



# Equipment Strategy for Stand By Diesel Generators – Strategy

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## 1. Introduction

### 1.1 Purpose

The Equipment Strategy document expresses Powerlink's vision of equipment technologies and equipment performance requirements, to provide both Powerlink and suppliers with consistent planning and project management platforms for the life of the Equipment Strategy. It is not a detailed contract specification.

The Equipment Strategy for diesel generators has been developed with input from the relevant teams.

### 1.2 Scope

This document covers the equipment requirements ranging from 150kVA to 500kVA diesel generators for use in new and existing substations during major/minor refurbishment and augmentation works.

In addition, Powerlink has various other Communications Sites which require diesel generator replacement or installation and although these have different technical specification, the general principles in this document are applicable.

### 1.3 Defined terms

| Terms | Definition  |
|-------|---|
| SAP   | Software package used for computerised maintenance management system and asset register |
| SCADA | Supervisory Control and Data Acquisition  |
| LPG   | Liquefied Petroleum Gas   |

### 1.4 Monitoring and compliance

This equipment strategy will guide development of the technical specification. The success is monitored through regulatory information notice, annual reporting and SAP records review of installed equipment.

The success of this strategy is measured by monitoring life cycle costs as well as availability and service history associated with this equipment.

The minimum records required are:

- Technical specification
- Tender evaluation report
- Period contract
- Purchase orders
- SAP equipment records
- Operation and Manufacturer Manual
- Nameplate details

### 1.5 Risk management

The risks considered in the development of this strategy are:

- **Network Operations Risk** – risk related to the increased probability of not having protection and telecommunication systems functional, which can result in the requirement of additional or extended network outages impacting supply to customers and the electricity market.

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- **Safety Risk** – risk associated with the operation and maintenance of diesel generator, as it is expected that safety features described in the technical specification are driven by safety requirements listed in this equipment strategy.
- **Environmental Risk** – related to oil and gas leaks and greenhouse gas emission.
- **Financial and Contractual Risk** – risks associated with the inability to make warranty claims, request access to adequate technical support and spares, increased maintenance costs, and additional capital investment costs.

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## 2. Strategy

The following are the main features of the vision for the Diesel Generators:

### The Vision:

- Evaluation and Assessment through Life Cycle Cost Analysis (termed "LCCA")
- Annual operation and maintenance cost less than 0.5% of the asset value.
- Identify Cost Contributors and Cost Effective Improvements.
- Focus on performance of the whole product.
- High availability and reliability and cost competitive on a whole of life basis.
- Appropriate monitoring and remote interrogation facilities to allow maintenance staff to optimise their site visits.
- Focus on performance of the whole product.

### Safety and Environmental:

- Safe operation and possess all required safety features to reduce safety risk during maintenance and fault finding including but not limited to the emergency safety switch.
- The risk of explosive failure or fire should be minimal.
- Working conditions should be safe to the greatest possible extent for personnel working in the yard.
- The design of the unit should allow for diesel fuel recovery.
- Minimise diesel fuel leakage rates to meet or better environment standards.
- Minimum noise and radio interference voltage (RIV)

### Maintenance Level:

Powerlink's preference is to procure equipment which has:

- Optimal maintenance requirements.
- Least number of moving parts.
- Simple and reliable design.
- Low stresses, both electrical and mechanical.
- Minimal number of parts which have short expected life (seals, etc.)
- No routine inspections required more frequently than 6 monthly.
- Routine generator service not required more frequently than every 2 years.
- Sealed battery for generator start with minimal expected service life of 5 years.

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## 2.1 Projected Use of Equipment

The primary use of diesel generators will be as a standby emergency power supply for substation or communications sites in the case that the main AC supplies fail. Generally these are run for a very small number of hours per year and this should be taken into account during design. Typical installation is outdoors in its own housing along with the diesel tank.

## 2.2 Technologies Available Now

Traditionally Powerlink has preferred to use diesel engines with electric alternators (generator) for the emergency power supply over petrol. The reasons are as below:

- Diesel fuel is heavier than petrol and less prone to evaporation and losses.
- Diesel engines are also more efficient to run than petrol engines.

The downside of this is that it is less environmentally friendly than petrol due to the lower evaporation rate.

There are many other types of generator technology available on the market. Most of them can be classified into two categories.

- Type that uses renewable energy resources such as solar and wind.
- Non-renewable resources type such as LPG and Hydrogen Fuel Cell.

Even though the generators with renewal energy sources are environmentally friendly, they are not a good candidate as the sources of fuel are not reliable unless used in combination with a back up battery storage system of adequate capacity. The cost may still be higher than that of diesel generators.

Non-renewable resources such as petrol, LPG and Hydrogen Fuel Cell are reliable sources of fuel, but do pose relatively high environmental and health risks.

## 2.3 Equipment Strategy Elements

The equipment strategy for diesel generator sets is required to ensure that they meet the criteria below:

- Design / Operating life of 40 Years in Queensland environmental conditions. Shorter life expectancy for electronic equipment used in the control and monitoring system of 15 – 20 years is acceptable if these are easily replaceable.
- Required minimum reliability and availability for the equipment.
- Safe operation and maintenance.
- Minimum whole of life cost in alignment with the Life Cycle Cost Analysis.
- Fit for purpose and value for money.
- Stainless Steel Canopy.
- Galvanized skid bases.
- Bunded tank.
- 7 Day double skin fuel tank as required (outside skin to be galvanised or stainless steel)
- Spare parts support over the life of the equipment.
- Designed to have minimal inspections (no more frequently than every 6 months) and/or corrective maintenance requirements.
- Designed to provide proper operational status and alarms for the purpose of monitoring and control.
- Capable of starting and shutting down via AC changeover switch.

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## 2.4 Concurrent Investigations

In view of continuous technological improvement, it is important that close examination of the available technologies be made to ensure that they meet Powerlink's requirement and adopt the most appropriate technology. Each time a new contract is required, a review of the previous purchase is undertaken to remedy any deficiencies.

It is envisaged that the life of this Equipment Strategy will be 5 years. It will be reviewed in its 3<sup>rd</sup> year to leverage evolving technological advancements associated with battery storage systems. It is also recommended that during the current equipment strategy period, other technologies be investigated or developed for suitability of use within the network.

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## 3. Summary

The Equipment Strategy detailed in this document will be adopted for all future requirements of stand by diesel generators for the life of the Equipment Strategy.

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