

S4

Backup Power Report

NEXTDC

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1 Preface

1.1 Executive Summary

This *Backup Power Report* has been prepared by *Aurecon* on behalf of NEXTDC Limited to accompany a detailed State Significant Development Application (SSDA) for the S4 data centre development at 16 Johnston Crescent, Horsley Park. The site is legally described as Lot 305 in Deposited Plan 1275011.

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-63741210). This report concludes that the proposed data centre development is suitable and warrants approval subject to the implementation of the following mitigation measures.

- Acoustic attenuation on generator engine equipment
- Limiting testing frequency

Following the implementation of the above mitigation measures, the remaining impacts are appropriate.

Backup power is required for the proposed mission critical facility as outlined in Section 3. While alternatives have been considered in Section 4, ultimately the site will be supported by backup diesel generators housed within acoustic-rated enclosures. Considerations for the design have been outlined in Section 5 in terms of the generator itself, acoustics and the fuel used. The exact frequency and duration of testing is not known at this stage but information has been provided within Section 5 to provide a general overview.

2 Introduction

2.1 Purpose of this Report

This report has been prepared to accompany a detailed SSDA for the proposed S4 data centre development at 16 Johnston Crescent, Horsley Park (SSD-63741210).

The application seeks consent for construction and operation of a data centre development and includes site preparation works, bulk earthworks and infrastructure, and construction of the buildings, ancillary facilities, and associated site works.

The key features of the Proposal are summarised as follows:

- Site preparation works including bulk earthworks.
- Staged construction and operation of five data centre buildings comprising a total gross floor area (GFA) of 63,654m² including 52,916m² of technical data hall floor space and 10,738m² of ancillary office and innovation floor space, including 'front of house' meeting and function spaces, and a café.
- Associated and ancillary on-site facilities on-site parking for 200 cars, business identification signage (pylon and elevation signage), civil and stormwater works and 9,900m² of deep soil landscaping.
- Delivery of 232 megawatts of power, including a 330kV substation and four 33kV switching stations, plus above ground diesel storage tanks and above ground water tanks for industrial water and fire water.

The Project will be delivered in three construction stages as follows:

- Stage 1 = Buildings A to C and substation
- Stage 2 = Building D
- Stage 3 = Building E

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 27 October 2023 issued for the SSDA (SSD-63741210). Specifically, this report has been prepared to respond to the SEARS requirement issued below.

Table 2-1 SEARs Compliance

Item	Description of Requirement	Section Reference (this Report)
10. Backup Power Requirement	<ul style="list-style-type: none">■ Provide a detailed overview of any proposed back-up power system, including the scale and capacity of the system, and any associated testing procedures (frequency and duration).■ Provide a detailed justification for the proposed back-up power system, including alternatives considered.	3 Backup Power Requirement 4.2 Alternatives Considered 5.2 Generator Design 5.3 Fuel on Site 5.4 Testing Procedures

2.2 The Site

The site is located at 16 Johnston Crescent, Horsley Park within the Fairfield Local Government Area (LGA). The site is legally described as Lot 305 in Deposited Plan 1275011.

An aerial photograph of the site is provided at Figure 1. The site comprises vacant land which has been cleared of vegetation and does not contain any existing built form structures. Bulk earthworks approved under DA-893-201 are currently underway on the site.

The site will be well serviced by infrastructure. The signalised intersection of Lenore Drive and Old Wallgrove Road at Eastern Creek is approximately 2 kilometres to the north, providing access to Wallgrove Road and the Westlink M7 Motorway to the east and Erskine Park Road and Mamre Road to the west. Each of these roads provides access to the M4 Motorway to the north and M5 Motorway to the south. A utilities and site services report will accompany the EIS.

The site is located approximately 35 kilometres west of the Sydney Central Business District (CBD), 17 kilometres west of the Parramatta CBD and 10 kilometres north-east of the future Western Sydney International (WSI) airport.

The site is within a developing employment precinct, including the ESR Horsley Logistics Park, Oakdale Central, Oakdale South and Horsley Park Employment Precinct. It is also close to other established and emerging employment-generating precincts, including Eastern Creek to the north, Huntingwood to the north-east, Wetherill Park and Mamre Road West to the north-west and Wetherill Park to the east.

Figure 2.2.1 Site Aerial Photograph



Source: Nearmap (2023)

2.3 Detailed Project Description

The key components of the Project are listed in the following table.

Table 2-2 Project Details

Descriptor	Project Details
Project Area	The site has a total area of 8.206 hectares. The entire site will be disturbed by the Project.
Use and Activities	Data centre with ancillary office and innovation floor space and café
Project Summary	<ul style="list-style-type: none"> ■ Site preparation works including bulk earthworks. ■ Staged construction and operation of five data centre buildings comprising a total gross floor area (GFA) of 63,654m² including 52,916m² of technical data hall floor space and 10,738m² of ancillary office and innovation floor space, including 'front of house' meeting and function spaces, and a café. ■ Ancillary development including on-site parking for 200 cars, business identification signage (pylon and elevation signage), civil and stormwater works. ■ Delivery of 232 megawatts of power, including a 330kV substation and a 33kV switching station, plus above ground diesel storage tanks and above ground water tanks for industrial water and fire water.
Gross Floor Area	<p>Total GFA of 63,654 m², broken down as follows:</p> <ul style="list-style-type: none"> ■ Data halls/technical: 52,916 m² ■ Mission critical (MCX) office, innovation and admin floor space: 10,738m². ■ Total number of data houses: 34 data houses
Maximum Height	<ul style="list-style-type: none"> ■ Building A – 32 metres over three storeys ■ Buildings B, C, D and E – 39 metres over four storeys
Floor Space Ratio	0.78:1
Deep Soil Area	9,900 m ² (12.1% of site area)
Car Parking	200 car spaces including 6 DDA spaces and 10 EV spaces
Motorbike Parking	5 spaces
Bicycle Parking	24 spaces

Descriptor	Project Details
Utilities	<p>Provision of required utilities:</p> <ul style="list-style-type: none"> ■ Building A Utilities including: <ul style="list-style-type: none"> - Above ground diesel storage tanks (10 x 25kL each) - Above ground water tanks for industrial water (4 x 170kL each) ■ Building B Utilities including: <ul style="list-style-type: none"> - Above ground diesel storage tanks (10 x 65kL each) - Above ground water tanks for industrial water (4 x 580kL each) ■ Building C Utilities including: <ul style="list-style-type: none"> - Above ground diesel storage tanks (10 x 65kL each) - Above ground water tanks for industrial water (4 x 580kL each) ■ Building D Utilities including: <ul style="list-style-type: none"> - Above ground diesel storage tanks (10 x 65kL each) - Above ground water tanks for industrial water (4 x 580kL each) ■ Building E Utilities including: <ul style="list-style-type: none"> - Above ground diesel storage tanks (14 x 65kL each) - Above ground water tanks for industrial water (6 x 580kL each) <p>Fire Water Storage Tanks:</p> <ul style="list-style-type: none"> ■ Above ground water tanks for fire water (6 x 340kL each) <p>Substation:</p> <ul style="list-style-type: none"> ■ On site 330kV substation plus 33kV switching station
Power Consumption	232 megawatts
Operations and Management	The facility would be constructed and operated by NEXTDC. The site would be operated on a 24-hour, 7 day a week basis.
Existing Services and Infrastructure	Existing services and infrastructures will be extended, adapted and augmented to meet the demands of the Project.
Staging/Phasing	<p>There will be 3 construction stages:</p> <ul style="list-style-type: none"> ▪ Stage 1 = Buildings A to C and Substation ▪ Stage 2 = Building D ▪ Stage 3 = Building E

2.4 Stakeholder Engagement

Stakeholder consultations with Transgrid & Lumea are ongoing. Refer to Section 6 of the *S4 SEARs Infrastructure Report* for further details on stakeholder consultations.

2.5 Methodology

This section outlines the methodology used to define the baseline and undertake the assessment of selection and potential impacts of the proposed backup power system on the surrounding area.

2.5.1 Study Area

The assessment area will be limited to the subject site (including site boundary) and the surrounding roads/buildings.

2.5.2 Method of Assessment

To address the project SEARs, this report has analysed the proposed electrical topology of the site and calculated the individual and aggregate backup power required for each building. The backup power sources have been identified through availability in the market, suitability for Data Centres, and viability for the proposed site. Through vendor discussions and application of Australian design standards, the designs of the generator enclosures and fuel storage have been proposed.

2.6 Existing Environment and Considerations

There are no backup power sources at scale known to exist at the current site. While already located in an industrial zone, there are residential properties to the east of the site which may be impacted by the proposed site while in construction and in operation.

The noise and emissions from the site backup power generation needs to be considered and mitigated through the design and operation of the site. While individual backup generation sources may produce limited pollution individually, the aggregate contribution of the site to the environment is of particular interest. Refer to Section 5.2 for further details and references to other relevant reports.

3 Backup Power Requirement

The new development is proposed to be supplied by a new Lumea 330kV/33kV Substation. The power supply will be distributed within the site via the proponent's own underground electrical infrastructure. The new substation will also supply developments in the proximity of the site.

The data centre is a mission critical facility and therefore requires back up generation if there is interruption to the utility supply. Each building will be provided with diesel-generators and uninterruptible power supply (UPS) systems. The UPS system is designed to maintain supply between loss of utility and changeover to the generator supply, it is not intended to maintain the full load on site for an extended period. For the purposes of this report, only the diesel-generators are considered as "Backup" power, the UPS and battery system are for energy storage and short-term supply only.

Although the energy transmission system in the area is designed to be highly reliable, there is always risk of interruption to utility supplies. The maximum allowable unserved energy per year from the upstream Sydney West 330kV supply point is 1 minute [1] however this does not capture incidental disruptions due to accidents, storms, etc. Any interruption without backup power generation on site would be of extreme detriment to the general community through disruption to the internet services facilitated by the data centre in the area.

4 Backup Power Selection

4.1 Selected Power Generation Technology

The Proponent has opted for diesel-generator sets for the backup power source for the proposed site. This is based on the most appropriate technology for a mission critical data centre and the market readiness for this technology in New South Wales. Alternatives have been considered for this site, but none are considered viable except for alternative fuel for the generator engines. See Section 4.2 for further details.

4.2 Alternatives Considered

Aurecon has previously investigated several options for backup power supply technologies for Data Centre applications in terms of suitability for deployment in data centres, technological maturity in Australia, and viability for the site [2].

4.2.1 Potentially suitable for deployment

The following table describes the backup supply technology, rates its technology maturity, and provides a recommendation on its suitability for data centres.

As outlined in the table, the following technologies were recommended as potentially suitable for deployment as long duration backup supply in data centres:

- Lithium-ion batteries
- Vanadium redox flow batteries
- Diesel generators with renewable diesel (HVO) as a fuel
- Open Cycle Gas Turbines (OCGT) or Reciprocating Engines with natural gas as a fuel
- Hydrogen Fuel Generators

Table 4-1 Backup Power Options Analysis Summary

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
Lithium-ion battery	<ul style="list-style-type: none"> Lithium-ion batteries uses a cathode (positive electrode), an anode (negative electrode) and electrolyte as conductor. Li-ion battery cells come in many varieties – but all use lithium ions. During charging the lithium ions flow from the cathode to the anode through the electrolyte and separator. When discharging the flow of ions reverses from the anode to the cathode. 	<ul style="list-style-type: none"> High - Lithium-ion batteries have been widely deployed in electric vehicles and are increasingly being deployed as stationary storage for grid applications. 	<ul style="list-style-type: none"> Potentially suitable - The high energy and power density, proven performance and declining costs of lithium-ion batteries make it an attractive option as a backup energy source. Required physical footprint, standby power consumption and fire risk management to be considered. Fire prevention and protection requirements shall be in accordance with the regulatory requirements at the design time. Possible risk assessment might also be required because of the Li-ion batteries. 	<ul style="list-style-type: none"> Capex costs drop per MWh to levels in line with alternatives Space requirements reduce (unlikely for this tech) 	<p>Due to the spatial requirements of Lithium-ion batteries for both fire-separation, fuel separation, and general safety requirements, it is difficult to provide enough battery storage to the site for a medium-term power failure. The current provision for battery storage on site is for short-term supply and energy storage only, to facilitate the switch between utility supply and the backup power supply if interruption to utility occurs (up to 5 minutes only). Thus, this technology is not viable be used as a standalone backup power supply for this site.</p>
Vanadium redox flow battery	<ul style="list-style-type: none"> Flow batteries store energy in electrolytes in electrolyte tanks. The active material of flow batteries comprises of electrolyte solutions that are stored in tanks. The electrolyte is pumped through a reaction stack of electrochemical cells, in which charge, and discharge reactions take place at electrode surfaces. Vanadium redox is the leading flow battery technology in terms of technical and commercial readiness. 	<ul style="list-style-type: none"> Low / Moderate – Limited number of vanadium redox flow batteries in commercial deployment. Most deployments are currently 10-20MWh in energy storage capacity. One 800MWh project is planned is under construction in China. 	<ul style="list-style-type: none"> Potentially suitable – Vanadium redox flow batteries are well suited to long duration storage (4+hrs) by increasing the size of the electrolyte tanks. Cost per MWh expected to decrease as storage duration increases. Higher costs and bigger physical footprint required compared to lithium-ion batteries. 	<ul style="list-style-type: none"> Capex costs drop per MWh to levels in line with alternatives Space requirements reduce (unlikely for this tech) but potential to stack to reduce m2 requirements, potentially advantageous over lithium ion batteries 	<p>Not viable for this site due to commercial availability and scale required to achieve energy autonomy on site during utility failure.</p>

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
HVO renewable diesel fuel	<ul style="list-style-type: none"> Biodiesel is produced from a diverse mix of resources including vegetable oils (corn, soybeans, rapeseed, palm etc.), animal fats (beef tallow, pork lard etc.), and recycled cooking oil. Conventionally feedstock goes to a transesterification process and becomes biodiesel, which can be blended with petroleum diesel. Advanced methods such as hydrotreatment, gasification, and pyrolysis can be used to produce 'drop in' biofuels. These biofuels are chemically the same as petroleum diesel fuel and is compatible with existing infrastructure designed around petroleum. 	<ul style="list-style-type: none"> Moderate – The biodiesel supply chain is still a localised industry, with some regions having higher biodiesel availability due to access to feedstock, or government mandates. No large scale HVO supply chain or policy support exists yet in Australia. ~440ML of biodiesel produced p.a. (not all are HVO) 	<ul style="list-style-type: none"> Potentially most suitable short-term solution – Biodiesel blends and renewable diesel that are compatible with the existing diesel generator infrastructure. Biodiesel has lower emissions compared to petroleum diesel. Full lifecycle emissions are dependent on the feedstock source. 	<ul style="list-style-type: none"> Supply chain readiness in Sydney & AU around HVOs Confirm high volume of diesel tanker trucks are possible to site for refills 	<ul style="list-style-type: none"> Moderate viability - This site is proposed to use diesel generators and HVO renewable diesel fuel could be used in lieu of standard diesel fuel subject to local supply chain availability.
Natural gas fuel	<ul style="list-style-type: none"> Natural gas as a fuel source, can be used as a backup power source through gas turbines generators. Gas turbine generators draw air into the engine and combusts the fuel to produce a high-pressure gas. This gas expands and rotates the turbines to produce electricity. Can also be used as fuel in fuel cells (e.g. Bloom Energy) 	<ul style="list-style-type: none"> High/ Moderate - Natural gas has a mature global supply chain, with gas turbines widely deployed in electricity grids around the world. 	<ul style="list-style-type: none"> Potentially suitable - Gas turbines are a proven technology. Fuel delivery can be through existing gas pipelines. Natural gas has slightly lower emissions compared to petroleum diesel Fire detection and suppression requirements as a standalone infrastructure will need to be considered to suit the NG turbine plans. 	<ul style="list-style-type: none"> Environmental approvals possible: depends on exact technology selected, expected usage, emissions profile, noise outputs, etc Pipeline capacity confirmed as feasible, impacting transmission throughout Sydney / Newcastle given other gas plants planned for the area 	<ul style="list-style-type: none"> Not viable – the technology requires more space than is currently possible on site compared to other solutions due to increased cooling/ventilation requirements. The impact of a 500MW gas turbine on existing natural gas pipelines may require significant upgrades in the area.

Technology	Description	Technology maturity	Suitability for deployment in data centres	Trigger points for viability	Viability for proposed site
Hydrogen fuel	<ul style="list-style-type: none"> Hydrogen can be used as a fuel source to using fuel cells. A fuel cell consists of a negative electrode (anode) and a positive electrode (cathode) sandwiched around an electrolyte. A catalyst at the anode separates hydrogen molecules into protons and electrons, which then flow to the cathode through different paths. The electrons go through an external circuit, creating a flow of electricity. The protons migrate through the electrolyte to the cathode, where they unite with oxygen and the electrons to produce water and heat. 	<ul style="list-style-type: none"> Moderate – The hydrogen production, delivery and storage supply chain are still immature, but progress is accelerating. One data centre owner is trailing a 3MW hydrogen fuel cell. 	<ul style="list-style-type: none"> Potentially suitable - Highly dependent on further cost reductions and the emergence of an established supply chain Hydrogen storage and delivery requires detailed planning to ensure safety and reliability Case-by-case fire and risk assessment studies need to be considered. Storage likely to trigger Major Hazard Facility requirements 	<ul style="list-style-type: none"> Safety exclusion zones for storage addressed – large site required H2 supply chain established, including market to contract supply H2 pipeline established, including safety and operational concerns addressed Capex costs drop per MWh to levels in line with alternatives 	<ul style="list-style-type: none"> Not Viable – significant spatial requirements of industrial tanks for 24-48 hours of hydrogen fuel on site. No current hydrogen pipeline would be possible within site development timeframe. Additional safety requirements for hydrogen usage on site. Safety considerations for nearby residential areas.

5 Backup Power Generators

5.1 Site Design

The generators are located adjacent to the buildings they serve in an external generator yard (Figure 5.1.1). Depending on the Building served the generators are either located directly on ground (Building A) or on a double stacked gantry enclosure (Buildings B-E). Refer to Section 6 of the *S4 SEARs Infrastructure Report* for breakdown of generator quantities per building.

Figure 5.1.1 Location of Generators on Proposed Site (Green)



5.2 Generator Design

The proposed site will use 98 low voltage 3MW generators and 10 low voltage 2MW generators for the first stage of construction (Buildings A-E). These generators will only operate in the event of a mains utility failure to the respective electrical block or for testing purposes. These generators support a total load of 296MW.

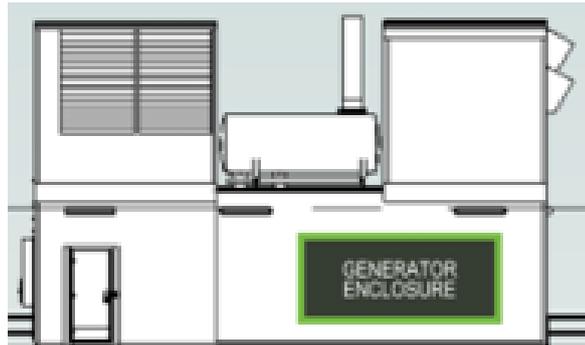
5.2.1 Enclosure

To improve acoustics, safety, and general site delivery/readiness, all generators will be housed in prefabricated, acoustic-rated, enclosures with belly tanks or shared bulk tanks to store diesel. The container will include the following:

- Generator Engine Set.
- Fuel System, including pumps.
- Control and Power Panels.
- Acoustic attenuation for cold air intake, hot air discharge (for ventilation).

- Exhaust Gas Silencer & Flue.

Figure 5.2.1 Typical Generator Enclosure



5.2.2 Acoustics

At this early stage the final acoustic requirements are not known. For preliminary results and details on the noise modelling for the site (including the generator enclosures) refer to *P521243 NEXTDC S4 Noise and Vibration Assessment*.

5.2.3 Emissions

For further details please refer to the *NEXTDC S4 Air Quality Impact Assessment*.

5.3 Fuel on Site

The generator engines on site will use diesel fuel to generate power. All 2 MW generator enclosures will have a belly tank as part of the enclosure providing 48 hours fuel storage. All 3 MW generator enclosures will be located on a 3-level gantry structure where two generators (each located on the second and third levels) are provided with fuel from a shared bulk fuel tank on the first level (refer to Figure 5.3.1). The 3 MW shared bulk fuel tank will provide 48 hours of fuel for both generators. Fuel tanks will be designed to comply with AS 1940.

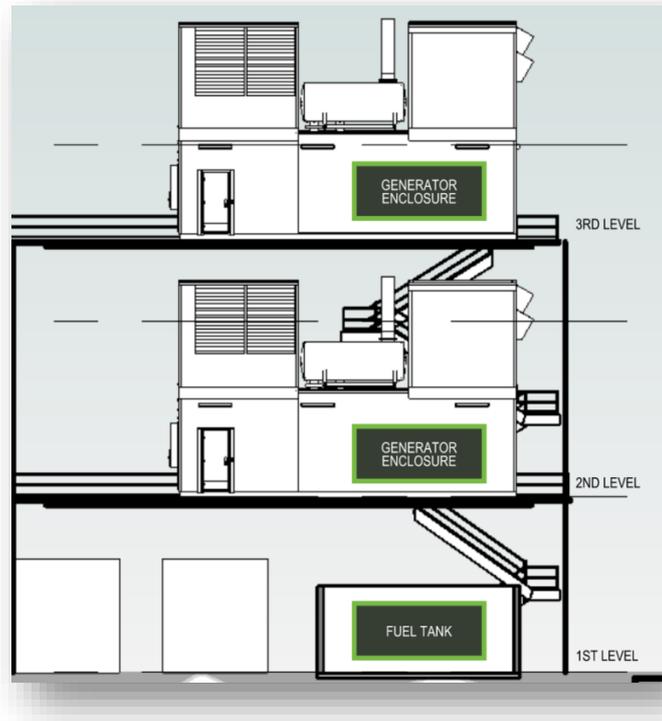
The following table provides the storage requirements per building based on the proposed design.

For the purpose of SEPP 33 planning approvals, the quantity of diesel in the SEARs Infrastructure Requirements Report is 3,600 kL or 3,000 tonnes.

Table 5-1 Fuel Storage per Building

Building	Fuel Storage	Comment
Building A / Retail	270 kL	10x 2MW Gensets with 10 x 27kL Belly Tanks
Building B	700 kL	20x 3MW Gensets with 10x 70 kL Bulk Tanks
Building C	700 kL	20x 3MW Gensets with 10x 70 kL Bulk Tanks
Building D	700 kL	20x 3MW Gensets with 10x 70 kL Bulk Tanks
Building E	980 kL	28x 3MW Gensets with 14 x 70 kL Bulk Tanks
Total	3,350 kL	~2,800 tonne

Figure 5.3.1 Double Stacked Generator Gantry (Building B-E)



5.3.1 Building A

The Building A (Retail) fuel storage is provided by a belly tank per genset. The following table summarises the sizing of the fuel storage.

Table 5-2 Building A Fuel Tanks

	Quantity	Comment
Fuel Consumption Rate per Generator	513.3 l/h	Based on MTU 16V4000 DS2500 at Full Load
Backup Required	48 hours	
Consumed Fuel per Genset	24,700 litres	
Total Fuel Storage Per Genset	25,650 litres	SViT 215-26,900 Tank @95% Fill
Number of Generators	10	N=8 and 2 Redundant
Total Building 1 Fuel Storage	256,500 litres	~215 tonne

The tank sizing is based on standard-sized belly tank. The SuperVault SViT 215-26,900 is a 240/240/240 fire rated and self-contained tank with a capacity of 27,000 litres and dimensions 2.4 W x 12.2 L x 1.5 H.

5.3.2 Buildings B to D

The fuel storage for the hyperscale buildings is provided by bulk storage tanks. The following table summarises the sizing of the fuel storage.

The fuel efficiency of generators varies with load. The hyperscale fuel system is based on the fuel consumption of the mtu 20V4000 DS4000 20V4000G94LF. Calculation are based on the following rates of fuel consumption:

- 806 l/h at 100% load (from the manufacturers data)

- 565 l/h at 75% load (from the manufacturers data)
- 614 l/h at 80% load (linear interpolated from the 75% and 100% consumption)

The generators are less efficient at 100% load, making this the governing case for fuel consumption. However, more generators running results in more fuel utilised from day tanks. The fuel consumption calculations have considered two load cases; as provided in Table 5-3. However, based on the assumed generator, there is negligible difference between the load cases.

Table 5-3 Buildings B to D Fuel Tanks

	16 @100%	20 @80%	Comment
Fuel Consumption Rate per Generator	806 l/h	614 l/h	
Backup Required	48 hours		
Genets Running	16	20	4 x Power groups per Building
Consumption Rate	12.9 kL/h	12.3 kL/h	
Consumable Fuel Required	619 kL	589 kL	
Consumed Fuel from Day Tanks	13.6 kL	17.0 kL	850 per Genset
Number of Bulk Storage Tanks	10 Tanks		
Fuel per Bulk Tank	66 kL		70 kL Tank 95% full
Consumable Fuel per Bulk Tank	62 kL		
Available Fuel	633 kL	637 kL	
Backup Power	49.1 h	51.8 h	
Total Building Fuel Storage	680 kL		~565 tonne

The tanks would be a custom length SuperVault SV5 tank, where the largest proprietary tank design is shortened to the required length. The tank would be approximately 8.5 m long, 3.65 m wide. However, Aurecon is investigating options with the tank supplier to is if they can be made wider with a reduced length to better use the available space.

5.3.3 Building E

The current design of Building E involves 20 generators configured 5N4 the same as Buildings B to D, but with an additional 8 generators configured 4N3.

Sizing has assumed the fuel storage for the 20 5N4 generators would be the same as Buildings B to D. Then an additional 4 tanks of the same size would be provided for the 8 additional tanks. Therefore, the buildings total fuel storage would be **980 kL** or **815 tonne**.

5.3.4 AS 1940 Separation Distances

AS 1940 has separation distance requirements dependent on the size and type of tank. The design utilises 240 minute fire rated tanks with integral secondary containment which halve the separation distances. The separation distances for fire rated tanks are:

- 27 kL Belly Tanks: 2.2 m
- 70 kL Bulk Tank: 3.0 m

On site protected places are defined in 1.4.47 of AS1940 as: *A building where people are employed within the property boundary, including offices, warehouses, manufacturing or processing areas, amenities and other dangerous goods stores where quantities exceed minor storage.*

The data centre buildings would be considered protected places.

AS 1940 5.2.5 (d) requires the separation distances of outdoor tanks under the same roof to be based off the aggregate volume of the tanks and be measured from the edge of the roof. This would substantially change the separation distance requirements if this applied to the gantry structure. However, these requirements do not apply to indoor tanks (Section 5.6), and it would seem reasonable that these would not apply to self-contained fire rated tanks which can be considered a chambered tank (Section 5.13); where these tanks are treated as individual contained units. Therefore, 5.2.5 (d) is not considered applicable.

5.4 Testing Procedures

The Generators will each be tested to ensure they are functional in the event of a utility failure. Initially all generators as they are installed at the proposed site will undergo commission testing which involves several hours that the generator will run. After the generator is installed and commissioned, regular testing will occur for all generators. For a breakdown of generator testing across the site, refer to Table 5-4 below.

Table 5-4: Summary of Site Generator Testing

Parameter	Value
Number of generators	98
Test frequency per generator	4 standard tests per year
Run time per test	2 tests run for 20 minutes, 1 test runs for 40 minutes, 1 test runs for 90 minutes. Total runtime of 170 minutes per year)
Number of generators per test	Up to 2 generators per standard test
Number of tests per day	Up to approximately 33 tests could be run in a single day. Dependant on the test, personnel efficiency, etc
Testing schedule	07:00am and 06:00pm (Monday to Saturday or Public Holidays) or 08:00am and 06:00pm on Sundays
Total testing time for all generators	153 hours per year

Generators are tested by connecting to a load bank (equipment that consumes electricity for testing purposes). Only one generator per building would be tested at any one time due to only one load bank being proposed for each building at any one time. However up to two buildings are proposed to run standard tests at the same time to reduce the total testing time of all generators per annum.

6 Conclusion

This report has provided an overview of the proposed diesel backup power system which will support the 232MW of load through 88 no. 3MW generators, and 10 no. 2MW generators. These generators will be tested at commissioning for several hours each, and subsequently once every few months for several hours at a time. Housing these generators inside acoustic-rated enclosures will mitigate risks of excessive noise pollution in the area. Limiting testing to the frequency mentioned within this report will reduce overall emissions and fuel usage at the site.

Although alternative technologies exist to provide backup power generation, none are viable for the site due to several factors. The main issues for alternatives are market availability and infrastructure readiness to cater for the increase in load, and the space available on site to make alternative options work for a medium-term utility power interruption.

The backup power generation design has been curated to deliver the most viable solution for the proposed site and ensure this state significant development will provide its services as early as possible with minimal impact to the surrounding area and community.

7 References

- [1] D. Harwin, *NSW Electricity Transmission Reliability and Performance Standard 2017*, Sydney: NSW Government, 2017.
- [2] Aurecon, "Low carbon Backup Options," Aurecon, Sydney, 2022.

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