Battery Box Briefing Paper

BATTERY BOX
Leading the charge

Who are AMP?

AMP build, fund, own and operate renewable and low carbon energy facilities and flexible power assets across the UK. We have over 180 assets and provide service and maintenance to over 1,000 customer sites and have 175 staff nationwide.

Over the past year AMP have been developing small scale energy storage systems (ESS) across the UK in order to support local networks and help in the transition towards net zero. These small ESS projects are called Battery Boxes.

What is a Battery Box?

A Battery Box imports and stores electricity from the local electricity network when demand for electricity is low or when there are high levels of renewable energy available. It then exports that electricity back to the electricity network when required in periods of high demand. This provides a solution to the growing need for flexibility and helps address concerns regarding electricity network reliability prompted by an increase reliance on intermittent generation of the electricity system.

Battery Boxes are unique in that they connect into the low voltage (LV) network, this is the lowest and most local point of our electricity system where there is an increasing demand for energy with the electrification of transport and heating systems. Stored electricity from the Battery Box will be exported and consumed in the locality of the box (when it is required).

Why do we need Battery Boxes?

The UK's electricity system has traditionally been dominated by a small number of large power stations fuelled by fossil fuel (namely coal and natural gas). However, the system is now becoming increasingly supplied by intermittent sources of renewable energy such as wind and solar power.

Renewable power generation does not always match when the demand for electricity is highest. To overcome this, we need a more flexible energy system that allows us to shift renewable energy to the periods of the day when the demand for power is at its greatest. As the UK builds more and more renewable projects, increasingly there are times when the amount of renewable electricity on the system is greater than the demand for it.

ESS's allow this 'excess' renewable electricity to be stored and used later when low carbon sources are unable to generate enough electricity (i.e., when it isn't windy and sunny). By doing so, ESS's can prevent the need to turn on fossil fuel generators and allow the UK to maximise the use of renewable power; facilitating the UK's transition to net-zero and providing electricity network flexibility. National Grid states "Battery storage technologies are essential to speeding up the replacement of fossil fuels with renewable energy…[and] play an increasingly pivotal role between green energy supplies and responding to electricity demands"[1].

Flexibility on our electricity network is growing, however much more is needed especially on our LV networks where there is a huge change in how we are using energy i.e. increasing electric vehicle

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>
> **- National Grid.**

[1] https://www.nationalgrid.com/stories/energy-explained/what-is-battery-storage

take up and electrification of heating putting a strain on our LV networks. UK Power Networks, the Distribution Network Operator for the South-East of England, has stated that "the future challenges on our low voltage networks could be greater than the ones we are already managing on our HV and EHV networks"[2] due to the current lack of flexibility.

Benefits of Battery Boxes?

- Whilst the amount of carbon saved each year will vary with changing weather and demand patterns, AMP expect each Battery Box will save 80 tonnes of Carbon each year and 2,400 tonnes of carbon over the project lifecycle.
- An average home may use up to 1kWh in any given hour. A Battery Box stores 800kWh and has the potential to power 200 homes for four hours where there is a disruption to the supply to an area.
- As people electrify the heating in their homes and switch to Electric Vehicles the demand on local networks has never been greater. ESS's can provide additional capacity to those local networks when demand is high.

The Development

The Battery Box projects are very small; occupying just 24 square meters of land, an area similar to 2 car parking spaces, and can be situated anywhere. The only restriction on location is that the project needs to be within 100m of one of the UK's 250,000+ secondary substations to connect into the local electricity network. Our projects are often best suited on land that has little to no alternative use and can generate income for the freeholder on otherwise unprofitable land.

The Battery Box will be developed within its own fenced compound; construction will take approximately 4 weeks. Please see accompanying image of an example Battery Box.

Operation and Safety

Battery Boxes will typically operate by importing and storing electricity when there is a surplus Excess Renewable Electricity and provide stored energy back to the local networks at peak periods (typically evenings between 16:00 and 20:00, Monday to Friday). The ESS is controlled remotely so site visits are expected once or twice a year, once operational.

The system is capable of operating in extreme temperatures between -30°C and 55°C well within the normal climatic environment of the UK.

The energy storage systems are based on highly stable Lithium Iron Phosphate battery cell and include a battery management system that monitors the system 24 hours a day. An AI-powered internal short circuit detection system, temperature sensor and built in current and voltage sensors all provide early warning of a malfunction and permit automatic switch off.

Battery Boxes are small developments and appear much like other utility structures, such as small substations, gas kiosks, and telephone exchanges. As such, alongside careful site selection, the potential landscape impacts are very limited, and are offset by the significant benefits the projects offer.

Landlord Benefits

In return for granting AMP a 30-year lease for a small piece of land that is otherwise not usable, the freeholder will receive an annual rental payment of £1,000 increasing annually with CPI. Alternatively, if the landlord should so choose, they can receive a one-off payment of £10,000 upon commencement of construction and a peppercorn rent thereafter.

Each Battery Box project installed saves an estimated 80 tonnes of carbon per year which the freeholder can highlight as avoided emissions as part of their sustainability initiatives.

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[2] https://smartgrid.ukpowernetworks.co.uk/wp-content/uploads/2019/11/futuresmart-flexibility-roadmap.pdf

Battery Boxes workflows

The principle of the Battery Box is:

1) There should be zero cost to the landlord.
2) All cost, planning, and development 'risk' lies with AMP.
3) The landlord is only committed to progressing with the project once they sign a lease.

The stages are broken down below, along with which party is responsible for what at each stage.

STAGE 1 **Site Identification**	**AMP – Preliminary Assessment:** The Battery Box team will make an initial suitability assessment on the site(s) using information from Land Registry, Distribution Network Operators (DNO), planning data, and geographic information systems. **Landlord – Site Confirmation:** The landowner/business/council to confirm if the property, in principle, would be suitable and available for a Battery Box project. There is no commitment from the landlord at this stage.
STAGE 2 **Electrical Connection**	**Landlord – Letter of Authority:** We ask the freeholder to sign a Letter of Authority (LOA) permitting AMP to submit a connection application to the DNO to assess the viability of the electrical connection for the project at the sites identified in Stage 1. There is no commitment from the landlord at this stage. **AMP – Connection Application:** AMP will prepare and submit the connection application, entirely at our own cost and risk, for all sites identified and included in the signed LOA. The DNO's typically take up to 90 days to confirm the viability of each site, viable sites will move onto Stage 3. AMP will not accept a connection offer at any site without the consent of the landlord.
STAGE 3 **Planning Application**	**Landlord – Landlord Confirmation:** AMP will confirm the sites that have received viable connection offers from the DNO. The landlord is asked to confirm if they want to proceed with these sites. We ask the landlord to confirm the location of the project to make sure both parties are clear on the projects moving into the planning stage. **AMP – Planning Application:** AMP will prepare and submit a planning application to the relevant local planning authority. Planning consent is typically granted within 3 months.
STAGE 4 **Lease Agreement**	**Landlord & AMP – Lease Agreement:** AMP will provide our standard lease document to the landlord and will provide £2,000 to cover the cost of a review of the legal document. It is noted that the lease agreement produced by AMP is purposefully short and landlord friendly in order to avoid costly and drawn-out negotiations. Stage 3 and 4 can run concurrently. **Once the lease is signed, it is at this stage that the landlord is committed to the project.**
STAGE 5 **Construction**	**AMP – Project Commencement:** Once the lease is signed the landlord will start receiving the rental payment. If the upfront payment option was chosen, this will be paid upon commencement of construction. Construction commencement will vary depending on region and equipment lead in times. At least one site visit will need to be completed prior to construction, AMP will liaise with the landlord in order to arrange this.