Aurecon New Zealand Limited
Spark Central
Level 8, 42-52 Willis Street
Wellington 6011
PO Box 1591
Wellington 6140
New Zealand

T +64 4 472 9589
F +64 4 472 9922
E wellington@aurecongroup.com
W aurecongroup.com

Memorandum

To	**Emmet McElhatton**	From	**Aurecon**
Copy	s7(2)(a) [redacted] **Nathan Briggs**	Reference	**255585**
Date	**2025-12-12**	Pages (including this page)	**2**
Subject	**Power Infrastructure Requirements and Solar Study**		

1 Executive Summary

- For clarity we have used the term Transit-Oriented Development (TOD) to refer to the transport development and associated small commercial development. The proposed future larger commercial development we have described separately as Future Commercial Development (FCD).
- The Waterloo TOD power demand is estimated to be 515kVA (including 25% spare capacity). A new 500kVA on-site transformer will be needed to supply the TOD.
- Wellington Electricity (WE) confirmed their current HV infrastructure likely has the capacity to accommodate a new 500kVA transformer. The early estimate of the customer capital contribution for the new transformer is around $200K.
- The FCD power demand is estimated around 1000kVA. WE will not guarantee the availability of the power supply for this development. The availability of the power supply will only be assessed by WE upon the receiving the application for a new power supply for the future TOD.
- Depending on the clients' aspirations, the indication is that Photovoltaic (PV) could on average cover the station development and approximately half of the TOD commercial building's demand. A number of options have been provided including with and without battery storage, and varying levels of energy export to the grid.
- The most cost-effective PV option explored has an approximate payback period of 6 years. This option includes a 1,754 m² PV array to serve TOD. This option does not include battery storage.

2 Introduction

Waterloo Station is a key interchange on the Hutt Valley and Wairarapa Lines and has been identified by the WRLC and GWRC as a Priority Development Area due to its end-of-life infrastructure, accessibility challenges, and its significant role as the region's first transit-oriented development (TOD) site. The Reference Design outlines how the station redevelopment supports TOD principles by optimising land use within the precinct, improving multimodal access, and enabling a more integrated and people-focused station environment. It demonstrates how the upgraded transport hub will act as a catalyst for better connectivity, public realm improvements, and more efficient use of the surrounding urban area.

Following the release of the Waterloo Station Reference Design, Greater Wellington received several public queries seeking further clarity on specific design decisions, operational assumptions, and station precinct outcomes. To support greater transparency and provide deeper insight into aspects of the design that attracted public interest, a series of targeted case studies have been developed.

The TOD is proposed to include a small commercial development. Separately a larger mixed use commercial building could be developed on the site in the future (FCD), we understand this would be a separate development and is not currently part of the TOD project.

3 Purpose

This memo outlines preliminary investigations on available power infrastructure for the support of the new development of the Waterloo Station TOD and a solar study to consider photovoltaic (PV) options.

The investigations covered the following:

- Required new infrastructure (including a high-level assessment of the FCD),
- Consideration to the capacity within the wider network,
- A feasibility study for the implementation of a PV array.

4 Power Infrastructure

4.1 Existing Electrical Supply Infrastructure

The existing train station is supplied from the nearby Waterloo substation with a 100A 3-phase supply. This supply is fed from the Wellington Electricity's 500kVA street supply transformer.

WE* advised during the Reference Design that there is limited spare capacity on this transformer to cater for any increased power supply for the station development.

Therefore, any request for an increase in the power supply for the TOD will necessitate a new transformer.

Figure 4-1 Existing Waterloo Station Infrastructure

4.2 New Development Power Demands

4.2.1 Transit Oriented Development (TOD)

The TOD comprises of:

- Upgraded Waterloo Train Station,
- A new 1650m^2 (3 storey) commercial development near the train station.

The TOD power demand is estimated to be 456kVA (breakdown below), based on this a 500kVA transformer has been proposed.

- The train station – 100kVA,
- The commercial building - 356kVA.

The above loads make no allowance for a carparking building which if added to the development would increase electrical demand.

4.2.2 Future Development

The TOD has identified a location for a larger mixed use commercial building development (FCD) where the current carpark is off Pohutukawa Street.

At the time of this study the development is assumed to be a 6 level building with 4700m^2 of Gross Floor Area.

Figure 4-2 Proposed FCD Render

The assumed breakdown of commercial usage is:

- Food and beverages business (15%),

- Service type business (15%),
- Offices type businesses (70%).

Power demand is estimated to be 1030kVA (including 25% spare capacity).

The power demand is a high-level estimate which will need to be re-visited when the future commercial usage of the building is confirmed.

4.2.3 Assumptions

The estimated electrical load for the TOD is based on the following assumptions:

1) We have currently proposed high level maximum demands for the TOD, should these need to be increased in further design stages, a larger 750kVA transformer may be required.
2) The new commercial building is assumed to be a 3-storey building with 1650m^2 of Gross Floor Area.
3) The assumed breakdown of building's commercial usage is:
    - Food and beverages business (33%)
    - Offices type businesses (67%)

4.3 New Infrastructure requirements

Aurecon engaged with Wellington Electricity (WE*) to confirm the infrastructure required to support the TOD's additional power supply needs.

On the basis of the additional power supply required, the following new infrastructure is expected to be required:

- A new 500kVA transformer on site or within the existing substation for the TOD.
- A new 1000kVA on-site transformer will be required for the FCD.

As shown in **Figure 4-3**, Pohutukawa Street and Oxford Terrace form a main thoroughfare for WE* feeder lines. A significant amount of existing High Voltage (HV) 33 kV and 11 kV underground cabling runs directly in front of the station development.

This is advantageous for the project, as it should reduce construction costs for future connections, with available capacity located within approximately 50 m.

Wellington Electricity (WE) confirmed their current HV infrastructure likely has the capacity to accommodate a new 500kVA transformer for the TOD. The early estimate of the customer capital contribution for the new transformer is around $200K.

WE will not guarantee the availability of the power supply for the FCD. If a significant upgrade is required to feed this development, there is a risk that this could be costly to undertake. The availability of the power supply will only be assessed by WE upon the receiving the application for a new power supply for the FCD.

While WE* cannot guarantee the availability of power supply until a formal request is submitted, the presence of multiple feeder lines in close proximity may provide options for any capacity issues.

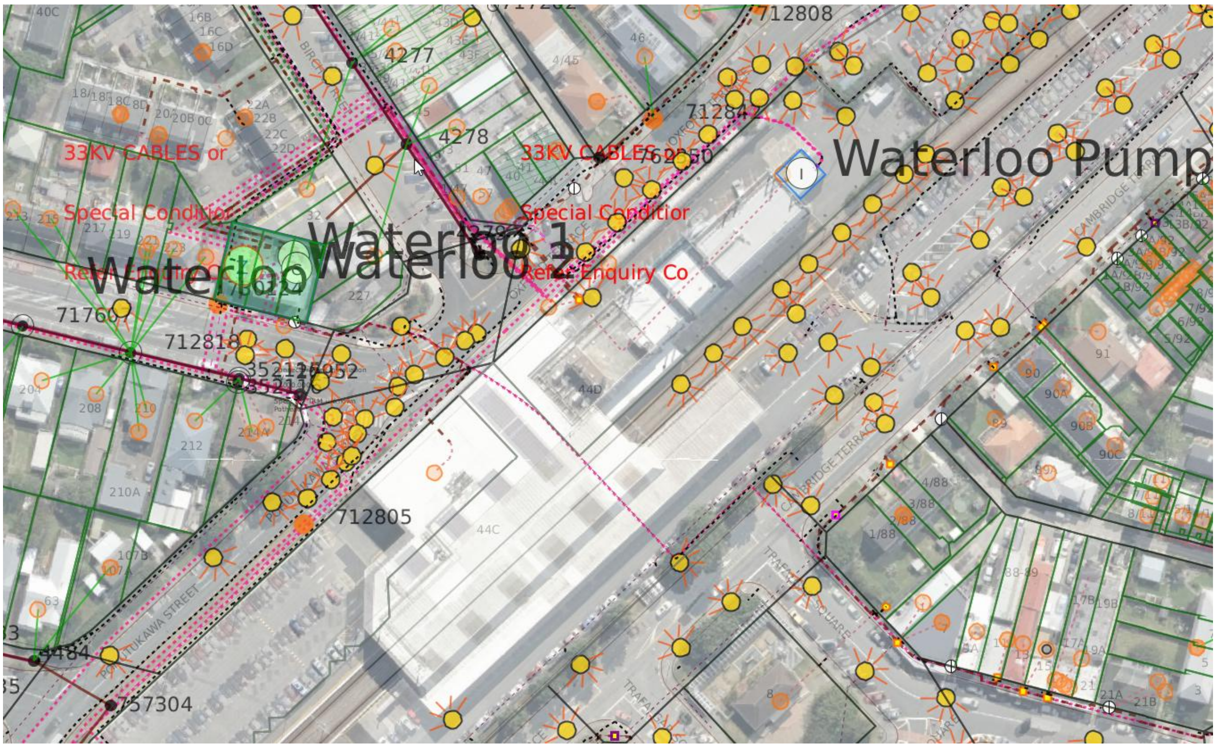

Figure 4-3 Existing Electrical Inground Infrastructure

5 TOD Solar Generation Study

A high-level simulation has been undertaken using the software PVsyst to calculate the expected annual solar PV generation potential for the TOD.

5.1 Areas Considered

The roof area considered in the simulation (~2,340m²) includes:

- Commercial Opportunity.
- Canopy 2.
- Bus Interchange Canopy.
- Overpass.

To account for roof access and shading a total PV area of 1,754m² was modelled across the roofs listed above. This was considered the maximum size of the array and the volume could be optimised in the future to balance cost, generation and demand.

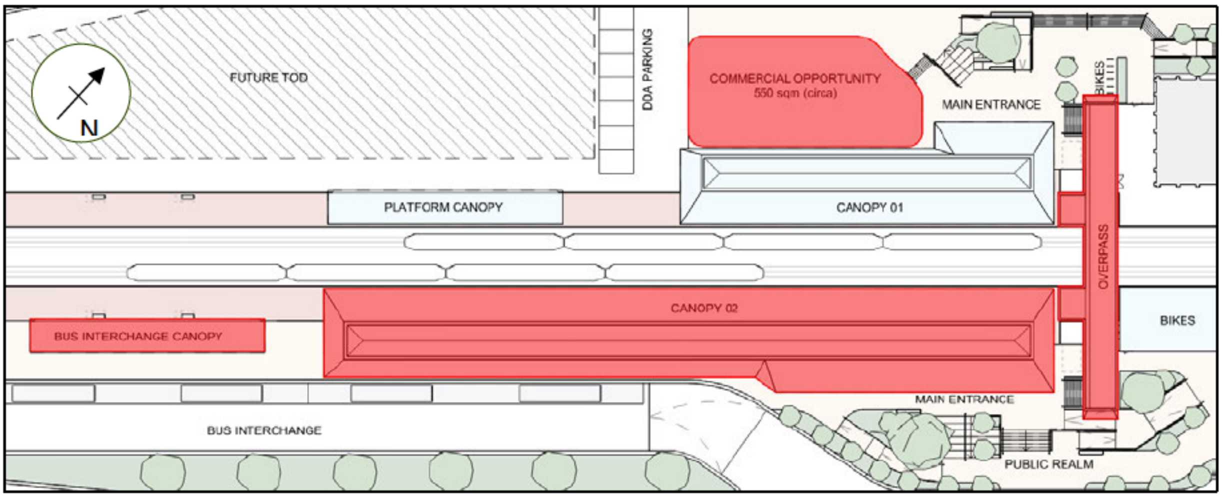

Figure 5-1 Roof Area Considered for PV Generation (highlighted in red)

Canopy 1 and the platform canopy appear to be significantly shaded from what will be the potential FCD development, the Commercial Opportunity, and the Overpass. For these reasons PV has not been explored in these areas.

5.2 TOD Electrical Demands

The assumed peak demand is as follows:

- Train station: 66kW.
  - We have assumed the train station peak demand is likely to be during the evening/night when all the external lighting is on.
- Commercial building (Commercial Opportunity): 323kW.
  - The commercial building peaks during standard business hours.

5.3 Modelling Results

PVsyst modelling results, for a PV array across 1,754m^2 of roof area, had a maximum solar capacity of 350kW which would typically provide peak (averaged across an hour) generation of 260kW in January through to 120 KW in June.

The average (between 6am and 6pm) hourly generation however would be much lower, between 196kW in January through to 54kW in June.

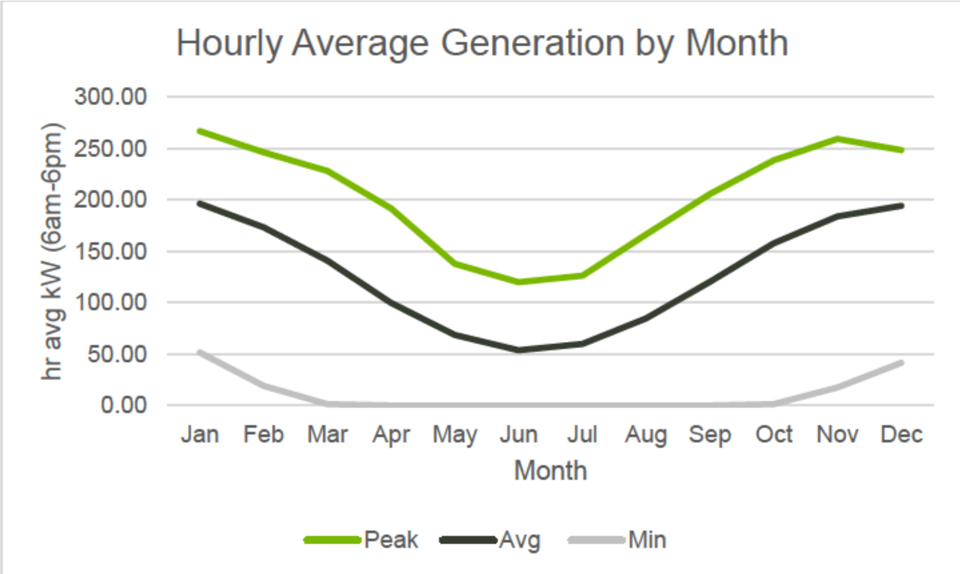

Figure 5-2 Hourly Average Generation (kW) by Month (6am-6pm) - 1,754m^2 Array

5.4 TOD PV System Arrangement Options

We have considered initial four options for the TOD PV arrangements. These options have been provided including with and without battery storage options and varying levels of energy export to the grid.

5.4.1 Option 1 – No storage and serving the TOD

This option will provide the following:

- It will utilise the full array (1,754m^2) to serve the station during daylight hours and excess serving the commercial building.
- Based on high-level estimates, the proposed PV array is expected to meet the station's electricity demand during daylight hours and supply approximately one-third of the commercial building's annual energy demand. While its contribution during the winter months is expected to be limited, modelling indicates that the system will meet most of the commercial building's demand during summer.
- For days where there PV array has excess generation, such as a weekend, the intent would be to export the power back to grid (subject to WE* acceptance).
- This is the most cost-effective option considered, with an approximate payback period of 6 years.

5.4.2 Option 2 – No storage export to grid only

This option will provide the following:

- It would utilise the full array (1,754m^2) then exporting all power back to the grid.
- This option would be subject to WE* acceptance of exporting power, and subject to having sufficient inground infrastructure to service the amount of power exported.
- Approximate payback period of approximately 27 years, this is not based on figures provided by WE*. This is based on previous project experience.

5.4.3 Options 3 - Storage and full array

This option will provide the following:

- It would utilise the full array (1,754m^2) then storing the power for nighttime use.
- Generation to service daytime station demand and charge battery to then service station nighttime demand.
- The winter generation would likely be able to meet the daily station demand via battery storage.
- Any excess generation would be used to either supplement TOD commercial building and/or export to grid .
- This will have spatial considerations for the storage, refer to the~600kW battery system example below.
- This is the most expensive option.
- As this option is dedicated to the station it will provide some resiliency benefits by being able to supply the station during power outage, when charge is available.
- Approximate payback period of 11 years.

5.4.4 Options 4 - Storage and reduced array

This option will provide the following:

- A smaller array based on station demand (1,373m^2). No solar PV on commercial building.
- The use is would be like option 3, but with less generation as follows:
  - Generation would service daytime station demand and charge battery to then service station nighttime demand.
  - The smaller array will likely be unable to meet station demands in winter.
  - If there is excess generation in the sunnier months this will be used to supplement the commercial building and/or export to grid.
- This will have spatial considerations for the storage, refer to the~600kW battery system large example in .
- As with option 3, having the ability for storage will provide resiliency benefits.
- Approximate payback period of 13 years.

5.5 Battery Storage Option

A typical solution for battery storage, that could be considered for this project, is as follows:

- A self-contained unit that can be located externally

Figure 5-3 600kWh Battery Example

- Approximately holds storage capacity (600kWh) to service the station for one night (~14hrs).
- 20-foot ISO high cube container.
- 6586mm x 2691mm x 2896mm.

Having battery storage provides increased resiliency for the station and further reduces the building's energy costs, however, inclusion of a battery also has the following implications:

- Increased upfront costs.
- Spatial constraints.
- Limited service life – approximately 15–20 years of useful life before capacity drops to ~70 %.
- Ongoing maintenance – a typical maintenance profile for this battery set up may be as follows.

Table 5-1 Typical Battery Maintenance Profile

Item	Frequency
Visual inspection	Monthly / quarterly
Cooling system service	6–12 monthly
Electrical inspection	Annual
Fire system inspection	Annual
Capacity/SOH assessment	Annual
Major overhaul (cooling, fans, pumps)	5–8 years

Disclaimers:

All numbers and statements provided are indicative only and require further market input and analysis for confirmation. We would recommend in the next design stages that a project/ PS design is submitted to WE* for commentary, they declined to comment at this stage.

Aurecon are not cost consultants. To understand the costs for the options and equipment listed within this memo we would recommend engaging with the project quantity surveyor. Following this we could further refine pay back periods.