

# Fundamental

## Research Corp.

*Investment Analysis for Intelligent Investors*

April 12, 2018

### American Manganese Inc. (TSXV: AMY / OTCBK: AMYZF / Frankfurt: 2AM) - Initiating Coverage: Process to Recycle Lithium Ion Batteries

**Sector/Industry: Junior Resource / Technology**

**www.americanmanganeseinc.com**

#### Market Data (as of April 12, 2018)

Current Price	C\$0.21
Fair Value	C\$0.45
Rating*	BUY
Risk*	5 (Highly Spec)
52 Week Range	C\$0.13 - C\$0.35
Shares O/S	161,844,403
Market Cap	C\$33.99 mm
Current Yield	N/A
P/E (forward)	N/A
P/B	6.3x
YoY Return	-8.7%
YoY TSXV	-6.0%

\*see back of report for rating and risk definitions.

\* All figures in C\$ unless otherwise specified.



#### Investment Highlights

- American Manganese Inc. ("company", "AMY") is focused on advancing its patented and patent pending process for recycling lithium ion batteries ("LIBs") to commercialization.
- The process recovers spent cathode materials, such as lithium, cobalt, nickel, aluminum and manganese, in LIBs. A proof of concept study demonstrated that leach and precipitation extractions of 100% had been achieved for all cathode materials.
- There is currently no known commercial technology for large scale recycling of cathode materials. AMY's technology has shown to be economic and environmentally safe. Third-party tests and peer reviewed journals have confirmed the potential of this process.
- **Management has several options to monetize the technology, such as build and operate a plant to recover and sell battery grade cathode materials to battery manufactures and/or license the technology to battery manufacturers or other technology companies.**
- AMY also holds a diversified portfolio of resource projects, including the Artillery Peak manganese project in Arizona, two niobium properties, and the Rocher Deboile property in British Columbia. A pre-feasibility study was completed on Artillery Peak in 2012.
- We believe AMY may appeal to both mining and technology related investors.
- We are initiating coverage on AMY with a BUY rating and a fair value estimate of \$0.45 per share.

#### Risks

- The company's cathode recycling technology has yet to be commercialized.
- No guarantee that it will be viable on a larger-scale.
- Competing technologies.
- Operating costs and margins may be different from the forecasts presented in this report.
- Exploration and development risks associated with the company's resource projects.
- Volatility in commodity prices.

#### Key Financial Data (FYE - July 31)

(C\$)	2017	2018 (6M)
Cash	\$486,088	\$253,190
Working Capital	\$403,671	\$353,975
Mineral Assets	\$5,021,687	\$5,008,517
Total Assets	\$5,846,175	\$5,524,618
Net Income (Loss)	-\$2,006,934	-\$841,079
EPS	-\$0.01	-\$0.00

## Overview

American Manganese Inc. was incorporated in 1987 as Navarre Resources Corporation. The name was subsequently changed to Ameridex Minerals Corp. in 1998, to Rocher Deboule Minerals Corp. in 2006, and to the current name, American Manganese Inc., in 2010. **The company is headed by Larry W. Reaugh, a veteran in the junior resource sector with over 50 years of experience.**

The company's primary focus is on commercializing its patent pending process for recycling lithium ion Electric Vehicle ("EV") batteries. In addition, the company holds a diversified portfolio of resource projects, including the Artillery Peak manganese project in Arizona, two niobium properties, and the Rocher Deboule property in British Columbia.

## Technology

### Overview

The company has developed a proprietary hydrometallurgical extraction process to recycle lithium ion EV batteries through the recovery of used, spent and faulty cathode materials such as lithium, cobalt, nickel, aluminum and manganese.

The technology was evolved out of the patented process that was originally developed in 2011 for producing Electrolytic Manganese Metal (EMM), Electrolytic Manganese Dioxide (EMD), and Chemical Manganese Dioxide (CMD) from the company's low-grade manganese deposit held by the Artillery Peak project. The grades of Artillery Peak's deposit ranges between 2% and 3% Mn versus the 35% to 55% Mn of typical deposits.

Testing conducted to date indicates the battery recycling technology to be low-cost, and environmentally friendly compared to conventional methods. The technology, if commercialized, is expected to significantly reduce the cost of extracting cathode materials relative to conventional mining and lower the cost associated with the disposal of used batteries (landfill or burnt). Several jurisdictions world-wide have already imposed mandatory recycling programs, such as B.C., Manitoba, and Quebec in Canada, and certain states in the U.S. The European Union has set a timeline for consumers to recycle spent batteries, and China has legislations in place for all EV manufacturers and importers to come up with a feasible recycling program.

### Development of the Technology

The conventional methods to process manganese (roasting) are highly energy (requiring up to 1,000°C) and water intensive, making those methods uneconomic for low-grade deposits, such as Artillery Peak. In 2009, the company retained Kemetco Research Inc. of Richmond, B.C to conduct studies and potentially develop an alternative method to process low grade Mn deposits. The program was partially funded by the Canadian Government through the National Research Council's Industrial Research Assistance Program (NRC-IRAP). **This program was successful in developing a process to produce Electrolytic Manganese Metal (EMM) from samples taken from Artillery Peak.**

Subsequently, in 2011 and 2012, Kemetco performed further testing, including a pilot plant study, which confirmed an economic processing method that can be scaled to a large-scale processing plant.



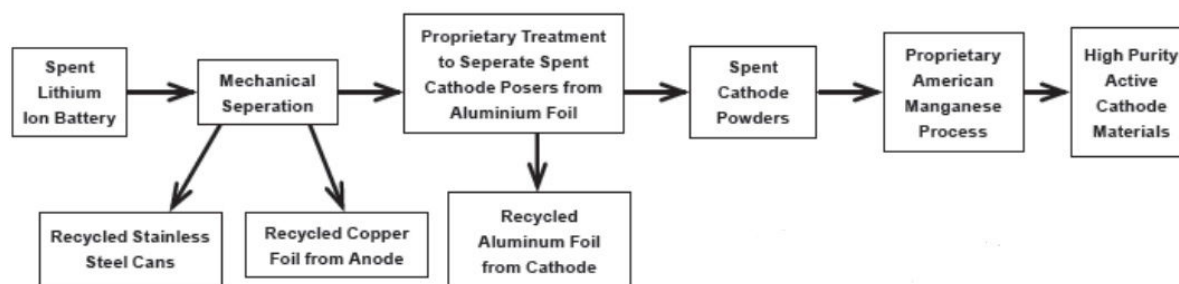
*Source: Company*

The studies up until then were focused on producing EMM using a reductive leach hydrometallurgical process, followed by electrowinning. In 2012, AMY retained Kemetco to undertake research in the production of ultra-high purity manganese dioxide for use in LIBs. By late 2012, Kemetco completed successful production of prototype rechargeable batteries utilizing CMD generated from Artillery Peak material.

A key problem with existing processes used to produce manganese dioxide for LIBs is that they contaminate cathode materials with metallic impurities when the materials are subject to mechanical size reduction for final use. This contamination causes internal short circuits after a number of charge/discharge cycles, which can lead to explosions. In contrast, the hydrometallurgical process eliminates electrowinning and the need for mechanical size reduction.

In 2015, Kemetco recognized the process could be adapted to recycling EV Batteries. There is currently no known commercial technology for large scale recycling of cathode materials. The hydrometallurgical process starts with leaching, then resulting solution is subject to concentration and further purification to produce high purity metals. The primary intellectual property (“IP”) of the company is the patent pending leaching and precipitation process. The following chart explains the process.

## AMERICAN MANGANESE CONCEPTUAL Lithium Ion Battery Recycling and Upcycling Flowsheet



*Source: Company*

A “Proof of Concept” testing program demonstrated that leach and precipitation extractions of 100% were achieved for lithium, cobalt, nickel, manganese, and aluminum from cathode materials used in LIBs. High purity cathode compounds are then precipitated and the recovered constituents could be heat treated to regenerate reusable cathode materials in LIBs.

Third-party tests and peer reviewed journals, such as NAATBatt, Cobalt Institute, and the International Congress for Battery Recycling have confirmed the potential of this process – which we consider as highly encouraging.

AMY has patented the technology for low-grade manganese recovery in the U.S., China and South Africa. In extensions to these patents, the company has completed and filed a U.S. and PCT International patent application on November 11, 2017, for lithium-ion battery recycling. The company expects to file additional process improvement patents in 2018.

According to management, the company’s process is currently the most advanced and closest to commercialization relative to others in development that use hydro metallurgy as shown in the table below.

	PROOF OF CONCEPT	PATENTS	RECOVERIES		*RECOVERY METHOD
			COBALT	LITHIUM	
<b>AMERICAN MANGANESE INC.</b> SURREY, B.C. CANADA	Completed	<b>Final US Patent Application</b> Filed on November 10, 2017	<b>100%</b>	<b>100%</b>	<b>Hydro Metallurgy</b>
RETRIEVE TECHNOLOGIES	Completed	Not Found	Small Amount Not Recovered	Not Recovered	Hydro Metallurgy
WORCESTER POLYTECHNIC INSTITUTE (BATTERY RESOURCES)	Completed	US Patent Application Applied for: November 22, 2016	Not Reported	Not Reported	Hydro Metallurgy
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA	Completed	Not Found	< 25%	< 50%	Hydro Metallurgy Plus High Cost Calcining
NEOMETALS LTD.	Completed	Patent Pending	99.2%	Not Reported	Hydro Metallurgy
UNIVERSITY OF CALIFORNIA SAN DIEGO	Completed	Not found	Not Reported	Not Reported	Heat Treating
UMICORE	Current Method of Disposal of Most Batteries	Not Patentable	40 - 70% Not Reusable in Batteries	Nil	High Cost of Smelting 'Not Environmentally Responsible'
<b>RECYCLE VS. REUSE</b>	2016 was a breakout year for the plug-in Vehicle Market which enabled cost reductions in Lithium Ion Batteries. Reuse has many Pro's and Con's such as increases cycle-life. Reuse would delay but not eliminate the need for battery recycling.				

Source: Company

In March 2017, the company entered into a Memorandum of Understanding (“MOU”) with Ames Laboratory, a U.S. Department of Energy National Laboratory, operated by Iowa State University. As per the agreement, the entities will collaborate in the area of materials science, with a focus on the recycling of EV battery materials. In addition, the company recently received an award from the NRC-IRAP for \$52.5k for the continued development of the recycling technology. The company recently completed a financing to conduct pilot plant testing.

Management has identified the following options to monetize its technology:

- Operate plant to recover and sell battery grade cathode materials feed stocks.
- License out the technology to battery manufacturers
- Sell royalty interest
- Joint venture with industry partners

The following points highlight management’s key development timelines:

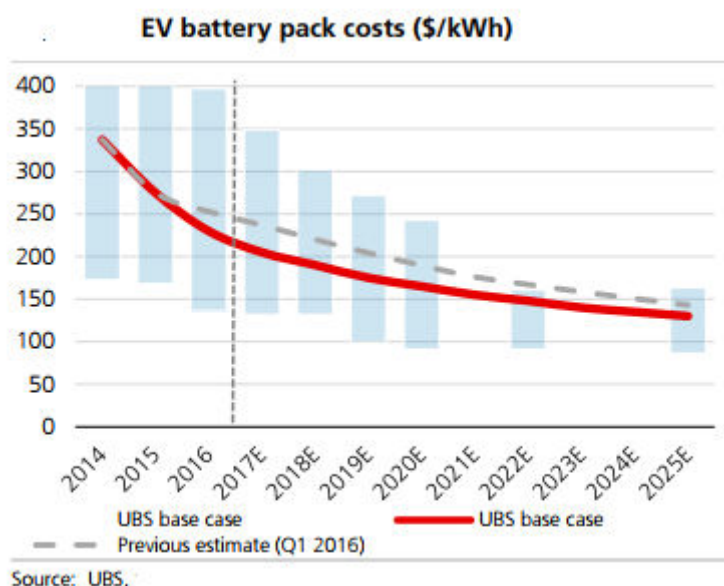
- Begin pilot plant construction – 2018
- Acquire scrap/faulty cathode materials
- Design battery disassembly plant - 2018
- Complete environmental permitting - 2019
- Build a 3 tpd demonstration plant (estimated CAPEX - \$10 million) – 2020
- Design a larger commercial plant

**We expect the demand for cobalt and lithium in rechargeable batteries will be the key driver going forward.** The most common rechargeable batteries in the market today are Lithium-Ion batteries (“LIB”). In a LIB, lithium is used as the electrolyte, graphite as



the anode (negative electrode) and cobalt typically as the cathode (positive electrode). LIB is used in a wide range of electronic equipment, such as mobile phones, laptops, and digital cameras to name a few. However, the biggest growth driver is the use of LIBs in electric cars.

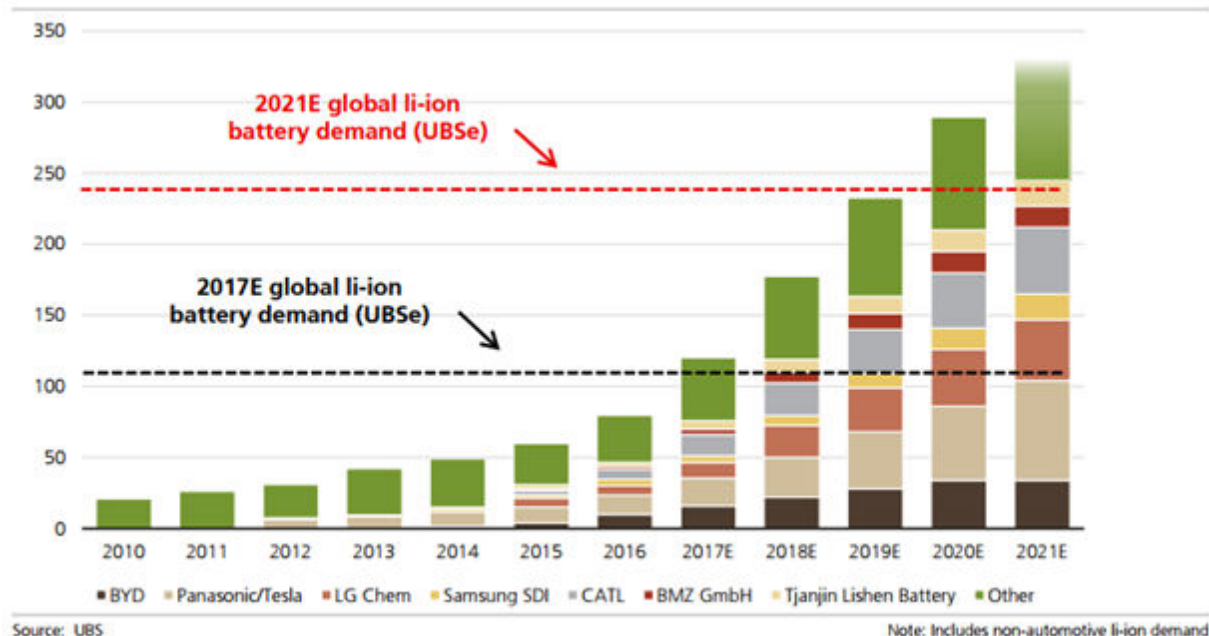
Declining technology costs (see chart below) are expected to drive demand for LIBs.



**In addition, a report by McKinsey & Co and Bloomberg New Energy Finance (BNEF) showed that the cost of a LIB pack has dropped by 65% over the past five years, from US\$1,000 per kWh to approximately \$350 per kWh.**

LIBs come in five primary types, namely Lithium Cobalt Oxide (“LCO”), Nickel-Manganese Cobalt (“NMC”), Nickel Cobalt Aluminum (“NCA”), Lithium Manganese Oxide (“LMO”) and Lithium Iron Phosphate (“LFP”). LCO, NMC, and NCA use cobalt and these three segments combined accounted for 73% of the LIBs’ market share in 2015 (Source: Avicenne / CRU). LCO’s contain about 60% cobalt by weight and are used primarily in portable electronic devices. NMC and NCA are the dominant batteries used in electric cars and stationary storage cells, which contain between 10% and 20% cobalt by weight.

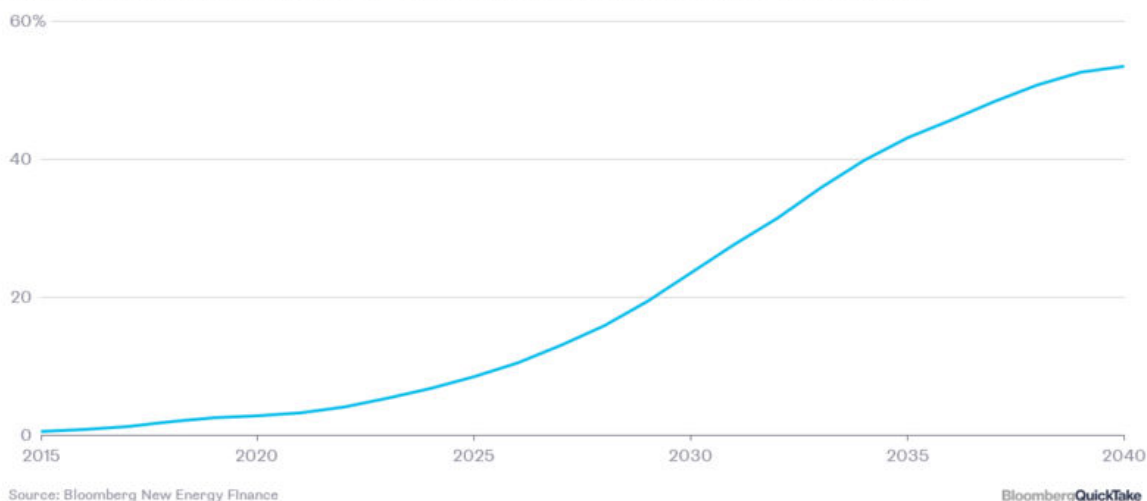
The current production capacity of lithium-ion batteries is approximately 75 GWh globally. However, the total capacity is estimated to reach 285 GWh by 2020.



The following chart shows that EV car sales are estimated to be approximately 54% of light-duty vehicle sales by 2040 globally.

### Electric Vehicles, Amping Up

Percentage of global light-duty vehicle fleet made up of battery-only and plug-in hybrid vehicles, projected



The Commodities Research Unit (“CRU”) Group estimates electric car and plug-in hybrid vehicle sales could reach approximately 16 million by 2025 (up from 0.77 million last year), reflecting a CAGR of 40% per annum (“p.a.”) from 2016 to 2025.



The above factors support a highly positive outlook on LIBs, and we believe the strong demand will benefit companies targeting battery-grade cobalt and lithium.

**Cobalt Prices:** Cobalt prices have had a strong run in the past 2 years, as shown in the chart below and currently trades at approximately US\$41.50/lb.



As shown in the below chart, approximately 53% of global refined cobalt production in 2016 was used in batteries, followed by super-alloys (21%). The following table shows the demand growth by application. The demand for batteries, which had only accounted for 27%



of the total demand in 2010, increased at a CAGR of 20%, to 49,794 tonnes in 2016. The total demand for cobalt was 93,950 tonnes in 2016, up 7.5% p.a. from 2010.

### Global Cobalt Demand

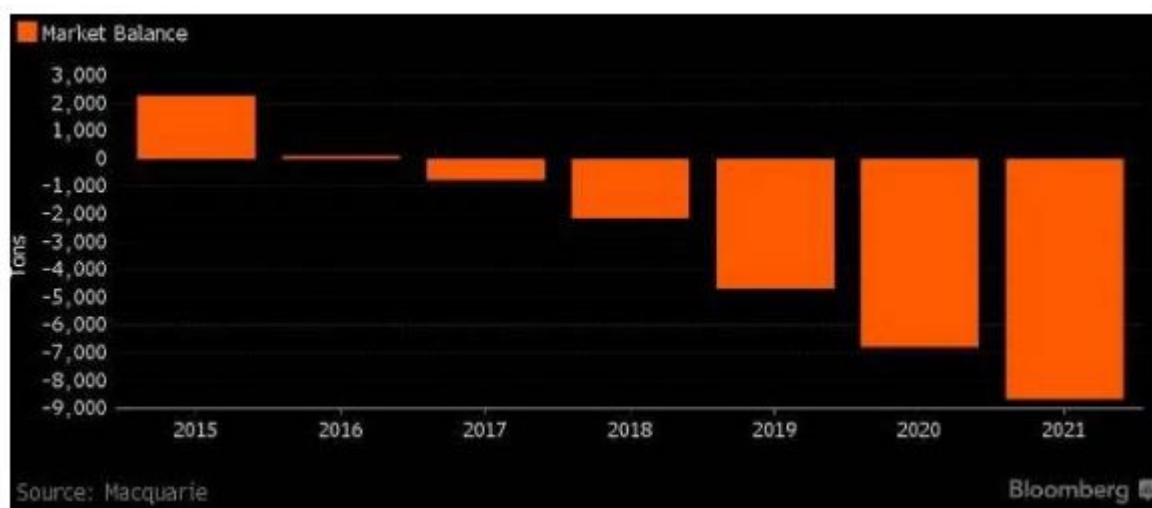
Unit (metric tons)	2010	2011	2013	2014	2015	2016	2020 Forecast	CAGR (2010- 2016)
Superalloy	11,590	14,250	11,360	10,530	13,920	19,730	19,200	9.27%
Hard Materials	7,930	9,750	7,100	8,100	8,700	5,637	7,200	-5.53%
Colours	6,100	6,750	4,260	4,860	4,350	5,637	7,200	-1.31%
Batteries	16,470	22,500	29,110	33,210	36,540	49,794	74,400	20.25%
Others	18,910	21,750	19,170	24,300	23,490	13,153	12,000	-5.87%
<b>Total</b>	<b>61,000</b>	<b>75,000</b>	<b>71,000</b>	<b>81,000</b>	<b>87,000</b>	<b>93,950</b>	<b>120,000</b>	<b>7.46%</b>

*Source: CDI and Benchmark Minerals*

Based on the CRU's estimate of 16 million electric car and plug-in hybrid vehicle sales by 2025, we **estimate this would equate to approximately 160,000 tonnes of cobalt demand just from EVs (16 million vehicles @ 10kg of cobalt per vehicle) by 2025.**

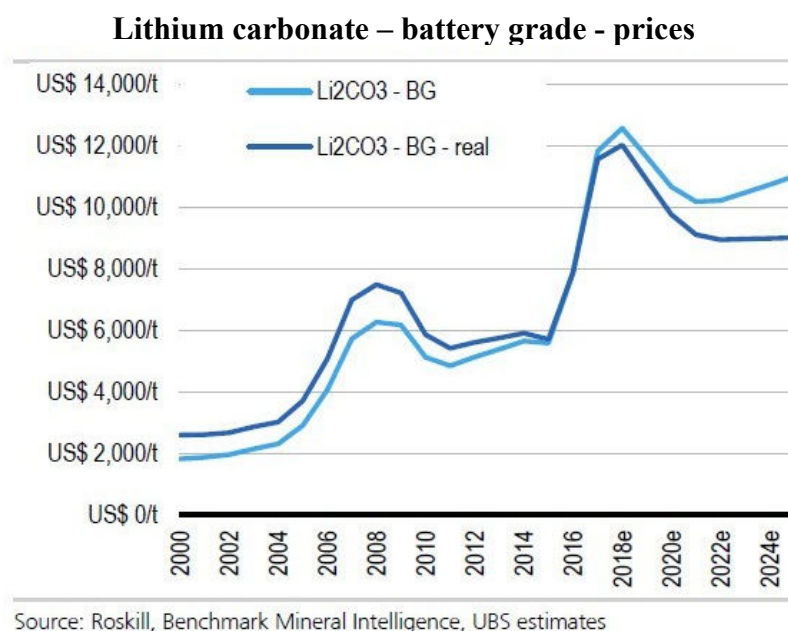
With regard to supply, in 2016, the DRC accounted for 66,000 tonnes, or 54% of the mine production and dominates the space. One of the biggest concerns with cobalt supply is that it comes from the DRC. First, the DRC has had an unstable political history including several civil wars. Second, Amnesty International (a non-governmental organization focused on human rights) stated in a recent study that approximately 20% of the cobalt mining in the DRC is by artisanal miners, and that there are approximately 40,000 child miners in the southern DRC. Amnesty International suggested that most of the leading technology and automotive companies are likely to be using cobalt in their products that has been mined by child labour. The study strongly encourages these large players to further investigate their cobalt supply chain and prove that they are addressing human rights abuses. Third, various sources suggest that a significant amount of the DRC's readily available, near-surface oxide copper-cobalt ores have been depleted – the primary material shipped to China for refining. Additional mining will transition into deeper sulphide ores, and this will increase processing costs.

The following chart shows the expected deficit in the cobalt market. The consensus is that the market may be in a 7,000 tonne deficit by 2020.



Based on the strong demand growth forecast, the high potential of users to seek supply outside of the DRC, we maintain a positive outlook on cobalt prices.

Lithium prices are shown in the chart below:



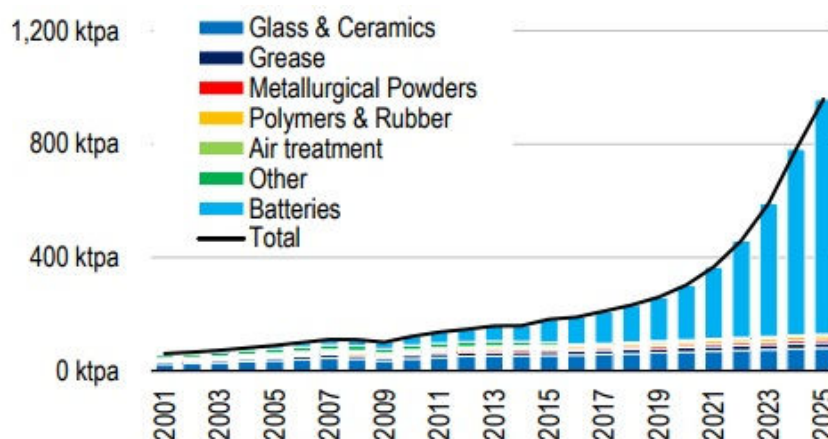
A recent report published by Industrial Minerals indicated that Chinese battery-grade lithium carbonate (LCE) prices are at record highs now of approximately \$23,000 to \$25,000 per ton.

The following table shows our estimate of the expected global demand for LCE from EVs. We estimated this based on Deutsche Bank's (DB: DBK) projections for EV sales, and our estimate of the required LCE per vehicle (derived from multiple sources).

Required LCE (kg)	in millions	2015	2020	2025
1.5	Hybrid	2.9	6.9	9
11.8	Plug-in Hybrid	0.4	1.6	3.9
19.0	Full EV	0.4	1.6	2.6
	Full EV (commercial)	0.1	0.3	0.4
	<b>Total</b>	<b>3.7</b>	<b>9.5</b>	<b>16</b>
Required LCE (tonnes)		16,662	59,598	108,842

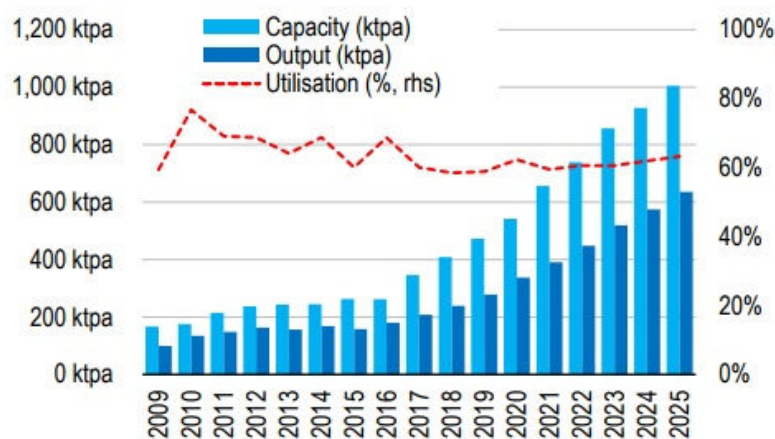
Source: FRC and Deutsche Bank

Current global annual consumption is approximately 217,000 tonnes, and EVs account for under 20,000 tonnes. As shown in the above table, an expected increase in demand to 108,800 tonnes from EVs implies that the global LCE market will significantly increase over the next decade. According to Roskill, global consumption of LCE will reach 785,000 tonnes by 2025, and that the market will be in a deficit by 26,000 tonnes. UBS estimates global consumption to reach approximately 1 Mt per year by 2025.



Source: UBS

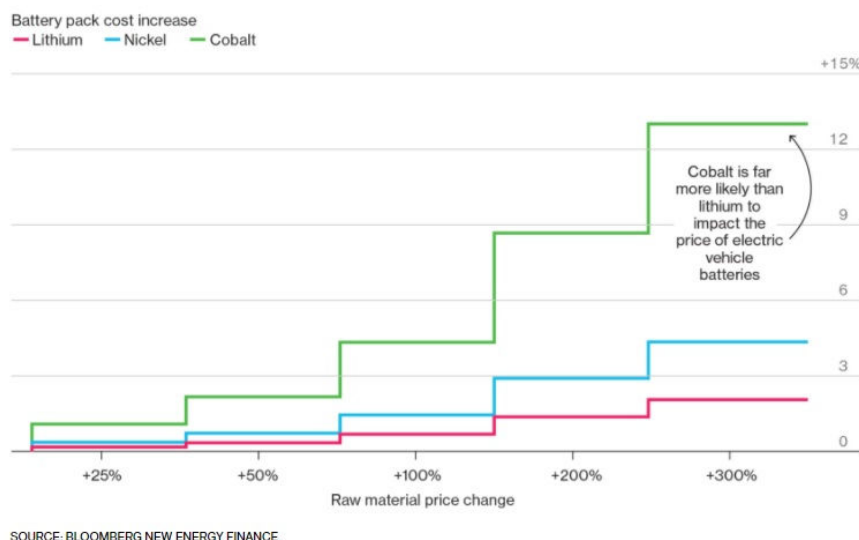
The above demand projections imply that production has to reach capacity to meet demand.



Source: UBS

The following chart shows that a 300% increase in lithium price will only result in a 2%

increase in battery cost. Cobalt has a bigger impact of over 12%. However, we believe the risk of substitution is low considering cobalt's superior energy density and ability to retain a charge for a longer period, make cobalt-bearing batteries preferred for use in EVs.



### Artillery Peak

The company acquired the Artillery Peak Manganese properties in Arizona, comprising 90 unpatented lode claims, in 2007 / 2008. The claims, which were previously owned by several individuals, are subject to a \$0.05/lb royalty on Mn, and a 1.5% NSR on other commodities. The property is located in northwest Arizona in the Artillery Mountains of Mohave County and on the southeastern edge of the Mojave Desert. It is approximately 170 km northwest of Phoenix, and 240 km southeast of Las Vegas, Nevada. The project is a historic manganese producer. **It is considered to be the largest known low-grade manganese deposit in the southern U.S.**

In 2007-2012, AMY completed resource estimates, pilot plant work with Kemetco, and a pre-feasibility study with Tetra-Tech. Due to the price of manganese metals dropping to uneconomic levels, the company discontinued work, eventually eliminating all of their leased holdings and retained their BLM claims hosting the highest values of manganese. Work by Kemetco and Tetra-Tech proved the company could produce electrolytic metals at prices that were competitive in production cost utilizing low grade (2-3%) ores compared to the Chinese production grading at 30-55%. The company went on to produce rechargeable button cell batteries utilizing Artillery peak ores. Patents received are registered in the U.S., China, and South Africa. These patents are the foundation of the company's patent pending process for recycling cathode materials.

**Management does not have any immediate plans for the project at this time.**

The 100% owned **Rocher Deboule property** is a 1,000 hectare gold/silver/copper/cobalt/tungsten property located 8 km south of New Hazelton, BC. In November 2017, AMY entered into an option agreement with Liaz Pty Ltd, a subsidiary of Longford Resources Limited (ASX: LFR), for Liaz to earn a 60% interest in the project for completion

## Management

of exploration spending of \$2 million over 4 years.

**The 100% owned Lonnie property** is a niobium exploration property covering approximately 3,477 hectares in the Omineca mining division of BC. The company had staked these claims in 2007. The property is drill ready and looking for JV partners.

Management and board members hold 12.96 million shares, or 8% of the total outstanding shares.

Management	Shares	% of Total
Larry Reaugh	3,816,675	2.4%
Norman L. Tribe	3,044,000	1.9%
Michael E. MacLeod	2,591,950	1.6%
Edward F. Skoda	2,950,000	1.8%
Andris Kikauka	560,500	0.3%
Jan Eigenhuis		-
Kurt Lageschulte		-
<b>Total</b>	<b>12,963,125</b>	<b>8.0%</b>

*Source: Company*

Brief biographies of the management team, board members and advisors, as provided by the company, follow:

### **Larry W. Reaugh – President & CEO, Director**

Larry Reaugh has 53 years' experience in the mining industry and for the past thirty-seven years he has been the CEO and President of several exploration, development and production companies including 12 years in internet and technology breakthroughs listed on the TSX, TSX Venture and NASDAQ exchanges. Several of his companies have made significant discoveries, three of which (gold/silver) went on to be producing mines. Mr. Reaugh founded American Manganese Inc. in 1998 and has served as its President and CEO since that time.

### **Michael MacLeod – P.Eng., MBA, Director**

Chief Operating Officer for American Manganese Inc., Mr. Michael MacLeod has spent 40 years executing major capital projects and mine developments in the mining industry, including the Byron Creek coal mine expansion for Esso Resources Canada Limited and in-pit crusher/conveying system and Highmont concentrator re-location for Highland Valley Copper Ltd.

### **Shaheem Ali - BBA, Chief Financial Officer**

Shaheem Ali is a finance and business management professional with 10 years' experience in operations management, full cycle accounting, systems development and people management. Proven record of implementing financial and operational processes reducing operations costs and improved internal controls with Alderwoods Group Inc. where his



experience includes governance and regulatory fund compliance with various states.

**Norman L Tribe – B.A.Sc., P.Eng., Director**

Norman Tribe is the president and principal of N. Tribe & Associates Ltd a geological contractor serving the mining industry for fifty-eight years. Mr. Tribe has a total of 58 years' experience in most phases of mining and reporting to the various government entities and stock exchanges.

**Andris Kikauka – P.Geo, Director**

Andris Kikauka is a graduate of Brock University, St. Catharines, Ont., with an Honours Bachelor of Science Degree in Geological Sciences, 1980. He is a member of the Geological Association of Canada. He is registered in the Province of British Columbia as a Professional Geoscientist. Andris has practiced his profession for thirty five years in precious and base metal exploration in the Cordillera of Western Canada working for Anaconda Canada Exploration (1980-1984), Skyline Explorations, Inel Resources, Gulf International Minerals (1985-1989), in South America working for Carson Gold (1990), in Mexico and Guatemala working mineral exploration projects for Francisco Gold and Almaden Minerals (1996-2006) and for three years in uranium exploration in the Canadian Shield working for Rayrock Mines and Uran-Canada (1977-1979).

**Jan Eigenhuis – Director**

Jan Eigenhuis is a former senior executive at Manganese Metal Company of South Africa (MMC). He currently acts as a consultant to the electrolytic manganese industry worldwide. It is notable that he counts MMC as well as the Chinese manganese producers as clients. Mr. Eigenhuis is a graduate of the University of Pretoria; B.Sc. (Chem. & Math.) and the University of South Africa; MBL (Master Business Leadership). He has 30 years of business experience in mineral beneficiation and in the electrolytic manganese metal industry.

**Ed Skoda – Director**

Edward Skoda obtained a Diploma in Mining Engineering Technology from the Haileybury School of Mines in Ontario in 1971 and a Diploma in Business Management from the British Columbia Institute of Technology in 1979. Mr. Skoda has over 30 years of experience in the mining industry in which time he has worked on many national and international projects. During the past 15 years, Mr. Skoda has worked as a consultant and in a supervisory capacity as a shift boss, superintendent, or project manager for various mining and exploration companies. Based out of Guadalajara, Jalisco, Ed oversees all Mexico operations for SJ Geophysics Ltd.

**Kurt Lageschulte – Director**

Kurt Lageschulte is a Partner and Senior Analyst at Broadbill Investment Partners, LLC in New York. Broadbill Partners is an investment firm with offices in New York, Florida and California and currently has \$130 million of assets under management across four managed funds. Kurt is a founding partner at Broadbill, and was previously employed as a Senior Analyst with Aspen Advisors from 2002 to 2010. Kurt has worked as an advisor and active member of a number of committees. Most recently, he has advised the Special Committee of the Penn Treaty American Company board in a complex negotiation with industry regulators.

Kurt's experience in the energy, renewable and mining industries, coupled with significant expertise in the capital markets will enable Kurt and the Broadbill team to help American Manganese in the reaching of its goals in the coming years.

#### **Shailesh Upreti - Advisory Board**

Shailesh Upreti is a well-respected lithium-ion technology expert and inventor of multiple breakthrough technologies. An IIT Delhi graduate, Mr. Upreti has worked closely with Professor Stan Whittingham in the past and holds multiple US patents and their foreign equivalents in more than 30 countries. In addition to his technical degree he has a second masters in international business management in combination with extensive experience as an entrepreneur. Shailesh has successfully brought more than 5 different technologies to market including one in the material recycling space. His 16 years of extensive experience includes bringing new products to market, business development, lithium-ion supply chain & industry networking, downstream processing and investigating organizational performance gaps. He is well integrated into the global battery industry and serves on various advisory boards. Shailesh is particularly adept in defining corporate commercial objectives, business support programs and achieving organizational goals while bringing new technology to market.

#### **David Langtry - Technical Advisor**

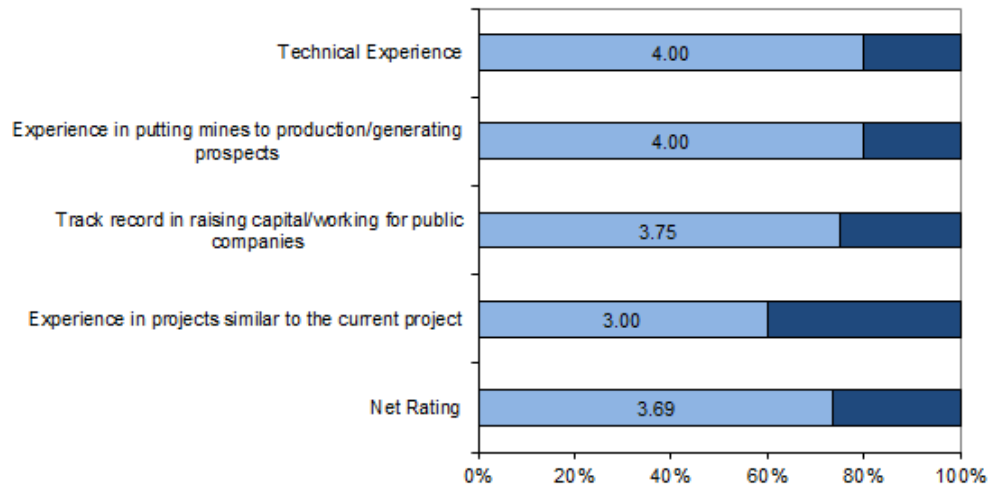
David Langtry has been a businessman since 1964 when he joined Langtry Agencies, a company which expanded nationally to become Langtry Industries and was sold in 2011 to ITOCHU, a Japanese conglomerate specializing in commodities. Mr. Langtry currently owns and operates Raider Hansen Inc., an industrial supplies company having 10 locations throughout British Columbia, as well as GRE Manufacturing, a glass recycling company. He also holds 10 worldwide patents. Mr. Langtry has a life time of experience in technology and financial markets.

#### **Dan McGroarty - Strategic Advisor**

Daniel McGroarty has consulted for nearly two decades to firms in the resource sector, with a focus on strategic and critical metals. He is principal of the non-profit American Resource Policy Network, a resource development think tank. He has served as a critical materials subject-matter expert for the U.S. GAO; testified before the energy and natural resource committees of the U.S. House and Senate; consulted to the Institutes for Defense Analyses, which provides research and analytical work to the U.S. Department of Defense for its National Defense Stockpile reports; and currently serves as Adjunct Professor at The George Washington University Graduate School of Political Management. Prior to establishing his consultancy, Dan served as Special Assistant to the President in the White House and as presidential appointee to two Secretaries of Defense.

**Our net rating on the company's management team is 3.7 out of 5.0 (see below).**

### Management Rating



Source: FRC

**The company's board has seven members, of which, five are independent.** We believe that the Board of Directors of a company should include independent or unrelated directors who are free of any relationships or business that could materially interfere with the director's ability to act in the best interest of the company. An unrelated/independent director can be a shareholder. The following table shows our analysis on the strength of the company's board.

	Poor	Average	Good
Five out of seven directors are independent			X
Five out of seven directors hold significant shares of the company		X	
The Audit committee is composed of 3 board members, 2 are independent		X	
Management compensation is decided by the Board.		X	

Source: FRC

At the end of Q2-FY2018 (ended January 31, 2018), the company had cash and working capital of \$0.25 million and \$0.35 million, respectively. We estimate the company had a burn rate (cash spent on operating and investing activities) of \$88k per month in the first six months of FY2018. The following table summarizes the company's liquidity position.

### Financials

(in C\$)	2017	2018 (6M)
Cash	\$486,088	\$253,190
Working Capital	\$403,671	\$353,975
Current Ratio	2.06	3.87
LT Debt / Assets	-	-
Monthly Burn Rate (incl. investing activities)	\$120,768	\$87,567
Cash from Financing Activities	\$2,681,162	\$433,098

*Data Source: Financial Statements*

Subsequent to the quarter-end, the company closed a \$2.05 million non-brokered private placement by issuing units at \$0.24 per unit. Each unit consisted of a common share and a common share purchase warrant (exercise price - \$0.30 for 2 years).

We estimate the company currently has 10.13 million options outstanding (weighted average exercise price of \$0.09 per share) and 28.24 million warrants (weighted average exercise price of \$0.22 per share) outstanding. At this time, 9.53 million options and 13.17 million warrants are in the money – the company can raise up to \$2.92 million if these options and warrants are exercised.

The following table shows our preliminary estimate of the potential cash flows from the demonstration plant. We have used an operating margin of 65%.

US\$	Lithium Carbonate	Cobalt	Nickel	Manganese	Total
Daily Production (kg)	1,100	750	750	400	3,000
Commodity Price (US\$/kg)	\$14	\$90	\$13.6	\$2.04	
Operating Profit, after Tax	\$7,508	\$32,906	\$4,973	\$398	\$45,784
Annualized					\$16,711,178
NPV @ 20%, net of \$10M CAPEX					\$68,935,113
Working Capital					\$2,126,342
Book Value of Mineral Assets					\$5,008,517
<b>Expected Value of AMY</b>					<b>\$76,069,972</b>
No. of Shares					170,661,012
<b>Value per Share</b>					<b>\$0.45</b>

*Source: FRC*

As shown above, we estimate an after-tax net present value at 20% of \$69 million. We are using a high discount rate considering the early stage nature of the company's operations. For conservatism, we have valued the company's minerals assets at their book values.

**We are initiating coverage on AMY with a BUY rating and a fair value estimate of \$0.45 per share.**

## *Risks*

We believe the company is exposed to the following key risks (not exhaustive):

- The company's cathode recycling technology has yet to be commercialized.
- No guarantee that it will be viable on a larger-scale.
- Competing technologies.
- Operating costs and margins may be different from the forecasts presented in this report.
- Exploration and development risks associated with the company's resource projects.
- Volatility in commodity prices.

As with most junior exploration and early stage technology companies, we rate AMY shares a risk of 5 (Highly Speculative).



**Fundamental Research Corp. Equity Rating Scale:**

**Buy** – Annual expected rate of return exceeds 12% or the expected return is commensurate with risk

**Hold** – Annual expected rate of return is between 5% and 12%

**Sell** – Annual expected rate of return is below 5% or the expected return is not commensurate with risk

**Suspended or Rating N/A**— Coverage and ratings suspended until more information can be obtained from the company regarding recent events.

**Fundamental Research Corp. Risk Rating Scale:**

**1 (Low Risk)** - The company operates in an industry where it has a strong position (for example a monopoly, high market share etc.) or operates in a regulated industry. The future outlook is stable or positive for the industry. The company generates positive free cash flow and has a history of profitability. The capital structure is conservative with little or no debt.

**2 (Below Average Risk)** - The company operates in an industry where the fundamentals and outlook are positive. The industry and company are relatively less sensitive to systematic risk than companies with a Risk Rating of 3. The company has a history of profitability and has demonstrated its ability to generate positive free cash flows (though current free cash flow may be negative due to capital investment). The company's capital structure is conservative with little to modest use of debt.

**3 (Average Risk)** - The company operates in an industry that has average sensitivity to systematic risk. The industry may be cyclical. Profits and cash flow are sensitive to economic factors although the company has demonstrated its ability to generate positive earnings and cash flow. Debt use is in line with industry averages, and coverage ratios are sufficient.

**4 (Speculative)** - The company has little or no history of generating earnings or cash flow. Debt use is higher. These companies may be in start-up mode or in a turnaround situation. These companies should be considered speculative.

**5 (Highly Speculative)** - The company has no history of generating earnings or cash flow. They may operate in a new industry with new, and unproven products. Products may be at the development stage, testing, or seeking regulatory approval. These companies may run into liquidity issues, and may rely on external funding. These stocks are considered highly speculative.

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The distribution of FRC's ratings are as follows: BUY (74%), HOLD (7%), SELL / SUSPEND (19%).

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