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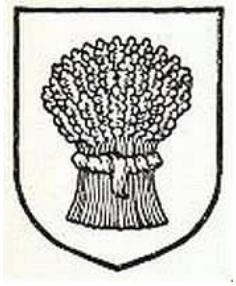

HALLGARTEN & COMPANY

Metals Review

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Rare Earths

Sunset for China's REE Dominance

Rare Earths

Sunset for China's REE Dominance

- + The ranks of producers/developers have been brutally thinned out leaving only a few serious players in the space
- + The latest price upturn may give impetus to restarting work on various stalled projects
- + We expect China to mine less than 50% of the world's Rare Earths by the mid-2020s
- + Few developers have mines ready to build (in contrast to Tungsten) thus there is no threat of oversupply
- + Some managements have realized that the current market is favouring smaller, phased projects
- × Trade war is not guaranteed to be a longer term phenomenon thus prices (and investor interest) may fade
- × Surviving companies from the last Rare Earth boom are not necessarily the best assets from that upsurge
- × Some of the surviving companies have done little to no work on their assets since 2011 and many of the resources and production plans are now outdated (or classifiable only as historic)
- × China still has a dominating position that it can play a role as a spoiler via pricing
- × Raising money for Rare Earth projects is still no easy task with tight financing conditions and little investor understanding of the metals' price dynamics

Post-Peak REEs in China

The boom of 2009-11 in Rare Earths was correct and yet it was mistaken. Yes, the West was dependent upon China for supply and yes that supply was finite. Its mistake was in coming to this realization some seven or eight years too early. True, the Chinese have a strategic near-stranglehold on REEs but that grip is now loosening as the squandering of a finite resource has left China in a position where by 2025 it will be less than 50% of the world's REE output.

We are now in the territory of post-peak Chinese production of Rare Earths. The country seemingly has an instinctual reaction to respond to the Trump trade tariffs with export restrictions on the one product that China has that the rest of the world does not. However, if that hand is played badly, the West will realise that the Jeremiahs at the turn of the decade were correct and that China is a predatory and malevolent force in REEs that must be replaced at any cost. An REE crisis will not win China the trade war, it will lose it REE dominance as the West revives the REE hunt and goes out of its way to make sure

that alternative supplies are found and brought to production.

China is not done in Rare Earths, but the best is behind it. In this review we shall look at the resurgence of interest and some of the companies that are serious and non-serious players in the space.

US over a Barrel?

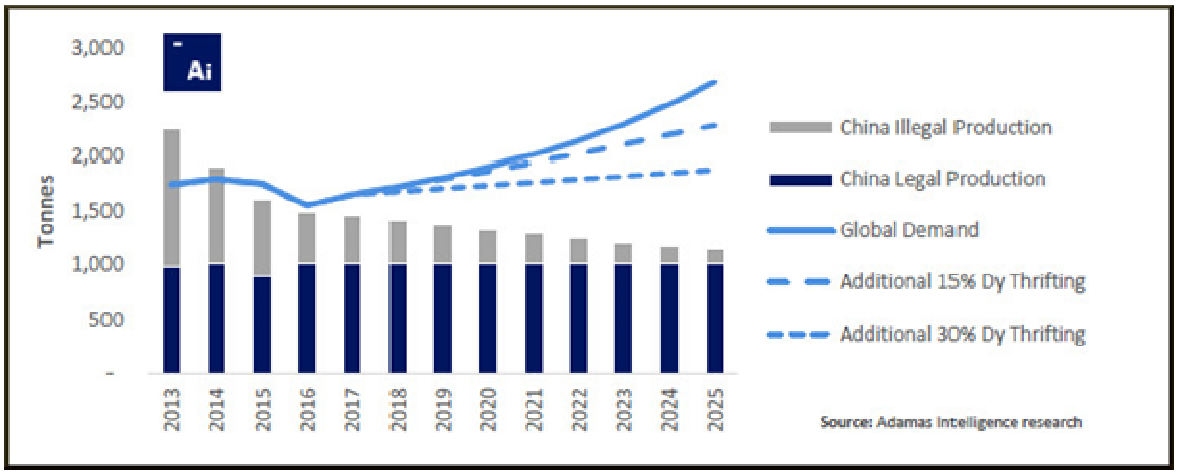
In 2017, China produced more than 80% of REE metals and compounds in the world (however this does not mean it was 80% of the mined metals). China accounted for 78% of U.S. REE imports while the REE imports from Estonia (Silmet), France (Solvay), and Japan accounted for 14% in total. In 2017, the United States imported more than 17,000 tons of REE compounds, of which 10,000 tons of Lanthanum compounds and 3,600 tons of Cerium compounds were from China. These are the relatively low-value REEs some of which are used in the oil refining industry.

In 2018, the United States announced import tariffs on China's Rare Earth products in its trade frictions with China but later it withdrew this decision.

REEs – China's Petroleum?

A statement from Deng Xiao Ping, decades ago, was much cited in the first REE boom. He was reputed to have said that Rare Earths would be to China like petroleum was to OPEC. Therein lies a lesson in itself. Indonesia used to be a member of OPEC. It had been a major oil exporter since colonial days under the Dutch. Then as its population grew and its reserves shrank, the country became, perversely, the only net importer in a grouping of oil exporters.

China has hitherto regarded itself not as the Indonesia of Rare Earths but as the Saudi Arabia of REEs. However, like Indonesia it has exploited a finite resource brutally to pull itself up by the bootstraps. Its proportion in the global Rare Earth reserves once exceeded 70% while at the end of 2016, the proportion was only 37%.



Source: Adamas Intelligence

In 2018, the production volume of neodymium-iron-boron permanent magnets in China increased by 5%

and the consumption increased by about 6%. The supply and demand in the domestic market were close to balance. The export volume and export value increased by 11% and 14% respectively.

In 2018, China only approved 115,000 tons of REE production quota, giving priority to meeting domestic demand. As a result, the global production of primary REE oxides grew by 20.8%.

On the other hand, since China started combating illegal Rare Earth mining in September 2018, illegal Rare Earth production decreased by 50%. The consequent market gap is filled by other countries. The concentrate imports from Myanmar (ironically, much of it from illegal artisanal mining there) have become an important source of the Dysprosium, Terbium, and Gadolinium for China's magnet and alloy manufacturing industries.

To plug gaps in its Rare Earth "range" the Chinese mining investors have been mining ionic adsorption ores in Myanmar and Vietnam and exporting the ores to China for refining. However, in early November 2018, the government in Myanmar prohibited the Rare Earth mining activities of Chinese enterprises because of the uneven distribution of benefits (i.e. the Chinese taking all the value-added).

In the end something has to give and many of us are looking towards a date in the middle of next decade when it seems likely that Chinese Rare Earth production (from its owned mined material) will be less than the amounts mined outside the country.

Next Trend – Chinese Go Abroad

This development will not happen from one day to another but it is already in train.

When the process reaches a certain critical mass then we should expect to see the Japanese Rare Earth end-users with plants in China to start heading to the exits and relocating in other locales in the region (e.g. Vietnam or the Philippines) and sourcing material from non-Chinese mines.

This will be like what is currently happening in the Tungsten space after China made it move at global domination of machine tools and failed.

With mines in decline and processors decamping to friendlier jurisdictions, the obvious Chinese move is to buy up REE mines (or at least offtakes….. though not their style) from nascent mines in other countries. However, by China itself having declared Rare Earths to be a sort of "National Treasure" it has alerted other governments to the sensitivity of Chinese ownership of such assets in their jurisdictions. The Chinese moves in Australian REE projects have largely been stealthily done, so far, with little pushback. Despite some of the stakes having been accumulated in some of the names being substantial (e.g. Arafura and Northern Minerals) we would doubt that the Chinese will be allowed to take total control of the assets.

The World of 2025

In one of its presentations, Greenland Minerals published a useful checklist of what the demand in 2025 for REEs might look like:

- Around 70-75 million EV's and HEV's will be produced annually requiring between 12-13,000 tpa of NdPrDy
- 135mn passenger vehicles will require approximately 10,000tpa REO (Ce) for catalytic converters
- 'Cracking' 7.1bn bbl of oil will require 50,000 tpa REO (40,000t La, 10,000t Ce)
- 150,000t of NdPrDy will be needed for wind turbine production in the period to 2025
- China's wind power capacity will increase by 175% to 2025, this will require ~ 50,000t NdPrDy
- To meet the goal agreed at the Paris climate change conference Europe will require 230GwH of offshore wind capacity by 2045 – equivalent to 50,000t of NdPrDy

The message here is that while China may look like the largest provider, it is also the most dependent on these REE supplies.

Motoring Along

As the largest producer of EVs (and the economy most dependent upon what is still a niche activity in the West) China is also the most dependent upon REE magnets that are used in the motors. In 2018, the global production of new energy vehicles exceeded two million units, of which 1.27 million units were produced in China (up by about 60% YOY). Beyond the motors there are also battery applications particularly for hybrids (HEVs) with Rare Earth hydrogen storage alloys are mainly used in NiMH power batteries.

A hybrid electric vehicle needs about 10 kg of hydrogen storage alloy. A hydrogen storage alloy may contain 30% *mischmetal*, which means that a HEV consumes about 3 kg of rare earth. The drive motor of a HEV consumes about 1 kg to 3 kg of neodymium-iron-boron magnetic materials while the drive motor of an EV consumes about 5 kg to 10 kg.

The strategy of the Chinese government is that the annual production of new energy vehicles in China will reach six million units in 2023. If this goal is achieved then new energy vehicles will consume 30,000 tons of REEs, thus exacerbating the shortage of REEs within China and its import requirement.

China to Net Importer?

Ostensibly to "regulate" REE mining the Chinese government, in the second half of 2018, began to shut down illegal mining enterprises and cut the REE production quota to 45,000 tons, down 36% from 70,000 tons in the first half of the year. Again, ostensibly, to keep more of the value-added, China shifted from exporting crude ores to exporting oxide products.

As a result of China Minmetals Rare Earth (Ganzhou) Co., Ltd. and CHALCO Guangxi Branch ceasing to produced ionic Rare Earth ores in Southern China, because they failed to meet environmental standards, these products fell into shortage.

In a strange move, China's Yunnan Customs announced that it would ban all mineral imports from Myanmar, as a result the prices of HREEs, such as Dysprosium and Terbium, increased on the global market with Dysprosium up nearly 60% over the last 12-months. In 2018, China imported about 26,000 tons of REE carbonates from Myanmar, which accounted for about 25% domestic demand. The HREEs

from Myanmar accounted for nearly one-third of domestic consumption. Thus producers of magnets and alloys are/were increasingly dependent upon imports of Burmese Dysprosium, Terbium, and Gadolinium.

In what is a telling development, in 2018, China's REO imports reached around 41,400 tons, up YoY by over 100%. Meanwhile, the domestic production of rare earth oxides shrank as China combated illegal rare earth production. China's REE imports are mainly minerals and chemical concentrates from Myanmar and the United States (i.e. Mountain Pass ores). Australia is also supposedly exporting REEs to China (though we wonder if this is actually Lynas out of Malaysia, though all of that product is said to go to Japan).

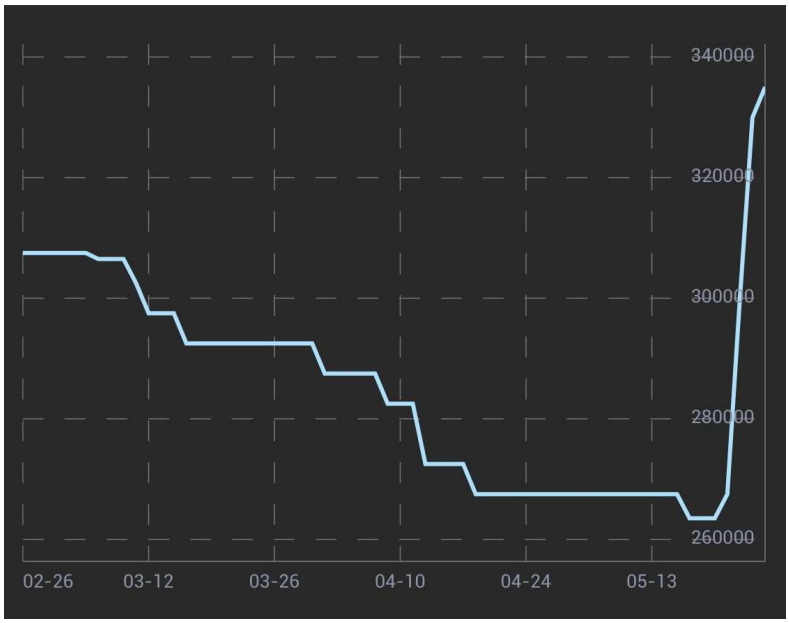
In our view, over the long term, China's REE imports will inevitably, and unavoidably, continue to grow.

Pricing – Back from the Dead

The prices or Rare Earths have long been largely flatlining. This was attributed to flaccid demand, which has never rung true for us. A far more plausible explanation is that the Chinese were on the rebound from their brief experience with "playing God" in the Rare Earth space and hadn't like what they'd seen. Back in 2009, by finally demanding they were paid a fair price for their output (or brutally displaying their dominance of supply, take your pick) they hiked prices and restricted supply and 200-300 Rare Earth wannabes appeared, putting the lie to the "rare" in Rare Earths. There was loads of it and it was everywhere. Something any geologist could have told them.

The Chinese had not figured upon the nimbleness of Vancouver promoters.

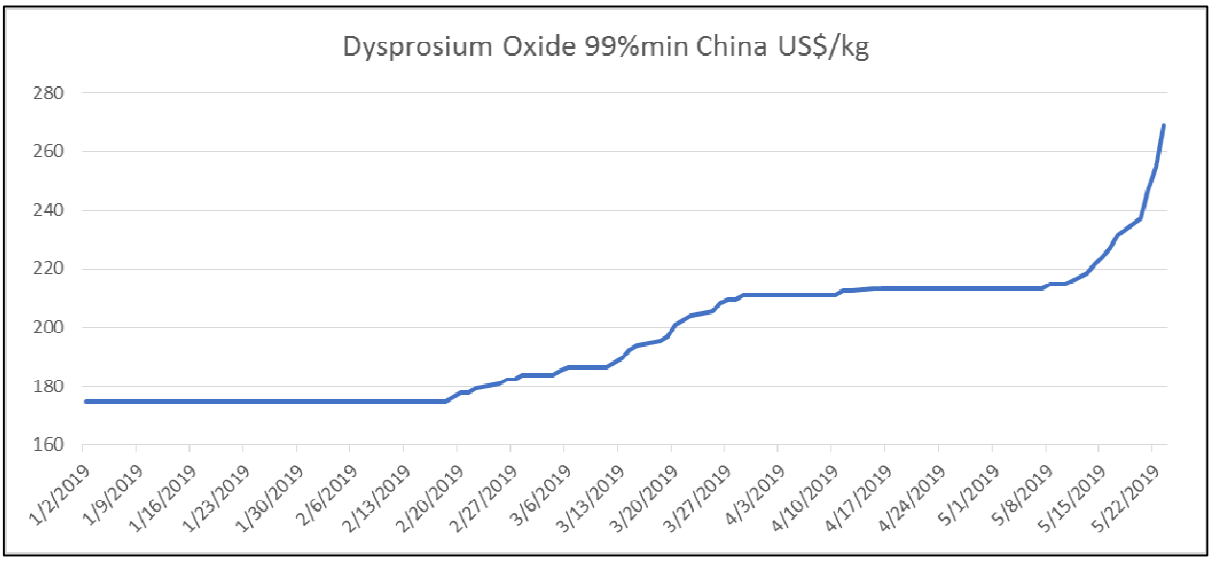
The recent trade war "scare" has resulted in a surge in REE prices that goes beyond the normal seasonal movements. Below can be seen the price of Neodymium Oxide in RMB per tonne.



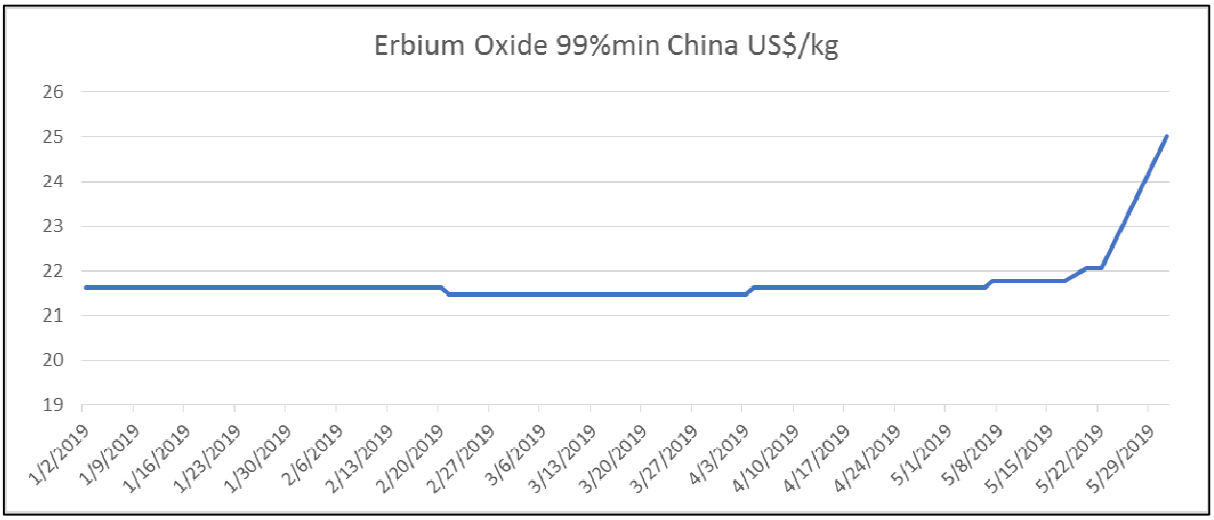
Ironically the best known magnet metals, Neodymium and Praseodymium, have not moved very much YoY, instead it has been the less sought after HREEs that have moved the most, with Dysprosium being up 60% YoY.

Erbium has also had a strong move. This metal has had less air time in recent years but its key role in 5G in Erbium-dosed fibres (EDF) is (part of) the secret sauce in this rising technology. Huawei's preferential access to this element could also become a future point of contention.

Terbium, in contrast, has scarcely moved this year. The charts for Dy's and Er's moves are shown below.



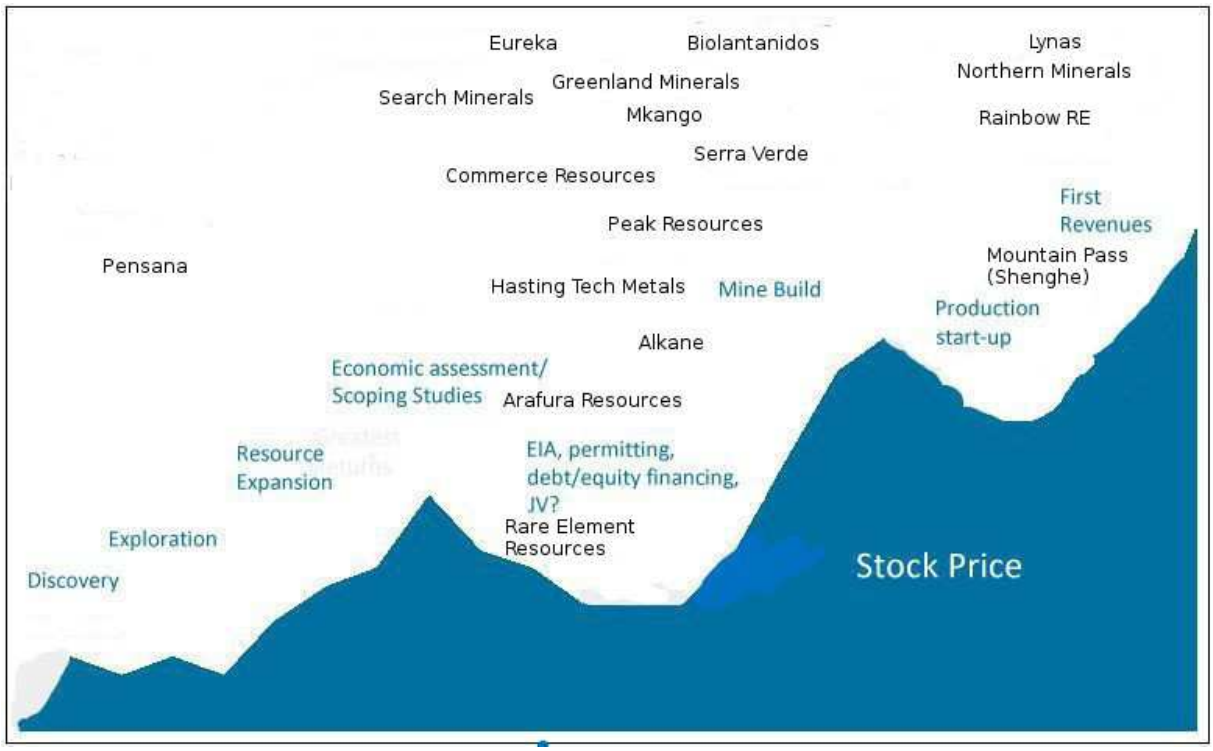
Source: Northern Minerals



Source: Northern Minerals

The Rare Earth Lifecycle Chart

The Rare Earth Lifecycle chart has not had an airing for some time and for many of the names there has been zero movement for seven years, let alone the last one or two.



The tough financing conditions mean that projects in the multi-hundreds of millions of dollars Capex range are likely to remain undeveloped without support from "big" government, and by that we mean the US Government.

We shall look at a near-random assortment of the names doing the rounds in recent weeks and some less-transited situations:

Lynas (LYC.AX)

Who ever thought that the Chinese would rescue (in a roundabout way) Lynas from the clutches of Wesfarmers? A month ago the fate of Lynas appeared sealed. It was grappling (once again) with the stupidities of the Malaysian government and REE prices were in their never-ending doldrums. The Wesfarmers bid for Lynas looked very hard to resist both for shareholders and for management at Lynas.

Then lo and behold, rescue came from leftfield in the form of an unholy non-alliance between the Chinese and Trump. The company had been mumbling about putting a pre-processing plant in Australia or elsewhere to remove the offending radioactive component of the Mt Weld ores but things were not

looking good. Then up blew the issue of potential Chinese REE export restrictions, and the Japanese (as Lynas's main customer) were facing a pincer movement on two fronts. Clearly a phone call was made to the Malaysian Prime Minister from someone in Japan (we doubt it came from the US) and, bingo, the Malaysians do an about-turn.

As the chart below shows, the price of Lynas has risen almost vertically, leaving Wesfarmers' bid looking sad and unwanted.

It's not just resolution of the Malaysian travails that aids Lynas, the rumoured clampdown on Chinese exports of Rare Earths lights a fire (well, a little one) under the Cerium and Lanthanum markets which have hitherto been the unwanted Ugly Sisters of any REE project.

Mkango Resources (MKA.L)

This is one of our perennial preferred stocks in the African REE space with its Songwe Hills project in Malawi. The management group here is one of the most serious around and their CSE programs are a model to emulate. Noble's venture division Talexis have made this company their main priority and despite the travails of the parent have been able to come through with the cash to move the project significantly towards a development decision.

Peak Resources (PEK.AX)

Peak's Ngualla project has been kicked into the penalty box by the inanities of the actions of the Tanzanian government over the last 18 months. In pursuing its squabble with a producing gold company it has thrown all other developments under a cloud, with negative implications for the price of stocks even if there are no practical or legal implications. Given a choice and all thing being equal most

investors will go for amenable jurisdictions over troubled ones.

This is not to say we do not like Ngualla or Peak. We initiated coverage in 2016 and arguably the scenario (except for the government) is better now for Peak. Its management is certainly experienced, with the CEO, Rocky Smith being a veteran REE mine builder. Its register is also impressive with Appian and the IFC as its two major holders.

The company aims to be one of the lowest cost players in the industry and has delivered, in April 2017, its Bankable Feasibility Study (BFS). The superior physical attributes of the Ngualla orebody, combined with the unique advantages of the Tees Valley refinery location makes Peak the lowest operating and capital cost project of any comparable rare earth developer.

Search Minerals (SMY.V)

The projects of Search Minerals are all in Newfoundland and it is very much connected to its location. It has soldiered on through the dark days with determination and support from local politicians and entrepreneurs. We have covered the company before in a coverage initiation back in March 2017.

The company has completed what it deems a "successful" drill program at Deep Fox and will be issuing a Mineral Resource estimate in the coming months on Deep Fox. It also has a plan to release an updated PEA which will look to increase the production rate from 1,000 tpa to either 1,500tpa or 2,000tpa.

The initial production will not double the current capital costs of the project (currently set at $152mn) but it will increase to some degree.

Northern Minerals (NTU.AX)

We have covered this stock since the early days because it was the only avowed Xenotime-focused REE company out there. We had it on our "Top 5 Most Likely" companies and finally it got into production last year. It is still our favorite REE play and has long been a stalwart in our Model Mining Portfolio. We shall shortly be publishing a fuller note on the subject.

Rare Element Resources (REEMF)

Arguably this has been the biggest mover in the space on the talk of Chinese export bans.

The fall from grace of Rare Element Resources has been one of the most brutal. This stock was rated in the top five of REE players at the turn of the decade (though not by us). It eventually had to surrender its Canadian listing and went into a netherworld of the bulletin boards. We had thought it had died entirely and its project gone to creditors. But, lo and behold, it lives!

The Bear Lodge project in Wyoming is located in the northwestern portion of the Black Hills uplift. The property is situated immediately near and east of the crest of the Bear Lodge Mountains, a relatively small northwesterly trending range. The project area is flanked to the west by the Powder River Basin, well-known for its extensive coal mines, and is surrounded by the Great Plains.

Between 2004 and 2013, a total of more than 50,000 metres of drilling was completed in over 200 core holes that range in depth from 88 to 1,886 feet. A NI43-101 compliant pre-Feasibility Study was published in October 2014. Initial CapEx was stated as USD$290. The study mooted average annual production of 7,510 tons (6,813 tonnes) of TREO concentrate from 423,000 tonnes of ore mined.

The proposed facilities included:

- a small surface mine,
- a Physical Upgrade (PUG) Plant located adjacent to the mine for mineral pre-concentration, and
- a Hydrometallurgical (Hydromet) Plant for further concentration, impurity removal and recovery of the rare earth oxides from the mineral pre-concentrate, located in Upton, Wyoming.

The grade at 3.7% was also far healthier than most REE plays in the first go-around.

As can be noted below the company went soaring on speculation about a Chinese REE export ban and was thus the best performer of all the movers. Well it should, as it's the best project in the US by a long way and the capex was not as frightening as that of most of the other soup-to-nuts pretenders. Bear Lodge can be built. It's a shame it wasn't built the first time around and instead a vast multiple of this project's capex was sent up in smoke by Molycorp at Mountain Pass.

Arafura (ARU.AX)

This company was originally (like Northern Minerals and some others) a uranium story. Its Nolan's Bore project, in Australia's Northern Territory, thus comes with some radioactivity. Ever was it thus in the REE world and this can be dealt with. A bigger problem is the sizeable capex at US$726mn. Another issue for us is the Chinese element in the ownership.

	Ticker	Market	Project location	Market Cap	Price	Twelve-month Low	Twelve-month High	Stage	Comments
Alkane Resources	ALK	ASX	Australia	AUD$157mn	0.31	0.18	0.35	Explorer	Multi-metal, unfocussed - gold producer
Appia Energy	API	CSE	Canada	**CAD$19.8mn**	0.305	0.14	0.41	Explorer	Uranium targetting
Arafura Resources	ARU	ASX	Australia	**AUD$62.5mn**	0.08	0.043	0.115	Explorer	Chinese dominated
Avalon Advanced Materials	AVL	TSX	Canada	CAD$28.6mn	0.1	0.045	0.17	Explorer	Project under water - literally, various other metals' projects
Canada Rare Earth	LL	TSX-V	Canada	CAD$14.2mn	0.08	0.04	0.105	Explorer	The old Red Wine asset
Commerce Resources	CCE	TSX-V	Canada	CAD$23.3mn	0.075	0.05	0.09	Explorer	Ashram asset - other Tantalum projects more interesting
Crossland Strategic Metals	CUX	ASX	Australia	AUD$6.1mn	0.006	0.003	0.007	Explorer	Alluvial sands deposit no action since 2013
Defense Metals	DEFN	TSX-V	Canada	CAD$3.8mn	0.16	0.12	0.25	Explorer	Uranium/REE explorer - early stage
GeoMega Resources	GMA	TSX-V		CAD$16.8mn	0.185	0.065	0.225	Processor	Mid-stream - in development funding stage
Greenland Minerals	GGG	ASX	Greenland	AUD$130.3mn	0.115	0.049	0.145	Explorer	Big and isolated - Uranium in the mix
Hastings Technology	HAS	ASX	Australia	AUD$150mn	0.17	0.12	0.28	Developer	Quite advanced - Singapore-dominated register
Leading Edge Materials	LEM	TSX-V	Sweden	CAD$27.2mn	0.285	0.1	0.7	Explorer	Project has permission denied
Lynas Corp	LYC	ASX	Aust./Malaysia	AUD$1.82bn	2.62	1.48	3.17	Producer	Under takeover threat, friction with govt in Malaysia
Minbos	MNB	ASX	Madagascar	AUD$5.7mn	0.001	0.001	0.004	Explorer	New player - early stage
Mkango Resources	MKA	AIM	Malawi	GBP11.5mn	0.0825	0.065	0.11	Developer	Moving to development with Noble backing
Namibia Critical Metals	NMI	TSX-V	Namibia	CAD$32.5mn	0.18	0.08	0.46	Explorer	Lofdal is low-grade but weighted to Xenotime
Neo Performance Materials	NEO	TSX		CAD$480.2mn	12.24	9.86	18.65	Processor	Mid- and Downstream-Processor
Northern Minerals	NTU	ASX	Australia	AUD$152mn	0.08	0.04	0.105	Producer	Producer - Xenotime - Dysprosium weighted
Peak Resources	PEK	ASX	Tanzania	AUD$39.2mn	0.049	0.02	0.061	Developer	Caught in backwash from Tanzania problems
Pensana Metals	PM8	ASX	Angola	AUD$26.7mn	0.022	0.012	0.027	Explorer	Early stage in Angola - pioneer territory
Rainbow Rare Earths	RBW	AIM	Burundi	GBP12mn	0.0575	0.015	0.195	Producer	Ore sales to China at hefty discount
Rare Element Resources	REEMF	OTCBB	USA	USD$23.9mn	0.30	0.03	0.60	Explorer	Bear Lodge - most prospective asset in US
Search Minerals	SMY	TSX-V	Canada	CAD$7.3mn	0.04	0.03	0.07	Explorer	Early stage developer in Newfoundland
Texas Mineral Resources	TMRC	OTCQB	USA	USD$18.2mn	0.39	0.101	0.4525	n/a	Focussed on extraction from coal waste
Ucore Rare Metals	UCU	TSX-V		CAD$55.2mn	0.195	0.085	0.335	n/a	No project, mid-stream but in litigation

Avalon Advanced Materials (AVL.TO)

This company can be all things to all fads. It was Rare Earths, then Tin, then Lithium and now may segue back to where it came from. Despite the years of distractions in returning to the Nechalacho project near Yellowknife, in the Northwest Territories, it will find that the deposit is still under water, literally, and as expensive, if not more so, than ever to develop. The last read on the likely capex was an eye-watering CAD$1.575bn.

In a case of "sold too soon" Avalon announced in January of 2019 that it had cut a deal with a private Australian group, Cheetah Resources, to work on the development of the Nechalacho.

The companies signed a binding Term Sheet under which Cheetah would acquire ownership of the near surface resources in the T-Zone and Tardiff Zones for a total cash consideration of CAD$5mn, while Avalon will retain ownership of the resources in the Basal Zone that was the subject of its 2013 Feasibility Study.

Avalon will also continue to manage work programs on the property and retain its 3% NSR-type royalty.

Alkane Resources (ALK.AX)

This is one we covered a while back with focus first on the Rare Earths and then on the gold production. Since then management has tried to light a flame under the Zircon element (pardon the pun) and the Hafnium component. None have worked. Now it has come full circle getting a boost from the turn in sentiment on Rare Earths. The only other stock to have had such a voyage around the houses has been Avalon.

The DZP (Dubbo Zirconia Project) is largely what it says on the box. However, different sides of the box say different things. The problem with the company segueing through various metals *du jour* is that none of them have been brought to development stage (with the exception of the totally distinct gold project elsewhere). This has left Alkane as the Jack of All Trades and the Master of None.

This was one of the few projects out there that could have developed the "other" metals and had REEs as a losing by-product category (and now possibly a profitable by-product) but instead it squandered the opportunity to move forward. It is way behind where it could have been at this juncture.

Minbos Resources (MNB.AX)

This is the newest listed "kid on the block" and we only stumbled upon them at the recent 121 event in London where they were the sole representative of the REE genre, a timely appearance if nothing else. Its main REE project is in Madagascar but it is early stage.

Pensana Metals (PM8.AX)

This project in Angola appeared out of the ether only a couple of months ago. This is very much unknown territory. The country itself has only been known in the past for its conflict mining, artisanal and child labour issues. When a REE project emerged it took everyone aback. Equally controversially, it is

headed up by the same crew that was at Berkeley Energia, the troubled Spanish uranium developer.

It has proximity to a railway going for it though.

Judges are out until a resource and a mine plan are available for perusal by those with hard noses in the REE analytical space.

Neo Performance Materials (NEO.TO)

This company is the in the Most Real category, with Lynas, as it has long been a major processor of Rare Earths. Its former reincarnation (Neomaterials) was merged with Molycorp in a sort of deathbed wedding early in the decade and then managed to detach itself from the ruins and get back on track taking with it the best bits of Molycorp's downstream, such as the Silmet refinery in Estonia and the Magnaquench business. It had announced a merger with a quite different company in the engineering industry in XXX and yet this fell through in March of 2019. However the damage was done with the rather poor terms for the proposed deal translating into a share price plunge from which the company has not recovered. The company was the brainchild of Constantine Karayannopoulos, who formerly headed Neomaterials and then was tasked with pulling Molycorp after its terminal dive. We wrote up the merger and its implications in our monthly of January this year.

The stock has been in our Model Mining Portfolio and has been a disappointment due to the failed merger (not that we liked that much). Despite that our interest in its potential as a key playing piece in the reconstruction of a non-Chinese REE supply chain is obvious. We used to think (pre-Molycorp) that it would be better as part of a vertically integrated structure, now we are happy with it being just mid- and downstream.

Serra Verde (unlisted)

This unlisted REE developer is operating in Brazil, the country that long-dominated the REE space before Mountain Pass appeared on the scene. One just needs to look at the curriculum of the CEO to see how well-positioned this company is in the *Establishment* of non-Chinese Rare Earths, and how far it is from the Vancouver crowd. The CEO is Eric Noyrez, the former CEO and Executive Director of Lynas Corporation, a member of the Executive Committee and President of Rhodia Silcea (currently Solvay - including Rare Earths activities) and an independent director of Neo Performance Material.

In the company's words, the type of deposit found in the Pela Ema is that of Rare Earths adsorbed ion clays, very similar to what is found in lateritic granite coasts of southeastern China. The enrichment of Rare Earths occurs during the laterization process of these granites, which results in the generation of exchangeable ions of REE, besides a residual source of REE minerals contained in the colluvium and saprolite. This type of deposit is known as "Rare Earths Deposit in Elution Crusts" or ion-adsorption clays. These are the Holy Grail of REE deposits, with only the Tantalus property in Madagascar and a p[roject in Chile (see below) as competition outside China.

Minera BioLantanidos (unlisted)

This Chilean-based developer is targeting an ion-adsorption deposit. The curious name is not a reference

to ecological leanings but to the fact that it is located in the Bio Bio region in south central Chile.

The company is, supposedly, completing by 2Q19 a Feasibility Study with the goal is to be producing 1,700 tpa of REE cons by the end of 2020.

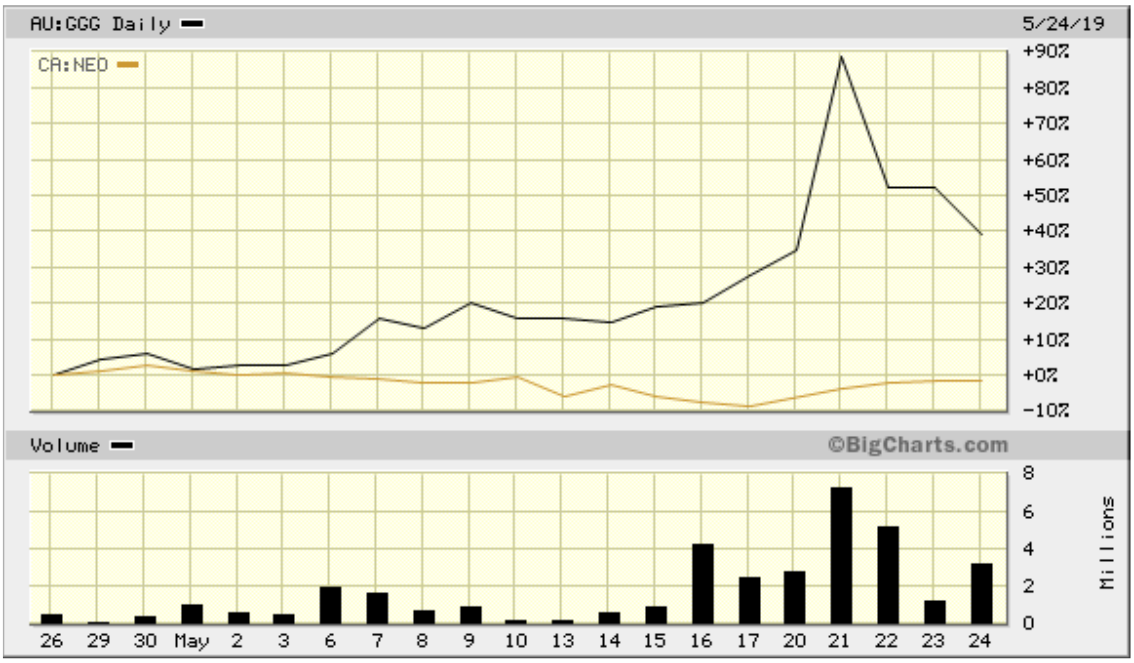
The company has a proprietary extraction method called Close Continuous Leaching Process (CCLP), claimed to be an environmentally friendly operation that optimizes the extraction of Rare Earths through the recirculation of water and reagents, obtaining, in management's opinion, an REO Concentrate with purity higher than 92%. One to watch….

Greenland Minerals (GGG.AX)

The focus here is the development of the Kvanefjeld rare earth project in south west Greenland (a Danish dependency). The resource contains one of the largest inventories of REEs and Uranium globally (11.1 million tonnes of rare earth oxide, 593 million pounds U_3O_8). Therein lies the rub. To further complicate matters access is terrible and the site is located on a rugged fjord. The capex at USD$832mn is one of the largest out there.

The company has the Chinese group Shenghe as the largest shareholder.

We never liked this story back in the day and see even less reason to like it now. Below is a chart comparing recent performance versus a "real" story, Neo Performance Materials. A joke..



Crossland Strategic Metals (CUX.AX)

This company made almost no waves in the last boom and has been pretty quiescent since, though it

was the subject of some deckchair shuffling in 2013. We had only heard of it due to a particularly disreputable Toronto financier who touted it to us (probably no reflection on the company though) many moons ago.

Its project is called Charley Creek and is focussed on the extraction of REE from ancient alluvial sands. The goal of the project was to produce several high-purity REOs that were to be exported to process refiners (presumably in China).

The project area is located in the Northern Territory, 110km north-west of Alice Springs and spans 2113 km2. The tenements extend approximately 50km to 200km north-west of Alice Springs.

Rare Earth Salts (unlisted)

Out on the plains of Nebraska stands a plant in which dwells a company called Rare Earth Salts that in recent years has commission a commercial separation unit for the production of low cost, separated and purified Rare Earth oxides. The initial production feedstock is sourced from recycled fluorescent light bulbs material supplied through a commercial agreement with Rare Earth Recovery Sciences, which makes the production, in the company's words "a 100% domestic solution". This would be making America Great Again if it wasn't for Mountain Pass exporting REE product to China….

The goal was to ramp up its production to reach a rate of 18 metric tons per month using its proprietary technology at its new custom production facility in Nebraska. Sales discussions are currently underway.

Above and beyond the lightbulbs, the company has also acquired light and heavy rare earth concentrates for separation with a goal to produce all four magnet-oriented oxides (neodymium, praseodymium, terbium, and dysprosium) and with the noble ambition to become the first producer of Heavy Rare Earth oxides in the United States in more than 20 years. The company is also targetting production of marketable quantities of Yttrium, Europium, Cerium, and Lanthanum.

Longer to the longer term the company has formalized agreements with BioLantanidos and Medallion Resources, though the latter is more of a processor wannabe than a miner.

Place Your Bets

We have often likened the REE scene to a horse race. There have been lots of scratchings, many horses sent to the glue factory and a couple of late entrants. The odds are all over the place and the bookmakers are dazed and

Rare Earth Stakes - Runners

Producers

Lynas
Northern Minerals
Rainbow Rare Earths

Next Wave

Hastings Technology
Biolantanidos
Serra Verde
Mkango

Serious Developers

Search Minerals
Peak Resources
Eureka

Names to Conjure With

Rare Element Resources
Cheetah
Alkane

confused.

The list below begs to have those of the betting disposition calculate some odds, it is beyond our ken. However the list is sure to offend some and cheer others. The producers are obvious. The next wave could be a matter for discussion but the companies mentioned have a combination of being advanced and determined and some have friends in high places (in the form of offtakers or backers of weight).

The serious developers are in a similar situation but still lack pieces of the puzzle.

The names to conjure with are either projects that should be more advanced than they are, but due to mistakes (or bouts of non-seriousness in the past) are not higher up the rankings. Cheetah meanwhile is a determined newcomer that is saddled/blessed with bits of the old Nechalacho project. The project as a whole is a non-starter but the carved out bits may yet surprise. That can only be achieved if it makes distance between itself and Avalon.

As for those left off the list, the balance of proof is with them and not for us to indulge in pipe-dreams to try and see how serious mines can be made out of the ephemeral smoke emitted by their promoters when on heat.

Risks

The risks for the Rare Earth space in general. These are:

- The Rare Earth price rises prove to be fleeting and they either flatline or decline
- The "trade war" is settled and peace and love break out between China and the US
- Ongoing difficult financing conditions
- US government favouring only projects on its own territory thus skewing the development away from other more worthy projects elsewhere.
- China skewing the market in some way to again create distortions in prices and trade patterns

As we all learnt to our grief in 2010-11, Rare Earth prices rise fast and can go plunging just as quickly. Without the impetus of trade war fears the main reason for prices to rise is declining Chinese production (which they are so far no admitting to) or rising demand (notably from EV manufacturers) which most of the auto manufacturers (particularly in the West) do not want to admit to.

The trade war has had a certain amount of *sturm und drang* to its prosecution up until now. A Kabuki show in ways that only the Peking leadership and Trump can do best. A sudden rapprochement between the warring parties could send the hopes of REE wannabes crashing back to earth. However it does not change China's long-term REE importing needs.

Financing is a perennial problem for the REE space. The (un)dearly departed Molycorp managed to vaporize around $5bn which could have otherwise gone to creative endeavours. Probably around another $7bn was turned into ether by the rest of the REE universe as the grifters and grinders of Howe Street worked their magic back in 2009-11. To put this in perspective for the lost $12bn, we could have constructed 120 fully-formed Brown Ranges… or replicated Lynas 10 times over. If this is creative destruction, count us out.

The US government, if it does anything in the face of a REE crisis, is not going to fund projects that are distant from North America or, more importantly, have any Chinese component. This rules out all the Australian projects, excepting Alkane. Most likely, for better or worse, it would fund some sort of revival of Mountain Pass (which solves little except a La/Ce shortage) or some development at Bear Creek. A more likely strategy would be a strategic stockpile which could be fed by purchases from anywhere.

The markets have as many Rare Earth developers in the pipeline as are needed for the foreseeable future.

Conclusion

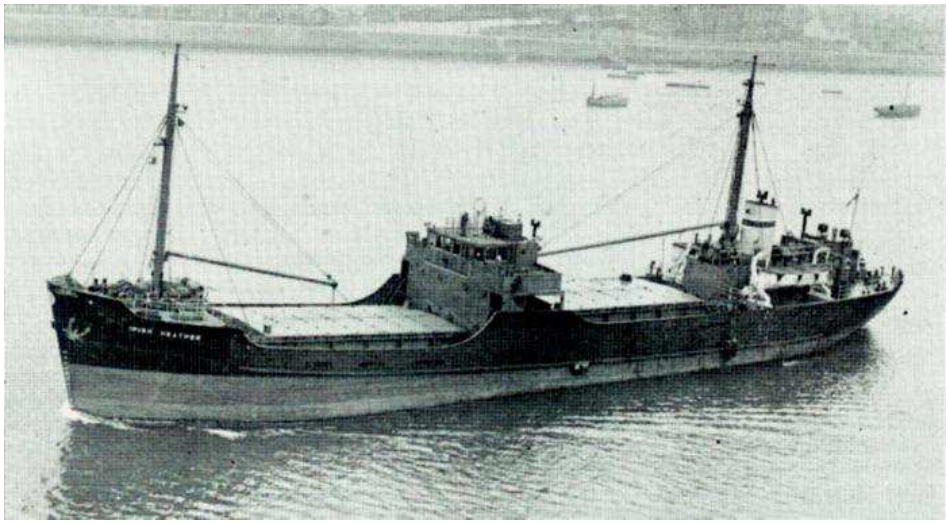
At the risk of dating ourselves, and being a bit obtuse, we can liken the Rare Earth scene to the classic disaster film: The Poseidon Adventure. Hundreds of happy revelers honking on horns and throwing balloons suddenly find their world turned upside down when a tsunami hits them. Of the hundreds, only a couple of handfuls decide to make the dash upwards (or is it a race to the bottom?). The hardy survivors struggle through innumerable challenges, some of the good guys go under, while some of the mediocre survive.

We might compare Avalon Advanced Metals to Shelley Winters, particularly with the affinity to being underwater, not that it works out well for her in the end. And how about the CEO of Lynas as Gene Hackman surviving (nearly) to the moment of ultimate redemption and rescue? Though she may prefer to be seen as Stella Stevens

And the background music is the Greek chorus (the SS Poseidon was, after all, Greek-flagged) performing 10 years without cease, consisting of ourselves, Dudley Kingsnorth and Jack Lifton..

But then there is the prospect of the sequel. This has the captain of the SS Rare Earths having survived the disaster and spent the subsequent eight years heading the tramp steamer the SS Elk Creek through

stormy seas, suddenly deciding to rename the vessel as the SS Rare Earths 2, dumping its cargo of Niobium and Scandium overboard and trying to persuade the world he is not the same guy who captained the first ship (and "it was the tsunami wot done it" anyway) and that the SS Elk Creek is actually a transatlantic liner in disguise. Hmmmm…. Fool me once, shame on you…. Fool me twice… no way…



On a more serious note, there are lessons to be learnt from the first "turning turtle" of the Rare Earth world. Don't overload your ship with useless passengers. "No Riffraff", should be the mantra. For those of us in the Greek Chorus, we never doubted that the ship would be righted again, but it has been our fervent hope that lessons would be learnt and that this would make for a more sane and measured response to declining Chinese supply, waning Chinese dominance and thus prices that better reflected supply and demand.

The mere fact that the Good, the Bad and the Ugly could resurge in recent weeks, with some of the biggest gains reserved for the most impossible projects, is somewhat dismaying. With any luck the fools diving back into the pond of uncertain depth will not come back to the surface. The REE market should remain niche and only for those prepared to do their homework and sort the wheat from the chaff (or the Xenotime from the Eudialyte, as the case might be).

The imperative for a non-Chinese Rare Earth production chain from soup-to-nuts is now stronger than ever. In 2009, China-dominance of REEs was regarded as a potential danger, and yet now we know that it truly is a massive threat to defense and other industrial needs. Counterbalancing that, the myth of China being the perpetually dominant player is now in retreat. Nothing lasts forever, particularly if you squander what you have.

The survivors from the first go-around in 2009-2011 have shown themselves to be a hardy and determined lot. However, some, despite their persistence are still unworthy and deserve a merciful bullet. Some new players will appear. If they can get the mineralogy that suits the market's need and create viable and sensible (read cheap) production plans in place then they will merit being added to the pool of investable REE players.

What we do not want is the reawakening of the carpet-bagger faction. The one advantage of the current weed-mania in Vancouver is that many of the low-lifes of the promotorial class are too stoned to notice what's going on in the Rare Earth space. Long may it stay that way.

We could never have named all the players the last go-around. Some said there were 200 wannabes, others said as many as 300. However many it was there was a need for less than twenty. Now we are down to a bit over twenty, but when we apply our filters we see less than ten that deserve to make it to production. From the first wave, only three made it to production (then Molycorp failed) and there has been the subsequent addition of Rainbow. Three out of three hundred? That is more than Darwinian attrition.

The outlook is good though. We stand ready with our mallet to play Whackamole and beat the unworthy back into their holes. Our outlook is optimistic and we have increasingly, in the last two years, subscribed to the sentiment that, as they sang in the classics, <cue music>, "There's Got be a Morning After".

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