

Calcium-antimony batteries are looking more suitable for grid networks than lithium-ion

Two weeks ago we said that the best news for the market would be evidence of a recession starting to bite. That is exactly what happened on Monday evening in the USA, causing the gold price to rally back to US\$1,700/oz and the Dow to jump 2.66%. We had another good day of rises on Tuesday and the Australian interest rate rise was only 0.25%.

The stress that drove prices lower the week before has run its course. We then saw the strong rally and the subsequent slow down at the end of the week. Many share prices had surged higher, but not enough to breach downtrends, so this means we are still trying to form a base around these levels.

Looking beyond the immediate economic turmoil, this week we have taken a closer look at the role antimony is playing in the next generation of large capacity stationary batteries, the type that are linked into the grid to provide the reliability that solar and wind power cannot. Tesla-style lithium models are the default battery at present, but these are not without their issues e.g. look at the fire in the Victoria facility⁽¹⁾. Vanadium Redox batteries are gaining more attention, but there is a new type coming out of the USA that could better both of these types of batteries - calcium-antimony batteries.

(1) Two Tesla Megapacks were engulfed in flames when a fire broke out during initial testing at the Victorian Big Battery site in Moorabool, near Geelong, on July 30.

Ambri Batteries will boost demand for antimony

The Massachusetts-based USA company, Ambri, has developed a liquid metal battery comprised of a calcium alloy anode, a molten salt electrolyte and a cathode comprised of solid particles of antimony. Last year it raised US\$144m, with Bill Gates being one of the funders.

The antimony-based battery has an expected life span twice that of lithium batteries, experiencing minimal capacity loss over a 20 year life. This is a grid-scale storage system for solar and wind energy that, according to Ambri, is *"the battery that will change the world"*. Key points that it emphasises are;

- high energy capacity, frequent cycling, long life and high efficiency
- high temperature chemistry, working at 500°C, generating its own heat source
- zero maintenance
- container-size units that can operate in parallel
- electrode materials that cost 1/3 of those in NMC lithium-ion cells
- manufacturing costs of only 1/3 to 1/2 of lithium-ion cells
- no risk of combustion - not explosive, combustive or temperature sensitive

- no level of overcharging, over-discharging, short circuiting or temperature has caused any safety concerns

The active materials in Ambri's cells;

- reversibly alloy and de-alloy while charging and discharging.
- The electrolyte is thermodynamically stable with the electrodes, avoiding unwanted side reactions such as film-formation that can degrade the performance of other cell chemistries. Furthermore,
- the negative electrode is fully consumed when discharged, and then is reformed on every cycle, resulting in a highly repeatable process with no memory effect.
- With these unique operating characteristics, Ambri's liquid metal battery technology avoids common degradation mechanisms that cause capacity fade in other chemistries.

If you want more detail on how these batteries actually work, click on the following link.

<https://www.greyb.com/ambri-liquid-metal-battery/>

These batteries have progressed past the bench-scale test level and are now going into pilot scale field operations with the US company, Xcel Energy, installing a demonstration battery at the Solar Technology Acceleration Centre in Colorado over the next year. Funded by the Department of Energy's Advanced Research Projects Agency-Energy as well as Bill Gates, Ambri has developed the [antimony-based battery](#) that does not require cooling or access to limited supplies of in-demand materials like lithium. The battery is cheaper and lasts longer than lithium-ion technology. The Excel facility is one of five similar pilot projects planned for 2023.

Competing battery technologies open new opportunities for investors

Tremendous profits have already been made by investors backing battery material companies. The most obvious ones have been in the lithium space, but one thing is certain; new battery technologies will emerge that provide opportunities for other commodities to outperform. Technological development never stops and the world is always looking for better alternatives. The development of the antimony-based grid storage battery is one such initiative that offers great upside for antimony companies and investors, of which there are very few so far.

How Nagambie fits into the picture - high grades

There are a number of companies that have reported antimony (in stibnite) grades of 1-2% Sb. At this level the antimony is a useful by-product, especially giving the high antimony prices being experienced today. Adding the gold

and the stibnite together can give an impressive AuEq grade.

Nagambie seems to stand out amongst these companies with much higher stibnite grades - up to 9.2% Sb in places. While we are waiting on further assays, visual inspection of the core suggests that the high grades will continue. The Company is optimistic that typical mine grades could be in the range of 5-10% Sb, which would make it one of the highest grade antimony orebodies in the world. As such, it is very well positioned to feed into the strong demand we can see coming from the calcium-antimony battery developments over the next few years.

Given that 85% of antimony supply comes from China, Russia and Tajikistan, the prospects of a reliable supplier from the most geopolitically reliable country that Australia appears to be, will be of great interest to US and European industry and the battery developers.

Nagambie reports its intercepts in AuEq numbers as most investors understand gold much better than antimony, but we thought it worthwhile focusing on the actual antimony grades in this Weekly, as it fits well with the battery narrative.

Nagambie undertaking a small raising

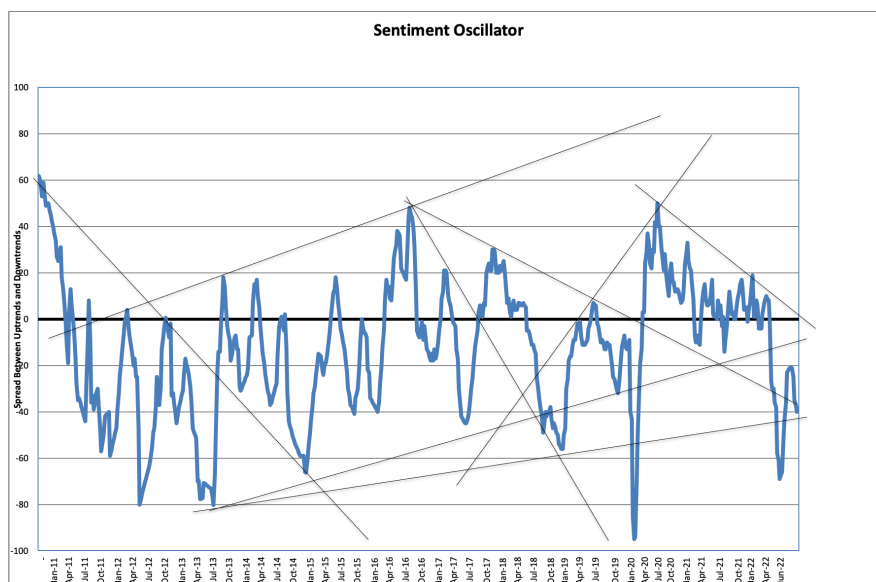
Yesterday Nagambie Resources (NAG) went into a trading halt to raise a small amount of \$1m, in order to keep the drilling rig operating at its high-grade gold/antimony project at its 100%-owned Nagambie Mine in Victoria. Far East Capital is managing the placement.

Regular readers will have seen our commentaries in recent months concerning Nagambie so you will be aware of my enthusiasm for this unique company with a granted mining licence in Victoria. You may have also seen that I joined the board last week, with a view to assisting the company as it seeks to develop Victoria's next underground high-grade gold mine (plus high-grade antimony).

As mentioned above, in considering the merits of the Company, it is important to also focus on the antimony. While antimony has its traditional uses that include steel hardening, ordnance, fire retardancy, semiconductors etc etc, there is a significant new source of demand emerging - liquid metal batteries.

If you like to participate in the placement, and you are a s708 qualified investor, please contact me on wgrigor@fareastcapital.com.au

Disclosure: Interests associated with the author own shares and notes in Nagambie Resources. The author is a non-executive director in Nagambie. Capital raising fees have been earned.



Sentiment Oscillator: Sentiment was slipped a little over the week. There were 14% (16%) of the charts in uptrend and 54% (53%) in downtrend on Friday's close.

Detailed Chart Comments

NB. Only the bold comments have been updated. Comments in grey type are from previous weeks and will be less relevant. Please note that this list is a cross section of the market. It IS NOT a list of recommendations.

Indices	Code	Trend	Comment	
All Ordinaries	XAO		surge higher, but still in downtrend	
Metals and Mining	XMM		hitting resistance line	
Energy	XEJ		spiked higher	
Information Technology	XIJ		down	
Stocks	Code	Trend	Comment (updated comments in bold)	Main Interest
A-Cap Energy	ACB		breached support line	uranium
Alpha HPA	A4N		breached downtrend	HPA
Adriatic Resources	ADT		approaching resistance line	zinc, polymetallic
Advance Metals (was Pacific American)	AVM		down	coal, gold exploration
Alkane Resources	ALK		testing downtrend	gold
Alicanto Minerals	AQI		new low	base metals, silver, gold
Altech Chemical	ATC		strongly higher	HPA, anodes
Anteotech	ADO		new low	silicon anodes, biotech
Alto Metals	AME		at resistance	gold exploration
American Rare Earths	ARR		fallen back to resistance line	rare earths
Antilles Gold	AAU		still down	gold
Arafura Resources	ARU		good bounce	rare earths
Ardea Resources	ARL		testing support	nickel
Aurelia Metals	AMI		new low	gold + base metals
Australian Potash	APC		sideways through downtrend	potash
Australian Rare Earths	AR3		at lows	rare earths
Auteco Minerals	AUT		recovering	gold exploration
Arizona Lithium	AZL		failed at resistance line	lithium
Azure Minerals	AZS		failing at resistance line	nickel exploration
BHP	BHP		testing resistance line	diversified, iron ore
Beach Energy	BPT		new uptrend confirmed	oil and gas
Bellevue Gold	BGL		breached downtrend	gold exploration
Benz Mining	BNZ		breached downtrend	gold
Black Cat Syndicate	BC8		breaching uptrend	gold
Blue Star Helium	BNL		sideways through downtrend	gas, helium
BMG Resources	BMG		down	gold exploration
Boab Metals	BML		failed at resistance line	silver/lead
Breaker Resources	BRB		testing downtrend	gold exploration
Buru Energy	BRU		gently lower	oil
Calidus Resources	CAI		new low	gold
Capricorn Metals	CMM		back into downtrend	gold
Caravel Minerals	CVV		at resistance	copper
Castile Resources	CST		down	gold/copper/cobalt
Celsius Resources	CLA		sideways at lows	copper
Chalice Mining	CHN		down	nickel, copper, PGMs, gold exploration

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Chesser Resources	CHZ	■	new low	gold exploration
Cobalt Blue	COB	■	testing uptrend	cobalt
Cyprium Metals	CYM	■	new low	copper
Dateline	DTR	■	down	rare earths
De Grey	DEG	■	good recovery	gold
E2 Metals	E2M	■	breached new uptrend	gold exploration
Ecograf	EGR	■	falling again	graphite
Element 25	E25	■	new uptrend commenced	manganese
Emerald Resources	EMR	■	trying to recapture uptrend	gold
Empire Energy	EEG	■	testing uptrend	gas
Euro Manganese	EMN	■	breached new uptrend	manganese
Evolution Mining	EVN	■	new low	gold
Firefinch	FFX	■	suspended	gold
First Graphene	FGR	■	breached downtrend	graphene
Fortescue Metals	FMG	■	failed at resistance line	iron ore
FYI Resources	FYI	■	sideways through downtrend	HPA
Galena Mining	G1A	■	testing steepest downtrend	lead
Galilee Energy	GLL	■	softer	oil and gas, CBM
Genesis Minerals	GMD	■	down	gold
Genmin	GEN	■	rising	iron ore
Gold Road	GOR	■	breached downtrend	gold
Great Boulder Resources	GBR	■	but approaching resistance line	gold exploration
Hastings Technology Metals	HAS	■	heavy fall	rare earths
Hazer Group	HZR	■	still in downtrend	hydrogen
Heavy Minerals	HVY	■	still in downtrend	garnet
Highfield Resources	HFR	■	new low	potash
Hillgrove Resources	HGO	■	down	copper
Iluka Resources	ILU	■	testing resistance line	mineral sands
Image Resources	IMA	■	down	mineral sands
ioneer (was Global Geoscience)	INR	■	testing resistance line	lithium
Ionic Rare Earths	IXR	■	rising again	rare earths
Jervois Mining	JVR	■	breached downtrend	nickel/cobalt
Kaiser Reef	KAU	■	recovering from lows	gold
Kingston Resources	KSN	■	improving	gold
Krakatoa Resources	KTA	■	rising	rare earths
Kingfisher Mining	KFM	■	down	rare earths
Kingwest Resources	KWR	■	new low	gold
Legend Mining	LEG	■	new low	nickel exploration
Lepidico	LPD	■	back to lows	lithium
Lindian Resources	LIN	■	another new high	bauxite
Lion One Metals	LLO	■	down	gold
Los Cerros	LCL	■	new uptrend breached	gold exploration
Lotus Resources	LOT	■	sideways through downtrend	uranium
Lucapa Diamond	LOM	■	new uptrend forming, but struggling	diamonds

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Lunnon Metals	LM8		breached support line	nickel
Lynas Corp.	LYC		down	rare earths
Magnetic Resources	MAU		surge on REO news, then retracement	gold exploration
Mako Gold	MKG		failed at resistance line	gold exploration
Marmota	MEU		sideways	gold exploration
Marvel Gold	MVL		new low	gold exploration
Matador Mining	MZZ		new low	gold exploration
Mayur Resources	MRL		strong rise from lows	renewables, cement
Meeka Gold	MEK		surge on drill results -capital raising	gold
Megado Gold	MEG		back to downtrend	rare earths, gold exploration
MetalsX	MLX		new low	tin, nickel
Metro Mining	MMI		slump out of new uptrend with a placement	bauxite
Mincor Resources	MCR		recovering from lows	gold/nickel
Mithril Resources	MTH		down	gold/silver
Musgrave Minerals	MGV		testing downtrend	gold exploration
Nagambie Resources	NAG		stronger	gold, antimony
Neometals	NMT		rising	lithium
Northern Star Res.	NST		strong rise	gold
Nova Minerals	NVA		down again	gold exploration
Orecorp	ORR		at lows	gold development
Oz Minerals	OZL		new high on BHP takeover moves	copper
Pantoro	PNR		new low	gold
Panoramic Res	PAN		down	nickel
Peak Resources	PEK		rising	rare earths
Peel Mining	PEX		breached steepest downtrend	copper
Peninsula Energy	PEN		sideways	uranium
Poseidon Nickel	POS		still down	nickel
Perseus Mining	PRU		down	gold
Provaris Energy	PV1		rising	hydrogen
PVW Resources	PVW		breached downtrend	rare earths
QMiner	QML		new low	copper
Queensland Pacific Metals	QPM		sideways	nickel/cobalt/HPA
Red River Resources	RVR		new low	zinc
Regis Resources	RRL		down	gold
Regergen	RLT		down	gas, helium
Resource Mining Corp.	RMI		sideways	nickel exploration
RIO	RIO		new low	diversified, iron ore
Rumble Resources	RTR		secondary downtrend	gold exploration
S2 Resources	S2R		sideways	gold exploration
St Barbara	SBM		down	gold
Sandfire Resources	SFR		heavy fall	copper
Santos	STO		breached trend line support	oil/gas
Saturn Metals	STN		down	gold exploration
Silex Systems	SLX		peaked, then sharp fall	uranium enrichment technology

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Silver Mines	SVL	■	down	silver
South Harz Potash	SHP	■	still in downtrend	potash
Southern Cross Gold	SXG	■	down	gold exploration
Stanmore Coal	SMR	■	surge higher	coal
Strandline Resources	STA	■	strong rise	mineral sands
Sunstone Metals	STM	■	downtrend	exploration
Talga Resources	TLG	■	testing steepest downtrend	graphite
Tamboran Resources	TBN	■	breached downtrend	gas
Technology Metals	TMT	■	down	vanadium
Tesoro Resources	TSO	■	new low	gold exploration
Theta Gold Mines	TGM	■	strong rise from lows - at resistance	gold
Thor Mining	THR	■	sideways through downtrend	gold exploration
Tietto Minerals	TIE	■	breaching downtrend	gold
Turaco Gold	TCG	■	bouncing from lows	gold exploration
Vanadium Resources	VR8	■	testing downtrend	vanadium
Venture Minerals	VMS	■	down	tin, tungsten
West African Resources	WAF	■	down	gold
Westgold Resources	WGX	■	down	gold
West Wits Mining	WWI	■	new low	gold
Whitehaven Coal	WHC	■	new high	coal
Yandal Resources	YRL	■	new low	gold exploration
Zenith Minerals	ZNC	■	breached steepest downtrend	gold exploration
Zinc Mines of Ireland	ZMI	■	new low	zinc
Totals	14%	20	Uptrend	
	54%	79	Downtrend	
		146	Total	

Guides to Chart Interpretations

- Charts usually go pass from one trend (up or down) into the other via a period of indecision and uncertainty during which the trend can either recover or change. This period is signified by the orange colour. The orange represent both the greatest risk and greatest reward possibilities.
- Once a chart is in confirmed up or downtrends it is not uncommon for 10-20% of that trend to have already transpired.
- There are trends within trends. The focus of this chart review is the immediate trend that affects the sentiment i.e. it can be a downtrend within a long-term uptrend.
- Not every chart warrants a new comment every week. The new comments are in bold type. Grey type comments may be dated.
- Individual charts provide a single view. It is valuable to look at charts of other companies in similar commodities, and the overall sentiment is also very valuable. Not many stocks can swim against the tide.
- We periodically add or delete charts, some times for obscure reasons. If a chart consistent gives poor signals or is very erratic, we may delete it. Sometimes we add a chart because we want to see what all the fuss is about. We do have a preference for charting stocks that we cover in our research as well.
- Errors and omissions may occur from time to time, especially in fast moving markets.

Amber Lights in Tables: Just a reminder if when the amber light is used in the table – it is when the charts are ambiguous or when there is a change of trend taking place. If a chart is breaching a downtrend it can either be a positive sign or a trap. Only once it has done more work can it be confirmed as a new uptrend. Maybe it is a new uptrend (or conversely a new downtrend); the risk takers can decide to jump on board early (or sell). They will maximise their profits (or minimise their losses if indeed it is the start of the new uptrend (downtrend). More risk-averse investors should wait a little longer, being prepared to give up some of the gains in return for greater certainty.

Weightings of Sectors Represented in the Company Charts			
Sector	No. of Companies	Weighting	
Gold	32	21.9%	
Gold Exploration	22	15.1%	
Rare Earths	12	8.2%	
Nickel	11	7.5%	
Copper	9	6.2%	
Oil/Gas	9	6.2%	
Iron Ore/Manganese	6	4.1%	
Zinc/Lead	5	3.4%	
Lithium	4	2.7%	
Uranium	4	2.7%	
Graphite/graphene	3	2.1%	
Potash/Phosphate	3	2.1%	
Coal	3	2.1%	
Mineral Sands	3	2.1%	
Silver	2	1.4%	
Bauxite	2	1.4%	
Vanadium	2	1.4%	
Cobalt	1	0.7%	
Tin	2	1.4%	
Diamonds	1	0.7%	
Other	10		
Total	146		

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