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# **Minerals and energy**

## **Major development projects – April 2011 listing**

Robert New, Allison Ball, Alan Copeland and commodity analysts

May 2011

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# Minerals and energy major development projects – April 2011 listing

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## Key points

- At the end of April 2011, there were 94 projects at an advanced stage of development, with a record capital expenditure of \$173.5 billion. This represents a 31 per cent increase from October 2010. The record value of advanced minerals and energy projects reflects, in part, the decision to proceed with the development of the Gladstone LNG project and BHP Billiton, Fortescue Metals and Rio Tinto's commitment to several coal and iron ore developments over the next three years.
- In 2010–11, exploration expenditure in Australia's minerals and energy sector is estimated to be \$5.9 billion, broadly similar to expenditure in 2009–10. Investment in mineral exploration remains strong, with Australia expected to record its third highest annual mineral exploration expenditure in 2010–11.
- New capital expenditure in the mining industry is estimated to be \$55.5 billion in 2010–11, 53 per cent higher than in 2009–10. Based on industry intentions from the December quarter 2010, Australian Bureau of Statistics (ABS) survey data indicate capital expenditure in the mining sector in 2011–12 may be around \$73.7 billion.
- In the six months to April 2011, 10 projects with a combined capital cost of \$2.8 billion were completed in Australia.

## Exploration expenditure

The amount of investment in mineral exploration affects critically the ability of Australia's minerals and energy sector to sustain its recent strong growth and expand its contribution to national economic growth over the medium to long term. Mineral exploration represents an investment in knowledge about the potential size, location and quality of mineral deposits.

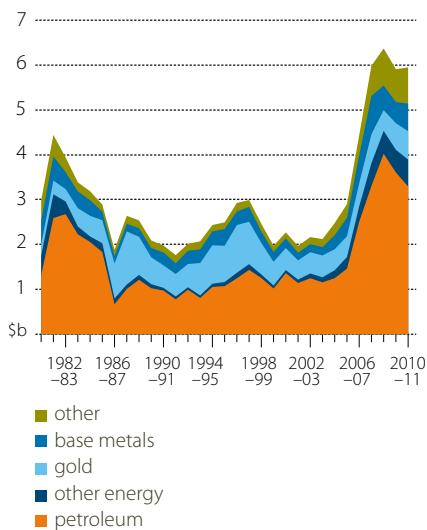
In general, decisions to invest in mineral exploration depend on the probability of discovering an economic mineral deposit or extending the resource base of a known deposit. However, a range of factors affect the decision to invest in mineral exploration. Some of these are common to investment decision across the economy, while others are specific to the minerals sector. These factors include current and expected future prices, mining and processing technologies, input costs, access to land, and government policies. Government policies are particularly important in deciding whether to undertake exploration expenditure as they determine the overall legal, social and environmental foundations that affect the security and economics of an investment.

Brownfield exploration expenditure—exploration around existing or known deposits—has accounted for around 60 per cent of total mineral exploration expenditure over the past eight years. Two factors have contributed to this trend. First, higher world prices have encouraged

companies to reassess reserves previously considered uneconomic. Second, brownfield mining is attractive for companies because infrastructure often already exists, which means extraction can start sooner and capital costs are lower.

The share of petroleum exploration expenditure undertaken on production leases (around one-quarter of total petroleum exploration expenditure) has been lower than the proportion of exploration expenditure spent on brownfield mineral deposits in recent years. This reflects in part the amount of exploration associated with feasibility studies on greenfield petroleum projects.

## 1 Australian private minerals exploration expenditure 2010–11 dollars



In 2010–11, mineral exploration expenditure in Australia is estimated to be \$5.9 billion, comparable to expenditure in 2009–10. In real terms, exploration expenditure in 2010–11 is expected to be the third highest on record and nearly double the average exploration expenditure of the past 30 years. Expenditure on mineral exploration in Australia since 1980–81 (in real terms) is provided in figure 1.

The estimate of only marginal growth in total exploration expenditure in 2010–11 follows a decline in 2009–10, the first since 2003–04. Higher commodity prices have supported an increase in exploration activity this year for all major minerals, with the exception of petroleum. Petroleum accounts for most of the exploration expenditure in Australia, and the decline in petroleum expenditure in the past two years has dampened the results for the minerals sector as a whole.

Although there is always a degree of uncertainty surrounding the outlook for commodity prices, minerals exploration expenditure is likely to remain high. This reflects expectations of a positive outlook for commodity prices over the medium term.

In 2010–11, exploration expenditure on energy minerals is expected to decline, with lower expenditure on petroleum more than offsetting increased expenditure on coal and uranium. Petroleum exploration expenditure is estimated to fall by 8 per cent to \$3.3 billion in 2010–11, although it is still the fourth highest recorded in Australia's petroleum industry. The fall in petroleum exploration expenditure does not necessarily reflect a decrease in activity. A significant proportion of petroleum exploration expenditure is associated with hiring of drilling rigs, the cost of which is denominated in US dollars. Because the Australian dollar has appreciated against the US dollar in 2010–11, this has resulted in lower Australian dollar costs for US dollar-denominated goods and services.

Exploration expenditure for coal is estimated to increase by 12 per cent to around \$360 million in 2010–11 in response to expectations of increasing world coal demand over the medium to longer term. Spending on uranium exploration is estimated to rise by 37 per cent in 2010–11, with stronger uranium spot prices for the first three quarters of the year reversing the decline in exploration activity from the previous year.

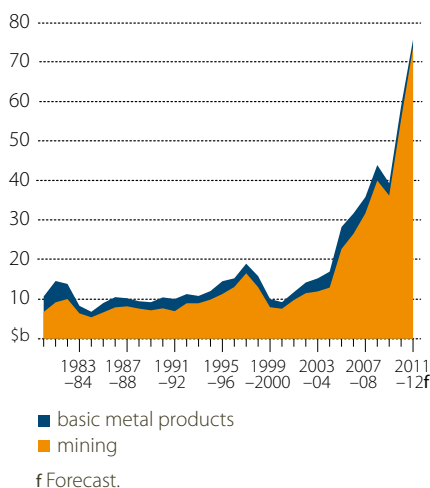
Exploration expenditure for all other major mineral commodities is also expected to rise strongly in 2010–11, in contrast to the decline in expenditure in the previous year for most metals. Expenditure on gold exploration is estimated to increase by 10 per cent to around \$632 million in 2010–11, as higher Australian denominated gold prices encourage exploration. Exploration expenditure on base metals is estimated to rise by 34 per cent to around \$614 million, supported by strong growth in copper and nickel prices. Iron ore exploration expenditure is estimated to grow by around 13 per cent to \$591 million in 2010–11.

Over the medium term, a set of common factors is expected to influence exploration expenditure in each sector of Australia's minerals and energy industry. These include prospectivity, the outlook for prices over the medium to longer term, expected future costs of exploration and development (including costs of labour, fuel, drilling rigs and other inputs), government policy settings and Australia's relative attractiveness for mineral exploration and extraction generally.

## Capital expenditure

New capital expenditure in the mining and metal products industries provides an indication, in aggregate terms, of the pace and scale of development in the Australian minerals and energy sector (figure 2).

### 2 New capital expenditure 2010–11 dollars



Capital expenditure in mining refers to spending on equipment, plant and assets directly related to mining or concentrating of ores or other raw materials. Expenditure on basic metals products refers to spending on equipment, plant and assets for basic processing of mine output. As Australia has a comparative advantage in mining, relative to basic metal processing, a larger proportion of capital expenditure is directed to mining rather than processing.

Based on ABS data, new capital expenditure in the mining industry is estimated to be \$55.5 billion in 2010–11, 53 per cent higher than in 2009–10. The significant increase in capital expenditure reflects the start of construction of several large projects, including in the petroleum, iron ore and coal sectors. In real terms (2010–11 dollars), new capital

expenditure in 2010–11 is the highest on record and nearly four times the average annual expenditure of the past 30 years (\$14.7 billion).

There are indications that capital expenditure in the mining sector may continue to increase strongly in 2011–12. Based on industry intentions surveyed in the December quarter 2010, ABS data indicate capital expenditure in the mining sector in 2011–12 is expected to be around \$73.7 billion (2010–11 dollars). If this expenditure is realised, it would represent a 33 per cent increase on 2010–11 expenditure. The scale and pace of expenditure estimated by the ABS are consistent with recent trends shown in the full ABARES list of major mineral and energy projects.

## **ABARES list of major minerals and energy development projects**

### ***The full list***

The ABARES list of major minerals and energy projects expected to be developed over the medium term is compiled every six months. Information contained in the list spans the mineral resources sector and includes energy and minerals commodities projects and mineral processing projects.

The information comes predominantly from publicly available sources but, in some cases, is supplemented by information direct from companies. The list is fully updated to reflect developments in the previous six months. The projects list is released around May and November each year.

### ***What's in the list?***

The latest projects list contains information on 399 projects, providing the following details:

- project name
- location
- expected start-up date
- capital cost of the project
- proponent company or joint venture
- project status
- additional output capacity
- additional employment, where available.

With one industry exception, the ABARES list provides details of each announced project for which total capital expenditure is expected to exceed \$40 million. The exception is the gold industry, which typically has a relatively large number of smaller projects. For gold, the expenditure threshold for inclusion in the list is \$15 million.

In general, included projects are at relatively advanced stages of planning. That is, for new projects, stage of planning categories range from 'pre-feasibility study underway' through to 'under construction'.

Projects are listed by the principal mineral commodity to be produced, under the broad headings: 'Mining projects – energy', 'Mining projects – minerals' and 'Mineral processing facilities'. The list includes new greenfield projects as well as expansions of existing projects.

### ***Where to get the list***

The list is available only as an electronic product and can be downloaded from [www.abares.gov.au](http://www.abares.gov.au) or obtained by phoning +61 2 6272 2010.

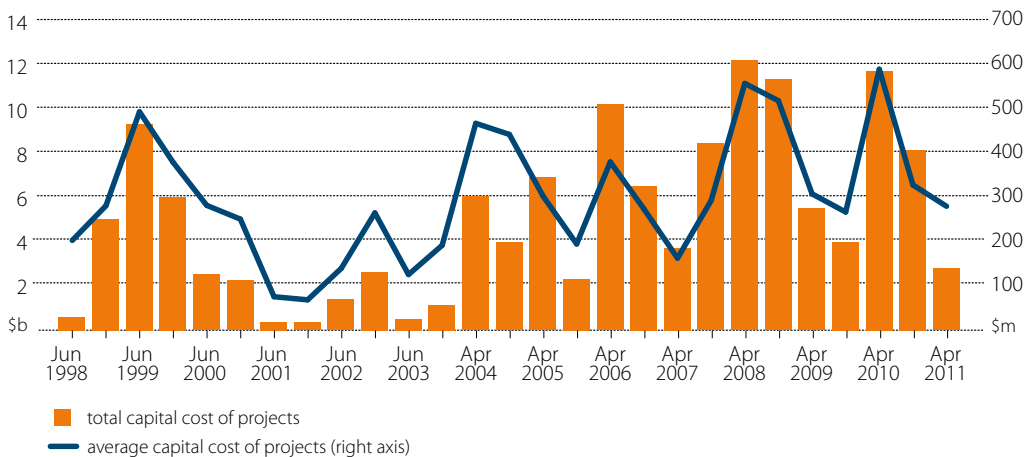
The *Minerals and energy development projects – October 2011 listing* is scheduled for release in November 2011 and will be published at [www.bree.gov.au](http://www.bree.gov.au).

Capital expenditure in the metal products sector, which includes mineral processing activities covered in the ABARES projects list, is estimated to be \$3.4 billion in 2010–11, approximately 8 per cent higher than in 2009–10. Surveyed industry intentions indicate metal products expenditure could fall by 41 per cent to \$2.0 billion in 2011–12, reflecting the completion of upgrades at the Boyne Island smelter, and the Worsley and Yarwun alumina refineries.

## Recently completed projects

In the six months ended April 2011, 10 major mineral and energy projects, with a combined capital cost of \$2.8 billion, were completed (table 1). The value of completed projects is the lowest since October 2005. Of the 10 projects completed, four were energy projects, three were mineral mining projects, two were infrastructure projects and one was an energy processing project. Both in terms of total capital cost and average capital cost, the number of completed projects was lower than the previous listing and below the average (in 2010–11 dollars) for the previous eight years (figure 3).

### 3 Completed projects, June 1998 to April 2011, total and average capital costs 2010–11 dollars



## Energy projects

In the six months to April 2011, four energy projects were completed at a capital cost of \$1.7 billion. Three of the four energy projects were coal mining projects, located in New South Wales.

The largest energy project completed in the six months to April 2011, in terms of capital expenditure and capacity, was Xstrata Coal's Mangoola open cut mine. This new mine was completed at a capital cost of US\$880 million and will have an annual production capacity of 8 million tonnes of thermal coal. Yancoal commenced production from the Moolarben open cut mine, which was completed at a capital cost of \$405 million. The Moolarben development also includes an underground mine which is expected to be in operation in 2012.

# 1 Major mineral resource developments – projects completed, November 2010 to April 2011

commodity	project	location	company	capital expenditure \$m
<b>Mining – energy projects</b>				
Black coal	Mangoola (Anvil Hill opencut)	NSW	Xstrata Coal	US\$880m
Black coal	Moolarben stage 1	NSW	Yancoal Australia	\$405m
Black coal	Mount Arthur opencut (MAC20)	NSW	BHP Billiton	US\$260m
Petroleum	Halyard	WA	Apache Energy / Santos	US\$115m
<b>Mining – mineral projects</b>				
Iron ore	Chichester Hub 40–55Mtpa	WA	Fortescue Metals Group	US\$630m
Iron ore	Nullagine iron ore project	WA	BC Iron / Fortescue Metals Group	\$52m
Mineral sands	Snapper (stage 2 of Pooncarie mineral sands project)	NSW	Bemax Resources	\$150m
<b>Infrastructure projects</b>				
Iron ore	Dampier Port Expansion	WA	Rio Tinto	US\$91
Petroleum – gas pipeline	Young–Wagga Wagga pipeline	NSW	Australian Pipeline Group	na
<b>Mineral processing projects</b>				
Petroleum	Micro LNG plant	Tas	BOC	\$150m

## 2 Completed projects, October 2003 to April 2011

2010–11 dollars

	number of projects	total capital cost of projects	average capital cost of projects (\$m)
<b>Six months ending</b>			
October 2003	6	1 145	191
April 2004	13	6 056	466
October 2004	9	3 970	441
April 2005	23	6 932	301
October 2005	12	2 325	194
April 2006	27	10 233	379
October 2006	24	6 541	273
April 2007	23	3 722	162
October 2007	29	8 466	292
April 2008	22	12 234	556
October 2008	22	11 380	517
April 2009	18	5 525	307
October 2009	15	3 993	266
April 2010	20	11 765	588
October 2010	25	8 175	327
April 2011	10	2 794	279
Total	298	105 256	353



The combined annual capacity of the Moolarben open cut and underground mine is around 12 million tonnes (run of mine production). In early 2011, BHP Billiton completed the MAC20 Project, which expanded annual production capacity at its Mount Arthur thermal coal mine by 3.5 million tonnes. This project was completed ahead of schedule and on budget at US\$260 million.

The other energy project completed in the six months to April 2011 was the Halyard gas project, located off the coast of Western Australia, which had a capital cost of US\$115 million.

## Mineral projects

In the six months to April 2011, three mining projects, including two iron ore projects, were completed at a capital cost of \$851 million. The largest, in terms of capital expenditure, was Fortescue Metals Group's expansion of its Chichester Hub. The US\$630 million project will increase production capacity from 40 million tonnes a year to 55 million tonnes a year. The other iron ore project completed is the Nullagine iron ore project in the Pilbara region of Western Australia. The BC Iron and Fortescue Metals Group project was completed at a capital cost of \$52 million in early 2011, and is expected to produce 3 million tonnes of hematite ore a year once full production is reached.

The other mineral mining project completed in the six months to April 2011 was Bemax Resources' Snapper project, which is the second stage of the Pooncarie mineral sands project. Located north of Mildura in New South Wales, it has an annual production capacity of 650 000 tonnes of heavy mineral concentrates, and was completed at a capital cost of \$150 million.

## Infrastructure projects

Two infrastructure projects were completed in the six months to April 2011—a gas pipeline in New South Wales and an iron ore port expansion in Western Australia.

Australian Pipeline Group completed the construction of the Young to Wagga Wagga gas pipeline, which supplies gas to towns including Griffith, Cootamundra, Young and Wagga Wagga in the central south of New South Wales.

Rio Tinto increased capacity by 5 million tonnes a year at its wholly owned Dampier Port in the Pilbara region of Western Australia at a capital cost of US\$91 million. This increases capacity at the port to 225 million tonnes a year, and will contribute to Rio Tinto's aim of increasing annual iron ore export capacity from its Australian operations to 283 million tonnes by 2013.

## Energy processing projects

The only energy processing project completed in the six months to April 2011 was BOC's Micro LNG plant. The plant, west of Launceston in Tasmania, cost \$150 million and has an annual production capacity of 20 000 tonnes of LNG.

## Advanced projects

At the end of April 2011, there were 94 projects at an advanced stage of development on the ABARES project list (table 3). Projects in this category are either 'committed' or 'under construction'. Of the 94 projects, 33 are either newly committed or entered the list at an advanced stage during the previous six months.

The total capital expenditure of the 94 advanced projects at the end of April 2011 is a record \$173.5 billion, an increase of 31 per cent from October 2010. The significant increase largely reflects the final investment decision on the Gladstone LNG project (Santos, Petronas, Total and Kogas), which has a capital cost of US\$16 billion. In addition, there were a number of projects advanced by BHP Billiton, Fortescue Metals Group and Rio Tinto, including metallurgical coal mining and infrastructure projects in Queensland, thermal coal projects in New South Wales and iron ore mining and infrastructure projects in Western Australia, with a total capital expenditure of US\$21.7 billion.

## Energy projects

As at April 2011, energy project developments accounted for 35 of the 94 advanced projects of the ABARES list and around 67 per cent (or \$116 billion) of committed capital expenditure. Capital expenditure on advanced energy projects increased by 25 per cent in the six months to April 2011, largely reflecting the addition of the Gladstone LNG project, the commitment by BHP Billiton to develop a number of coal projects and cost increases for a number of gas projects. Petroleum projects (comprising oil and gas projects) account for around 92 per cent (\$106.1 billion) of the total estimated capital cost of all advanced energy projects.

The largest petroleum project, by capital expenditure, is the Gorgon LNG project, which is a joint venture between Chevron, Shell and ExxonMobil, as well as three Japanese customers that hold minor equity stakes. The 15 million tonne LNG development received a final investment decision in 2009 and is scheduled for completion by 2015. With an estimated capital expenditure of \$43 billion, it is the largest single resource project to be undertaken in Australia. Other significant LNG projects on the list include BG Group's Queensland Curtis LNG project and the Gladstone LNG project. BG Group approved the development of its Queensland Curtis Island LNG facility in October 2010. Once completed in 2014, the facility will have an annual capacity of 8.5 million tonnes of LNG and will be the first facility in the world to use coal seam gas as a feedstock in the production of LNG. The Gladstone LNG development was approved in early 2011, with an estimated capital cost of US\$16 billion. This project will also use coal seam gas as a feedstock for LNG production, and with an annual capacity of 7.8 million tonnes is scheduled to commence production in 2015.

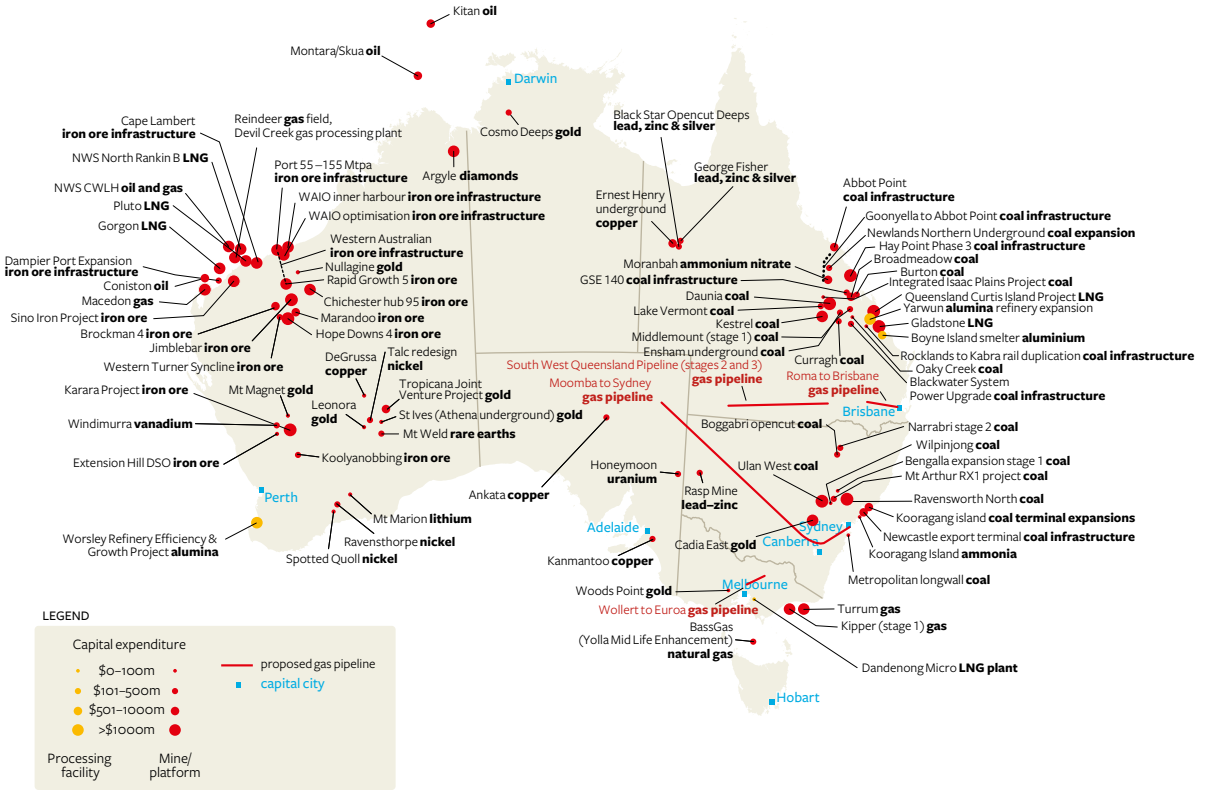
Twelve other petroleum developments account for a further \$30 billion in capital expenditure. Woodside is involved in three major petroleum projects in Western Australia: the wholly owned Pluto train 1 LNG facility and two oil and gas projects on the North West Shelf in a joint venture with BHP Billiton, BP, Chevron, Shell and Japan Australia LNG. The Pluto train 1 LNG project has an annual capacity of 4.3 million tonnes of LNG, and is scheduled for completion in late 2011 at a capital cost of \$14 billion. The North West Shelf Joint Venture is planning to develop the CWLH and North Rankin B projects, for completion in 2011 and 2013,

### 3 Advanced projects, April 2011

number and estimated capital cost by state

	energy projects		minerals projects		infrastructure projects		minerals and energy processing		total	
	no.	cost (\$m)	no.	cost (\$m)	no.	cost (\$m)	no.	cost (\$m)	no.	cost (\$m)
New South Wales	8	4 202	3	2 146	4	1 897	0	0	15	8 245
Victoria	2	4 639	1	32	1	45	1	65	5	4 781
Queensland	13	38 204	4	1 964	9	6 138	2	2 644	28	48 950
Western Australia	8	67 077	24	29 172	6	10 934	1	2 268	39	109 451
South Australia	1	146	2	279	0	0	0	0	3	425
Tasmania	1	345	0	0	0	0	0	0	1	345
Northern Territory	2	1 340	1	0	0	0	0	0	3	1340
Australia	35	115 953	35	33 593	20	19 014	4	4 977	94	173 537

## 1 Advanced minerals and energy projects



respectively. North Rankin B is the larger of these projects, with a planned annual capacity of 967 petajoules of gas at an estimated capital cost of US\$5.1 billion. Other significant gas projects include the US\$1.5 billion Macedon project (BHP Billiton and Apache Energy) in Western Australia, which is scheduled for completion in 2013, and the Kipper and Turrum gas projects located off the coast of Victoria, which are due for completion in 2012 and 2013, respectively.

Shell's Prelude LNG project is not included as an advanced project in the April 2011 list, because the final investment decision was taken after the cut off date of 30 April 2011. The project will be categorised as an advanced project for the October 2011 listing.

Coal mine projects account for 8 per cent (\$9.7 billion) of the estimated \$116 billion capital cost of all advanced energy projects. In the six months to April 2011, 10 coal projects were added to the advanced list, including four in New South Wales and six in Queensland. In March 2011, BHP Billiton and its joint venture partners announced a total commitment of US\$2.9 billion to coal mining projects, including US\$400 million for the RX1 thermal coal development in the Hunter Valley region of New South Wales, US\$1.6 billion for the development of the Daunia

metallurgical coal mine in Queensland, and US\$900 million for the extension of the mine life of the Broadmeadow metallurgical coal mine in Queensland. All three of these projects are scheduled for completion in 2013.

Other major coal projects added to the advanced list include Xstrata Coal's Ravensworth North development in New South Wales, which is expected to have an annual capacity of 8 million tonnes (thermal and semi-soft) when it is completed in 2012. In Queensland, Jellinbah Resources is expanding the Lake Vermont mine, which will increase annual capacity by 4 million tonnes by 2013, at an estimated capital cost of \$200 million.

Apart from those already listed, 14 other advanced coal mine developments are expected to raise coal production capacity by around 36 million tonnes annually; all of these developments are scheduled for completion over the next three to four years. The combined capital cost of these projects is \$4.8 billion.

The only uranium project at an advanced stage of development is the Honeymoon project in South Australia, which is being jointly developed by Uranium One and Mitsui. This project is expected to have a production capacity of 300 tonnes of uranium oxide ( $U_3O_8$ ) when completed in 2011.

## Mineral projects

At the end of April 2011, there were 35 advanced mineral mining projects, with a total estimated capital expenditure of \$33.6 billion. Over two-thirds of these projects are in Western Australia and comprise 87 per cent (\$29.2 billion) of the estimated total capital expenditure, reflecting a number of large iron ore projects at an advanced stage of development in the state. The 11 advanced iron ore projects at an advanced stage of development, all of which are located in Western Australia, account for almost three-quarters of total estimated capital expenditure of Australian mineral projects.

In the six months to April 2011, 14 mineral mining projects with a combined capital value of \$10.7 billion were added to the advanced project list. Of these 14 projects, five were iron ore projects with a value of \$9.1 billion. The largest of these projects in terms of capital expenditure is BHP Billiton's Jumblebar mine and rail project, which is expected to result in an additional 35 million tonnes of annual export capacity at an estimated capital expenditure of US\$3.4 billion. Other significant iron ore projects include the second stage of Rio Tinto's Hamersley Iron Brockman 4 iron ore project, including the Western Turner Syncline (additional 27 million tonne annual capacity for an estimated capital cost of US\$1.1 billion), and Fortescue Metals Group's Chichester Hub expansion (40 million tonnes, US\$1.5 billion). Both of these projects are scheduled for completion in 2013. Also added to the advanced list in the six months to April 2011 were four gold projects, three base metal projects, one ammonia project and one lithium project.

In addition to those already listed, major iron ore projects on the advanced list include BHP Billiton's US\$5.65 billion Rapid Growth Project 5 (additional annual production capacity of 50 million tonnes), CITIC Pacific's US\$5.2 billion Sino Iron Project (28 million tonnes), and Gindalbie's \$2.6 billion Karara project (10 million tonnes). All three of these projects are scheduled to commence production in the second half of 2011. Rio Tinto and Hancock

Prospecting's US\$1.6 billion Hope Downs 4 project is expected to have a production capacity of 15 million tonnes annually, and is scheduled for completion in 2013.

The largest advanced gold project is Newcrest's Cadia East underground development in New South Wales. By 2013, total gold production at Cadia Valley is expected to increase to between 700 000 and 800 000 ounces of gold a year and around 100 000 tonnes of copper. The Cadia East development is estimated to have a total capital cost of \$1.9 billion. In November 2010, AngloGold Ashanti and Independence Group commenced construction at the Tropicana Joint Venture gold project in Western Australia. With an estimated capital cost of \$725–775 million, this project is expected to produce between 330 000 and 350 000 ounces of gold annually, with first production scheduled for 2013. Six other advanced gold projects have a total expected capacity of between 423 000 and 438 000 ounces and a total estimated capital cost of \$230 million. All six projects are scheduled for completion in either 2011 or 2012.

At the end of April 2011, there were 10 base metal projects at an advanced stage of development, including four copper projects, three lead–zinc–silver projects and three nickel projects. In terms of capital expenditure, the largest base metal project on the advanced list is Xstrata's Ernest Henry underground copper mine expansion in Queensland. With a capital cost of \$589 million, this mine is expected to increase its annual production capacity by 50 000 tonnes of copper and 70 000 ounces of gold, and is scheduled for completion in 2013. Sandfire Resources' DeGrussa copper mine commenced construction in April 2011. This has an expected capacity of between 60 000 and 70 000 tonnes of copper and between 40 000 and 45 000 ounces of gold, and is scheduled for completion in 2013 for a capital cost of \$400 million. Other significant projects include Xstrata's George Fisher lead–zinc mine expansion in Queensland, First Quantum's redevelopment of the Ravensthorpe nickel mine in Western Australia and the Spotted Quoll underground nickel operation expansion of Western Areas in Western Australia.

Significant projects for other commodities currently under construction include Rio Tinto's Argyle underground development (diamonds) and Incitec Pivot's Moranbah ammonium nitrate project. Rio Tinto's Argyle underground development, which is scheduled for completion in 2013, has a capital expenditure of US\$1.6 billion and will allow mining at Australia's largest diamond mine to continue. In Queensland, Incitec Pivot's Moranbah ammonium nitrate project is scheduled for completion in 2012. The project has an estimated capital cost of \$935 million and is expected to produce around 330 000 tonnes of ammonium nitrate annually.

## Infrastructure projects

At the end of April 2011, there were 20 infrastructure projects at an advanced stage of development, with a combined capital cost of \$19 billion. Infrastructure projects include iron ore and coal port and rail projects and gas pipelines. Of the 20 advanced infrastructure projects, 10 are coal-related, six will support iron ore exports and four are gas pipelines.

At the end of April 2011, there were six coal terminal expansions and four rail expansions either committed or under construction. In terms of capital expenditure, the largest coal port expansion is the third phase of BHP Billiton's Hay Point coal terminal in Mackay, Queensland, which received a final investment decision in March 2011. Scheduled for completion in 2014,

this expansion will increase the port's capacity by 11 million tonnes annually to 55 million tonnes a year, for a capital cost of US\$2.5 billion. This capital expenditure also includes replacing the existing jetty to increase its ability to withstand high seas and winds. There are also several port expansions at Newcastle, including the second stage of the Newcastle Coal Infrastructure Group (NCIG) terminal, which will lift capacity by 23 million tonnes annually, and two stages of expansion at Port Waratah Coal Services' Kooragang Island Coal Terminal, which will collectively increase annual capacity by 32 million tonnes to a total of 145 million tonnes a year. Finally, two projects at Queensland's Abbot Point Coal Terminal are scheduled for completion in 2011—a 25 million tonne a year expansion and a terminal yard refurbishment. Collectively, these six projects have a total estimated capital cost of \$5.3 billion.

The four major coal rail infrastructure projects that are either committed or under construction are all being developed by QR National, with a total estimated capital cost of \$1.5 billion. The Goonyella to Abbot Point rail line will support the X50 port expansion at Abbot Point, and is scheduled for completion in 2012. The Goonyella System Expansion (GSE) project is expected to increase rail capacity by 11 million tonnes a year, to deliver coal from the Bowen Basin to Mackay for export. The Rocklands to Kabra duplication and the Blackwater system power upgrade projects will support the development of the Blackwater rail system, which supports the delivery of coal to Gladstone.

As at April 2011, there were six iron ore infrastructure projects at an advanced stage of development, three of which have received a final investment decision since October 2010. Three of the six projects are being developed by BHP Billiton—infrastructure related to the RGP5 expansion, the 20 million tonne a year expansion to Port Hedland's inner harbour, and an optimisation project. The total capital cost for the inner harbour and optimisation projects is US\$3.9 billion. Rio Tinto is undertaking a US\$3.1 billion expansion at Cape Lambert, which will increase annual capacity by 53 million tonnes to 133 million tonnes by 2013. In addition, Rio Tinto is lifting Dampier Port's capacity by 5 million tonnes to 230 million tonnes a year by early 2012. Finally, Fortescue Metals Group is expanding port capacity by 100 million tonnes a year, which will support a further 40 million tonne a year expansion at Chichester Hub and the first stage (60 million tonnes a year) of the Solomon Hub. With an estimated capital cost of US\$2.4 billion, it is scheduled for completion in 2013.

There are four gas pipelines under construction, with a total estimated capital cost of \$1.1 billion. The largest in terms of capital expenditure are stages 2 and 3 of the South West Queensland pipeline, which run 755 kilometres from Wallumbilla to Ballera. This project will lift capacity by 77 petajoules a year, and is scheduled by developer Epic Energy for completion in 2012. The Australian Pipeline Group is developing three projects: the Moomba to Sydney gas pipeline, the Wollert to Euroa pipeline in Victoria and the Roma to Brisbane pipeline in Queensland.

## Mineral processing projects

At the end of April 2011, there were four mineral processing projects at an advanced stage of development: one LNG plant, two alumina refineries and one aluminium smelter. These projects have a combined estimated capital expenditure of \$5 billion, and are all scheduled for completion by 2012.

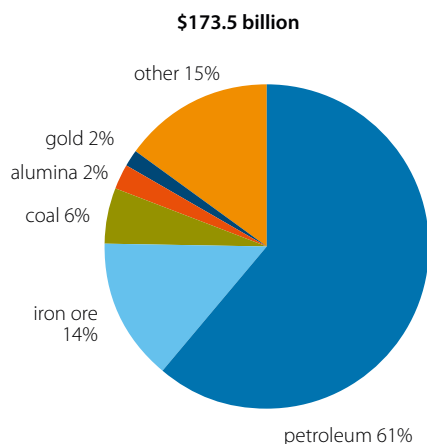
In terms of capital expenditure, the two largest mineral processing projects at an advanced stage of development are both alumina refineries. The Worsley refinery Efficiency and Growth project near Collie, Western Australia, is being developed by BHP Billiton, Japan Alumina and Sojitz Alumina, and is scheduled for completion in 2011. For an estimated capital cost of US\$2.2 billion, it is expected to increase the refinery's annual production capacity by 1.1 million tonnes. Rio Tinto Alcan is expanding capacity at the Yarwun refinery in Queensland by around 2 million tonnes upon completion in 2012, and is expected to have a capital cost of US\$1.9 billion.

Rio Tinto Alcan's Major Sustaining project at the Boyne Island Smelter is not expected to result in any additional capacity, but is designed to optimise two reduction lines and erect a fourth carbon bake furnace. At an estimated capital cost of \$685 million, it is scheduled for completion in 2012.

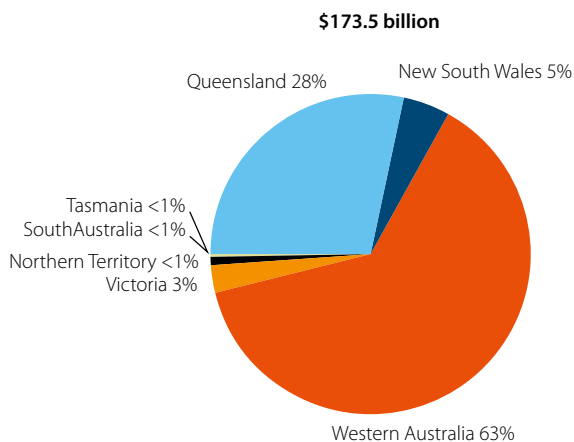
In 2012, BOC is scheduled to complete an expansion of its LNG plant in Dandenong, Victoria. Once completed for an estimated capital cost of \$65 million, it is expected to have an annual production capacity of 25 000 tonnes.

A breakdown of the proposed capital expenditure on advanced projects, by major commodity grouping, is provided in figure 4. Figure 5 shows the estimated capital expenditure on a state basis.

#### 4 Value of advanced projects by commodity, April 2011

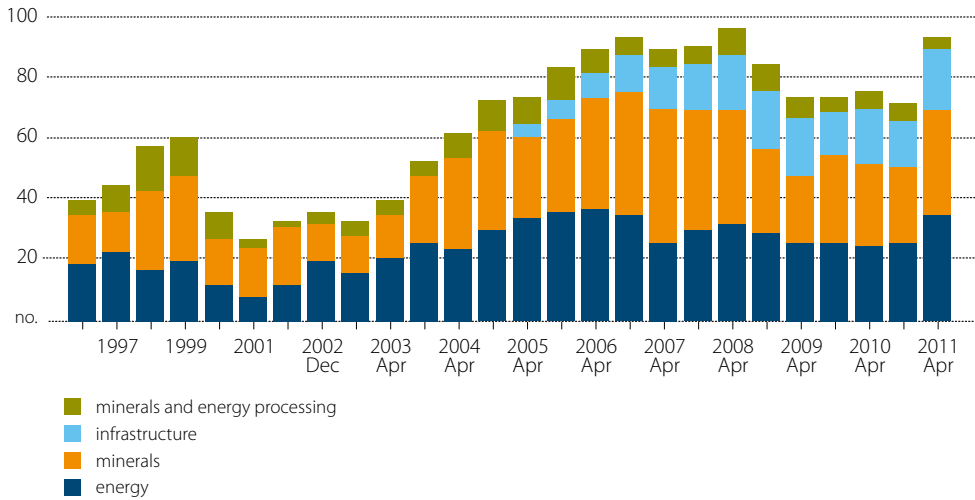


#### 5 Value of advanced projects by state and territory, April 2011



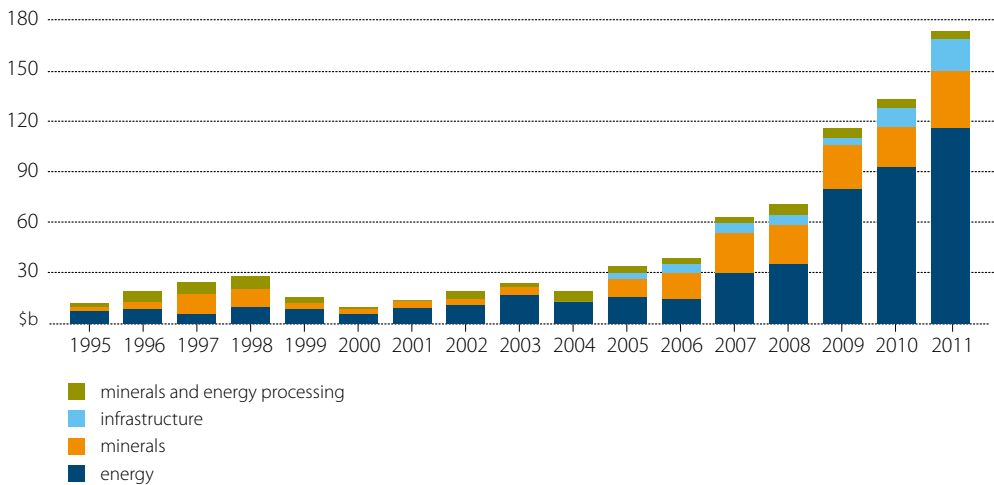


## 6 Number of advanced projects

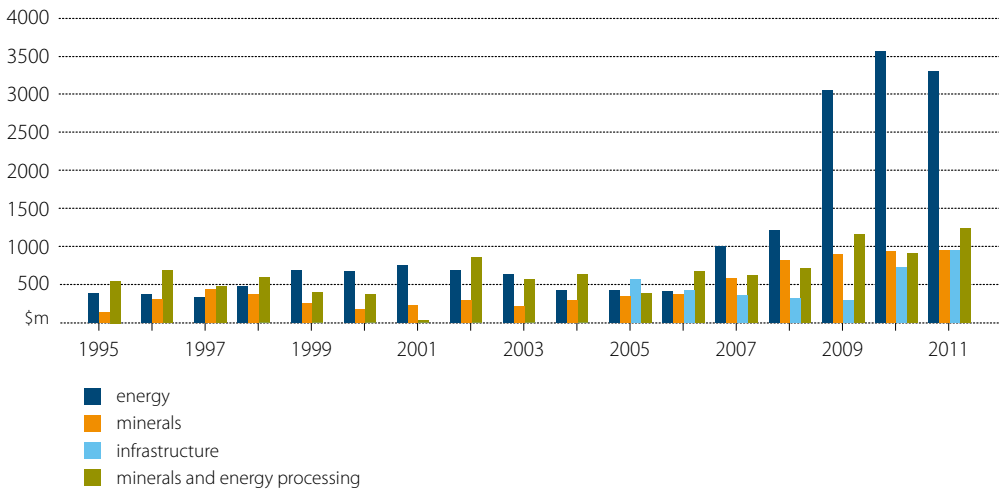


## 7 Value of advanced projects

2010–11 dollars



## 8 Average value of advanced projects 2010–11 dollars



## Less advanced projects

Projects considered to be less advanced are either undergoing feasibility (in some cases, pre-feasibility) study, or have not yet been subject to a final investment decision since the completion of a feasibility study. Some projects may face changes in economic or regulatory conditions, or may be targeting the same emerging market opportunities, necessitating rescheduling. In addition, securing finance for project development, even for high-quality projects with a high probability of success, is not guaranteed.

Despite the inherent uncertainty in projects at these earlier stages of consideration, the significant number of large-scale projects at less advanced planning stages under consideration for development is expected to provide a firm platform for future growth in Australian minerals and energy production over the medium term and beyond.

Of the 399 projects on the April 2011 ABARES list, 76 per cent (305 projects) remain uncommitted. Table 4 contains a summary of the numbers and commodity distribution of the 305 uncommitted projects, together with their potential capital expenditure. The potential capital expenditure data should be used as an approximate guide only. Capital expenditure data for many early stage projects are either not available or, if available, are likely to change significantly if these projects proceed to development. In addition, changes in market conditions can often lead to significant variations in capital expenditure estimates. However, most of the projects which will ultimately proceed to development in the medium term are included in the current ABARES list of 305 less advanced projects.

## 4 Number of less advanced projects, April 2011

commodity	NSW no.	Vic no.	Qld no.	WA no.	SA no.	Tas no.	NT no.	Aust no.	potential capital expenditure \$m
<b>Mining – energy projects</b>									
Black coal	21	0	46	1	0	0	0	68	40 646
Coal seam methane	5	0	2	0	0	0	0	7	1 635
Petroleum	1	3	4	9	0	0	8	25	104 097
Uranium	0	0	2	5	3	0	2	12	1 907
Subtotal	27	3	54	15	3	0	10	112	148 285
<b>Mining – minerals projects</b>									
Bauxite	0	0	4	1	0	0	0	5	2 506
Copper	2	0	5	1	5	0	1	14	1 994
Gold	5	0	6	19	0	0	4	34	2 580
Iron ore	0	0	0	26	4	0	1	31	33 620
Lead–zinc–silver	6	0	2	5	1	0	2	16	4 157
Mineral sands	2	2	0	3	0	0	0	7	551
Nickel	0	0	5	11	0	1	0	17	12 138
Rare earths	0	0	0	1	0	0	1	2	170
Tin	0	0	1	0	0	2	0	3	486
Vanadium	0	0	0	1	0	0	0	1	630
Other commodities	3	0	5	6	0	1	2	17	5 661
Subtotal	18	2	28	74	10	4	11	147	64 493
<b>Infrastructure</b>									
Coal	7	0	9	0	0	0	0	16	14 913
Petroleum pipelines	4	0	3	2	0	0	0	9	4 160
Iron ore	0	0	0	6	2	0	1	9	15 374
Subtotal	11	0	12	8	2	0	1	34	34 447
<b>Minerals and energy processing</b>									
Alumina	0	0	2	2	0	0	0	4	6 246
Copper	0	0	0	0	1	0	0	1	0
Crude iron and steel	0	0	1	0	0	0	0	1	1 400
Magnesium	0	1	0	0	0	0	0	1	20
Petroleum	1	0	1	0	2	0	0	4	460
Rare earths	0	0	0	0	1	0	0	1	1 000
Subtotal	1	1	4	2	4	0	0	12	9 126
Total	57	6	98	99	19	4	22	305	256 351

Among the capital-intensive projects in the April 2011 ABARES list still undergoing feasibility studies are 15 proposed LNG developments, which collectively could add up to 85 million tonnes to Australia's annual LNG production capacity in the longer term. These projects include the Browse, Ichthys, Sunrise and Wheatstone projects off the coast of Western Australia and three coal seam gas based LNG projects in Queensland and one in New South Wales.

Among the less advanced iron ore mining projects, 12 have an estimated capital expenditure of \$1 billion or more. These include Aquila Resources' and AMCI's West Pilbara mine (\$5.8 billion); the first stage of Australasian Resources' Balmoral South magnetite project (\$3 billion); Atlas Iron's Ridley Magnetite Project (\$2.7 billion); Asia Iron Holdings' Extension Hill Magnetite Project (\$2.5 billion); Fortescue Metals Group's Solomon Hub stage 1 (US\$2.3 billion); and Sinosteel Midwest's Weld Range project (\$2 billion).

## Projects new to the list

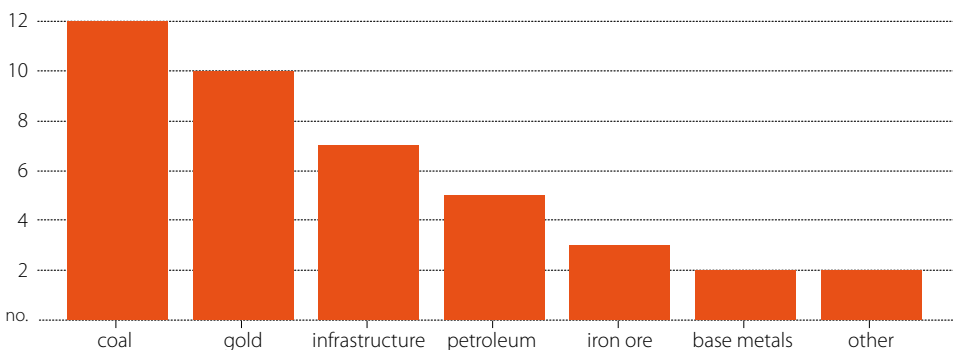
There are 41 projects (both advanced and less advanced) that are new to the ABARES list since October 2010. The relatively high number of new projects reflects an increase in prices over the past two years, with an improved outlook for minerals, and increased investment in exploration expenditure in recent years. Figure 9 provides a summary of the 41 newly listed projects in the six months ended April 2011, by commodity category. Of these 41 projects, seven are either committed or currently under construction.

Notable additions to the less advanced project list include the proposed \$1.3 billion Narrabri coal seam gas project in New South Wales, and Rio Tinto's 26 million tonne a year Nammuldi iron ore expansion in Western Australia, which has an estimated capital expenditure of US\$1.6 billion.

Two notable infrastructure projects new to the list are the 100 million tonne a year fourth terminal at Port Waratah Coal Services' port in Newcastle, New South Wales, and BHP Billiton's 100 million tonne a year Outer Harbour development at Port Hedland in Western Australia. These projects will underpin significant increases in Australia's export capacity of coal and iron ore over the medium and long term.

Also new to the list are 10 gold projects, which could add up to 770 000 ounces a year to Australia's future production capacity. Among those with the largest capacities are the Meekatharra, Bullabulling, HBJ and Central Murchison projects in Western Australia, and Cosmo Deeps in the Northern Territory.

### 9 Projects added to list six months to April 2011 (total number: 41)



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Australian Competition & Consumer Commission	Goulburn-Murray Water
Australian Fisheries Management Authority	Grains Research and Development Corporation
Australian Government Department of Innovation, Industry, Science and Research	Grape and Wine Research and Development Corporation
Australian Government Department of Climate Change and Energy Efficiency	Horticulture Australia Limited
Australian Government Department of Resources, Energy and Tourism	Industry & Investment NSW
Australian Government Department of Sustainability, Environment, Water, Population and Communities	Meat & Livestock Australia
Australian Government Department of the Treasury	Murray–Darling Basin Authority
Australian National University	New Zealand Institute of Veterinary, Animal and Biomedical Sciences
Cooperative Research Centre for National Plant Biosecurity	Plant Health Australia
CSIRO	Queensland Competition Authority
Dairy Australia	Queensland Department of Employment, Economic Development and Innovation
Ensis (joint venture between the CSIRO (Aust) and Scion (NZ))	Rural Industries Research and Development Corporation
	Sinclair Knight Mertz
	Southern Cross University
	University of Melbourne