

🌐 Key materials

50 Production

51 Reserves

51 Prices

A large, stylized graphic of the letter 'R' that serves as a background for the title. The 'R' is filled with a topographic map of the world, using shades of green and yellow to represent land and water. The 'R' is positioned on the right side of the page, with its vertical stem on the right and its curved part on the left.

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Key materials for the changing energy system

Cobalt production

Mine production

Thousand tonnes	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Growth rate per annum		Share 2017
												2017	2006-16	
Australia	4.7	4.8	4.7	3.9	3.9	5.9	6.4	6.2	5.7	5.1	4.7	-8.8%	♦	3.4%
Canada	8.7	9.0	3.9	4.6	6.8	6.7	7.2	6.9	7.5	7.0	6.4	-8.1%	-0.2%	4.6%
DR Congo	25.4	42.5	56.1	84.0	99.5	86.4	76.6	76.5	84.4	69.0	90.3	31.2%	9.8%	65.7%
Cuba	4.5	4.0	4.6	4.8	5.1	4.9	4.2	3.7	4.3	4.3	4.1	-2.3%	-2.7%	3.0%
Madagascar	–	–	–	0.2	0.5	0.6	2.2	3.1	3.7	3.5	3.1	-10.1%	–	2.3%
Morocco	1.8	1.7	2.6	3.1	2.2	2.0	2.0	2.2	2.6	2.7	2.5	-7.3%	0.5%	1.8%
New Caledonia	2.3	2.1	2.0	2.9	3.1	2.7	3.2	4.0	3.7	3.4	2.8	-17.2%	7.6%	2.0%
Papua New Guinea	–	–	–	–	–	0.5	1.0	2.1	2.5	2.2	3.2	46.5%	–	2.3%
Philippines	1.0	1.2	1.4	2.1	2.0	2.7	2.8	4.6	4.3	4.0	4.2	4.8%	16.2%	3.1%
Russian Federation	6.3	6.2	6.1	6.2	6.1	6.3	6.3	6.3	6.2	5.5	5.6	2.1%	-1.3%	4.1%
South Africa	0.6	0.6	0.6	1.8	1.6	2.5	3.0	3.0	3.0	2.3	2.5	9.0%	14.4%	1.8%
Zambia	4.7	4.6	5.9	8.6	7.7	5.4	5.9	4.6	3.0	5.0	2.7	-46.5%	0.7%	1.9%
Rest of World	7.3	7.0	6.2	7.3	8.2	7.7	8.2	8.3	7.7	5.5	5.4	-2.1%	-0.4%	3.9%
World	67.3	83.6	94.1	129.6	146.7	134.3	129.0	131.5	138.6	119.5	137.5	15.4%	6%	100%

♦Less than 0.05%.

Sources: includes data from US Geological Survey, British Geological Survey © UKRI and World Mining Data.

Lithium production

Mine production

Thousand tonnes of Lithium content	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Growth rate per annum		Share 2017
												2017	2006-16	
Argentina	3.0	3.2	2.2	3.0	3.0	2.7	2.5	3.2	3.6	5.8	5.5	-4.9%	7.2%	12.3%
Australia	6.8	6.7	5.5	8.5	11.7	12.6	10.1	12.4	11.9	14.9	18.7	26.2%	9.1%	41.8%
Brazil	0.2	0.2	0.2	0.2	0.3	0.2	0.4	0.2	0.2	0.2	0.2	–*	-1.9%	0.4%
Chile	11.5	11.0	6.0	10.4	13.6	13.9	11.7	12.0	10.9	15.2	15.0	-1.0%	4.3%	33.6%
China	3.0	3.3	3.8	4.0	4.1	4.5	4.7	2.3	2.0	2.3	3.0	30.8%	-2.0%	6.7%
Portugal	0.6	0.7	–	0.8	0.8	0.6	0.6	0.3	0.2	0.4	0.4	–*	2.3%	0.9%
US	1.5	1.5	1.5	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	–*	-5.0%	2.0%
Zimbabwe	0.3	0.5	0.4	0.5	0.5	1.1	1.0	0.9	0.9	1.0	1.0	–*	5.2%	2.2%
Rest of World	0.7	0.7	0.3	–	–	–	–	–	–	–	–	–	-100.0%	–
World	27.6	27.7	19.8	28.2	35.0	36.5	31.9	32.2	30.7	40.7	44.7	10.2%	5%	100%

*Zero (not leap year adjusted).

Sources: includes data from US Geological Survey, British Geological Survey © UKRI and World Mining Data.

Natural graphite production

Mine production

Thousand tonnes	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Growth rate per annum		Share 2017
												2017	2006-16	
Brazil ¹	77.2	80.5	59.4	92.4	105.2	88.1	91.9	87.0	75.1	72.0	72.0	– ³	-0.6%	7.0%
Canada	28.0	27.0	15.0	20.0	25.0	24.0	20.0	30.0	30.0	30.0	30.0	– ³	0.7%	2.9%
China	800.0	650.0	450.0	700.0	800.0	820.0	750.0	780.0	780.0	780.0	780.0	– ³	0.8%	75.5%
India ²	170.8	117.8	124.6	115.7	153.3	134.7	146.4	116.7	135.5	151.8	151.8	-69.4%	-0.7%	4.5%
Madagascar	5.4	4.9	3.4	3.8	3.6	2.9	4.3	5.3	8.1	9.2	8.2	-10.6%	6.6%	0.8%
Mexico	9.9	7.2	5.1	6.6	7.3	7.5	7.0	9.2	6.5	3.8	3.8	– ³	-10.6%	0.4%
Mozambique	–	–	–	–	–	–	–	–	–	–	–	–	–	2.2%
Russian Federation	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	15.9	19.4	25.0	29.2%	3.3%	2.4%
Sri Lanka	9.6	6.6	3.2	3.4	3.4	4.2	3.1	3.1	2.8	3.1	3.1	– ³	-6.0%	0.3%
Ukraine	10.6	11.3	4.3	2.8	0.6	4.6	6.9	13.8	14.5	14.6	14.6	– ³	3.2%	1.4%
Zimbabwe	5.4	5.1	2.5	4.0	7.0	6.0	4.0	7.0	7.0	6.0	6.0	– ³	-0.9%	0.6%
Rest of World	36.9	40.7	58.5	24.7	25.3	49.8	51.6	37.1	22.8	21.6	21.6	– ³	-7.1%	2.1%
Total World	1167.8	965.2	740.0	987.4	1144.7	1155.8	1099.3	1103.2	1098.2	1111.6	1033.8	-6.7%	0%	100%

¹Including beneficiated and directly shipped material.

²Run of the mine.

³Zero (not leap year adjusted).

Sources: includes data from US Geological Survey, British Geological Survey © UKRI and World Mining Data.

Rare earth metals production

Mine production

Thousand tonnes ¹	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Growth rate per annum		Share 2017
												2017	2006-16	
Australia	–	–	–	–	2.2	3.2	1.3	6.2	11.9	13.9	17.3	24.8%	–	13.2%
Brazil	0.6	0.5	0.2	0.1	0.1	1.6	0.3	–	0.9	2.2	2.0	-8.8%	15.4%	1.5%
China	120.0	125.0	129.0	89.2	93.8	93.8	93.8	105.0	105.0	105.0	105.0	– ²	-2.3%	80.5%
India	†	†	†	–	–	–	0.3	1.7	1.0	1.0	1.0	– ²	35.7%	0.7%
Malaysia	0.4	0.1	†	0.4	0.4	0.1	0.2	0.2	0.3	0.3	0.3	– ²	-3.5%	0.2%
Russian Federation	2.7	2.5	1.9	1.5	1.4	2.1	1.4	2.1	2.3	3.1	3.3	7.4%	0.4%	2.5%
Thailand	–	–	4.0	5.6	3.1	0.1	0.1	1.9	0.8	1.6	1.6	– ²	–	1.2%
US	–	–	–	–	–	3.0	5.5	5.4	5.9	–	–	–	–	–
Rest of World	–	–	–	0.2	0.2	0.2	0.1	–	0.3	0.2	0.1	-54.4%	–	0.1%
World	123.8	128.1	135.1	97.0	101.3	104.2	103.0	122.6	128.3	127.2	130.5	2.9%	-1%	100%

†Less than 0.05.

¹Thousand tonnes of rare earth oxide equivalent.

²Zero (not leap year adjusted).

Sources: includes data from US Geological Survey, British Geological Survey © UKRI and World Mining Data.

Reserves of key materials

Cobalt reserves

Thousand tonnes	At end of 2017	Share	R/P ratio
Australia	1200	16.9%	257
Canada	250	3.5%	39
Democratic Republic of Congo	3500	49.3%	39
Cuba	500	7.0%	121
Madagascar	150	2.1%	48
Morocco	17	0.2%	7
New Caledonia	64	0.9%	23
Papua New Guinea	51	0.7%	16
Philippines	280	3.9%	66
Russian Federation	250	3.5%	45
South Africa	29	0.4%	12
Zambia	270	3.8%	102
Rest of World	539	7.6%	101
World	7100	100.0%	52

Lithium reserves

Thousand tonnes	At end of 2017	Share	R/P ratio
Argentina	2000	12.5%	364
Australia	2700	16.9%	144
Brazil	48	0.3%	240
Chile	7500	46.9%	500
China	3200	20.0%	1067
Portugal	60	0.4%	150
US	35	0.2%	39
Zimbabwe	23	0.1%	23
Rest of World	434	2.7%	–
World	16000	100.0%	358

*Reserves included in world total.

♦Less than 0.05%.
n/a not available.

Natural graphite reserves

Thousand tonnes	At end of 2017	Share	R/P ratio
Brazil	70000	25.9%	972
Canada	*	n/a	n/a
China	55000	20.4%	71
India	8000	3.0%	173
Madagascar	1600	0.6%	194
Mexico	3100	1.1%	808
Mozambique	17000	6.3%	739
Russian Federation	14800	5.5%	592
Sri Lanka	*	n/a	n/a
Ukraine	*	n/a	n/a
Zimbabwe	*	n/a	n/a
Rest of World	*	n/a	n/a
World	270000	100.0%	261

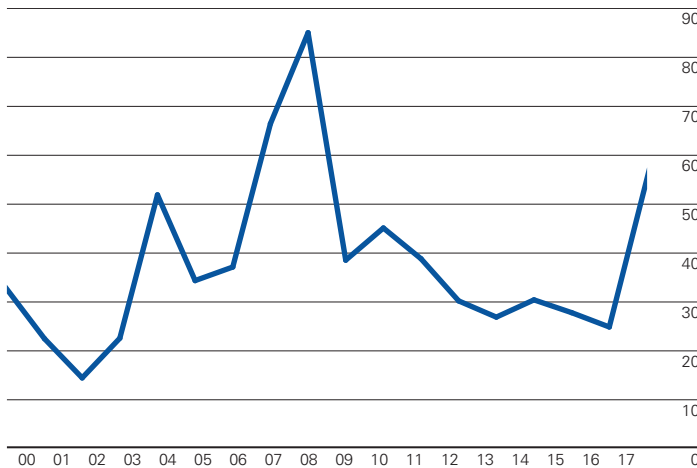
Rare earth metals reserves

Thousand tonnes	At end of 2017	Share	R/P ratio
Australia	3400	2.8%	197
Brazil	22000	18.3%	11000
China	44000	36.7%	419
India	6900	5.8%	7218
Malaysia	30	♦	100
Russian Federation	18000	15.0%	5485
Thailand	*	n/a	n/a
US	1400	1.2%	–
Rest of World	*	n/a	n/a
World	120000	100.0%	920

Source (for all tables): includes data from US Geological Survey.

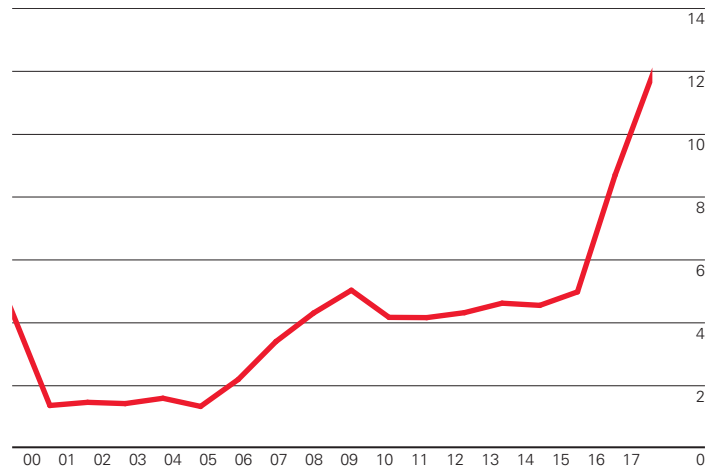
Cobalt prices

Thousands of US dollars per tonne*



Lithium carbonate prices

Thousands of US dollars per tonne†



*2000-2012 spot grade for cathodes, source US Geological Survey.
2013-2017 minimum purity 99.8%, source London Metal Exchange.
†2000-2008 unit value, data series 140, source US Geological Survey.
2009-2017 FOB South America, source Benchmark Mineral Intelligence.