

**Power Supply .....Plan B.  
A Report and Summary Prepared for the Altair Executive Committee.**

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Power Supply .....Plan B.  
A Report and Summary Prepared for the Altair Executive Committee.  
Submitted by Kevin Wellington as coordinator for the Project.

**1. Introduction:-**

It was resolved at the February 2017 Altair Annual General Meeting, that the Executive Committee be charged with re-visiting the limitations of the power supply to the Altair Building.

The project would assess the future demands on the building's electrical infrastructure, particularly with regard to equally accessible, universal Air Conditioning.

The project would examine past history, previous reports, current capability, expansion capability, infrastructure upgrading and costs.

In 2012 the then Executive Committee engaged Northrop Consulting Engineers to prepare an "Electrical Infrastructure Assessment Report" for the building. Northrop Engineers conducted a site inspection and presented their report in January 2013.

The 2017 project [Plan-B] was charged with re-examining the Northrop report and to prepare a brief for an alternative reference Company.

City Electrical Services (Aust) p/L was given the brief and was contracted to prepare a second report. City Electrical Services (Aust) P/L then engaged Shelmerdines Consulting Engineers to provide their professional, expert opinion.

The results of this project are presented herewith.

## 2. Details and Assessment of the Current Infrastructure as presented in each report:-

Notes:-

- Northrop Consulting Engineers are referred to as NCE
- Shelmerdines Consulting Engineers are referred to as SCE
- City Electrical Services (Aust) P/L are referred to as CESA
- Please refer to the schematic diagram [Appendix [A] for progress through the report.

### Sub Station [A1]:-

NCE:-

The NCE report does not identify the substation supplying current to the building other than to identify it as *“an existing Ausgrid pad kiosk substation located adjacent to this building”*

There is no reference in the NCE report as to the availability of any additional capacity to Altair from within the sub-station.

SCE:-

The SCE report identifies the sub-station as Number S673. The SCE report also includes their application to Ausgrid for an assessment of availability of additional capacity from the sub-station. The SCE report includes the following reply from Ausgrid. [Appendix F]

*“According to our records 3 Kings Cross Rd is supplied via substation 673 “Kings Cross Tunnel” via an 800A direct distributor on distributor #3.”*

*“There is also enough spare capacity in the substation overall to supply the full 800A to # 3 Kings Cross Rd.”*

### Consumer Mains Cabling [A2]:-

NCE:-

The NCE report Identifies the Consumer Mains as 7 x single core 240mm<sup>2</sup> XLPE/PVC cables [6 active cables {2 per phase} and 1 neutral cable]. NCE also identifies the carrying capacity of this configuration as approx. 400 amps over the supply distance of approx. 95 metres . NCE also notes that in their opinion this *“confirms that we only have 400amps available at the substation to feed this building”*.

SCE:-

The SCE report does not specifically identify the Mains cabling but confirms that *“subject to voltage drop calculations, it may be necessary to augment the existing consumer mains cabling by installing an additional set of cables in parallel with the existing (cables).”*

In a separate e-mail exchange between KW and John Macinger [CESA], the voltage drop calculations were explained to me and these confirmed that the current consumer mains would need to be replaced or supplemented in order to carry an increased supply current.

#### Service Protection Device [A3]:-

NCE:-

The NCE report does not mention the need for a "Service Protection Device"

SCE:-

The SCE report identifies that Ausgrid will require such a device at the point where the Ausgrid supply cable enters the building.

#### Main Switchboard [A4]:-

NCE:-

The NCE report identifies the Main switchboard as unable to accommodate the potential increased capacity and potential new submains. NCE has indicated that a new Main switchboard will be required.

SCE:-

The SCE report identifies the busbar system in the current switchboard as *"not rated to carry the required additional supply"* and thus *"will require extensive modifications / replacement of the switchboard"*.

#### Rising Submains [A5]:-

NCE:-

The NCE report does not specifically refer to the rising submains, but does note in its *"Required Upgrades"*: *"New Submains to supplement existing"*.

SCE:-

The SCE report identifies the core of each tower [east and west] as being serviced by a 250 amp per phase rising submain. SCE reports that *"it will be necessary to install an additional submain in each riser to reduce the number of floors served by each submain from 16 to 8"*.

#### Service Mains to Each Apartment [A6]:-

NCE:-

The NCE report does not specifically refer to the Apartment Service Mains, but does note in its *"Required Upgrades"*: *"Upgrading submains to the apartments"*.

SCE:-

The SCE report identifies *"Supply to each of the individual apartment is rated at 63 amps single phase. This supply should be adequate to serve the installation of air conditioning and does not require replacement."* [Appendix:- H]

### **3. Data Logging:-**

[To determine the highest standing load during the recorded period.] Each data logging Company installed measuring equipment for a period of 1 week

NCE [Appendix B]:-

7 – 14 November 2012

NCE data logging recorded a building peak of 320amps per phase.

CESA [Appendix E]:-

1 – 9 May 2017

CESA contracted Electrical Testing Company Pty Ltd to carry out the data logging. The results recorded a peak of 339 amps on the A phase - 345 amps on the B phase and 291 amps on the C phase.

### **4. How much additional capacity do we need to allow for Universal Air Conditioning?**

NCE:-

NCE presents in its report several alternate Daikin Models that were available at the time of presenting their report [Jan 2013].

NCE concluded that the building would require an additional 525 amps per phase to allow for universal air conditioning. This added to their measured peak would mean an overall total required supply of 845 amps per phase [with no provision for any further upgrading or expansion within the building].

SCE:-

SCE does not specifically refer to any particular form of air conditioning but rather applies a generic 'rule of thumb'. *"When we are assessing the load of residential buildings similar to yours, we use a load of 4KVA for 1-Bed apartments and 5KVA for 2-bed and 3-bed apartments."* The calculation when applied to 89 x 1-Bed and 50 x 2&3-Bed apartments equates to a total building requirement of 841amps per phase. [Appendix G]

03/07/2017 KW:- In answer to my request for clarification SCE confirmed that for a building the size of Altair the power usage of the common property is included in this calculation.

### **5. Works Necessary to Increase the Capacity of the Building Reticulation System and Budget cost estimates:-**

Sub-Station [A1]:-

NCE:-

NCE does not indicate how or where any additional supply will come from.

SCE:-

SCE have been advised by Ausgrid that an 800amp rated supply is available to the building at no [or minimal] cost. SCE advise that 800amps should be considered the practical limit. If service is required above this capacity then it is probable that Ausgrid will require the establishment of a sub-station within the building. This would involve the loss of valuable space and considerable expense. SCE offer the "back of an envelope" figure of \$250,000.00.

Consumer Mains Cabling [A2]:-

NCE:-

New Service Mains - \$100,000.00

SCE:\_

Augmentation of the Consumer Mains - \$48,000.00

Service Protection Device [A3]:-

NCE:-

This Item is not included in the NCE required upgrades

SCE:-

Installation of a Service Protection Device [including fire rated cabinet]:- \$22,000.00

Main Switchboard [A4]:-

NCE:-

Supply and install new Main Switchboard:- \$50,000.00

SCE:-

Supply and install modifications to Main Switchboard:- \$55,000.00

Rising Sub-Mains [A5]:-

NCE:\_

New Sub-Mains to supplement existing:- \$150,000.00

Builders' works to reticulate new cabling etc.:- \$100,000.00 pc sum

SCE:-

New Sub-Mains Cabling:- \$50,000.00

Service Mains to Each Apartment [A6]:-

NCE:-

New penetrations in the existing slabs:- \$30,000.00

Cutting Holes in the apartments to feed power:-

[\$2,500.00 per apartment]      129 x \$2,500.00 = \$322,500.00

Upgrading Sub-Mains to the apartments:-

[\$5,000.00 per apartment]      129 x \$5,000.00 = \$645,000.00

SCE:-

The service mains to un-air conditioned apartments are rated at 63 amps single phase. *"These mains do not require replacement"*. [Appendix – H]

Total estimates:-

NCE:-

As at 11<sup>th</sup> January 2013 :- \$1,397,500.00

SCE:-

As at 5<sup>th</sup> June 2017 :- \$175,000.00

**6. Summary and Comment:-**

In comparing the 2 reports it is obvious that there are general areas of agreement which I conclude are probably correct. There are also several items of disparity. Which I feel require further examination

Items of Agreement:-

- 1) The Altair building does not currently have sufficient electrical infrastructure to support universal air conditioning.
- 2) The current infrastructure will give a maximum supply of 400amps per phase.
- 3) The theoretical supply needed to cover the existing usage and allow for universal air-conditioning installation [but not provide for any future upgrades or expansion] is 840 - 845amps per phase. However, both companies agree that the figures used to make this calculation are conservative and that the actual load in-situ will [probably] be less than 800amps per phase.
- 4) The Consumer Mains require upgrading.
- 5) The Main Switchboard requires upgrading.
- 6) The Rising Sub-Mains in each tower require upgrading.

Items of Disparity:-

- 1) NCE have nominated 400amps as the maximum available supply but have not offered any options as to how this may be increased.  
SCE have engaged with Ausgrid who advise that 800amps of capacity is available at the main distributor. If this is not sufficient then there is the possibility of a private sub-station [albeit at considerable expense].
- 2) SCE have highlighted the requirement for the installation of a Service Protection Device.  
NCE do not mention this in their report. This may very well be due to more recently introduced regulations.
- 3) NCE have included in their report as a "Required Upgrade": - *"Upgrading submains to the apartments"* at a total estimated cost of \$997,500.00.  
SCE have noted in their report:- *"Supply to Apartments":-....."Supply to each of the individual apartments is rated at 63amps, single phase. This supply should be adequate to serve the installation of air conditioning and does not require replacement."*  
KW Note:- The 2 Penthouse apartments and 4 of the Sub-Penthouse apartments are supplied and protected by a 3-phase 63amp rated service.

Comment:-

I believe that the following conclusions can be taken from the project [Power Supply – Plan B]

- The Altair building does not currently have sufficient electrical infrastructure to support universal air conditioning.
- Supply from Ausgrid can, relatively simply and cheaply be upgraded to a maximum of 800amps per phase
- The building infrastructure can be upgraded to cope with the 800amp supply at a cost of [estimated] \$200,000 - \$450,000.00 [depending on whose quotation is accepted]
- The 800amp supply will probably be limited to 780 amps margin by Ausgrid.
- There is a whole new project in determining whether the 800amp capacity is sufficient to allow unrestricted universal air conditioning and also offer some margin for future up-grading of lifts, car charging etc. This would need to be fleshed out with engineers such as Northrop or City Electrical, obviously at additional cost.  
There will be conflicting opinions between the theoretical calculations and the actual, practical outcome.
- If the 800amp supply cannot guarantee universal air conditioning [either restricted or unrestricted] and also offer some margin for future up-grading of lifts, car charging etc., then there is another whole new project in dealing with Ausgrid and the establishment of a private sub-station kiosk.

## 7. TABLE OF APPENDICES

- A) Schematic Layout of the Power Supply to the Altair
- B) Northrop Consulting Engineers' 2013 Report  
Northrop Consulting Engineers' 2017 Data Logging
- C) Shelmerdines Consulting Engineers P/L 2017 Report
- D) Electrical Testing Company P/L 2017 Data Logging
- E) Altair Executive Committee "Plan-B" Brief
- F) E-mail from Ausgrid confirming service capacity at the sub-station.
- G) Shelmerdines e-mail response to KW questions
- H) Typical Apartment level circuit breaker sub-board.