

Alphamin Resources

Alpha tin actually

Initiation of coverage

Metals & mining

16 March 2021

Price **C\$0.64**

Market cap **C\$759m**

C\$1.2691/US\$

Net debt* (US\$m) at end-December 2020 54.1

*Excludes US\$3.4m in lease liabilities

Shares in issue 1,185.3m

Free float 42%

Code AFM

Primary exchange TSX-V

Secondary exchange JSE AltX

Alphamin Resources offers rare exposure to immediate positive cash flow from a metal both Rio Tinto and the Massachusetts Institute of Technology regard as being the most likely to benefit from the widespread electrification of transport networks and the world economy. Fortuitously, Alphamin's Bisie tin mine in the north-eastern Democratic Republic of the Congo (DRC) is hitting its stride at just the moment that the tin price is being forced upwards in the biggest squeeze in decades, providing it with a golden opportunity to repay debt and even to consider making distributions to shareholders as early as next year.

| Year end | Revenue (US\$m) | PBT* (US\$m) | EPS* (US\$) | DPS (US\$) | P/E (x) | Yield (%) |
|----------|-----------------|--------------|-------------|------------|---------|-----------|
| 12/19 | 27 | (3) | 0.01 | 0.00 | 73.4 | N/A |
| 12/20 | 187 | (1) | (0.01) | 0.00 | N/A | N/A |
| 12/21e | 271 | 113 | 0.06 | 0.00 | 8.4 | N/A |
| 12/22e | 258 | 110 | 0.06 | 0.00 | 8.7 | N/A |

Note: *PBT and EPS are 'as reported'.

In arcadia?

Bisie is the only commercial mine of scale in the North Kivu province. It occupies a small footprint and is technically simple in that processing involves no more than the gravity concentration of cassiterite (one of the world's heaviest minerals) into a concentrate that is then exported to Uganda. Despite requiring a two to three-month round trip for resupply (depending on the weather), procurement to site has not proved to be a problem and critical parts can be flown into the mine, if necessary, within seven days. In the meantime, such unrest as may arise in the region occurs in distinct 'hot spots' from which the mine is protected by its remoteness and relative obscurity and the region's lack of infrastructure which, when combined with the increasing barriers to tin smuggling (cf gold), provide it with an effective security moat. Like most of Africa, Bisie has, to date, been left relatively unscathed by the coronavirus.

Valuation: C\$0.496 doubling to C\$1.117 per share

Bisie is now operating, to all intents and purposes, at full capacity. With the current tin price having risen by 30.2% since Q420, we estimate that there is scope for net debt to reduce to zero before end-FY21. Beyond that, at a long-term tin price of US\$23,425/t, we estimate that Alphamin should be capable of generating revenues of c US\$266m pa (average FY22–27), EBITDA of US\$139m and EPS of 6.19 US cents per share. On this basis, we estimate a valuation for Alphamin of 39.1 US cents, or 49.6 Canadian cents per share. This valuation assumes that management executes the Bisie life of mine (LOM) schedule according to plan and applies a 10% discount rate to future forecast dividends. If, however, management proves itself adept at continually replenishing reserves and resources to the extent that it keeps its plant fully utilised beyond FY27 (NB see Exploration section on page 6), then our valuation of Alphamin's shares on average rises by 2.5 Canadian cents for every year at full capacity up to FY32 and, beyond that, potentially to as high as C\$1.117/share (subject to capex etc).

Share price performance



% 1m 3m 12m

Abs 10.3 85.5 276.5

Rel (local) 8.1 72.7 149.8

52-week high/low C\$0.64 C\$0.12

Business description

Alphamin Resources owns (84.14%) and operates the Mpama North tin mine in the North Kivu province of the Democratic Republic of the Congo with a grade of c 4.5% Sn (the world's highest). Accounting for c 4% of the world's mined supply, it is the second largest tin mine in the world outside China and Indonesia.

Next events

Q121 results May 2021

Q221 results August 2021

Q321 results October 2021

Q421/FY21 results March 2022

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Alphamin Resources is a research client of Edison Investment Research Limited

Investment summary

Company description: In the right place at the right time

Alphamin owns (84.14%) and operates Bisie, the highest-grade tin mine in the world in the North Kivu province of the DRC. Fortuitously, Bisie is hitting its stride just as the tin price is being forced upwards in the biggest squeeze in decades, providing it with a golden opportunity to repay debt and even to consider making distributions to shareholders as early as next year.

History and early teething troubles

The development of the Bisie mine was sanctioned by Alphamin in late 2017 and, after two years of construction, it declared commercial production in Q319. No sooner had it done so, however, than the logistically crucial Maiko bridge (by which Alphamin exported its concentrate) collapsed, simultaneously delaying revenues and increasing costs. The bridge has since been repaired; however, the company continued to suffer as the initial Chinese lockdown in early 2020 caused the tin price to fall to a level first seen in 1980. Now however, the key industrial areas of China (the world's largest consumer of tin) have largely emerged from lockdown, at the same time as the key producing nations (especially Indonesia) continue to remain beset by restrictions while demand for electronic goods in Europe and America is rising. Suffice it to say that Bisie, like much of the rest of Africa, remains largely unaffected by the COVID-19 pandemic.

Valuation: C\$0.496 potentially doubling to C\$1.117 per share

Assuming a long-term real tin price of US\$23,425/t, we estimate a discounted dividend valuation of Alphamin of 39.1 US cents, or 49.6 Canadian cents per share. This valuation assumes that management executes the Bisie LOM schedule according to plan and applies a 10% discount rate to future forecast dividends. If, however, in addition to its execution of the Bisie mine plan, management is also successful in its exploration to first delineate new resources and then to convert those resources into reserves, our valuation of Alphamin's shares on average rises by 2.5 Canadian cents for every year by which it maintains throughput at FY27 levels until FY32. Replenishing reserves and resources continually potentially increases this valuation up to a maximum of C\$1.117/share.

Financials: Net debt already declining rapidly

Bisie is now operating, to all intents and purposes, at full capacity. With the current tin price having risen by 36.4% since Q420, we estimate that there is scope for net debt to have reduced to zero before the end of FY21 and for Alphamin, at least theoretically, to be in a position to make dividend distributions to shareholders. Beyond that, at our long-term tin price of US\$23,425/t, we estimate that Alphamin should be able to generate revenues of c US\$266m per year (average FY22-27e), EBITDA of US\$139m pa and EPS of 6.19 US cents per share at a 59.1% gross margin.

Risks and sensitivities: Share price discounting lower tin price

Self-evidently, operating in the DRC is not without risk (eg rains in Q420) and readers are encouraged to form their own views on the level of returns acceptable for an operating mine in North Kivu (see Exhibit 17). Otherwise, for each 10% by which the price of tin moves relative to our long-term price of US\$23,425/t, our valuations, above, change by approximately 17% (see Exhibit 15), whereas for each 10% by which operating costs move, our valuations change by approximately 8% (see Exhibit 16). Alternatively, Alphamin's share price of C\$0.64 can be said to discount a long-term real tin price of US\$27,358/t (ie 16.8% above our assumed long-term price), whereas adopting the current (three-month) tin price (of US\$25,600/t) as our long-term price instead results in a valuation for Alphamin (excluding any blue-sky, upside exploration potential) of C\$0.58/share.

Company description: World's highest-grade tin mine

Alphamin owns (84.14%) and operates the Bisie tin mine in the North Kivu province of the DRC. Bisie comprises the Mpama North underground mine with a grade of c 4.5% Sn (the world's highest and equivalent to a 21.2g/t gold grade) and the nearby Mpama South prospect. Accounting for c 4% of the world's mined supply, it is the second largest tin mine in the world outside China and Indonesia.

History

A brief history of Alphamin's involvement in the Bisie tin project is provided below. A fuller one is provided in the Appendix at the back of this report, on page 19.

The tin-bearing gossan on the Bisie ridge was discovered in 2002 whereupon it became the subject of widespread small-scale, artisanal mining. Alphamin's interest began in 2011, when it acquired an initial 70% interest in the Bisie Tin Project from Kivu Resources, which it later increased to 100%.

Prior to Alphamin's involvement there had never been a formal mineral reserve or resource delineated at Bisie. However, this changed when, in November 2013, the company reported a maiden NI 43-101 compliant inferred mineral resource of 4.0Mt at a 3.5% tin grade containing 141,200t of contained tin (at a 0.25% Sn cut-off), with the best assay results occurring in the four deepest holes drilled. Copper, lead, zinc and silver were also present.

An initial definitive feasibility study (DFS) was completed in February 2016, which estimated that the project could produce 9,000t of tin per year over an estimated 10.5 years after an initial US\$119.2m in capital expenditure. The DFS was subsequently updated and optimised to reflect front-end engineering & design and control budget estimates, such that it ultimately projected production of 152,300t of tin over a 12-year life with payback in 17 months after an initial US\$126.1m in capital expenditure, resulting in a project NPV₈ of US\$402.2m and an internal rate of return of 49.1%.

After a final investment decision, Alphamin secured an US\$80m senior secured, non-revolving credit facility in November 2017 with Sprott, Barak and Tremont to be provided to ABM. Construction at Bisie commenced later the same year and, after slightly more than a year's construction, plant commissioning commenced in early 2019. Just prior to plant commissioning however, it was decided to change the mining method at Mpama North to one of cut and fill, after a management review into the suitability of sublevel caving in the light of prevailing rock conditions. Ultimately, the change resulted in revised reserves and a revised mining schedule in addition to adjustments to operating cost assumptions, mined grades and metallurgical recoveries. Nevertheless, the mine declared commercial production in Q319.

While Bisie was ramping up to full production, on 30 October 2019, the logistically important Maiko Bridge at Waine-Rukula (50km south-east of Kisangani in the direction of Walikale), collapsed. Prior to the collapse, concentrate produced at Bisie was typically trucked over the Maiko Bridge en route to Kisangani and, from there, to Gerald Metals depots (based in Kampala, Uganda) and then on to Mombasa. As a result, without the Maiko Bridge, Bisie concentrates were unable to move east by road. In addition, the collapse of the bridge also meant that consumables used in processing and general mine operation could not be imported, which was a key consideration in the ramp-up of the mine at a time when it needed to alter process flows in order to deal with elevated arsenic concentrations. As a consequence of the collapse, Alphamin incurred additional logistics costs in Q120 relating to the sale of concentrate produced in Q419, which was not sold as a result of the Maiko bridge collapse plus additional costs (eg hiring a helicopter from South Africa to transport material across the Maiko river during the bridge repair). In consequence, on 9 December 2019, the

company accepted a trader advance of US\$12.6m from the company's offtake partner, Gerald Metals, to assist with cashflow during the period of the bridge's repair. The advance took the form of a spot contract for the sale of US\$20m of tin concentrate and was ostensibly extinguished in Q120 and then fully extinguished in Q320 after the delivery of the associated lots to the designated delivery point in Uganda.

On 15 May 2020, Alphamin concluded a private placement of US\$31m which was applied to reduce its debt balance. Concurrently, it signed an amended and restated credit agreement with improved terms. Finally, in May 2020, it settled certain third-party indebtedness of ABM, the owner of the Bisie tin mine, by the issue of Alphamin shares in consideration for a temporary loan due by ABM. Subsequently, it secured the required board and shareholder approvals from ABM to convert this ABM loan into new shares of ABM, which increased Alphamin's equity ownership of ABM to 84.14%, with the IDC's interest then being diluted to 10.86% and the government of the DRC's interest remaining at 5%.

Geography

The Bisie Tin Project is located approximately 60km northwest of Walikale Centre and 180km northwest of Goma, the capital of the North Kivu Province, in the eastern DRC.

Among other things, the area is characterised by dense forest, deeply weathered soils and high rainfall.

Exhibit 1: Alphamin Bisie mine location



Source: Alphamin presentation

Operating in North Kivu

Bisie is the only commercial mine of scale in the North Kivu province. It is technically simple and occupies a small footprint. Out of necessity, it has to be self-reliant. Nevertheless, procurement to site has not proved to be a problem. In the rainy season (at its height in Q4), this can involve a three-month round trip; however, the average journey time is typically measured in days. Moreover, critical parts can be flown into the mine, if necessary, within seven days. Plant spares are typically sourced from South Africa and engineering spares from Sweden, while the jig (the essential gravity separating component of the plant) is made in Australia. Otherwise, the mine requires no bulk consumables and few reagents. Cement is sourced within the DRC and all other supplies from the southern African region. In the meantime, unrest in the Walikale Territory is reported to have practically ceased while what unrest there is in North Kivu takes place primarily on the Ugandan

border, some 300km to the north-east as the crow flies (note: it is almost 1,000km via the only road that links the two through impenetrable jungle) and in distinct 'hot spots' from which the mine is protected by its remoteness and relative obscurity which, together with the region's lack of infrastructure, forms a very effective security moat around it.

Relative to gold concentrate, tin concentrate has a much higher volume per unit value of metal contained, making it relatively unattractive as a target for either rebel activity or smugglers. As a consequence, management reports that there have been no artisanal miners located on the property since being asked to leave by the provincial government. In addition, recent consumer protection and anti-foreign corruption legislation both in the US and the wider world has made it significantly harder for smelters to accept ore from non-accredited or unofficial sources. As well as offering relatively low rewards and relatively high logistical hurdles therefore, tin concentrate is also increasingly hard for smugglers to sell into the official market.

Geology

ABM has conducted a detailed mapping exercise across the permits that includes geological and structural interpretations from airborne geophysical campaign and full details of the geology at Bisie may be found in the NI 43-101 technical report lodged by Alphamin on Sedar.com on 13 February 2019. The following is the briefest possible summary of this geology. A more detailed summary is reproduced in the Appendix at the end of this report, on page 21. In simple terms however, the mineralisation at Mpama North site consists of a number of narrow veins, blocks or dispersions of cassiterite hosted in a chlorite schist. The tin mineralisation is also strongly associated with copper, introduced in late-stage fractures. For the purposes of its resources and reserves, the mineralisation is defined in three distinct vein systems, namely the Hanging Wall, Main and Footwall veins. The Main vein accounts for 95% of the resources at Mpama North and has thicknesses ranging from 2–22m. The Hanging Wall vein occurs 4–20m above the Main vein, while the Footwall vein occurs 2–12m below the Main vein. These two mineralised veins are restricted to the northern and southern areas of the deposit respectively.

Reserves and resources

A summary of Alphamin's mineral reserves and resources at Bisie is as follows:

Exhibit 2: Bisie resources & reserves

| Category | Resources* | | | | Category | Reserves | | | | Reserve/resource conversion | | |
|--------------|-------------|--------------|--------------------|---------------------------------|--------------|-------------|--------------|--------------------|-------------------------|-----------------------------|--------------|-------------------|
| | Tonnes (Mt) | Grade (% Sn) | Contained tin (kt) | Attributable tin contained (kt) | | Tonnes (Mt) | Grade (% Sn) | Contained tin (kt) | Implied life ** (years) | Tonnes (%) | Grade (%) | Contained tin (%) |
| Measured | 0.33 | 4.75% | 15.60 | 13.1 | Proven | 0.05 | 3.77% | 1.89 | 0.1 | 15.2% | 79.4% | 12.1% |
| Indicated | 3.99 | 4.59% | 183.40 | 154.3 | Probable | 3.28 | 4.01% | 131.49 | 9.1 | 82.2% | 87.4% | 71.7% |
| Inferred | 0.48 | 4.57% | 21.80 | 18.3 | Possible*** | | | | 0.0 | 0.0% | 0.0% | 0.0% |
| Total | 4.80 | 4.60% | 220.80 | 185.8 | Total | 3.33 | 4.01% | 133.38 | 9.3 | 69.4% | 87.1% | 60.4% |

Source: Alphamin, Edison Investment Research. Note: *0.5% Sn cut-off grade; **At a 360ktpa processing rate; ***Archaic.

Mineral resources were estimated as at end-June 2019. Mineral reserves were updated as at 31 December 2019 to take account of the revised LOM plan following a change in mining method from the previous Sub-Level Caving (SLC) mining method to Open Stopping with Hydraulic Backfill (LHS). The decision to transition from one to the other was made to improve safety and reduce technical risks associated with SLC in the underground environment at Mpama North. The LHS mining method has lower levels of dilution than the SLC mining method, which positively affects mined grades as well as reducing waste tonnes. However, it also requires more pillar support than SLC and thus has a lower extraction rate. As a result, a higher cut-off grade of 1.6% tin was used in the updated mineral reserves estimate of the 1.4% used in the 6 February 2017 estimate.

Although the amount of contained tin decreased by 20.3% or 33.9kt tin in the 31 December 2019 update, it was accompanied by an absolute increase in tin grade of 0.42 percentage points (11.8%). Of the 33.9kt decline in contained tin, more than a quarter, or 9.1kt tin, was attributable to mining depletion, while 24.8kt was attributable to the additional support required by the new mining method. Note that, at currently prevailing prices, Alphamin's resource at Bisie is the equivalent of a not insubstantial 3.3Moz gold equivalent.

Exploration

Alphamin regards the whole of the 13km Bisie ridge as being highly prospective. Initially, as part of its three-year objective to produce over 12,000 tons of contained tin per year, management conceived a resource drilling and conceptual small-scale development plan for the Mpama South prospect. Mpama South is located approximately 750m to the south of Mpama North and the resource drilling and study campaign was budgeted at US\$2.7m for FY20. In the event that the campaign confirms an economically viable project, Alphamin will have the option to expand and/or extend the life of its mining and processing operations. Expanding resources to the extent that reserves will support a 15-year life, in particular, holds out the possibility that the company could build a second plant – probably at Mpama South – which would approximately double production, but at a proportionately lower incremental unit cost, since the current footprint absorbs a big portion of Alphamin's current fixed costs. To this end, Alphamin's recent exploration update (released 12 March 2021) may prove significant. In addition to historical holes (recording intercepts as high as 18.75m at 3.91% Sn and 2.50m at 5.76% Sn, among others), in December 2020, Alphamin undertook an exploration programme at Mpama South that comprised 5,800m over 25 drill holes (average 232m/hole). To date, 23 holes totalling 5,056m (average 220m/hole) have been completed. All holes completed are reported to have exhibited visual mineralisation, confirming the continuity of the Main Zone system, while several exceptional intercepts were deemed to be comparable to the thick veins and brecciated zones existing at Mpama North. In addition, one new zone of mineralisation was discovered in the footwall which is said to have the appearance of being 'continuous and highly mineralised'. Highlights of the programme reported to date are as follows:

- Main Zone mineralisation intercepted at Mpama South is comparable to the resource mined at Mpama North
- A new parallel mineralisation zone has been discovered in the footwall of the Main Zone at Mpama South

Alphamin's initial goals from its exploration programme are to extend the life of Mpama North as well as declaring a maiden mineral resource at Mpama South and discovering at least one additional orebody along the highly prospective 13km Bisie Ridge. As a consequence of the work conducted to date, Alphamin has determined that additional drilling will now be conducted at Mpama South both to increase the size of the Main Zone and to incorporate the Footwall Zone into a maiden mineral resource estimate. The specific programmes to achieve these aims have been conceived as follows:

- Mpama South – 8,000 to 14,000m of drilling before declaring a maiden mineral resource towards the end of FY21 to be followed by a conceptual mining study, in-fill drilling and further step-out drilling to determine the extent of mineralisation
- Two drill targets 6-8km south of Mpama North have been identified along Bisie Ridge. A high-density geochemical soil sampling programme is underway and more accurate drilling targets will be identified from the outcomes of this programme in Q321.

In addition, the company also plans to begin underground drilling at Mpama North during FY21 to both expand and extend the current tin resource. Mpama North is open down dip, as well as along strike below Level 9. Development drilling in these areas has the potential to increase the resource base, while in-fill drilling has the potential to upgrade inferred mineral resources into the indicated category and, from there, potentially, into reserves. Drilling is anticipated to commence in August

2021 on the establishment of an underground drill drive on Level 6 and aims, via a 7,500m drilling campaign, to test the strike and dip extension of the currently producing orebody.

Mining and processing

Mining

Mining at Bisie is fully mechanised and trackless, using a small fleet and remotely operated load, haul dump machines. Host rock is described as 'very competent' and 'competent' even in the shear zone, with the possible exception of where it is in contact with the hanging wall. It is also not a wet mine. The decision to transition from a SLC mining method to LHS was made to improve safety and reduce technical risks associated with SLC in the underground environment encountered at Mpama North. The associated NI 43–101 technical report was compiled by Sound Mining Solutions. In general terms, the LOM schedule under the optimised 2019 mine plan (ie the one management is following) accelerated the production of both ore tonnes and higher grades forward within the life of the mine, thereby improving cash flows (all other things being equal). A comparison of the two LOM plans is as follows:

Exhibit 3: Bisie 2019 LOM schedule cf 2017 LOM schedule

| | | *Yr 1 | Yr2 | Yr 3 | Yr 4 | Yr 5 | Yr 6 | Yr 7 | Yr 8 | Yr 9 | Yr 10 | Yr 11 | Yr 12 | Yr 13 | Yr 14 |
|---------------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 2017 LOM | Tonnes ROM (kt) | 62.6 | 289.1 | 404.7 | 388.2 | 394.4 | 397.4 | 386.3 | 370.1 | 373.9 | 363.9 | 366.9 | 360.7 | 343.4 | 171.1 |
| schedule | Grade Sn (%) | 2.39 | 4.38 | 3.63 | 3.22 | 2.91 | 2.92 | 3.73 | 3.04 | 2.95 | 3.25 | 4.31 | 5.61 | 3.53 | 4.00 |
| | Contained tin (kt) | 1.5 | 12.7 | 14.7 | 12.5 | 11.5 | 11.6 | 14.4 | 11.2 | 11.0 | 11.8 | 15.8 | 20.2 | 12.1 | 6.8 |
| 2019 LOM | Tonnes ROM (kt) | 172.0 | 332.8 | 385.0 | 393.5 | 377.3 | 362.2 | 386.6 | 339.8 | 361.8 | 307.8 | 250.8 | 236.8 | 85.3 | 35.1 |
| schedule | Grade Sn (%) | 5.30 | 4.06 | 4.14 | 4.21 | 4.23 | 3.96 | 4.47 | 3.68 | 4.89 | 2.67 | 2.59 | 2.99 | 6.56 | 8.91 |
| | Contained tin (kt) | 9.1 | 13.5 | 15.9 | 16.6 | 15.9 | 14.3 | 17.3 | 12.5 | 17.7 | 8.2 | 6.5 | 7.1 | 5.6 | 3.1 |
| Cumulative tin (kt) | | +7.6 | +8.5 | +9.7 | +13.8 | +18.2 | +21.0 | +23.8 | +25.1 | +31.7 | +28.1 | +18.8 | +5.6 | -0.9 | -4.6 |

Source: Alphamin. Note: *Corresponds to FY19 for the 2019 LOM schedule.

The optimised 2019 LOM schedule includes a portion of inferred resources, which account for 13.6% of total tonnes mined, albeit less than half of these are scheduled in the first eight years of operations. NB: The original 2017 LOM schedule did not include any inferred resources. It also delivers cumulatively 28.1kt more tin contained in an equivalent ROM volume to the plant in the first 10 years of operation compared with the previous LOM schedule. As a consequence, however, it also has a longer 'tail' and lower volumes in the final years than the previous schedule. However, Alphamin's management's plan is that this will be augmented via exploration success at both Mpama South and underground at Mpama North (as described above).

In the meantime, in pursuit of further optimising overall tin processing recoveries to above the targeted level of 72%, the company has initiated a programme for the procurement and installation of a fine tin recovery circuit.

Processing

With a specific gravity of c 7 (akin to most metals in their elemental form and only slightly below that of pure tin itself), cassiterite has proved ideal for concentration via gravity separation and has been the principal source of tin ore since ancient history. The processing plant at Mpama North has a throughput capacity of 360ktpa and uses just such conventional gravity separation methods for the recovery of tin at Bisie into a c 60% concentrate.

The process starts with the crushing of the ore, with the coarse material accounting for 75% of the overall crushed material and the fine material accounting for 25%. The coarse material is then recovered using conventional jigs. Fine material is recovered from flotation cells employed to

remove sulphide material. The tin-rich concentrates are then thickened, filtered and exported to a smelter for refining.

Infrastructure

Power and water

Power at Bisie is supplied from a light fuel oil (LFO) diesel power station on site, that uses approximately 0.23 litres of LFO per kWh produced. Cables link the diesel power station to the process plant substation and an overhead 11kV power line links the mine with the diesel power station.

The required water for the project is sourced from existing mine water supplemented by supply from nearby springs and rivers.

Infrastructure and logistics

In order to gain day-to-day access to the site, ABM constructed a 34km access road from the project area to the village of Logu through rugged terrain and dense forest to link Bisie to National Route 3 (N3) that runs between Kisangani and Walikale. In general, fuel is transported to site in standard fuel tankers, carrying 30,000l per trip, while concentrate is exported in sealed containers holding c 22t per container on standard tri-axle mechanical trailers.

Notwithstanding the coronavirus pandemic, after some early disruptions (eg along the trucking routes between Kenya and Uganda), management reports that east African countries have generally reacted in an appropriate manner that is proportionate to the risks and that the logistical supply routes to and from the east of the DRC from Mombasa have continued to operate in an orderly and efficient manner.

COVID-19

As of 4 February 2021, the number of confirmed COVID-19 cases in Africa amounted to 3.6m, representing only around 3.5% of global infections (cf its 17.2% of the world's population, second only to Asia and approximately twice as large as the third most populous continent, Europe).

In the meantime, however, the novel coronavirus has caused considerable disruption to worldwide supply chains of goods, people and movement. To date however, no disruptions have been reported at Bisie and its supply routes to and from Mombasa, in particular, have remained functioning and unimpeded.

Assumptions

The tin market

Recent history

Between end-2016 and end Q119, the (three-month) tin price traded in a relatively narrow range of US\$20,131/t ($\pm 10\%$). From there, it declined materially (15%), to US\$17,175/t by the end of December 2019, following a reduction in tin demand as a result of the effect of the US/China and Japan/South Korea trade wars on the global electronics industry. It then fell further (23%) to reach US\$13,250/t in early 2020 due to the disruption to the world economy on account of the coronavirus outbreak and, in particular, the initial decline in demand from the world's largest consumer, China.

From its nadir of US\$13,250/t however, the price has to all intents and purposes, doubled as, first, producing countries such as Indonesia and Malaysia began to impose their own coronavirus restrictions, thereby constraining supply, and then demand began to recover in China as it started the process of relaxing its restrictions. As a consequence, the market is now in its tightest squeeze in over three decades. Refined tin exports so far in 2021 have recovered to pre-coronavirus levels at the same time as the world's top exporter, Indonesia, is struggling to ship product as anti-coronavirus restrictions at its mining and smelting operations in Bangka Belitung (Indonesia's largest tin producing province; NB it was formerly spelt Billiton and is the origin of the mining company of the same name) curb supply, while demand for solder and electronic products has risen, rather than fallen, as a consequence of the pandemic. As well as disrupting mining operations, seasonal bad weather has also disrupted exports of tin product from Indonesia, with January shipments from Indonesia falling 35% compared with December. More generally, like other tin-producing regions of the world, Indonesia is suffering from a depletion of reserves and, at the same time, is enforcing a crackdown on small scale and artisanal mining.

Exhibit 4: Cash LME tin price (99.85%), US\$/tonne, January 2020 to present



Source: Refinitiv

Note that we recently published a more detailed description of the longer-term dynamics driving the tin market (Edison explains: Tin), including the effects of the electrification of the world economy and transport systems and high-tech applications such as robotics on likely global demand. To the extent that these result in a higher future real price of tin, the following analyses may prove conservative (our Alphamin valuation sensitivity to the long-term price of tin is provided in the 'Sensitivities' section of this note).

Long-term tin price

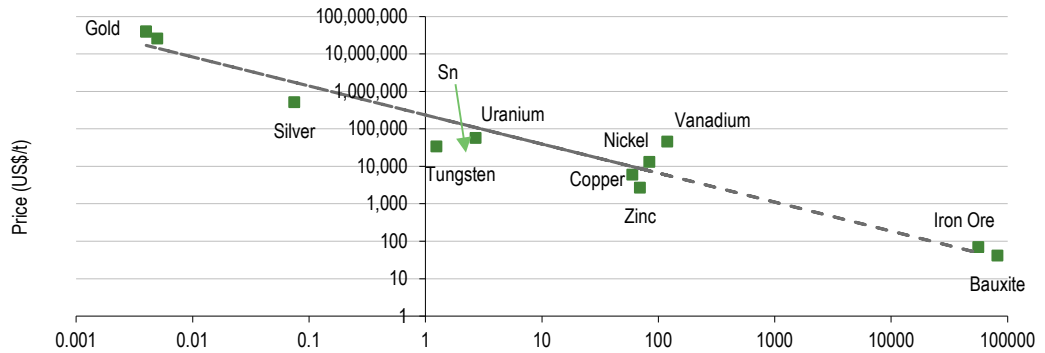
Edison has adopted two methods in determining its long-term tin price. The first is its long-term real price. The second is the correlation of the real tin price with the real oil price.

Geological context

Relative to its crustal abundance, the price of tin is something of a statistical anomaly.

Conducted at the same time that our report, Gold stars and black holes, was published in January 2019, a regression analysis between the logarithm of the price of a metal or mineral (in US dollars per tonne) and the logarithm of its crustal abundance demonstrated a strikingly close correlation.

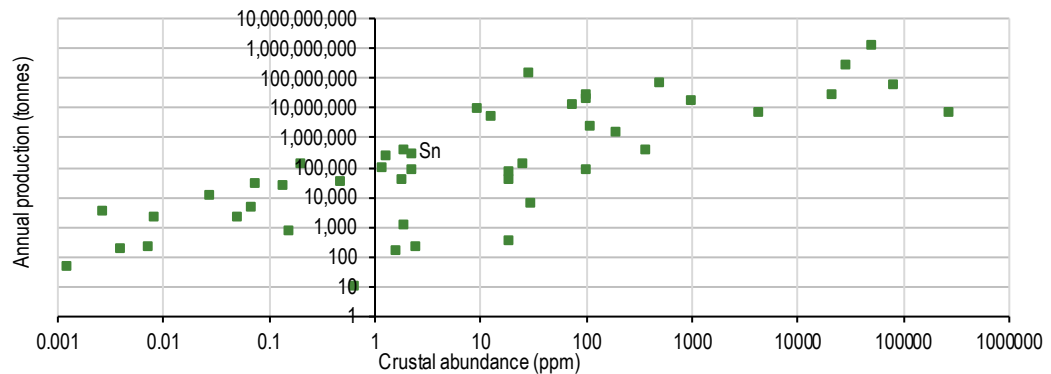
Exhibit 5: Graph of log (price in US\$/t) vs log (crustal abundance in ppm), selected metals and minerals



Source: Edison Investment Research

In this case, the Pearson Product-Moment (correlation) coefficient of the regression is -0.97 which is statistically significant at the 5% level (that is to say, there is less than a 5% chance that the relationship occurred by chance). The position of tin (currently) on the graph is shown by the arrow. In this particular case, however, it can be seen that the current price of tin is low relative to its crustal abundance of 2.2 parts per million (ppm). In fact, on the basis of the strict correlation between the two, a crustal abundance of 2.2ppm should, all other things being equal, imply a price of US\$125,265/t with a likely lower limit (derived from the error of estimation) of US\$39,811/t. The fact that tin is trading at a price of US\$26,215/t at the time of writing and that its price has only ever peaked at US\$34,700/t in nominal terms and US\$63,429/t in real terms therefore indicates that it is cheap in relation to its crustal abundance. At the same time, the following chart demonstrates that tin is also over-exploited relative to its crustal abundance:

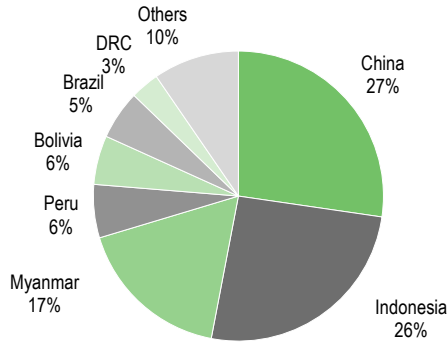
Exhibit 6: Crustal abundance (ppm) vs annual production (tonnes), selected metals and minerals



Source: Edison Investment Research.

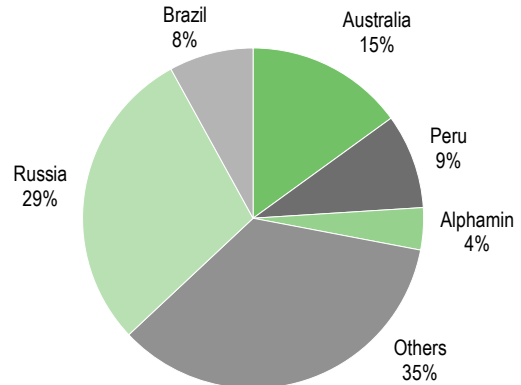
The explanation for these two apparent anomalies is likely to lie in the fact that tin – on account of its very high specific gravity – is relatively easy to concentrate and extract from its ore from a metallurgical perspective. Nevertheless, it has potential consequences for the long-term price of tin in the event that its continued exploitation at current rates depletes existing reserves and resources. Within this context, it is especially interesting to note that (uncommonly among natural resources) the countries that account for the highest proportion of global production are not the same countries that account for the highest proportion of resources (or reserves).

Exhibit 7: Percentage proportion of global tin-in-concentrate production (%), selected countries



Source: USGS

Exhibit 8: Percentage proportion of global tin resources (%), selected countries



Source: Alphamin

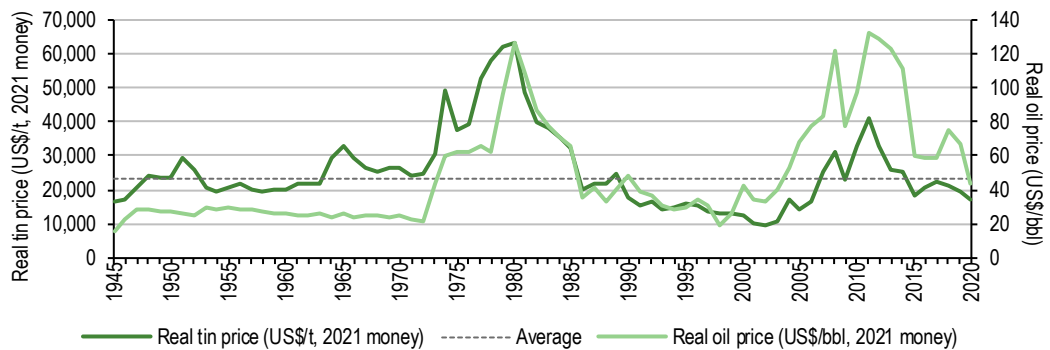
Notable discrepancies between production and resources can be observed for China (27% of global production, but <8% of global resources), Indonesia (26% of production, but <8% of resources) and Myanmar/Burma (17% of production, but <8% of resources) and, at the other end of the spectrum, Australia (15% of resources, but only 2% of production) and Russia (29% of resources, but <1% of production). In broad terms, while global production is concentrated in mid- to low-income countries (eg China, Indonesia, Myanmar/Burma), global resources are concentrated in mid- to high-income countries (eg Australia, Russia). This too may become significant if there is a shift in production from the former to the latter and the effect that this could have on the cost curve and the marginal cost of production. Note that a potential example of this shift may already be apparent in Myanmar/Burma, where concentrate supplies to China (which produces c 50% of the world's tin) are reported to have fallen by c 30% in recent months as immediately accessible ore from unregulated mines has been exhausted.

Notwithstanding its over-exploitation relative to its crustal abundance however, the absolute level of consumption is still very low at only 46.2g tin per person per year. As such, even a small increase in consumption in grams per head per year in the future will translate into a requirement for materially more tin production globally in percentage terms.

Real tin price

Since 1945, the average real price of tin has been US\$23,425/t, with a peak in 1980 of US\$63,429/t and a trough in 2002 of US\$9,500/t. The standard deviation of this population of prices is relatively high, at US\$11,578/t. However, there is a valid argument to say that prices were squeezed upwards artificially during the 1970s by the actions of the International Tin Council (ITC) and that the subsequent collapse in price between 1980 and 1986 was equally artificial. More details of the history of this episode may be found in the Appendix at the back of this report, on page 21. Nevertheless, the shock of the ITC collapse and its aftermath may be clearly seen in the following graph of the real tin price since 1945:

Exhibit 9: Real tin price, 1945-present (US\$/tonne)



Source: USGS, Independent Oil & Gas Association, US Bureau of Labor Statistics

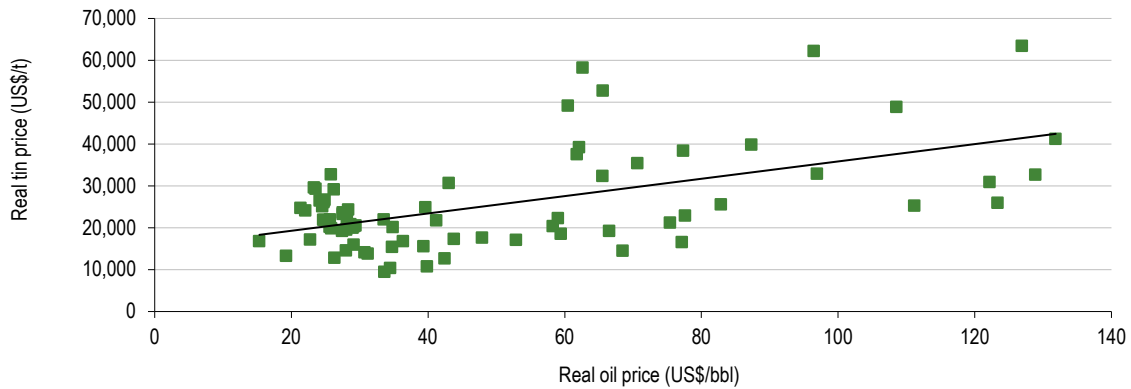
In addition to the impact of the ITC's failure on the price of tin, a number of other features of the graph are noteworthy:

- Excluding the period 1973–2002, the real price of tin has rarely been above US\$30,000/t and only very rarely below US\$16,500/t; in the period 1945–1972, the average real price of tin was US\$23,354/t; in the period 2003–2020, the average real price of tin was US\$23,081/t (ie less than 2% difference between the two periods); over the whole period from 1945–2020, the average real price of tin was US\$23,425/t.
- Although the standard deviation of the population of real price numbers is high, at US\$11,578/t, it contracts to a much more reasonable US\$5,585/t if the anomalous 1973–2002 period is excluded.
- The third noteworthy feature of the graph is the correlation between the real tin price and the real oil price (see below).

Real tin price: Real oil price correlation

The prices of many commodities have a close correlation with the price of oil. The qualitative justification for using the correlation as a means of calculating a long-term metal price is that energy costs make up a large proportion of a typical mining company's total costs and so determines the absolute level of the cost curve. Should metal prices deviate materially from their oil price correlation for material periods of time therefore, it would result in mining companies being exposed to either excessive profits or losses which, in the case of the former, should result in an increase in investment, supply and/or substitution and, in the case of the latter, would be unsustainable. Within this context, it should be noted that Alphamin itself is an exception, given that its gravity and water-based concentration process is extremely energy efficient and not at all intensive. More generally however, the methodology may be justified on the basis of the energy intensity of the smelting and refining processes for tin, which tend to take the form of either electrolytic purification or, more typically, smelting in a traditional furnace.

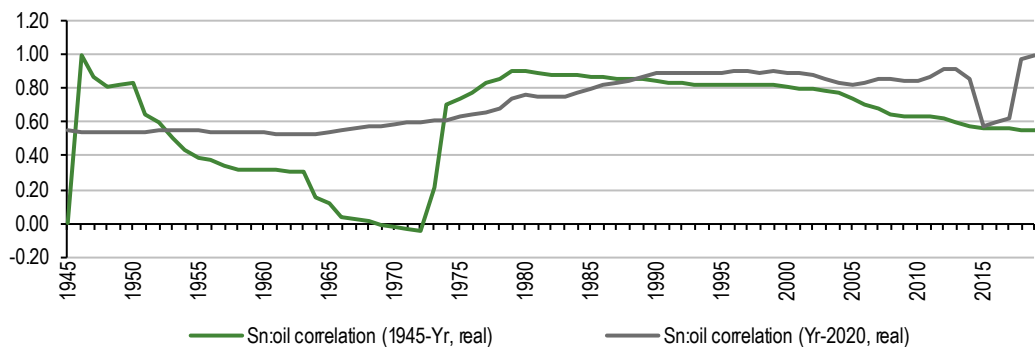
Exhibit 10: Real tin price (US\$/t, 2021 money) versus real oil price (US\$/bbl, 2021 money), 1945–2020



Source: USGS, Edison Investment Research, US Bureau of Labor Statistics, Independent Oil & Gas Association

Between 1945 and 2020, the Pearson Product-Moment (correlation) coefficient between the real tin price and the real oil has been 0.55 (in a scale between -1 and +1). While that is statistically significant at the 5% level for the number of data points employed in the analysis, readers should nevertheless be aware that this has not always been the case. The graphs below show the correlation between the real oil price and the real tin price over time:

Exhibit 11: Real oil versus real tin Pearson Product-Moment (correlation) coefficient, 1945–2020



Source: Edison Investment Research. Underlying data: USGS, US Bureau of Labor Statistics, Independent Oil & Gas Association.

While the correlation between the real oil price and the real tin price was strong in the immediate aftermath of the Second World War (the green line in the above chart), it is notable that the correlation waned to nothing (ie uncorrelated) by the late 1960s. However, it was re-established strongly once again by 1974 and has remained so ever since with the brief exception of the period 2015–2017 (the grey line in the above chart).

Within this context, on the basis of a long-term real oil price of US\$60/bbl (that currently being used by Edison’s oil & gas team), the long-term real tin price should be US\$27,555/t. We believe this is an eminently defensible long-term tin price to use in our valuation of Alphamin. For reasons of conservatism, however, we have elected to use the (lower) long-term average, real price of tin of US\$23,425/t. Note that variations from this level are considered in the ‘Sensitivities’ section.

Sales, marketing and offtake

In January 2018, Alphamin entered into an offtake agreement with Gerald Metals for 100% of the tin concentrate from the Bisie mine for a period of five years. The details of the agreement have been modified from time to time since then. Under the current terms, Alphamin’s product is assayed at the mine site with the sale of the concentrate then being deemed to occur at Logu (free-on-truck,

FOT, ex-Logu), 36km from the mine, where the mine access road meets the local provincial road). Pricing risk passes to Gerald Metals at this point. However, ownership remains with ABM until the cargo reaches Kampala and ABM is the exporter of the concentrates. Ownership passes to Gerald Metals in Kampala and Gerald Metals is responsible for the onward transportation of the product out of east Africa and to its ultimate destination (typically a smelter in either China, Malaysia or Thailand). The net selling price received by Alphamin is now fixed at the four-month LME price for tin on delivery and sale at Logu less tin concentrate treatment charges, export fees, duties, levies and royalties, transport and logistics costs and marketing commissions. Payment terms FOT Logu is 95% once the cargo reaches Kampala and ownership passes to Gerald Metals; the final 5% is paid on smelter finalisations.

Costs

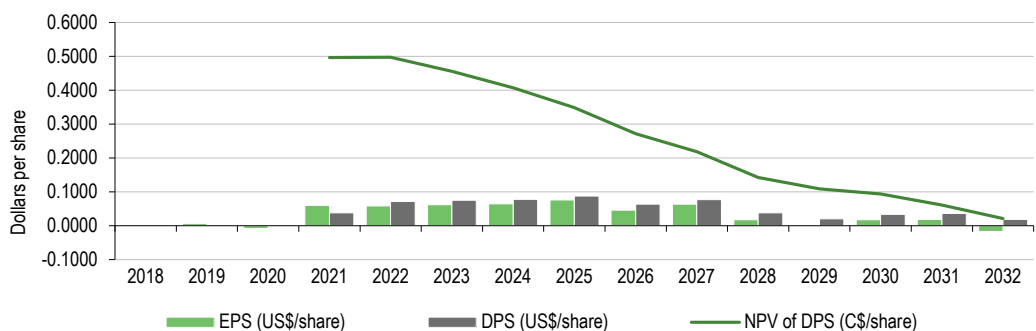
In simple terms, Alphamin’s costs at Bisie comprise mine operating costs and treatment costs (on-mine costs) and transport costs and royalties (off-mine costs) plus depreciation (a non-cash cost).

For the purposes of its financial modelling, Edison has assumed long-term total costs at Bisie of US\$285.91/t ore processed (cf US\$260.86/t in Q320), split approximately 59:41 on-mine:off-mine – in line with the costs assumed in the NI 43-101 technical report filed by Alphamin on Bisie, dated 31 December 2019, and filed on Sedar on 13 February 2020. Note that this level of costs equates to US\$6,607/t concentrate produced. Sustaining capex has been assumed to average US\$3.4m per year plus an additional closure cost of US\$6.8m in the final year of operations. Depreciation is assumed to occur over the remaining life of the mine.

Valuation

On the basis of the above cost assumptions and assuming a long-term real tin price of US\$23,425/t, we estimate a discounted dividend valuation of Alphamin of 39.1 US cents, or 49.6 Canadian cents per share, assuming that management executes the Bisie LOM plan according to the schedule in Exhibit 3 and using a 10% discount rate:

Exhibit 12: Alphamin LOM forecast EPS, DPS and NPV₁₀ of DPS, FY18–32 (\$/share)



Source: Edison Investment Research

Sensitivities

Empirically, our valuation of Alphamin has three principal sensitivities: to the long-term price of tin, to costs and to the discount rate. These are considered below. However, one further, critical sensitivity is to exploration success. Alphamin’s processing schedule follows its mining schedule very closely. As this drops away towards the end of the life of the mine, so too does production, earnings and cash flow. In the event that Alphamin is successful in its exploration both underground

at Mpama North and at Mpama South to the extent that it is able to keep its plant fully utilised at FY27 levels into the future, its valuation increases as follows:

Exhibit 13: Alphamin valuation sensitivity to exploration success

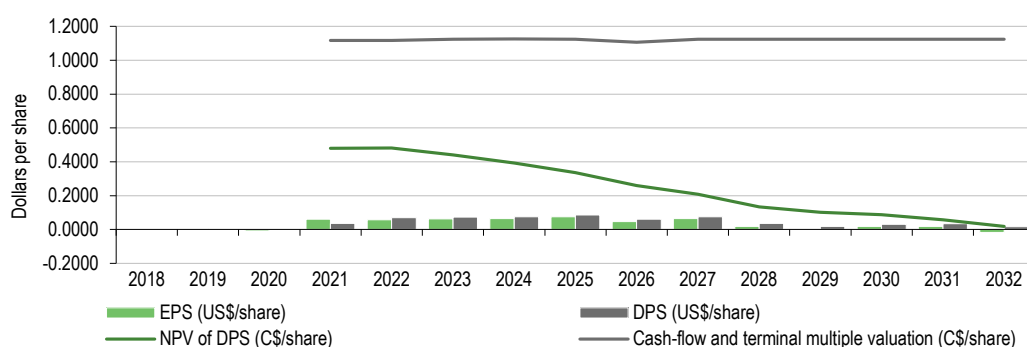
| Additional years at full capacity | To year | Valuation (C\$/share) | Incremental change (C\$/share) |
|-----------------------------------|---------|-----------------------|--------------------------------|
| | | 0.496 | |
| 0 | 2027 | 0.480 | -0.016 |
| +1 | 2028 | 0.506 | +0.026 |
| +2 | 2029 | 0.537 | +0.031 |
| +3 | 2030 | 0.559 | +0.022 |
| +4 | 2031 | 0.578 | +0.019 |
| +5 | 2032 | 0.605 | +0.027 |

Source: Edison Investment Research.

For the purposes of this valuation, we have assumed an ongoing exploration commitment at Alphamin of US\$2.7m per year in order to achieve the replenishment of reserves and resources required to keep the mine operating at full capacity. Readers should note that this is the reason for the apparent decline in valuation for '0' years of additional life in Exhibit 13, above; in this case, extra exploration expenditure has been incurred for no additional increase in mine life.

On average therefore, each additional year by which the plant is maintained at full capacity (in the short term) increases our valuation by 2.5 Canadian cents per share. In the limiting case, in which exploration success is sufficient to maintain production at FY27 levels indefinitely (which, for these purposes may be taken to mean c 56 years), our valuation of Alphamin rises to C\$1.117/share and its valuation profile to that shown in Exhibit 14, below:

Exhibit 14: Alphamin EPS, DPS and valuation forecast, including exploration success, FY18–32 (\$/share)



Source: Edison Investment Research

Aside from exploration success, Edison's valuation of Alphamin is most sensitive to changes in our assumptions about the long-term price of tin, costs of production and the discount rate. Each of these is considered in turn below:

Exhibit 15: Alphamin valuations (C\$/share) sensitivity to long-term price of tin (US\$/t)

| Tin price (US\$/t) | 18,740 | 21,083 | 23,425 | 25,768 | 28,110 |
|--|--------|--------|-----------|--------|--------|
| Change (%) | -20% | -10% | Base case | +10% | +20% |
| Edison discounted dividend valuation (C\$/share) | 0.325 | 0.411 | 0.496 | 0.582 | 0.668 |
| Change of 'base case' (%) | -34.5 | -17.1 | - | +17.3 | +34.7 |
| Valuation with exploration success (C\$/share) | 0.734 | 0.925 | 1.117 | 1.309 | 1.501 |
| Change of 'base case' (%) | -34.3 | -17.2 | - | +17.2 | +34.4 |

Source: Edison Investment Research

Note we calculate Alphamin's current share price of C\$0.64 discounts a long-term real tin price of US\$27,358/t (ie 16.8% above our assumed long-term price of US\$23,425/t). Alternatively, adopting the current (three-month) tin price, of US\$25,600/t, as our long-term price would result in a

valuation for Alphamin (excluding any blue-sky, upside exploration potential) of 57.6 Canadian cents.

Exhibit 16: Alphamin's valuations (C\$/share) sensitivity to operating cost changes (%)

| Change (%) | -20% | -10% | Base case | +10% | +20% |
|--|-------|-------|-----------|-------|-------|
| Edison discounted dividend valuation (C\$/share) | 0.579 | 0.538 | 0.496 | 0.455 | 0.414 |
| Change cf 'base case' (%) | +16.7 | +8.5 | - | -8.3 | -16.5 |
| Valuation with exploration success (C\$/share) | 1.285 | 1.201 | 1.117 | 1.033 | 0.950 |
| Change cf 'base case' (%) | +15.0 | +7.5 | - | -7.5 | -15.0 |

Source: Edison Investment Research

Exhibit 17: Alphamin valuations (C\$/share) sensitivities to the discount rate applied (%)

| Discount rate (%) | 0 | 5 | 10 | 15 | 20 | 25 | 30 |
|--|-------|-------|-------|-------|-------|-------|-------|
| Edison discounted dividend valuation (C\$/share) | 0.809 | 0.624 | 0.496 | 0.405 | 0.337 | 0.286 | 0.246 |
| Valuation with exploration success (C\$/share) | N/A | 2.143 | 1.117 | 0.745 | 0.557 | 0.445 | 0.371 |

Source: Edison Investment Research

Financials

Between Q419 and Q420 (when the tin price was relatively low) Alphamin paid down net debt by US\$34.6m, from US\$88.6m at end-December 2019 to US\$54.1m at end-December 2020. This level of net debt equates to a gearing (net debt/equity) ratio of 31.5% and a leverage (net debt/[net debt+equity]) ratio of 23.9% (cf 37.9% and 61.0% at end-FY19, respectively). With the tin price having risen by 36.4% from Q420 to the present however, we estimate that there is scope for net debt to have reduced to zero before the end of FY21 and for Alphamin, at least theoretically, to be in a position to make dividend distributions to shareholders.

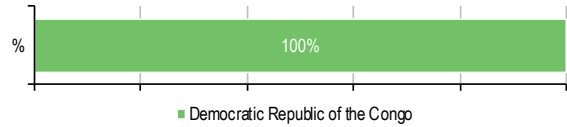
Exhibit 18: Financial summary

| Accounts: IFRS; year end 31 December; US\$000s | 2018 | 2019 | 2020 | 2021e | 2022e |
|--|-----------|----------|-----------|-----------|-----------|
| INCOME STATEMENT | | | | | |
| Total revenues | 0 | 27,221 | 187,445 | 271,013 | 258,248 |
| Cost of sales | 0 | (7,915) | (119,554) | (111,372) | (108,408) |
| Gross profit | 0 | 19,306 | 67,892 | 159,640 | 149,840 |
| SG&A (expenses) | (9,440) | (14,526) | (17,238) | (18,318) | (18,318) |
| R&D costs | 0 | 0 | 0 | 0 | 0 |
| Other income/(expense) | 0 | 0 | 0 | 0 | 0 |
| Exceptionals and adjustments | 0 | (3,673) | (7,649) | 0 | 0 |
| Depreciation and amortisation | (20) | (7,927) | (25,471) | (21,853) | (22,220) |
| Reported EBIT | (9,460) | (3,147) | 25,182 | 119,469 | 109,302 |
| Finance income/(expense) | 3 | (6,330) | (15,614) | (6,197) | 257 |
| Other income/(expense) | 7 | (4) | (1,518) | 0 | 0 |
| Exceptionals and adjustments | 6,272 | 6,850 | (8,776) | 0 | 0 |
| Reported PBT | (3,178) | (2,632) | (725) | 113,272 | 109,559 |
| Income tax expense (includes exceptionals) | 0 | 7,755 | (7,141) | (28,318) | (27,390) |
| Reported net income | (3,178) | 5,123 | (7,866) | 84,954 | 82,169 |
| Basic average number of shares, m | 733 | 845 | 1,066 | 1,185 | 1,185 |
| Basic EPS (US\$/sh) | (0.00) | 0.01 | (0.01) | 0.06 | 0.06 |
| Adjusted EBITDA | (9,440) | 8,453 | 58,302 | 141,323 | 131,522 |
| Adjusted EBIT | (9,460) | 526 | 32,831 | 119,469 | 109,302 |
| Adjusted PBT | (9,450) | (5,809) | 15,699 | 113,272 | 109,559 |
| Adjusted EPS (C\$/sh) | (0.00) | 0.01 | (0.01) | 0.08 | 0.07 |
| Adjusted diluted EPS (US\$/sh) | (0.00) | 0.00 | (0.01) | 0.06 | 0.05 |
| BALANCE SHEET | | | | | |
| Property, plant and equipment | 230,626 | 255,125 | 239,103 | 221,387 | 203,201 |
| Goodwill | 0 | 0 | 0 | 0 | 0 |
| Intangible assets | 0 | 0 | 0 | 0 | 0 |
| Other non-current assets | 2,467 | 10,632 | 15,882 | 18,592 | 21,302 |
| Total non-current assets | 233,093 | 265,757 | 254,985 | 239,979 | 224,503 |
| Cash and equivalents | 17,105 | 5,941 | 6,559 | 51,406 | 149,745 |
| Inventories | 3,235 | 27,755 | 21,866 | 22,275 | 21,226 |
| Trade and other receivables | 0 | 1,486 | 7,601 | 1,114 | 1,061 |
| Other current assets | 3,738 | 17,633 | 6,710 | 6,710 | 6,710 |
| Total current assets | 24,078 | 52,815 | 42,736 | 81,505 | 178,743 |
| Non-current loans and borrowings | 80,896 | 78,229 | 34,821 | 0 | 0 |
| Other non-current liabilities | 6,699 | 9,641 | 8,872 | 8,872 | 8,872 |
| Total non-current liabilities | 87,595 | 87,870 | 43,693 | 8,872 | 8,872 |
| Trade and other payables | 7,030 | 23,487 | 17,037 | 15,305 | 14,899 |
| Current loans and borrowings | 0 | 16,339 | 25,810 | 0 | 0 |
| Other current liabilities | 5,711 | 16,290 | 13,250 | 13,250 | 13,250 |
| Total current liabilities | 12,742 | 56,116 | 56,098 | 28,556 | 28,150 |
| Equity attributable to company | 131,914 | 145,215 | 171,735 | 244,386 | 313,523 |
| Non-controlling interest | 24,921 | 29,371 | 26,196 | 39,669 | 52,701 |
| CASHFLOW STATEMENT | | | | | |
| Profit before tax | (3,178) | (2,632) | (725) | 113,272 | 109,559 |
| Net finance expenses | 0 | 5,456 | 15,616 | 0 | 0 |
| EBIT | 0 | 0 | 0 | 0 | 0 |
| Depreciation and amortisation | 20 | 7,927 | 26,504 | 21,853 | 22,220 |
| Share based payments | 300 | 403 | 471 | 0 | 0 |
| Other adjustments | (6,272) | (6,851) | 8,842 | 0 | 0 |
| Movements in working capital | 3,942 | (6,710) | (20,281) | 4,347 | 696 |
| Interest paid / received | 0 | (3,092) | (11,378) | 0 | 0 |
| Income taxes paid | 0 | 0 | (843) | (28,318) | (27,390) |
| Cash from operations (CFO) | (5,188) | (5,498) | 18,205 | 111,154 | 105,085 |
| Capex | (116,094) | (22,720) | (7,448) | (6,847) | (6,745) |
| Acquisitions & disposals net | 0 | 0 | 0 | 0 | 0 |
| Other investing activities | 151 | (46) | (96) | 0 | 0 |
| Cash used in investing activities (CFIA) | (115,943) | (22,766) | (7,544) | (6,847) | (6,745) |
| Net proceeds from issue of shares | 55,235 | 11,936 | 10,010 | 1,171 | 0 |
| Movements in debt | 69,448 | 0 | (18,735) | (60,631) | 0 |
| Dividends paid | 0 | 0 | 0 | 0 | 0 |
| Other financing activities | 6,317 | 5,165 | (1,319) | 0 | 0 |
| Cash from financing activities (CFF) | 131,000 | 17,100 | (10,044) | (59,461) | 0 |
| Currency translation differences and other | 0 | 0 | 0 | 0 | 0 |
| Increase/(decrease) in cash and equivalents | 9,869 | (11,164) | 617 | 44,847 | 98,340 |
| Currency translation differences and other | 0 | 0 | 0 | 0 | 0 |
| Cash and equivalents at end of period | 17,105 | 5,941 | 6,559 | 51,406 | 149,745 |
| Net (debt)/cash | (63,791) | (88,627) | (54,073) | 51,406 | 149,745 |
| Movement in net (debt)/cash over period | (63,791) | (24,836) | 34,554 | 105,478 | 98,340 |

Source: Company sources, Edison Investment Research

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Revenue by geography

Management team
CEO: Maritz Smith

Alphamin's CEO since August 2019, Maritz has over 20 years' experience in African mining and corporate finance. Prior to joining Alphamin, he was CEO of Denham Capital's African mining platform, COO of Pangea and CFO of Metorex. He was educated at the University of Johannesburg and is a member of the South African Institute of Chartered Accountants.

CFO: Eoin O'Driscoll

Eoin is a chartered accountant and, prior to joining Alphamin in April 2015, was with KPMG Ireland. He has been involved in the DRC mining industry for seven years and has extensive experience in the gold mining sector.

Executive director: Boris Kamstra

Former CEO Boris also hails from Pangea, which serves as Denham Capital's African investment arm. He has been involved in the DRC mining industry for 14 years and has extensive experience establishing mining operations in remote locations. In the case of Bisie, he was instrumental in raising funds and also for guiding it through the development and mine building phases of the project before stepping down in August 2019.

COO: Trevor Faber

Like the CEO, Trevor was also employed by Metorex. An engineer by academic training, he was awarded a bachelor's degree in engineering from the University of the Witwatersrand and joined Alphamin in May 2015. All told, he has been involved in the DRC mining industry for 10 years, having successfully established two major copper mines in the Katanga (formerly Shaba) province.

Principal shareholders

| | (%) |
|--|-------|
| Tremont Master Holdings | 58.39 |
| Wadeville | 7.59 |
| Adansonia Private Equity Opportunities | 0.88 |
| CBS Needham | 0.19 |
| D Stevens | 0.17 |
| MK Cope | 0.17 |
| BR Kamstra | 0.09 |

Appendix

A history of Alphamin's involvement in the Bisie tin project

The tin-bearing gossan on the Bisie ridge was discovered in 2002 whereupon it became the subject of widespread small-scale, artisanal mining. Alphamin's interest began in 2011, when it acquired an initial 70% interest in the Bisie Tin Project, which it later increased to 100%. In November 2015, it announced that it had concluded an agreement with the Industrial Development Corporation of South Africa (IDC, analogous to Britain's Commonwealth Development Corporation) whereby the latter invested US\$10m directly into Alphamin Bisie Mining (ABM, the owner of Bisie) in return for a 15% interest in its Class 'A' shares payable in three tranches.

Prior to Alphamin's involvement there had never been a formal mineral reserve or resource delineated at Bisie. However, this changed when, in November 2013, the company reported a maiden NI 43-101 compliant inferred mineral resource of 4.0Mt at a 3.5% tin grade containing 141,200t of contained tin (at a 0.25% Sn cut-off), with the best assay results occurring in the four deepest holes drilled. Copper, lead, zinc and silver were also present. Resources were subsequently updated in May 2016 and then regularly since the start of mining operations.

In line with the DRC mining code, in 2015, ABM granted 5% of its share capital to the government of the DRC. In order to facilitate this, ABM divided its share capital into two classes, 'A' shares and 'B' shares. The 'B' shares were intended to be held solely by the government of the DRC and are non-dilutable at 5% of total share capital ('A' plus 'B'). 'B' class shares have normal voting rights on a pro rata basis and the DRC government has the right to appoint one director to the ABM board. The 5% is a free carry under the terms of the DRC mining code; hence, the DRC government was not required to make any contribution in respect of its initial holding nor will it be for any further issues of equity to maintain its 5% stake.

An initial definitive feasibility study (DFS) was completed in February 2016, which estimated that the project could produce 9,000t of tin per year over an estimated 10.5 years after an initial US\$119.2m in capital expenditure. The DFS was subsequently updated and optimised to reflect front-end engineering & design and control budget estimates, such that it ultimately projected production of 152,300t of tin over a 12-year life with payback in 17 months after an initial US\$126.1m in capital expenditure, resulting in a project NPV₈ of US\$402.2m and an internal rate of return of 49.1%.

After a final investment decision, Alphamin secured an US\$80m senior secured, non-revolving credit facility in November 2017 with Sprott, Barak and Tremont to be provided to ABM. Construction at Bisie commenced later the same year and, after slightly more than a year's construction, plant commissioning commenced in early 2019. Just prior to plant commissioning however, it was decided to change the mining method at Mpama North to one of cut and fill, after a management review into the suitability of sublevel caving in the light of prevailing rock conditions. Ultimately, the change resulted in revised reserves and a revised mining schedule in addition to adjustments to operating cost assumptions, mined grades and metallurgical recoveries.

As a consequence of the change in mining method which, among other things, resulted in a slower ramp up of material to the run-of-mine (ROM) stockpile, Alphamin took the decision to review its working capital requirements, which indicated a near-term shortfall on account of a number of factors, including a delayed response to a request to partially export concentrates by airfreight causing it to export them instead by truck (thereby deferring revenue), a delay in VAT refunds and the delayed manufacture and delivery of certain components to finalise plant commissioning. At the time, the company estimated that it required up to US\$9m to bridge the anticipated working capital deficit as well as funding sustaining capital and critical spares, as a result of which, management took the decision to seek a working capital facility of up to US\$12m. Nevertheless, the mine declared commercial production in Q319.

While Bisie was ramping up to full production, on 30 October 2019, the logistically important Maiko Bridge at Waine-Rukula some 53km southeast of Kisangani, collapsed. Prior to the collapse, concentrate produced at Bisie was typically trucked over the Maiko Bridge at Waine-Rukula en route to Walikale and, from there, to Gerald Metals depots (based in Kampala, Uganda) and then on to Mombasa. As a result, without the Maiko Bridge, Bisie concentrates were unable to move east by road. In addition, the collapse of the bridge also meant that consumables used in processing and general mine operation could not be imported, which was a key consideration in the ramp-up of the mine at a time when it needed to alter process flows in order to deal with elevated arsenic concentrations. As a consequence of the collapse, Alphamin incurred additional logistics costs in Q120 relating to the sale of concentrate produced in Q419, which was not sold as a result of the Maiko bridge collapse plus additional costs (eg hiring a helicopter from South Africa to transport material across the Maiko river during the bridge repair). In consequence, on 9 December 2019, the company accepted a trader advance of US\$12.6m from the company's offtake partner, Gerald Metals, to assist with cashflow during the period of the bridge's repair. The advance took the form of a spot contract for the sale of US\$20m of tin concentrate, of which US\$7.4m was returned to the customer as a deposit return. Under the terms of the agreement between the two, Alphamin was obliged to ensure that the tin concentrate entered Uganda within 30 days of the repair of the bridge or Gerald Metals could demand a refund. The transaction was accounted for as trader financing and was secured against 2,964t of tin concentrate and carried an interest rate of 15% plus Libor while the lots remained in the DRC. The advance was ostensibly extinguished in Q120 and then fully extinguished in Q320 after the delivery of the associated lots to the designated delivery point in Uganda.

On 15 May 2020, Alphamin concluded a private placement of US\$31m, which was applied to reduce its debt balance. Concurrently, it signed an amended and restated credit agreement with improved terms, of which the following is a summary:

- Senior secured, non-revolving term credit facility.
- Capital repayments commence on 31 July 2020 for an amount of US\$0.845m, increasing to US\$2.1m from January 2021.
- Effective coupon of 10.56% (down from 14%) plus the greater of US dollar three-month Libor and 1% per year until December 2021.
- Partial interest holiday from May 2020 to December 2020.
- Cash sweep of 50% of excess cash flow with effect from 31 July 2020.
- Mortgages over the company's shares in each subsidiary, cash balances, moveable assets and the PE1355 mining licence covering the Mpama North Tin Project.
- Typical material adverse change clauses.
- Covenants, effective from commencement of capital repayments, including, but not limited to:
 - from January 2021, net working capital excluding credit facility amounts due to be in excess of US\$10m and unrestricted cash to be greater than US\$5m;
 - a debt service cover ratio of greater than or equal to 1.5 to 1.0 from July 2021;
 - a total debt to equity ratio less than 60:40;
 - a loan life cover ratio greater than 2:1; and
 - a reserve tail ratio greater than 30%.

Finally, in May 2020, in connection with the above equity offering, Alphamin settled certain third-party indebtedness of ABM, the owner of the Bisie tin mine, by the issue of Alphamin shares in consideration for a temporary loan due by ABM. Subsequently, it secured the required board and shareholder approvals from ABM to convert this ABM loan into new shares of ABM, which increased Alphamin's equity ownership of ABM to 84.14%, with the IDC's interest then being diluted to 10.86% and the government of the DRC's interest remaining at 5%.

Geology of Bisie tin project

The Bisie Mine area is underlain by Kibaran Orogenic Belt lithologies, interpreted as being an inter-cratonic collision zone with different periods of extension and compression. The two units present at the mine are the lower Paleoproterozoic basement comprising Rusizian and Ante-Rusizian units (comprising mainly dolomites, quartzites, amphibolites, mica schists and migmatite gneisses) and the upper Mesoproterozoic unit (comprising dominant micaceous schists to red arenaceous phyllites with minor interbedded quartzites and amphibolites). Both units have been intruded by different generations of granites, starting in the Mesoproterozoic and continuing until the Neoproterozoic, which are believed to be the last of the 'tin granites' and source of the numerous tin occurrences.

The stratigraphic rock package hosting the deposit has been divided into five separate units, from hanging-wall to footwall:

- Carbonaceous shale – dark grey to black, thinly bedded, fine grained, carbonaceous siltstone-shale greater than 150m true thickness. Contains abundant quartz-tourmaline-carbonate veins and minor pyrite;
- Meta-sediments – pale grey, thinly bedded, fine-grained siltstone-shale 30–40m true thickness. The host rock has been moderately silica-magnetite altered. Magnetite occurs as either discrete bands (1–2cm), pervasive, disseminated alteration or stock-work veins;
- Quartz-sericite schist – in drill core appears more like a feldspar-rich, polymictic tuff. Pale to dark grey/green, thinly bedded to massive, medium grained, feldspar-sericite rich tuff 80–90m true thickness;
- Mica schist – pale to dark grey, laminated to moderately banded, fine grained mica-rich schist 100–150m true thickness. Intensity of dark and light-coloured bands varies according to biotite-muscovite content. Interpreted as a weak to moderately chlorite-talc-garnet alteration zone; and
- Amphibolite schist – dark green to black, moderately banded to massive, fine grained to porphyroblastic (garnet), chlorite-amphibolite schist 20–30m true thickness. Moderate to intense chlorite-talc-garnet alteration. Hosts the tin and base metal mineralisation at Bisie.

The mineralisation is associated with a steeply east dipping, north-south striking zone of intense chloritisation and shearing contained within micaceous schists. The main tin bearing chloritised zone is on average approximately 9m thick. Narrower subordinate zones occur several metres above and below the main zone in certain areas. The mineralisation occurs in the form of irregular high-grade veins of botryoidal cassiterite (the tin-bearing mineral) several tens of centimetres thick and lesser amounts of cassiterite blebs and vein fragments irregularly disseminated in the chlorite schist. The strength differential between lithologies often results in boudinage cassiterite lenses.

The mineralised zone plunges approximately to the north, although local steeper plunging high grade trends are evident. Copper, lead and zinc occur as chalcopyrite, galena and sphalerite in locally significant concentrations, together with silver. Two zones of mineralisation have been discovered at Bisie; these are known as Mpama North, which is the zone for which the mineral resource estimate described below applies, and Mpama South, which occurs about 750m to the south of Mpama North.

The ITC's role in the collapse of the tin market, 1980–1986

The ITC was formed in 1956 as the operating arm of the International Tin Agreement (ITA), an association of states with interests in the long-term stability of the world tin market (ie a sort of OPEC for the tin market). The ITA's objectives were to:

- Prevent or alleviate widespread unemployment and other serious difficulties resulting from shortages or over-supply in the international tin market
- Prevent excessive fluctuations in the price of tin

- Ensure adequate supplies of tin at 'reasonable' prices.

To achieve these goals, the ITC mandated to itself two tools, being:

- Export controls
- A buffer stock of tin metal.

In 1965, the ITA also granted the ITC the power to borrow funds for the purchase of buffer stocks of tin. By the late 1970s however, disagreements over the objectives and scope of the agreement led many participant nations to begin operating outside the ITA. The United States, for example, withdrew from the agreement and began selling tin from its strategic stockpile, while Malaysia secretly began purchasing it. As the organisation fractured and more countries began to operate outside the ITA, so the price of tin began to fall which, in turn, put financial pressure on the ITC. As so often with organisations dedicated to price control, rumours surrounding the ITC's financial position only served to make a bad situation worse. Fearing market collapse, the ITC's Buffer Stock Manager exhorted members to continue financing the purchase of tin stocks. On 24 October 1985 however, when promised funds failed to materialise, he regretfully informed the London Metal Exchange (LME) that it would be suspending operations owing to a lack of liquidity. Insolvency was declared shortly afterwards and both the LME and the Kuala Lumpur Commodity Exchange immediately suspended trading in tin contracts. International court cases following the ITC's collapse established that it had accumulated physical stocks and forward purchases that were far greater than members had authorised and over 120,000t of tin (approximately eight months' worth of global supply at the time) had to be liquidated. Overall, the ITC's liabilities amounted to US\$1.4bn (c US\$3.5bn in 2021 money terms). Moreover, as the ITC's long position was unwound, it added further downward pressure to the market, with the price of tin falling 35% between 1985 and 1986. In the real economy meanwhile, Malaysia shut 30% of its tin mines, with the loss of 5,000 jobs, while Thailand shut 40% of its mines (c 8,500 jobs) and Bolivia's tin production fell by a third with the loss of c 20,000 jobs. At the same time, 28 LME brokers went bankrupt and six others withdrew from the exchange. The final bill for the Malaysian government is estimated to have been over US\$300m (c US\$742m in 2021 money terms). While the price bounced for three years between 1986 and 1989, it resumed its downward trend thereafter, bottoming in 2002 at US\$6,440/t (in nominal terms).

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