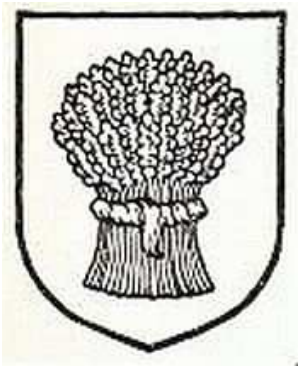
Wednesday, July 15, 2015



HALLGARTEN & COMPANY

Coverage Update

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Ucore Rare Metals (TSX-V: UCU)
Strategy: LONG

Key Metrics			FY14	FY15e	FY16e
Price (CAD)	$ 0.355	Consensus EPS		n/a	n/a
12-Month Target Price (CAD)	$ 0.92	Hallgarten EPS		$ (0.02)	$ (0.03)
Upside to Target	159.2%	Actual EPS	($0.04)		
12mth hi-low CAD	$0.195 -$0.44	P/E	n/a	n/a	n/a
Market Cap (CAD mn)	$ 70.0				
Shares Outstanding (mns)	197.2	Dividend	0.00	0.00	0.00
Fully Diluted (mns)	236.7	Yield	0.0%	0.0%	0.0%

Ucore Rare Metals

Derisked Innovation

- + New processing techniques, in the form of Molecular Recognition Technology, have given Ucore a new vertical as an innovation marketer
- + Ucore now owns the rights to MRT usage with any REE project and with tailings in any metals
- + MRT addresses both cost and environmental challenges that have bedeviled the REE space
- + The "new" technology has been tried and tested already in applications with PGMs
- + The new business line is already bearing fruit with a usage license providing cash for Ucore's REE activities and impelling the share price higher
- + Stock is now in territory where substantial warrant exercise is likely
- + New advisory board additions from the technology provider give the company one of the most intellectually heavyweight boards in the REE space
- ✘ Rare Earth prices remain in the doldrums which restrains the broader investment public from re-entering the space
- ✘ Outside of the troubled "giants" in the REE space, none of the smaller players have yet brought a project into production

The Over-Riding Dilemma

Now five years on into the "rediscovery" of Rare Earths several things have become clear that were swept under the rug in the first flush of enthusiasm. Firstly finding and mining the Lanthanide Series minerals was not the hard part. Indeed it was frighteningly easy to find deposits (even if most were also-ran). The mining was in most cases rather straightforward open-pit but even the underground deposits presented few challenges.

The real problem (and expense) was in the chemistry. In a mining community where difficult was manifested in refractory gold deposits or laterite nickel deposits, Rare Earths presented as a whole new level of trouble altogether. The requirement in most cases to process all the material through a myriad of chemical phases to get at the more valuable components was mind-boggling and expensive. Moreover it quickly became clear that dealing with substantial amounts of noxious by-products was the price miners would have to pay to achieve commercial product of a desirable product range. As Dr. Reed Izatt succinctly put it ".. the world needs a better mousetrap to capture REE; one without the toll that comes with wholesale disposal of effluents, reagents and caustic byproducts".

The Current State of Play

Conventional methods used in all REE separation processes are based primarily on solvent extraction (SX) and ion exchange (IX). These methods unfortunately rank very low relative to their ability to meet

stringent standards of clean chemistry, efficiency and economics. In fact, they are responsible, in large part, for severe environmental and human health problems associated with REE mining world-wide. These collateral problems are particularly evident in China, where most REE are mined and processed via low selectivity separation methods. The result is the discharge of generated waste into surrounding air, water, and land sites. Lax enforcement of existing regulatory laws has only served to exacerbate the problem.

The Problem with Conventional Methods

We have said before that Rare Earth processing is all about Chemistry, Chemistry, Chemistry. This is generally unwelcome talk for mining mavens as they mainly have their minds wrapped up in Geology, Geology, Geology. However, as the five years that Rare Earths have been in investors' minds have shown it's all in the processing and very little to do with the mining. It's useful to look at the current processing of Bastnaesite (one of the key mineralisations at Bokan and many other REE deposits) to highlight how the current methodology is not only enormously laborious but also expensive in terms of opex, capex and consumables (mainly acid).

In order to reduce the acid consumption, bastnaesite concentrates are typically roasted to decompose the carbonate minerals before leaching with either hydrochloric or sulfuric acid. Cerium comprises about half of the rare earth content within bastnaesite, so removing it prior to solvent extraction dramatically reduces the solvent extraction capacity required for selective separation of individual Rare Earth elements.

At Bayan Obo, the largest producer of Rare Earths in China, the process starts with roasting with concentrated sulfuric acid to "crack" the monazite. The rare earth sulphates formed during this process are then leached with water, and excess acid is neutralized with magnesia and filtered. The leach solution then proceeds to solvent extraction, alternatively a mixed rare earth chloride (for electrolysis to *mischmetal*) could be produced by precipitation with ammonium carbonate, followed by dissolution with HCl and crystallization. Unfortunately, the radioactive element, thorium, is precipitated and reports to the leach residue. It cannot be recovered economically, resulting in both loss of the valuable thorium and potential environment hazards. HF and sulfur dioxide report to the off-gas from roasting. Large amounts of water or alkaline solutions are needed to remove them, resulting in large volumes of acidic effluents.

All this amounts to an enormous quantity of acid and water employed, not to mention environmental emissions. It is no wonder that Rare Earth companies in the West have found themselves stymied in trying to develop processing flowsheets that tick all the environmental boxes while remaining in the lands of reality in terms of capex. We all know the names of those companies that have sunk with no survivors from presenting excessive capex numbers in PEAs or PFS's (if they ever got that far). Ucore has eschewed that path, employed lateral thinking and gone outside the box to bring MRT into the REE processing equation.

Molecular Recognition Technology

MRT is a branch of Supramolecular chemistry, originally pioneered by Charles Pedersen at E.I. DuPont Laboratories in the 1960's. That original research into the capabilities of MRT for selective binding of

metal ions culminated in the awarding of the Nobel Prize for Chemistry jointly to three researchers in the development of the technology in 1987 (Lehn, Pedersen and Cram).

First some definitions may be in order. Elution, in layman's terms, is the separation of material by washing; the process of pulverizing substances and mixing them with water in order to separate the heavier constituents, which settle out in solution, from the lighter.

Then, Ligands, which are central to the MRT process are best described as ions or neutral molecules that bond to a central metal atom or ion. Ligands act as electron pair donors, and the central atom acts as a electron pair acceptor. Ligands have at least one donor atom with an electron pair used to form covalent bonds with the central atom.

'SuperLig' a registered trade mark of IBC Advanced Technologies of American Fork, Utah (IBC). SuperLig is essentially a customized ligand which is tethered to a solid substrate. The tether enables the ligands to act as a filter. SuperLigs trap the target element as the PLS is flowed through the column. The raffinate exits and the target elements remain tethered to the substrate by the SuperLig. The eluate then releases the target element and leaves the Superlig ready to trap more target elements when another batch of PLS is flowed through the column. The Superligs are very resilient and remain effective through many cycles.

The MRT platform now being utilized by Ucore is derived from the research of the founders of IBC (Dr Reed Izatt, Dr Jerald Bradshaw and Dr James Christensen) and associates who have developed and applied this technology to the separation of metal ions. In early March, Ucore announced that it had reached an exclusive agreement with IBC to license IBC's MRT technology (SuperLig) within the Rare Earth industry.

The advantages of MRT are seen as being:

- Low capital and operating costs due to high selectivity and rapid rates of reaction
- Flexible and easy operation offered by:
  - ability to treat large concentrations ranges of ions in the feed
  - efficient loading and elution profiles
  - small number of elution bed volumes
  - rapid flow rates and cycle times
  - longevity and stability of SuperLig
  - automated operation
- Environmentally friendly operation resulting from closed-loop systems
- No contamination of processed solutions by ions transferred from SuperLig
- Waste streams treated by MRT systems contain almost none of the contaminants targeted by SuperLig
- The eluant can often be recycled
- High purity, high-concentration eluate can produce value-added products.

Current and Previous Applications – MRT & PGMs

IBC's MRT-based SuperLig technology is currently already utilized extensively in metals processing, and

is now being introduced into the Rare Earth separation field as a means of both selectively extracting the Rare Earths as a group from a mixed polymetallic solution and of selectively isolating and refining individual high-purity Rare Earth elements.

One of the world's leading PGM producers, Impala Platinum of South Africa, has long been a card-carrying fan of MRT with its JV with IBC to market PGM applications of MRT dating back to 1994.

Industrial applications for IBC's SuperLig/MRT platform in the PGM space are well proven with platinum, palladium and rhodium recovery from spent automobile catalytic converters resulting in high-purity products, improved recoveries, reduced processing costs and metal lock-up. The other application has been palladium separation and purification in PGM refineries resulting in reduced processing time and costs, increased palladium separation efficiency and recovery and reduced environmental impact. It has also been applied to rhodium refining.

Palladium circuit at Impala Platinum Liited-Refineries, RSA, showing the MRT columns.

PLS & Mixed Concentrate Preparation

The production of a high-purity heavier REE concentrate is the key initial step in the separation of individual high-purity heavier Rare Earth salts. The resultant salts can be utilized to generate output products tailored to customer specifications. Those products include oxides, carbonates, nitrates and other salts of each of the individual Rare Earth elements. A highly purified concentrate of the heavier REEs can be considered an end product to be sold to independent Rare Earth separation facilities, or can be used as input material for an in-house individual rare earth salt separation facility.

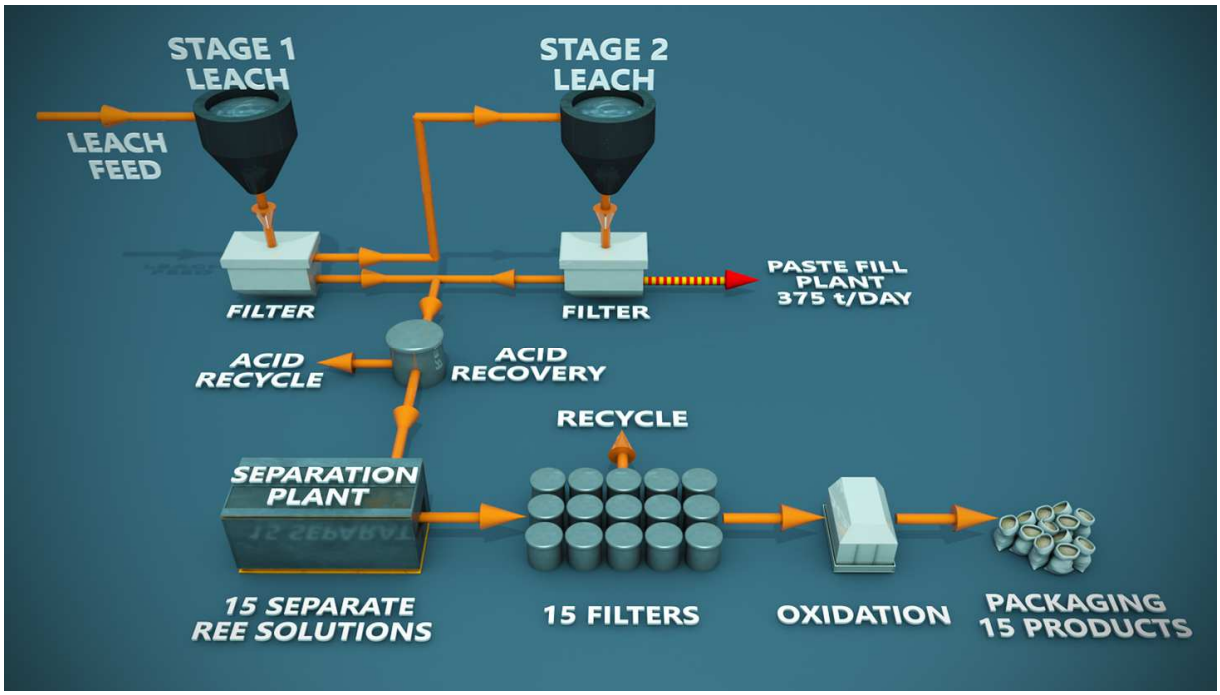
The envisioned output from Ucore's Bokan mine complex is a concentrate that the company more accurately refers to as a Pregnant Leach Solution (PLS). The tests on the PLS using MRT were conducted by IBC.

Due to the amount of non-REEs in the Bokan Pregnant Leach Solution, MRT is the second phase of the

process. The Bokan PLS was initially produced using a beneficiation circuit set out in the PEA. That beneficiation circuit, which included X-Ray Fluorescence ore sorting, magnetic separation, and a nitric acid leach to generate the REE pregnant solution, has been upgraded during the ensuing period.

As preparation for the MRT testing process, non-REEs, including Al, Fe, Th, Ti, and Zr, are first removed from the Bokan PLS by way of precipitation at controlled pH levels. Removal by way of pH controlled precipitation results in cost saving economies and reduction in the number of MRT SuperLig resin columns used in the process.

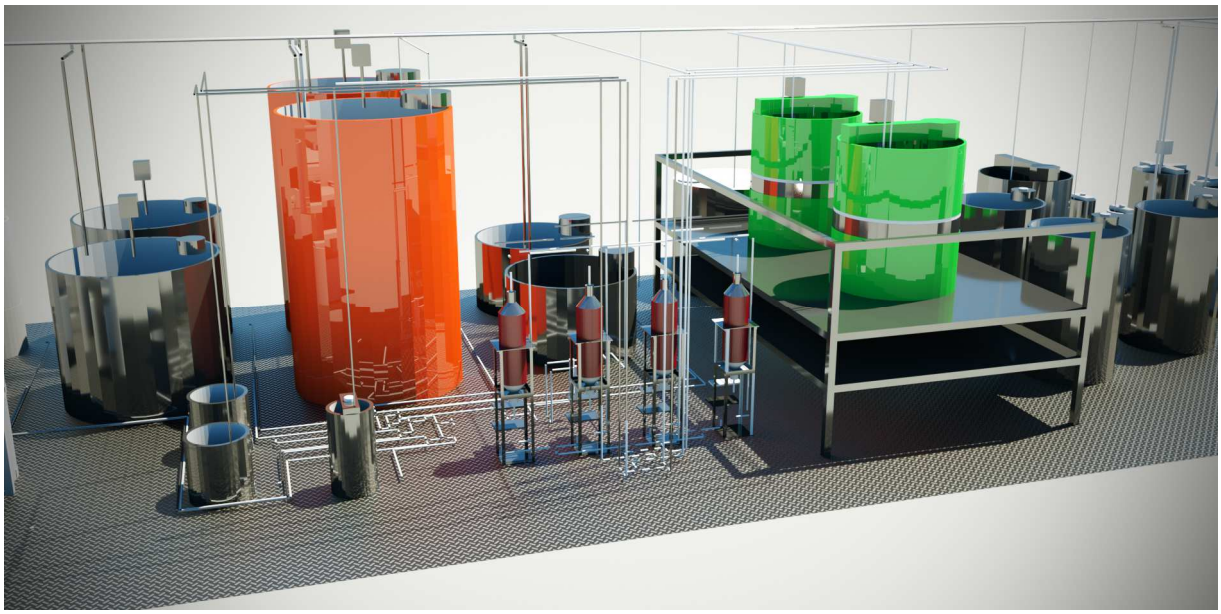
Greater than 99% of the REEs remain in solution along, with non-target elements including Cu, Ni, Zn, Co and Mn. This output solution is then fed into the first SuperLig column designed to selectively remove these non-target elements. The rare earth metals, as a group, are then selectively removed from the resulting raffinate through binding onto an additional SuperLig column. These bound elements are then eluted into solution as essentially a pure mixed rare earth concentrate.



The resulting solution contains greater than 99% of the REE originally contained in the Bokan PLS. Mass/balance calculations show the percentage of each individual rare earth metal in the Bokan PLS and in the combined rare earth eluate to be equal within analytical error indicating minimal, or no, loss of the Rare Earth metals during the separation procedure. Recovery percentages of the combined rare earth metals are very high (nearing 100%).

This Rare Earth-enriched raffinate solution is fed through a further SuperLig extraction column (pictured on the following page) which is designed to separate the heavier REE's, as a group. The heavier REE's are then eluted from the column with a small amount of eluant and easily precipitated from the resulting concentrated solution to form the carbonate salt. Recovery rates for the HREE's from the Bokan PLS to

the salt are in excess of 99%. The remaining raffinate containing the light rare earths, as well as Yttrium, is preserved for further processing. Ucore is working to develop a high-purity Yttrium salt as an additional output product of the MRT process.



The >99% pure HREE concentrate is a carbonate salt Rare Earth concentrate comprised of heavy rare earths ranging from Samarium (Sm) through Lutetium (Lu). The Rare Earth concentrate is easily convertible to oxide or other salt forms depending upon commercial requirements and contains the following rare earth content:

Carbonate	**Sm**	**Eu**	**Gd**	**Tb**	**Dy**	**Ho**	**Er**	**Tm**	**Yb**	**Lu**
Content	24.54%	4.00%	21.82%	6.01%	25.65%	3.14%	5.96%	1.71%	6.09%	1.08%

In summation MRT produces a clean and high-grade heavy REE mixed concentrate, free of radioactive elements and free of commonly produced elements that interfere with traditional Solvent Extraction separation such as Al, Fe, and Fluoride. While the application of MRT to REE may be pioneering, as an industrial process MRT is a known and proven technology.

Next Steps – Pilot Plant

Ucore announced last week that it had commissioned the construction of a pilot plant (codenamed "SuperLig-One"). The purpose of the Plant will be to test the use of MRT for the separation of REE's on a bulk scale.

Ucore has contracted with the IBC for the design and construction of the pilot plant, targeting completion before the end of 2015. The test unit will be constructed at IBC's Utah facility. Once

complete, the test unit will then be relocated to a third party facility for an independent review of pilot scale test procedures.

The intention is for the unit to be a test mule, capable of accepting Pregnant Leach Solution and bulk concentrates from REE feedstock locations around the world. Ucore has entered into agreements with several REE feedstock providers, and will be securing test material from a variety of locations over the next six months as construction is under way.

The pilot plant unit is currently undergoing design at IBC. It will be both modular and portable in design, capable of transport to remote testing sites as required. Columnar units within the Plant will contain customized proprietary SuperLig products that are designed to selectively separate the metal being targeted. To optimize utility, the Plant will be customizable over time, with capacity for treating varying ratios of metals in different PLS feed solutions.

The mid-term objective is to have the test unit serve as a prototype for a full sized SuperLig separation plant, to be located somewhere in North America, to receive PLS or concentrates from locations in the Americas and beyond.

MRT Proves to be a Deal-Magnet

An agreement with a high net worth US-based investor was signed in late May under which the unnamed investor will pay US$4 million to Ucore in consideration for a royalty on the sale of products and services related to the processing of Rare Earth elements and other specialty metals and critical materials utilizing the SuperLig MRT.

Under the terms of the agreement, the investor was to make a US$4 million payment to Ucore, with a US$1 million down payment on or before May 26, 2015, with the balance payable within 120 days (i.e. just before the end of September.

In consideration the investor receives a royalty from the production of Ucore's early stage MRT installations. This will be comprised of two components:

- a Gross Royalty equal to 5% of gross sales from the first MRT installation or installations, payable until the recapture of the Investment
- a Net Smelter Royalty equal to 2% of the net sales from Ucore's first Tier I production client.

The deal is quite intriguing as the investor is leaving a lot of his fate in Ucore's hands. The agreement defines the "Tier I production client" as one with an estimated gross revenue volume to Ucore exceeding CAD$50 million per annum, with net sales figures to be calculated by Ucore on an annual basis during the production term. While Ucore has not intimated that such a client has been found one suspects that it is indeed the case as both Ucore and the client clearly are very relaxed about this element of the deal being relatively readily achieved.

Interestingly the investor has a form of escalator clause with an option to increase the amount of the investment by up to US$ 1 million in exchange for a larger royalty. However this ramp-up has a rather short life as the investor ends to advise by mid-August of this year as to whether he would like to

increase the investment, which can be done in tranches of US$500,000 in exchange for a pro-rata increase in its royalty. Each US$500,000 additional investment will result in an increase in the NSR by a factor of 0.25%.

The agreement has a convertible aspect with the investor having the right to convert the total amount of the investment (minus any royalty amounts already paid out by Ucore) into common shares of Ucore. If the investor elects to convert such amount, then Ucore's Royalty obligations shall cease and the conversion amount shall be converted into common shares at the greater of: (i) the 30 day volume weighted average share price of Ucore's common shares, less a 20% discount; or (ii) the market price of Ucore's common shares on the day immediately prior to the conversion date, less a 20% discount; or (iii) $0.25 per common share.

The Warrants

An important adjunct to these royalty flow sales is the more traditional warrant exercise mode of financing which has proven reliable as a source of funds for Ucore in the past. So many companies issue warrants that never get into the money and yet Ucore has a proven history of issuing warrants that get "over the line" and prove an eventual financial kicker for those that participate in its financings.

The company currently has around 20 million warrants that are exercisable at $0.35, ergo they are now in the money and have been for several weeks now. The company advises us it has already seen some of these exercised and feels that it will the rest of them process above the $0.40 mark. The average daily volume will contribute to the decision of holders who might sell stock to raise funds to exercise replacement warrants to maintain or build their position.

Strengthening the Advisory Board

In a clear signal that Ucore sees its future as being two-pronged, REE mining on one side and technology driven on another, the company announced the appointment of the principals of IBC, the specialist in MRT to Ucore's board in recent weeks.

Dr. Reed Izatt is one of the founding principals of IBC Advanced Technologies. He is the author or co-author of over 550 publications, and has broad research experience in macrocyclic and separations chemistry, calorimetry, and thermodynamics of metal-ligand interactions. Dr. Izatt's publications have received over 25,000 citations. He is a Fellow of the American Association for the Advancement of Science. He received a BS degree in Chemistry from Utah State University in 1951 and a PhD degree in Chemistry, with an Earth Sciences minor, from Pennsylvania State University in 1954. After post-doctoral work at Mellon Institute of Industrial Research, he embarked on an academic career at Brigham Young University where he was the Professor of Chemistry until 1993.

Steven Izatt, his son, is the President and CEO of IBC. He serves on the Board of Directors of the International Precious Metals Institute. He has authored or co-authored over 100 publications and presentations. He is a Registered Member of The Society for Mining, Metallurgy, and Exploration. Prior to IBC, he worked as a management consultant at PA Consulting Services and Touche Ross & Co (now Deloitte Consulting), as well as a new ventures engineer and project manager at Bethlehem Steel Corporation. He graduated in 1984 from MIT with a degree in Chemical Engineering Practice and a

degree in Technology and Policy. He graduated in 1981 with High Honors and as a University Scholar from Brigham Young University where he obtained a B.A. in Chemistry.

Risks

Derisking a REE project involves more than just getting a solid Feasibility Study under the belt. The biggest challenge is the price scenario where the main driver is not supply and demand but the (seemingly) capricious policies of the Chinese. Of course, these actions are not random but all part of an on-going struggle to maintain dominance in the REE space. As we have said elsewhere, this dominance is now seriously threatened and the onset of production at Bokan will be yet one more straw towards breaking the camel's back of Chinese price and supply dominance.

The potential pitfalls with this venture are few but merit mentioning:

- That the REE company space goes back into hibernation
- Prices remain in the doldrums
- Environmental concerns raise their head

For now Ucore has put together a caucus of political supporters that seems solid but is also so large that one or more of them departing the scene would not damage its prospects. The main anchor is the seemingly unassailable and rising star Senator Murkowski.

Environmental concerns are probably the most persistent issue. Once again having a bi-partisan support amongst the political class in Alaska will certainly help keep the focus on sustainable jobs. Ucore thus far has gone out of its way to be enviro-friendly particularly as the paste-backfill policy was a major carrot as it reduces enormously the potential for lingering environmental problems. The use of MRT changes the dynamics of the processing operation on the mainland, significantly reducing any "dirty" element in the process through substantially reduced use of acids.

Conclusion

It is said (and has been since the ancient Romans) that: *Sub Sole Nihil Novi Est*, or there is nothing new under the sun. This may indeed have been true for the Romans but sometimes even the repurposing of something already in existence can constitute an innovation. MRT has been around for some decades now and has become a proven technology in the PGM space, as well as other metals applications. It is somewhat ironic that Rare Earths are referred to as the cutting edge of metals with super high-tech applications and yet the production of the REEs has shown itself to be mired in traditionalism and showing a lack of innovation.

Ucore has seemingly struck a happy medium in bringing a mold-breaking technology to the REE space and yet at the same time adopting a tried and tested technology. One might call this derisked innovation. The MRT process is notable in that it uses green chemistry procedures throughout. No solvents or pernicious chemicals are used. The highly selective separations achieved with the MRT process make REE separations and recovery at high purities possible. Conservation of the Rare Earth metals has great importance, especially since large amounts, as much as 30% of these metals, remain unrecovered using conventional separation processes, such as Solvent Extraction.

Ucore holding the licensing rights for MRT creates a whole new vertical for the company. As the rights extend to tailings in other metals as well, Ucore not only will have a whiphand over those in the REE space wanting to employ MRT but they shall also have a potential source of diversification of risk away from the REE space. Clearly the creators of this innovation have not been able to move it up to a new level of application and penetration within the mining space and that is where Ucore sees it value-added and this is already starting to manifest itself in the level of inquiries the company is fielding.

The new technology is already bearing fruit on the financing side with resale of licenses and royalties giving the company access to cash in the ongoing extremely difficult market for market finance while pushing the stock price up to levels at which sizeable warrant exercise becomes viable. Ucore thus becomes one of the few REE companies with a steeply rising cash balance. That alone should ensure in being numbered amongst the very small group that will survive to cash-flowing status in the REE space.

We reiterate our Long position in Ucore Rare Metals with a 12-month target price of CAD$0.92.

Important disclosures

I, Christopher Ecclestone, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject securities and issuers. I also certify that no part of my compensation was, is, or will be, directly or indirectly, related to the specific recommendations or view expressed in this research report.

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