Solar and BESS Standard Development



Project Background

Client: Tier 1 Miner
Date: May 2024 - October 2025
Location: Pilbara Region, WA

Background

GTE's client operates a rail network supported by distributed signalling and communications assets, many of them powered by standalone solar photovoltaic (PV) and battery energy storage systems (BESS). Across that asset base, installations varied in their AC and DC supplies, battery arrangements, solar arrays, UPS systems and protective devices.

GTE was engaged to develop a standardised engineering framework, supported by representative AC and DC arc flash assessments, asset classification, standard arc flash labels, a technical specification and operation and maintenance (O&M) requirements.

The Challenge

- **Varied installations:** Rail signalling and communications sites differed in AC/DC supplies, battery arrangements, solar arrays, UPS systems and protective devices.
- **Incomplete legacy information:** Asset information was inconsistent, so assessments had to represent typical installations and use conservative assumptions where protective device, generator, cable or enclosure details were unavailable.
- **Arc flash and electric shock hazards:** Incident energy, arc flash boundaries and PPE categories needed to be assessed and converted into clear labels that could be used on applicable equipment.

The Solution

GTE Group developed a standardised engineering framework for the client's standalone solar PV and BESS systems. Existing drawings and asset information were reviewed, representative AC and DC arc flash calculations were prepared, and worst-case typical installations were identified and grouped into defined assessment types. Results were consolidated into a summary tool and standard label drawings so they could be applied consistently in the field.

Key Features

Representative AC and DC Arc Flash Assessments

AC assessments followed IEEE 1584-2018 and DC assessments followed the Ammerman method, supported by AS/NZS 5139, AS/NZS 4836 and NFPA 70E.

Type-Based Asset Classification

Assets were grouped by supply type, system voltage, fault current, equipment arrangement and protective devices, so similar installations could be assessed consistently.

Arc Flash Summary Spreadsheet

A custom tool classified locations into AC/DC assessment types, linking them to the governing arc flash results and generating label content, with instructions for adding future locations.

Standard AC and DC Arc Flash Labels

Standard individual and group label formats were developed, and GTE produced and printed more than 500 labels for deployment on site.

Technical Specification

GTE developed a standalone solar PV/BESS specification that defined requirements for monitoring, communications, protection, isolation and control of future systems, with a stated hierarchy of legislation, client standards, Australian Standards and other codes.

Operation and Maintenance Procedure

Operation and maintenance (O&M) requirements were developed around the client's existing standards and management requirements, giving a consistent basis for future design, operation and maintenance.

Results & Impact

Operational Efficiency

Our client can now identify the applicable hazard category and PPE requirements for similar assets without repeating a full calculation for every location. The reusable summary sheet also reduces the need to start from scratch when similar assets are added.

System Reliability and Integration

The classification is based on existing asset characteristics, and the specification and O&M procedure were built around the client's existing standards. The summary tool is structured for expansion, so new locations can be classified against the established assessment types.

Safety and Compliance

The primary outcome was improved electrical safety and consistency. Standard AC and DC labels now clearly communicate arc flash hazards and PPE requirements in the field, and assumptions and data limitations were stated openly in the calculations.

Outcome

Our client now has a practical, repeatable system for managing arc flash hazards across its standalone solar PV and BESS assets, backed by a technical specification and O&M framework for future systems. Looking ahead, maintaining the asset summary as a controlled live register and updating the methodology as standards and client requirements evolve would keep the framework current, and more complete digital asset data would reduce the need for conservative assumptions. As Western Australia's largest independent system integrator, GTE Group combines electrical engineering, control systems, communications and functional safety expertise with a client-first approach to turn detailed analysis into tools that work day to day.

