Pawsey Supercomputing Centre

Post-implementation report—public component

PROJECT NAME	Pawsey Supercomputing Centre for SKA[1] Science and Provision of Sustainable Energy (extension of scope)
Proponent agency	Department of Education Lead agency CSIRO
Date referred to the Committee	18 March 2010
Committee report/s	Report 2/2010 Report 3/2010
Date of expediency (House of Representatives)	24 June 2010
COSTS	
Original cost estimate	Pawsey Supercomputing Centre – Total Centre Cost $66M (ex GST) Provision of Sustainable energy (Extension of Scope) – $19.8M (ex GST) **Total Original Cost Estimate $85,800,000** (excluding GST)
Final cost of project	Pawsey Centre Building $32,000,000 Pawsey Supercomputer $37,000,000 Provision of Sustainable Energy $6,056,000 **Total final Cost of project $75,056,000** (excluding GST).
Reasons for cost changes	Improvements in supercomputing technology led to reduced cooling requirements which caused a technology reprioritisation from deep drilling (involving wells three kilometres deep) to shallow groundwater cooling (GWC) (where wells need only be 100 metres deep). Savings realised allowed $13.17m to be returned to the Commonwealth.
TIME	
Original estimate of commencement and completion of works	**Detailed Design / Construction of Pawsey Centre Building:** Commencement: June 2010 Completion: December 2011 **Supercomputer:** Completion December 2013 **Provision of Sustainable Energy:** Commencement: March 2011 Completion: September 2013

[1] The Square Kilometre Array (SKA) is a global project to build the world's largest radio telescope in Australia and southern Africa.

Actual date of commencement and completion of works	**Detailed Design / Construction of Pawsey Centre Building:** Commencement: June 2010 Completion: April 2013 **Supercomputer:** Completion: September 2014 **Provision of Sustainable Energy:** Commencement: March 2011 Completion: June 2014
Reasons for time changes	CRAY supercomputer configuration selected utilized latest Haswell chip technology provided Pawsey with a higher performance and lower electricity load for improved system obsolescence protection and lower operating costs. 12 week extension of program to enable chip supply and acceptance testing to be completed. Improvements in supercomputing technology led to the decision in late 2012 to utilise ambient temperature water cooling of the supercomputer, allowing a change in technology from deep well geothermal cooling to a shallow GWC system. The required cooling solution was delivered to the Pawsey Supercomputing Centre only two months late. Additional educational infrastructure was proposed, approved, contracted and installed by June 2014.
SCOPE	
Did the project deliver the original scope? Y/N	No
If no, was the scope increased or decreased?	The scope of the Pawsey Supercomputing Centre was **increased**, both in technical offerings by the Supercomputer vendor and to include the extension of scope for the provision of a sustainable cooling solution, as approved by the Committee in July 2010. The scope of the sustainable cooling solution itself was **decreased** in line with reduced cooling requirements due to improvements in supercomputing technology. The performance of the sustainable cooling solution was not compromised.
Details of scope changes	1. Enhancements latest technology Intel Haswell Chip set used in Supercomputer. 2. Provision of a sustainable cooling solution for the Supercomputer. (PWC approved – Report 3/2010) 3. Reprioritisation from deep drilling to shallow groundwater cooling

Reasons for scope changes	1. New Haswell Chip set used in Supercomputer provided higher performance, operates at higher inlet water temperatures, lower electrical load requirements and mitigated obsolescence. Had the Pawsey project not utilised the new Haswell chip sets in the system purchased the system would have been obsolete in 6 months and used 50% more electricity while provide a lower peak performance supercomputer. 2. CSIRO was successful in its application for funds in the sustainability round of the Australian Government's Education Investment Fund (EIF), allowing CSIRO to take up renewable energy deployments foreshadowed in the original Pawsey Centre submission. 3. Primary cooling solution developed through the main construction design was cooling towers. The climatic conditions of Perth during summer renders significant loads on cooling towers with a risk that on days of very hot ambient temperatures and/or high humidity the supercomputer may need to be closed down for several hours. The Project undertook exploration of Groundwater Cooling (GWC) which provides significant operational and sustainability benefits over cooling towers. The highly insulated nature of the whitespace in the Pawsey Super Computing Centre results in the cooling system only having to deal with the supercomputer itself. This assists in reducing demand for energy and potable water.