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**Bureau of Resources  
and Energy Economics**

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# Mining Industry Major Projects

April 2012



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# Foreword

Mining industry major projects is a bi-annual publication of BREE that provides a list of major projects in the mineral resources sector and includes energy and minerals commodities projects and mineral processing projects. The data in this publication comes from a wide variety of sources and provides a snapshot, at the end of April 2012, of the state of play in terms of advanced (either 'committed' or 'under construction') and less advanced (undergoing a feasibility study, pre-feasibility, awaiting an approval process, or have not yet been subject to a final investment decision) projects.

Of the 393 projects on the April 2012 list, 98 are advanced and 295 are in the less advanced category. The total value of the proposed capital expenditure on the advanced projects list is over \$260 billion which is a 12 per cent increase from October 2011 and a 34 per cent increase in nominal dollars from April 2011. The large increase, in part, is due to the decision to proceed with the Ichthys LNG project, the Greater Western Flank gas field and the Nammuldi iron-ore operation and a cost increase at BG Group's Curtis Island LNG project.

A key finding of this report is that planned capital investment in the mining sector is at record levels and that mineral exploration expenditures in 2010–11 are double the average expenditure in real terms than over the previous 30 years.

For more information about BREE and its activities, please contact us at [www.bree.gov.au](http://www.bree.gov.au).



**Quentin Grafton**  
Executive Director/Chief Economist

# Data sources

The information contained in the BREE Mining Industry Major Projects list is obtained from project and government websites, company reports and/or media releases. Where possible, this information was verified with the project proponents.

## **BREE's list of Mining Industry Major Projects**

### **The full list**

BREE's list of major minerals and energy projects that are 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 collected directly from companies. The list is fully updated to reflect developments in the previous six months and is released in May and November each year.

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

The latest projects list contains information on 393 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, BREE's 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, the stage of planning categories range from 'pre-feasibility study underway' through to 'under construction'.

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

The list is available only as an electronic product and can be downloaded from [www.bree.gov.au](http://www.bree.gov.au).

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# Key points

- At the end of April 2012, there were 98 projects at an advanced stage of development, with a record capital expenditure of \$260.8 billion. This represents an increase of 12 per cent from October 2011 and a 34 per cent increase from April 2011. The record value of advanced minerals and energy projects reflects, in part, the decision to proceed with the development of the Ichthys LNG project, the Greater Western Flank gas field and the Nammuldi iron ore mine expansion. A \$5 billion increase in capital costs at BG Group's Curtis Island LNG project also contributed to the growth in the value of projects.
- In 2010–11, exploration expenditure in Australia's minerals and energy sector totalled \$6.4 billion, 6 per cent higher than in 2009–10. Investment in mineral exploration remains strong, with Australia recording its second highest annual mineral exploration expenditure in 2010–11.
- New capital expenditure in the mining industry totalled \$52 billion in 2010–11, 29 per cent higher than in 2009–10. Based on industry intentions from the December quarter 2011, Australian Bureau of Statistics (ABS) survey data<sup>1</sup> indicate capital expenditure in the mining sector in 2011–12 may be greater than \$80 billion.
- In the six months to April 2012, 25 projects with a combined capital cost of \$23.6 billion were completed in Australia. The total capital cost of completed projects in the six months to April 2012 was double the previous record achieved in April 2008.

## Exploration expenditure

Mineral exploration investment affects the ability of Australia's minerals and energy industry to increase and expand its contribution to national economic growth over the medium and longer term. The expenditures are important for understanding the potential location, size 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 influence the decision to invest in mineral exploration, some of these are common to investment decisions across the economy, while others are more 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.

Since 2004, brownfield exploration expenditure, (exploration associated with existing or known deposits) has accounted for around 62 per cent of total mineral exploration expenditure. Increasing world prices have provided an incentive for companies to re-evaluate reserves previously considered uneconomic. Brownfield projects (expansions to existing operations) are attractive for companies because existing infrastructure can enable extraction to commence within a shorter period of time and, typically, capital costs are lower.

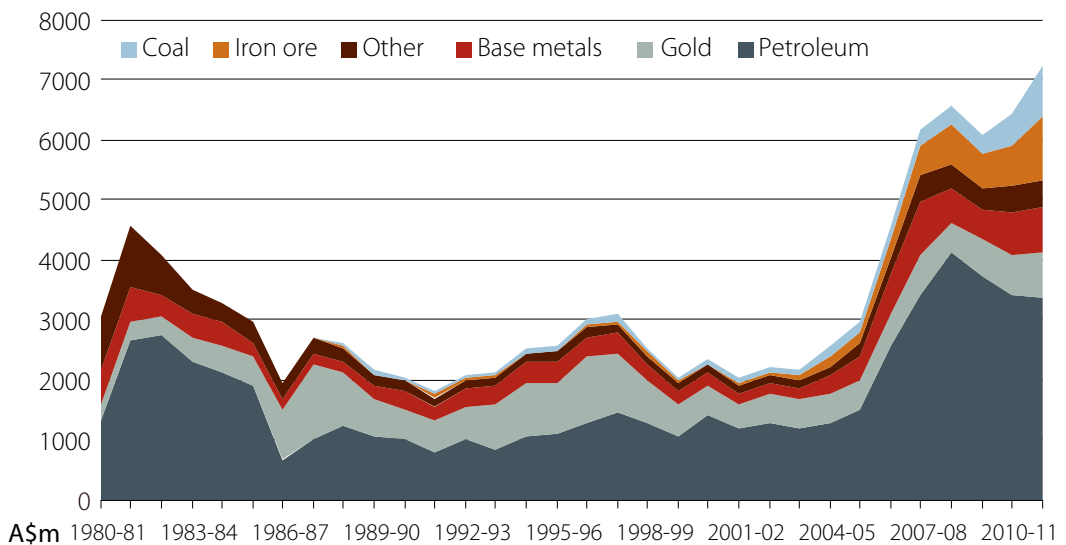
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<sup>1</sup> ABS Cat. No. 5625.0 - Private New Capital Expenditure and Expected Expenditure, Australia, December 2011

While the proportion of exploration expenditure spent on brownfield mineral deposits is high, the share of petroleum exploration expenditure undertaken on production leases has been comparatively lower in recent years, averaging around 25 per cent of total petroleum exploration expenditure. A lower proportion of exploration undertaken on production leases reflects, in part, the number of undeveloped petroleum projects currently undertaking feasibility studies.

In 2010–11, mineral exploration expenditure in Australia totalled \$6.4 billion, an increase of 6 per cent relative to 2009–10. In real terms, exploration expenditure in 2010–11 was the second highest on record (\$6.6 billion recorded in 2008–09) and 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.

Figure 1: Australian private minerals exploration expenditure 2011–12 dollars



The cost of exploration and access to credit are likely to continue to be important factors driving exploration activity in the sector over the coming years. Although uncertainty surrounds the outlook for future commodity prices, exploration expenditure is likely to remain high provided resource prices remain high.

In 2010–11, exploration expenditure on energy declined mainly as a result of lower expenditure on petroleum exploration. However, this was partly offset by increased expenditure on uranium and coal exploration. In 2010–11, petroleum exploration expenditure decreased by around 8 per cent, relative to 2009–10, to \$3.4 billion. Nevertheless, the total in 2010–11 was still the third highest level of exploration expenditure recorded in Australia’s petroleum industry (\$4.2 billion recorded in 2008–09). In 2010–11, coal exploration expenditure increased year-on-year by 57 per cent to around \$537 million. This is attributable to the large number of coal projects currently undergoing feasibility studies. Spending on uranium exploration in 2010–11 increased by 26 per cent, relative to 2009–10, to \$214 million,



primarily as a result of increased exploration in Western Australia following the removal of a ban on uranium mining in 2008.

All major mineral commodities experienced increasing exploration expenditure in 2010–11. In 2010–11, expenditure on gold exploration increased by 10 per cent, relative to 2009–10, to around \$674 million. Iron ore exploration expenditure increased by around 23 per cent to \$687 million in 2010–11 following a 13 per cent decline in iron ore exploration expenditure in 2009–10.

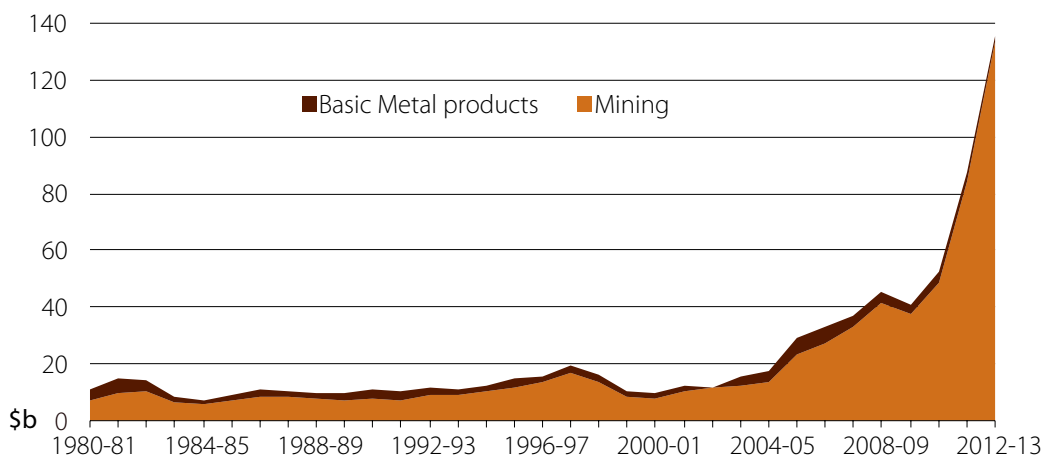
Exploration expenditure on base metals increased by 42 per cent to around \$692 million in 2010–11, due to higher expenditure on copper, silver, lead, zinc and nickel exploration. In particular, in 2010–11, expenditure on copper exploration increased by 60 per cent, relative to 2009–10, to around \$323 million.

In the six months to December 2011, total exploration expenditure was \$3.7 billion an increase of 16 per cent from the first six months of 2011 and a 19 per cent increase from the corresponding period in 2010. This substantial increase is due to higher exploration across the mineral sector including for base metals, iron ore, coal and gold. Based on ABS expectations of exploration expenditure in the first half of 2012, total exploration expenditure in 2011–12 for minerals and petroleum could reach \$7.2 billion. If this level was to be reached, it would be a record for exploration expenditure in a financial year.

## 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).

Figure 2: New capital expenditure 2011–12 dollars



Capital expenditure in mining refer to spending on equipment, plant and assets directly related to mining or the 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. Given that Australia has a comparative advantage in mining, relative to basic metal processing, a larger proportion of capital expenditure is directed to mining rather than basic metal processing.

Based on ABS survey data, new capital expenditure in the mining industry totalled \$49 billion in 2010–11, 30 per cent higher than in 2009–10. In real terms (2010–11 dollars), new capital expenditure in the mining industry in 2010–11 were the highest on record and around three times the average annual expenditure over the past 30 years (\$17.1 billion).

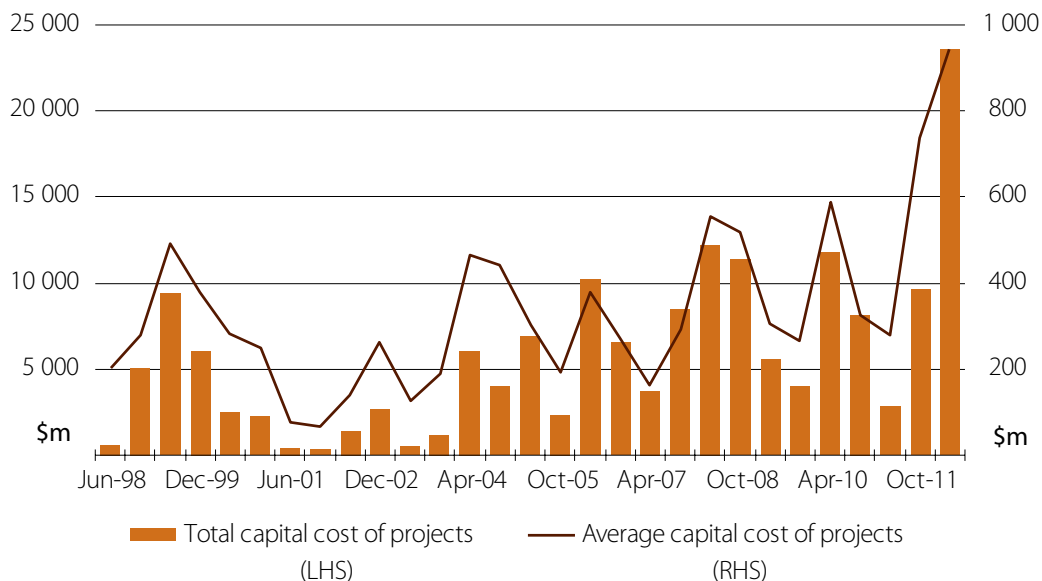
There are indications that capital expenditure in the mining sector may increase further in 2011–12. Based on industry intentions canvassed in the December quarter 2011, ABS data indicate capital expenditure in the mining sector in 2011–12 may be around \$84 billion (2010–11 dollars). If this expenditure is realised, this would represent a 72 per cent increase on 2010–11 expenditures. The scale and pace of expenditure estimated by the ABS is consistent with recent trends shown in the full list of major mineral and energy projects published by BREE ([www.bree.gov.au](http://www.bree.gov.au)).

Capital expenditure in the metals products sector, which includes mineral processing activities covered in BREE's projects list, totalled \$3.5 billion in 2010–11. The increase in capital expenditure in the sector is approximately 8 per cent higher (in real terms) than in 2009–10. ABS estimates indicate that mineral processing capital expenditure could increase marginally to \$3.5 billion in 2011–12 before decreasing to \$2.4 billion in 2012–13. The decrease in capital expenditure in 2012–13 could be a result of the completion of a number capital intensive mineral processing projects in 2011–12 such as the Worsley refinery Efficiency and Growth project and the Yarwun alumina refinery expansion.

## Completed projects

In the six months that ended April 2012, 25 major mineral and energy projects were completed, with a combined capital cost of \$23.6 billion, (Table 1). Of the 25 projects completed, six were energy projects, fourteen were mineral mining projects, three were infrastructure projects and two were mineral processing projects. In terms of average capital cost (in 2011–12 dollars), the cost of the completed projects was the highest on record (Figure 3).

Figure 3: Completed projects, June 1998 to April 2012: (total costs and average capital costs 2011–12 dollars)



## Energy projects

In the six months to April 2012, six energy projects were completed at a record capital value of \$16.8 billion. Of the six energy projects, four were coal mining projects and two were petroleum projects. The record value of completed energy projects reflects the completion of the Pluto project which at a cost of almost \$15 billion is Australia's largest minerals and energy project in nominal capital cost terms. The Pluto project is Australia's third LNG project and has an annual capacity of 4.3 million tonnes. The project was sanctioned in 2007 and had an original capital cost of \$12 billion and a completion date of late 2010. The Pluto project is notable because of the very short period of time between the gas discovery (2005) to project completion (2012). The other petroleum project completed in the six months to April 2012 was the Reindeer gas field and Devil Creek gas processing field. The project, which is owned by Apache Energy and Santos, had a capital cost of \$1.05 billion and the Devil Creek plant has a gas processing capacity of 78 petajoules a year. The start up of this project will increase gas supply for the Western Australian gas market.

There were four coal mining projects completed in the six months to April 2012 which will add 8.3 million tonnes of production capacity. Three of the projects are located in Queensland; Newlands Northern Underground, Oaky Creek expansion and Middlemount, while the Wilpinjong mine is located in New South Wales. The expansions to the majority owned Xstrata Newlands and Oaky Creek will add 3 million tonnes and 1 million tonnes of annual capacity at a cost of US\$150 million and US\$90 million, respectively. The first stage of the Middlemount project has a capacity of 1.8 million tonnes of raw coal. The US\$500 million capital cost includes a second stage of the project that is yet to be given a final investment decision. The Wilpinjong mine has a capacity of around 2-3 million tonnes and was completed with a capital cost of around US\$95 million.

Table 1: Major mineral resource developments – projects completed, November 2011 to April 2012

Commodity	Project	Location	Company	Capital expenditure
<b>Mining – energy projects</b>				
Black coal	Wilpinjong	NSW	Peabody Energy	US\$95m (A\$93m)
Black coal	Middlemount (stage 1)	QLD	Macarthur Coal / Noble	\$500m (includes stage 1 and 2)
Black coal	Newlands Northern Underground	QLD	Xstrata	US\$150m (A\$147m)
Black coal	Oaky Creek	QLD	Xstrata	US\$90m (A\$88m)
Petroleum – oil and natural gas projects	Pluto (train 1)	WA	Woodside Energy	\$14.9b (inc site works for train 2)
Petroleum – oil and natural gas projects	Reindeer gas field/ Devil Creek gas processing plant (phase 1)	WA	Apache Energy / Santos	\$1.05b
<b>Mining – mineral projects</b>				
Copper	Ankata (Prominent Hill underground)	SA	OZ Minerals	\$148m
Copper	Kanmantoo	SA	Hillgrove Resources	\$144m
Copper	Osborne	SA	Ivanhoe Australia	\$137m
Gold	Mt Magnet	WA	Ramelius Resources	\$28m
Gold	Woods Point	Vic	Morning Star Gold	\$32m
Iron ore	Extension Hill Direct Shipping Ore (DSO) project	WA	Mt Gibson Iron	\$90m
Iron ore	Yilgarn iron ore project (stage 1) (Carina)	WA	Mineral Resources	\$120-130m
Lead–zinc–silver	Black Star Open Cut Deeps	QLD	Xstrata	\$133m
Lead–zinc–silver	Handlebar Hill	QLD	Xstrata	\$40m

Table 1: Major mineral resource developments – projects completed, November 2011 to April 2012 *(continued)*

Commodity	Project	Location	Company	Capital expenditure
Lead–zinc–silver	Rasp mine project	NSW	Toho	\$136m
Nickel	Ravensthorpe	WA	First Quantum Minerals	US\$200m (A\$196m)
Nickel	Spotted Quoll (underground)	WA	Western Areas	\$98m
Nickel	Talc Redesign Project (Mount Keith)	WA	BHP Billiton	US\$152m (A\$149m)
Other commodities	Kooragang Island ammonia project	NSW	Orica	\$110m
<b>Infrastructure projects</b>				
Black coal	Kooragang Island coal terminal expansion	NSW	Port Waratah Coal Services	\$670m
Petroleum – gas pipeline projects	South West Queensland pipeline (stage 2 and 3)	QLD	Epic Energy	\$830m
Iron ore – infrastructure projects	Dampier Port Expansion	WA	Rio Tinto	US\$284m (A\$278m)
<b>Mineral processing projects</b>				
Petroleum	Dandenong LNG plant	Vic	BOC	\$65m
Alumina	Worsley refinery Efficiency and Growth project	WA	BHP Billiton / Japan Alumina / Sojitz Alumina	US\$3.5b (A\$3.4b)

Table 2: Completed projects, October 2003 to April 2012 (2010–11 dollars)

Six months ending	Number of projects	Total capital cost of projects (\$millions)	Average capital cost of projects (\$million)
Oct-03	6	1145	191
Apr-04	13	6056	466
Oct-04	9	3970	441
Apr-05	23	6932	301
Oct-05	12	2325	194
Apr-06	27	10233	379
Oct-06	24	6541	273
Apr-07	23	3722	162
Oct-07	29	8466	292
Apr-08	22	12234	556
Oct-08	22	11380	517
Apr-09	18	5525	307
Oct-09	15	3993	266
Apr-10	20	11765	588
Oct-10	25	8175	327
Apr-11	10	2794	279
Oct-11	13	9598	738
Apr-12	25	23578	943
Total	335	138432	412

## Mineral projects

In the six months to April 2012, 14 mining projects were completed at a capital cost of \$1.5 billion including three copper projects, three lead-zinc-silver projects, three nickel projects, two iron ore projects, two gold projects and an ammonia project. The three copper projects, Ankata (Prominent Hill underground), Kanmantoo and Osborne, have a combined capital cost of \$429 million. The three projects will add around 66 000 tonnes to Australia's copper mine production, however, all three projects are based on polymetallic deposits where gold and other by products will also be produced. Of the three lead-zinc-silver projects, two are operated by Xstrata and located around its Mount Isa operations. The Black Star Open Cut Deeps will allow mining operations to continue, while the Handlebar Hill expansion will allow increased annual production of 88 000 tonnes of zinc and 21 000 tonnes of lead. The Black Star and Handlebar Hill projects have a capital cost of \$133 million and \$40 million, respectively.

The three nickel projects are all located in Western Australia and were completed at a combined capital cost of around \$440 million. The largest of the projects, in terms of capital cost was the redevelopment of the Ravensthorpe project. Ravensthorpe was originally built by BHP Billiton, however, the project faced many delays and cost overruns during construction and did not function as designed when in operation. BHP Billiton shut down the mine and plant and sold it to First Quantum in late 2009. First Quantum then spent US\$200 million redeveloping it. The Spotted Quoll underground mine was completed by Western Areas at a cost of \$98 million and will add around 10 000 tonnes of annual capacity. The third nickel project was a US\$152 million refurbishment of BHP Billiton's Mount Keith operations.

There were two iron ore projects completed in the six months to April 2012; Extension Hill DSO and Yilgarn (stage 1), both located in the Mid West region of Western Australia. The Extension Hill project, which is owned by Mt Gibson Iron, has an annual production capacity of 3 million tonnes and a capital cost of \$90 million. The Yilgarn project has an annual production capacity of 4 million tonnes and a construction cost of around \$120 million.

Between November 2011 and April 2012 there were two gold projects completed. The largest project, in terms of production capacity, is Ramelius Resources redevelopment of Mt Magnet, which will have an annual production capacity of 80 000 ounces. The relatively low project capital cost of \$28 million, is due to much of the processing infrastructure already being in place. In Victoria, Morning Star Gold completed its Woods Point project at capital cost of \$32 million. The mine has a production capacity of 25 000 ounces.

## Infrastructure projects

Three infrastructure projects were completed in the six months to April 2012, including an expansion to the Kooragang Island Coal Terminal at Newcastle, and expansion to the SWQP (South West Queensland Pipeline) in Queensland and an upgrade to Rio Tinto's port at Dampier. The largest project, in terms of capital expenditure, was the expansion to the SWQP at a cost of \$830 million. The project increases the gas transport capacity between Moomba in north-eastern South Australia and Wallumbilla in southern Queensland. The Kooragang Island Coal Terminal at Newcastle was completed at a capital cost of \$670 million and will add around 20 million tonnes of annual capacity to give the terminal a total capacity of 133 million tonnes. A further 12 million tonnes expansion is ongoing and when complete at the end of 2012 will give the terminal a total capacity of 145 million tonnes, the limit of its government approval. In Western Australia, Rio Tinto completed a 5 million tonnes expansion to its Dampier port to give it a capacity of 150 million tonnes. The project had a capital cost of US\$284 million.

## Mineral processing projects

In the six months to April 2012 there were two mineral processing projects completed – an expansion to the Worsley (alumina) refinery Efficiency and Growth project in Western Australia and BOC's LNG small scale plant in Dandenong Victoria. The Worsley refinery project had a capital cost of US\$3.5 billion which included the Marradong mine and the construction of co generation electricity generator. By completing the project, around 1.1 million tonnes of additional capacity will be added. BOC completed a \$65 million LNG processing plant which has an annual capacity of around 25 000 tonnes. The LNG will be used as a fuel for trucks.

## Advanced projects

At the end of April 2012, there were 98 projects at an advanced stage of development on BREE's project list (Figure 4). Projects in this category are either 'committed' or 'under construction'. That is, projects have received all government approvals and internal company approvals and the proponents have publically announced their intention to proceed with the project. Of the 98 projects, 21 are either newly committed or entered the list at an advanced stage during the previous six months.

At the end of April 2012, there were 98 projects at an advanced stage of development, with a record capital expenditure of \$260.8 billion (Figure 5). This represents an increase of 12 per cent from October 2011 and 34 per cent from April 2011. The record value of advanced minerals and energy projects reflects, in part, the decision to proceed with the development of the Ichthys LNG project, the Greater Western Flank and the Nammuldi iron ore mine expansion. A \$5 billion increase in capital costs at BG Group's Curtis Island project also contributed to the growth in the value of projects.

Table 3: Advanced projects, April 2012

State	Energy projects		Minerals projects		Infrastructure projects		Minerals and energy processing		Total	
	number	cost (\$m)	number	cost (\$m)	number	cost (\$m)	number	cost (\$m)	number	cost (\$m)
New South Wales	10	4419	2	1958	6	2670	0	0	18	9047
Victoria	2	4412	0	0	0	0	0	0	2	4412
Queensland	14	62310	6	2475	7	7540	2	2940	29	75265
Western Australia	10	91818	25	29139	6	14375	0	0	41	135 482
South Australia	0	0	2	1361	0	0	0	0	2	1361
Tasmania	1	460	0	0	0	0	0	0	1	460
Northern Territory	2	34020	3	724	0	0	0	0	5	34744
<i>Australia</i>	<i>39</i>	<i>197439</i>	<i>38</i>	<i>35657</i>	<i>19</i>	<i>24736</i>	<i>2</i>	<i>2940</i>	<i>98</i>	<i>260 770</i>



Figure 4: Number of advanced projects

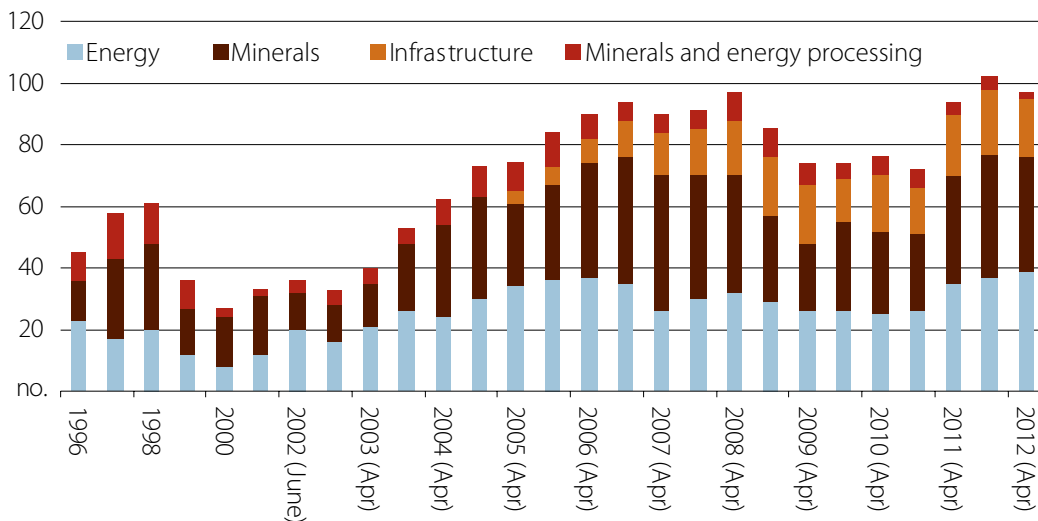
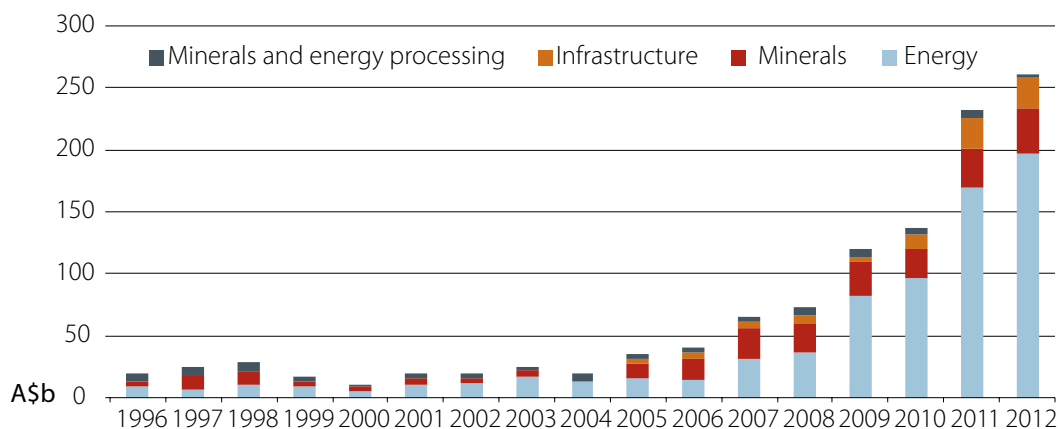


Figure 5: Value of advanced projects (in 2011–12 dollars)



## Energy projects

As at April 2012, energy project developments accounted for 39 of the 98 advanced projects of BREE's list and around 76 per cent (or \$197 billion) of advanced capital expenditure. Capital expenditure on advanced energy projects increased by 16 per cent in the six months to April 2012. The increase capital expenditure on energy projects is largely attributed to the sanctioning of three petroleum projects (including the Ichthys LNG project) at a value of over \$36 billion and the decision to proceed with five coal mining projects with a capital cost of over \$3.5 billion.

In total, there are seven LNG projects under construction at a value of over \$164 billion. These projects, when in full operation, will increase Australia's LNG export capacity from around 24 million tonnes a year to over 80 million tonnes a year. Of these projects, the Ichthys project

was given a final investment decision in January 2012. All other projects appeared on BREE's list that was published in November 2011.

The Ichthys LNG project is owned by INPEX (72.8 per cent), Total (24 per cent) with the remainder of the project owned by Japanese LNG offtake customers. The US\$34 billion project will see gas and condensate produced from the Ichthys field which is located in the Browse Basin. Gas will be piped to the onshore processing plant at Darwin via a 900 kilometres underwater pipeline. The pipeline will be the world's longest undersea pipeline when built. The project will have an annual capacity of 8.4 million tonnes of LNG, 1.6 million tonnes of LPG and a peak production capacity of 100 000 barrels a day of condensate. The gas has been sold under long term contracts to a range of Japanese customers, Taiwan's CPC Corporation and Total Power and Gas. The project is scheduled to start up by the end of 2016.

In addition to Ichthys, a further three LNG projects have been sanctioned in the 12 months to April 2012. In September 2011, the Wheatstone LNG project, which is majority owned and operated by Chevron was given a final investment decision. The project has a capital cost of over \$29 billion and will consist of two trains capable of producing 8.9 million tonnes of LNG. The project, which is located at Ashburton North in Western Australia, is scheduled to be in operation by 2016. In July 2011, the Australia Pacific LNG project was sanctioned by its proponents; Origin Energy, ConocoPhillips and Sinopec. At that time, only one 4.5 million tonnes train was sanctioned at a cost of US\$14 billion, however, the proponents expect to sanction a second train in 2012 at an additional cost of US\$6 billion. The APLNG project is the third LNG plant to be based on Curtis Island and will use coal seam gas as a feedstock. Also sanctioned in the twelve months to April 2012 was Shell's Prelude project which will be the world's first floating LNG development. Gas from the Prelude field will be processed on a floating LNG plant located above the gas field, several hundred kilometres from the Australian coast. The Prelude floating LNG project will have a capacity of 3.6 million tonnes a year and is scheduled for completion in 2016.

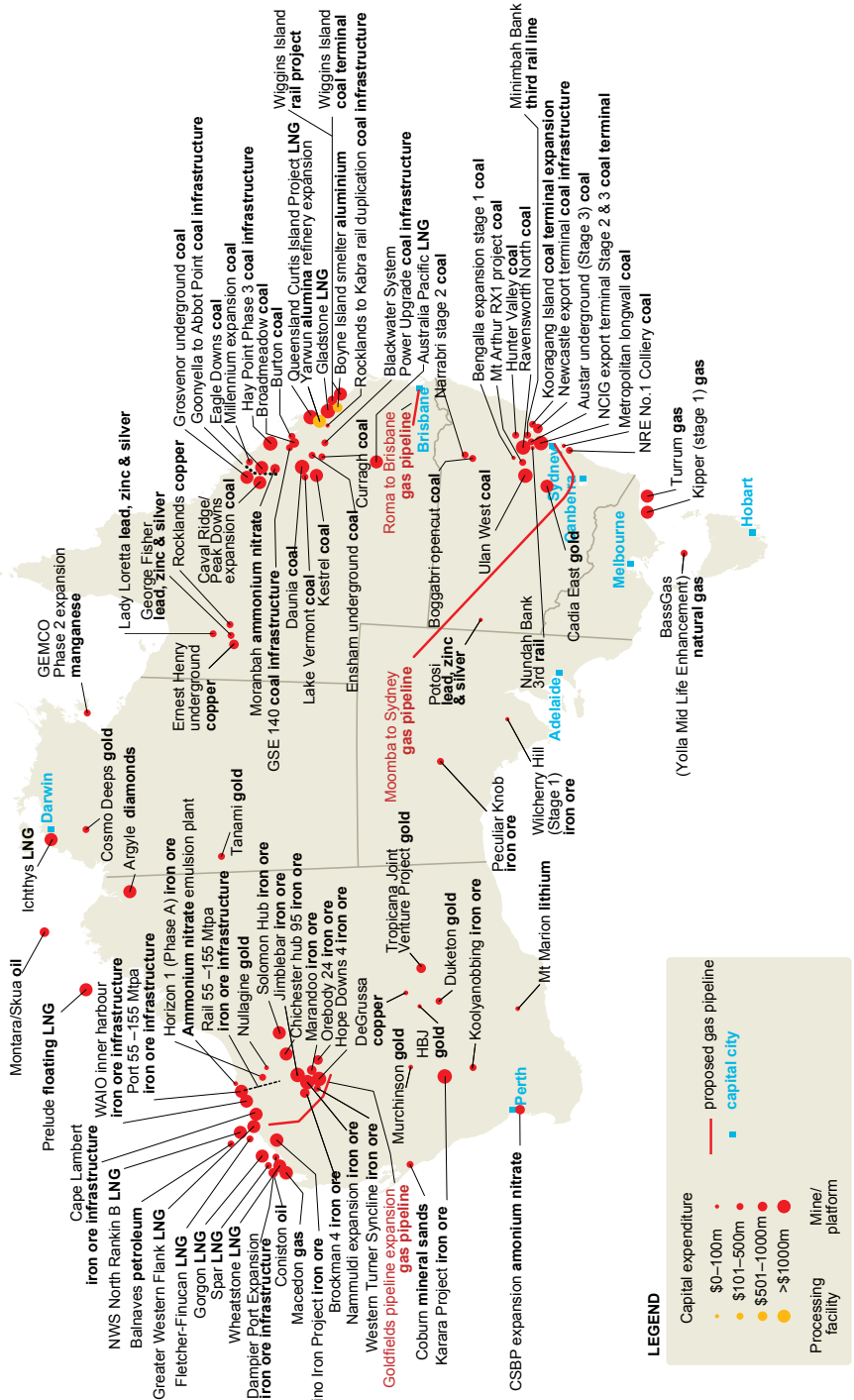
The largest LNG project under construction, by capital expenditure, is the Gorgon LNG project, which is a joint venture between Chevron, Shell and ExxonMobil, as well as three Japanese customers that hold minor equity stakes. This 15 million tonnes LNG development received a final investment decision 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 BREE list include BG Group's Queensland Curtis LNG project and the Gladstone LNG project (Santos, Petronas, Total, KOGAS). 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 project has a capital cost of US\$20 billion that has been revised upwards from US\$15 billion when sanctioned in 2010. The increase in capital cost reflects local market effects (higher costs for local goods and services), unanticipated costs to comply with regulatory processes, scope change and an appreciation of the Australian dollar. 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.

Map 1: Advanced minerals and energy projects

# 1 Advanced minerals and energy projects

April 2012



Eleven other petroleum developments account for a further \$15.9 billion in capital expenditure. There were two petroleum projects sanctioned in the six months to April 2012, the Greater Western Flank and the Fletcher-Finucan oil field. Natural gas produced from the Greater Western Flank will be used as a feedstock at the North West Shelf LNG plant and will offset declining production from existing fields. The US\$2.4 billion project is scheduled to start up in 2016. When operational in 2013, the Fletcher-Finucan oil field will have a production capacity of around 15 000 barrels a day. The field development will be tied back to the floating, production, storage and offtake facility that is located over the nearby Mutineer-Exeter field.

In terms of capital expenditure, the North Rankin B is the largest of the eleven (non LNG) petroleum projects, with a planned annual capacity of 967 petajoules of oil and 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.

At the end of April 2012, there were 21 coal mine projects valued at around \$17.3 billion. Eleven of the projects are located in Queensland, while the other ten are in New South Wales. Five coal projects were added to the list of advanced projects in the six months to April 2012 – three in Queensland and two in New South Wales. The five projects have a combined capital cost of over \$3.5 billion and will add around 15 million tonnes to Australia's coal production capacity. Of these five projects, the two largest projects, in terms of capital expenditure were the Grosvenor underground and Eagle Downs project. The two mines have a combined capital cost of almost \$3 billion and will have a production capacity of 9.5 million tonnes of coking coal.

The largest coal mine project, by capital expenditure, is the Caval Ridge / Peak Downs project which is being developed by BHP Billiton Mitsubishi Alliance (BMA) and is located in the Bowen Basin. The project consists of constructing the Caval Ridge mine (capacity of 5.5 million tonnes of coking coal) and expanding the neighbouring Peak Downs mine (additional capacity of 2.5 million tonnes of coking coal). The US\$4.4 billion project is scheduled for completion in 2014.

Apart from those already mentioned, 15 other advanced coal mine developments are expected to raise coal production capacity by around 52 million tonnes a year, all of which are scheduled for completion over the next three to four years. The combined capital cost of these projects is \$9.4 billion.

## Mineral projects

At the end of April 2012, there were 38 advanced mineral mining projects, with a total estimated capital expenditure of \$35.7 billion. Of this total, 68 per cent of these projects are located in Western Australia and comprise 82 per cent (\$29.1 billion) of the estimated total capital expenditure, reflecting a number of large iron ore projects at an advanced stage of development in the state. Of the 15 iron ore projects at an advanced stage of development, 13 are located in Western Australia, and account for around 72 per cent of total estimated capital expenditure of Australian mineral projects.

In the six months to April 2012, 12 mineral mining projects were added to the advanced project list with a combined capital value of \$5.1 billion. Of these 12 projects four were iron ore projects, four gold projects, two ammonium nitrate projects, a mineral sands project and a copper project. The largest mineral project added to the list of advanced projects in the six months to April 2012 was Rio Tinto's Nammuldi mine expansion. The mine will have an iron ore production capacity of 26 million tonnes a year at a capital cost of US\$2.2 billion.

In addition to Nammuldi, there are 14 major iron ore projects on the advanced list. In terms of capital expenditure, the largest include: CITIC Pacific's US\$6.1 billion Sino Iron Project (28 million tonnes); BHP Billiton's US\$3.4 billion Jimblebar mine (35 million tonnes); Gindalbie's \$2.6 billion Karara Magnetite project (10 million tonnes); and Rio Tinto's US\$2.1 billion Hope Downs 4 project (15 million tonnes).

The largest advanced gold project is Newcrest's Cadia East development in New South Wales, which is scheduled for completion in 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, at a total capital cost of \$1.9 billion. AngloGold Ashanti and Independence Group have started construction at the Tropicana Joint Venture gold project in Western Australia. With an estimated capital cost of \$690-740 million, this project is expected to produce between 470 000 and 490 000 ounces of gold annually, with first production scheduled for 2013. Eight other advanced gold projects have a total estimated capital cost of \$896 million and could add around 750 000 ounces a year of gold to Australia's production capacity. All six projects are scheduled for completion by 2015.

As at April 2012, there were six base metal projects at an advanced stage of development, including three lead-zinc-silver projects and three copper projects. In the six months to April 2012 there was one copper project added to the advanced list – the Rocklands Copper Project. The project, which is owned by CuDeco, has a capital cost of \$250 million and will process around 3 million tonnes of ore each year. The project is scheduled to start up later this year. The other five base metal projects, are Xstrata's George Fisher and Lady Lorretta lead-zinc mine project and Ernest Henry underground copper mine in Queensland, Sandfire's DeGrussa copper mine in Western Australia and stages 2 and 3 of Perilya's Potosi lead and zinc mine in New South Wales.

In the six months to April 2012, construction commenced on two ammonium nitrate projects in Western Australia. The largest, in terms of capital expenditure was Wesfarmers 260 000 tonne expansion of its CSBP plant near Kwinana at cost of \$550 million. Incitec Pivot approved a 100 000 tonne upgrade to its ammonium nitrate emulsion plant in Port Hedland at a cost of \$40 million.

Other 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, once completed, will enable mining at Australia's largest diamond mine to continue operating. 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 2012, there were 19 infrastructure projects at an advanced stage of development, with a total capital cost of \$24.7 billion. Infrastructure projects include iron ore and coal port and rail projects and gas pipelines. Of the 19 advanced infrastructure projects 11 are coal-related, there are five related to iron ore and three gas pipelines.

Of the coal related infrastructure projects, six are rail expansions and five port expansions under construction. In the six months to April 2012, no coal related infrastructure projects were added to the advanced list.

In Queensland, there are six coal infrastructure projects under construction at a value of \$7.5 billion. The largest project, in terms of capital expenditure, 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. Associated with the increase in port capacity is an upgrade to the Goonyella rail system at a cost of \$185 million. At the port of Gladstone, the Wiggins Island Coal Terminal is under construction. The new coal terminal will have a capacity of 27 million tonnes a year and is expected to cost around \$2.4 billion to construct. Associated with the Wiggins Island Coal Terminal is a \$900 million rail project that will support increased coal supply from the southern part of the Bowen Basin. There are two other projects under construction, the Goonyella-Abbot Point Expansion (GAPE) and an upgrade to the Blackwater power system. Commissioning has commenced on the GAPE project, which connects the Goonyella train network to Abbot Point. The project is expected to be fully operational by the middle of this year.

In New South Wales, there are five coal infrastructure projects under construction; three port and two rail projects. At the port of Newcastle, the Kooragang Island terminal is under going an expansion to bring annual capacity to 145 million tonnes, from 133 million tonnes, at a cost of \$227 million. There are two expansion projects taking place at the Newcastle Coal Infrastructure Group (NCIG) terminal. The second stage expansion will increase capacity from 30 million tonnes a year to 53 million tonnes a year at a cost of \$900 million. The third stage of the NCIG terminal will cost around \$1 billion and add 13 million tonnes of coal export capacity. When complete, the NCIG terminal will have a total capacity of 66 million tonnes, which is the maximum capacity under its New South Wales government planning approval. The two rail projects under construction are the Minimbah Bank and Nundah Bank projects which will contribute to lifting the Hunter Valley's coal haulage capacity to 145 million tonnes.

As at April 2012, there were five iron ore infrastructure projects at an advanced stage of development, at a cost of around \$14.4 billion. Two of these projects are being developed by BHP Billiton, including an expansion to Port Hedland's inner harbour port capacity, and an optimisation project. The total capital cost for the inner harbour and optimisation projects is US\$3.8 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 February 2012, Rio Tinto announced that it had approved US\$1.2 billion of pre-final investment decision funding to support early works for a further 70 million tonnes expansion at Cape Lambert.

Finally, Fortescue Metals Group is also expanding port and rail capacity by 100 million tonnes a year, which will support a further 40 million tonnes a year expansion at the Chichester Hub and the first stage (60 million tonnes a year) of the Solomon Hub. The rail project is estimated to cost \$US2.2 billion. The port expansion is estimated to cost US\$2.4 billion, with both projects scheduled for completion in 2013.

There are three gas pipelines under construction, with a total estimated capital cost of \$300 million. The Australian Pipeline Group is developing all three – an expansion to the Goldfields pipeline in Western Australia, the Moomba (South Australia) to Sydney gas pipeline, and the Roma to Brisbane pipeline in Queensland. The Goldfield pipeline capacity will be expanded by 28 per cent to 73 PJ a year at a capital cost of \$150 million. Rio Tinto has contracted to transport through the pipeline an additional 7.3 PJ a year for 20 years, while BHP Billiton has contracted for 8.7 PJ a year for 15 years. Both BHP Billiton and Rio Tinto will use the increased gas supplies to support expansions at their iron ore operations in the Pilbara.

## Mineral processing projects

At the end of April 2012, there were two mineral processing projects at an advanced stage of development, an alumina refinery and an aluminium smelter. These projects have a combined estimated capital expenditure of \$2.9 billion, and are all scheduled for completion by the end of 2012.

Rio Tinto Alcan is expanding capacity at the Yarwun refinery in Queensland through the second stage of the CAR project. Capacity is expected to increase by around 2 million tonnes upon completion in 2012, and is expected to have a capital cost of US\$2.3 billion. Pacific Aluminium's, a subsidiary of Rio Tinto Alcan, Boyne Island Smelter upgrade is not expected to result in any additional capacity, but is designed to optimise two reduction lines and the fourth carbon bake furnace. At an estimated capital cost of \$685 million, it is scheduled for completion in mid to late 2012.

A breakdown of the proposed capital expenditure on advanced projects, by major commodity grouping, is provided in Figure 6. Figure 7 shows the estimated capital expenditure on a state basis. The average value of advanced projects is shown in Figure 8.

Figure 6: Value of advanced projects by commodity, April 2012

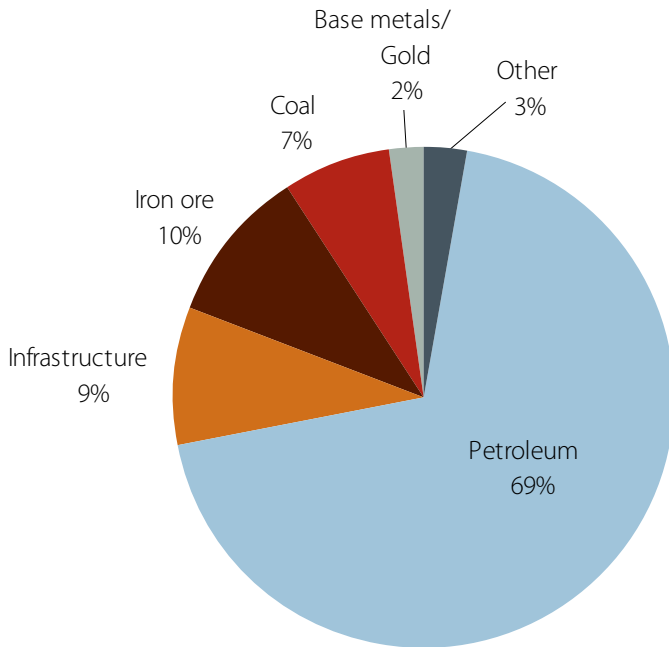


Figure 7: Value of advanced projects, by state and territory, April 2012

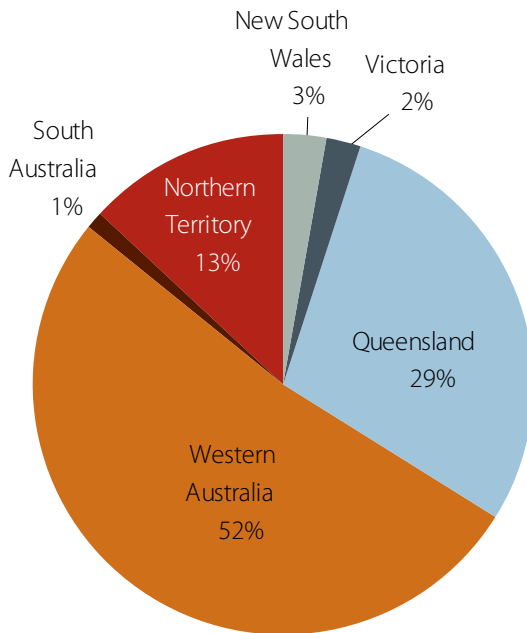
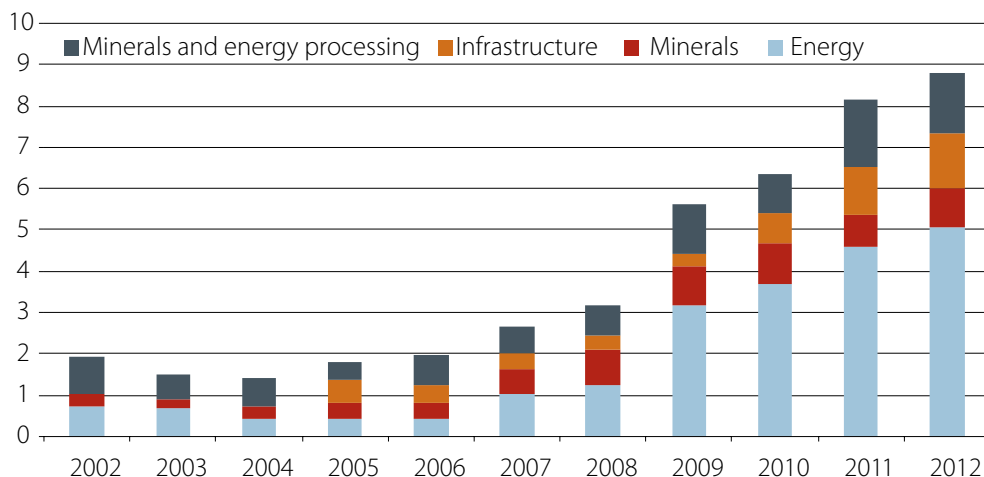




Figure 8: Average value of advanced projects (2011–12 dollars)



## Less advanced projects

Projects that are in the less advanced category are either undergoing feasibility study (in some cases, pre-feasibility), awaiting the outcome of government approval processes or have not yet been subject to a final investment decision by the project proponents. Some projects may face changes in expected returns associated with price or currency movements or may be targeting the same emerging market opportunities, resulting in changes to the projects estimated start up date. In addition, securing finance for project development, even for high-quality projects with a high probability of success, is not guaranteed.

Of the 393 projects on BREE's April 2012 list, 75 per cent (295 projects) remain uncommitted. Table 4 contains a summary of the numbers and commodity distribution of the 295 less advanced 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. Nevertheless, many of the projects which will ultimately progress to development in the medium term are included in BREE's current list of 295 less advanced projects.

Among the capital intensive projects in BREE's April 2012 list still undergoing feasibility studies are 12 proposed LNG developments, which collectively could add over 65 million tonnes to Australia's annual LNG production capacity in the longer term. These projects include the Browse, Sunrise and Bonaparte projects off the coast of Western Australia and the Arrow LNG plant and the second train at the APLNG project at Gladstone in Queensland.

Table 4: Number of less advanced projects, April 2012

Commodity	NSW	Vic	Qld	WA	SA	Tas	NT	Aust	Potential capital expend. (\$m)
<b>Mining - energy projects</b>									
Black coal	23	0	49	1	0	0	0	73	40691
Coal Seam Methane	5	0	2	0	0	0	0	7	1635
Petroleum	0	2	4	4	0	0	7	17	49363
Uranium	0	0	2	5	1	0	1	9	1820
<b>Sub-total</b>	<b>28</b>	<b>2</b>	<b>57</b>	<b>10</b>	<b>1</b>	<b>0</b>	<b>8</b>	<b>106</b>	<b>93499</b>
<b>Mining - minerals projects</b>									
Bauxite	0	0	3	1	0	0	0	4	2197
Copper	3	0	6	1	5	0	1	16	2594
Gold	5	0	5	17	1	0	3	31	2851
Iron ore	1	0	0	29	2	0	1	33	50449
Lead-zinc-silver	5	0	1	5	1	0	2	14	3839
Mineral sands	2	2	1	3	0	0	0	8	605
Nickel	0	0	5	11	0	1	0	17	12382
Rare earths	0	0	0	1	0	0	1	2	420
Tin	0	0	1	0	0	2	0	3	486
Vanadium	0	0	0	1	0	0	0	1	489
Other commodities	3	0	5	4	0	1	2	15	6714
<b>Sub-total</b>	<b>19</b>	<b>2</b>	<b>27</b>	<b>73</b>	<b>9</b>	<b>4</b>	<b>10</b>	<b>144</b>	<b>83025</b>
<b>Infrastructure</b>									
Coal	4	0	12	0	0	0	0	16	38170
Petroleum pipelines	4	0	3	2	0	0	0	9	4160
Iron ore	0	0	0	7	2	0	1	10	21553
<b>Sub-total</b>	<b>8</b>	<b>0</b>	<b>15</b>	<b>9</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>35</b>	<b>63883</b>
<b>Minerals and energy processing</b>									
Alumina	0	0	0	2	0	0	0	2	na
Copper	0	0	0	0	1	0	0	1	na
Crude iron and steel	0	0	1	0	0	0	0	1	1400
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	1000
<b>Sub-total</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>2880</b>
<b>Total</b>	<b>56</b>	<b>5</b>	<b>101</b>	<b>94</b>	<b>16</b>	<b>4</b>	<b>19</b>	<b>295</b>	<b>243287</b>

There are 33 less advanced iron ore projects on the list, which if all were to be built would have a combined capacity of 465 million tonnes. On this list, 14 have an estimated capital expenditure of \$1 billion or more. These include Aquila Resources' West Pilbara mine (\$5.8 billion); Hancock Prospecting's Roy Hill project, the first stage of Australasian Resources' Balmoral South magnetite project (\$3.3 billion); MCC Mining's Cape Lambert magnetite project (\$3.7 billion) and the Extension Hill magnetite project (\$2.9 billion).

## Projects new to the list

There are 25 projects (both advanced and less advanced) that are new to BREE's list since October 2011 (see Figure 9). Figure 9 provides a summary of the 25 newly listed projects in the six months ended April 2012, by commodity category. Of these 25 projects, four are either committed or currently under construction.

Notable additions to the less advanced project list include several Queensland coal ports around Bowen, Mackay and Gladstone. These include Abbot Point terminals T0 and T4-T9 near Bowen, Dugeon Point near Mackay and Fitzroy Terminal and the 3TL project near Gladstone. Collectively, these ports could have an ultimate combine capacity of over 400 million tonnes.

Figure 9: Projects added to list six months to April 2012 (total no. 25)

