14th December 2018

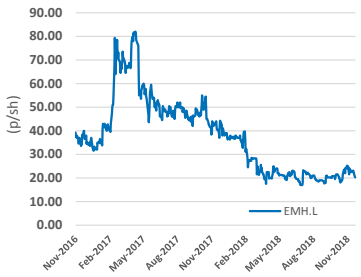
Sector: Mining

Commodities:

Lithium, tin, tungsten in the Czech Republic

Market data

Ticker	EMH
Price (p/sh)	19p
12m High (p/sh)	41p
12m Low (p/sh)	16p
Shares (m)	146.6m
Mkt Cap (£m)	27.8m
Markets	AIM & ASX



Source: LSE

Description

European Metals Holdings Limited is a mineral exploration and development company listed on AIM and the ASX. The company's main focus is on advancing the Cinovec lithium-tin project located in the Czech Republic. EMH has completed a PFS and is now progressing the project through to a DFS. Cinovec will produce either lithium carbonate or lithium hydroxide.
www.europeanmet.com

Board & key management

Chairman	Dave Reeves
MD	Keith Coughlan
Exec Director	Richard Pavlik
Non-Exec	Kiran Morzaria
COO	Neil Meadows

Analyst

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European Metals

Security of supply for the European battery market

EMH is making solid progress at Cinovec. Drilling and metallurgical test work since the 2017 PFS has been highly successful, resulting in vastly increased lithium recoveries and lower operating costs. One of the most exciting strands of the current PFS optimisation is the test work to demonstrate the production of lithium hydroxide, a higher value-add product increasingly favoured by lithium-ion battery manufacturers. We model the economics of a lithium hydroxide scenario and the results are transformative.

- **Largest lithium deposit in Europe.** Cinovec is an exceptionally large deposit with the potential to become a long-life operation, providing an answer to the security of supply question facing Europe's lithium-ion battery and EV manufacturers. The project has several competitive advantages driven by its location in an area of well-developed infrastructure in the Czech Republic and proximity to a growing number of new lithium-ion battery megafactories**. Resource Upgrade on the way.** The current round of drilling is aimed at upgrading a significant portion of the Indicated resource to the Measured category with an ore reserve upgrade set to follow, supporting the early years of the mine plan.

- **Vertically integrated.** Cinovec is neither brine or spodumene - it doesn't have the capex and long lead times associated with brines, nor the loss of value-add exposure faced by most spodumene concentrate producers. Cinovec ore is hosted in a friable lithium-mica permitting coarse grinding and high rejection of the mass of ore mined. Crucially, battery-grade lithium carbonate or hydroxide is planned to be produced on site. Zinnwaldite processing uses cost-effective reagents and offers compelling opex savings versus spodumene conversion. A chronic lack of spodumene conversion capacity outside China coupled with Europe's build-out of battery capacity should ensure that Cinovec remains on the radar for major battery producers, providing potential for strategic partnerships and funding, in our view.

- **Lithium hydroxide optionality.** Current test work is focused on the potential to produce lithium hydroxide as an option instead of lithium carbonate. This high-quality product is gaining market share versus carbonate with key battery manufacturers. No change is required to the front end of the plant, just the chemistry after the lithium sulphate step. Furthermore, EMH believes that any additional cost to produce hydroxide would likely be off-set by reduced reagent costs. Lithium hydroxide currently receives a c.20% premium to carbonate although this premium has been significantly higher over the past 24 months.

- **Upcoming key catalysts.** Locked cycle test-work, resource/reserve update, lithium hydroxide test work results, commencement of pilot plant operations, PFS optimisation. Given recent political turbulence in the country, permitting milestones are likely to be important drivers.

- **Valuation considerations.** Our current base-case valuation for European Metals is 45p/sh fully-diluted (c.A$0.79/sh) based on a risked sum-of-the-parts NAV valuation for the Cinovec project on a lithium carbonate basis. Our valuation standpoint is highly cautious at present; we use conservative modelling assumptions and risk our valuation heavily. We also present a flex case where we assume that EMH adjusts its strategy to produce a battery-market facing lithium hydroxide product. Our fully diluted risked NAV under a lithium hydroxide scenario increases to 80p/sh (A$1.40/sh). This implies EMH is trading at an undemanding 0.4x P/NAV to our base-case and 0.2x to our hydroxide scenario. Our valuation does not factor in leverage to higher lithium prices – we use $10,000/t for carbonate and $12,000/t for hydroxide. Our base case valuation at $12,000/t lithium carbonate, 1.0x NAV and 8% discount rate increases to 137p/sh, fully funded.

EMH is trading well below our risked NAV but we see considerable scope for renewed price traction as the company meets development milestones. Permitting progress is key to improved investor sentiment but the market should not lose sight of the fact that Cinovec is the largest European lithium deposit, a non-brine, non-spodumene resource with true vertical integration potential to produce battery-grade lithium hydroxide directly to the EV/battery market on EMH's doorstep. Whilst funding and permitting risk remains, the current market valuation is undemanding and despite challenging lithium market conditions at present, EMH offers a compelling call on a multi-decade commodity play.

Contents

Recent developments and key milestones

Test work demonstrates improved recoveries over the PFS

- In March 2018, EMH reported that laboratory scale leach and roasting tests indicated lithium leach recoveries of 94-95%, with the work providing confirmation that a modest increase in roasting temperature significantly increases lithium recovery. Furthermore, the optimisation work confirmed that lithium recovery was not reduced when limestone and waste gypsum, more cost effective reagents were used to substitute lime. The ore used in this test work was sourced from a portion of the resource that EMH intends to be mined and processed during the first years of Cinovec's life.
- The 94-95% range represents a significant increase over the 85% assumption used in the PFS. After taking into account 90% lithium recovery to concentrate, the **extra recovery in leach step translates to overall lithium recovery of 84.6% to 85.5%**, a substantial increase from the overall recovery in the PFS of 76.5%. Higher recoveries should have a significant positive impact on project economics.

Increase in modelled production to 22,500tpa

- In July 2018, EMH reported that modelled production for Cinovec increased to 22,500tpa from 20,800tpa, an 8.2% increase. This was based on the results of roast optimisation test work which indicated the potential for improved recoveries (see above). EMH reported that the modelled increase in production would result in a 10% increase in EBITDA margins for the project.

Further reduction in reagent costs

- As part of the optimisation work, EMH has also proposed the use of low-cost gypsum waste as a roasting reagent. The gypsum would be sourced from local power plants in the form of a waste material sourced from the scrubbing of power station off gases. This will produce an environmental benefit for the region and a cost benefit for the project. EMH believes that this gypsum material will be available at a competitive price.

Beneficiation test work completed

- In June 2018, EMH commenced the beneficiation process and magnetic separation of a 15 tonne bulk sample which represents the ore that will be mined in the first stages of project. The lithium concentrate produced will provide pilot plant feed for planned downstream processing through the roast, leach, purification and final product precipitation flowsheet that has been developed. It is intended to ultimately produce up to 200 kg of battery grade lithium carbonate or lithium hydroxide from this material for marketing and user acceptance purposes.

Lithium hydroxide test work has commenced

- Metallurgical test work at Dorfner Anzaplan in Germany has commenced with the first stage of test work is focused on proving up a flowsheet developed for the production of lithium hydroxide. It is the intention that this work will be followed by locked cycle testing of the flowsheet settled upon.

Permits granted for geotechnical drilling

- In September 2018, permits were issued to EMH geotechnical drilling. The geotechnical drilling initially amounts to 4 holes (completed in early October) for the portal and decline positions of the planned underground.
- A rig is continuing to drill and another 5 geotechnical holes are in the process of being drilled along the planned mining decline route to allow final development ready designs to be completed for the portal and decline designs.

Permits granted for DFS resource drilling campaign

- In October, EMH received permission from the relevant statutory authorities in the Czech Republic for the commencement of a comprehensive diamond drilling campaign, a key activity supporting the Cinovec DFS.
- The drilling is aimed at converting a sufficient portion of the existing Indicated Mineral Resource to the Measured Resource category to cover the first 2 years of the scheduled mining plan. A total of 8 diamond drill holes will be completed for 2,560 metres.

Next steps – the year ahead

- **Locked cycle test-work.** This detailed work will confirm the flowsheet all the way through to the production of battery grade lithium carbonate and enable larger scale roasting proof of technology testing to be completed in the next few months. The Company will also undertake the production of lithium hydroxide during the latter phase of this work. The locked cycle test work will commence post the lithium hydroxide test work as outlined above. The point of the locked cycle test work is to confirm the flowsheet all the way through to a battery-grade product. Expected to commence in late January 2019.
- **Resource update.** On the back of the ongoing DFS-level resource drilling and expected around April 2019. EMH expects to convert a significant portion of the current Indicated resource to the Measured category to cover the initial two years of the scheduled mine plan. The updated resource will form the basis of an updated ore reserve estimate.
- **Pilot plant test work - commencing May/June 2019.** The pilot plant will produce representative product samples for marketing purposes.
- **Equipment selection testing**
- **PFS optimisation.** Work has commenced on the development of an updated PFS to model the economics of the production of lithium hydroxide.
- **2nd round of drilling** to define Measured Resources to extend coverage to the first 5 years of mining may be undertaken subsequently depending on feedback from on-going discussions with financing entities and their requirements
- **Progress EIAs for mining and processing**
- **Progress strategic partner discussions**
- **Progress work on the planned DFS**

Permitting progress

- **Added to the State Register.** On 19 December 2017 the Company announced that the Cinovec NorthWest Resource had been added to the Czech State resource register. This followed the addition of the Cinovec South Resource earlier in the year. The addition of Resources to the Czech State register is the first step in the process for the granting of a mining permit.
- **Purported MOU cancellation.** In March 2018, EMH reported statements and correspondence from the Minister of Industry and Trade of the Czech Republic, purporting to terminate the Memorandum of Understanding dated 2 October 2017 between the Company and the Ministry of Industry and Trade. The MoU outlines mutual willingness to explore downstream processing opportunities, Czech academic research into lithium processing, potential future co-operation and discussing and exploring possibilities of future agreements.
- **No effect on tenure / rights.** The purported cancellation of the MOU does not in any way affect the exploration rights of the Company or the Company's tenure over its exploration. However, it **may affect the speed and path of the remaining processing steps required for the grant of the final mining permit.**
- **Permits still being awarded.** It should be pointed out that despite the current political turbulence; there is not a moratorium on the issue of new permits. EMH been awarded both geotechnical drilling and resource drilling permits recently which demonstrates that the permitting system is still functioning. While uncertainty remains, it is business as usual for the time being. The main cog that is missing at present is a replacement for the MOU. I.e. a new positive government endorsement of the project and its development.
- **Background to recent government turbulence.** The MOU with the government was signed with the previous government, the social democrats. Andrej Babis was sworn in as Prime Minister in July 2018, for a second attempt at forming a stable government. Babis' ANO Party won the October 2017 elections. However, the Czech Republic's coalition government resigned in January 2018 after losing a no-confidence vote that it had to win in order to stay in office, and instead maintaining a caretaker administration.

  Babis is billionaire businessman and reportedly the Czech Republic's second richest person. Babis was stripped of his parliamentary immunity, allowing the police to investigate his alleged involvement in an EU subsidy fraud case. Babis is accused of removing a farm from his Agrofert Conglomerate in 2007 in order to make it eligible for 2m in EU subsidies, before returning the farm back in the holding. On November 23rd 2018, the Czech coalition government survived a no-confidence vote in parliament over the fraud scandal, with only 92 votes casted to out the current cabinet, short of the 101 needed.

Corporate Structure

European Metals Holdings Ltd was incorporated in the British Virgin Islands and registered in Australia. The company is listed on AIM in London and on the ASX, in both cases under the ticker "EMH". The company was admitted to trading on AIM in December 2015.

Capital Structure

EMH has 146.6m shares in issue. This current share count reflects the latest issue of shares on 19th November 2018 as a result of a placement of 5,155,500 shares at 20p/sh for gross proceeds of £1,035,000. The placing was completed at a 13% discount to the mid-market closing price on the 16th November.

Cadence Minerals (AIM: KDNC) has been a long term shareholder and currently holds an approximate 19% interest in EMH.

Recent placings:

- November 2017 - £2.28m at 35p/sh for 6.52m CDIs
- November 2018 - £1.035m at 20p/sh for 5.18m CDIs

Figure 1 - Major shareholders

	Significant shareholders	Number of Shares	%
1	CITICORP NOMINEES PTY LIMITED	30,440,874	20.76
2	ARMCO BARRIERS PTY LTD	13,060,000	8.91
3	J P MORGAN NOMINEES AUSTRALIA PTY LIMITED	8,970,524	6.12
4	INSWINGER HOLDINGS PTY LTD	8,500,000	5.80
5	MRS ELEANOR JEAN REEVES <ELANWI A/C>	3,720,244	2.54
6	VIDACOS NOMINEES LIMITED<CLRLUX>	3,495,988	2.38
7	BARCLAYS DIRECT INVESTING NOMINEES LIMITED<CLIENT1>	3,076,356	2.10
8	JIM NOMINEES LIMITED<JARVIS>	2,905,044	1.98
9	HARGREAVES LANSDOWN (NOMINEES) LIMITED<15942>	2,708,834	1.85
10	HARGREAVES LANSDOWN (NOMINEES) LIMITED<VRA>	2,473,608	1.69
11	PERSHING NOMINEES LIMITED<WRCLT>	2,250,000	1.53
12	LAWSHARE NOMINEES LIMITED<SIPP>	2,247,015	1.53
13	INTERACTIVE INVESTOR SERVICES NOMINEES LIMITED<SMKTISAS>	2,132,180	1.45
14	HSBC GLOBAL CUSTODY NOMINEE (UK) LIMITED<777329>	1,910,000	1.30
15	HSDL NOMINEES LIMITED	1,852,812	1.26
16	INTERACTIVE INVESTOR SERVICES NOMINEES LIMITED<SMKTNOMS>	1,803,483	1.23
17	CGWL NOMINEES LIMITED<GC1>	1,769,433	1.21
18	MR NEIL THACKER MACLACHLAN	1,707,483	1.16
19	LICHTER SERVICES PTY LTD <LICHTER FAMILY S/F A/C>	1,400,000	0.95
20	SHARE NOMINEES LTD	1,387,850	0.95
Total Top 5 holders of CHESS DEPOSITARY INTERESTS (Total)		64,691,642	44.12
Top 20 holders of CHESS DEPOSITARY INTERESTS (Total)		97,811,728	66.70
Total Remaining Holders Balance		**48,830,499**	33.30
Total shares in issue		**146,642,227**	**100.00%**

Source: EMH

November placing – use of funds

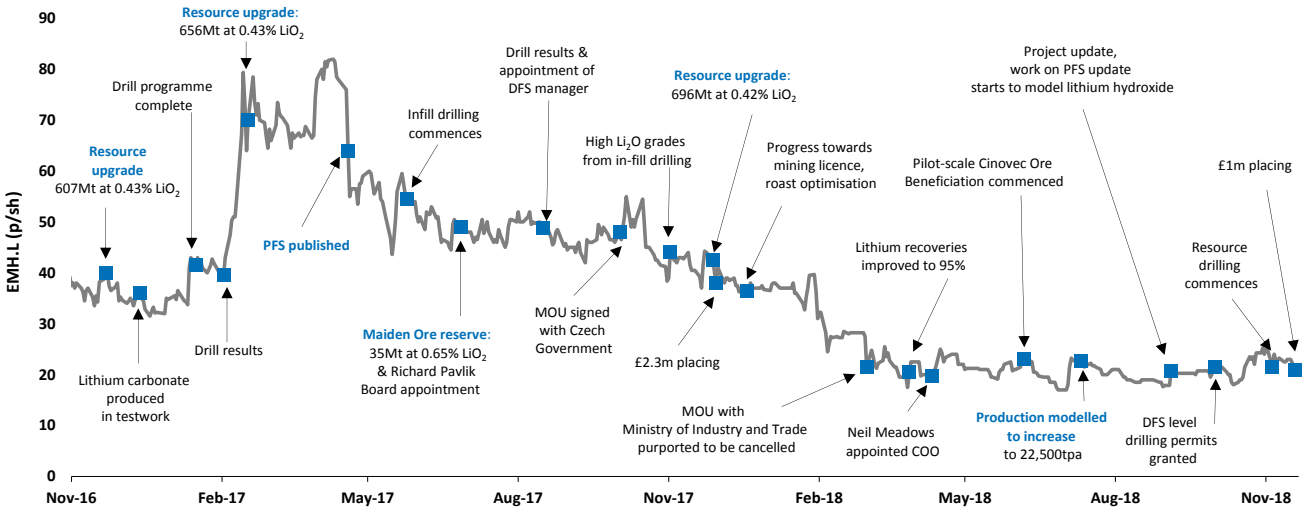
The net proceeds from the November placing will be used to:

- Progress EMH's drilling programme and upgrade the resource model to include measured resources and facilitate an estimation of proven reserves
- Begin the engineering process for the DFS
- Progress Environmental Impact Assessments for mining and processing
- Operate a pilot plant for production of samples for marketing
- Progress discussions with potential strategic partners

Potted History and share price

- EMH has had a relatively volatile trading history over the last two years. The considerable progress made on project development has not been reflected in the overall share price trend which has been on a downward path since April 2017.
- Project-level milestones have been regularly reported with several resource upgrades, maiden reserves and the release of the PFS. However, political issues resulting in uncertainty surrounding permits, and more recently, a weak lithium price have weighed heavily on EMH shares.

Figure 2 - EMH's share price timeline and key events – last 2 years



Source: Shard Capital, LSE

Directors and Senior Management

Dave Reeves - Chairman

Dave is a qualified mining engineer with 20 years' experience in Africa and Australia. He is a highly experienced underground mining specialist with a first class honours degree in mining engineering from the University of New South Wales and a graduate diploma in applied finance and investment from the Securities Institute of Australia and a Western Australian first class mine managers certificate of competency. Dave is currently the Managing Director of ASX listed Calidus Resources Limited and a Non-Executive Director of AIM listed Keras Resources, which are Australian Gold and Togo Manganese exploration and mining companies. Dave is a member of the Audit & Risk, Remuneration and Nomination Committees.

Keith Coughlan - Managing Director

Keith has 30 years' experience in stockbroking and funds management. He has been involved in the funding and promoting of resource companies listed on the ASX, AIM and TSX. He has advised various companies on the identification and acquisition of resource projects and was previously employed by one of Australia's then largest funds. He is currently a Non-Executive Director of Calidus Resources Limited and a Non-Executive Director of Southern Hemisphere Mining Limited.

Richard Pavlik - Executive Director

Richard is the General Manager of Geomet s.r.o., the Company's wholly owned Czech subsidiary, and is a highly experienced Czech mining executive. He holds a Masters Degree in Mining Engineer from the Technical University of Ostrava in Czech Republic. He is the former Chief Project Manager and Advisor to the Chief Executive Officer at OKD, a major coal producer in the Czech Republic. He has almost 30 years' relevant industry experience in the Czech Republic. He has held previous senior positions within OKD and New World Resources as Chief Engineer, and as Head of Surveying and Geology. He has also served as the Head of the Supervisory Board of NWR Karbonia, a Polish subsidiary of New World Resources (UK) Limited. He has an intimate knowledge of mining in the Czech Republic.

Kiran Morzaria - Non-Executive Director

Kiran is currently CEO and Director of the Company's largest shareholder, Cadence Minerals. Kiran holds a Bachelor of Engineering (Industrial Geology) from the Camborne School of Mines and an MBA (Finance) from CASS Business School. He has extensive experience in the mineral resource industry working in both operational and management roles. Kiran spent the first four years of his career in exploration, mining and civil engineering before obtaining his MBA. He has served as a director of a number of public companies in both an executive and non-executive capacity.

Neil Meadows - Chief Operating Officer

Neil has previously held the positions of COO at Karara Mining Ltd, Managing Director of IMX Resources Limited and worked with the Australian Premium Iron Ore Joint Venture on mine infrastructure. Prior to that, he was the COO of Queensland Nickel Pty Ltd, subsequent to the sale of the business by BHP. Neil was also previously the General Manager at the Murrin Operation for Minara Resources Ltd, a position he held for almost five years. Neil holds a Masters of Applied Science in Metallurgy from the South Australian Institute of Technology, and was the recipient of the Mine Manager of the Year Award through the Sydney Mining Club in 2007. He was the Australasian Institute of Mining and Metallurgy North Queensland Resources Industry Professional of the Year in 2009. His technical qualifications are supported by a Graduate Diploma of Business Administration from Charles Sturt University, along with a Diploma from the Australian Institute of Company Directors.

Julia Beckett, CSA(Cert) - Company Secretary

Julia holds a Certificate in Governance Practice and Administration and is a Certificated Member of the Governance Institute of Australia. Julia is a corporate governance professional, having worked in corporate administration and compliance for the past 10 years. She has been involved in business acquisitions, mergers, initial public offerings and capital raisings, as well as statutory and financial reporting. Julia is currently Company Secretary of Drake Resources Limited and Doriemus PLC.

Grant Harman - Metallurgical Consultant

Grant is one of the world's foremost lithium metallurgists and he's played a significant role in the Company's successful PFS. Grant was previously Manager Lithium Chemicals for Talison Lithium and was involved in the management of the Talison Lithium Carbonate Plant from Scoping Study to Definitive Feasibility Study. He was involved in the design and technical direction of the Talison Test Facility and has more recently been a technical consultant on the Sonora Lithium Project in Mexico. Grant has had previous roles with UGL, SNC Lavalin, CleanTeq and Ausenco.

Dr Pavel Reichl - Geological Consultant

Pavel has over 15 years' experience in precious, base and PGE metals exploration and production and has a PhD from University of Montana. Pavel was formerly Business Unit Manager of a Canadian listed minerals exploration company responsible for Europe and Central Asia. He was the former head of the Newmont acquisition program in Eastern Europe and exploration manager for Kyrgyzstan and Uzbekistan. Pavel is fluent in English, Czech and Russian.

Valuation

Summary. Our base-case indicative valuation for European Metals is 45p/sh fully-diluted (c.A$0.79/sh). This is based on a sum-of-the-parts NAV valuation driven by our NPV$^{10\%}$ of US$289m (£222m) for the Cinovec project and appropriate adjustments. Our valuation standpoint is highly cautious at present; we use conservative modelling assumptions, a high discount rate and risk our valuation heavily, using a 0.5x multiple. Our sum of the parts NAV is £214m or 45p/sh after adjusting for equity dilution (at 35p/sh) from our assumption of the equity component of a mine-build fundraise. On an unrisked, unfunded basis, our sum of the parts NAV would be 226p/sh. We also present a flex case where we assume that EMH adjusts its strategy to produce a battery-market facing lithium hydroxide product. **Our fully diluted risked NAV under a lithium hydroxide scenario increases to 80p/sh (A$1.40/sh).**

Discounted NAV. Our risked sum of the parts NAV implies that EMH is trading (based on current share price 19p) at an unchallenging 0.42x P/NAV discount. Based on our sum of the parts NAV for the lithium hydroxide case it implies EMH is trading at a 0.24x P/NAV discount. Whilst this is clearly a substantial discount to NAV we believe that there are several milestones ahead that could drive a considerable re-rating in the company's share price.

Binary outcome? Notwithstanding leverage to the prevailing lithium price and outlook, there are numerous other factors in play. Whilst the company has made good progress operationally, the machinations of the new Czech coalition government and resulting uncertainty surrounding permitting timelines has created a disconnect between project value and share price. Our view is that an overhang on the share price has been created by the perception of the binary outcome vis à vis the mining permit. This adds another layer of market discount to the NAV on the top of usual discount that companies at this development stage typically carry.

Deep-value play at a low point. We see significant scope for a re-rating in EMH's shares if the company delivers on development milestones and moves closer towards production. European-focused lithium production sets the company apart from most of its competitors and we favour the investment opportunity over the majority of South American brine projects. We see many advantages over the raft of recent spodumene projects which are largely stranded, with very few options for conversion of spodumene concentrate outside of China. Production of lithium from Zinnwaldite offers compelling potential for operating cost savings versus the production of lithium carbonate from spodumene concentrate.

The shares are currently trading at two-year low levels and we see little rationale for further price erosion. We believe that external permitting hurdles which are largely out of the company's control will provide considerable momentum to the share price if successfully resolved. Cinovec is a few years away from production and if the company can successfully navigate the near-term development process then we believe that the patient investor is likely to be rewarded given that the Li-ion battery story looks likely to be a driver for the next decade or so at the very least.

Lithium carbonate is the base-case

- Our base-case modelling assumes that EMH sticks to the PFS scenario of producing lithium carbonate (Li_2CO_3)
- We incorporate relatively punitive assumptions regarding capital expenditure, adding a 25% to the company's PFS estimate to reflect the PFS level of capex accuracy of +/- 25%. Whilst EMH have undertaken considerable optimisation work since the PFS, we retain a conservative view for now. Our capex assumption is therefore $491m, 25% higher than the PFS $393m. This is particularly punitive as the PFS estimate already includes 10% contingency.
- Using the PFS capex assumption and no escalation, increases project $NPV^{10\%}$ to $365m ($507m at 8%) and our sum of the parts NAV to 53p/sh (67p/sh at 8% discount rate) fully diluted.
- Despite the fact that recent metallurgical optimisation has demonstrated improved lithium recoveries up to 95%, we retain a conservative stance and use 85% as per the PFS. Whilst this is punitive, we retain caution until all DFS-level test-work has been completed.
- Our base-case outputs annual LOM average lithium carbonate production of 20,100tpa.
- Tax is calculated at 19% with a 10-year tax-free window as provided by Czech investment legislation.

Figure 3 - Indicative Base-case NAV valuation - Shard Capital estimates

Base case Valuation				
NPV	**Disc Rate**	**US$m**	**£m**	**£/sh**
Cinovec - Lithium carbonate operation	10%	289	222	0.47
Subtotal		289	222	0.47
Risked NPV	**NAV multiple**		0	
Cinovec	0.50x	144	111	0.24
Exploration	-	0	0	0.00
Sub-total		144	111	0.24
Cash from B/S		2.1	1.6	0.00
Cash from option exercise		0.0	0.0	0.00
Equity funding		147.5	113.5	0.24
Forward Corporate G&A / Other		(16)	(12)	(0.03)
Base-case NAV VALUATION		**278**	**214**	**£0.45**
Current NAV Multiple (Implied)				0.42
Shares on issue (basic)		146.6m		
Shares on issue (Fully-diluted, post equity financing)		470.9m		

Source: Shard Capital estimates

Lithium hydroxide is our upside scenario

Our upside-case modelling assumes that EMH moves forward with the production of lithium hydroxide instead of lithium carbonate due to its increasing use in lithium-ion batteries.

- We assume the same mining and ROM input to the plant.
- As a result of the process to recover lithium hydroxide we assume an increase in overall recovery of 5% over the base-case lithium carbonate assumption of 85%, translating to recovery of 90%. Note that this assumption remains conservative given that our base-case recovery remains 10% below the 94-95% achieved in recent test work.
- We incorporate a 15% increase in capex to account for the construction of a lithium hydroxide recovery plant instead of the LCP. We add this 15% increase to our base-case capex assumption for total capex of $564m. **If we remove our 25% escalation but retain the 15% added capex, our NPV$^{10\%}$ for Cinovec hydroxide increases to $856m and our sum of the parts NAV to 95p/sh (117p/sh at 8% discount rate) fully diluted.**
- Our upside-case hydroxide scenario outputs annual LOM average lithium hydroxide production of c.24,850tpa.
- EMH believes that the increased cost to produce hydroxide will be offset by cost savings due to the use of cheaper reagents. As such we retain the same opex inputs as our base-case, although costs on a unit basis are different due increased to hydroxide production in terms of tonnage.

Figure 4 - Indicative Lithium Hydroxide scenario NAV valuation - Shard Capital estimates

Lithium hydroxide scenario				
NPV	**Disc Rate**	**US$m**	**£m**	**£/sh**
Cinovec - Lithium Hydroxide	10%	768	591	1.14
Subtotal		768	591	1.14
Risked NPV	**NAV multiple**			
Cinovec	0.50x	384	296	0.57
Exploration	-	0	0	0.00
Sub-total		384	296	0.57
Cash from B/S		2.1	1.6	0.00
Cash from option exercise		0.0	0.0	0.00
Equity funding		169.7	130.5	0.25
Forward Corporate G&A / Other		(16)	(12)	(0.02)
Hydroxide scenario NAV VALUATION		**540**	**415**	**£0.80**
Current NAV Multiple (Implied)				0.23
Shares on issue (basic)		146.6m		
Shares on issue (Fully-diluted, post equity financing)		519.5m		

Source: Shard Capital estimates

Shard capital modelling assumptions

Our base case unrisked, unfunded $NPV^{10\%}$ of the Cinovec project (100% basis) is US$289m (£222m) or 48p/sh. At an 8% discount rate with no other variables changed this increases to $427m (£329m) or 56p/sh, again on an unfunded basis.

Our valuation is driven by DCF modelling of the Cinovec operation, with parameters based on a combination of the April 2017 PFS and recent test-work results. In addition, we add in some of our own assumptions in order to derive a more conservative valuation. We assume a nominal construction start date of 2020 with a 24-month construction period leading to commissioning in 2022. We assume full production from 2023.

Figure 5 - Shard Capital DCF assumptions

Shard Capital Assumptions	Units	
Construction start	*year*	2020
Commissioning	*year*	2022
Full capacity production	*year*	2023
LOM	*years*	21
Total ore mined	*Mt*	34.4
Li_2O grade	*%*	0.65%
Sn grade	*%*	0.09%
W grade	*%*	0.03%
Average mill feed	*Mtpa*	1.68
Lithium recovery in carbonate plant	*%*	85%
Avg Li_2CO_3 production	*tonnes*	20,100
Avg potash production	*kt*	12.6
Avg Sn production	*tonnes*	810
Avg W production	*mtu*	24,500
Li_2CO_3 price	*$/t*	10,000
Sn price	*$/t*	22,500
W APT price	*$/mtu*	330
Assumed % received of APT price	*%*	80
Tax		19% tax rate, 10 yr holiday
Base-case Lithium Carbonate		
Discount rate	*%*	10
Pre-production capex (+25% x $393m)	*US$m*	491
Sustaining capex	*%*	4% of direct opex
Average C1 cast cost	*US$m/pa*	108
LOM avg Cash cost	*$/t Li_2CO_3*	5,253
LOM avg Cash cost after by-products (inc royalty)	*$/t Li_2CO_3*	3,931
Lithium Hydroxide scenario		
Discount rate	*%*	10
Capex under hydroxide sceanario (+15% to base-case)	*US$m*	565
Lithium hydroxide price	*$/t*	12,000
Lithium Hydroxide recovery	%	90
Avg hydroxide production	tonnes	24,857
Average C1 cast cost	*US$m/pa*	108
LOM avg Cash cost	*$/t LiOh. H_2O*	4,366
LOM avg Cash cost after by-products	*$/t LiOh. H_2O*	3,220

Source: Shard Capital estimates

Risked sum-of-the-parts NAV assumptions

To derive our nominal valuation of European Metals, we risk our project NPVs for both scenarios and present a sum of the parts valuation to reflect corporate adjustments and funding assumptions.

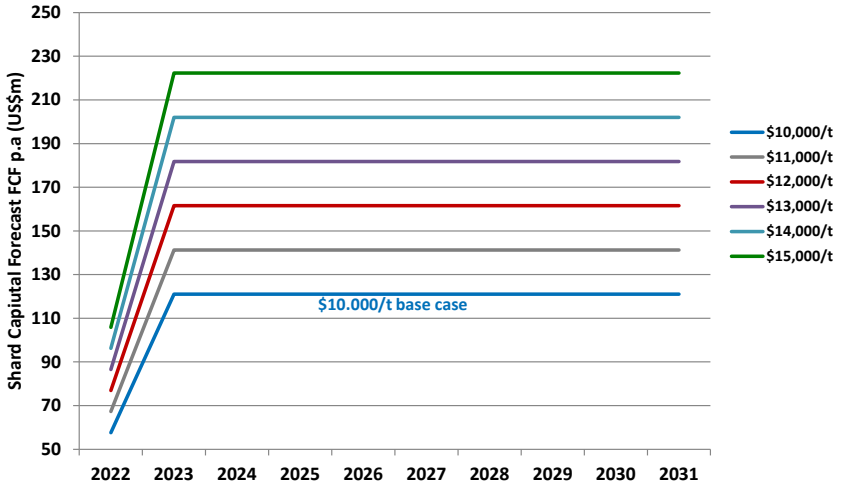
We generally value advanced exploration and development companies in the range of 0.1-1.0x NAV, in line with industry averages. We believe that EMH deserves to trade in the middle of this range with Europe's largest lithium project at the DFS stage, attractive economics and potential to directly supply the lithium-ion battery market. We currently apply a 0.5x multiple to reflect remaining permitting risk in the Czech Republic in addition to typical risks surrounding timelines, funding and execution. We anticipate unloading this risk discount as EMH hits key development milestones and obtains all necessary permits.

We further adjust for future corporate costs (DCF basis), net debt (in this case cash on balance sheet as EMH is debt free) and funding assumptions. It is too early to speculate about potential funding mechanisms but we simplistically assume a 70% debt, 30% equity funding scenario based on our escalated capex and assume mine-build equity funding at 35p/sh. Whilst this is in excess of the current share price, it is conservative when compared to EMH's share price prior to the purported cancellation of the MOU with the government. It also reflects the fact that equity funding will post-DFS and with considerable time for the company's share price to recover, in our view.

Sensitivity Analysis – base case

- A robust project with leverage to higher lithium prices

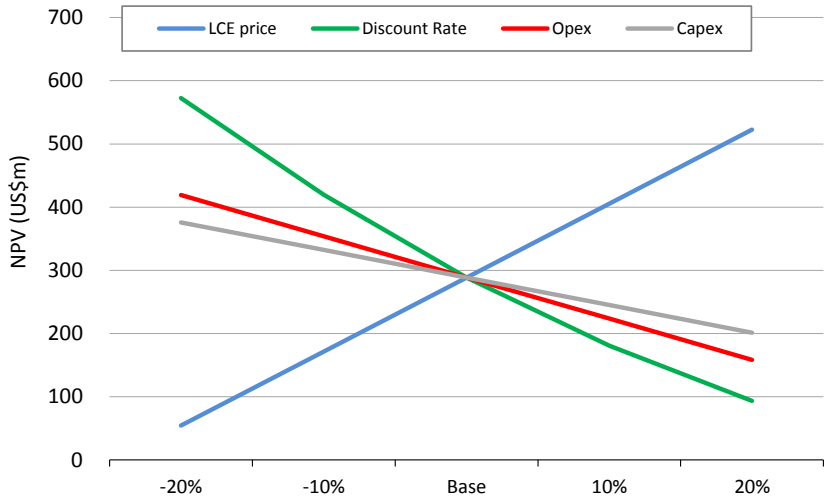
Figure 6 - Base-case forecast FCF at various lithium price assumptions



Source: Shard Capital estimates

- Sensitivity analysis on our unrisked base-case Cinovec NPV indicates that the company shows extremely strong lithium price leverage as would be expected. Our NAV increases by 40% for a 10% increase in our LT lithium price. If we flex our lithium price assumption by +20% (i.e. to $12,000/t from $10,000/t), our NAV increases by 81%.

Figure 7 - Sensitivity Analysis – unrisked project NPV at 10% discount rate



Source: Shard Capital estimates

Figure 8 - Sensitivity Analysis – base case

Base case NPV Sensitivity **(USD $m)**

LCE price ($/t) \ Discount rate (%)	5%	8%	10%	12%
8,000	336	141	54	-9
9,000	535	284	172	88
10,000	733	427	**289**	185
11,000	932	570	406	282
12,000	1130	714	523	379
13,000	1329	857	640	476
14,000	1527	1000	757	573
15,000	1726	1143	874	670

Base case Risked NAV/sh Sensitivity **(GBP £/sh)**
At 0.5x multiple

LCE price ($/t) \ Discount rate (%)	5%	8%	10%	12%
8,000	0.48	0.33	0.25	0.20
9,000	0.65	0.44	0.35	0.28
10,000	0.81	0.56	**0.45**	0.36
11,000	0.97	0.68	0.54	0.44
12,000	1.13	0.79	0.64	0.52
13,000	1.30	0.91	0.73	0.60
14,000	1.46	1.03	0.83	0.68
15,000	1.62	1.14	0.92	0.76

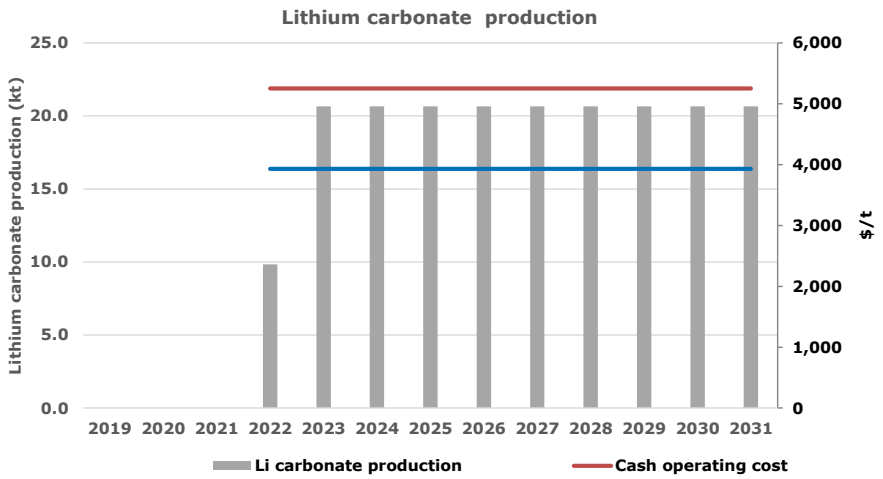
Base case Risked NAV/sh Sensitivity **(GBP £/sh)**
At 1.0x NPV multiple

LCE price ($/t) \ Discount rate (%)	5%	8%	10%	12%
8,000	0.76	0.44	0.30	0.20
9,000	1.08	0.67	0.49	0.35
10,000	1.41	0.91	**0.68**	0.51
11,000	1.73	1.14	0.87	0.67
12,000	2.06	1.38	1.06	0.83
13,000	2.38	1.61	1.26	0.99
14,000	2.71	1.84	1.45	1.15
15,000	3.03	2.08	1.64	1.30

Source: Shard Capital estimates

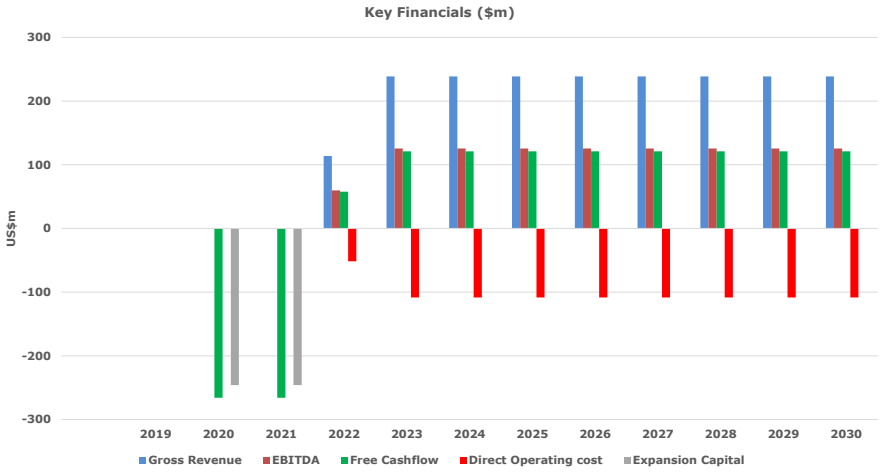
Base-case outcomes

Figure 9 - Production (tpa) and operating costs ($/t)



Source: Shard Capital estimates

Figure 10 - Key financials - Shard Capital estimates



Source: Shard Capital estimates

Figure 11 - Key project-level financials - Shard Capital estimates – base case

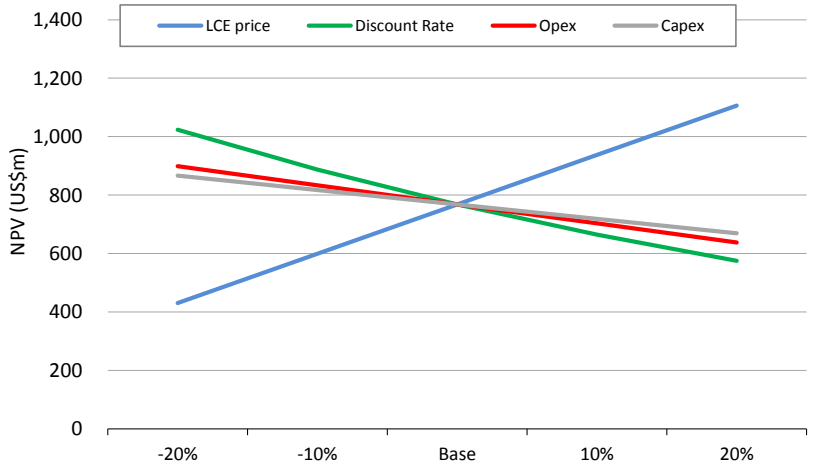
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Ore Mined	kt	0	0	0	800	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Li Concentrate produced	kt	0	0	0	171	360	360	360	360	360	360	360	360	360
Total ore processed	kt	0	0	0	800	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680
LCE produced	kt	0.0	0.0	0.0	9.8	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7
Tin produced	t	0.0	0.0	0.0	396.0	831.6	831.6	831.6	831.6	831.6	831.6	831.6	831.6	831.6
W produced	mtu	0	0	0	12,000	25,200	25,200	25,200	25,200	25,200	25,200	25,200	25,200	25,200
Potash produced	kt	0.0	0.0	0.0	6.2	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Total revenue	$m	0	0	0	114	239	239	239	239	239	239	239	239	239
Direct Operating cost	$'m	0	0	0	-52	-109	-109	-109	-109	-109	-109	-109	-109	-109
Total opex	$'m	0	0	0	-54	-113	-113	-113	-113	-113	-113	-113	-113	-113
EBITDA	$'m	0	0	0	60	125	125	125	125	125	125	125	125	125
Free Cashflow		0	-266	-266	58	121	121	121	121	121	121	121	121	121
Expansion Capital	$'m	0	-246	-246	0	0	0	0	0	0	0	0	0	0
Sustaining Capital	$'m	0	0	0	-2	-4	-4	-4	-4	-4	-4	-4	-4	-4

Source: Shard Capital

Sensitivity Analysis – hydroxide scenario

- Sensitivity analysis on our unrisked hydroxide scenario Cinovec NPV.

Figure 12 - Sensitivity Analysis – Cinovec hydroxide NPV at 10% discount rate



Source: Shard Capital estimates

Figure 13 - Sensitivity Analysis – Cinovec hydroxide

Hydroxide scenario Sensitivity **(USD $m)**

Hydroxide price ($/t)	Discount rate (%) 5%	8%	10%	12%
8,000	625	335	205	108
9,000	864	508	346	225
10,000	1103	680	487	341
11,000	1342	852	627	458
12,000	1581	1024	**768**	575
13,000	1820	1196	909	692
14,000	2058	1368	1050	808
15,000	2297	1541	1191	925

Hydroxide Risked NAV/sh Sensitivity **(GBP £/sh)**
At 0.5x multiple

hydroxide price ($/t)	Discount rate (%) 5%	8%	10%	12%
8,000	0.69	0.48	0.38	0.31
9,000	0.87	0.61	0.49	0.40
10,000	1.05	0.73	0.59	0.48
11,000	1.22	0.86	0.69	0.57
12,000	1.40	0.99	**0.80**	0.66
13,000	1.58	1.12	0.90	0.74
14,000	1.75	1.24	1.01	0.83
15,000	1.93	1.37	1.11	0.92

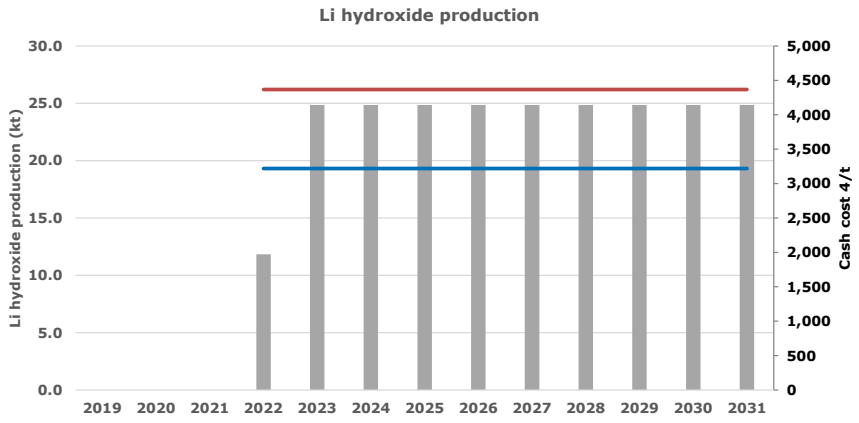
Hydroxide Risked NAV/sh Sensitivity **(GBP £/sh)**
At 1.0x NPV multiple

Hydroxide price ($/t)	Discount rate (%) 5%	8%	10%	12%
8,000	1.16	0.73	0.53	0.39
9,000	1.51	0.98	0.74	0.56
10,000	1.86	1.24	0.95	0.74
11,000	2.22	1.49	1.16	0.91
12,000	2.57	1.75	**1.37**	1.08
13,000	2.92	2.00	1.58	1.25
14,000	3.28	2.26	1.79	1.43
15,000	3.63	2.51	1.99	1.60

Source: Shard Capital estimates

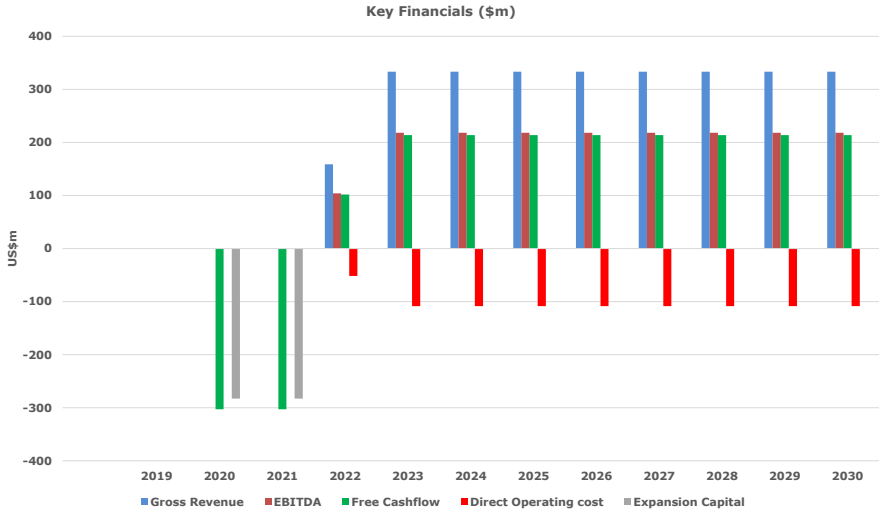
Hydroxide scenario outcomes

Figure 14 - Production (tpa) and operating costs ($/t) - Hydroxide



Source: Shard Capital estimates

Figure 15 - Key financials - Shard Capital estimates - Hydroxide



Source: Shard Capital estimates

Figure 16 - Key project-level financials - Shard Capital estimates – hydroxide

		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Ore Mined	kt	0	0	0	800	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Li2O grade	%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%	0.65%
Sn grade	%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%	0.09%
W grade	%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
Li Concentrate produced	kt	0	0	0	171	360	360	360	360	360	360	360	360	360
Total ore processed	kt	0	0	0	800	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Lithium Hydroxide	kt	0.0	0.0	0.0	11.8	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9
Tin produced	t	0.0	0.0	0.0	446.4	937.4	937.4	937.4	937.4	937.4	937.4	937.4	937.4	937.4
W produced	mtu	0	0	0	13,200	27,720	27,720	27,720	27,720	27,720	27,720	27,720	27,720	27,720
Potash produced	kt	0.0	0.0	0.0	6.2	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Total revenue	$m	0	0	0	159	333	333	333	333	333	333	333	333	333
Cash operating cost	$/t Lithium hydroxide	0	0	0	4,366	4,366	4,366	4,366	4,366	4,366	4,366	4,366	4,366	4,366
Net cash cost (after by-products)	$/t Lithium hydroxide	0	0	0	3,220	3,220	3,220	3,220	3,220	3,220	3,220	3,220	3,220	3,220
Expansion Capital	$'000	0	-283	-283	0	0	0	0	0	0	0	0	0	0
Sustaining Capital	$'000	0	0	0	-2	-4	-4	-4	-4	-4	-4	-4	-4	-4
Total opex	$'m	0	0	0	55	115	115	115	115	115	115	115	115	115
EBITDA	$'m	0	0	0	104	218	218	218	218	218	218	218	218	218
Net Profit (Loss)	$'m	0	0	0	84	176	176	176	175	175	174	174	173	172
Free Cashflow	$'000	0	-303	-303	102	214	214	214	214	214	214	214	214	214

Source: Shard Capital

Lithium hydroxide optionality

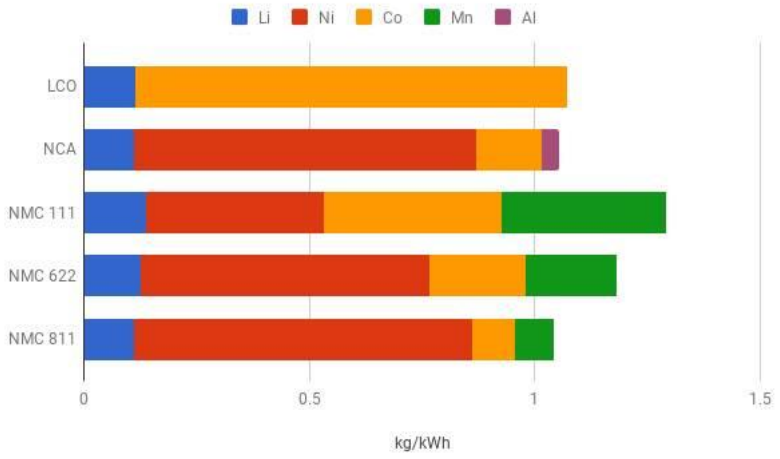
► **Lithium hydroxide – a battery focused value-add product**

Lithium hydroxide (LiOH) or more commonly a product called lithium hydroxide monohydrate ($LiOH.H_2O$) is another form of lithium compound which along with lithium carbonate are suitable for direct use in the battery market, unlike spodumene concentrate which is an intermediate product. Lithium hydroxide currently represents approximately 25% of the global lithium product market, compared to 50% for lithium carbonate. Lithium hydroxide (LiOH used for brevity from this point) has a number of specialist applications, the most important being batteries and grease, with additional applications in speciality organics for the polymer and pharmaceutical industry. Further processing is typically required to upgrade the LiOH to battery-grade.

► **Pricing premium for hydroxide**

Based on atomic weights, lithium hydroxide contains 16.54% Li whereas lithium carbonate contains 18.8%. However, the hydroxide has a higher energy mass and the advantage is the production of more "product" for the same lithium tonnage. As a result, hydroxide is becoming the preferred product by battery makers, especially for the long-range batteries whose chemistry calls for highly variable utilisation of other elements (e.g. Cobalt, nickel) but with lithium always as the common denominator (see chart below). Over the last couple of years this has resulted in lithium hydroxide trading at a premium to lithium carbonate. At the end of November 2018, the lithium carbonate price is $13,000-15,000/t, with lithium hydroxide trading at $15.000-$17,000/t, a 15% premium, although this was much higher in 2017 (c.40%).

Figure 17 - Comparison of different battery chemistries – LCO, NCA, and NMC – and their material/elemental composition



Source: Research Interfaces after Fu et al

► **EMH has the flexibility to produce either carbonate or hydroxide**

Whilst lithium hydroxide can be produced from both brine and hard rock operations, both present challenges. For brines, the conversion of lithium carbonate to lithium hydroxide is typically more expensive than producing a lithium hydroxide product directly from spodumene. This is because the process of producing hydroxide from spodumene does not require an intermediate step, i.e. brine operations first produce a carbonate that requires further processing into

hydroxide. As a hard rock deposit, albeit non-spodumene, EMH will have the flexibility to build either a carbonate or hydroxide plant. McKinsey estimate that the additional conversion cost of producing hydroxide from lithium carbonate produced from brines is approximately $500/t.

► **Carbonate is a larger market, but hydroxide gaining importance**

At present, Lithium carbonate remains the dominant choice for cathode manufacturers especially in China, and this is likely to remain the case. Nevertheless, hydroxide expected to gain market share given that hydroxide is the preferred product for companies such as Tesla and Panasonic. Hydroxide is preferred in the NMC battery chemistry.

► **Hydroxide will favour non-brine deposits…**

Any further move towards hydroxide will favour hard-rock producers, either those producing a spodumene concentrate for downstream processors, those producing or planning to produce hydroxide on site, or companies like EMH with a non-spodumene resource but ability to build conversion capacity at the mine site.

► **but limited LiOH opportunities at the mine site for other hard-rock producers**

There are limited opportunities for the production of LiOH at mine sites currently. Hard rock lithium producers (pegmatites etc.) tend to have a smaller resource base and generally produce a spodumene 6% Li_2O concentrate. This concentrate requires further processing in order to produce lithium carbonate or hydroxide.

As hard rock resources tend to be smaller (Cinovec being noticeable exception) it is harder to justify or fund the capital outlay and indeed many projects cannot support the resulting capital intensity. Consequently, most spodumene producers have historically not been vertically integrated, requiring concentrates to be shipped to a conversion plant. Typically, this incurs significant transport and logistics costs as there is limited lithium carbonate/hydroxide conversion capacity outside of China. This is particularly problematic for hard-rock lithium producers that are not in close proximity to China.

► **Lithium hydroxide processing capacity build-out has commenced.**

CRU expects lithium hydroxide processing capacity to be operational in seven countries by 2020 including China, Australia, Argentina, Japan, USA and Canada. Although CRU reports that current hydroxide capacity growth in 2018 actually outstrips demand, but the consultancy believes that this is to fill a lithium hydroxide deficit that emerged in 2016 and also to position in anticipation of future demand growth in 2019 and beyond. CRU estimates that that it takes on average 1.5 years to build a conversion facility and 6 months to optimise production to produce battery-grade lithium hydroxide.

► **Lithium security of supply deals are on the increase – hydroxide dominated**

- November 2018, Kidman Resources signed 2-year (plus 2-year option) to supply Mitsui & Co for approximately 15% of company's 22.6ktpa production. Interestingly, the agreement has been signed prior to the finalisation of final hydroxide product specifications.

- November 2018. Altura Mining signs 100% off-take deal with Ganfeng for downstream carbonate and hydroxide production.

- September 2018, Chinese firm, Ganfeng Lithium signed an agreement with Tesla for the delivery of lithium hydroxide from 2018 to 2020 with an option to extend for three years.

- September 2018, LG Chem, the South Korean battery manufacturer signed an agreement with Ganfeng Lithium to supply 48,000t of lithium hydroxide until 2022.

- August 2018 – South Korean POSCO buys lithium rights in Argentina from Galaxy Resources for $280m.

- July 2018. LG Chem signed an agreement with Nemaska Lithium for 7,000tpa lithium hydroxide.

- May 2018. Kidman Resources signs 3-year lithium hydroxide off-take with Tesla

► **Hydroxide metallurgical processes are varied but widely employed**

The process to produce hydroxide is relatively and not that different from the production of lithium carbonate. There are a number of different processes to produce hydroxide depending on the source material; conversion from Li_2CO_3, conversion from Li_2SO_4, lime roast of spodumene, Na_2CO_3 pressure leaching (e.g. Quebec lithium) and membrane electrolysis (Nemaska, Neometals, Albemarle). In Europe:

- **Keliber Oy**, a private company, has commenced a pilot plant test work programme to produce lithium hydroxide from its Finnish spodumene projects. The pilot plant includes soda leach of calcined spodumene, solution purification by ion exchange and lithium hydroxide crystallization.
- **Infinity Lithium** completed a scoping study on lithium hydroxide in November 2018 at the San Jose deposit.

We do not have much information about the potential process route at Cinovec yet, but we understand that relatively simple crystallisation process could be employed. EMH states that it is investigating the "*Production of lithium carbonate (or hydroxide) via gypsum & sodium sulphate roast, water leach, purification and product precipitation / crystallization route".* The updated PFS will include a process flowsheet whereby battery grade lithium hydroxide is precipitated directly from the roast and water leach steps.

► **Same front-end.** This would essentially have the same front-end plant but then a different process for impurity removal and hydroxide production using different reagents. The process is therefore the same from initial ore beneficiation through to the production of lithium sulphate. At that point, the process can be adapted to produce either carbonate or hydroxide. The final product selection is likely to be influenced by market dynamics and the product requirements of potential off-take and funding partners.

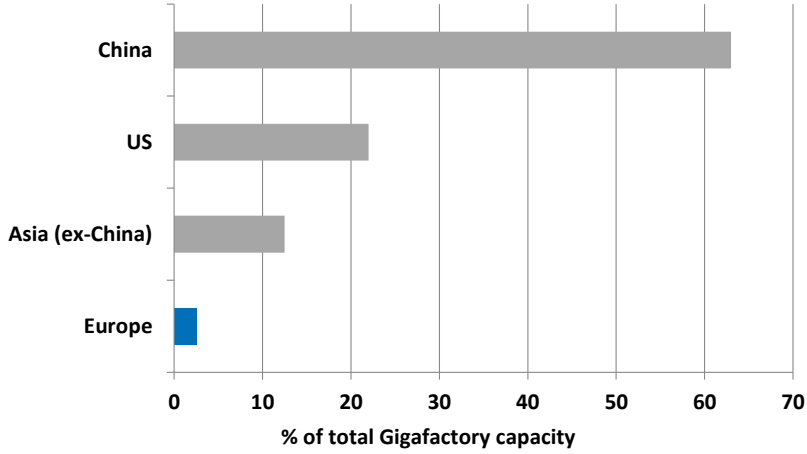
► **Cost off-set.** EMH believes that any increased in costs relating to the hydroxide plant are likely to be off-set by lower reagent costs.

European Battery market heating up

European battery capacity set to increase market share

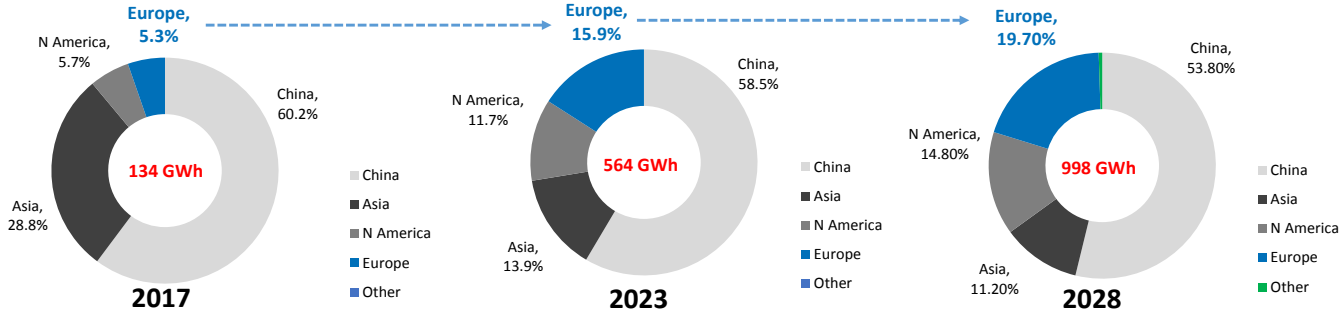
- At present, the production of lithium-ion batteries is dominated by China and the rest of Asia. Although growth in North America is expected with Tesla's gigafactory build-out, Europe looks set for a dramatic increase in factory capacity according to Benchmark.
- The data suggests that total megafactory capacity will grow from 134 GWh to 564GWh in 2023 and 998 GWh over the next ten years in 2018. This equates to a 320% and 644% increase in global capacity of which Europe's share is expected to increase from 5.3% to 19.7% by 2028, an increase from 7.1 GWh to 196 GWh for a forecast total European capacity of 189 GWh.

Figure 18 - European gigfactory capacity current lags



Source: Benchmark Mineral intelligence

Figure 19 - Lithium-ion Battery Megafactory capacity by region – European capacity increasing



Source: Cobalt 27 after Benchmark Mineral Intelligence 9July 2018)

- Numerous plans have been circulated in the media with regards to new lithium-ion battery capacity in Europe. It's a secretive industry and very little detail is attached to the build out plans of various companies. Nevertheless, the trend is the same, with European manufacturing capacity forecast to rise significantly over the next 5 years. All the major European car manufacturers have ambitious plans for the future production of electric vehicles, yet European lithium conversion and battery production is limited.
- We outline some of the new initiatives in the table below.

Figure 20 - European Lithium-ion Battery Megafactory projects

Company	Factory Location	Purpose	Projected Annual Capacity (GWh pa)	Projected Year of Completion
LG	Wroclaw, Poland	Electric Vehicles	4	2019
Samsung	Budapest, Hungary; Austria	Electric Vehicles	?	2018 (Hungary)
A123 Systems	Ostrava, Czech Republic	Electric Vehicles	?	?
Northvolt	Sweden	Multi Purpose	32	2023
Northvolt	Sweden	Multi Purpose	8	2020
Tesla	Germany or The Netherlands	Electric Vehicles	?	?
BMZ	Bavaria	Electric Vehicles / General Purpose	30	2020
Terra E	Germany	Industrial and electromotive	34	2028
HE3DA	Czech Republic	Vehicles, medical equipment,	1.2	?
SK Innovation	Hungary	Electric Vehicles	7.5	2020
GS YUASA	Hungary	SLI (Starting, Lighting, Ignition)	?	?

Source: Company reports, Shard Capital estimates

Cinovec in context

- **Resource size.** Cinovec hosts the largest lithium resource in Europe, with 7.2Mt of contained LCE. The only other resource even close to this magnitude is Rio Tinto's Jadar project in Serbia. The PFS mine plan assumes mining of only 34.5Mt (Ore Reserves) over the 22 LOM which equates to 4.9% of the 695Mt resource tonnage or 9.2% of Indicated resource tonnage.

Figure 21 - European lithium development projects – major economic study outputs

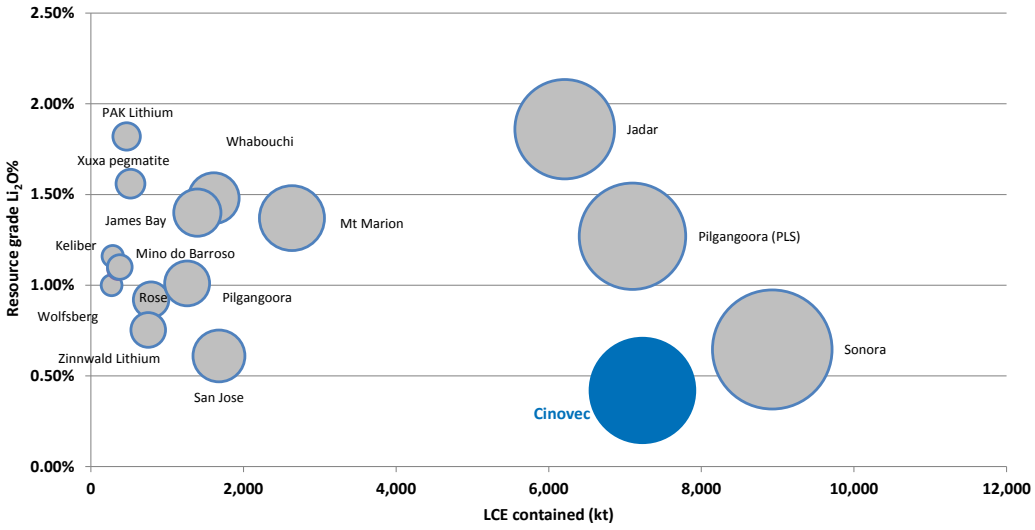
Project	Exchange	Company	Market Cap US$m	Location	Stage	Resource			
						Mt	Li_2O%	Cont. Li_2O (kt)	LCE contained (kt)
Cinovec	AIM / ASX	European Merals	32.5	Czech Rep	DFS	695.9	0.42%	2,923	7,228
Jadar	LSE	Rio Tinto	-	Serbia	PFS	135	1.86%	2511	6,210
San Jose	ASX	Infinity Lithium	10.5	Spain	Scoping Study	111.3	0.61%	679	1,679
San Jose	ASX	Infinity Lithium	10.5	Spain	Scoping Study	111.3	0.61%	679	1,679
Zinnwald Lithium	-	Deutsche Lithium	-	Germany	DFS	40.4	0.75%	304	752
Mino do Barroso	AIM	Savannah Resources	66.3	Portugal	DFS	14.0	1.10%	154	381
Keliber	Private	Keliber OY	-	Finland	DFS	10.0	1.16%	116	287
Wolfsberg	ASX	European Lithium Ltd	47.8	Austria	DFS	11.0	1.00%	110	272

Project	Exchange	Company	Capex US$m	Total cash cost $/t	Total cash cost after by-products	LOM	Production tpa	Product	Capital Intensity per tonne product
Cinovec	AIM / ASX	European Merals	393	5,211	3,483	21	22,500	Carbonate	17,467
Jadar	LSE	Rio Tinto	-	-	-	-	-	-	-
San Jose (hydroxide scenario)	ASX	Infinity Lithium	344	5,343	-	24	14,338	Hydroxide	23,992
San Jose (carbonate scenario)	ASX	Infinity Lithium	273	5,004	-	24	12,133	Carbonate	22,501
Zinnwald Lithium	-	Deutsche Lithium	-	-	-	-	-	Fluoride	-
Mino do Barroso	AIM	Savannah Resources	136	$271/t con	-	11	175,000	Spodumene	-
Keliber	Private	Keliber OY	288.15	5,499	-	13	16,530	Carbonate	17,432
Wolfsberg	ASX	European Lithium Ltd	388	8,739	7,160	12	8,400	Hydroxide	46,190

Source: Shard Capital, company reports

- **Grade.** At face value, Cinovec's resource grade (0.46% Li_2O) appears low and the deposit is often perceived as a large tonnage, low-grade deposit. However, with lithium deposits, in-situ resource grade is not always king given the range of metallurgical characteristics and recovery of various ore types. Two points; 1.) EMH's projected overall lithium recovery is very high – c.94-95% in recent test work and 2.) Cinovec ore is a lithium-bearing mica and EMH's test work indicates that the **ore is readily concentrated via magnetic separation from 0.41% to 2.7% Li_2O.**

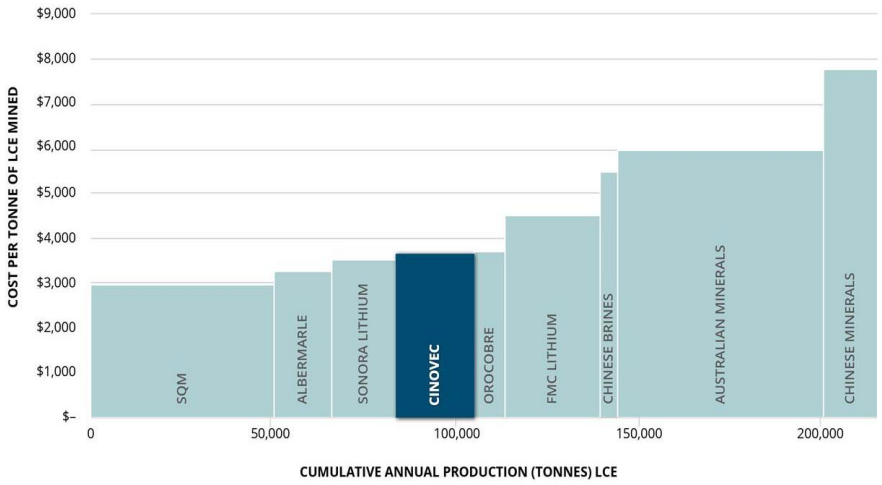
Figure 22 - Global lithium development projects – grade does tell the whole story – see paragraph above



Source: Shard Capital, company reports

- **Operating cost advantage.** Cinovec is projected to be a low-cost asset. Assuming lithium carbonate production as per the PFS, operating costs are projected to be c.$3,500/t net of by-product credits. This implies that Cinovec will be placed in the lower half of the cost curve. Note that the cost curve generally reflects brine-sourced production (predominantly Argentina and Chile) in the lower half and spodumene-sourced production in the upper half of the curve. Cinovec will then be one of the lowest cost

Figure 23 - Lithium carbonate production cost curve



Source: EMH, after HSBC

Cinovec's low costs are driven by:

- **Location** in an area of excellent local infrastructure and superior links into regional infrastructure and European markets. The project also benefits from access to low-cost grid power.
- **By-products.** The project's cost base is lowered significantly with the inclusion of tin, tungsten and potash credits.
- **Simple processing.** The mica ore is relatively friable which negates the need for multiple stages of power intensive crushing and grinding. Instead, the current PFS flow sheet indicates a single stage of crushing and single stage of SAG milling. The ore is milled to only 250 µm to allow the initial beneficiation process and rejection of 78% of the mass of ore mined. In addition, roasting is undertaken at a relatively low temperature and the process recycles reagents.

Zinnwaldite vs spodumene:

- **Zinnwaldite is paramagnetic.** This means that low-cost wet high and low-intensity magnetic separation can be employed in the beneficiation plant in order to produce a lithium mica concentrate.
- **Lithium carbonate directly.** As we have touched on already, Lithium extraction from Zinnwaldite offers compelling potential for cost savings when compared with spodumene-hosted hard rock deposits. Zinnwaldite is able to be treated with less severe operating conditions compared with spodumene. The sodium sulphate roast process envisioned by EMH can produce lithium carbonate directly in comparison to spodumene producers who produce a spodumene concentrate that requires further processing/conversion into carbonate.

- **Spodumene is expensive**. The current price for 6% spodumene concentrate is approximately $930/t, with Q3 2018 averaging $1,070/t, although there is limited price transparency. As spodumene requires further processing to produce a value-add lithium product such as lithium carbonate, the concentrate price is a key input cost for Chinese-based conversion facilities or mine sites looking to vertically integrate and produce on site. At present there is a bottle neck in Chinese conversion capacity. The increase in the spodumene concentrate price means that producing lithium carbonate from zinnwaldite is likely to be considerably lower cost.

  Spodumene conversion involves a relatively complex chemical process and expensive reagents. EMH's PFS in 2017 indicated that based on a conversion price of $365/t for a Chinese-based conversion plant and a spodumene concentrate price of $905/t, that the total cost per tonne of LCE would be $11,240/t. This compares to Cinovec's total cost of $3,583/t.

  In the sodium sulphate roast process for producing lithium carbonate from zinnwaldite, the sodium sulphate is recycled, resulting in a considerable decrease in the amount of reagents required in the process.

Cinovec brief overview

Location

Cinovec is located in the Krusne Hore Mountains which straddle the border between the Czech Republic and the Saxony State of Germany, 100km northwest from Prague. The project is centrally located, surrounded by a multitude of car, electronics and chemical manufacturers and lithium-ion battery manufacturers. There are numerous plans for more mega and gigafactories within Europe (see section on European battery market).

Figure 24 - Cinovec's location in the heart of Europe

Source: Benchmark Mineral intelligence

History

The region has a long history of mining dating back to the 1300s. Mining was last undertaken in modern times in the 1940s when a large underground mining operation was established to produce tungsten for the war effort. Mining and processing activities continued under the Czechoslovakian Government with the mine continuing to expand and producing tin as well as tungsten. The mine was eventually closed in 1993 due to the fall of communism and lower tin prices.

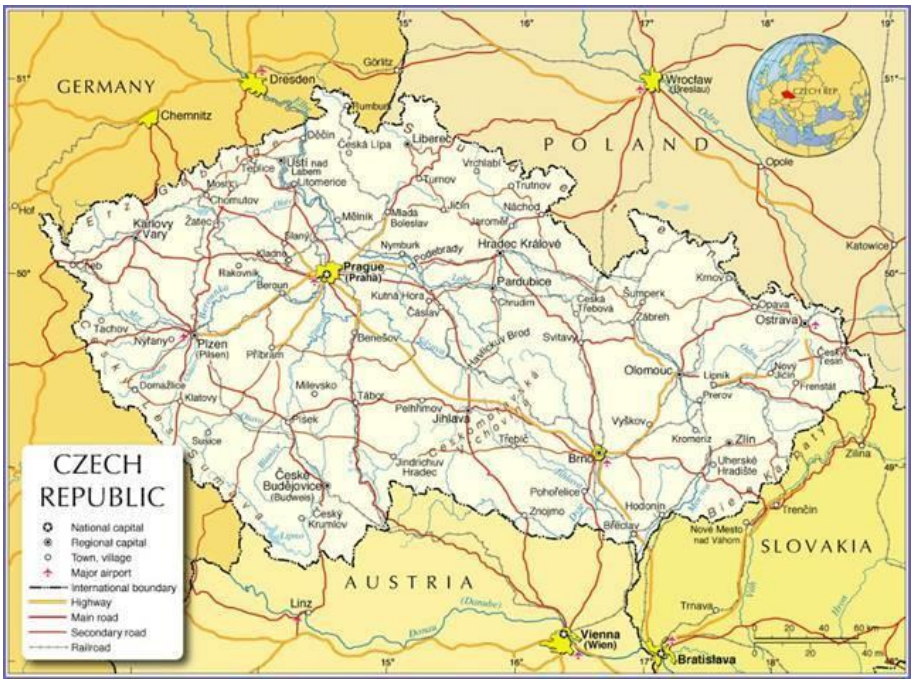
- **Project History under EMH.** European Metals purchased a 100% interest in the Cinovec project exploration rights, along with an extensive database of historical data.
- **2015 Scoping Study.** EMH completed a scoping study in 2015 for the redevelopment of Cinovec. The scoping study flowsheet was based on the as yet un-commercialised L-Max process proprietary to Lepidico Ltd.
- **2016 New flowsheet.** A trade-off study was undertaken in 2016, comparing the operating and capital costs of the conventional sodium-sulphate roast and the L-Max process. It was concluded that conventional roasting technology would deliver high lithium recoveries with a lower operating cost, lower technical risk, less impurity removal, and be less dependent on potassium by-product credits.
- **2017 PFS.** In April, EMH released the results of a PFS, with the sodium-sulphate roasting option selected as the preferred method of lithium extraction.

First world Infrastructure

The project's position on the border of Germany and the Czech Republic gives Cinovec a key advantage compared to the majority of other lithium development projects in remote areas and those with undeveloped infrastructure.

- The area is exceptionally well serviced by supporting infrastructure including access to rail, national highways, power, water, gas, skilled workforce, engineering companies and chemical companies. The Czech Republic has a considerable pool of skilled labour as the country is one of Europe's major coal producers.
- EMH has identified a processing location 2km from an existing rail line in an industrial estate and adjacent to primary coal mining and power producing areas. This provides close access to grid power and sites for tailings disposal. EMH plans on using a slurry pipeline to transport ore from mine to plant.
- 22kV transmission lines pass close by the mine and processing site.

Figure 25 - Cinovec and the Czech Republic – an ideal location for infrastructure



Source: Nationsonline

April 2017 PFS

- EMH completed a PFS on Cinovec in April 2017. The PFS demonstrated the production of 20,800tpa lithium carbonate with tin, tungsten and potash by-products.
- The project is slated to have a 21 year LOM with an average processing rate of 1.68Mtpa with an average head grade of 0.65% Li_2O. Lithium leach recovery was 85% and overall lithium recovery was 76.5%. Note that since the PFS, EMH has undertaken additional test work which has improved recoveries considerably.
- The PFS estimated upfront capex of $393m, an average production cost of $5,211/t Li_2CO_3, falling to $3,483/t Li_2CO_3 after by-product credits. This resulted in post-tax $NPV^{8\%}$ of $540m, IRR of 20.9% at a lithium carbonate price of $10,000/t. The PFS indicated a breakeven lithium carbonate price of $5,200/t.
- 10-year tax-free window. Tax is calculated at 19% and a 10-year tax free window has been applied as provided for by Czech investment legislation for projects of this scope. This represents a major benefit for Cinovec.

Cinovec PFS – Key Findings

Figure 26 - Cinovec PFS – Key findings

PFS Key findings	Unit	Value
NPV @ 8% Discount	US$ m	540
NPV @ 10% Discount	US$ m	392
IRR (pre-tax)	%	21.6
IRR (post-tax)	%	20.9
Capital Expenditure	US$ m	393
Total Mined Ore	Mt	34.4
Peak Mill Feed	Mtpa	1.8
Project Breakeven (IRR=0%) $/t Li_2CO_3	US$ /t	5,200
Avg Li_2CO_3 Production (yr. 3-20)	tpa	20,800
Avg Potash Production (yr. 3-20)	tpa	12,954
Avg Producion Cost (without credits)	US$ /t	5,211
Avg Production Cost (with Credits)	US$ /t	3,483
Life of Mine	Years	21
Avg Mill Rate (yr. 3-20)	Mtpa	1.68

Source: EMH

PFS operating cost estimate

- Total opex estimated to be $5,211/t, falling to $3,483/t after tin, tungsten and potash by-product credits.

Figure 27 - Cinovec PFS – Opex estimate

Average Operating Cost (yr. 3-20)	$m pa	$t / ROM	$t / LCE	% Op Cost
Mining	40.7	24.3	1,960	38%
FECAB	19.4	11.6	935	18%
LCP	47.3	28.2	2,274	44%
Overall Project Admin	0.9	0.5	42	1%
Total Operating Cost	**108.3**	**64.6**	**5,211**	

By-product Revenue Credits	$m pa	$t / ROM	$t / LCE
SN/W (yr 3-20)	29.2	17.4	1,404
Potash	6.7	4	324
Excluding Sn/W Royalties & Transportation Cost			
Total Opex (Net of By-product credits)	**72.4**	**43.2**	**3,483**

Source: EMH

PFS development Capital cost estimate

- The PFS estimated total pre-production capex at $393m. This includes contingency at 10%. The accuracy of the capex estimate is considered to be +/- 25%, typical of PFS-level accuracy. In addition, a total of $40m is required in working capital.

Figure 28 - Cinovec PFS – Capex estimate

PFS capex breakdown	Total US$ M
Underground Mining Development	
Mining Directs	67.3
Mining In directs	3.0
Total Mining Cost	70.3
Front End Communication & Beneficiation Plant (FECAB)	
Communication - Direct	25.2
Beneficiation - Direct	40.5
Infrastructure - Direct	20.8
FECAB in directs	18.4
Total FECAB	104.9
Lithium Carbonate Plant (LCP)	
LCP Directs	141.9
LCP In directs	38.0
Total LCP Capital	179.9
Total Tailings	2.6
Overall Project Contingency @10%	35.8
Total Capital Cost	**393.4**

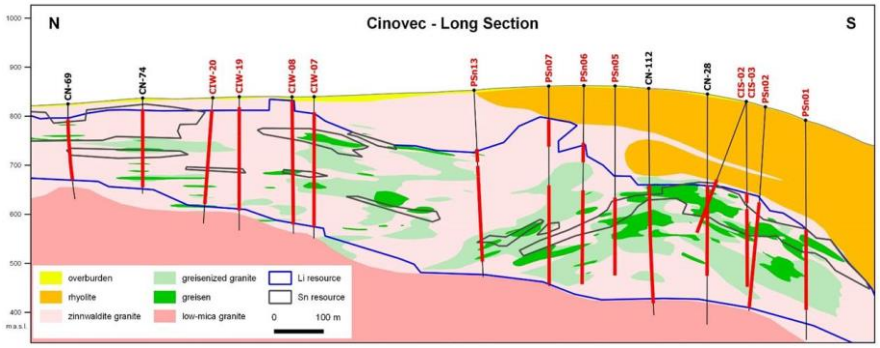
Source: EMH

Geology – not your typical hard rock lithium project

Cinovec deposit is located on the Krusne hory/Erzgebirge metallogenic province at the northern border of the Bohemian Massif, in the Saxothuringian Zone of European Variscides. Country rocks are dominated by Proterozoic metamorphic complexes, underlain by granites, and overlain by rhyolites.

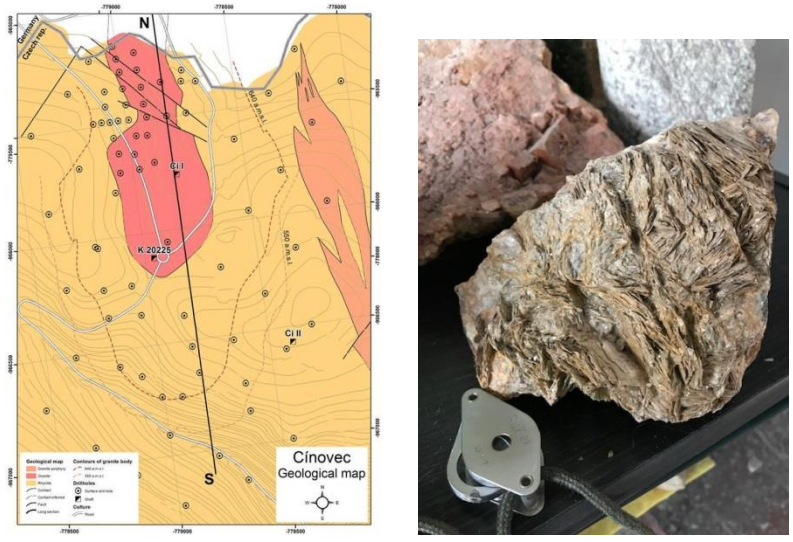
- **Greisen.** The Cinovec greisen is intimately associated with the cupola of the Cinovec-Zinnwald granite and is classified as a greisen type deposit, typically formed by the metasomatic alteration and spatially associated with the contact of surrounding county rocks or adjacent to, or in the cupola zones of granitic plutonic rocks.
- **Mineralisation** at Cinovec is hosted by irregular metasomatic greisen and greisenised granite zones from several tens to hundreds of metres thick that follow, and are located near or at, the upper contact of the cupola, or as thin, flat greisen zones enclosing quartz veins up to 2m thick.
- **Zinnwaldite not spodumene**. The main lithium ore mineral is Zinnwaldite, a lithium-bearing mica and not spodumene like the majority of other hard rock deposits. This has important processing implications. The tin ore mineral is cassiterite and tungsten is hosted by wolframite.

Figure 29 - Cinovec long section



Source: EMH

Figure 30 - Cinovec surface geology and Zinnwaldite hand specimen



Source: EMH (LHS), Shard Capital (RHS)

Resources and Reserves

- **November 2017 Resource.** The latest resource estimate for Cinovec was released in November 2017. The update was compiled subsequent to a four-month drilling campaign at Cinovec South, comprising 6 holes for 2,697m. The aim of the resource drilling was to close 'gaps' in the existing resource model in and around the initial planned mining areas and upgrading part of the resource from the Inferred category to the higher confidence Indicated category.
- The entire Cinovec resource base is comprised of 1,222 holes, including 32 surface diamond holes drilled by EMH.
- The drill programme added 39.4Mt to the resource, with 97% of the increase at Cinovec South where initial mining will commence. The total resource amounts to 695Mt at 0.42% Li_2O.

Figure 31 - JORC – compliant Mineral Resource Estimate – November 2017

Resource Category	Mt	Li (%)	Li_2O (%)	LCE (Mt)	Sn (%)	Sn (kt)	W(%)	W (kt)
Indicated	372.4	0.206	0.44	4.05	0.04	139.08	0.016	59.6
Inferred	323.5	0.183	0.39	3.12	0.04	123.52	0.013	42.1
Total	**695.9**	**0.195**	**0.42**	**7.17**	**0.04**	**262.6**	**0.014**	**97.4**

Source: EMH

Ore Reserve.

- **Maiden Ore Reserves** were reported in July 2017 after the publication of the PFS. The Probable Reserves have been declared solely from the Indicated. Mineral Resource category based on the February 2017 resource, not the latest November 2017 estimate.
- **Assumptions.** $10,000/t lithium carbonate price, lithium recoveries as per the PFS, un-planned dilution 3%, unplanned ore loss 3%, minimum cash margin of $35/t to define blocks for the mine schedule.

Figure 32 - JORC – compliant Ore Reserve Estimate – July 2017

Ore Reserve Category	Mt	Li (%)	Li_2O (%)	Sn (%)	W (%)
Proven	0	-	-	-	-
Probable	34.5	0.30	0.65	0.09	0.03
Total Ore Reserves	**34.5**	**0.30**	**0.65**	**0.09**	**0.03**

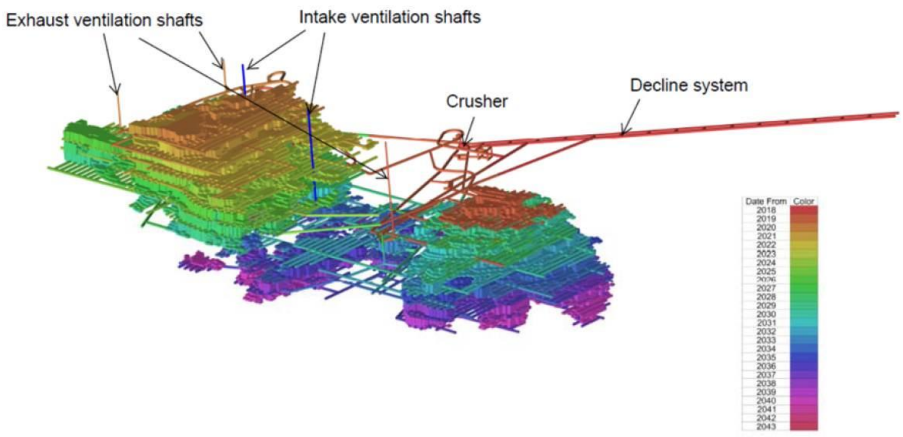
Source: EMH

An underground mine

- Cinovec will be an underground mine. The PFS envisages that the geometry of the payable ore is largely flat or shallow dipping and massive enough to mechanise using long-hole open stope mining.
- The preferred option is to mine with pillars support only, negating the requirement for a backfill plant.
- Mine access via a twin decline system with a conveyor installed from the underground primary crusher on 590m Elevation to surface in the conveyor decline. The second decline will be used as a service decline for men, material and as an intake airway.
- The payable ore will be split into blocks approximately 90 m long in the strike direction and 25 m high, accessed by a cross-cut, with the stope mined on retreat. The stopes will be a maximum of 13m wide with rib pillars between stopes of 4 to 7 m wide depending on stope height.

- The deposit has previously had over 400,000 tonnes of ore mined as a trial sub-level open stope underground mining operation.

Figure 33 - Cinovec mine design and schedule

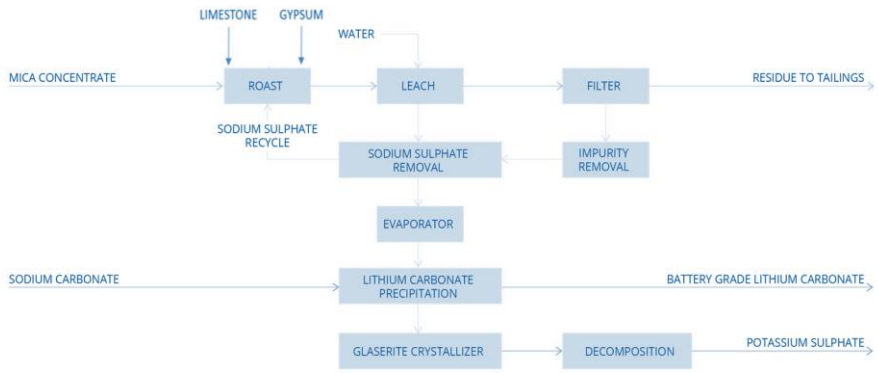


Source: EMH

Processing

- **Lithium carbonate but may change.** The PFS is based on the production of lithium carbonate using conventional sodium-sulphate roasting. This may change if EMH opts to produce lithium hydroxide although the majority of the flowsheet will stay the same. The plant is based on 1.68Mtpa ore feed rate to produce 360,000t of lithium-mica concentrate.
- **FECAB. Simple comminution and beneficiation** – ROM ore is crushed underground and then milled down to a relatively coarse 250µm in a single stage SAG mill. The ore is then beneficiated to magnetically separate (using WHIMS) the paramagnetic zinnwaldite to produce a lithium rich magnetic stream (mica-concentrate) to feed the downstream lithium carbonate plant. The non-magnetics stream is then treated with gravity, flotation, magnetic and electrostatic separation to produce tin and tungsten product

Figure 34 - Cinovec flowsheet – lithium carbonate option



Source: EMH

- **Lithium carbonate plant (LCP).** The Lithium Carbonate Plant receives a mica concentrate slurry from the FECAB plant. This slurry is then de-watered before being roasted to convert the lithium into a lithium potassium sulphate which dissolves in the leach as lithium sulphate.
- **PLS.** A pregnant leach solution is separated from the residue and then undergoes a number of impurity steps to remove calcium, magnesium, fluoride and silica by precipitation and adsorption. Test work has been focusing on fluoride and silica removal to reduce these down to acceptable levels.
- **Precipitation and purification.** Crude lithium carbonate is then precipitated from the PLS which is re-dissolved to form bi-carbonate. After filtering and purification by ion-exchange, a pure lithium carbonate is recrystallised by heating the solution causing the bicarbonate to decompose. The battery grade lithium carbonate is then dried, micronised and packaged for sale.
- **Potash by-product.** A fertiliser grade potash (potassium sulphate) by-product is also recovered from the depleted lithium carbonate solution (spent liquor).
- **Tailings.** EMH plans to dispose of tailings in abandoned coal pits in near proximity to the proposed processing plant.

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