Factsheet
Energy storage

What is energy storage?

Using energy storage at home comes with many more considerations than just the equipment. The way you use your energy – how much and at what times of day – is crucial to making the most of your energy-storage system and should be the first thing you should think about.

Energy-storage systems, also known as batteries or thermal stores, allow you to capture heat or electricity when it is available (for example, from a solar PV system during daylight, from a wind turbine when it's windy, or from a log boiler when burning batches of logs), and then save it until a time when it can be useful to you. Heat can be stored in 'thermal stores' like hot-water cylinders or larger 'buffer' or 'accumulator' tanks. Heat can also be stored in phase-change materials (similar to gel hand warmers) in the form of 'heat batteries'. Electricity is stored in electrical battery units made from various chemicals – common examples are lead-acid or lithium-ion batteries.

What are the benefits of home energy storage?

Home energy storage systems make the most of electricity and heat by managing the time difference between when the energy is available and when it is needed. If you have a renewables system, an energy storage system can reduce your fuel bills and carbon emissions by allowing you to make the most of free renewable energy by storing it until you need it.

Savings are dependent on the system installed and how it is used but because some types of home energy storage are using fairly new technology, there isn't currently enough independent evidence available to estimate typical savings. Ask installers to calculate savings for you based on your home and circumstances and to explain how these calculations are done.

Most energy storage systems offer smart operation. This allows you to keep track of your energy use online and charge the batteries with low rate electricity from the grid if you're on a tariff that is cheaper at certain times of day, for example Economy 7 tariffs. It is becoming more likely that people with energy storage devices will benefit from payments or reduced tariffs in the future for providing smart services to the grid – for example, allowing their energy storage device, including hot water cylinders, to be used to store excess electricity on the grid.

If you store energy you'll still currently get your Feed-in Tariffs (FITs) export payments for eligible solar PV systems and wind turbines, even if you're exporting less electricity back to the grid. This may change, as the UK Government are looking to base FITs export payments on actual meter readings after the smart meter roll-out. Payments under the domestic Renewable Heat Incentive (DRHI) are expected to be unaffected by using home energy storage.

In this factsheet...

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Heat Storage

What is heat storage?

Heat storage is a catch-all term for different ways of storing and managing heat until it is needed. If you live in a home where the heating system can't produce enough heat on demand, or produces heat or electricity at a time when you don't need it, heat storage can be an effective way to manage your needs. Typical forms of home energy generation such as a gas or oil boiler, solar panels, heat pumps, biomass boilers and wood-pellet stoves can all generate heat and then have it stored in a heat storage unit. You can also use electricity as this can be converted to heat and stored in the same way.

What heat storage systems are there?

Thermal stores

Your standard hot-water cylinder in a regular boiler system is a heat storage device known as a thermal store. Larger cylinders of this type are also often called buffers or accumulator tanks. Thermal stores store heat in the form of hot water. This heat energy will stay in the thermal store for many hours due to the highly insulated sides of the unit. Thermal stores can have a single heating input, just like a standard hot-water cylinder connected to a gas boiler. Or, they can have multiple heat inputs, for example you could connect several types of renewables system and a conventional boiler to your thermal store. You can then control these systems to make sure you always have heat when you need it by using the most appropriate heating sources.

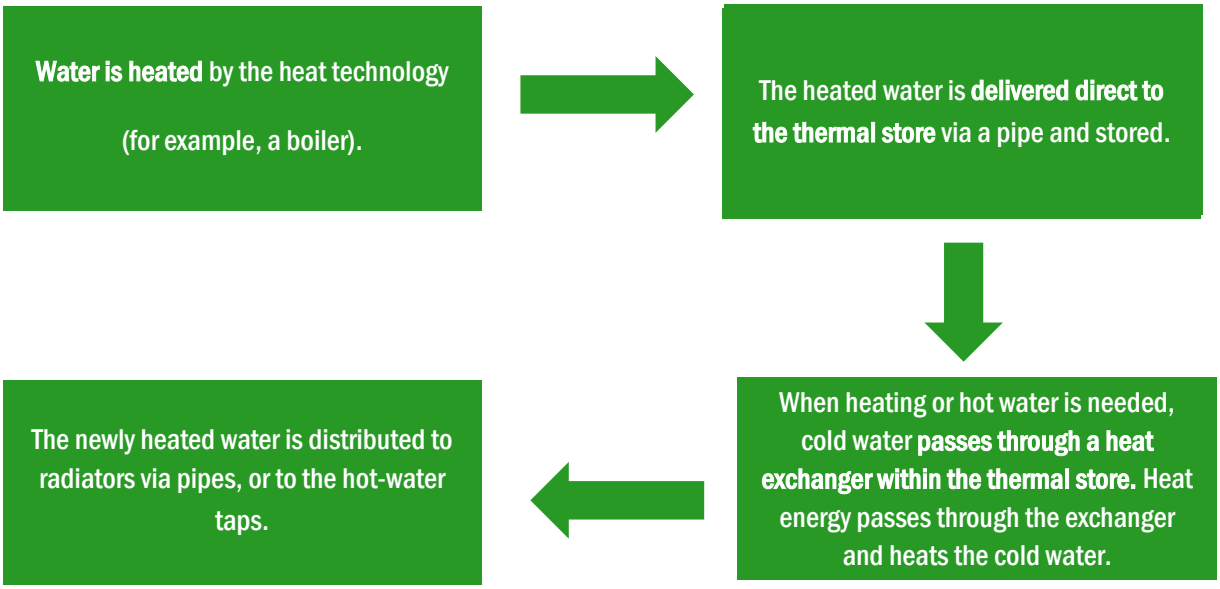
Heat batteries

This is a relatively new technology for home heat storage. They can be used to store heat from a range of different sources to supply hot water and space heating. Heat batteries take up less space than a hot water tank and can store heat for longer. They are based on latent heat storage; heat or electrical energy is used to change a phase change material (PCM) from one phase to the other (in other words solid to liquid) and this captures the energy. When you need to extract the heat it does this by doing the reverse process (in other words liquid to solid) with a release of heat which can then be used to heat water for you to use in the home.

Thermal stores

How does a thermal store work?

Thermal stores range from very basic systems using one energy input to more complicated systems designed to store and manage a number of different heat inputs and outputs. An example of a common system is shown below:



Heat exchangers, especially flat-plate heat exchangers, can transfer lots of heat in a short time – so you can have a mains pressure shower or fill a bath very quickly.

Thermal stores can be made from various materials, but usually they are made of metal, surrounded by an insulated material (to make sure as little heat is lost as possible) and finished with a plastic casing. The insulation is the most important part, as this makes sure the heat that is stored stays within the thermal store until you need it.

Controls

Thermal stores are fitted with one or more thermostats that monitor the temperature of the stored water. If not enough heat is being provided using the heat exchangers, another heating method such as a boiler or immersion heater can be used to bring the water up to the temperature you need.

What are the benefits of a thermal store?

Thermal stores allow you to manage the time difference between when heat is available and when it is needed. For example, hot water produced by a solar water-heating system during the day can be stored for use in the evening when little or no solar energy is available. They allow warm water to be heated up by a secondary heating source such as a conventional boiler or electric immersion heater.

As such, thermal stores allow renewable heating systems to work more efficiently. This is particularly relevant to wood-fuelled heating systems such as log boilers that operate much more efficiently if they are used at maximum output rather than kept ticking over.

How would a thermal store work with a renewables system?

Biomass or wood-fuelled heating systems

Thermal stores are very important for the efficiency of wood-fuelled heating systems, particularly log boilers, which are designed to burn batches of logs at high levels of efficiency rather than in small quantities throughout the day. A log boiler should be linked to a large thermal store, also called a buffer or accumulator tank. A thermal store can also reduce the delay (which could be at least an hour) between lighting the boiler or stove and the water heating up to the temperature you want. It does this by storing hot water from the last time the stove or boiler was lit.

Thermal stores used with wood-fuelled heating systems tend to be fairly large, as they are usually designed to provide space heating using radiators or an underfloor heating system as well as hot water. Normally they will hold between 500 to 5000 litres of water and can store hot water for several days if properly insulated.

Smaller thermal stores (300 litres, around the size of a typical fridge-freezer) can also work well with wood-fuelled boilers and stoves with back boilers. These stoves tend to be in living spaces and are fed with fuel throughout the day. Boilers and stoves with back boilers differ in the proportion of heat they put into the room or water. Boilers will put around 65% of their output into water, whereas stoves with back boilers may only put around 20% into water.

The size of the thermal store connected to a wood-fuel boiler is something for the installer to decide and discuss with you as part of the total system design.

Solar water heating

Thermal stores work very well with solar water heating systems as they allow heat captured from the sun to be used for heating rooms (space heating) as well as heating water. On a sunny spring or autumn day, a solar water heating installation may collect far more heat than would be needed for the hot tap water alone. Combined with a thermal store also supplying space heating, this heat can be put to good use (if you need any space heating).

Thermal stores designed to work with solar water heating systems often have a heat exchanger at the bottom of the store (the coldest part) which allows heat to be captured even when the temperature of the fluid from the solar panels is only tepid. This improves efficiency and allows the solar energy to be gathered as useful heat even on less sunny days. With a simple design and control strategy, a thermal store can also be designed to prioritise heat from a solar panel above all other sources. This will mean that if solar heat is available, no other heat source will come on.

When a solar water heating system is combined with a thermal store, the system will not be eligible for the domestic Renewable Heat Incentive because heat is being used for a purpose other than hot water.

Heat pumps

An air-source or ground-source heat pump will work more efficiently, with less wear on the pump and compressor, if it does not have to continually cycle on and off (short cycling) when the demand for heat is low. This on-off cycling is more likely to happen if your heat pump is relatively large and less likely if it is relatively small and running more often to meet demand. It is also less likely if you have an air-source heat pump with a motor that can control its output.

One of the ways to avoid the short cycling of a heat pump is for it to be linked to a thermal store (usually referred to in this instance as a buffer tank). However, there are other ways (such as leaving a part of the heating system permanently open). Your installer, by following the recommendations of the manufacturer, will decide whether a buffer tank linked to your heat pump is appropriate, as well as what size buffer tank you should use.

Smart control technology

If you have a renewables system which generates electricity rather than heat (such as solar PV panels, a wind turbine, or a micro-hydro system), you can install 'smart controls' which allow you to convert any spare electricity (in other words, electricity which is generated but which you don't use) into heat which can be stored for later. These devices come in the form of an 'intelligent switch' or 'smart control box' which, when wired into your renewable systems, divert any electricity you don't use to an electric immersion heater which will then heat water in your thermal store.

This has several benefits. You will not only reduce your heating bill (as the spare electricity will be used to create hot water in your thermal store), you will also currently still get your Feed-In Tariff (FITs) generation and export payments. Currently, the FITs scheme assumes that you will export 50% of the electricity you generate from solar PV and wind turbines and 75% from micro-hydro installation. However, what you actually export is not measured (in most cases), which means that even if you use 100% of the electricity generated, you will still receive the FITs export tariff on 50% of it. This situation may change in the future as the UK Government have said that they plan to end these 'deemed' exports for all FITs installations and see the entire scheme moved to export tariff payments based on actual meter readings when the smart meter roll-out has been completed. If that becomes policy and it applies to you, every kilo Watt hours (kWh) that heats hot water is one less kWh on which you will get paid the export tariff.

This technology can be installed within an hour or so by a qualified electrician or by someone competent at DIY (though it will need to be checked by a qualified electrician). Intelligent switches can range from £350 to £700 including installation. This system will help save you money as it will shift your spare energy into another form (in this case heat) and reduce the need for your other heating systems to use fuel that you pay for. However, due to the lack of independent information on this subject, we cannot currently supply an average saving from this kind of device.

How much can thermal stores save and what do they cost?

Having a thermal store installed will not, by itself, save energy. It is the way you use your heating alongside the thermal store that will help make the most of what you have got and prevent you wasting energy. If you have a renewables system and a conventional boiler system, you can make the most of the free renewable energy by putting the spare energy into a thermal store to be used later. This will reduce the need to use other costly heating sources when the renewable system isn't generating.

If you are planning a whole new heating system with multiple renewable systems such a heat pump, solar thermal panels and a gas boiler, getting a thermal store with multiple input points linked to an intelligent control system will help you use the different systems most effectively. The thermal store will help create these savings by making sure it makes the most of the free renewable energy used and reduce, as far as possible, the use of fuels that you have to pay for, like your gas boiler. The scale of savings will depend on the system installed in your home and how you use it. Speak to installers about how best to work out the savings for your particular circumstances.

The cost of these devices depends on the volume and complexity of the thermal store. Usually a single-heat-source thermal store costs around £450 including installation whereas a multi-heat-source thermal store can cost around £1900 including installation. Larger-volume thermal stores (for example, 500 litres) can cost around £500 more than this.

Economy 7 or 10 immersion heaters

Some thermal stores, such as those with electric immersion heaters, use cheaper electricity during off-peak economy 7 (E7) or 10 (E10) tariff hours (in other words, overnight) to heat water so it can be stored and used when needed. Usually, off-peak E7 or E10 tariffs are cheaper than the standard electricity tariff. However, the E7 and E10 -peak tariff is far more expensive.

Generally, electricity is the most expensive and carbon-intensive way to heat your home. So, if possible it makes sense to switch to other heating fuels. However, if you live off the gas network and you have limited options to switching the type of fuel, then combining your electric immersion heater and electric heating with a renewable system such as solar panels or a heat pump feeding into a multi-point thermal store will save you energy in the long run. It will involve a high investment in the new equipment and systems.

How do you get a thermal store installed?

When you are looking for a new thermal store, make sure you ask a qualified heating engineer, as there are many things that need to be considered when choosing the right equipment for your home.

- What heat-storage technology do you want to use (thermal store or heat battery)?
- How many heat sources do you want to feed into your thermal store?
- Do you have existing heating systems you want to include in your thermal store?
- How many people live in your home?
- How big is your home?
- How is your heat distributed around your home?
- How big is your heating distribution system?
- Do you want to use smart technology?

Always talk to more than one heating installer to get different approaches, system options and quotes. When you have decided what you'd like to do, get at least three different quotes for the system to make sure you are getting the best value for money. Be sure to get the quote in writing with a list showing the full details of the work to be done and make sure it is dated and signed.

Make sure that any gas work is done by an engineer registered with Gas Safe. For electricians and plumbers, look for their qualifications and membership of a professional body to make sure they can carry out the work safely and properly. If you do any electrical work yourself, you still need to get an electrician to check it before it can be signed off as safe to use.

In general, there are no limits on where a thermal store can be installed. However, installing the thermal store far from the heating source would make the installation more complicated. This means you will need more pipework and increases the overall cost and heat losses of the system. You also need to consider space restrictions.

Any thermal store product must fully keep to several different standards. If you use diverting devices, they must keep to the highest EMC (electromagnetic compatibility) standards. Ask your installer to confirm the standards are being met.

It is important to get your heating system regularly inspected by a heating engineer to make sure it is working properly and safely. These checks can cost under £100 but may be several hundred pounds for a more complicated system. They must be registered by Gas Safe if you have a gas boiler system, and you may want a specialist renewable energy engineer that will check your entire system, including any renewable systems. Any of these professionals should look over your thermal store as well, as this will be an essential part of the heating system. By law, landlords must carry out a gas safety check each year and keep a landlord gas safety record.

Heat batteries

How does a heat battery work?

Heat batteries are different to thermal stores as they use latent heat rather than the thermal store's sensible heat (where the temperature of the water changes but the water stays as a liquid). The home heat batteries currently available use a special salt-based solution called a phase change material (PCM). When the material changes from a solid to a liquid it absorbs heat and stores this energy. When the heat is needed the PCM is cooled and crystallised, which prompts the material to turn back into a solid and release the heat that it previously absorbed (the latent heat). The PCM in these home heat batteries is typically a salt safe for use in the home.

In a home heat battery unit, the PCM is housed in square units known as 'cells'. A heat battery would be made up of several cells. This is a relatively new technology for the home market and there are limited products available at the moment but there is a growing product range, tailored for specific applications.

What are the benefits of a heat battery?

There are several benefits of using a heat battery. It:

- helps to make best use of electricity and heat from renewable systems;
- reduces CO2 emissions from the home;
- reduces fuel bills;
- can be lighter and smaller than thermal stores; and
- is claimed not to lose performance over time compared with an electrical battery.

What heating sources could you use with a heat battery?

Heat batteries can work with solar thermal panels, which are most effective on sunny days, with log boilers where you burn logs in batches and with heat pumps when running on an off-peak electricity tariff. Renewable electricity systems like solar PV can work with heat batteries as well. They do this by diverting any spare electricity to the heat battery where it is converted to heat and stored instead of letting the electricity leave the home and go onto the electricity grid.

How much can heat batteries save and what do they cost?

Heat batteries can help to make the most of the amount of renewable electricity and heat you use at home. This in turn will reduce the amount of heating fuel and electricity you need to bring into your home and pay for. As it will store any heat generated as this heat is produced (and when you may not necessarily need the heat), your heat battery may be able to supply you with a significant proportion of your heat demand. We cannot currently supply an average saving for installing a heat battery in a typical home as we do not yet have sufficient independent information about performance. Speak to the installer and ask what savings you could expect based on your home and lifestyle, and how you can make the most of savings by making small lifestyle changes.

How do I get a heat battery installed?

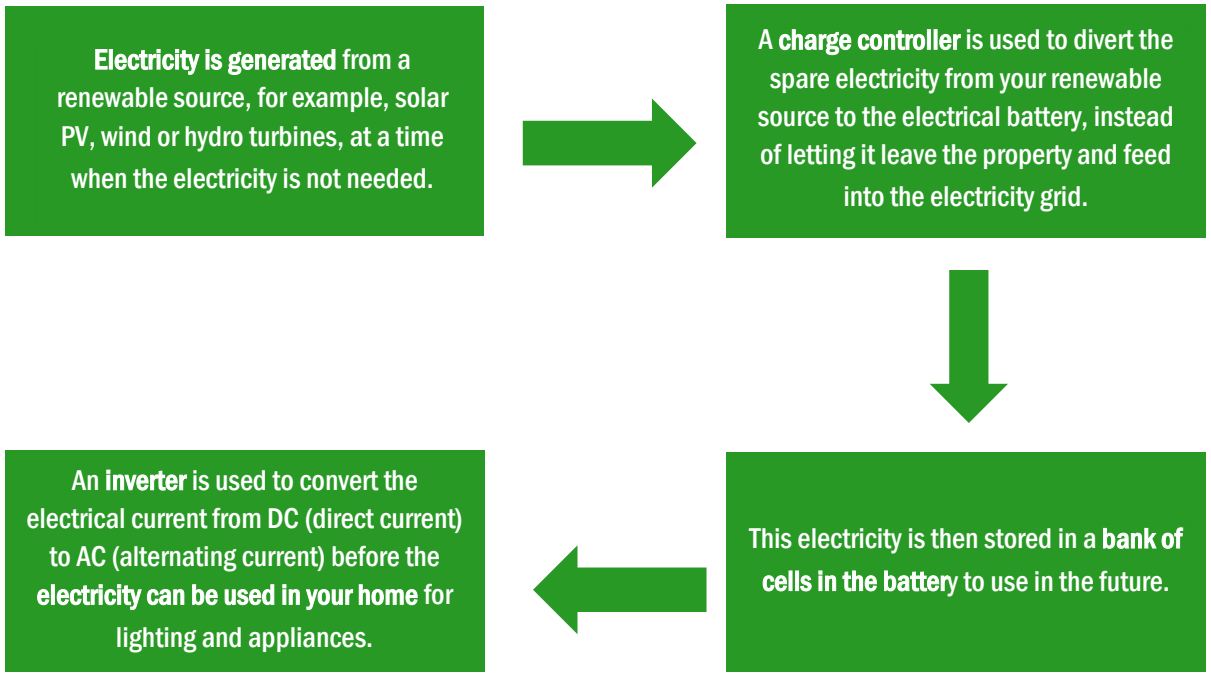
Currently we are aware of only one company supplying domestic-scale heat batteries (Sunamp Limited). We recommend these products are installed by an approved Sunamp installer. It takes around half a day to install and is smaller and lighter than a typical thermal store, so it can be placed in the same position as a hot-water cylinder. Due to the way the system is set up, the larger products can be broken down into segments. This means if there are narrow stairs or access issues, the unit can be separated and carried into position more easily. The cost will depend on how much heat you want to store and the space you have to keep it in. A 5 kWh heat battery unit has a list price of £1,700, plus the cost of installation on top of this. As the market for this technology grows, we expect the costs to come down.

Heat batteries need minimal maintenance, however you should get professionals to check your heat battery and they should be approved to do so as batteries do not need any specialist servicing but they are part of your whole heating system. Your installer will be able to provide details of their maintenance and warranty conditions.

Electricity batteries

How does electricity storage work?

Many renewable energy sources, particularly solar and wind may generate electricity at a time when it's not needed or the electricity may not be available when you want to use it. With an electricity storage system, you can store electricity as it is generated and then use it later.



Is electricity storage suitable for my home?

If you want to install an electricity-storage system, you need to consider whether there is enough spare energy generated from the solar PV or other renewable electricity system which can be stored in the battery system. An electricity storage system may not provide much financial saving in households with a solar PV system and high electricity demand during the day due to the limited amount of spare electricity available for storage. The two main factors that you need to consider are the capacity of your solar PV system or wind turbine and the amount of power you will want to use and at what times of day. Homes with a solar PV system and a divert device, which uses spare electricity from a renewable source to heat hot water, or with a phase-change material heat battery (see earlier), may usually see very limited financial benefits from also installing an electricity battery storage system. Homes with a wind turbine or micro hydro system may see greater financial benefits from electricity storage.

Batteries may reduce your direct carbon emissions, as they reduce the amount of electricity you need to use from the grid. However, the rare metals and materials used in making them can have a significant effect on the environment, which you should consider if you're trying to reduce your effect on the environment. However, some home-battery systems are being based on reused batteries from electric vehicles which keep 60% to 70% of their remaining capacity, making them suitable to be used for another purpose and could cost less and also be more environmentally friendly.

If your home is **connected to the electricity grid**, a battery storage system will help you make the most of the renewable electricity generated for use at home, as a result reducing your electricity bills and lowering your carbon emissions. If you switch to a tariff where the price of electricity is lower at off-peak hours, a battery system could also save you money by charging up with cheap electricity from the grid during off-peak hours, and releasing this to your home during on-peak hours. You could also possibly gain extra money in the future, for example, by providing smart balancing services to the grid; by giving permission to someone else to operate your unit, you are helping National Grid to match supply and demand second by second.

If your home is **not connected to the electricity grid** and you have installed or are thinking about installing renewables, battery storage can help you make the most of the renewable electricity you are generating and reduce how much you rely on electricity from fossil fuel generators. Most battery storage systems are designed for on-grid applications, and are unlikely to function off-grid. If you want to install this type of system, it is very important to speak directly to an installer to get an appropriate system tailored to your needs. This is usually more expensive, but its cost strongly depends on the size of your household and the number of days that you want to have back-up power for your home. Try to avoid using many devices that demand a lot of power (for example, a kettle or iron) at the same time and use electricity direct from the renewable source when it is available rather than storing it.

What are the different types of battery technology?

It is best to use deep-cycle batteries for renewable energy systems as these batteries are designed to use from 60% to 100% of their stored energy each time they are used. The number of times batteries can be fully charged and discharged depends mainly on the technology and how deeply the batteries are discharged. Deep-cycle batteries tend to have a longer life. The most common types of batteries that are used in home battery storage applications are shown below.

Lead-acid batteries

These have been used in several electricity-storage applications for more than 30 years. This technology offers low energy density (the amount of electricity that can be stored in a given size and weight of battery) and limited lifetime (700 to 1000 cycles) compared with more advanced technologies. Lead-acid batteries, due to their low cost, are widely used in many larger energy storage applications and especially in applications not connected to the grid where there are no limits on space. However, you need to replace the batteries several times during the lifetime of a battery storage system. In terms of their effect on the environment, lead-acid batteries contain lead, which is a toxic material and can be dangerous and needs to be handled appropriately.

Lithium-ion batteries

This technology is increasingly becoming more popular and is currently used in many modern, compact home electricity storage systems because they are lighter and need less space. Lithium-ion batteries are more expensive than lead-acid batteries but due to their longer lifetime (more than 4000 cycles) they do not need to be replaced as often. They are made of fewer toxic elements and they are considered as non-hazardous materials. However, lithium is highly volatile and is flammable if not treated properly.

What are the different types of installation?

There are two main types of home installation for an electrical battery; a DC system and an AC system.

DC-connected battery storage systems are connected directly to the renewable source of generation, for example, a solar PV system and before the renewable electricity generation meter. There is no need to install another inverter in the system to feed electricity from the batteries to your home, which results in better efficiency. However, the batteries are not as efficient during the charging-discharging operation, which ranges from 60% to 90%. A DC system is not generally recommended for retrofit applications because of the possible reduction in FITs payments. Some DC systems may also not work well with your existing solar system's inverter and may mean you would need to replace the existing inverter at a high cost. DC systems do not have the ability to charge the battery system from cheap off-peak electricity from the grid (if you have an appropriate electricity tariff) and make the most of the benefits of the battery storage system. These systems are more suitable for a new solar PV installation with battery storage when you can choose appropriate equipment to avoid compatibility issues.

DC system summary

- Potentially lower FITs generation payments
- More efficient battery storage system as reduces losses
- More suitable for new builds
- May have compatibility issues with an existing renewables system
- No benefit from low rate electricity charging

AC-connected battery storage systems are connected after the renewable electricity generation meter of the home. The electricity from the solar PV or other renewables system is converted by an inverter from DC into AC current, and is then fed into your home's mains electricity circuit for use. The battery captures any spare AC electricity which isn't being used in the home and then converts it back into DC electricity so it can be stored in the battery. You will need an extra bi-directional AC to DC power unit to charge and discharge the battery system. AC-connected systems are usually more expensive than DC-connected units as they need extra equipment. However, the generation meter of the solar PV system registers the total output of the renewables system and so does not affect your FITs generation payments.

AC system summary

- More expensive system
- Does not affect FITS generation payments
- Less efficient method of storing electricity due to higher losses
- More suitable for retrofit

How do I get an electricity battery installed?

Depending on the home battery storage product, the system would be either mounted on the floor or the wall. Lithium-ion products are usually more compact and need less space. There is currently no particular requirement in the UK in terms of where the battery-storage system should be installed. In general, to reduce the wiring needed and to simplify the installation, it is a good idea to install the systems close to your electricity mains input, and DC systems close to the solar inverter. However, if you would like to install the battery storage system in a specific place, you should ask for the installer's advice about how feasible it is to do.

Some, but not all, battery storage systems can be installed outdoors. If you are interested in installing an outdoor battery storage system, you must make sure that that it achieves the high protection class IP65 or higher (for outdoor usage). For indoor installations, you have also to take into account the noise level from the system when you decide on where to place it. The typical noise level of a home-battery system is 30 to 50 decibels (similar to the noise level of a fridge-freezer). The noise they produce might affect your sleep if the home-battery system is installed in your bedroom.

If you are not connected to the electricity grid, the battery system is more likely to be installed outdoors in a waterproof cabinet.

Depending on the installation, installing a home battery storage system takes from a few hours to up to a whole day.

Although there are no official requirements to give notice about installing battery storage in your home, it is recommended that you let your local distribution network operator know about the installation beforehand.

Presently, there are no standards specifically for home electricity battery installation although any electrical work must be signed off by a qualified electrician.

Some useful guidance on electricity batteries has been issued by the Renewable Energy Consumer Code (RECC) along with BRE National Solar Centre (NSC), go to www.recc.org.uk/storage.

What system should I choose?

There are a number of electricity battery systems for homes currently on the market and more are likely to appear in the future. The capacity of home electricity batteries ranges from 1kWh to 8kWh, enough energy to boil your kettle from 10 to 70 times. However, if you need more capacity, you could buy a 'stackable' system where you can add extra batteries, or you can get a bespoke system design.

In terms of how much electrical power can be put out, some products present power outputs of a few hundreds of Watts while others have power outputs of 3kW or more. Speak to an installer about what you would like the battery to power so they can assess what will be suitable for you. It is also important to understand that most battery storage systems will not provide power during a power cut.

Lead-acid battery storage units have a lifetime of around five years on average, depending on how the system is used, while lithium-ion systems generally have a lifetime of 10 years or more. Most electricity battery storage manufacturers also offer a five-year warranty for lead-acid products and a 10-year warranty for lithium-ion products.

Home electricity battery storage systems require little ongoing maintenance although you should speak to an installer about what is required. The main maintenance cost is therefore the cost of replacing the batteries at the end of their lifetime.

In most cases, the electricity battery storage systems currently available in the market offer some sort of 'smart' operation to make the most of the system, such as charging the batteries with low-rate electricity from the grid, or free access to online applications or dashboards so you can monitor the operation of the battery storage system and keep track of your energy savings.

How much can electricity batteries save and what do they cost?

Every installation must be assessed separately.

The following case study provides a theoretical example of what savings could be achieved. This is based on information for a particular system and place, and does not represent a 'typical' saving.

In this example, we look at the economic benefits of installing a 4kWh battery storage unit with a 2kW inverter/charger and 90% efficiency in a household in Leuchars, Scotland. We have assumed that the household uses 10kWh a day, has a 4kWp solar PV system and nobody is in during the morning.

Before installing the electricity battery, the system operates in the following way:

Yearly PV electricity generation	3400 kWh
PV electricity used on-site	800 kWh
Electricity export to the grid (without battery storage)	2600 kWh

After installing the electricity battery, the results are as follows:

Yearly PV generation	3400 kWh
PV electricity used on-site	800 kWh
Electricity stored in the battery system	950 kWh
Electricity export to the grid (with battery storage)	1650 kWh

Assuming a standard 14.37p/kWh electricity tariff, for this situation, the battery storage system would reduce the electricity bills by about £137 a year. This figure is based on simulation results and cannot be used as evidence for the actual economic benefits of a battery storage system. Any changes to the assumptions used here would lead to different results.

The payback time for installing a battery-storage system depends not only on the yearly savings of the units, but also on the cost of the system over its lifetime, including any costs for replacing the batteries. Assuming that in the above situation the cost of the 4kWh energy system is £5,000, in a simple payback model the customer will repay their investment in over 20 years (assuming that a battery replacement is not needed).

At the moment, with current battery costs and electricity prices, electricity storage options have a long payback time, although this may not be your main reason for installing a system. If energy prices increase and battery costs fall in the future, the payback will improve. There may also be other financial benefits if you own a home electricity battery; you may be able to receive payments or reduced electricity tariffs by providing smart services to the grid. For example, allowing your battery to be used to store spare electricity on the grid. These sorts of arrangements are only just starting to appear but more are expected in the future.