

Perovskite cells at the cutting edge of solar power technology

It was a difficult, volatile week we just had as the debate concerning inflationary expectations pivoted around energy prices. All the traditional sources of energy have been experiencing price rises lately, whether it be oil, gas or coal. Flexibility of supply lines for these commodities is being compromised by the obsessive push towards renewable energy, so the movements should not come as a surprise.

The irony is that the traditional energy producers that have been under assault from self-designated ethical investment groups will be experiencing better profit margins due to the greater hurdles that new projects must overcome, with the consequential pinching of supply.

International politics is playing a role here as well with one example being Russia withholding gas supplies to Europe. Saudi gas supply has had its interruptions. The UK is experiencing panic buying of petrol at the bowser as Brexit has robbed the country of many truck drivers from Europe, and this has been exacerbated by covid lockdowns restricting cross boarder travel of other drivers.

The next best thing in solar power - perovskite

Crystalline silicon cells have become the benchmark for any solar power system. They have been adapted universally around the globe as economies of scale associated with Chinese manufacturing capability have lowered their cost over the last 20 years, but the curve is starting to flatten. Silicon is a mature technology that offers only incremental improvements from this point, so where do we turn to now to get disruption in the solar power business? Try perovskite solar cells (PSC).

Strong improvements in efficiency

PSCs are still at a relatively early stage of technical development and while they don't yet offer a perfect solution for all photovoltaic applications the rate of improvements in design and efficiency since 2012, has outstripped the rate of improvement of any other solar technology. The first generation of PSC products are on the cusp of becoming commercially available with the growth of the Technology Readiness Level we are currently witnessing, and we should expect that there will continue to be advances in the material used in their manufacture that will open the door to an expanding list of applications.

Advantages of perovskite solar cells

Thin film perovskite solar cells offer greater flexibility than silicon cells across a wider range of applications. They generate high power with very low weight (known as 'high specific power') for applications such as textiles and clothing, remote control devices, IoT, digital farming, low-orbit satellites and drones. The list of potential uses is lengthy.

Perovskite cells can be as thin as a \$20 note, and can be printed on a flexible plastic substrate in a similar way. As such the supportive glass structure that silicon panels require is not essential. The silicon solar cell typically accounts for only 30-35% of the price of a photovoltaic system, with framework and structure accounting for a larger proportion of the cost. At some point in the not too distant future perovskite cells will be suitable for all outdoor uses such as in the roof and panels of cars, on exterior walls of buildings and roofs, and on large span sheds, to name a few examples. Weight reduction is a very important consideration for all of these applications.

The thin film, low light competing technologies

Low light solar technologies are still being researched. Crystalline silicon (used on roof top solar panels) performs poorly in low light and shade. Amorphous silicon can perform better in low light but it cannot compete with PSC. Today there are about 10 types of low light cells being advanced with efficiencies that range from 5% to 21%. Perovskite-based modules are outperforming all affordable others.

The leading Australian company - Greatcell

There is a private Australian company at the cutting edge of PSCs, named Greatcell Energy Pty Ltd. Greatcell is at the point of manufacturing bench scale volumes for the delivery of samples to potential electronic industry purchasers. Assuming that these are well received, the Company will progress to the installation of larger scale roll-to-roll (R2R) manufacturing equipment commencing in the middle of 2022.

Focus is on indoor solar cells at present

At this juncture Greatcell is focusing on PSCs for use with indoor electronic equipment, for which there is no real substitute for PSC when considering cost, flexibility and efficiency. Subsequent improvements in design and manufacturing should enable the development of weather-proofing to open the door to long term outside applications as well.

Research note is available on request

We have completed a four page research note on Greatcell in support of a \$2m seed capital raising that is being undertaken. We have only sent this to our s708 investors list but we can make it available on request, together with a company presentation.

Los Cerros continues to confirm and expand expectations with the layer three hole

The excitement that comes with a new discovery can be very exciting, especially when it comes out of left field, but it is always a challenge to hold the attention of speculators when the novelty wears off. Sometimes a share price will keep rising as the magnitude of a discovery is quickly appreciated, such as with Chalice or De Grey, but even these stocks top out at some point and the shares go into retreat.

Los Cerros shares have performed very well over the past 12 months but the share price is drifting lower now, following the introduction of strategic institutional shareholders in the recent placement at 16¢. At 13.5¢ the market capitalisation of LCL is \$85m, with a cash balance of \$20m. There is no premium for what is obviously a multi-million ounce discovery.

We still don't know the ultimate size of the Tesorito. Every time the company drills to define the boundaries, it invariably extends the dimensions both of the extremities and the high grade zone. The three holes announced last week are cases in point.

Hole 28 was drilled across the NW face of the system for 608m, testing the vertical continuity in the order of 200-300m under earlier holes that had previously shown encouraging shallow intercepts e.g Hole 22. That was a big confidence booster with an intercept of 116m at 1.17 gpt, including 12m at 2.11 gpt and 32m at 1.3 gpt.

Holes 29 and 30 were drilled to test the SE extremities. Both came up with the goods, showing that the mineralisation has not been closed in this direction, although we do know the Marmato Fault must define the eastern edge eventually. Reported assays were 107m at 1.1 gpt from surface and 144m at 1.2 gpt from 6m down hole. Importantly, the near surface high grade zone was hit again with assays of 14m at 3.45 gpt and 27.7m at 1.94 gpt.

Still, the most important observation is that the ultimate size of Tesorito South is not yet known. Recent drilling points to extension to the north the southeast and to the southwest.

At some point LCL will need to collect all the data and switch to more a more regular drill pattern to enable the calculation of an inferred resource, enabling analysts to offer indicative valuations, but at this juncture it is still an open book and a steep learning curve.

In terms of future news flow, we have the assays still in the lab. The four rigs will keep drilling and there may even be something to say on other projects such as Ceibal. While the gold price isn't helping sentiment right now, that is merely a short term consideration for impatient traders.

Disclosure: Interests associated with the author own shares in Los Cerros.

When promotion starts to look silly

Promotion is an essential ingredient for any successful company. CEOs are charged with the task of building successful companies but at the same time they need to fulfil the task of telling the market how well things are going. Shareholders expect them to generate a certain level of hype even though this can get to be a distraction from the real longer term operational objectives.

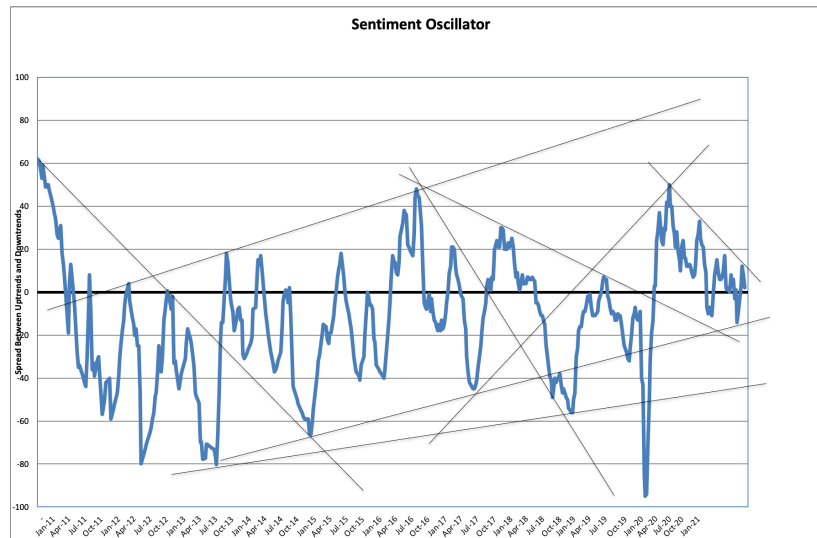
The perfect scenario is one where you have both; good results and good promotion. The results come down to delivery, which we all want. Good promotion comes down to effective communication of those results in a fashion where they can be easily or quickly understood. It is amazing how many companies have difficulty in getting the message across.

It is becoming more commonplace for companies to outsource the promotion to parties that have expertise in marketing and communication. There is nothing wrong with that if it helps get the message across, but what about when the message is the message, as opposed to articulating the results? What if the tail starts wagging the dog and the promotion starts to become the real story?

We have recently seen a number of meaningless statements in company presentation, such as;

- *"A game changer with visibility to a maiden drilling program"*. Please tell me what that means.
- *"Unprecedented leverage to Nickel/PGE drilling"*. Does this mean it is better leverage than anyone else?
- *"A working sulphide mineral system present"*. What does the word "working" add to the description?
- *"Diligent execution of exploration plan"*. Isn't this what every company needs to do.
- *"New data closing in on the resource discovery"*. It either is or isn't a discovery.
- *"Making rapid progress towards a discovery"*. How do you measure this, objectively?

It can get silly when companies and their agents try to be too creative with the promotional phrases.



Sentiment Oscillator: Sentiment turned down at the resistance line last week, suggesting that there is more pain on the way. There were 35% (39%) of the charts in uptrend and 33% (331%) in downtrend on Friday's close. The bouncing is extending.

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	down	
Metals and Mining	XMM	collapse	
Energy	XEJ	rising	
Stocks	Code	Trend Comment (updated comments in bold)	Main Interest
Alpha HPA	A4N	breached ST downtrend	HPA
Adriatic Resources	ADT	on trend line	zinc, polymetallic
Alkane Resources	ALK	down	gold
Alicanto Minerals	AQI	pullback on good drill result	base metals, silver, gold
Altech Chemical	ATC	breached downtrend	HPA, anodes
Alto Metals	AME	sideways	gold exploration
American Rare Earths (was BPL)	ARR	rising	rare earths
Antilles Gold	AAU	testing downtrend	gold
Arafura Resources	ARU	rising	rare earths
Ardea Resources	ARL	sideways through support line	nickel
Aurelia Metals	AMI	still in downtrend	gold + base metals
Australian Potash	APC	down	potash
Australian Rare Earths	AR3	new high	rare earths
Auteco Minerals	AUT	resumed uptrend	gold exploration
Azure Minerals	AZS	softening	nickel exploration

BHP	BHP		collapse on oil deal, iron ore prices	diversified, iron ore
Base Resources	BSE		sideways	mineral sands
Beach Energy	BPT		rallying	oil and gas
Bellevue Gold	BGL		testing support	gold exploration
Blue Star Helium	BNL		strong rise	gas, helium
BMG Resources	BMG		surged higher	gold exploration
Boab Metals	BML		in a secondary downtrend	silver/lead
Breaker Resources	BRB		*	gold exploration
Buru Energy	BRU		gently higher	oil
Calidus Resources	CAI		rising again	gold
Capricorn Metals	CMM		surge to new high	gold
Caravel Minerals	CVV		testing downtrend	copper
Celsius Resources	CLA		breached downtrend	copper
Chalice Mining	CHN		testing uptrend again	nickel, copper, PGMs, gold exploration
Chase Mining	CML		breached downtrend	nickel/copper/PGE
Chesser Resources	CHZ		sideways	gold exploration
Cobalt Blue	COB		new uptrend being tested	cobalt
Cyprium Metals	CYM		continuing down	copper
Danakali	DNK		long term downtrend	potash
De Grey	DEG		shallow downtrend	gold
E2 Metals	E2M		shallower downtrend	gold exploration
Ecograf	EGR		new downtrend	graphite
Element 25	E25		testing downtrend	manganese
Emerald Resources	EMR		rising again	gold
Euro Manganese	EMN		down	manganese
Evolution Mining	EVN		down	gold
Firefinch	FFX		strongly higher	gold
First Graphene	FGR		back to support line	graphene
Fortescue Metals	FMG		down	iron ore
Galena Mining	G1A		breached downtrend	lead
Galilee Energy	GLL		down	oil and gas, CBM
Genesis Minerals	GMD		testing downtrend	gold
Genmin	GEN		back in downtrend	iron ore
Gold Road	GOR		weaker	gold
Hastings Technology Metals	HAS		rising again	rare earths
Hazer Group	HZR		new uptrend	hydrogen
Highfield Resources	HFR		down	potash
Hillgrove Resources	HGO		breached downtrend	copper
Iluka Resources	ILU		new high	mineral sands
Image Resources	IMA		sideways	mineral sands
Independence Group	IGO		new high	gold
ioneer (was Global Geoscience)	INR		rising	lithium
Ionic Rare Earths (Oro Verde)	IXR		recovering long term uptrend	rare earths
Jervois Mining	JVR		breaching uptrend	nickel/cobalt

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Jindalee Resources	JRL		testing uptrend	lithium
Kairos Minerals	KAI		down	gold exploration
Kingston Resources	KSN		down	gold
Kingwest Resources	KWR		surge out of downtrend	gold
Latitude Consolidated	LCD		back to recent lows	gold
Legend Mining	LEG		turned down at resistance line	nickel exploration
Lepidico	LPD		breached uptrend	lithium
Lindian Resources	LIN		new high	bauxite
Lithium Australia	LIT		rising again	lithium
Los Cerros	LCL		down	gold exploration
Lotus Resources	LOT		rising	uranium
Lucapa Diamond	LOM		rising from lows	diamonds
Lynas Corp.	LYC		heavy fall	rare earths
Magnetic Resources	MAU		back to highs	gold exploration
Mako Gold	MKG		down again	gold exploration
Manhattan Corp	MHC		stronger out of downtrend	gold exploration
Marmota	MEU		rallying	gold exploration
Marvel Gold	MVL		new high	gold exploration
Matador Mining	MZZ		down	gold exploration
MetalTech	MTC		new high	gold
Meteoric Resources	MEI		down heavily	gold exploration
MetalsX	MLX		new high	tin, nickel
Metro Mining	MMI		back to lows	bauxite
Mincor Resources	MCR		new high	gold/nickel
Musgrave Minerals	MGV		down	gold exploration
Neometals	NMT		new high	lithium
Northern Minerals	NTU		breached ST uptrend	REE
Northern Star Res.	NST		down	gold
Oceana Gold	OGC		testing downtrend	gold
Oklo Resources	OKU		testing downtrend	gold expl.
OreCorp	ORR		heavy correction after placement	gold development
Orocobre	ORE		new high	lithium
Oz Minerals	OZL		testing downtrend	copper
Pacific American	PAK		off its lows	coking coal
Pantoro	PNR		breached support line	gold
Panoramic Res	PAN		breakout on the upside	nickel
Peak Minerals	PUA		new low	copper exploration
Peak Resources	PEK		down	rare earths
Peel Mining	PEX		down	copper
Peninsula Energy	PEN		new high	uranium
Poseidon Nickel	POS		breached uptrend	nickel
Perseus Mining	PRU		rising	gold
Pilbara Minerals	PLS		new high	lithium
Polarex	PXX		spike higher	polymetallic exploration

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Queensland Pacific Metals	QPM		new high	nickel/cobalt/HPA
Red River Resources	RVR		down	zinc
Regis Resources	RRL		new low on large financing	gold
Renegen	RLT		rising	gas, helium
RIO	RIO		collapse through support line	diversified, iron ore
Rumble Resources	RTR		breached downtrend	gold exploration
Salt Lake Potash	SO4		voluntary suspension	potash
St Barbara	SBM		testing downtrend	gold
Sandfire Resources	SFR		back in downtrend	copper
Santos	STO		rallying	oil/gas
Saturn Metals	STN		breached short term uptrend	gold exploration
Sheffield Resources	SFX		breached uptrend	mineral sands
St George Mining	SGQ		risen to resistance line	nickel
Silex Systems	SLX		heavy correction	uranium enrichment technology
Silver Mines	SVL		down	silver
Sipa Resources	SRI		testing downtrend	general exploration - Ni,Cu, Co, Au
South Harz Potash	SHP		breaching downtrend	potash
Stanmore Coal	SMR		new high	coal
Strandline Resources	STA		pullback	mineral sands
Sunstone Metals	STM		down	exploration
Talga Resources	TLG		testing downtrend	graphite
Technology Metals	TMT		rising	vanadium
Tesoro Resources	TSO		new low	gold exploration
Theta Gold Mines	TGM		testing downtrend	gold
Thor Mining	THR		strong rise	gold exploration
Tietto Minerals	TIE		improving	gold
Titan Minerals	TTM		sideways	gold
Venturex	VXR		down	zinc
Vimy Resources	VMY		surge through downtrend	uranium
West African Resources	WAF		struggling at resistance line	gold
Westgold Resources	WGX		turned down at resistance line	gold
West Wits Mining	WWI		strong rally	gold
Western Areas	WSA		surge higher	nickel
Whitehaven Coal	WHC		surge to new high	coal
Wiluna Mining	WMC		testing downtrend	gold
Yandal Resources	YRL		wedge forming	gold exploration
Zenith Minerals	ZNC		placement and downtrend	gold exploration
Zinc Mines of Ireland	ZMI		softening	zinc
Totals	35%	50	Uptrend	
	33%	46	Downtrend	
		141	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	29	20.6%	
Gold Exploration	25	17.7%	
Nickel	13	9.2%	
Copper	10	7.1%	
Lithium	7	5.0%	
Rare Earths	8	5.7%	
Oil/Gas	6	4.3%	
Iron Ore/Manganese	6	4.3%	
Zinc/Lead	5	3.5%	
Mineral Sands	5	3.5%	
Potash/Phosphate	5	3.5%	
Uranium	4	2.8%	
Graphite/graphene	4	2.8%	
Coal	3	2.1%	
Bauxite	2	1.4%	
Silver	2	1.4%	
Cobalt	1	0.7%	
Tin	1	0.7%	
Diamonds	1	0.7%	
Other	4		
Total	141		

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