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**Australian Government**  

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**Department of Defence**

**ROBERTSON BARRACKS ELECTRICAL  
RETICULATION SYSTEM UPGRADE**

Robertson Barracks,  
Palmerston, Northern Territory

**Statement of Evidence  
to the  
Parliamentary Standing Committee  
on  
Public Works**

Canberra, ACT  
February 2011

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# Robertson Barracks Electrical Reticulation System Upgrade

## Need for the works

### Identified need

1. Robertson Barracks is a purpose-designed Army base located approximately 20 kilometres east of Darwin city and 5 kilometres north of the satellite town of Palmerston (refer to Site Location Plan at Attachment 1). The base was constructed during the 1990s under the Army Presence in the North (APIN) project and is the home of Army's 1st Brigade.
2. The role of 1st Brigade is to maintain a high readiness light armoured capability in order to conduct mid-intensity conventional operations and peace time operations.
3. The main Barracks area is approximately 450 hectares and caters for a working population of about 3,500 personnel, both military and civilian.
4. Since the completion of the APIN project there has been significant growth within the base, including:
  - a. general growth associated with changes to Army's command and operational requirements over the last 15 years;
  - b. construction of the 1<sup>st</sup> Aviation Regiment facilities; and
  - c. additional living-in accommodation.
5. This growth has led to increased demands on the electrical reticulation system throughout the base with the result that there is almost no spare capacity within the existing system. The existing system is also prone to failure during tropical and electrical storms and does not provide adequate redundancy (i.e. back-up and alternative supply routes in the event of partial system failure).
6. Unless the existing capacity and redundancy problems are addressed, the base will continue to experience operational difficulties and it will not be possible to continue to develop the base into the future to meet Army's capability requirements in the North.

7. The demand on the electrical reticulation system will continue to increase in the future as further capital works are developed.
8. The existing high voltage power supply is provided by the Northern Territory's Power and Water Corporation (PaWC) via three intake stations – two on the eastern boundary adjacent to Thorngate Road and one on the northern boundary adjacent to Campbell Road.
9. The aim of this project, which is complemented by works being undertaken by PaWC, is to provide a major upgrade to the electrical distribution system on the base in order to:
  - a. meet the existing demand with sufficient redundancy to enable operation in the event of a failure of one of the power supply routes; and
  - b. meet future demand resulting from continuing developments on the base.
10. When completed, these works will provide Robertson Barracks with a reliable, efficient and flexible power supply and distribution system for approximately 15 years.

#### Options considered for meeting the need

11. An engineering study was conducted to examine the requirements for the base's existing and future power supply needs. Based on that study, a number of options were examined to determine the best value for money proposal.
12. The preferred and recommended option is to undertake a major upgrade of the high voltage power supply and distribution system throughout the base. This will rectify the unreliability and the lack of redundancy of the existing system and make reasonable allowances for growth.
13. The project includes works at the interface between the external distribution network, which belongs to PaWC, and the base internal distribution network. This interface is housed within a single building which contains the 'intake station' on the PaWC side of the interface and the 'intake switching station' which is on the base side of the interface. The scope of this option includes:
  - a. increasing the capacity of the intake stations and intake switching stations to receive additional power from PaWC feeders by:
    - i. upgrading one existing intake station;
    - ii. installing one new intake switching station; and
    - iii. upgrading two existing intake switching stations;

- b. extending a feeder and interconnecting the intake switching stations to provide a better distribution of load in the event of failure in a single power supply;
  - c. upgrading the base ring mains to provide a better distribution of load in the event of failure in a single power supply;
  - d. installing new substations and upgrading, relocating and decommissioning existing substations to meet localised power distribution requirements;
  - e. extending the primary and secondary power distribution systems to cater for the increase in electrical load;
  - f. upgrading the network configuration to achieve compliance with all relevant codes and standards;
  - g. constructing a new central emergency power station and decommissioning the existing central emergency power station to support the existing and future emergency load requirements; and
  - h. installing improved power control and monitoring systems to better manage the base power supply and distribution.
14. This option would bring the electrical supply and distribution system into compliance with the Defence Manual of Infrastructure Engineering – Electrical (MIEE) which was introduced in September 2010 and is the primary Defence policy document for determining electrical engineering requirements for Defence facilities and infrastructure. The MIEE is mandatory for all electrical engineering projects on Defence sites.
15. A second option was based on the above scope of works but only catered for existing demand. It did not allow for upgrading of the existing substations and made no provision for future growth. This option was not supported because it provided minimal savings (less than 5%) and constrained future growth and development. Although it would bring the electrical supply and distribution system into compliance with the MIEE, it was assessed as not meeting Army's future requirements and did not represent good value for money.
16. A third option involved a significantly reduced scope of work, resulting in only a minor upgrade that improved the base's ability to receive additional power, but did not improve the internal distribution system nor provide a new central emergency power station. It did

not address existing power reliability problems or redundancy problems and made no allowance for future growth and development. While this option represented a cost reduction of approximately 55% compared to the preferred option, it did not address the existing shortcomings and would not bring the electrical supply and distribution system into full compliance with the MIEE.

## Historical background

17. The existing power supply and distribution system was originally constructed as part of the APIN project in the mid 1990s. It has been modified and extended in an ad hoc way over the past 13 years as additional facilities have been constructed, including:
  - a. working and living-in accommodation for 1<sup>st</sup> Aviation Regiment;
  - b. working accommodation for the Abrams tanks project; and
  - c. working accommodation for the Tactical Training Simulation Site.
  
18. In 2007 a study was conducted into the capacity of the Robertson Barracks electrical supply and distribution system. This study was an interim measure to cover the period until a formal, integrated master plan for the base was prepared. It recommended:
  - a. an increase in the total supply capacity to the base;
  - b. the provision of interconnectors and ring mains within the base;
  - c. the construction of a new central emergency power station; and
  - d. upgrading of the power control and monitoring systems.
  
19. The Robertson Barracks Master Plan Report was approved in August 2009. The 2007 study and the Master Plan informed the combined strategic and detailed business case for this project. The business case developed the preferred and recommended option detailed above and identified the following impacts on capability if the upgrade was not undertaken:
  - a. in the event of a failure in any part of the supply system:
    - i. an inability to provide power to key elements on the base; and
    - ii. disruption to preparation and training for operational deployments;
  - b. delays in the delivery of future capital works on the base.

20. The unreliable power supply is also a risk to the capability requirement to utilise the Barracks in a 'post-disaster' coordination and logistics role (e.g. Defence Assistance to the Civil Community following a cyclone), which is a specified task for 1<sup>st</sup> Brigade.

### Heritage and environment impact

21. An Environmental Impact Assessment (EIA) was conducted for the Robertson Barracks Redevelopment project, which is currently in the construction phase. The EIA concluded that the proposed works would have no impacts on existing flora or fauna.
22. Similarly, this electrical upgrade project will have no impacts on existing flora or fauna and will not require referral under the Environment Protection and Biodiversity Conservation Act.
23. The main environmental aspect of the project work relates to the digging of trenches for the installation of new cabling. However these are predominantly beside existing roads and in existing services corridors and will not involve any sensitive environments.
24. The location of the new central emergency power station has been selected so that the site:
  - a. is in an appropriate area on the base and in a zone in accordance with the endorsed 2009 Master Plan for the base;
  - b. satisfies the technical requirements of the project; and
  - c. will not create any environmental issues.
25. A Construction Environment and Heritage Management Plan for the Robertson Barracks Redevelopment project has been prepared by the contractor and cleared by the Base Environmental Officer. A similar plan will be prepared for this project before work commences.

### Key legislation

26. The following legislation is relevant to this project:
  - a. *Environment Protection and Biodiversity Conservation Act 1999*; and
  - b. *Building and Construction Industry Improvement Act 2005*.



## Impacts on local community

27. The majority of the works planned for this project will take place within the secure fenced perimeter of Robertson Barracks and the material storage and construction work will have no significant impact on the surrounding community.
28. The power supply upgrading works to be undertaken by PaWC external to the Barracks do not form part of this project but are related and will also have minimal impact on the local community.
29. There will be some increased traffic during construction due to materials and equipment being delivered and workers travelling to and from the base. However this will be minimal by comparison with the existing traffic from the approximately 3,500 personnel located at Robertson Barracks.
30. The project will create work for local industry, through the suppliers, contractors and sub-contractors that will be required to carry out the construction work.

## Consultation with stakeholders

31. Following Government approval and referral to the Parliamentary Standing Committee on Public Works (PWC), consultation will occur with the following key stakeholders:
  - a. Federal Member for Solomon, Mrs Natasha Griggs MP;
  - b. Northern Territory Member for Nelson, Mr Gerry Wood MLA;
  - c. Litchfield Council;
  - d. Power and Water Corporation;
  - e. Department of Climate Change and Energy Efficiency; and
  - f. the general public.
32. The ongoing involvement of PaWC is crucial to the successful development and delivery of this project and consultation with them will continue throughout the project.

## Purpose of the works

### Project objectives

33. The primary objectives of this project are to:
  - a. upgrade the existing high voltage power supply and distribution system so that it is reliable and has adequate redundancy to maintain power supply to essential infrastructure in the event of failure of one of the supply points; and
  - b. provide sufficient spare capacity to allow for future development of the base for approximately 15 years.

### Project description and scope of works

34. The existing high voltage power supply is provided by PaWC via three intake stations (IS) – two on the eastern boundary adjacent to Thorngate Road (IS1 and IS2) and one on the northern boundary adjacent to Campbell Road (IS3). From the PaWC intake station, the high voltage power supply passes through Defence's intake switching station (ISS). Each intake station and its associated intake switching station are within the same structure.
35. The existing PaWC high voltage power supply to the base comprises:
  - a. Feeder A to IS1 on Thorngate Road, rated at 4.0MVA;
  - b. Feeder B to IS2 on Thorngate Road, rated at 6.5MVA; and
  - c. Feeder C to IS3 on Campbell Road, rated at 5.0MVA.
36. The existing total supply capacity is therefore 15.5MVA, with a 'firm' capacity of 9.0MVA. 'Firm' capacity takes into account the possible failure of one feeder. It is calculated by deducting the capacity of the largest feeder (6.5MVA) from the total supply (15.5MVA). The existing maximum demand (Diversified Total Peak Demand) at the base is 10.9MVA. 'Diversity' is a factor which is applied to take into account that not all electrical loads will be turned on at the same time. The difference between the Diversified Total Peak Demand and firm capacity is therefore 1.9MVA. In the event of a failure of Feeder B or Feeder C the base would not have an adequate power supply.

37. To support the upgrading works proposed by this project, PaWC has agreed to the following staged increases in the high voltage power supply to the base:
- a. Increase the capacity of Feeder A by 2.5MVA to 6.5MVA and of Feeder C by 1.5MVA to 6.5MVA. This development makes provision for taking 1.5MVA from Feeder C for the Shoal Bay Receiving Station<sup>1</sup>, therefore the net increase to Robertson Barracks is 2.5MVA. The total supply capacity for Robertson Barracks will increase to 18.0MVA, with a firm capacity of 11.5MVA. This work will be completed prior to the commencement of construction for this project (which is scheduled for late 2011);
  - b. Install a new fourth feeder (Feeder D) with a capacity of 7.9MVA to IS2 on Thorngate Road. This development makes provision for taking 2.5MVA from Feeder A for other purposes (outside of Defence), therefore the net increase to Robertson Barracks is 5.4MVA. The total supply capacity will increase to 23.4MVA, with a firm capacity of 15.5MVA. This work is due to be completed in 2012;
  - c. No upgrade is required for Feeder B.
38. The on-base works will include the following:
- a. installation of a new intake switching station (ISS1), upgrading of an existing intake station (IS1) and upgrading two existing intake switching stations (ISS2 and ISS3);
  - b. extension of Feeder A from IS1 to ISS1 and interconnection of all the intake switching stations;
  - c. installation of high voltage cables to improve ring main configuration;
  - d. installation of five new substations, upgrading the equipment in five existing substations and upgrading the capacity of one substation;
  - e. extension of the primary and secondary high voltage distribution systems;
  - f. upgrading the network configuration;
  - g. increasing the existing emergency power from 1.0 MVA to 7.0 MVA by constructing a new 7.0MVA central emergency power station (the existing 1.0MVA central emergency power station will be decommissioned); and
  - h. installation of new power control and monitoring systems.

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<sup>1</sup> Defence is delivering a medium works project to upgrade the Shoal Bay Receiving Station, which requires an increase in its power supply. This project was notified to the PWC in July 2007.

## Details of and reasons for site selection

39. The majority of the work will be the installation of new underground cabling to integrate with the existing network and to link all functional areas of the base. Most of this cabling will be run through existing designated services corridors, which are generally beside existing roadways. The routes for cabling to be run through new areas of the site have been selected in accordance with best industry practice to create minimal disturbance to existing roadways, facilities, landscaping and operational requirements.
40. The upgrades to ISS2 and ISS3 will involve minor extensions to the existing structures. To comply with the MIEE, which requires an even distribution of intake switching stations around the high voltage network, the existing ISS1 near Thorngate Road is to be disconnected and a new ISS1 is to be constructed on the western side of the barracks, adjacent to the new central emergency power station.
41. Other works involve the upgrading of existing electrical substations and the provision of new substations. The new substations have been located for optimum technical efficiency and are generally in existing cleared areas of the base.
42. None of the proposed works are expected to impact adversely on the base environment and all disturbed areas will be remediated on completion.
43. The major building activity for the project is the new ISS1 and the new central emergency power station. Three options for the location of these new facilities were considered. The proposed location has been selected to:
  - a. be in accordance with the endorsed 2009 Master Plan for the base;
  - b. suit the technical requirements of the power distribution system;
  - c. be located on an un-used and lightly treed part of the base; and
  - d. not be required for any other known purpose.
44. The selected site is adjacent to Paratus Parade (on the western side of the base) just outside the north-east boundary of the 1<sup>st</sup> Construction Engineer Regiment compound.
45. This location has been reviewed through the Defence Site Selection Board process and approved by the delegate following consultation with the key stakeholders.

## Public transport

46. Robertson Barracks is not serviced by public transport.

## Local road and traffic concerns

47. As noted previously, construction traffic in the area to and from the base will be minimal. When the plant and equipment required for the project has been established on the base it will remain there for the duration of the works.

## Zoning, local approvals and land acquisition

48. No external authority zoning or planning approvals are required and no additional land acquisition is required for this project, although the works will comply with the relevant standards and regulations.
49. The proposed works are in accordance with the zones and precincts set down in the endorsed 2009 Master Plan for Robertson Barracks.

## Planning and design concepts

50. A preliminary concept layout drawing for the proposed supply and distribution system has been prepared by professional engineering consultants. Detailed design and construction drawings and specifications will be prepared for the works.
51. The new central emergency power station is proposed to be a simple building structure in accordance with the existing palette of forms, materials and colours prevalent on the base. The building would be approximately 500 square metres in area, house two 3.5MVA generators and would be acoustically treated and engineered to minimise impacts on other base users.
52. The new and upgraded intake switching stations and the new central emergency power station building will be designed in accordance with the requirements of the Defence Manual of Infrastructure Engineering – Electrical, the Defence Manual of Fire Protection Engineering, the Building Code of Australia and all other relevant Australian and Northern Territory codes and standards.

53. The majority of the completed works will be underground electrical cabling, so once the ground has been reinstated, there will be no visual impact.

### Civil and structural design

54. All excavation and civil works for underground cabling, intake stations, intake switching stations and substations will be designed by professional engineers in accordance with all relevant Defence and industry standards. The structural requirements for the central emergency power station will be developed in accordance with the applicable Defence and industry standards.

### Mechanical and hydraulic services

55. There will be minimal mechanical and hydraulic services required by the project.
56. The new central emergency power station will have stand-by exhaust fans installed to prevent overheating inside the building and an emergency eyewash and shower station will also be installed.

### Electrical services and fire protection

57. The majority of the project works will be carried out by electrical contractors, including:
- a. installation of new underground cabling network;
  - b. upgrading of an existing intake station;
  - c. installation of new and upgrading of existing intake switching stations and substations;
  - d. installation of new interconnectors;
  - e. installation of generators in the new central emergency power station; and
  - f. installation of new power control and monitoring systems.
58. Fire detection and fire extinguishers will be installed inside the new central emergency power station.

## Acoustics

59. The new central emergency power station will have acoustic treatment to minimise impact on base occupants during regular run testing and when required as a backup, in accordance with the Building Code of Australia and Australian Standards for noise and acoustics.

## Landscaping

60. Any areas disturbed by the works will be reinstated on completion and the new central emergency power station will have new and retained landscaping (trees and bushes) to provide a degree of screening.
61. Disturbances by trenching will be treated to match the surrounding area where applicable.

## Water and energy conservation measures

62. Due to the nature of the works there will be negligible water usage by this project both during construction and in operation of the new system.
63. There are limited energy conservation opportunities available to this project. The purpose of the project is to provide an adequate and reliable power supply and distribution system for the base, so a degree of redundancy (i.e. spare capacity) is critical to that objective. However, the specification of all new engineering equipment will require modern and efficient equipment to be installed, in accordance with standard industry practice.
64. High efficiency lighting will be installed in the new central emergency power station. The new power control and monitoring systems will contribute to energy conservation and efficient usage of the new high voltage distribution network across the base.

## Demolition and disposal of existing structures

65. The existing central emergency power station on the base will be decommissioned on completion of the new central emergency power station.
66. All other redundant infrastructure (substations, cabling, etc) will be removed and the area rehabilitated on completion. Materials will be removed in accordance with the relevant regulations and recycled where appropriate.

## Provisions for persons with disabilities

67. The new central emergency power station will be designed to allow access for persons with disabilities.

## Occupational health and safety measures

68. The work to be carried out under this project will comply with the *Occupational Health and Safety Act 1991*, Occupational Health and Safety (Safety Arrangements) Regulations 1991, the Occupational Health and Safety (Safety Standards) Regulations 1994 and the Defence Safety Manual.
69. In accordance with Section 35(4) of the *Building and Construction Industry Improvement Act 2005*, contractors will be required to hold full occupational health and safety accreditation from the Office of the Federal Safety Commissioner under the Australian Government Building and Construction Occupational Health and Safety Accreditation Scheme. All construction sites will be appropriately secured to prevent public access during the construction period. No special or unusual public safety risks have been identified.
70. The new central emergency power station building will be provided with fire detection and fire extinguishers, adequate escape doors and an emergency eyewash and shower facility.

## Cost-effectiveness and public value

### Outline of project costs

71. The estimated out-turn cost of this project is \$43.4 million, excluding GST, which includes the cost of management and design fees, construction, equipment, contingencies and an allowance for escalation.
72. Net operating costs associated with the proposed works are projected to increase due to the construction of the new facilities and infrastructure.



## Details of project delivery system

73. The Robertson Barracks Redevelopment and Hardened and Networked Army (Darwin) projects were considered by the PWC in a combined submission in April 2008. Delivery of those combined projects is being undertaken by a Managing Contractor following an open tender process.
74. The scope of work in that tender included the development phase of this Robertson Barracks Electrical Reticulation System Upgrade project to enable the proposal to be developed for consideration by the PWC. The contract also provided an option for the Managing Contractor to undertake delivery of this project, subject to consideration of the project by the PWC.
75. The Managing Contractor will provide the Commonwealth with buildability experience and fitness for purpose warranties while promoting access for small to medium enterprises through sub-contract construction trade packages.

## Construction schedule

76. Subject to Parliamentary clearance of the proposed works, construction is expected to commence in late 2011 and be completed in mid 2013.

## Public value

77. By rectifying existing electrical problems and failures and ensuring effective and reliable power supply to the facilities at Robertson Barracks, the proposed works will contribute significantly to Army capability and effectiveness, which has an inherent public value.
78. Public value is also achieved by undertaking all high voltage upgrade works now to allow for future growth for approximately 15 years. An ad hoc approach in the future to cater for growth will be more costly than addressing those future needs as part of this project. The cost of investment, both in capital and operating terms, has been optimised through taking a long term view of a major upgrade of infrastructure.

## Revenue

79. No revenue will be derived from this project.

