PROJECT JUSTIFICATION 3

3.1 INTRODUCTION

The mineralisation at Olympic Dam starts at about 300 to 350 m below the surface, which means it is an expensive ore body to mine (whether underground or open pit mining). The current operation uses a method of underground mining to selectively extract the most valuable parts of the ore body (i.e. the higher grade ore). Underground mining only recovers about 25% of the mineralisation, whereas about 98% can be recovered by open pit mining.

The extensive drilling program undertaken at Olympic Dam in recent years has further defined this massive resource. The current and projected demand for the minerals mined at Olympic Dam, combined with the financial resources of the BHP Billiton Group, create an opportunity to introduce open pit mining to Olympic Dam to maximise the recovery of ore and the economic return.

Section 3.2 examines the global demand and supply for the minerals mined at Olympic Dam in more detail, and Section 3.3 shows the extent to which Olympic Dam can increase its output to meet this growing demand. Section 3.4 explains how the proposed expansion aligns with the BHP Billiton Group Charter and South Australia's Strategic Plan 2007 (the South Australian Government being the owner of the minerals on behalf of the people of South Australia).

Section 3.5 describes the consequences of not proceeding. The justification for expanding Olympic Dam at the scale and in the configuration proposed, is addressed in Chapter 4, Project Alternatives.

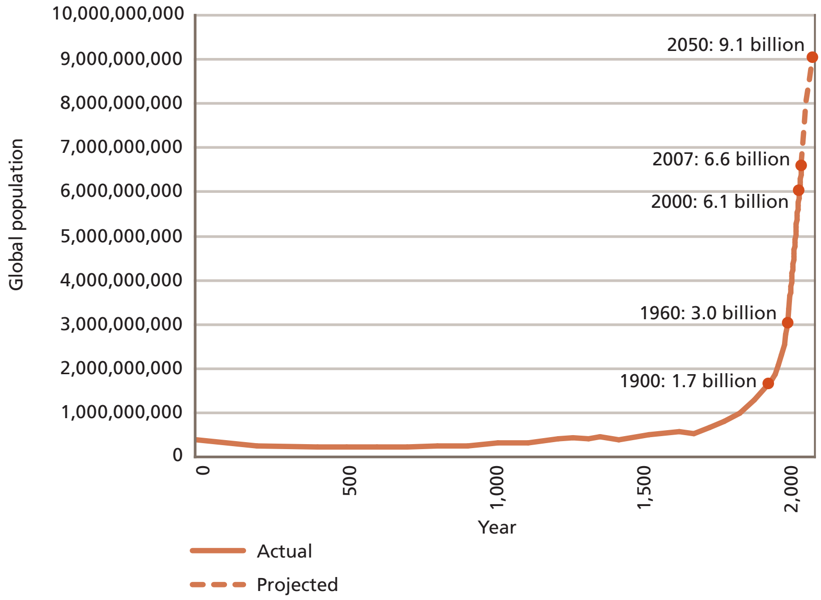
3.2 MARKET DEMAND AND SUPPLY

3.2.1 INTRODUCTION

The global demand for raw materials, housing, services and infrastructure has grown significantly over the past decade and is expected to remain strong in coming decades. Much of this can be attributed to population increase and economic growth. Recent authoritative studies (i.e. World Bank 2006; United Nations Population Fund 2007; US Census Bureau 2007) predict the global population will grow a further 40%, from 6.6 billion to 9.1 billion people, by the year 2050 (see Figure 3.1). The following conclusions are of particular interest:

- almost 40% of the world's population lives in China and India (see Figure 3.2)
- China's population is projected to grow about 8% (from 1.3 to 1.4 billion people) by 2050. However, its economy is expected to grow at a faster rate compared to global economic growth, leading to a significant improvement in living standards but also a significant increase in demand for raw materials
- India's population is projected to grow by 46% (from 1.1 to 1.6 billion people) by 2050. This population growth, combined with projected strong economic growth will underpin a long-term increase in the consumption of raw materials for additional housing, services and infrastructure
- populations in other developing countries are projected to grow by 65% (from 3.9 to 6.5 billion people) by 2050, resulting in significant demand for raw materials to support major improvements in basic services such as housing, infrastructure and health services.

A considerable gap is growing between the predicted demand for raw materials such as copper and the available supply (see Figure 3.3). This is reflected in prices, with Figures 3.4 to 3.7 showing the growth in spot prices for the four metals mined at Olympic Dam (i.e. copper, uranium, gold and silver). The BHP Billiton Group remains confident about long-term demand for metals driven by the longer-term growth fundamentals of the emerging economies.



Source: US Census Bureau 2007 and Census Bureau of the US Department of Commerce 2007

Figure 3.1 Global population growth

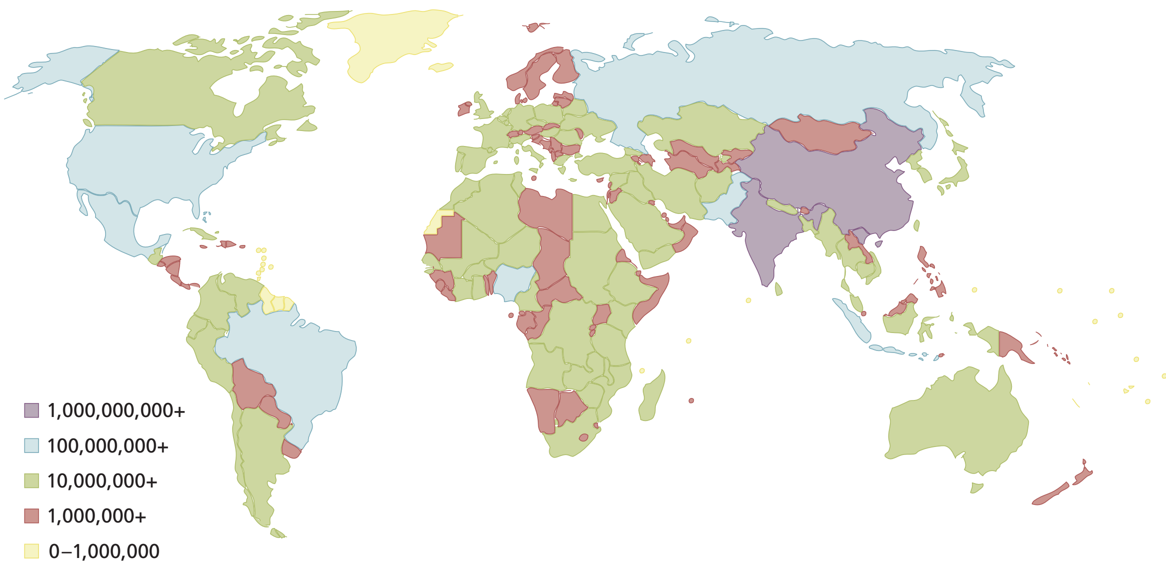
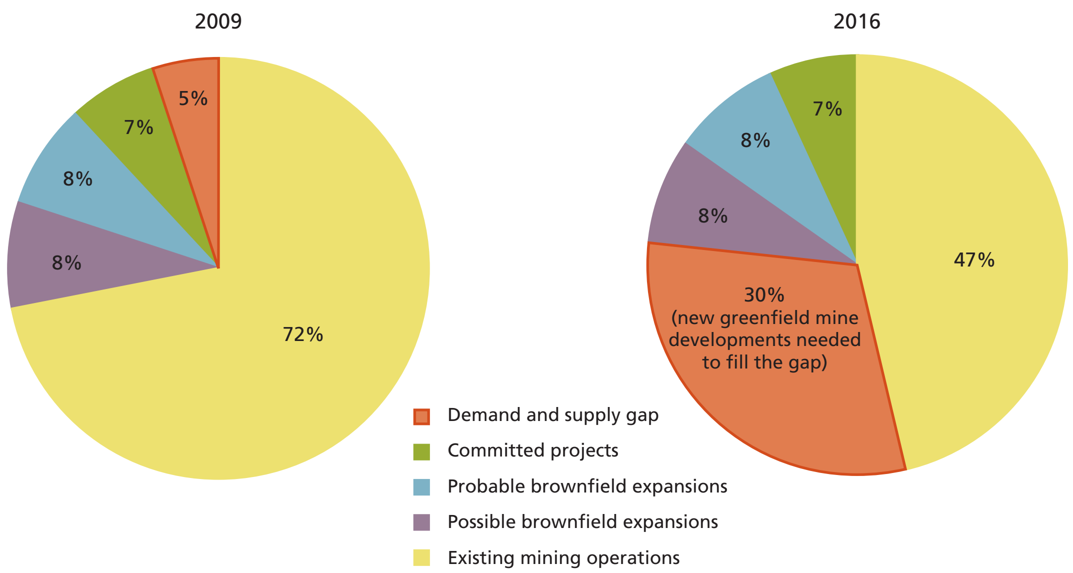
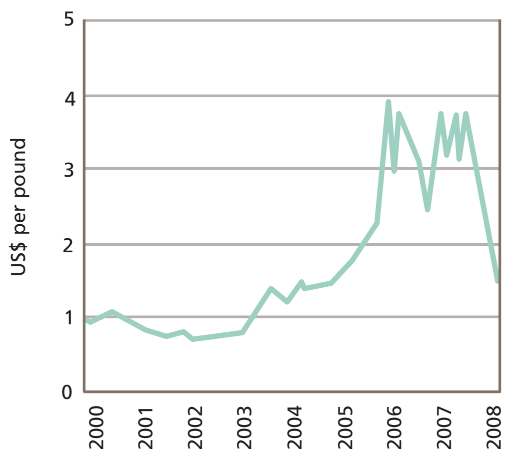


Figure 3.2 Distribution of global population



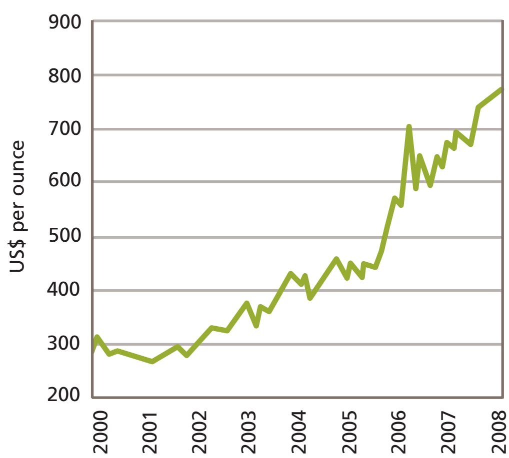
Source: Brook Hunt, HansonWesthouse, 2006

Figure 3.3 Predicted gap in global copper demand and supply



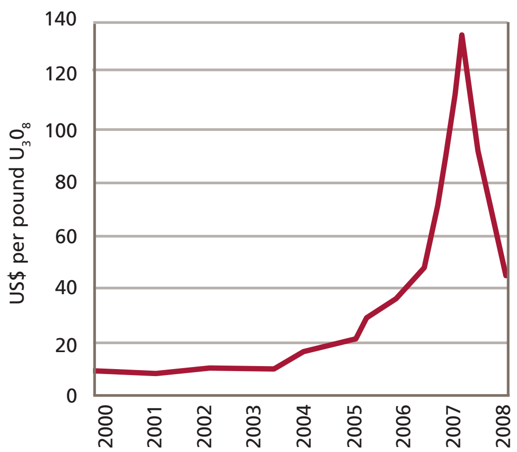
Source: www.kitco.com

Figure 3.4 Copper price



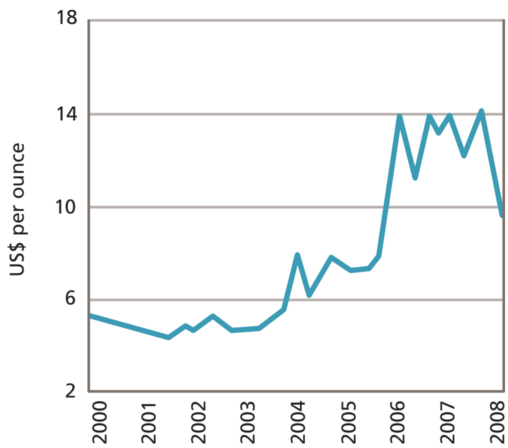
Source: www.kitco.com

Figure 3.6 Gold price



Source: www.uxc.com

Figure 3.5 Uranium price



Source: www.kitco.com

Figure 3.7 Silver price

3

3.2.2 COPPER

The main commodity produced at Olympic Dam is copper and this would remain so with the proposed expansion (see Plate 3.1). Copper is an efficient conductor of electricity, has excellent thermal conductivity, is resistant to corrosion, is strong yet readily workable and can be recycled. Copper is widely used across various industries and in numerous products, including water tubing, electrical wire, electric motors, and as a heat exchanger in air-conditioners and refrigeration units (see Plate 3.2). Copper is also a component of brass, bronze and other alloys. It plays a minor part in the production of coinage, is a supplement in human diets and is used in fertilisers.

Forecasts to the year 2018 predict increases in copper demand based on the growth of urbanisation and expenditure on major infrastructure in China, India and Russia. Figure 3.8 illustrates the projected demand and supply and emphasises, as did Figure 3.3, the emerging gap between the two.

To match the growth in demand, production of refined copper needs to grow from the current rate of 13 million tonnes per annum (Mtpa) to about 20 Mtpa. To place this in context, Olympic Dam, which is currently the thirteenth largest copper mine in the world, produces 200,000 tpa of copper; another 35 mines the size of the current Olympic Dam operation are required to meet the predicted demand to 2018 alone. As illustrated in Figure 3.1, the growth in population and the associated demand for raw materials such as copper are predicted to continue well beyond 2018, adding further justification to expanding large, long-term copper resources such as Olympic Dam (see Figure 3.9 for the life of the Olympic Dam mine compared to other mines).

3.2.3 URANIUM

Background

Uranium is a relatively common element; it is as abundant as tin and one thousand times more abundant than gold. In an enriched form, it is used in 30 countries and produces 16% of the world's baseload electricity capacity.

Nuclear power reactors require 'enriched' uranium fuel, in which the proportion of the U-235 isotope has been raised from the natural level of 0.7% to about 4%. Uranium is enriched in a four-stage process:

- Step 1: mining and milling – produces uranium oxide (U_3O_8) (see Plate 3.3)
- Step 2: conversion – where the uranium oxide is converted into the gas uranium hexafluoride (UF_6)
- Step 3: enrichment – where isotopic separation is used to further upgrade the gaseous uranium hexafluoride
- Step 4: fuel fabrication – where the enriched UF_6 is sent to a fuel fabrication plant and the fuel assemblies forming the core of the nuclear power reactor are manufactured.

Plate 3.1 Copper is transported from Olympic Dam as copper cathodes

Plate 3.2 Copper cable

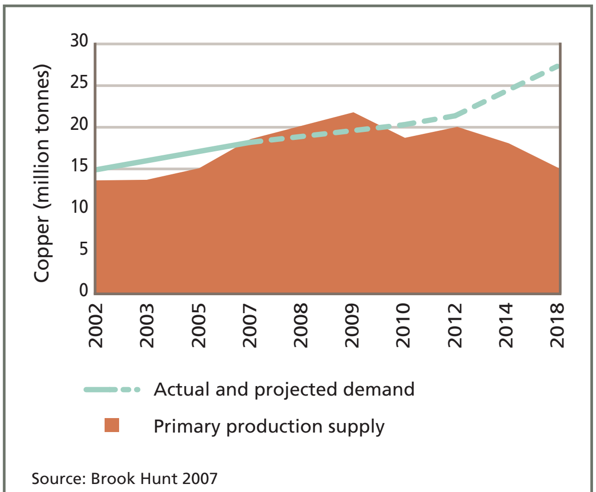
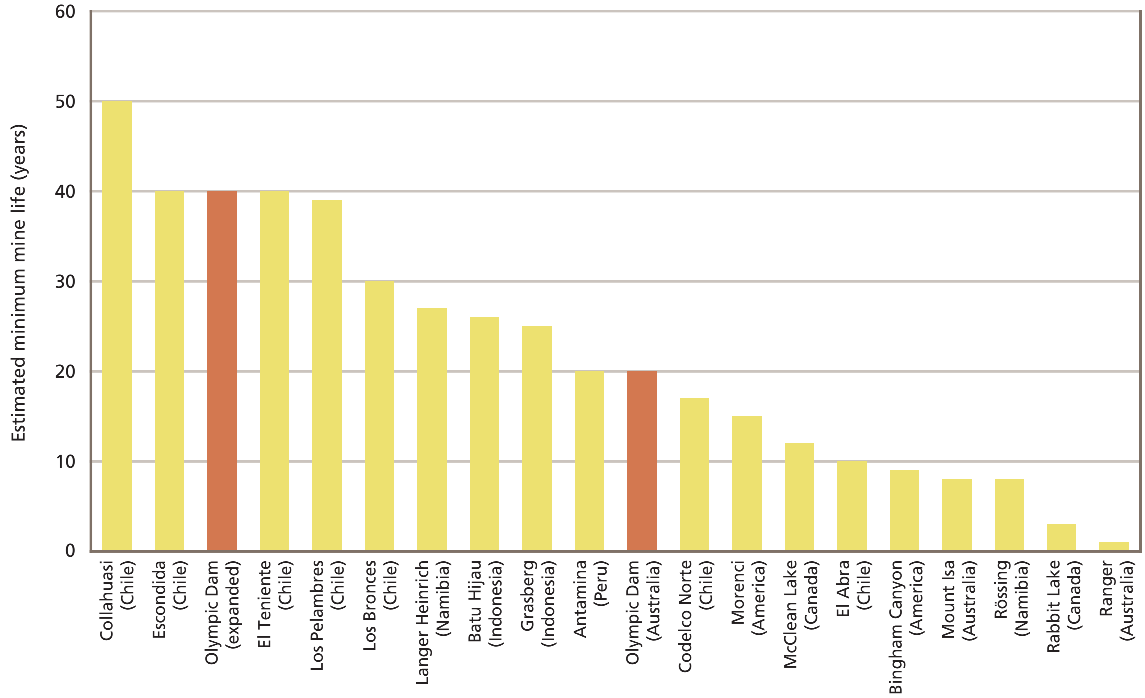


Figure 3.8 Copper demand and supply



Source: Multiple references cited, refer to Figure 3.9 in reference list for the various data sources

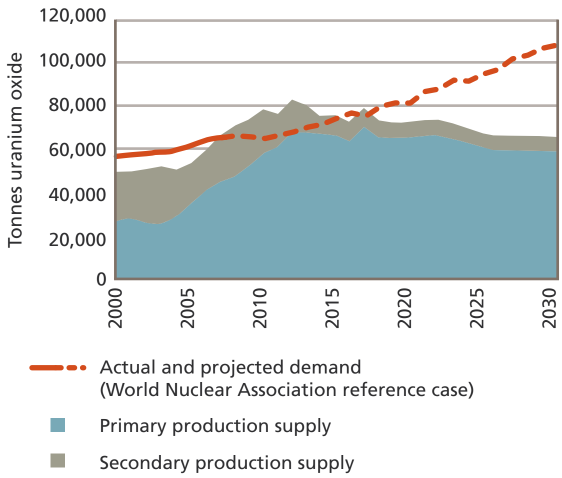
Figure 3.9 Life of Olympic Dam mine compared to other mines

Plate 3.3 Storage of uranium oxide

The mining and milling component of the nuclear fuel cycle occurs in 16 countries, including Australia. No conversion, enrichment or fuel fabrication occurs in Australia, although such plants are located in another 21 countries worldwide (World Nuclear Association 2008b).

After uranium has been used to produce electricity in a reactor it becomes 'spent fuel' and may undergo a further series of processes, including temporary storage, reprocessing and recycling (including the extraction and reprocessing of 'unburnt' fuel) before eventually being disposed of as waste. Reprocessing facilities are located in eight countries worldwide, but there are none in Australia (World Nuclear Association 2008b).

Highly enriched uranium can also be used for nuclear weapons, but since the early 1990s, a considerable percentage of world demand for uranium fuel has been met by converting highly enriched uranium from dismantled nuclear weapons (Australian Bureau of Agriculture and Resource Economics 2007) (see Figure 3.10). From the year 2000, about 30 tonnes per year of highly-enriched uranium from nuclear weapons has been used in nuclear reactors, representing about 13% of the world's current nuclear reactor requirements.



Source: Adapted from World Nuclear Association 2007 and 2008a

Figure 3.10 Uranium oxide demand and supply

3

Australian uranium may only be exported for peaceful purposes under Australia's network of bilateral safeguards agreements. Australia retains the right to be selective as to the countries with which it is prepared to establish safeguards arrangements. Non-nuclear weapon state customer countries must at a minimum be a party to the *Treaty on the Non-Proliferation of Nuclear Weapons* (NPT) and have a full-scope safeguards agreement in place with the International Atomic Energy Agency (IAEA). An additional protocol with the IAEA (providing for strengthened safeguards) is also a pre-condition for the supply of Australian obligated uranium to non-nuclear weapon states. Nuclear weapon state customer countries must provide an assurance that Australian uranium will not be diverted to non-peaceful or explosive uses and accept coverage of Australian uranium by IAEA safeguards.

The safeguards system is in place to ensure that uranium is not diverted for use in nuclear weapons. The system has three main elements: accounting for uranium as it moves through the fuel cycle to ensure that it is not diverted to military uses, physical security of nuclear material, and inspections to verify compliance (see Appendix E3 for further discussion on the nuclear fuel cycle and product stewardship).

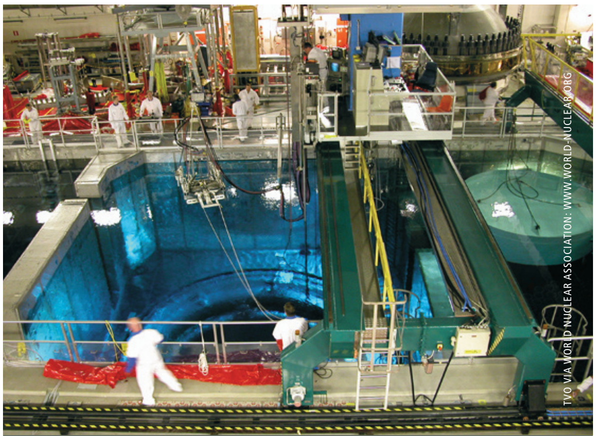
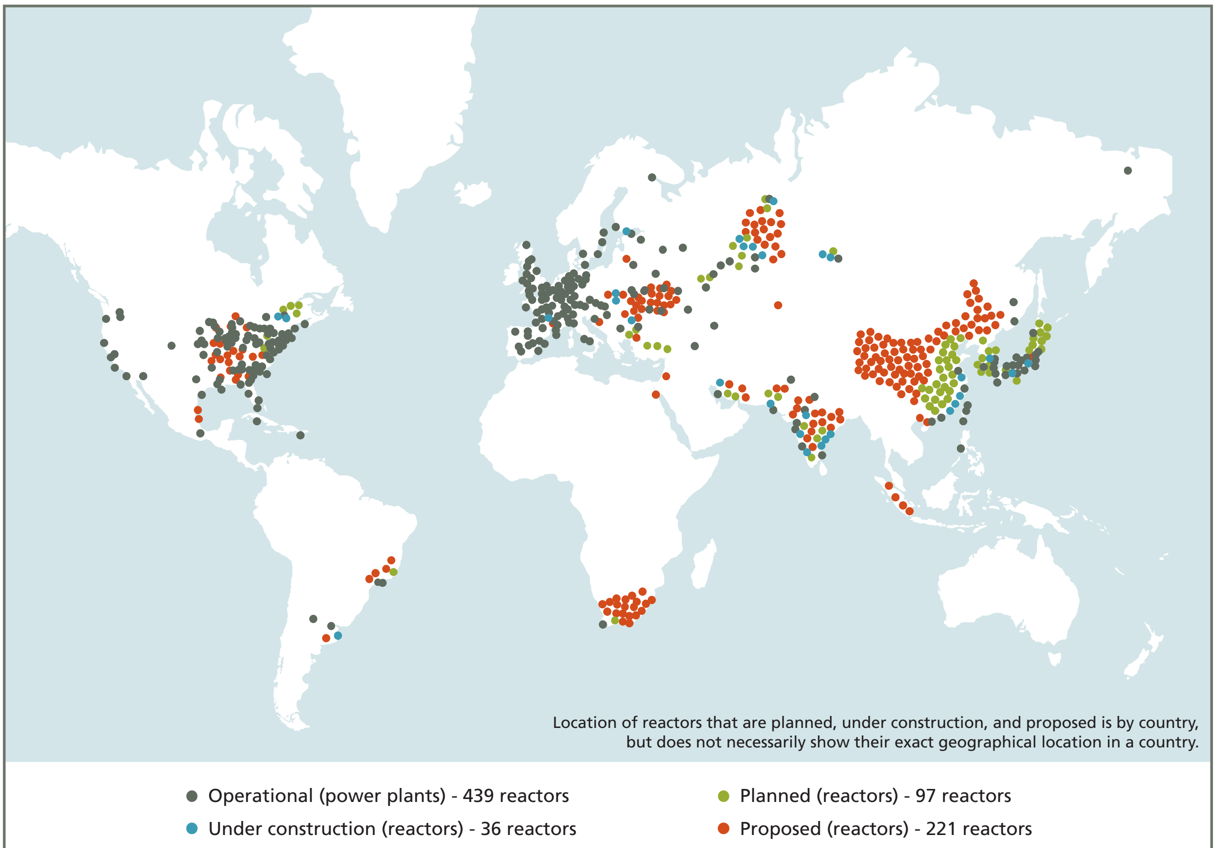


Plate 3.4 One of the reactor halls at TVO's Olkiluoto nuclear power plant in Finland

Demand and supply

The fundamental driver of growth in the demand for uranium is the generation of electricity from nuclear power reactors (see Plate 3.4), although other important applications include the production of radioisotopes used extensively in medical applications, industry and scientific research.

Five hundred and fifty-two nuclear reactors have been built, of which 113 have been decommissioned and 439 are currently in operation. An additional 36 nuclear reactors are under construction, a further 97 are planned for construction in the next 15 years and a further 221 are proposed (see Figure 3.11) (World Nuclear Association 2008b). About 40 reactors at the



Sources: International Nuclear Safety Centre at ANL August 2005
World Nuclear Association 2008

Figure 3.11 Existing and proposed nuclear power reactors end of their operating lives are expected to be decommissioned by 2015. In total, 748 nuclear reactors are expected to be operating worldwide by 2030.

The world's total installed nuclear power generation capacity in 2007 was 370 gigawatts of electricity (GWe). The increasing global trend to reduce greenhouse gases from burning fossil fuels is expected to contribute to a rise in nuclear generation capacity, with a projected increase to 524 GWe by 2030 (World Nuclear Association 2007). To put this in context, Australia's total installed electricity capacity is about 47 GWe (International Atomic Energy Agency 2007). Therefore, the current global nuclear generation capacity is almost eight times Australia's current total electrical output and the projected capacity is more than 10 times.

The demand for uranium has exceeded the supply from primary production for several years. As mentioned above, the supply gap is being met from secondary supplies (see Figure 3.10). For example, in 2007 the world's uranium mines produced 41,279 tonnes of uranium oxide, whereas world demand was 64,200 tonnes (World Nuclear Association 2008a). The shortfall was met from stockpiles and obsolete or decommissioned weaponry. Remaining stockpiles of secondary supplies are expected to fill the shortfall until about 2013 (Australian Bureau of Agriculture and Resource Economics 2006c), after which the demand for uranium for use in nuclear reactors will need to be met by increased primary production (i.e. mining).

About 92,000 tpa of uranium oxide would be required from mining operations (or more than double that produced from mines in 2007) to meet the projected nuclear generation capacity of 524 GWe in 2030. To place this in context, Olympic Dam currently produces 4,000 tpa of uranium, and is the third largest uranium producing mine in the world. To meet the predicted increase in demand to 2030, a further 13 operations the size of the current Olympic Dam operation are required.

Olympic Dam has by far the world's largest known uranium resource, representing more than one quarter of the world's reasonably assured uranium resources (Australian Mines Atlas 2008). Olympic Dam is therefore well placed to take advantage of the expected growth in demand.

3.2.4 GOLD AND SILVER

Gold and silver are valuable by-products of the Olympic Dam mining operation.

The main uses for gold are:

- investment – gold is expected to remain a viable investment option as a hedge against inflation
- jewellery and collectables – prospects depend heavily on future price movements, but demand should remain strong in the short to medium term. The major jewellery markets are India, North America, China, the Middle East, Turkey and Italy (see Plates 3.5 and 3.6)
- industrial applications – gold is used in electronics, dentistry, nanotechnology and is used in other areas such as coated superconductors. Future demand could also come from biomedical applications, as gold has excellent biocompatibility and is resistant to bacterial colonisation.

The main uses for silver are:

- as a low-cost substitute for gold, competing with copper and aluminium, in electronic products such as televisions, mobile phones and batteries. Plasma display panel televisions have significantly boosted silver demand in recent years, and as flat screen televisions become more affordable, the demand for silver in this application is predicted to continue (see Plate 3.7)
- as jewellery – like gold, prospects depend heavily on future price movements but demand is predicted to remain strong in the short to medium term, with the major markets in India, North America, China, the Middle East, Turkey and Italy
- in solar panels – more than 90% of solar panels use silver (Silver Institute 2008), and as the world continues to encourage and develop alternative energy supplies, the demand for solar panels is expected to remain strong
- as an anti-bacterial agent – silver is used as a bactericide and algaecide in an increasing number of water purification systems in hospitals, remote communities and more recently, domestic households (Silver Institute 2008). This demand is expected to double over the next few years.

Plate 3.5 Gold and silver are used in the production of jewellery

Plate 3.6 Gold and silver are used in commemorative coins

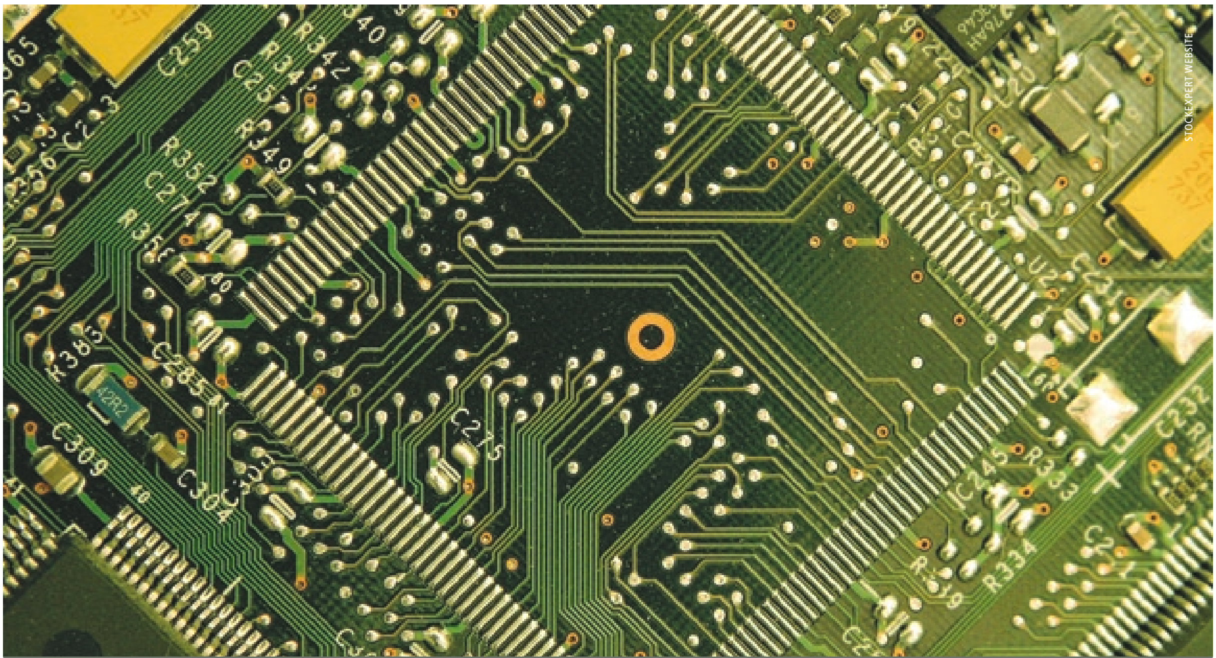


Plate 3.7 Silver and copper are used in electronics

3.3 INCREASING THE SUPPLY FROM OLYMPIC DAM

The size of the mineral resource is the primary driver determining the life of a mine and therefore the period over which the mine can supply raw materials.

The ultimate size of the Olympic Dam mineral resource has not yet been determined. However, recent drilling programs have provided considerable further insight into this resource and the growing knowledge of the ore body over time is shown in Figure 3.12. Figure 3.9 provided a comparison of the predicted life of the proposed Olympic Dam open pit mine and other mines, demonstrating the long-term production opportunity that Olympic Dam provides. The world-class nature of the Olympic Dam mineral resource is further illustrated in Figures 3.13 and 3.14.

Section 3.2 outlined the main drivers underpinning the increasing demand for the metals mined at Olympic Dam. It also highlighted the emerging gap between primary production and demand projections, with 35 copper mines the current size of Olympic Dam required by 2018, and 13 uranium mines the current size of Olympic Dam required by 2030. Olympic Dam can supply copper, uranium oxide, gold and silver for at least another 40 years and the proposed expansion would contribute considerably to closing the gap between the world's demand and supply.

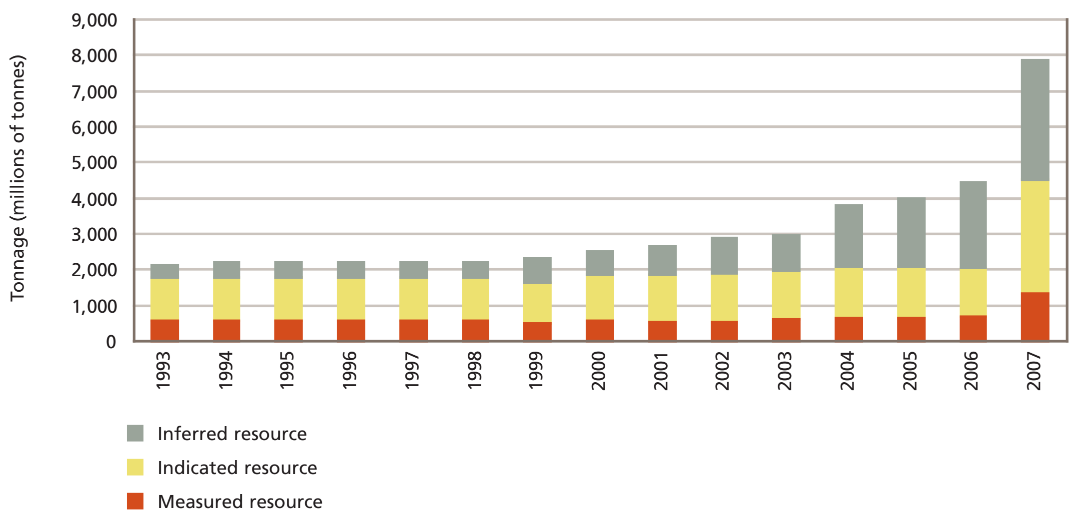
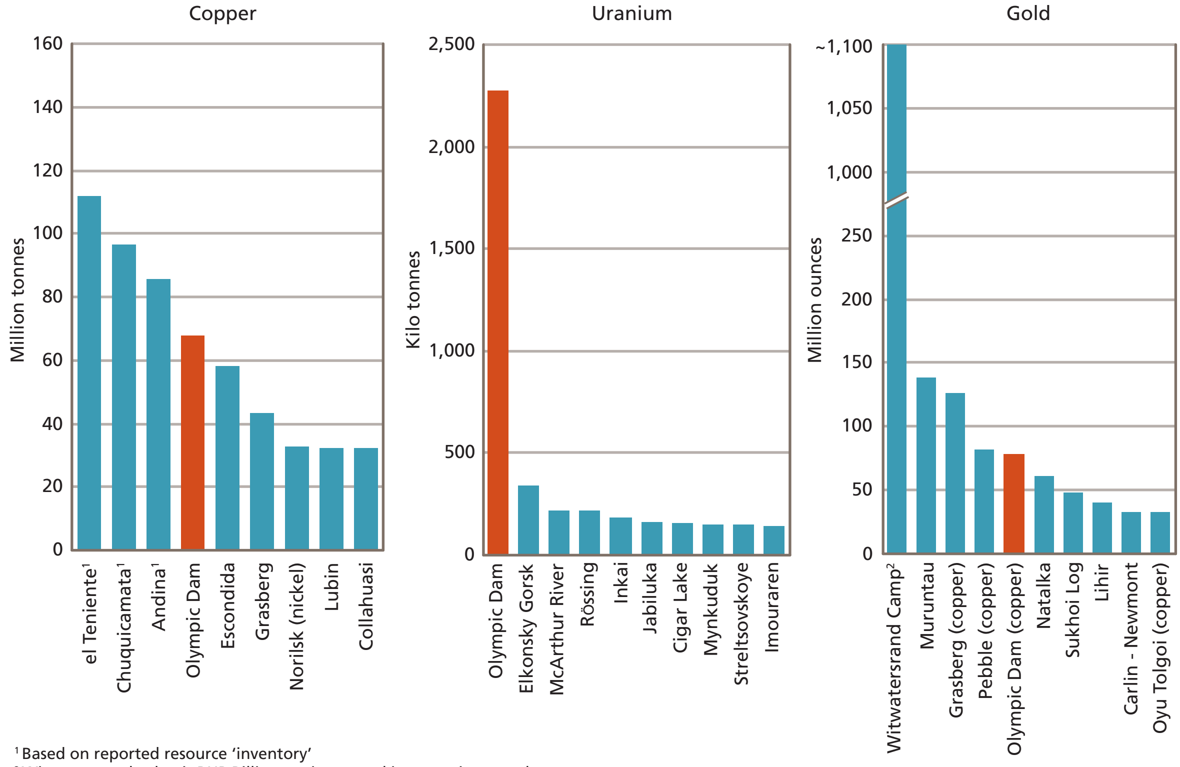


Figure 3.12 A growing understanding of the Olympic Dam mineral resource



[1] Based on reported resource 'inventory'
[2] Witwatersrand value is BHP Billiton estimate and is approximate only
Sources: BHP Billiton 2007 and International Atomic Energy Agency 2007

Figure 3.13 The world's largest copper, uranium and gold deposits

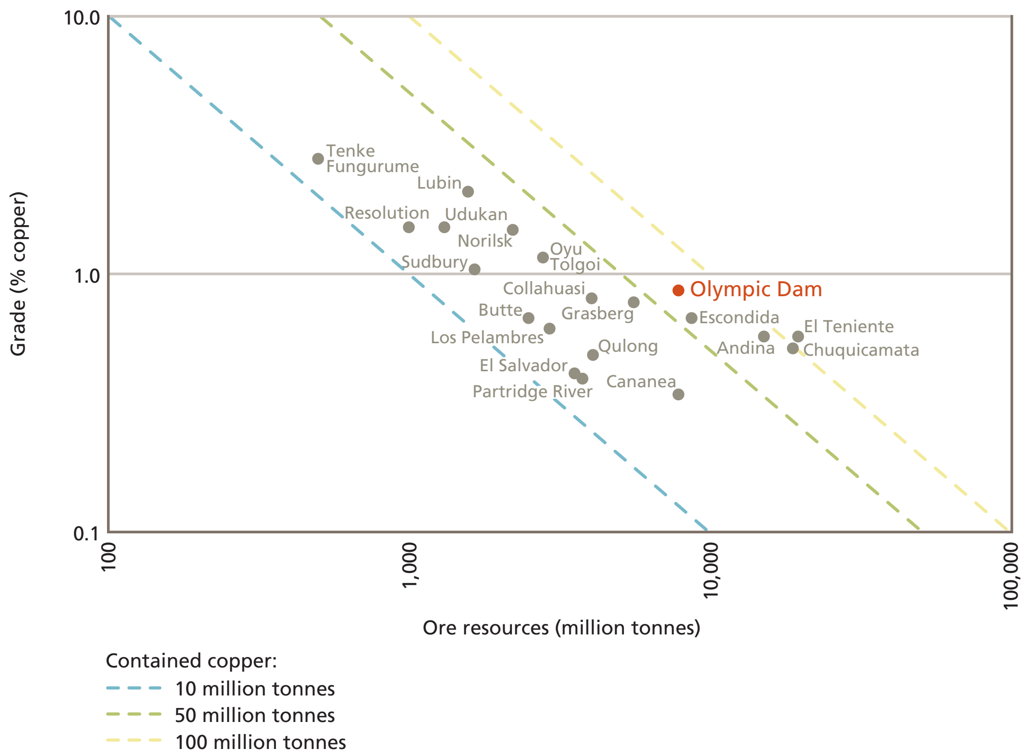


Figure 3.14 Resource and grade of the top twenty copper deposits in the world

3.4 ALIGNMENT WITH STRATEGIC DIRECTIONS

3.4.1 BHP BILLITON GROUP CHARTER

The BHP Billiton Group Charter states the company's purpose is 'to create long-term value through the discovery, development and conversion of natural resources, and the provision of innovative customer and market-based solutions' (see Appendix E5).

The BHP Billiton Group defines success in creating value as achieving the following goals:

- shareholders realise a superior return on their investment
- customers and suppliers benefit from their business relationships with the company
- the communities in which the company operates value its citizenship
- every employee starts each day with a sense of purpose and ends each day with a sense of accomplishment.

The Olympic Dam expansion is aligned with the company's purpose and values, in that it provides:

- the opportunity for significant long-term economic returns for shareholders and the local, regional, state and national economies (see Chapter 21, Economic Assessment)
- significant long-term benefits to its customers and suppliers as a secure source of large metal volumes
- an opportunity for BHP Billiton to enhance its relationship further, and create significant social benefits, for the traditional claimant groups and the communities of the Olympic Dam region (see Chapter 17, Aboriginal Cultural Heritage, and Chapter 19, Social Environment)
- considerable challenges and rewarding experiences for the BHP Billiton workforce and its contractors through each phase of the proposed expansion from planning, construction and operation through to ultimate closure.

3.4.2 SOUTH AUSTRALIA'S STRATEGIC PLAN

The proposed expansion would assist the South Australian Government in about 45 of the proposed targets of South Australia's Strategic Plan 2007. Table 3.1 provides a summary of 10 targets and contributions relevant to the proposed Olympic Dam expansion (see Appendix D for further details of the full contribution).

3.5 CONSEQUENCES OF NOT PROCEEDING

Not proceeding with an otherwise feasible development project will typically entail the inverse of its benefits and drawbacks. However, if the project does not proceed as planned, then it may well remain as a development option for the future. In other words, the costs and benefits may just be deferred.

Nonetheless, the consequences of the forgone benefits and impacts do have some immediacy:

- the time value of money means that collateral benefits now are preferable to later
- a new development adds to the critical mass of the industry, from which a number of broader benefits flow beyond the confines of the project itself (see Section 3.5.2).

Thus the consequences of not proceeding fall respectively into two groups: specific benefits forgone or delayed; and strategic opportunity costs.

3.5.1 SPECIFIC BENEFITS FORGONE

The specific benefits forgone mainly comprise the economic benefits of the project over the first 30 years expressed as increases above the business-as-usual case (BAU-case) projections in net present value (NPV) terms. These include (see Chapter 21, Economic Assessment, for details):

- $18.7 billion in Australia's gross domestic product (GDP)
- $45.7 billion in gross state product (GSP) in South Australia
- $22.6 billion in gross regional product (GRP) in the Northern Statistical Division
- $936 million in GSP in the Northern Territory
- private consumption of goods and materials in Australia would be around $21.8 billion higher than otherwise. The benefits of this increase in living standards would be concentrated in South Australia
- royalties from production at Olympic Dam paid to the South Australian Government would increase from an annual average $59 million to a forecast annual average of $190 million above the BAU-case projections.

Other benefits forgone include:

- business opportunities in South Australia
- 4,000 new full-time jobs plus a peak of 6,000 short-term jobs (over and above the current Olympic Dam workforce)
- a legal trust to hold funds for the long-term benefit of Aboriginal communities in northern South Australia
- the potential to supply water to the Upper Spencer Gulf and Eyre Peninsula areas from the Point Lowly desalination plant (with the South Australian Government's participation) thereby reducing the region's current reliance on the River Murray by up to 30 GL per annum of water (see Chapter 4, Project Alternatives, for details).

In addition, some improvement opportunities created by the proposed expansion would be lost, for example:

- improvements to water management and a reduced exposure of water birds to acidic solutions (see Section 15.5.7)
- development of skills and training opportunities in the South Australian workforce (see Section 19.5.1)
- redundancy in the acid plant to avoid emissions of untreated sulphur dioxide off-gases (see Section 13.4.2)
- electricity cogeneration to use waste heat from the acid plants (see Section 13.4.4)
- the greater range and diversity of facilities and opportunities in Roxby Downs that would come with a larger population (see Section 19.5.4).

Table 3.1 Alignment of the proposed Olympic Dam expansion with South Australia's Strategic Plan 2007

SA Strategic Plan objective	Target	Target description	Contribution by the proposed Olympic Dam expansion	Relevant EIS Chapter
Growing prosperity	T1.1	Economic growth to exceed the national average by 2014	The proposed expansion is predicted to contribute $45.7 billion over 30 years to the South Australian Gross State Product (GSP) (in Net Present Value (NPV) terms, above the BAU-case). The proposed expansion would contribute significantly to the State's economic growth rate by providing an average increase of $650 million per year (1% over the BAU-case) in years 0–6; $4.3 billion per year (6.4%) in years 7–11, and $6.9 billion per year (8.7%) in years 12–30.	21
	T1.10	Average employment growth rate to exceed the national average by 2014	The proposed expansion would increase the operational workforce at Olympic Dam from 4,150 to approximately 8,500. In addition, the construction workforce is expected to average 4,000 workers and reach a peak of more than 6,000 in Year 5. The size of the total Olympic Dam workforce (including shutdowns and existing workforce) would peak at 14,000 in Year 6. This would contribute significantly to the State's employment growth rate.	19
	T1.14	Treble the value of South Australia's export income to $25 billion by 2014	The proposed expansion would increase the value of total South Australian exports by $28.7 billion, and net exports would increase by $16.3 billion (above the BAU-case over 30 years (NPV 7%)).	21
	T1.18 T1.19	Increase the value of minerals production to $3 billion by 2014 Increase the value of minerals processing to $1 billion by 2014	Production output from the expanded mining and minerals processing operation would increased significantly, as follows: • refined copper equivalent (from 235,000 tpa to 750,000 tpa) • uranium oxide (from 4,500 tpa to 19,000 tpa) • gold bullion (from 100,000 ounces to 800,000 ounces) • silver bullion (from 800,000 ounces to 2,900,000 million ounces) • 1.6 million tpa of the concentrate product.	3
	T1.21	Match the national average in terms of investment in key economic and social infrastructure	The proposed expansion would provide the impetus for expenditure on strategic infrastructure, stimulated by business and population increases in both metropolitan and regional South Australia. Social infrastructure such as schools, medical services, transport options and community health services would be developed to support the population growth in towns directly affected by the proposed expansion (predominantly Roxby Downs, which could become a regional hub and major service centre for the Far North of South Australia).	5
Improving well-being	T2.11	Achieve the nationally agreed target of 40% reduction in injury by 2012	BHP Billiton aspires to Zero Harm and seeks to ensure its business contributes lasting benefits to society through the consideration of health, safety, social, environmental, ethical and economic aspects in all company decisions and activities. This is communicated and implemented through its Health, Safety, Environment and Community (HSEC) management system.	22

3

Table 3.1 Alignment of the proposed Olympic Dam expansion with South Australia's Strategic Plan 2007 (cont'd)

SA Strategic Plan objective	Target	Target description	Contribution by the proposed Olympic Dam expansion	Relevant EIS Chapter
Attaining sustainability	T3.5	Achieve the Kyoto target by limiting the state's greenhouse gas emissions to 108% of 1990 levels during 2008–2012, as a first step towards reducing emissions by 60% (to 40% of 1990 levels) by 2050	The proposed expansion would result in increased greenhouse gas emissions. Strategies developed to reduce the greenhouse footprint of the proposed expansion include: the use of natural gas; maximising energy efficiency; minimising energy consumption; and consideration of renewable energy sources. For the Olympic Dam operation, BHP Billiton has committed to applying a goal of reducing greenhouse gas emissions (reportable under the National Greenhouse and Energy Reporting (Measurement) Determination 2008) to an amount equivalent to at least a 60% (to an amount equal to or less than 40%) of 1990 emissions, by 2050.	13
	T3.10	Increase environmental flows by 500 GL in the River Murray by 2009 as a first step towards improving sustainability in the Murray-Darling Basin, with a long-term target of 1,500 GL by 2018	The proposed desalination plant includes a South Australian Government allocation of 80 ML/d to replace water currently drawn from the River Murray for use in the Upper Spencer Gulf and Eyre Peninsula regions. This would enable the return of water to the River Murray for environmental flows.	4
Fostering creativity and innovation	T4.7	The proportion of South Australian businesses innovating to exceed 50% in 2010 and 60% in 2014	BHP Billiton's HSEC Standards specify that opportunities should be sought to conduct or support innovation which promotes the use of products and technologies which are safe and efficient in their use of energy, natural resources and other materials.	19
Building communities	T5.9	Maintain regional South Australia's share of the State's population (18%)	The proposed expansion would increase the population of Roxby Downs up to 10,000 people. For the construction phase, the expansion would also require a short-term increase of an average 4,000 people, peaking at 6,000.	19
Expanding opportunity	T6.1	Improve the overall well-being of Aboriginal South Australians	With the implementation of the Olympic Dam Agreement, the proposed expansion would provide long-term benefits including increased training and employment opportunities for Aboriginal South Australians.	17

On the other hand, the impacts of the project described in the Draft EIS would not occur, notably:

- a major increase in the project footprint and associated vegetation clearance and habitat loss (see Chapter 15, Terrestrial Ecology)
- increased dust, noise and radon emissions (see Chapter 13, Greenhouse Gas and Air Quality; Chapter 14, Noise and Vibration; and Chapter 22, Health and Safety)
- the amenity and safety impacts of construction traffic (see Chapter 19, Social Environment and Chapter 22).

3.5.2 STRATEGIC OPPORTUNITY COSTS

The immediate opportunity costs of the 'no project' option have been set out above. There are broader consequences as well.

For the BHP Billiton Group, the proposed Olympic Dam expansion is of a scale that only the largest and most capable mining companies in the world could deliver. Such projects are rare, and so the opportunity cost in economic and human capital (i.e. upskilling many people) of not proceeding with the project would be deferred or lost.

For the mining sector as a whole, to lose a project of this scale would be to forgo a rare opportunity for stability and continuity. This is an industry where most mines open and close within a timeframe of a decade or two, and so a mine with a life of many decades or perhaps half a century or more becomes a cornerstone for the development of human capital (i.e. a workforce of skilled professionals and experienced tradespersons from which other mines and industries may benefit). In other words, individual mines may come and go, but there will always be a need for skilled people to extract and process metals to meet global demands.

For the broader community, no expansion project would mean an opportunity lost of a more diverse and resilient regional economy and improved access to human services facilities.