



Australian Resource Reviews

Iron Ore 2017

Daisy Summerfield, Geoscience Australia

Resource figures are current as at 31 December 2016.

Iron (Fe) is a metallic element that constitutes about 5.6% by weight of the Earth's crust and is the fourth most abundant element in the crust. Iron ores are rocks from which metallic iron can be economically extracted. The principal iron ores contain hematite (Fe_2O_3) and magnetite (Fe_3O_4).

Hematite is an iron oxide mineral. It is non-magnetic and has colour variations ranging from steel silver to reddish brown. Pure hematite contains 69.9% Fe. It has been the dominant iron ore mined in Australia since the early 1960s. Approximately 96% of Australia's iron ore exports are high-grade hematite, the bulk of which has been mined from deposits in the Hamersley province of Western Australia (WA). The Brockman Iron Formation in the Hamersley province is the most significant host for high-grade hematite iron ore deposits.

Magnetite is an iron oxide mineral that is generally black and highly magnetic; the latter property aiding in the beneficiation of magnetite ores. Magnetite contains 72.4% Fe, which is higher than hematite, but the presence of impurities usually results in magnetite ores having lower ore grade (generally 20-30% Fe) than hematite ores, making it more costly to produce concentrate for steel smelters. Large magnetite deposits occur across Australia including the producing George Palmer deposit operating under the Sino Iron Project in the Pilbara region of WA.

At the present time, Australia has three producing magnetite projects, namely Savage

River in Tasmania, Karara in WA's mid-west and the Sino Iron project in the Pilbara region of WA. In the first half of 2016, all six magnetite concentrator lines at Sino Iron project were fully operational, boosting production and increasing the target capacity rate from 11 Mt (in 2016) to 15 Mt in 2017. For the same period, Sino exported more than 13 Mt of magnetite concentrate to its special steel plant and for their steel mill customers in China. The Karara project has reported production of approximately 7.09 million wet tonnes of magnetite concentrate during the 2015-16 financial year, whilst production of magnetite concentrate from the Savage River operation has marginally decreased from 2.61 Mt in 2015 to 2.39 Mt in 2016.

Mining and processing hematite and magnetite ores

High-grade hematite ore is referred to as direct shipping ore (DSO) because, once mined, the ore goes through a relatively simple crushing and screening process before being exported for use in steel making. Australia's hematite DSO from the Hamersley province averages from 56% to 62% iron. Like hematite ores, magnetite ores require initial crushing and screening but also undergo a second stage of processing that exploits the magnetic properties of the ore to produce a concentrate. Further processing of magnetite

involves agglomeration¹ and thermal treatment of the concentrate to produce pellets that can be used directly in blast furnaces or in direct reduction steel-making plants. The pellets contain 65% to 70% Fe, which is a higher grade than the hematite DSO currently being exported from the Hamersley province. Additionally, when compared to hematite DSO, the magnetite pellets contain lower levels of impurities, such as phosphorous, sulphur and aluminium. Thus, magnetite pellets are a premium product and attract higher prices from steel makers, offsetting the higher costs of production.

JORC Reserves

Australia's iron ore reserves and resources comprise both hematite and magnetite ores. Because of the high average grades (% Fe) of hematite ores when compared to the average, unbeneficiated, grades of magnetite ores, it is necessary to report national reserves and resources in terms of contained iron as well as bulk iron ore. Thus, since 2010, the national estimates for iron ore (Table 1) are reported in two categories, namely:

- Million tonnes of iron ore, and
- Million tonnes of contained iron.

Total Australian Ore Reserves of iron ore reported in compliance with the Joint Ore Reserves Committee (JORC) Code were estimated to be 23 532 Mt in 2016 (Table 1), representing 47% of Economic Demonstrated Resources (EDR; Table 2). Under the JORC Code, Ore Reserves represent a higher level of economic, technical and legal certainty than Mineral Resources. Deposits with Ore Reserves have, at a minimum, a prefeasibility study indicating a reasonable expectation of being mined within the development timeframe, while Mineral Resources are of

potential value with reasonable prospects for eventual economic extraction over a longer timeframe. The JORC Code Reserves of contained iron totalled 10 470 Mt in 2016 (Table 1), or 44% of the EDR of contained iron (Table 2).

However, not all mining companies are publicly listed so unreported reserves and resources are not included in these figures. Based on publicly available data, JORC Code Reserves are sufficient for approximately 27 years at the current (2016) rate of mine production (Table 1), unreported quantities would increase this estimate if included. Interestingly, the potential reserve life of contained iron is only 20 years (Table 1), indicating preferential depletion of deposits with higher iron content.

¹ Agglomeration is the process in which magnetite grains are aggregated into pellets using a chemical binding reagent. Pellets are produced in a pelletising plant.

Table 1: Ore Reserves of iron ore and contained iron reported in compliance with the JORC Code, production and potential reserve life*, 2002-2016.

Year	IRON ORE			CONTAINED IRON		
	Proved and Probable Ore Reserve (Mt)	Production (Mt)	Reserve Life (years)	Proved and Probable Ore Reserve (Mt)	Production (Mt)	Reserve Life (years)
2016	23 532	858	27	10 470	531	20
2015	21 920	811	27	10 244	502	20
2014	20 487	735	28	9665	424	23
2013	18 362	609	30	9320		
2012	15 305	520	29	7931		
2011	15 032	488	31	7804		
2010	13 600	430	32	7100		
2009	12 300	394	31			
2008	10 800	341	32			
2007	8100	299	27			
2006	7800	275	28			
2005	6900	262	26			
2004	4600	234	20			
2003	4300	213	20			
2002	4100	187	22			

*Reserve life is the ratio of Ore Reserves to production and represents a snapshot in time. It assumes that future production continues at the same rate and does not take into account future resource upgrades and successful exploration for new deposits.

Table 2. Ore Reserves and Mineral Resources of iron ore (million tonnes) reported in compliance with the JORC Code of iron ore at operating mines in 2016.

No. of Operating Mines ¹	Ore Reserves ² at Operating Mines	Measured and Indicated Resources ³ at Operating Mines	Mine Production 2016 ⁴	Average Reserve Life (years)	Average Resource Life (years)
29	6368	16 224	858	7	19

1. The number of operating mines counts individual mines that operated during 2016 and thus contributed to production. Some of these mines may belong to larger, multi-mine operations and some may have closed during or since 2016.
2. The majority of Australian Ore Reserves and Mineral Resources are reported in compliance with the JORC Code, however there are a number of companies that report to foreign stock exchanges using other reporting codes, which are largely equivalent. In addition, Geoscience Australia may hold confidential information for some commodities. Ore Reserves are as at 31 December 2016.
3. Mineral Resources are inclusive of the Ore Reserves. Mineral Resources are as at 31 December 2016.
4. Source: Office of the Chief Economist (Resources and Energy Quarterly, June 2017).

Figure 1 shows that annual production is a small fraction of the iron ore Reserve (3.6% in 2016) but cumulative production over the last 15 years (6656 Mt) has accounted for all of the iron ore Reserve from 2002 (4100 Mt), plus another 60%, with cumulative production from 2003 and 2004 similarly exceeding the Ore Reserve for those years. Figure 1 also shows

that both Ore Reserves and production have steadily risen over the last 15 years. Ore Reserves of iron ore in 2002 were 4100 Mt increasing 474% to 23 532 Mt in 2016 which is faster than production which has increased 359% (from 187 Mt to 858 Mt) over the same time period reflecting the major companies' plans to ramp up production in coming years.

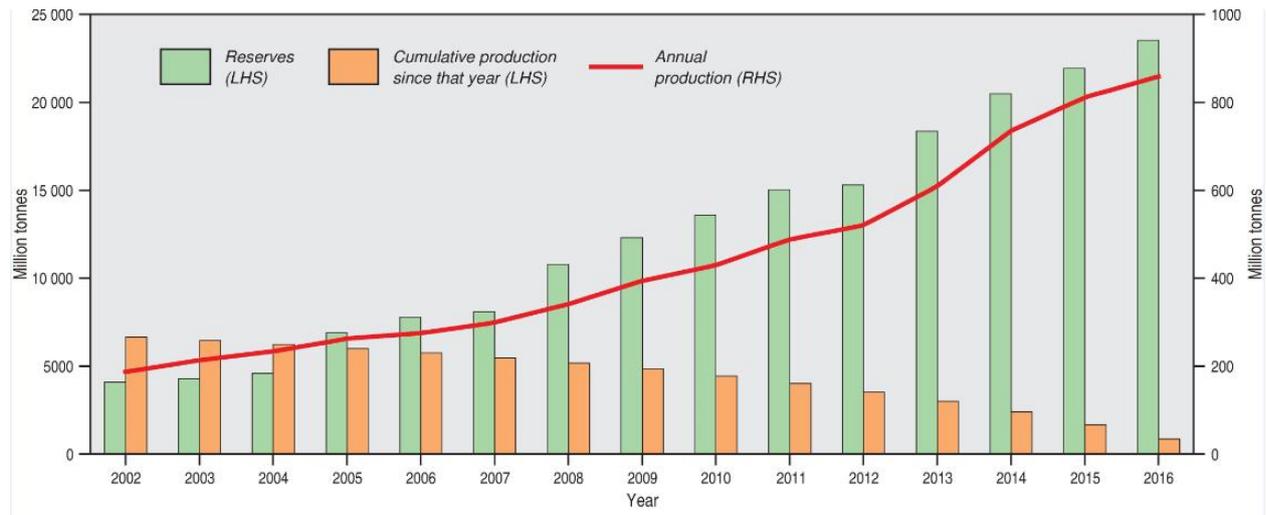


Figure 1. Iron Ore Reserves and annual production 2002-2016, as well as cumulative production since each year. LHS/RHS = refer to axis on left-hand side/right-hand side.

Identified Resources

In 2016, Australia's EDR of iron ore decreased from 2015 levels by 4% to 49 588 Mt (Table 3) with a corresponding slight 1% decrease in EDR of contained iron to 23 771 Mt (Table 4). Of note was the 16% decrease in EDR at magnetite deposits.

Seaborne iron ore supply continued to exceed market demand, driving the instability of the iron ore market price since its initial downturn three years ago (2014). This instability translates across to project development and deferment of exploration programs by resource companies. Development activities were seen at established operations (that only

require low-cost and low-capital expenditures) by either expanding existing operations or replacing exhausting mines. The continuing slowdown of exploration and development activities in iron ore together with the re-assessment review process of deposits by Geoscience Australia resulted in the 4% decrease in Australia's EDR of iron ore in 2016.

Paramarginal Resources of iron ore were estimated at 10 939 Mt with 3672 Mt of contained iron and Inferred Resources were estimated at 90 123 Mt of iron ore with 40 342 Mt of contained iron (Table 3 and Table 4).

Table 3: Australia's identified iron ore resources and world figures (million tonnes) for selected years from 1975-2016.

Year	Demonstrated Resources			Inferred Resources ²	Accessible EDR ³	Australian Mine Production ⁴	World Economic Resources ⁵	World Mine Production ⁵
	Economic ¹	Paramarginal	Submarginal					
2016	49 588	10 939	1433	90 123	49 588	858	173 769	2230
2015	51 906	7639	1510	86 430	51 906	811	180 000	3300
2014	54 412	1569	1727	82 167	54 412	735	190 000	3220
2013	52 578	474	1635	78 577	52 578	609	186 878	3024
2012	44 650	566	1365	73 570	44 650	520	175 650	2959
2011	37 762	1414	1507	61 489	37 762	488	168 762	2814
2010	34 500	700	1500	47 800	34 500	430	191 000	2400
2009	28 000	300	1900	33 500	37 900	394	168 000	2300
2008	24 000	300	1600	28 900	23 900	341	158 000	2200
2007	20 300	300	1700	24 400	20 200	299	154 000	1900
2006	18 600	200	1800	17 900	18 500	275	163 000	1700
2005	16 400	200	1800	18 800	16 400	262	160 000	1500
2000	13 600	2100	1400	14 200		168	135 600	1010
1995	17 800	13 800	400	17 200		143	150 000	1000
1990	14 700	13 100	200	20 100		109	151 000	929
1985	16 220	11 830		14 280		93	210 000	896
1980	14 870	17 230		6730		96	266 000	882
1975	17 800					98		875

1. EDR includes Ore Reserves and most Measured and Indicated Mineral Resources reported in compliance with the JORC Code.
2. Total Inferred Resources in economic, subeconomic and undifferentiated categories.
3. Accessible Economic Demonstrated Resources (AEDR) is the portion of total EDR that is accessible for mining. AEDR does not include resources that are inaccessible for mining because of environmental restrictions, government policies or military lands.
4. Source: Office of the Chief Economist (Resources and Energy Quarterly).
5. Source: United States Geological Survey (Mineral Commodity Summaries)

Table 4: Australia's identified contained iron resources and world figures (million tonnes), 2010-2016.

Year	Demonstrated Resources			Inferred Resources ²	Accessible EDR ³	Australian Mine Production ⁴	World Economic Resources ⁵	World Mine Production ⁵
	Economic ¹	Paramarginal	Submarginal					
2016	23 771	3672	480	40 342	23 771	531	82 986	1360
2015	23 985	2796	515	38 562	23 985	502	85 000	
2014	24 639	799	570	36 173	24 639	424	87 000	
2013	23 035	344	574	34 297	23 035		86 785	
2012	20 638	224	473	33 827	20 638		83 688	
2011	18 152	501	736	29 204	18 152		81 101	
2010	17 000	400	600	23 300	17 000		89 000	

1. EDR includes Ore Reserves and most Measured and Indicated Mineral Resources reported in compliance with the JORC Code.
2. Total Inferred Resources in economic, subeconomic and undifferentiated categories.
3. Accessible Economic Demonstrated Resources (AEDR) is the portion of total EDR that is accessible for mining. AEDR does not include resources that are inaccessible for mining because of environmental restrictions, government policies or military lands.
4. Source: Office of the Chief Economist (Resources and Energy Quarterly).
5. Source: United States Geological Survey (Mineral Commodity Summaries).

Figure 2 shows the proportion of iron ore EDR in each state and the Northern Territory. Western Australia clearly dominates with 94% of the nation's economic endowment. Based on 2016 production levels and Accessible EDR (AEDR; Table 3), iron ore in Australia has a potential resource life of 58 years.

Maps showing locations of Australian in Situ Iron Ore Resources (Sheet 1: Hematite; Sheet 2: Magnetite), 2012 are available for free [download](#).

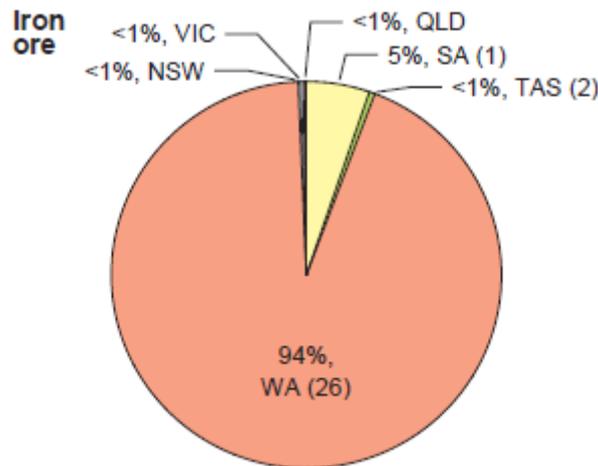


Figure 2. Distribution of iron ore EDR in Australian states and the Northern Territory, as at December 2016. Where applicable, the number of operating mines is in brackets after the percentage of EDR for each jurisdiction.

Figure 3 demonstrates the vast Australian inventory of iron ore when EDR rather than just Ore Reserves are considered. Over the last 40 years, cumulative production (9731 Mt) has removed only 55% of 17 800 Mt of Mineral Resources assessed as economic back in 1975. Despite these vast resources, Figure 4 shows that over the last 40 years, iron ore production has increased more rapidly than the resource inventory, particularly from 2000 onward. In 1975, iron ore production was 98 Mt which rose to 858 Mt in 2016, a 756% increase. Iron ore EDR has increased 179% over the same time period (17 800 Mt in 1975 to 49 588 Mt in 2016) and total resources of iron ore (EDR + subeconomic + inferred) have increased from 35 000 Mt in 1976 to

152 083 Mt in 2016, an increase of 335%. As a ratio, production has increased from 0.6% of EDR in 1975 to 1.7% in 2016, the highest it has ever been.

Much of these increases occurred rapidly after a period of decline in iron ore EDR from 1994 through to 2003 which was caused by the combined impacts of increased rates of mine production and mining companies re-estimating reserves and resources to comply with the requirements of the JORC Code. Subsequent to this period, EDR increased rapidly due to large increases in magnetite resources (including reclassification of some magnetite deposits to economic categories), and increases in hematite resources, mainly at known deposits.

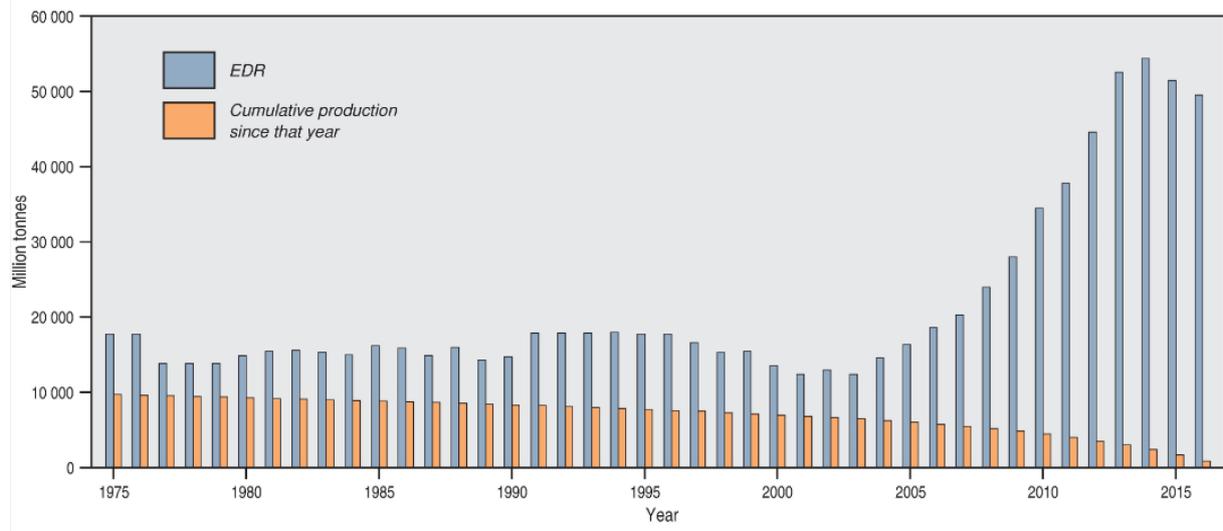


Figure 3. Economic Demonstrated Resources of iron ore 1975-2016, as well as cumulative production since each year.

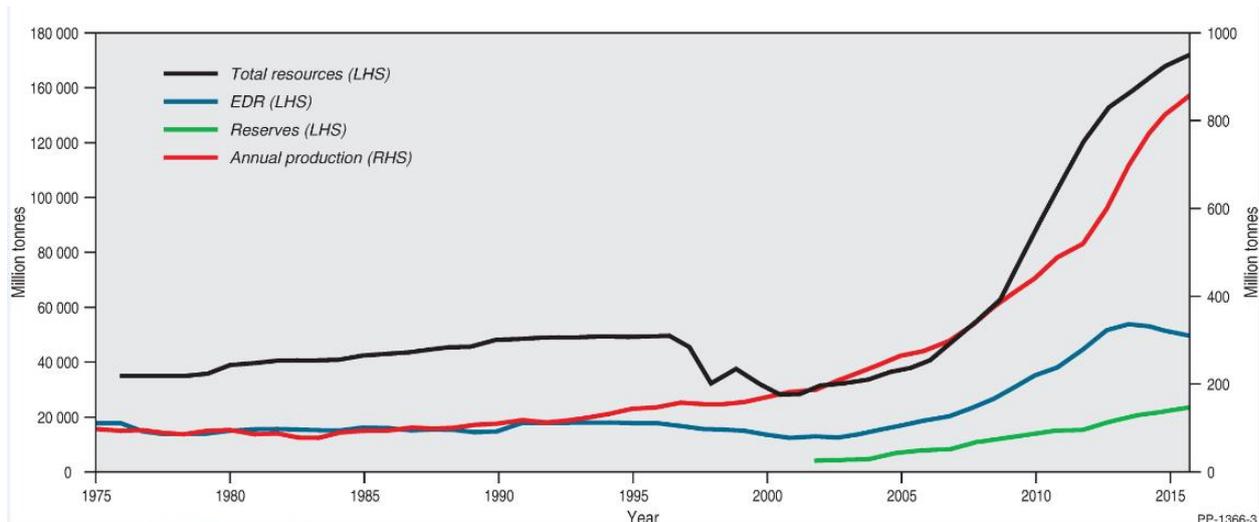


Figure 4. Trends in total resources, Economic Demonstrated Resources, Ore Reserves and annual production of iron ore, 1975-2016. LHS/RHS = refer to axis on left-hand side/right-hand side.

Accessible EDR

Australia's AEDR of iron ore also totals 49 588 Mt (Table 3) as all of Australia's iron ore deposits with an EDR are regarded as accessible. Thus both AEDR and EDR during the 2016 period decreased by 4% from the previous 2015 assessment period due to the lingering volatility of iron ore prices combined with Geoscience Australia's re-assessment process.

Mine operations that increased their reserves and resources during the 2016 assessment period included Rio Tinto Ltd's Hamersley Iron operation and the Koodaideri development project deposits at 38 West/21 West. The Rio Tinto Hope Downs Joint Venture operation with Hancock Prospecting Pty Ltd also increased its inventory, (Reserves are up by ~ 400 Mt), focussing on Hope Downs 1 North and South West area.. BHP Billiton Ltd's Western Australia Iron Ore (WAIO) operations reported a 2% increase in JORC Reserves from 3920 Mt to 3980 Mt during the 2015-16 financial year. WAIO production has increased by 4% from 257 Mt to 268 Mt during the 2016-17 financial year as a result of production ramp up of expanded operations, such as in Jumblebar, and from expanded infrastructure.

Conversely, most of Fortescue Metal Group Ltd's hematite operations have reported a modest decrease in their JORC Resources during the 2015-16 financial year period with the exception of approximately 5% increase in JORC Resources at its Cloudbreak operation to 1090 Mt. In addition, discovery of the Eastern Limb deposit, which is adjacent to the North Star deposit, has delivered increased magnetite resources for Fortescue's Iron Bridge project.

Exploration Expenditure

Australian Bureau of Statistics Mineral and Petroleum Exploration data indicate that mineral exploration expenditure in Australia for 2016 totalled \$1426.9 million, a 1% decrease on the \$1437 million spent in 2015, consistent with the current economic conditions. About \$278.6 million was spent on iron ore exploration in WA, which represented 30% of WA's total mineral exploration expenditure. Western Australia also accounted for 65% of the total mineral exploration expenditure in Australia during 2016 at around \$927.6 million. Iron ore exploration expenditure in South Australia was \$3.2 million.

Production

Australia's total production of iron ore for 2016 was 858 Mt (Table 1, Table 3), with WA producing 846 Mt, or 99% of overall production. South Australia and Tasmania have maintained their iron ore production to approximately 9 Mt and 3 Mt, respectively, representing approximately 1% of the national total of iron ore production for 2016.

The Office of the Chief Economist (OCE) reported Australia's iron ore exports during 2016 as 809 Mt, a 5% increase on the 2015 figure of approximately 767 Mt. The OCE project a continuing trend of exports increasing to 876 Mt in 2017 to 902 Mt in 2018. The projected increase will be supported by major producers' brown field expansions, including Rio Tinto's Silvergrass mine operation which was officially commissioned in August 2018. Infrastructure improvements and utilisation of new technology at BHP's and Fortescue's operations will also contribute to the projected increase in exports.

Australia's main export destinations of iron ore are China (~82%), Japan (~9%) and the Republic of Korea (~6%). The OCE has projected an increase in world steel production to over 1.7 billion tonnes by 2022, mainly generated from growing production in countries such as India, Japan, the EU and the United States.

World Ranking

Australia has the world's largest iron ore EDR with 29% of the global total at 49 588 Mt, followed by Russia's 15% (25 000 Mt). Brazil occupies third spot at 14% (23 000 Mt). In terms of contained iron, Australia has 29% of world EDR, while Russia has the second largest EDR with 17%.

World Production Trends

Hematite ore dominates world production and is sourced mainly from Australia and Brazil. Australia led in 2016 with 38% (858 Mt) of world iron ore production, followed by Brazil with 17% (391 Mt) and China with 16% (353 Mt). Magnetite ore has established a presence in world production and contributes to the increase in Australia's EDR of iron ore, mainly from established operations such as Savage River in Tasmania, Sino Iron in the Pilbara and from other magnetite resource deposits in WA and South Australia, representing 36% of Australia's total EDR of iron ore.

Industry Developments

Industry focus has shifted to ore quality over production quantity, triggered by global environmental issues and the drive to reduce emissions of gasses that contribute to climate change. Concern over the population's wellbeing in highly polluted cities, particularly China, had led authorities to address high emission problems by closing down inefficient steel mills. Furthermore, steel mill preference for high grade ore (greater than 62% Fe) over lower grade ore is a rising trend in the iron ore market, contributing to a fluctuating iron ore price. The industry's large established producers have recognised these challenges. To improve beneficiating technology and boost low-grade (below 62% Fe) iron ore, the preferential development of deposits capable of producing high grade products is inevitable. Recent economic challenges and the current environment has meant that some explorers and developers have been unable to recommence activity at some projects.

Western Australia

Continued market volatility has led Atlas Iron Ltd to defer the **Corunna Downs** project development in favour of its **Mount Webber** operation. Atlas said that this expansion will increase the Mount Webber mine production rate from 7 Mt to 9 Mt annually. The Mount Dove processing plant was recommissioned to accommodate additional production from the Mount Webber mine. Atlas reported its operations and developing projects have total JORC Resources, as at 30 June 2016, to be approximately 1189 Mt at an average grade of 56.2% Fe, a slight decrease from the previous resource assessment period. Total iron ore production from Atlas operations for the 2015-16 financial year was 14.4 Mt.

Mount Gibson Iron Ltd reported the commencement of production at its **Iron Hill** deposit, located 3 km south of the company's depleted **Extension Hill** mine in the Mid-West region of WA. The new mine will extend the Extension Hill mine operation until late 2018. The company also announced the restart of its **Koolan Island** mine in the Kimberley region of WA, following a two-year technical evaluation and an economically positive feasibility study. At 30 June 2016, Mount Gibson reported that the Koolan Island project has a total JORC Resource of 60.51 Mt with an average grade of 63% Fe.

Gindalbie Metals Ltd reported a production increase of 12.8% for magnetite concentrate to 8 Mt wet metric tonnes for the **Karara** project during the 2016-17 financial year, aided by optimisation activities to improve production output.

The **Mount Alexander** project is approximately 260 km southwest of the town of Karratha in the West Pilbara region of WA. Zenith Minerals Ltd said that project activity was kept to a minimum at its Alexander iron project in 2016. The project's already defined JORC Inferred Resource estimate of 565.7 Mt at 30% Fe for the central and southwest areas of the deposit was re-announced in the company's 2016 annual report. Included in the

re-announcement is the **Mount Alexander West BIF** deposit Inferred Resource of 25.9 Mt at 22.7% Fe.

Legacy Iron Ltd reported that exploration activity at the **Mount Bevan** project was kept to a minimum in 2016, affected by the lagging, unstable, iron ore market. Thus, the Mount Bevan project's overall JORC Indicated (322 Mt at 34.7% Fe) and Inferred (847 Mt at 35% Fe) Resource estimates are unchanged from the previous assessment period to approximately 1170 Mt at 34.9% Fe. The Mount Bevan project is located approximately 95 km northwest of Menzies in the Yilgarn region.

In November 2016, Red Hill Iron Ltd reported an upgrade to its Red Hill Iron Ore Joint Venture (RHIJV) project's JORC Measured Resources to 263.5 Mt at 57.17% Fe resulting from a revised mineral resource estimate for the three channel-iron deposits at **Red Hill Creek West**. The company also reported some significant intersections from two completed reverse circulation (RC) drill holes at the **Breccia** bedded iron prospect, which include an eight metre interval at 56.31% Fe from 26 metres depth. The RHIJV project and the Breccia prospect are both located in the west of the Pilbara region of Western Australia.

BC Iron Ltd's **Iron Valley** project has reported total JORC Resources, as at 30 June 2016, of 238.7 Mt at 58.4% Fe and JORC Reserves of 123.2 Mt at an average grade of 58.8% Fe. The Iron Valley mine is operated by Mineral Resources Ltd, producing direct shipping hematite ore (fines and lump). Mineral Resources transports the ore through a truck haulage operation to Utah Point in Port Hedland in WA. The project reported total shipments of 8.0 Mt during the 2016-17 financial year.

Fortescue Metals Group's four mining operations at the Chichester (**Cloudbreak** and **Christmas Creek**) and Hamersley Ranges (**Kings Valley** and **Firetail**) hubs have recorded a slight production increase of 2%

from 165.4 Mt to 169.4 Mt. A corresponding 2% increase in the company's overall operational EDR of 3675 Mt was recorded for the 2015-16 financial year. The company's **Iron Bridge** magnetite joint venture project with the Famosa and Baosteel Groups reported completion of the project's production processes and testing at their pilot plant, which was developed during stage one of the project. Infill resource drilling at the North Bridge project deposits, including **North Star**, **Eastern Limb** and **Glacier Valley**, have resulted in resource category upgrades. Maiden resources from the newly discovered **Eastern Limb** deposit have also contributed to the overall increase in the **Iron Bridge** resources of 6 706 Mt at an average grade of 31.4% Fe.

A plan for small scale mining at the **Marillana** project was announced by Brockman Mining Ltd during the first quarter of 2016. Mining activity will be conducted in a small part of the Marillana deposit's defined Ore Reserve with an initial target capacity of between 2.5 Mt to 3.0 Mt per year. Brockman's ongoing mine planning studies indicate that the initial pit will have the capability of being expanded to produce a total of 83.8 Mt of ore over 14 years. Brockman's 2016 annual report states that the **Marillana** project has a total JORC channel iron deposit of 101.9 Mt at an average grade of 55.6% Fe. The total resources are inclusive of a JORC Reserve of 48.5 Mt at 55.5% Fe. The **Marillana** project is approximately 100 km northwest of the township of Newman, WA.

Rio Tinto's mine expansions have delivered a 6% increase to its Pilbara production, reaching 329.5 Mt in 2016. The company has reported no significant production increase for 2017 but achieved its production guidance of 329.8 Mt. Some operating mines, including **Brockman 2**, **Marandoo**, **Mount Tom Price**, **West Angelas** and **Channar**, recorded decreased Reserves mainly owing to depletion from production. Conversely, the **Koodaideri** project has increased its Ore Reserve 31% from 452 Mt to 594 Mt, resulting from the

addition of a new mining area. Increased JORC Resources were reported for other projects, including the **Hope Downs** JV for a 14% increase to 1578 Mt and the **Robe River** JV for a 6% increase to 5557 Mt, mostly due to additional resource drilling and an updated geological model.

BHP's Western Australia Iron Ore (WAIO) operations recorded a 2% production increase to 257 Mt in the 2015-16 financial year. The gain is mainly due to a strong recovery after the wet season and production ramp up at the **Jimblebar** mining operation. The WAIO operations also recorded a slight increase in total JORC Reserves during the 2015-16 financial period to 3980 Mt at an average grade of approximately 61% Fe. A narrowed down production target of between 268 Mt and 272 Mt was achieved (total production increased by 4% to 268 Mt) for the 2016-17 financial year, which was mainly supported by technical and process improvements at the Jimblebar operation.

GWR Group Ltd's proposal to mine the **Wiluna West** Iron Ore Project has received approval from the WA Department of Mines and Petroleum. However, no development plan exists at this stage and the project will remain on care and maintenance. GWR's 2016 annual report stated that there are no changes to the project's total JORC (2004) Resources of 130.3 Mt at 60% Fe. The report also stated that the JORC-compliant (2004) Reserve is 69.2 Mt at 60.3% Fe.

South Australia

Iron Road Ltd reported that its commercialisation program for its **Central Eyre** Iron Project (CEIP) continued to progress, achieving the securement of a co-operation agreement with Chinese Railway Group. CEIP achieved a milestone with the project gaining Mining Lease and Development Application approvals, announced by the state premier and the federal minister for Mineral Resources and Energy on 3 May 2017. CEIP has JORC

Reserves of 3681 Mt at an average grade of 15% Fe and a total JORC Resource of 4510 Mt at an average grade of 16% Fe. The project is located on the Eyre Peninsula of South Australia.

Magnetite Mines Ltd's project activities last year included continuing metallurgical studies at its **Mawson** Iron Project. The company stated that the study will result in an improved production plan. The project is approximately 250 km north-northeast of Adelaide in South Australia and has total JORC Resources of approximately 2732 Mt at 18.2% Fe.

The total JORC resources for Havilah Resources Ltd's **Maldorky** and **Grants** iron ore projects remained unchanged during the past year at 451 Mt. As stated in the previous review, the mining lease application process for the **Maldorky** project is in progress. **Maldorky** is approximately 300 km east of Port Pirie in South Australia.

New South Wales

New prefeasibility studies were successfully completed at the **Hawsons** Iron Project according to Carpentaria Exploration Ltd. The study is for 10 Mt per year production of magnetite concentrate for export to its prospective steel-producer customers overseas. The company also reported the completion of a 5963 m drilling program as part of the prefeasibility studies at **Hawsons**. The exploration effort resulted in an upgrade of JORC Resources to 1769 Mt at an average grade of 17.5% Fe (with a JORC Indicated Resource of 215 Mt at 18.2% Fe). **Hawsons** is located 60 km southwest of Broken Hill, NSW.

Tasmania

Grange Resources Ltd's **Savage River** magnetite mine is the only established magnetite operation in Tasmania. Savage River processes and beneficiates its magnetite ore to produce magnetite pellets at its plant at Port Latta (on the northwest coast of

Tasmania) for export throughout the Asia Pacific region. Savage River comprises several magnetite deposits, which include the **North Pit**, **Centre Pit** **South** and **South** deposits. Savage River has reported a total magnetite JORC Resource at 31 December 2016 of 377.5 Mt at Davis Tube Recovery² with a grade of 47.7% Fe. The magnetite mineral resource is inclusive of 86.6 Mt of Proved and Probable Ore Reserves. Savage River reported that its 2016 annual magnetite concentrate production was 2.39 Mt and equivalent pellet production was 2.38 Mt.

Victoria

A project activity at Easter Iron Ltd's Nowa Nowa Iron Project has remained on hold since Geoscience Australia's last resource assessment in 2015. The company states that project progress will be subject to favourable market conditions for iron ore. The JORC Resources at the project's **Five Mile** deposit remained the same during the review period at approximately 9.05 Mt at an average grade of 50.8% Fe. The **Nowa Nowa** Iron Project is located approximately 270 km east of Melbourne.

2. Davis Tube Recovery testing is a laboratory technique that firstly pulverises the magnetite sample and then uses a Davis Tube wash to recover the magnetic particles. It measures the proportion of the sample that is magnetic and therefore the likely grade of magnetite concentrate at a given grind size. The recovered magnetic and non-magnetic portions can be further analysed for chemical composition.

Contact Details

mineral.promotions@ga.gov.au

Department of Industry, Innovation and Science

Minister for Resources and Northern Australia: Senator the Hon Matthew Canavan
Secretary: Dr Heather Smith PSM

Geoscience Australia

Chief Executive Officer: Dr James Johnson

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