energy saving trust

Energy storage

An energy storage system allows you to capture heat or electricity when it is readily available, such as from a renewable energy system, storing it for you to use later. The most common energy storage systems include electric batteries, hot water cylinders and electric storage heaters.

In this guide, we will only talk about battery storage systems.

What are the benefits of battery storage?

Electrical batteries can help you make the most of your renewable generation system. For example, electricity generated during the day by solar PV panels could be stored in an electric battery to be used when your panels are no longer generating electricity.

A battery can also be used to store electricity bought from the grid at cheaper times of the day, so you can use it at peaks times when electricity may be more expensive. This can save you money if you are on a variable electricity supply tariff.

Some tariffs also pay you different rates for electricity you export at different times of day, so you can use a battery to wait until the best time to export your surplus generation.

Is battery storage suitable for my building?

If you have, or plan to have, a renewable generation system supplying your premises then you need to consider how much electricity will be generated when, how much you are likely to use when, and how the two match up. If you have a solar installation that generates during the day and you only occupy the building during the day then you may be able to use most of your generated electricity immediately, rather than exporting it, and there may be little benefit in adding battery storage. However, if your

electricity demand peaks at times of the day when generation is likely to be low then you are far more likely to see a financial reward from fitting a battery. It is very difficult to predict generation, use and the value of storage with complete accuracy, but a rough assessment of the likely match between time of generation and time of use can help you decide whether storage is worth investigating further. Your installer will make an assessment of possible savings, and the tariff structure and control strategies that will help to realise those savings, so that you can make an informed choice before investing.

It is possible to install a battery in a building that does not have any renewable generation but does have a variable tariff. The battery can be charged when import prices are low and then used to run equipment when prices are high, and also to export electricity if there is surplus available and a variable export tariff. These systems are currently uncommon as it is often difficult to generate enough financial savings to pay for the battery within its lifetime.

Battery characteristics

There are two different battery technologies that can be used for small scale and short term storage of electricity within a building's energy system:

- **Lead-acid batteries.** These have been used in a range of electricity-storage applications for more than 30 years. The technology is similar to that used in a petrol or diesel vehicle's starter battery, but designed specifically for longer term energy storage. These 'deep cycle' lead acid batteries are optimised to store and release the maximum amount of energy at a modest rate, as opposed to starter batteries that can provide very short bursts at a high power. 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.
- **Lithium-ion batteries.** This technology is increasingly becoming more popular and is currently used in many modern, compact small-scale or domestic 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.

Whatever the technology, batteries are characterised primarily by their storage capacity, quoted in kilowatt hours or kWh. This is the total amount of electricity that can be stored in the battery, but the amount you can put in and take out repeatedly will usually be less than 80% of this theoretical figure.

The second parameter is the charge or discharge power, quoted in kilowatts. This is the maximum rate at which you should charge or discharge the battery.

The third important parameter is the battery lifetime, quoted either in number of charge/discharge cycles or just in years. 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.

Electricity battery storage systems usually 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.

What battery size do I need?

Your battery size depends on a number of factors, including budget and space available, but also the amount of timing of your likely generation and likely electricity use, as well as the electricity tariff structure for both importing and exporting.

There are a number of electricity battery systems currently on the market and more are likely to appear in the future. The capacity of typical small (domestic-sized) electricity batteries ranges from 1kWh to 8kWh, enough energy to boil your kettle from 10 to 70 times. Larger "off-the-shelf" units are available for non-domestic use, or you could buy a 'stackable' system where you can add multiple smaller 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 hundred 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.

Indicative costs and savings

Installation costs

The cost will vary depending on the size and type of battery as well as the practicalities of the installation. As an indication we would suggest a 5 kWh lithium ion battery will cost around £6,000, rising to around £8,000 for 10 kWh batteries. Larger systems will be more bespoke and so it is not possible to give indicative costs.

Will installing a battery save me money?

You are likely to save money from installing a battery alongside a renewable generation system as you will be able to use more of the generated energy to operate your appliances rather than exporting it to the grid. As you usually pay more to import electricity than you can earn from exporting it, this will reduce your bills. You may be able to increase this saving by choosing a variable tariff and changing when you charge and discharge the battery to take advantage of the varying prices offered.

The amount of the saving will depend on the amount of electricity you generate, when you generate it, the amount you use, when you use it, whether you adjust when you use it, and the tariff structures available to you. It is impossible to generalise about the scale of savings available - you will need your installer to provide guidance on this, and we recommend you speak to several installers to ensure you get a representative response.

When considering the financial payback of investing in batteries you need to consider installation costs and potential savings, but also the lifetime of the equipment. Batteries typically come with a 5 or 10 year warranty, but you can expect the storage capacity to decline during this period. The warranty will set a lower limit for storage capacity remaining at the end of the term. Remember that the inverter will have a limited lifetime too, and a warranty to cover this.

Carbon savings

Installing a battery will not directly reduce your carbon dioxide emissions as it will not reduce the total amount of electricity you. In fact, as some energy is lost in charging and discharging the battery, your total consumption is likely to increase slightly. However, fitting a battery does have significant indirect benefits by enabling the installation of additional renewable generation systems without putting extra strain on the network. There is currently no appropriate and accepted methodology for quantifying this benefit and so it cannot be used when calculating your carbon footprint, but it is a very real benefit nonetheless.

How long does it take to install commercial battery storage?

The installation time can vary depending on the complexity of the installation and the size of the battery. Typically, for smaller systems, it takes just one day.

Disruption during the installation

No major disruptions are expected during the installation of battery storage systems, apart from disconnection of the electricity supply for a short period.

Can I do this by myself?

Energy storage systems are not a technology that you can install by yourself. You will need to talk to an installer who will assess your needs and evaluate your building before proposing which system could be right for you. **Click here** to learn more about this.