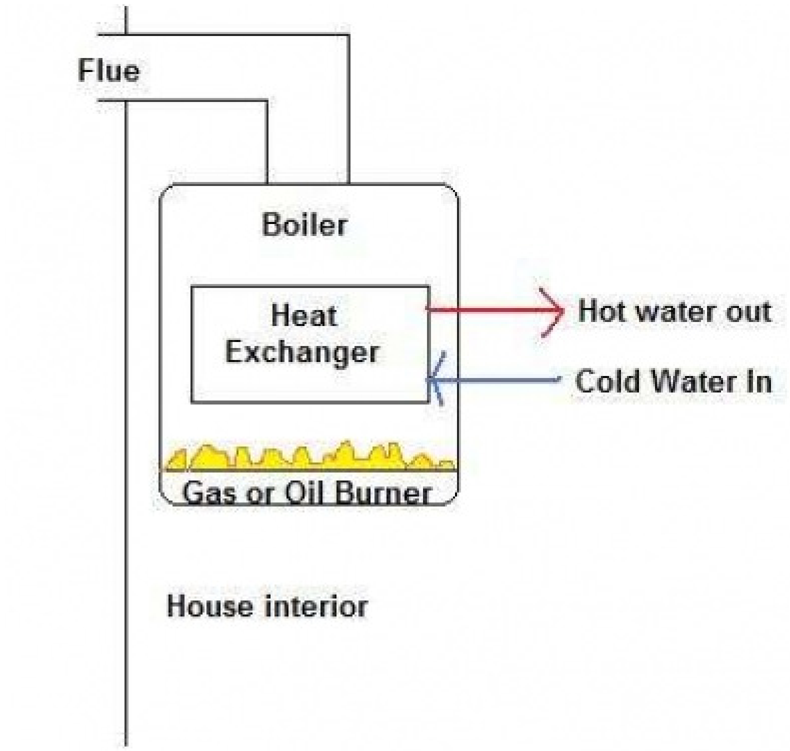
Without going into calculations, it can be estimated through mathematical formulae that not having insulation on piping can create losses of up to 500Wh per annum. In the above example, this equates to (500/7600) 6.5% of total annual output. Similarly, if the water tank is not properly insulated this can create thermal losses of another 500Wh, giving a total of 13% annual losses just because of poor insulation on the water tank and piping!

4. Traditional Boilers Systems:

In this section we aim to describe the main types of boiler systems currently in use in UK properties. Following this we shall begin to integrate Renewable Heating Systems into existing boiler systems.

4.1 Conventional Boilers (Unvented)

A conventional boiler comprises a burner (gas or oil) to transfer the heat to the water. Of the heat put into the boiler, around 80% is transferred to the water, with the rest being lost through the flue. The water that is returned to the boiler, from either the hot water tank or radiator system, cannot fall below 55 to 60 degrees as this would cause condensation which will lead to premature failure of the heat exchanger due to corrosion.



The advantages of such a system are that:

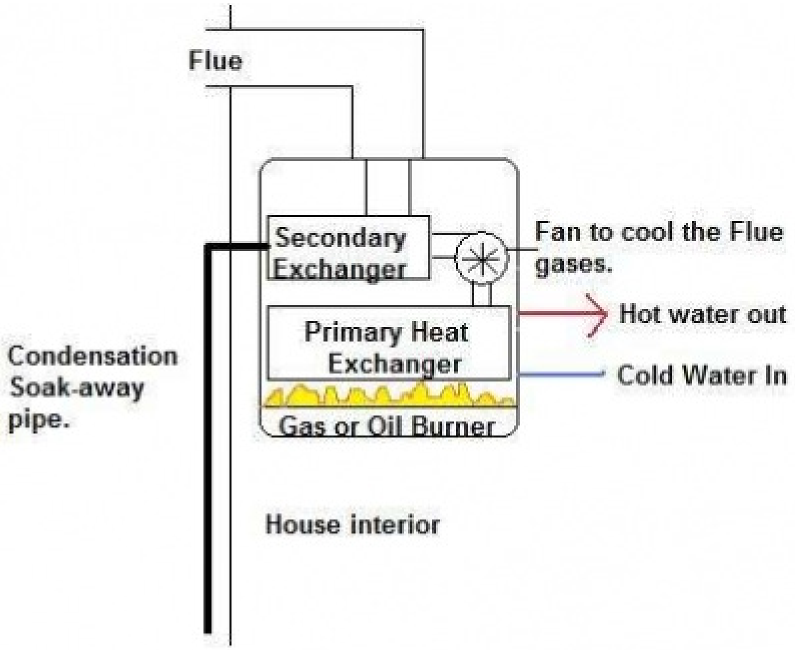
- They are easy to install
- Can be used with renewable systems
- Do not require a pressurised system (making them safer and less expensive to service)
- Tend to be very efficient and reliable in all temperatures

The disadvantages are that:

- They take up a lot of space
- Are inefficient and costly to run
- Water pressure can be low if the storage/feeder tanks aren't high enough

4.2 Condensing Boilers (vented)

Condensing boilers attempts to recover the 20% heat loss in conventional boilers by deliberately inducing condensation. The conventional boilers will see the flue gas release reach 180 degrees, and the condensing boiler will use this heat to heat more water through a secondary heat exchanger, taking the flue gas heat down to 55 degrees. This is achieved by adding a second heat exchanger (usually stainless steel or aluminium) on the flue. This second heat exchanger makes the condensing boilers bigger and more expensive than conventional boilers (typically double the cost), although efficiency rates can be as high as 90%, meaning that the extra capital outlay is usually recovered within 5 to 7 years. In other respects the condensing boiler works in the same way as a conventional boiler. The condensing boilers also need a drain-away to be installed on the flue to remove the condensation and often these soak-aways are external pipes. These pipes are susceptible to freezing in harsh winters (which is especially the case this winter).



The advantages of this system are that:

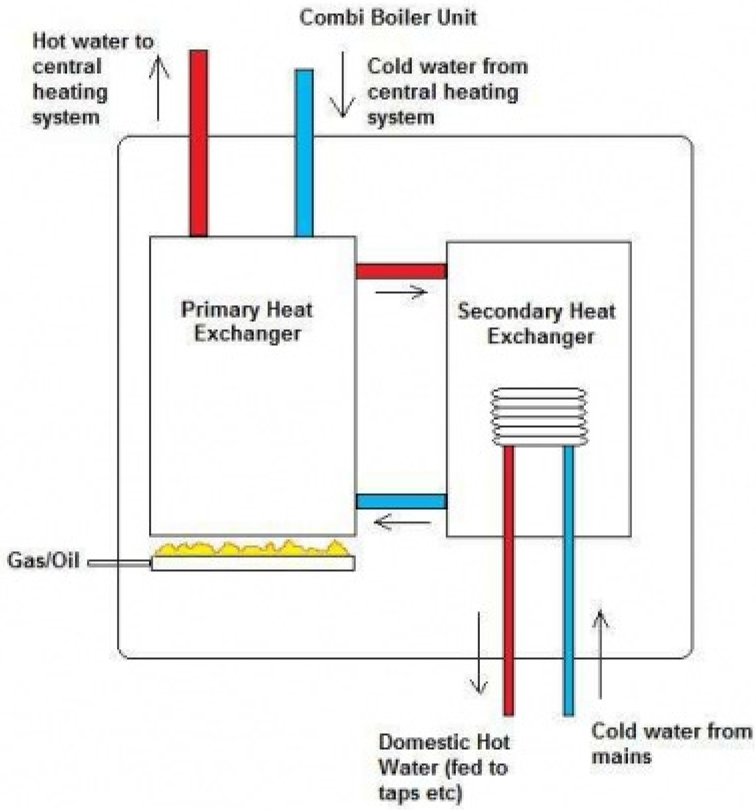
- It provides mains pressure hot water
- It is more efficient and cheaper to run
- Can be used with renewable systems

The disadvantages are that:

- They cost more
- Are a pressurised system that require professional installation
- Have high annual maintenance costs
- Have external pipe-work prone to freezing
- They take a long time to re-heat the water tank

4.3 Combi Boilers

Combis dispense with the need for a hot water cylinder and cold water cistern (and the smaller feeder cistern) as all the major components are housed in one unit, making then very convenient to the install as they take up very little space. The Combi unit houses a primary heat exchanger for the central heating system (heated by a gas or oil burner) and a secondary heat exchanger for the domestic hot water, which has a heat exchanger unit running from the primary heat exchanger unit. The mains water feeds into the Combi, inside which there is also a pump to increase the water pressure supplied to the house. The basic workings of a Combi are:



The advantages of this system are that:

- They require little space

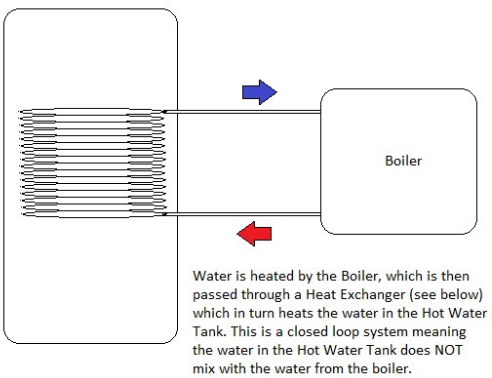
The disadvantages of the system are:

- They are inefficient
- They are expensive to run
- They can’t be run alongside other systems (renewable)
- They do not provide high pressure water
- They are unsuitable for larger houses or those requiring a lot of heating
- They require annual maintenance

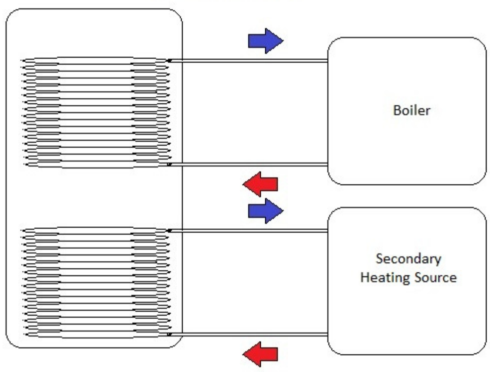
5. Introducing Renewable Heating Systems: Thermal Stores

So far we have discussed how to size a heating system and how traditional heating systems work. Now we will begin to look at how we can integrate a renewable heating system into an existing system. The first thing to realize is that your Hot Water Tank is going to need replacing (unless you already have a hot water tank that can accept multiple heating inputs). Traditional Hot Water tanks can only accept one source of heating (unless you have a dual coil hot water tank), whereas with a renewable heating system you are going to need two (or more) sources of heating (as the renewable heating system will not provide 100% of your heating needs). You could, of course, use the renewable heating source as your only form of heating and your back-up heating source coming from an immersion heater, however this is not advisable unless you have a high grade heating system and a very well insulated property. This sort of heating design tends to be installed on new build properties (such as the Cernunnos Eco Homes).

Single Coil Hot Water Tank

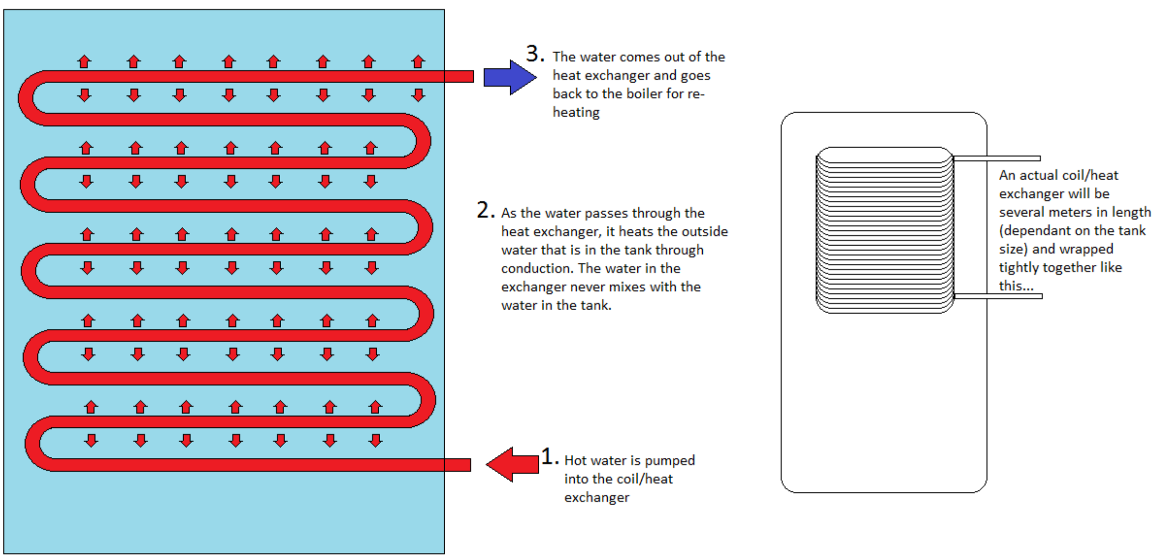


Dual Coil Hot Water Tank



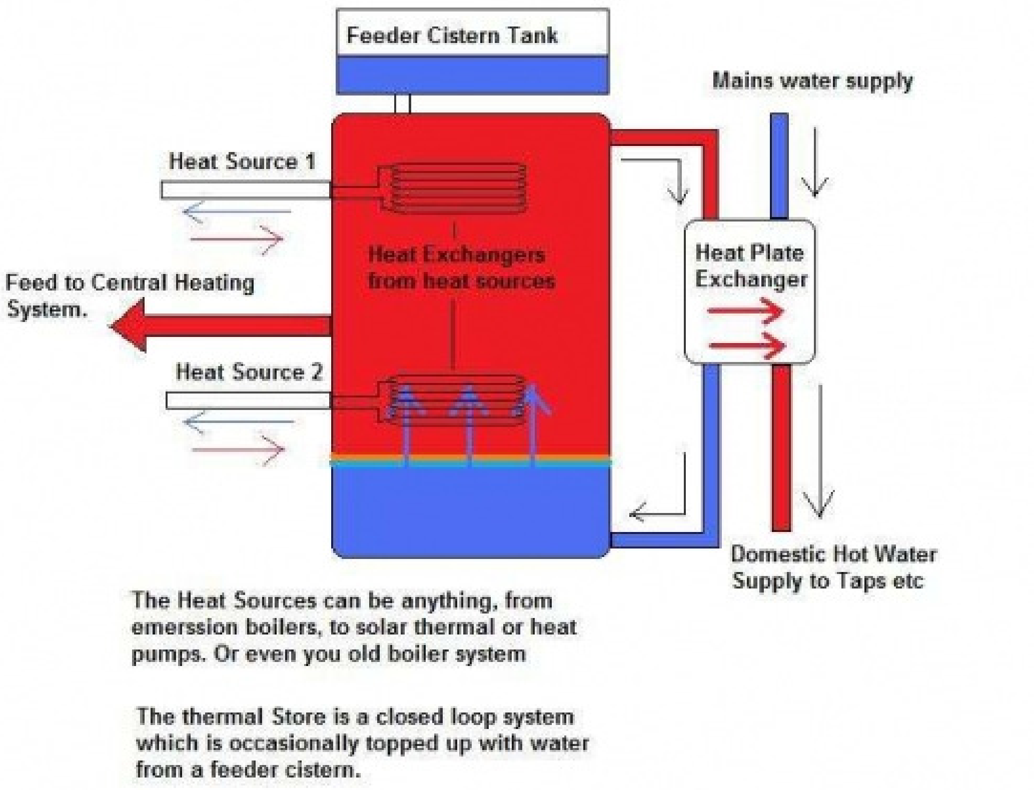
The tank used for renewable heating systems is called a “Thermal Store” (also known as a “Heat Bank”). These are slightly taller than traditional hot water tanks, and come in all sorts of sizes. The primary advantage of Thermal Stores is that they can accept multiple heating sources.

How a Heat Exchanger works



Thermal store cylinders work on the process of stratification whereby hotter water rises to the top of the cylinder and cooler water goes to the bottom. Each level of the cylinder therefore has a different temperature. It is for this reason that thermal stores are taller than conventional water tanks. Under-floor heating, which require lower water temperatures and a more constant flow of heat would be connected towards the bottom of the cylinder, whilst the domestic hot water needs would come from the top. The domestic hot water needs are not stored in the tank itself, but is fed from the mains system and heated through a heat exchanger. The heat exchanger draws the hot water from the top of the thermal store, and passes it through a heat plate. As the mains water passes around the heat plate, it absorbs the heat from the thermal store water, thereby heating the mains water. The water from the thermal store that has passed through the heat plate is finally pushed back into the thermal store at the bottom for it to be heated again. This way the thermal store is the closed loop system for central heating, whilst the mains water feed is passed through to heat the mains water. The thermal store provides mains pressured domestic hot water needs at up to 45 litres per minute. Also, this allows the thermal store to be a vented system (i.e. non-pressurised) and thus it is a lot safer and easier to maintain. Quite often these heat plates are stored within the thermal store, but for the purpose of analysis we have shown it externally below.

Thermal store cylinders also allow multiple heat sources to contribute to the heating of the water in the tank. It can have more than one heating coil (also known as heat exchanger or heat plat exchanger), and therefore solar thermal systems or heat pumps could heat the water in the tank. Also, in a conventional Hot Water Tank the heat exchanger is connected directly to the boiler, which pumps hot water through the coil that heats the water in the tank before being fed through the central heating system (radiators etc). The DHW needs are run from the tank, being replaced by cold water from the cistern, which is then heated by the coil. This coil has to transfer all the boiler heat and this is the weak point, resulting in long warm up times and long recovery periods. Thermal Stores differ in that the boiler (or multiple heat sources) is (are) connected directly to the hot water tank, circulating the whole tanks contents. This direct transfer of heat means faster response and warm up time for the water in the tank. The transfer coils are also much larger in surface area and much longer (typically 10 meters long). There are also 2 transfer coils, one at the bottom, feeding the heating system (which requires lower temperatures) typically to 60 degrees, and one at the top to feed the DHW needs, typically heating the water to 75 degrees. The bottom heat source tends to be the renewable heating system, which provides heat up to 50 degrees Celsius. The higher heating source tends to be the more traditional system which can be used as a “top-up” system that brings the water temperature up to 60 or 70 degrees Celsius. This can be your existing oil/gas system or an immersion heating system.



As the Thermal Store is much bigger than a traditional water tank, it can run for a long efficient burn rather than repeated smaller cycles that are seen in conventional tanks. This makes them ideal for under-floor heating, as they supply a constant flow of water at lower temperatures. Otherwise the heating of the under-floor heating pipes would cause repeated cycling of the boiler.

The advantages of Thermal Stores are:

- They provide mains pressure water
- They can be used by multiple systems
- They have quick re-heating time periods
- Require no loft tanks
- They are vented and thus easy to install and maintain

Thermal stores are by far one of the best systems on the market. The only problem is that many who do not need to replace their water tank do not want the upfront cost, which is understandable. Those looking to replace or upgrade their system should consider Thermal Stores.

Obviously, a renewable energy system will replace some of the need for your boiler, thereby reducing your energy bill. However, you will always need a form of traditional boiler system in place as a back-up for your renewable energy system. This can be in the form of oil and gas to emersion heaters. Also, some renewable energy systems can only heat water to 45 to 55 degrees Celsius, and thus you will need another system to heat the water to 65 degrees to get rid of the legionnaires disease risk. Thus the ability to have a dual heating system is important when installing renewable energy systems. It is for this reason that Thermal Stores are the preferred option. However, that is not to say that your current system won't suffice.

Thermal Stores in practice come in a variety of shapes, sizes and names. If you search for products you are likely to see Heat Pump Thermal Tanks, Solar Thermal Stores, Solar Heat Banks, Heat Pump Solar Tanks etc. However, in reality, they are just simple Thermal Stores that have been further developed. Some even now offer 3 or more input heat sources, allowing you to use Solar Thermal, Heat pumps and Gas/Oil in conjunction. These are ideal for larger properties that want a complete solution, or for business premises. However, the basics of Thermal Stores are the same.

However, Thermal Stores do require more space than traditional Water Tanks, and not every house has room for one. An alternative is to have a Twin Coil Water Tank, which is a mixture between the tradition Single Coil tank (except it has two coils and thus can take two heat sources) and a Thermal Store (in as much it can take multiple heat sources but is a smaller tank!).