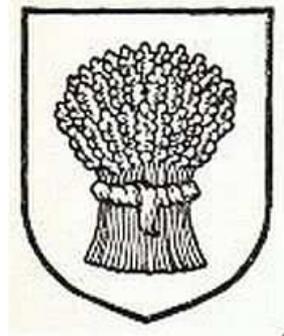


Friday, March 9, 2018



# HALLGARTEN & COMPANY

**Portfolio Strategy**

**Editor: Christopher Ecclestone**  
[ceccestone@hallgartenco.com](mailto:ceccestone@hallgartenco.com)

**Guest Contributor: Lindsay Newland Bowker**

## **Model Mining Portfolio: Cobalt – Passing the Baton to Manganese?**

**Performance Review – February 2018**

# Model Mining Portfolio

## Cobalt – Passing the Baton to Manganese?

- + Cobalt supply crisis is the long-awaited opportunity for the much more abundant (and cheaper) Manganese
- ✗ Trump measures against steel and aluminium imports to the US create chaos and negatively impact base metals' prices (particularly Zinc) without much rationale
- ✗ Gold and silver drifted aimlessly with gold threatening at one point to go beneath the \$1,300 mark
- ✗ Fluorspar is in something of a supply crisis but almost all the plays on this mineral that existed earlier this decade have disappeared
- ✗ Our guest contributor questions the real viability of many of the projects that companies and consultants tout as economic

### Key Takeaways from Argus Metals Week

The *Great & the Good* of the London commodities trading community came together in the last week of February to mull upon the prospects of specialty metals, in particular the battery metals. Braving the snow (nothing by New York or Toronto standards) they attempted to fathom fact from fiction as it pertained to metals where the sound and the fury exceed the reality by a long way, particularly when it comes to Cobalt.

The chief takeaway was that EV's will soar in popularity and adoption BUT Cobalt will not be able to deliver therefore, most probably, Manganese will step up to the plate and be the metal of choice to replace it in Lithium-Ion battery combinations. Our thesis is that the Cobalt crunch is upon us and that various industry majors are *whistling past the graveyard* hoping that no-one notices that they don't have enough of the "stuff" and have even less chance of securing the product despite potentially throwing substantial amounts of money at the price. The problem is that these companies (Tesla being one) are not and have not put their money where their mouth is in backing projects. To a degree we have sympathy with them not having backed any of the Cobalt chancers that are doing the rounds, but neither have they thrown any money at the Lithium developers to ensure they get a supply of that metal outside the Chinese orbit.

Key takeaways were:

- Cobalt crisis is looming without any solution and that few, if any, are prepared for it

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- Cobalt can be replaced with other metals and combinations of Lithium with Manganese look like the most likely winners going forward
- Governments are not geared up for the EV boom. It has revenue implications (lower tax take on fossil fuels), infrastructure implications (lack of charging stations and need for probably 25% more electricity) and there is the Cobalt consideration (a metal most politicians do not know has supply issues)
- Rare Earth supply implications are being ignored in the rush towards battery metals
- Lithium is NOT in any sort of supply crisis. There will be abundant supply
- Fluorspar (used in electrolytes in Li-Ion batteries) is in a difficult supply situation. This is compounded by China controlling 70% of the current production
- Mass storage devices will NOT be Lithium-Ion based and Vanadium Redox batteries look to have a strong potential for larger applications

Three “mining” companies presented. These were a pre-listing Canadian entity pursuing manages through tailings recycling in the Czech Republic, Bushveld Minerals (which we have launched coverage on recently) and Bacanora Minerals on which we have a Short rating. On the basis of the presentation and subsequent talks we decided to upgrade Bushveld from a Neutral to a Long. Not overwhelmed by the virtues of Bacanora (light mention was made of the basalt cap that overlays the deposit) reassured us in our Short call on this stock.

### **Portfolio Changes**

There were four portfolio changes during the month of February:

- Closed our Long position in Komet Resources. Sold 200,000 shares in KMT.v at CAD 39 cents per share on 22 February
- Closed our Long position in Eldorado Gold. Sold 30,000 shares in EGO at USD\$1.11 per share.
- Closed our Long position in Sama Resources. Sold 800,000 shares in SME.v at CAD 39 cents per share.
- Closed our Long position in Capstone Mining. Sold 47,293 shares in Capstone Mining at CAD\$1.44 per share.

With the departure of Capstone we shed our oldest position. Nothing exciting has happened at the stock for years, it has shed assets in recent months and it hasn't positioned itself to say anything new to the market about copper as the metal has moved back into the limelight.

Komet Resources was discarded for not matching the promise of when we meet them last year.

Eldorado Gold sits like a lump of lead in most portfolios these days. It botched China and just about everything else. Out it goes.

Sama Resources had performed beyond our expectations but is now in bed with Robert Friedland. We decided to take our profits off the table with this name.

### **The Portfolio Move**

The portfolio continued its slide in February closing at \$5.044mn down from \$5,220,659 at the end of January. Cash soared from \$756k to \$1.150mn during the month due to our hefty sales program.

### **Fluorspar – Gone but Not Forgotten**

Earlier this decade we had a flirtation with coverage of the Fluorspar space. We covered Canada Fluorspar and then were working on a sector review when CFI was taken over (as was the London-listed Fluormin) and the listed space shrank to enough players that everyone could fit in a phone box. Our encounter at the Argus conference with DFD Chems (the largest Chinese player in Fluorspar and Mexchem, the largest non-Chinese player renewed our attention on this metal. While unlikely to spark any sort of Fluoroboom, this mineral is defiantly up there with Vanadium as one to watch over the next two years.

Fluorspar is scarcely the word on everybody's lips and in fact hardly gets a mention despite its economic importance and the grip that China has had on supplies in recent years. Our first interaction with mineral was in relation to some rather unique REE deposits in New Mexico that occurred in concurrence with Fluorspar. However, Fluorspar is ranked fifth in the United States' list of foreign source-reliant minerals and included in the European Union's list of 14 critical minerals.

### **Applications**

Calcium fluoride (CaF<sub>2</sub>) comes in three industrial grades:

- Acid grade (>97% CaF<sub>2</sub>)
- Ceramic grade (93-97% CaF<sub>2</sub>)
- Metallurgical grade (60-93% CaF<sub>2</sub>).

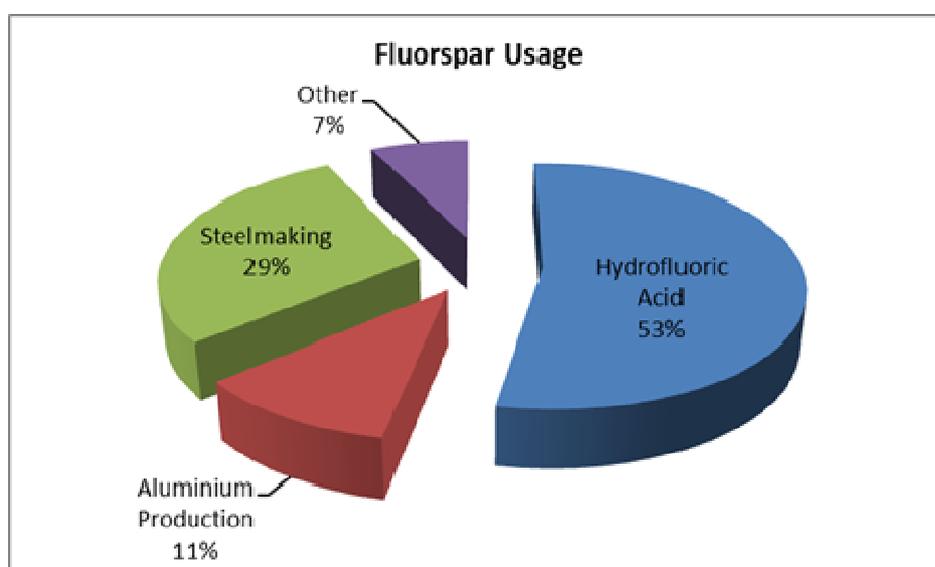
Calcium fluoride is a vital component in several industrial applications, including steel production. It is also used to make hydrogen fluoride (HF) which, in turn, is used in the production of refrigerants and to make: aluminium tri-fluoride (AlF<sub>3</sub>), critical in aluminium smelting; uranium fluoride (UF<sub>6</sub>), used in nuclear power stations; and lithium hexafluorophosphate (LiPF<sub>6</sub>), used to make lithium batteries. Tri-fluoride used in the manufacture of various downstream products, which are then re-imported at high cost.

Fluorspar is used in the production of hydrofluoric acid which is the primary feedstock for the manufacture of virtually all organic and inorganic fluorine-containing compounds including

fluoropolymers and fluorocarbons. Some examples are anaesthetics, non-stick coatings, and fire retardant clothing. It is also used in the production of electronic components, aluminum, and steel.

Hydrogen fluoride is generally made from acid-grade fluorspar, the top 97.2% grade. Fluorspar-linked products are used in refrigeration, ceramics, chemicals, dental products and pharmaceuticals, as well as nuclear physics.

Fluorspar is not without its alternatives/substitutes. Aluminum smelting dross, borax, calcium chloride, iron oxides, manganese ore, silica sand, and titanium dioxide have been used as substitutes for fluorspar fluxes in the steel industry while the by-product fluorosilicic acid has been used as a substitute in aluminum fluoride production and also has the potential to be used as a substitute in HF production.



Fluorite is especially critical for making electrolytes for lithium batteries and a key ingredient in industries including pharmacy, chemical, optics and environmental protection.

### Geology

Fluorite ( $\text{CaF}_2$ ), is virtually the only fluorine mineral of commercial significance. When mined it is usually called fluorspar. Another mineral, cryolite ( $\text{Na}_3\text{AlF}_6$ ), was important last century for the production of soda, alum and aluminium sulphate, and also in production of aluminium, but the only known source, in Greenland, has been exhausted. Most cryolite now used is manufactured.

Fluoroapatite, the major phosphate-bearing mineral in sedimentary phosphate deposits, is a major potential source of fluorine (commercially produced phosphates may contain up to 3-4% fluorine).

Fluorite occurs in a wide range of geological environments. The most commercially important deposit types include: hydrothermal veins and stockworks associated with felsic igneous rocks; stratiform

replacement deposits in carbonate rocks; skarns and other contact metamorphic rocks; at the margin of carbonatite and alkali igneous rock complexes; and residual deposits in the regolith. Fluorite also occurs as a gangue mineral in some base metal deposits (e.g. Mississippi Valley type deposits). These consist of veins or replacement bodies and cavity fillings of fluorite, carbonates, quartz and silver–lead–zinc mineralisation in carbonate sequences. Other deposit types (for fluorine) of lesser economic significance include pegmatites and lacustrine sedimentary deposits (e.g. Piancino in Italy).

Fluorite may occur as a vein deposit, especially with metallic minerals, where it often forms a part of the gangue (the surrounding "host-rock" in which valuable minerals occur) and may be associated with galena, sphalerite, barite, quartz, and calcite. It is a common mineral in deposits of hydrothermal origin and has been noted as a primary mineral in granites and other igneous rocks and as a common minor constituent of dolostone and limestone.



*Source: China Shen Zhou*

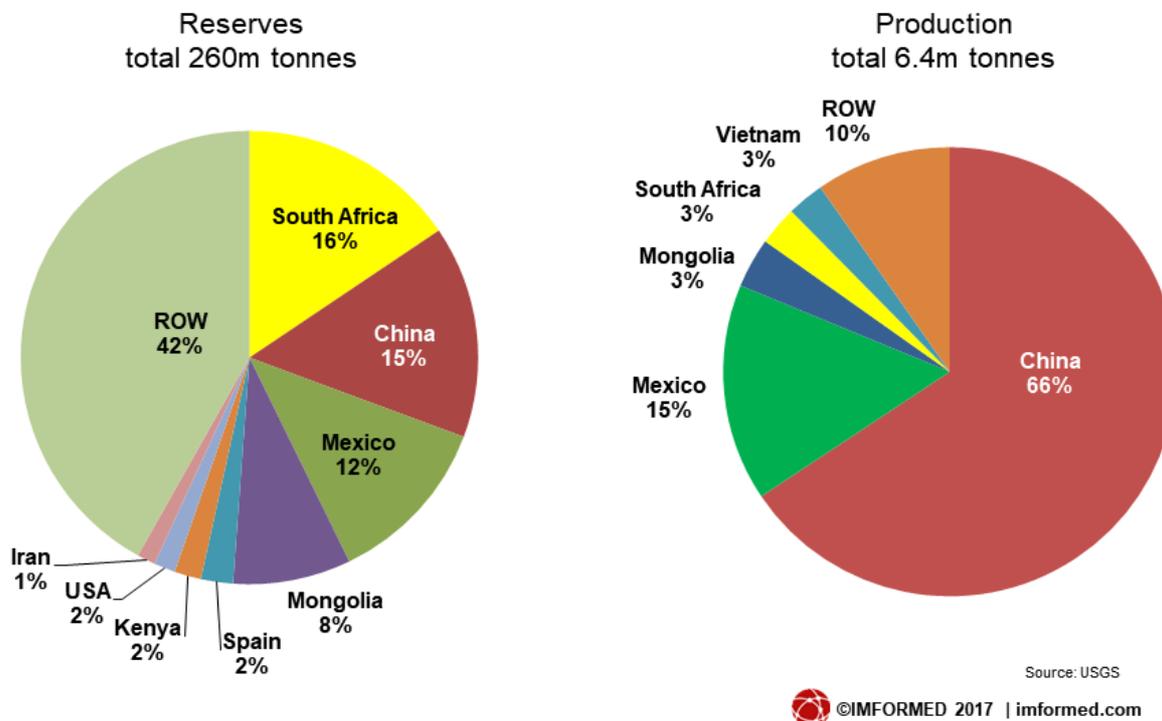
## **Global Resources**

Fluorite is a widely occurring mineral which is frequently found in large deposits. Notable deposits occur in China, Germany, Austria, Switzerland, England, Norway, Mexico, and both the Province of Ontario and Newfoundland and Labrador in Canada. Large deposits also occur in Kenya in the Kerio Valley area within the Great Rift Valley. South Africa hosts the largest reserves of fluorspar at 41-million tons, followed by Mexico with 32-million tons and China with 21-million tons.

In the United States, deposits are found in Missouri, Oklahoma, Illinois, Kentucky, Colorado, New Mexico, Arizona, Ohio, New Hampshire, New York, Alaska, and Texas. Illinois was the largest producer of fluorite in the United States, but the last fluorite mine in Illinois was closed in 1995.

The table below shows the USGS' current view of where the major Fluorite resources are distributed. The USGS has noted that identified world fluorspar resources were approximately 500 million tons of contained fluorspar. The quantity of fluorine present in phosphate rock deposits is enormous.

## World fluorspar reserves & production



Current U.S. reserves of phosphate rock are estimated to be one billion tons, which at 3.5% fluorine would contain 35 million tons of fluorine, equivalent to about 72 million tons of fluorspar. World reserves of phosphate rock are estimated to be 18 billion tons, equivalent to 630 million tons of fluorine and 1.29 billion tons of fluorspar. Thus is not a shortage of Fluorspar resources only a shortage of production in the Western world at this time. However as we all know the mining capital markets are tough going even for well-known commodities let alone that of obscure elements such as Fluorspar. The key component in any plan has to be securing an off-taker arrangement. The rush for Lithium-Ion battery production creates a new universe of customers for this mineral.

### Production

The international market consumes approximately 5-6 million tonnes of Fluorspar per annum with an estimated value of US\$1.6 billion to US\$2.3bn.

South Africa was the leading producer with, in 2010, some 280,000 tonnes produced. South Africa's Witkop and Buffalo fluorspar mines are owned by Fluormin (FLOR.L), the Doornhoek mine is owned by ENRC, of Kazakhstan and the Vergenoeg mine is owned by Minersa, of Spain.

Development work by a firm called Hastie Mining resulted in the new U.S. fluorspar mine at Burna in western Kentucky. This facility began production in the second half of 2010 and has capacity to produce

about 50,000 tons of fluorspar per year.

The German specialty chemicals company Lanxess sources some of its fluorspar from South Africa for its hydrogen-fluoride manufacturing facility in Leverkusen.

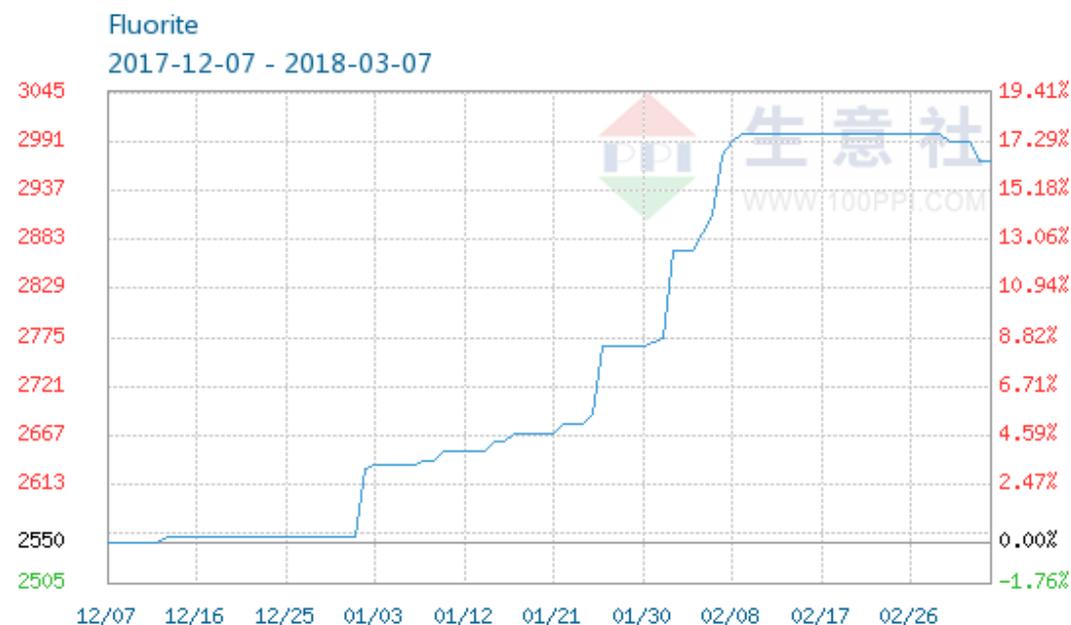
### China doing that thing it does

The Chinese government closely controls the total fluorite production through licensing requirements and production limitations. China has been the world's leading producer over the last 20 years. The availability of Chinese material on the international market has decreased significantly over the past five years. The reasons for flat to declining production in China might be a combination of shutdowns for environmental reasons and its policies on export quotas and tariffs combining with rapidly increasing domestic demand.

It has been noted though that China has been producing about its theoretical share of the global resources meaning, as with so many things, it has squandered a potentially scarce asset while those it forced out of the market still have their resources relatively undepleted. This augurs for less Chinese influence on the market (from the supply-side at least) in the coming decades.

### Price trends

Fluorite's last market surge was at the turn of the decade when its price went up over 192% between 2009 and 2011. The situation in China at least is showing a rapid price escalation in recent times as can be seen by the chart on the following page showing the internal price in China in recent months.



Source: Sun Sirs CommodityData

### **Resurgent Producers**

Construction began on two fluorspar mines in the third quarter of 2017. Ironically, the St. Lawrence Mine of Canada Fluorspar (now a subsidiary of the French group, Arkema) is powering ahead and has an anticipated annual acid-grade fluorspar production capacity of 200,000 metric tons per year. First production was expected in early 2018. The Nokeng Mine in Gauteng, South Africa, owned by SepFluor (a wholly owned subsidiary of Sephaku Holdings Ltd listed on Johannesburg Stock Exchange) began construction in July 2017, with the first production anticipated for the first quarter of 2019. The mine is expected to produce 180,000 t/yr of acidgrade fluorspar and 30,000 t/yr of metallurgical-grade fluorspar.

Meanwhile, Mexchem (listed on the Mexican Stock Exchange), the major Western producer is enjoying the better prices and its sizeable market share.

### **The Worm Has Turned**

It's no wonder the bulk of the listed Fluorspar producers/developers faded from sight earlier this decade. Prices were poor and the Chinese were stamping on the market to make it their own. Now the improved situation is reviving production efforts outside China.

It will be interesting to see whether more players start to join the fray when they realise the importance of Acid-spar in Lithium-Ion battery electrolytes.

### **Parting Shot – Guest Contributor – Lindsay Newland Bowker**

After studying minerals waste management almost exclusively for 4 years from a perspective of governance, I see no easy fixes, no whole set of corrections. Yet I see no component (exchanges, resource assessment, permitting, planning, management) that is working as it should to provide the checks and balances needed to keep an efficient reliable supply of minerals to the world. The very nature of the minerals industry is a bad fit with all known models and traditions of governance and yet the industry it is so deeply affected with a public interest beyond the worlds needs for minerals that sound responsible governance is essential. That can't be entrusted to self -governance under negotiated terms.

It is often the case that by the time the entrenched practices and technologies essential to the economics of a given industry begin to cause real public harm necessitating correction by governance that what emerges as governance is not a result of systematic thinking and meaningful negotiation with the regulated industries. Law emerging in public anger and crisis often ends up only creating a structure/framework for the ongoing polarities and conflicts of the debate rather than resolving or even understanding the fundamental problems. No many parts of the world this is playing out now in minerals governance in the form of reactive prohibitions.

Australia is the best model of “what could be” in minerals production governance. I am impressed with

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what I am beginning to understand about the supply side reforms China has undertaken. Both are a continuing process of systematic thinking, long term planning, active national mineral resource portfolio management aimed at an adequate within nation supply, an outflow of globally competitive mineral product with an environment- and community-first standard. Governance needs to start thinking about the set of mines it gives permits to as a portfolio that needs wise stewardship and management. It needs to work explicitly like a public private partnership because its output is required in all communities and an adequate, reliable supply matters.

There should be a solution but mining is so complex, so unique, so high risk and involves so much inherent uncertainty there are no exactly suitable models and traditions of governance that really fit. Utilities regulation and commercial goods transport are probably the closest. But even, if a model of governance could be put to paper and agreed to by all, where is the technical capacity to implement it? Developing a mineralized deposit is far more complex than building a rail line or creating a distribution network for power supply. It requires specific, not generalized, expertise and field experience for every part. Even within the consultant autocracy the well of real talent is going dry. Old venerable company names go on some pretty shoddy work these days. There isn't enough talent to even do adequate self-governance so obviously it can't be built into the system at the permitting level. As you may have seen, Bowker Associates is advocating some version of "Buildings Codes & Buildings Departments" tailored to the unique qualities of mineral exaction and its waste management. That can't be staffed or rely on the consultant autocracy but whence cometh a cadre of professionals willing to be in governance? Though it aims only at "public safety", only at the waste management part of minerals extraction, that may be enough to make a major part of the needed shift.

The investment and equity sector also needs its own reforms. Fitch gave a glowing endorsement to Samarcos \$2.2Bn bond offering for its planned expansion in July of 2015, just 4 months before the worst minerals waste disaster in recorded history. BHP/Vale's own retained *Cause of Failure Expert*, the elegant Dr. Norbert Morgenstern stated unequivocally that the failure event was already irrevocably formed and advancing for a long time. Day by day I see no match between what appears in enthusiastic investment analysis and what I know of the quality and condition of the deposit and its infrastructure through authoritative assessment.

The entire industry is awash with memes & mayhem at the edge of the great minerals abyss. Rio Tinto's \$38Bn aluminum acquisition error followed by the SEC charges of fraud alleging an attempt to hide a \$3bn mistake in Mozambique while trying to raise capital on U.S exchanges is a sobering reality check that juniors are not the only poor performing high investor risk/high community risk part of the minerals production industry. Even after OK Tedi, it had never occurred to BHP that a corporate wide tailings and waste policy made sense until they got a glimpse of the unexpected findings of their own cause of failure analysis for the Fundao.

It should be easy to fix. The world actually does need minerals not just for "obnoxious" as Bucky Fuller used to call much of what industry produces and consumerism adores but for essentials. Within the

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limits of existing proven technology here is an adequate supply in all minerals sectors at the global level. Even economists like David Humphreys agree that there is no inherent conflict between environmental/community security and the minerals production the world needs. Bowker Associates work has hopefully made it undeniably clear that the public consequence of minerals production grows astronomically as grades across the sector have reached the limits of presently known technology. The forensics on the failures we have mapped show that all was and is preventable not just unavoidable risk as the industry has tried to insist. There is no need for a local "sacrifice zone" to serve the larger good of the worlds needs for minerals.

Our most recent research (Dark Shadows) suggests that not more than 70% of all permitted mines are economically viable now and that many weren't viable at permitting. Somewhere recently I saw an estimate by one of the big auditing firms that at least 50% of what is already permitted isn't actually needed to meet world mineral needs. The other 50% aren't just mistakes in judgment but a whole industry within the industry where money is made until the game is up. The consultant autocracy makes plenty on that not needed half of the minerals industry where individual sites are traded like commodities themselves even by top producers and the top 40.

As an analyst of large complex systems, I honestly have no idea how to bring about the big shift. I have only this vague idea that it involves getting rid of the 50% of the minerals industry that is pure speculation and nothing to do with the worlds actual needs for minerals and that portfolio management at the national level, radical de novo, never done or tried supply side reforms in minerals resource governance is the key to ongoing stability between supply and demand.

That's not much of a start standing here at the edge of the minerals production abyss.

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**Mining Model Portfolio as at: 2-Mar-18**

Security	Initiated	Currency	Price Avg.	Current	Portfolio Weighting	Increase in Value	Target	
<b>Long Equities</b>								
<b>Various Large/Mid-Cap</b>	Teck Resources (TECK.B)	5/29/2009	CAD	22.46	36.61	10.0%	63.0%	\$38.00
	NevSun (NSU)	3/23/2012	CAD	3.45	2.82	3.0%	-18.3%	\$5.00
	Sherritt International (S.to)	7/11/2013	CAD	1.78	1.21	3.8%	-32.0%	\$2.50
	Metals X (MLX.ax)	29/5/2014	AUD	0.98	0.82	2.3%	-16.2%	\$1.00
<b>Trading House</b>	Noble Group (CGP.SG)	15/11/2017	SGD	0.2	0.16	2.3%	-19.6%	\$1.35
<b>Uranium</b>	Uranium Participation Corp (U.to)	10/20/2010	CAD	7.01	3.97	2.1%	-43.4%	\$6.00
	Western Uranium (WUC.cx)	7/5/2016	CAD	2.25	0.78	1.0%	-65.3%	\$4.80
	GoviEx (GXU.v)	6/29/2015	CAD	0.08	0.22	5.5%	167.7%	\$0.50
<b>Zinc/Lead Plays</b>	Zinc ETF (Zinc.L)	1/15/2010	USD	7.04	9.80	2.7%	39.2%	£11.00
	Canadian Zinc (CZN.to)	12/9/2011	CAD	0.82	0.14	0.4%	-82.9%	\$0.70
	Ascendant Resources (ASND.v)	10/31/2016	CAD	0.48	1.10	4.6%	131.6%	\$1.70
	Nyrstar (NYS:BR)	9/28/2009	Euros	65.1	5.53	3.3%	-91.5%	\$11.00
	Southern Silver Exploration (SSV.v)	8/25/2016	CAD	0.25	0.485	2.5%	94.0%	€ 0.94
<b>Gold Producers</b>	Patagonia Gold (PGD.L)	10/2/2013	GBP	3.6	1.09	0.8%	-69.7%	£4.00
	Para Resources (PBR.v)	2/17/2017	CAD	0.23	0.20	2.1%	-13.0%	\$0.58
	Westgold (WGX.ax)	12/6/2016	AUD	2.01	1.60	2.9%	-20.4%	\$2.40
	Teranga Gold (TGZ.to)	6/21/2012	CAD	1.57	3.76	9.5%	139.4%	\$3.80
<b>Copper Producer</b>	Coro Mining (COP.to)	2/23/2015	CAD	0.03	0.11	2.3%	266.7%	\$0.30
	RNC Minerals (RNX.to)	11/17/2016	CAD	0.33	0.28	1.8%	-15.2%	\$0.60
<b>Royalty Trust</b>	Abitibi Royalty (RZZ.v)	5/31/2017	CAD	9.1	9.65	2.2%	6.0%	\$18.00
<b>Processor</b>	IBC Advanced Alloys (IB.v)	4/29/2016	CAD	0.3	0.35	0.7%	16.7%	\$1.40
<b>Driller</b>	Cabo Drilling (CBE.v)	9/28/2016	CAD	0.025	0.02	0.8%	-20.0%	\$0.08
<b>Tungsten Producer</b>	Almonty Industries (AII.v)	7/31/2015	CAD	0.36	0.55	5.8%	51.8%	\$1.00
<b>Copper Explorer</b>	Asiamet Resources (ARS.v)	4/28/2016	CAD	0.05	0.12	3.7%	136.4%	\$0.12
	Panoro Minerals (PML.v)	1/22/2018	CAD	0.34	0.37	2.3%	7.4%	\$0.65
	Western Copper & Gold (WRN.to)	4/25/2017	CAD	1.57	1.08	2.3%	-31.2%	\$2.74
<b>Lithium</b>	Neometals (NMT.ax)	7/31/2014	AUD	0.04	0.34	3.6%	818.9%	\$0.45
	Lithium Power Intl (LPI.ax)	10/25/2017	AUD	0.44	0.4	2.5%	-9.1%	\$1.38
<b>Scandium Explorer</b>	Scandium International (SCY.to)	8/23/2016	CAD	0.14	0.19	2.4%	35.7%	\$1.00
<b>Gold Explorer</b>	Banyan Gold (BYN.v)	11/14/2017	CAD	0.07	0.09	2.5%	28.6%	\$0.25
<b>Graphite Producer</b>	Elcora Resources (ERA.v)	29/5/2014	CAD	0.2	0.29	3.0%	45.0%	\$0.64
<b>Graphite Developer</b>	Talga Resources (TLG.ax)	8/25/2016	AUD	0.27	0.78	4.1%	194.3%	\$0.90
<b>REE Explorer</b>	Northern Minerals (NTU.ax)	6/9/2011	AUD	0.23	0.08	1.1%	-65.9%	\$0.38
	NET CASH					<b>1,150,532</b>		
<b>Short Equities</b>								
<b>Shorts</b>	Bacanora (BCN.v)	12/4/2015	CAD	1.53	1.60	36.1%	-4.6%	\$0.80
	Lithium Americas (LAC.to)	10/25/2017	CAD	10.1	8.21	43.2%	18.7%	\$5.00
	Galane Gold (GG.v)	4/28/2016	CAD	0.06	0.05	20.7%	16.7%	\$0.03

<b>Current Cash Position</b>	<b>1,150,532</b>
<b>Current Liability on Shorts Not Covered</b>	<b>206,155</b>
<b>Net Cash</b>	<b>1,356,687</b>
<b>Current Value of Bonds</b>	<b>0</b>
<b>Current Value of Long Equities</b>	<b>3,687,889</b>
<b>TOTAL VALUE OF PORTFOLIO</b>	<b>5,044,576</b>

## Important disclosures

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