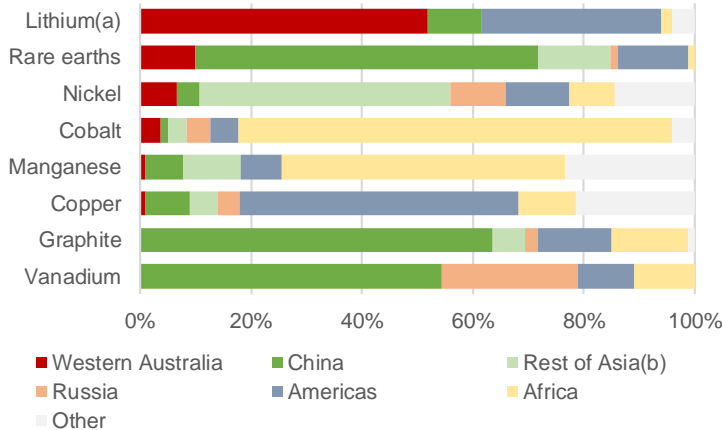




WORLD BATTERY MINERALS MARKET

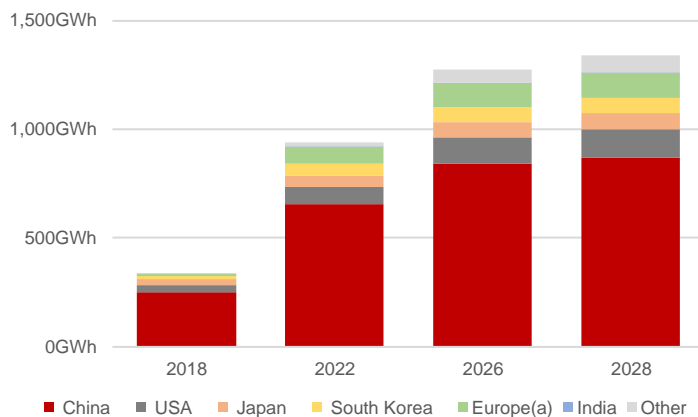
Major global battery minerals mine production: 2019



(a) Lithium content of brine, spodumene, other hard rock or clay mine production. (b) Excludes China.
Source: US Geological Survey, Mineral Commodity Summaries; Office of the Chief Economist, Resources and Energy Quarterly; and Geoscience Australia.

- Western Australia is the world's largest lithium producer and a significant producer of other battery minerals.
- Western Australia accounted for 52% of global lithium production in 2019, followed by Chile (23%), China (10%) and Argentina (8%).
- Western Australia also ranked among the top 5 global producers for cobalt (4% global share), rare earths (10%) and nickel (7%) in 2019.
- China was the world's largest producer of graphite (64%), rare earths (63%) and vanadium (55%) in 2019, and a significant producer of all other battery minerals.
- In 2019, the world's largest producer of:
 - Nickel was Indonesia (30%).
 - Cobalt was Congo (71%).
 - Manganese was South Africa (29%).
 - Copper was Chile (28%).

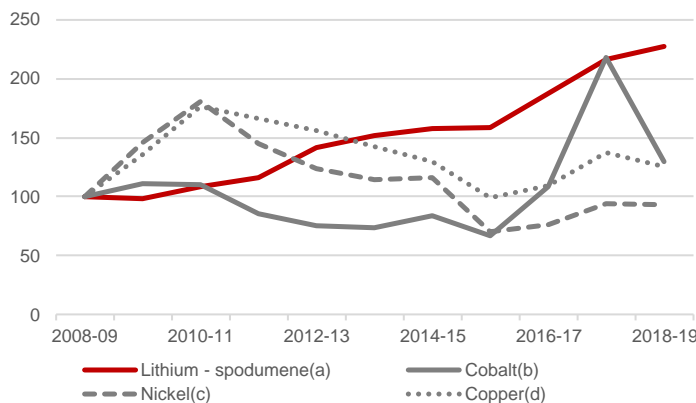
World lithium-ion battery manufacturing capacity forecast¹



¹ Large-sized cells. (a) Sweden, Hungary, Germany, Poland, United Kingdom and France.
Source: Roskill, Lithium-ion Batteries Outlook to 2028 (April 2019).

- Lithium-ion batteries are made from mostly lithium, graphite, nickel, cobalt and manganese.
- World lithium-ion battery manufacturing capacity rose 54% to 335 gigawatt hours (GWh) in 2018.
- China accounted for 74% of global lithium-ion battery manufacturing capacity in 2018, followed by the United States (9%), Japan (8%), South Korea (4%) and Europe^(a) (3%).
- Roskill forecasts global lithium-ion battery manufacturing capacity will quadruple to 1,340GWh by 2028, led by China.
- By 2028, Roskill forecasts 65% of global lithium-ion battery manufacturing capacity will be in China, followed by the United States (10%), Europe^(a) (9%), Japan (6%) and South Korea (5%).

Battery minerals price indexes¹ (annual average)



¹ Prices in nominal US dollars a tonne (price index reference year is 2008-09 = 100.0). (a) Western Australia's unit prices of spodumene concentrate sales converted to US dollars using annual average exchange rates. (b) Minimum 99.80% purity. (c) Minimum 99.80% purity, cathodes. (d) Minimum 99.9935% purity, cathodes and wire bar.
Source: World Bank, Commodity Markets; and WA Department of Mines, Industry Regulation and Safety, Resource Data Files.

- Lithium and other battery minerals prices have started to ease because of slowing electric vehicle demand in China and an oversupply of battery minerals.
- Western Australia exports lithium as spodumene concentrate, but will begin exporting lithium hydroxide in 2020. Lithium hydroxide prices fell 34% to US\$14,257 a tonne in 2018-19.
- In 2018-19, the annual average price of:
 - Lithium spodumene concentrate^(a) rose 5% to US\$608/t.
 - Cobalt^(b) fell 40% to US\$45,368/t.
 - Nickel^(c) fell 1% to US\$12,339/t.
 - Copper^(d) fell 9% to US\$6,155/t.



WESTERN AUSTRALIA'S COMPETITIVENESS

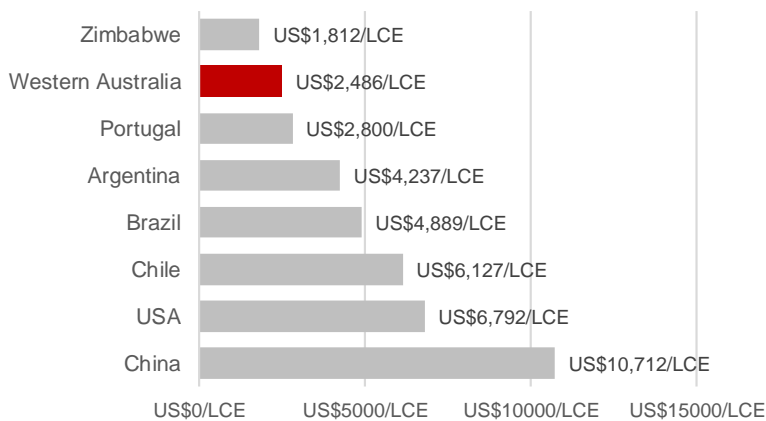
Estimated¹ battery minerals reserves: 2019

| Commodity | Unit | WA | Aust. | World | WA share of world |
|-------------|------|------|-------|-------|-------------------|
| Nickel | Mt | 19.0 | 20.0 | 89 | 21% |
| Cobalt | Mt | 1.1 | 1.2 | 7 | 16% |
| Lithium | Mt | 2.7 | 2.8 | 17 | 16% |
| Vanadium | Kt | 2.7 | 4.0 | 22 | 12% |
| Manganese | Mt | 36.0 | 100.0 | 810 | 4% |
| Rare earths | Mt | 2.3 | 3.3 | 120 | 2% |
| Copper | Mt | 5.2 | 87.0 | 870 | 1% |
| Graphite | Mt | 1.3 | 7.1 | 300 | 0.4% |

¹ Estimated from Australia's battery minerals reserves.
Source: US Geological Survey, Mineral Commodity Summaries; and Geoscience Australia.

- Western Australia has globally significant battery minerals reserves of a quality suitable for battery manufacturing.
- In 2019, Western Australia accounted for 21% of the world's nickel reserves.
- Western Australia accounted for over 10% of the world's cobalt, lithium and vanadium reserves in 2019.
- Western Australia had 5% or less of the world's manganese, rare earths, copper and graphite reserves in 2019.
- Western Australia's estimated battery minerals exploration expenditure rose 67% to \$466 million in 2019.

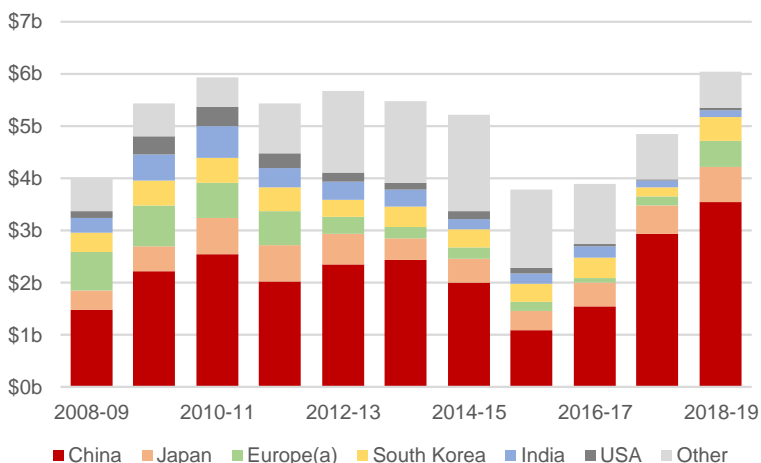
Total cash cost¹ of seaborne lithium exports: 2019



¹ Production costs for different lithium products and grades are adjusted to a benchmark product (lithium carbonate equivalent).
Source: S&P Global Market Intelligence, Mine Economics Model.

- Western Australia's lithium producers are among the world's lowest cost seaborne lithium exporters.
- The average total cash cost¹ of Western Australia's lithium exports was US\$2,486 a lithium carbonate equivalent (LCE) in 2019, well below the world average of US\$4,084/LCE.
- In 2019, the average total cash cost of Western Australia's exports of:
 - Nickel was US\$8,554/t (world average was US\$8,395/t).
 - Copper was US\$3,990/t (world average was US\$3,497/t).

Battery minerals¹ export markets (selected)



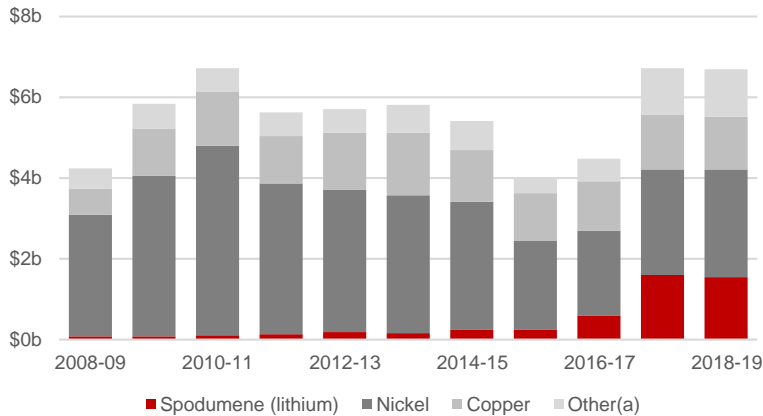
¹ Includes copper, lithium, nickel and graphite. Excludes rare earths, cobalt and vanadium, and manganese from 2015-16. (a) Includes the larger European markets for Western Australia's nickel exports only.
Source: ABS 5368.0 International Trade in Goods and Services, and WA Department of Mines, Industry Regulation and Safety, Resource Data Files.

- Around 59% of Western Australia's battery minerals exports went to China in 2018-19, with the value of exports up 21% to \$3.6 billion.
- In 2018-19, Western Australia's battery minerals exports to:
 - Japan rose 20% to \$670 million.
 - Europe^(a) rose from \$165 million to \$497 million.
 - South Korea rose from \$177 million to \$448 million.
 - India rose 6% to \$136 million.
 - United States rose from \$13 million to \$52 million.
- Western Australia's lithium and cobalt exports are mostly for battery manufacturing, as well as some nickel exports.
- New processing investment in Western Australia will see more nickel and other battery minerals exported for battery manufacturing.



CONTRIBUTION TO WESTERN AUSTRALIA'S ECONOMY

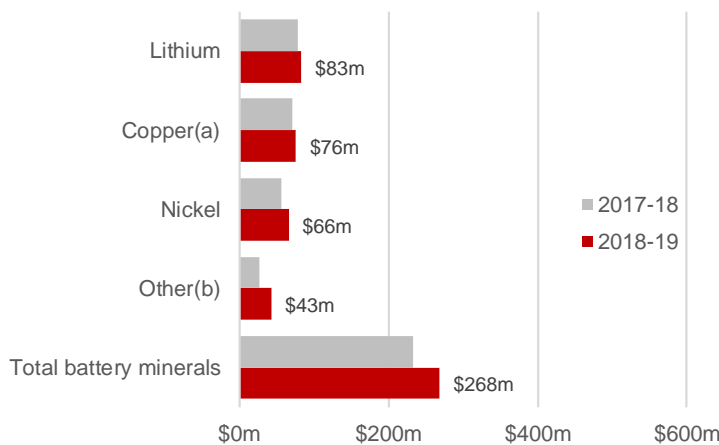
Battery minerals sales



(a) Includes cobalt, manganese, vanadium and rare earths (and other minerals).
Source: WA Department of Mines, Industry Regulation and Safety, Resource Data Files.

- Battery minerals accounted for 5% of the value of Western Australia's minerals and petroleum sales in 2018-19.
- The value of Western Australia's battery minerals sales fell 0.4% to \$6.7 billion in 2018-19.
- In 2018-19, the value of sales for:
 - Spodumene (lithium) fell 2% to \$1.5 billion.
 - Nickel rose 1% to \$2.7 billion.
 - Copper fell 2% to \$1.3 billion.
 - Other battery minerals^(a) rose 1% to \$1.2 billion.

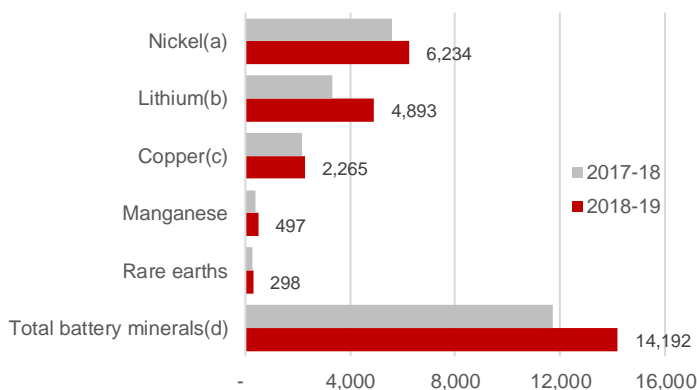
Battery minerals royalties



¹ Includes North West Shelf Grants. (a) Includes lead and zinc. (b) Includes rare earths, manganese, cobalt, vanadium and graphite.
Source: Western Australian Department of Mines, Industry Regulation and Safety, Resource Data Files.

- Battery minerals accounted for 4% of Western Australia's royalty revenue¹ in 2018-19.
- Battery minerals royalty revenue rose 15% to \$268 million in 2018-19.
- In 2018-19, the royalty revenue from:
 - Lithium rose 6% to \$83 million.
 - Copper^(a) rose 8% to \$76 million.
 - Nickel rose 16% to \$66 million.
 - Other battery minerals^(b) rose 58% to \$43 million.

Direct battery minerals industry employment¹



¹ Full-time equivalent. (a) Includes cobalt. (b) Includes tin and tantalum. (c) Includes lead and zinc. (d) Excludes graphite.
Source: Western Australian Department of Mines, Industry Regulation and Safety, Resource Data Files.

- Battery minerals^(d) accounted for 14% of direct employment in Western Australia's minerals mining industry in 2018-19 (excluding exploration) on a full-time equivalent basis.
- Direct employment in Western Australia's battery minerals^(d) industry rose 21% to 14,192 in 2018-19.
- In 2018-19, direct employment in the industry of:
 - Nickel^(a) rose 12% to 6,234.
 - Lithium^(b) rose 47% to 4,893.
 - Copper^(c) rose 5% to 2,265.
 - Manganese rose 31% to 497.
 - Rare earths rose 3% to 298.



CONTRIBUTION TO WESTERN AUSTRALIA'S ECONOMY continued

- Western Australia's Greenbushes mine has produced lithium since 1983 when it was mainly used in glass and ceramics manufacturing. More recently, the Greenbushes mine has expanded production and other lithium mines have been developed to meet the growing demand from lithium-ion battery manufacturers. Lithium-ion batteries are used in consumer electronics, clean energy storage and electric vehicles.
- Western Australia exports lithium as spodumene concentrate for further processing in mainly China. Western Australia will begin exporting lithium hydroxide once Tianqi's Kwinana processing plant begins production in 2020 and Albemarle's Kemerton plant begins production in 2021. There are other spodumene mines and hydroxide processing plants under consideration in Western Australia.
- Western Australia has battery-grade nickel and other minerals, although most of these minerals are exported for uses other than battery manufacturing. New investment is proposed to produce nickel sulphate and hydroxide suitable for battery manufacturing, as well as other battery minerals. In February 2020, Western Australia had \$3.2 billion of major battery minerals projects under construction or committed and \$24.4 billion under consideration.

Major battery minerals projects¹

| Operator | Project | Primary commodity | Region | Capex (\$m) | Capacity (ktpa) | Start-up |
|--|-------------------------------------|-------------------|----------------------|-------------|-----------------|----------|
| Operating² | | | | | | |
| Lithium | | | | | | |
| Talison Lithium [^] | Greenbushes mine | Spodumene | South West | n.a. | 650 | 1983 |
| Galaxy Resources | Mt Cattlin mine | Spodumene | Goldfields-Esperance | 250 | 180 | 2016 |
| Mineral Resources | Mt Marion mine | Spodumene | Goldfields-Esperance | 211 | 20 | 2016 |
| Pilbara Minerals | Pilgangoora mine (stage 1) | Spodumene | Pilbara | 274 | 45 | 2018 |
| Altura Mining | Pilgangoora mine (stage 1) | Spodumene | Pilbara | 140 | 33 | 2018 |
| Nickel, cobalt | | | | | | |
| BHP | Nickel West mines & plants | Nickel* | Goldfields-Esperance | n.a. | 70 | 1967 |
| Glencore | Murrin Murrin mine & plant | Nickel* | Goldfields-Esperance | 2,500 | 32 | 1999 |
| Other | | | | | | |
| Sandfire Resources | DeGrussa mine | Copper | Mid West | 409 | 77 | 2012 |
| Hancock Prospecting | Nicholas Downs mine | Manganese | Pilbara | n.a. | 600 | 2013 |
| Lynas | Mt Weld mine & plant | Rare earths | Goldfields-Esperance | 713 | 27 | 2013 |
| Artemis Resources | Whundo mine | Copper | Pilbara | n.a. | 50 | 2017 |
| Consolidated Minerals | Woodie Woodie mine | Manganese | Pilbara | 30 | 1,500 | 2017 |
| Northern Minerals | Browns Range pilot plant | Rare earths | Kimberley | 89 | 0.05 | 2018 |
| Under construction or committed | | | | | | |
| Lithium | | | | | | |
| Tianqi Lithium | Kwinana plant (stage 1) | Li Hydroxide | Perth | 400 | 24 | 2020 |
| Talison Lithium [^] | Greenbushes mine (expansion 1) | Spodumene | South West | 320 | 700 | 2020 |
| Albemarle | Kemerton plant (trains 1-2) | Li Hydroxide | South West | 1,700 | 40 | 2021 |
| Nickel, cobalt | | | | | | |
| BHP | Nickel West/Kwinana plant (stage 1) | Ni Sulphate* | Perth | 60 | 100 | 2020 |
| Panoramic Resources | Savannah mine (extension) | Nickel** | Kimberley | 36 | 11 | 2020 |
| Artemis Resources | Radio Hill plant (restart) | Nickel** | Pilbara | 30 | 500 | 2020 |
| BHP | Nickel West/Leinster mine expansion | Nickel | Goldfields-Esperance | 190 | n.a. | 2020 |
| Western Areas | Cosmos/Odysseus mine (stage 2) | Nickel | Goldfields-Esperance | 300 | 13 | 2023 |
| Other | | | | | | |
| Sandfire Resources | Springfield/Monty mine | Copper | Mid West | 90 | n.a. | 2020 |
| Under consideration³ | | | | | | |
| Lithium | | | | | | |
| Altura Mining | Pilgangoora mine (stage 2) | Spodumene | Pilbara | 119 | 33 | 2020 |
| Pilbara Minerals | Pilgangoora mine (stage 2) | Spodumene | Pilbara | 235 | 55 | 2022 |
| Tianqi Lithium | Kwinana plant (stage 2) | Li Hydroxide | Perth | 300 | 24 | 2023 |
| Covalent Lithium | Mt Holland/Earl Grey mine | Spodumene | Wheatbelt | 443 | 40 | 2023 |
| Talison Lithium [^] | Greenbushes mine (expansion 2) | Spodumene | South West | 516 | 600 | 2024 |
| Albemarle | Kemerton plant (trains 3-5) | Li Hydroxide | South West | n.a. | 60 | 2025 |
| Talison Lithium [^] | Greenbushes mine (expansion 3) | Spodumene | South West | 256 | 400 | 2026 |
| Covalent Lithium | Mt Holland/Kwinana plant | Li Hydroxide | Perth | 642 | 45 | n.a. |
| Nickel, cobalt | | | | | | |
| First Quantum Minerals | Ravensthorpe mine (restart) | Nickel | Goldfields-Esperance | 500 | 28 | 2020 |
| Ardea Resources | Kalgoorlie/Goongarrie mine & plant | Ni Hydroxide* | Goldfields-Esperance | 1,165 | 20 | 2022 |
| Metals X | Wingellina mine & plant | Ni Hydroxide* | Goldfields-Esperance | 2,500 | 40 | 2023 |
| PJSC Mining & MCN | Honeymoon Well mine | Nickel | Mid West | 1,500 | 40 | 2023 |
| GME Resources | NiWest/Murrin Murrin mine & plant | Ni Sulphate* | Goldfields-Esperance | 800 | 19 | 2023 |
| Conico | Mt Thirsty mine | Nickel* | Goldfields-Esperance | 371 | 35 | 2023 |
| BHP | Nickel West/Yakabindie mine | Nickel* | Goldfields-Esperance | 60 | 32 | 2024 |
| BHP | Nickel West/Kwinana plant (stage 2) | Ni Sulphate* | Perth | n.a. | 100 | n.a. |
| Ardea Resources | Yerilla mine | Nickel* | Goldfields-Esperance | 1,215 | 21 | n.a. |
| Other | | | | | | |
| Venturex Resources | Sulphur Springs mine | Copper | Pilbara | 169 | 14 | 2020 |
| Atlantic | Windimurra mine (restart) | Vanadium | Mid West | 150 | 5 | 2020 |
| Hastings Tech. Metals | Yangibana mine | Rare earths | Gascoyne | 427 | 15 | 2021 |
| Mineral Commodities | Munglinup mine | Graphite | Goldfields-Esperance | 52 | 55 | 2021 |
| Australian Vanadium | Gabanimtha mine | Vanadium | Mid West | 249 | 10 | 2021 |
| Element 25 | Butcherbird Yanneri Ridge mine | Manganese | Mid West | 155 | 500 | 2021 |
| Technology Metals | Gabanimtha mine | Vanadium | Mid West | 454 | 13 | 2022 |
| Mineral Resources | McIntosh mine | Graphite | Kimberley | 148 | 88 | 2023 |
| Caravel Minerals | Calingiri mine | Copper | Wheatbelt | 440 | 36 | 2023 |
| Lynas | Kalgoorlie C&L plant | Rare earths | Goldfields-Esperance | 500 | 10.5 | 2023 |
| OZ Minerals | West Musgrave mine | Copper- | Goldfields-Esperance | 995 | 28 | 2024 |
| Kibaran Resources | Kwinana plant (stages 1 & 2) | Graphite | Perth | 100 | 20 | n.a. |

Note – Spodumene concentrate produced from the Greenbushes mine contains around 5% to 7.5% lithium. n.a. – not available or not applicable. Li = Lithium. Ni = Nickel. ^ Tianqi Lithium and Albemarle Joint Venture. * Produces cobalt. ** Produces copper. - Produces nickel. ¹ Major projects that produce battery minerals as a primary commodity (excludes projects that produce battery minerals as a by-product only, such as copper produced at the Boddington, Telfer and Deflector gold mines). ² Includes all lithium projects and the two largest projects by capital expenditure for each of the other commodities. ³ Projects that have not made a final investment decision and may not proceed. Includes projects with the largest capital expenditures across each commodity, as well as some projects without reported capital expenditures but of significant importance.
Source: S&P Global Market Intelligence; and company announcements, reports and presentations.