

Case Study

iINNOVA

SUSTAINABLE ENERGY

Eccles BESS, UK
(500 MW / 1 GWh)

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Project Overview

Innova delivered the Planning discharge support, detailed civil, electrical, and protection & control design for the Eccles Battery Energy Storage System (BESS) in Scotland. The project forms part of a 500 MW / 1 GWh grid-scale energy storage development adjacent to the SPEN Eccles 400 kV substation, supporting Tesla's delivery of one of the largest BESS installations in the UK. The scope covered all design activities within the BESS compound and the associated cable route up to the Point of Connection at the 400 kV Cable Sealing Ends inside the SPEN substation.

Client Requirement

The client required a highly capable design partner to deliver a fully integrated, construction-ready design for a complex, high-voltage BESS project, including:

- Integration of large-scale OEM equipment across multiple voltage levels
- Compliance with UK Grid Code, SPEN requirements, and client standards
- Management of significant civil, electrical, and P&C interfaces
- Delivery of a structured design package aligned with a defined review and approval process
- Support for the planning discharge conditions

Given the project scale and grid voltage level, particular emphasis was placed on design robustness, interface clarity, and programme certainty.

Scope & Key Deliverables

Innova was responsible for the end-to-end detailed design of the BESS facility, including:

Electrical Design

- 33 kV and LV system design and coordination
- Overall electrical system design from Megapacks through MV collection systems to the 400 kV grid interface
- Development of Single Line Diagrams and system interconnection philosophies
- 33 kV and HV cable sizing, routing, duct banks, and trenching design up to the POC

Earthing and Protection & Control Design

- Protection philosophy covering MV and HV systems
- Interface design for Tesla-supplied protection, control, and SCADA equipment
- Control, interlocking, and trip circuit design for customer switchrooms and HV equipment
- Coordination with SPEN requirements at the 400 kV interface

Civil & Structural

- Civil Layout with multidisciplinary layout coordination to support constructability and efficient installation
- Cut and Fill and proposed levels with backfill quantity
- Foundation design for BESS and HV compound Equipment including Megapack, Switchroom building, transformers-Bund, HV structures, Harmonic Filter, fire tanks, lighting columns and fire tank

- Drainage, collection pond, access roads, cable routing and earthworks

Design Documentation

- Design deliverables aligned with the client's Design Deliverables Register
- Foundation design calculations, Drainage / SUDS design reports, Earthworks and pavement design
- Submission packages progressed through review to AFC status
- Assurance documents including Design Risk Register, Design Decision logs and Assumption Register

Our Approach

Innova adopted a design-for-delivery and design-for-scale approach, recognising the challenges associated with a 500 MW, 400 kV-connected BESS. Early design effort focused on interface definition, constructability, and standardisation to minimise risk during construction and commissioning.

Key strengths of the approach included:

- Proactive management of interfaces between OEM equipment and balance-of-plant systems
- Early identification and mitigation of constructability and programme risks
- Clear, consistent documentation aligned with client and DNO expectations
- Contractor queries and clarification responses

Value Delivered

- Programme certainty: Design milestones were achieved in line with the agreed schedule, supporting procurement and construction activities
- Reduced interface risk: Clear definition of electrical and protection boundaries between OEM and balance-of-plant systems
- Construction efficiency: AFC documentation minimised site queries and reduced rework during installation
- Regulatory compliance: Designs aligned with UK standards and DNO (SPEN) requirements, supporting smooth 400kV grid connection approval

Outcome

The project design was successfully delivered to Approved for Construction status, enabling timely construction and commissioning of the BESS facility. The client benefited from a robust, compliant, and well-coordinated design solution that supports reliable grid integration and long-term operational performance.

Why Innova

Innova combines deep technical expertise in grid-scale BESS design with a strong commercial focus, delivering solutions that are practical, buildable and aligned with programme and cost objectives. Our experience on complex energy storage projects enables clients to progress confidently from detailed design through to construction and operation.