Version 1.0

Battery Energy Storage Systems

Frequently Asked Questions

This guide provides general information about the development, construction and operation of Battery Energy Storage Systems.

Technology

Large-scale energy storage will play an important role in creating a flexible and reliable energy system and supporting the rapid deployment of variable renewable energy sources.

Battery Energy Storage Systems, or BESS, provide the ability to store energy, so that excess energy produced during periods of low demand or high output (e.g.: from variable sources such as wind or solar) can be stored for use during periods when there might otherwise be a shortfall in supply.

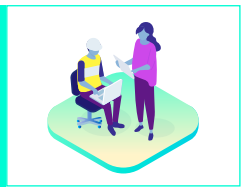
In addition to providing energy storage, BESS can operate flexibly with very fast response times and can be used to provide a range of services to support the stable operation of electricity grids including frequency regulation and voltage control.

BESS typically consist of several key components including enclosures containing battery modules in racks, inverters, transformers, control systems and communications systems. The final configuration of a BESS facility will depend on the specific BESS technology used, the equipment supplier and project/site specific considerations.

> **Most BESS currently use lithium-ion technology, however there are a variety of technologies and chemistries available.**

Where possible, BESS are co-located with or near a network connection point (such as a terminal station), in order to minimise the need for additional connection infrastructure.

Project Development and Approvals



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A number of workstreams are involved in developing a BESS facility.

Key activities include:

- Feasibility studies
- Establishing agreements with landowners
- Network connection studies and application to connect
- Site investigations
- Consultation with local Council and government agencies
- Neighbour and community engagement
- Planning and environmental studies and approvals
- Detailed design
- Preparation of management plans in accordance with the development approval
- Investment decision and arranging funding
- Procurement of contractors and components

What's involved in designing a BESS?

BESS are designed in consideration of a range of technical, community and environmental factors including:

- Proximity and connectivity to the electricity network
- Safety
- Noise
- Potential environmental and heritage impacts
- Relevant standards, guidelines and legislations
- Constructability – whether the design is practical to build
- Operations and maintenance requirements
- Project costs

What planning and environmental approvals are required for a BESS project?

Depending on the BESS location, local, state and/or federal government approvals may be required.

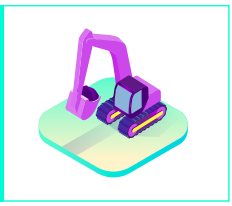
What environmental studies are undertaken for a BESS project?

As part of early feasibility works for a BESS project, key environmental constraints across a project area will be identified. These inform the BESS design with the aim of minimising environmental impacts where possible.

To support the planning and environmental approvals process for a BESS, detailed environmental assessments are undertaken by technical specialists to assess potential impacts and associated mitigation measures. The required environmental assessments are based on the location and jurisdiction of the BESS, but typically include:

- Biodiversity
- Cultural heritage
- Noise
- Landscape and visual
- Hydrology
- Bushfire and other hazards
- Traffic

Construction and Commissioning



Mint will work closely with our contractors, landowners, neighbours, local councils and communities to plan and manage construction responsibly.

We are committed to reducing construction impacts on communities and the environment and keeping people safe whilst we work. Some of the ways we do this include:

- a strong safety culture and clear procedures
- working during standard construction hours where possible
- monitoring and actively managing construction activities
- using well-maintained equipment
- meeting requirements set out in planning conditions, legislation, industry standards and guidelines
- regular communication with the surrounding community and local council

How long does it take to build a BESS?

The size of the BESS will determine the construction period, however, construction typically takes between 6 to 12 months.

How is construction undertaken responsibly?

There are a range of requirements, standards and guidelines in place to ensure construction is well planned and effectively managed. Requirements are set by government authorities, developed as part of the approvals process, and built into construction contracts.

Management plans are developed to ensure that potential impacts are managed, and all requirements are understood and addressed by the project. Management plans will set out the approach to managing all aspects of construction including working hours, safety and security, biodiversity, heritage, water and dust management, noise and vibration controls and traffic.

> **Feedback and suggestions for how local impacts could be managed and minimised during construction are welcomed. Input from communities and other stakeholders during a project's development will help inform construction and environmental requirements and mitigation measures employed.**

What can I expect during construction?

Safety

Safety is our number one priority. We work closely with our construction contractors to develop robust Health and Safety Management Plans that drive safe construction practices and ensure that potential risks are identified, mitigated and communicated to workers. All staff and contractors undertake mandatory training in safety and emergency procedures before starting work on site.

Working hours

The Environment Protection Agency (EPA) in each state recommends standard construction hours. This is generally around 7am to 6pm Monday to Friday and 8am to 1pm on Saturdays. On occasions when we need to work outside these standard hours, we provide as much advance notice as possible and put measures in place to minimise disruption.

Traffic

Peak traffic movements associated with a BESS will occur during construction. A Traffic Management Plan (TMP) is developed in consultation with the relevant road authority to ensure that construction traffic is appropriately managed. We will use major highways and main roads where possible and local roads only where necessary to access the construction site.

Noise

Construction noise limits are set out in project approvals and state or territory legislation to ensure local residents are not unreasonably impacted. Mitigation measures are put in place to ensure these requirements are complied with.

This may include scheduling work so that noisier activities occur at times when they will have the least impact. Using well maintained equipment and machinery, minimising noise from vehicle reversing beepers, turning off machinery that is not in use and putting speed limits in place to minimise engine noise, are some of the measures used to reduce noise from our sites.

Social and economic

During construction, you may find more people and vehicles around town and on the roads. We work with local communities, councils and our contractors to reduce any inconvenience this causes and to ensure local towns get an economic boost through spending on accommodation, food and local goods and services.

Operations

Utility scale BESS are generally expected to have an operational life of approximately 15 to 20 years and are typically monitored remotely, without the requirement of permanent staff on site. Staff are however required to access the site from time to time to undertake inspection and maintenance activities.

What does a BESS look like?

BESS are typically containerised, modular systems that can be configured based on specific site and capacity requirements. However, BESS technology is continuously evolving, with BESS components becoming increasingly more efficient and compact in size.

BESS can be screened (by either vegetation or artificial means) to minimise any potential visual or acoustic impacts.

How do BESS connect to the Electricity Network?

BESS connect to the electricity network via either an overhead or underground transmission connection into a nearby terminal station or substation.

What is the risk the BESS will cause a fire?

BESS are equipped with management systems that monitor the operational and fault status of the system for all parameters required to ensure safe operation of the BESS, including state of charge, voltage, current, power limits, and temperatures. Parameters are monitored at the appropriate level of the battery cell, module and rack as applicable. The management system functions to prevent potential fires by shutting down battery modules / racks if monitored conditions are outside of those permissible for safe operation.

Each BESS supplier has a unique integrated fire monitoring and control system. However, all BESS must comply with the relevant guidelines, standards and conditions of any approvals and operate in accordance with the legislation of the local jurisdiction.

Fire risk management of a BESS facility is typically undertaken by way of a Risk Management Plan developed in conjunction with the relevant fire authority, that identifies, assesses and outlines controls for the management of on-site and off- site risks at the BESS facility.

> **The emergency procedures for a BESS facility are developed in conjunction with the relevant fire authority and outlined in an Emergency Management Plan.**

BESS facilities are protected by multiple systems that take every earliest opportunity to prevent a fire. This diagram is an example of the cascading controls of a BESS.

1 **Battery Management System**

A Battery Management System (BMS) prevents damage to the battery cells from overcharging or overdischarging. The BMS functions to prevent fires by shutting down battery modules/racks if monitored conditions are outside of those permissable for safe operation.

Most issues are addressed at this stage and is extremely rare that an issue will progress beyond this point.

2 **Gas detection**

If the BMS becomes damaged or malfunctions, the battery can become unstable, causing the temperature in pressure inside the cell to rise and produce carbon monoxide. A gas detection system will intervene and mitigate the problem by shutting down power to the affected cell, activate a ventilation system within the BESS enclosure, activate alarms, and provide early warning to operations.

3 **Fire suppression and Management**

If the gas detection system fails and smoke is detected in the BESS module, some BESS are equipped with fire suppression systems that will activate, releasing a fire suppression agent (water mist of gaseous agents) to prevent and/or distinguish a fire. In other instances, some BESS are designed to resist thermal runaway and in the unlikely event of a fire, the fire will be contained to a single BESS module.

4 **Action emergency response**

If a fire is detected at the BESS facility, the emergency response set out in an in an Emergency Management Plan will be actioned. Local firefighters will attend the site utilising the onsite fire management measures including fire hydrants or water tanks, access tracks for direct access to the BESS modules and Emergency Information Container.

Will the BESS leak chemicals?

BESS are designed to manage chemicals on site. Containment measures such as bunding and spill trays are in place to capture on site, should a leak occur. Chemical hazards or 'dangerous goods' are typically identified and addressed by way of a Hazard Assessment and Emergency Management Plan (or equivalent).

Will I be able to hear a BESS?

BESS do generate some sound. The main source of the sound is the cooling fans required to regulate the operating temperature of the individual battery cells. The sound they make is similar to that of an air conditioning unit, a dull whirring noise.

Noise studies are undertaken by specialist consultants who apply noise guidelines to assess potential noise levels during project design and ensure that noise generated by the completed project will be within the applicable limits.

Once operating, BESS are required to meet strict noise requirements developed during the approval process and relevant noise protocols and/or guidelines.

What does MW and MWh mean?

MW means megawatts and is the measurement of the rated power capacity of a BESS. It is the maximum possible instantaneous charge/discharge capability of the BESS and is an upper limit imposed by the rating of equipment such as invertors in the BESS system.

MWh means megawatt-hours and is the total amount of energy that the battery can store. For example, a 100 MW, 100 MWh battery could provide 100 MW for one hour or 50 MW for 2 hours or 25 MW for 4 hours etc.

Image: Fluence

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Employment

Construction creates an economic boost for regional communities by increasing demand for local goods and services.

What kind of jobs are available during construction?

Typical jobs created during construction include:

- General labourers
- BESS installers
- Concrete workers
- Accommodation providers
- Local pubs, hotels, food and service providers

What kind of jobs are available during operation?

During the operation of a BESS, employment is generally limited to inspection and maintenance activities by the BESS operator.

Is there work for local people and businesses?

Mint is committed to employing local people and buying local wherever possible. We are always on the lookout to build new working relationships in the industry and encourage you to register your services / business on our Goods & Services Register.

> **Mint, as the owner of the BESS facility, will not typically be directly employing workers. However, opportunities will exist with our delivery partners and contractors (and their sub-contractors).**

The project Goods and Services Registers will be provided to these partners/contractors once they have been engaged.

Decommisioning

When a BESS reaches the end of its life, the facility can be decommissioned and the area returned to its original condition.

What does decommissioning involve?

Decommissioning will likely involve:

- Dismantling and removing the BESS infrastructure
- Removing related infrastructure
- Rehabilitation of the site

The owner will be responsible for the decommissioning of the BESS. Requirements for decommissioning – such as reinstating the land – are set out in contracts with landowners and in planning and environmental approvals.

> **Decommissioning of a BESS facility will be undertaken in accordance with the applicable regulations that govern the safe transport and disposition of used equipment or waste.**

Details of the decommissioning process are typically outlined by way of a Decommissioning Management Plan, that is prepared prior to a BESS being decommissioned and identifies all infrastructure, equipment, buildings and structures to be removed and details of how these will be removed.

Where possible, balance of plant material (such as steel and concrete) will be recycled. Whilst inverters, control systems and other electronic equipment may be more challenging to recycle, useful materials from these components can often be recovered.

Whilst it is still early days in the research and opportunities for recycling BESS components, the industry continues to develop processes that are in line with circular economy principles: cradle to-cradle design, achieving 100% recyclability, designing out waste and using recycled inputs.

*Source: https://www.cleanenergycouncil.org.au/advocacy-initiatives/energy-transformation/wind-turbine-recycling

Working with Communities

As the ultimate owner and operator of our development projects we have a long-term vision for every project and work hard to build strong relationships with local residents, businesses and organisations to share that vision.

What economic benefits will the project bring to the local community?

Local community benefits can include:

- boost to the local and regional economy and local businesses
- jobs during construction
- direct payments to landowners
- wider community benefit sharing such as education and training programs

How do you continue to engage with communities?

We are committed to positive engagement practices and ongoing engagement throughout all stages of a project's life – from site selection through to decommissioning.

We engage with local councils, landowners, neighbours and surrounding communities as early as possible, keeping people informed and involving people in decisions that they are able to influence.

We also encourage our community stakeholders to sign up to our project newsletters to make sure they stay up to date with projects as they progress.

How do I find out more and/or provide feedback?

Feedback and questions are always welcome. If you have any concerns or local knowledge that could help us then please get in contact by phoning us on 1800 HI MINT (446 468) or emailing us at info@mintrenewables.com.

You can find our Complaints Handling Procedure on our website, or we can send you a copy on request.

How do you keep people informed?

We use a range of tools to keep people up to date. These include:

- website – dedicated project page
- meetings, phone calls, emails and/or letters to anyone directly affected
- regular newsletters
- construction updates – via email or text message
- fact sheets
- information displays in nearby towns – community noticeboards
- drop-in information sessions
- presentations to community groups and organisations

Contact us

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info@mintrenewables.com

complaints@mintrenewables.com

www.mintrenewables.com

We know that for our projects to be successful, we must have the support of key stakeholders. Landowners, neighbours, communities and local authorities are our priority.