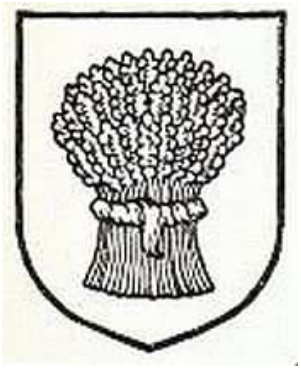
Monday, December 12, 2016



HALLGARTEN & COMPANY

Coverage Update

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Western Uranium
(CSE:WUC, OTCQX:WSTRF, FSE:7WT)
Strategy: Long

Key Metrics		
Price (CAD)	$1.40	
12-Month Target Price (CAD)	$4.80	
Upside to Target	243%	
High-low (12 mth)	$1.20 - $3.49	
Market Cap (CAD mn)	$23.41	
Current Shares O/S	16.7	million
Fully-Diluted	17.6	million

	FY15	FY16e	FY17e
Hallgarten EPS		(0.02)	0.13
Actual EPS	(0.12)		
P/E	n/a	n/a	10.8

Western Uranium

Yellowcake with Vanadium Frosting

- + Strong price moves in Vanadium bring nearer the day that WUC can fire up its operations with Vanadium underpinning the viability
- + Interesting new applications in massive energy storage devices signal potential for rising demand from non-traditional users
- + The Sunday mine complex (SMC) is just one of a whole portfolio of past producing and prospective properties bunched in the same part of Colorado
- + The SMC was mined by Denison last decade and produces both Vanadium and Uranium
- + Company holds an exclusive license for the Ablation Mining Technology for extracting Vanadium (and Uranium) from sandstone-hosted mineralisation
- + Sizeable stockpiles at the SMC means short term cashflow at no mining cost
- ✘ Uranium spot price remains in the dumps with attendant effect upon broader investor sentiment
- ✘ Financing is the next goal and this remains a tough market

Double Dipping in Vanadium

It seems appropriate that as 2017 looks like it's shaping up to be the "Year of the Infrastructure Metals" that we look at one of the metals that is a key alloy metal used in construction steels. While we could rhapsodize about Vanadium's potential use in large scale or massive batteries it's in the infrastructure context that Vanadium strengthened steel is going to make the most difference in the short term.

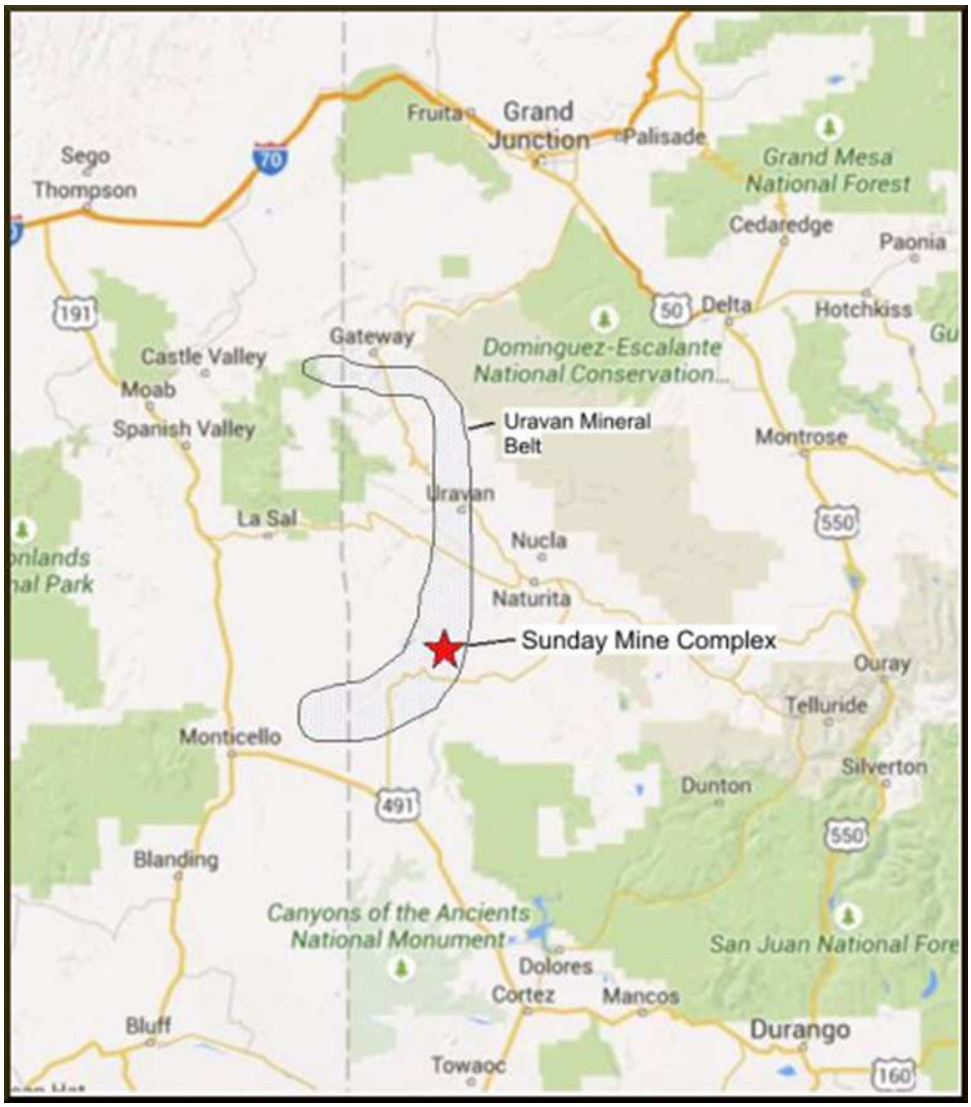
In the past we have written extensively on Largo Resources (LGO.t), the Vanadium miner in Brazil and mentioned the massive Vanadium resource that Energizer Resources (EGZ.v) has as their "back-up asset". However, the most recent focus of our Vanadium attentions has been Western Uranium, which because of its position on the Uravan mineral belt in the western US, it gets to double dip in both the current Vanadium rush and the potential uranium recovery. This metal is a key co-product at the Sunday Mine complex and at most of its other properties in the Uravan Mineral Belt. Below can be seen a high-grade Vanadium seam at the SMC.

Western also holds an exclusive license to use ablation mining technology, a technology that improves the efficiency of the sandstone-hosted vanadium/uranium mining process and which is attracting the attention of other uranium developers that see it is a fast path to production within the constraints of low uranium prices.

In this piece we shall look at the Vanadium dynamics of the moment and also how Western Uranium can potentially harvest the strong rebound in Vanadium, with Uranium tagging along.

The Uravan Mineral Belt

The Uravan Mineral Belt (outlined in the map below) has a long history of exploration and mining for Vanadium and Uranium. The deposits have been well studied by public and private entities.



Deposits containing uranium, vanadium and radium were first discovered in the Roc Creek area, about 22 miles north of the Sunday Mine Complex, intensive mining of these ores did not begin in the Plateau region until 1911 when radium was the primary element of interest. This ceased after the Belgian Congo pitchblende deposits were discovered in 1923. Plateau mining resumed in about 1937, when vanadium became of interest and then since the early 1940's when uranium became ascendant. Except for two minor periods of activity, one in the 1990's and the other in the mid-2000's, the Uravan mineral belt has been fairly quiet.

The relation between (some) Uranium production and Vanadium supplies is worth mentioning in the context of the Uravan Mineral Belt (and thus Western Uranium). The production of U_3O_8 from carnotite ores creates a Vanadium-bearing waste solution that must be neutralized to have the heavy metals fixed before waste disposal. An alternative treatment is a circuit which extracts vanadium and produces V_2O_5. For example, Denison Mines' White Mesa uranium processing mill near Blanding, Utah processes feed from that company's mine properties on the Colorado Plateau as well as uranium/vanadium ores purchased from independent miners. For every 0.45 kg of U_3O_8 (yellowcake) produced, White Mesa's Vanadium co-product recovery circuit produced approximately 1.8 kg of vanadium in the form of V_2O_5.

The Sunday Mine

The Sunday Mine Complex covers 3,748 acres (1,517 ha). It is located on public lands administered by the BLM.

The Sunday Mine Complex has significant drilling and production history. Mining and drilling occurred contemporaneously from the 1950's through the mid 1980's. From the 1980's to the present, mining and drilling occurred only sporadically, typically when uranium or vanadium prices were high. The last mining interval was from 2006 to 2009, and based on the available records, only in 2009 did any drilling take place since mid-1980.

The mines have had a number of owners and operators. Prior to WUC's acquisition of the complex in April 2014 the ownership was a miscellany of well-known names: Matterhorn Mining (1950's-1960's, Climax Uranium 1960's, Union Carbide Corporation (UCC) 1970's-1980's, Atlas Minerals (1980's), Energy Fuels Nuclear (early 1990's), International Uranium Corp. (1990's-2000's), Denison Mines (2000's), and Energy Fuels (2010's).

The NI43-101 report prepared by Anthony Adkins in July 2015 stated that the Sunday Mine Complex, based on historical records, appeared to have "very good to excellent potential" to host in excess of 3,000,000 pounds of Uranium-Vanadium resources with characteristics suitable for underground mining.

PROJECTS	MEASURED & INDICATED				INFERRED			
	Uranium (lbs)	Grade (%)	Vanadium (lbs)	Grade (%)	Uranium (lbs)	Grade (%)	Vanadium (lbs)	Grade (%)
Sunday Complex**	1,007,833	0.25	6,047,000	1.49	1,906,081	0.36	11,436,484	2.16
San Rafael	1,700,000	0.22	4,596,000	0.3	1,860,000	0.21	2,510,000	0.28
Sage	459,640	0.23	3,350,000	1.67	122,265	0.15	1,485,233	1.8
Dunn	360,716	0.13	2,885,731	1.04	200,815	0.14	1,606,518	1.16
Farmer Girl	74,215	0.32	371,076	1.61	0	0	0	0
Hansen/Taylor Ranch***	39,400,000	0.062	0	0	51,000,000	0.058	0	0

Uranium and vanadium occur frequently occur together in the Uravan Belt with ratios that range from 1:5 to 1:10. An Energy Fuels internal document from 2013 shows that the U:V ratio of the Sunday Mine Complex is 1:5.36. Maps prepared by Denison Mines show a uniform 1:6 ratio. Twenty randomly selected drill holes with vanadium values and shown on the 1980's era maps were taken from over the expanse of the property. Only holes with intervals >1 ft and with U_3O_8 values >0.1% were selected. The results show U:V ratios that vary from 1:3.63 to 1:14, with a weighted average of 1:7.42. This thus implies that if Vanadium prices are sound then they alone can carry a Vanadium/Uranium mining and processing operation even if Uranium remains the underperformer that it has been of late.

Mine Plan

In the first instance the company shall be exploiting the extant stockpiles at the SMC. These stockpiles save the $100 per tonne mining cost, under these low uranium and vanadium prices, therefore it makes sense to exploit these stockpiles first. When U_3O_8 prices permit (estimated to be $45 per lb) then the reopening of the underground at the Sunday mine complex represents an easy option, with the mine in good condition and with no water to contend with. The company also intends to source material from a number of mines that are in various states of readiness/repair in the vicinity but that lack an outlet to mill their ore. The goal would be to harvest material from mines within a 10-100 miles radius.

So the goal would be to have the 2-3 ablation mining machines working the stockpiles first. As the stockpiles were worked through then underground mining would come on. The company is working under the premise that with five portals and four surface stockpiles production could ramp up to 5-6 machines operating in two shifts at 20 tonnes per hour. It should take around 90 days to manufacture and assemble each Ablation machine with a cost of $300,000 per machine.

The time for building a machine is estimated as 60 days at a minimum, but the company is working upon the premise of 90 days to err on the side of caution. The process is the welding of the frame and then the securing the components such as nozzles, pump, piping, hoses, and screens. The completed module would need to be put into a mobile frame for transportation underground.

The Ablation technology reduces the amount of ore that leaves the mine by 90% so effectively upgrades the mined material by a factor of ten, reducing the amounts to be trucked and milled elsewhere. It should also be remembered that the ratio of Vanadium to Uranium is 8:1 at the Sunday Mine complex and this other metal shall likewise be upgraded by a factor of 10 in the Ablation process.

Western already has two contract mining companies lined up to reactivate the mine. These were the miners of the Sunday Complex when it was last in production so they know the ore body very well. Therefore, the only staff that WUC will have at the mines will be a mine engineer, geologist, health and safety officer, the COO, and another engineer that would be a jack-of-all-trades, a total of five people. Each ablation machine will need, on average 1.5 operators so for the ablation machines, this implies around 6-8 people to hire in for that role.

Sunday Mine Complex - Comps on Processing

One tonne of ore contains 20lbs of Vanadium and 5lbs of U3O8

Revenue		Price	Value
Vanadium	20lbs	$5	$100
Uranium	5lbs	$33	$165
Total			$265

Using Conventional Milling

Mining per tonne	$100				
Transport	$20				
Milling	$130				
Total	$250	Profit	$15	per tonne	

Using Ablation

Mining per tonne	$100				
Transport	$20				
Ablation	$10				
Milling	$45				
Total	$175	Profit	$90	per tonne	

Vanadium

Vanadium has its scientific roots in Latin America as it was originally discovered by Andrés Manuel del Río, a Spanish-born Mexican mineralogist, in 1801. Del Río extracted the element from a sample of a Mexican "brown lead" ore, later named vanadinite.

In 1831, the Swedish chemist Nils Gabriel Sefström rediscovered the element in a new oxide he found while working with iron ores. He named the new element Vanadium after Old Norse Vanadís. Vanadium has the atomic number 23. It is a hard, silvery gray, ductile and malleable transition metal. The formation of an oxide layer stabilizes the metal against oxidation. The element is found only in chemically combined form in nature.

The isolation of vanadium metal proved difficult. Henry Enfield Roscoe eventually produced the metal in 1867 by reduction of vanadium(II) chloride, VCl_2, with hydrogen. In 1927, pure vanadium was produced by reducing vanadium pentoxide with calcium.

Usage

The first large scale industrial use of vanadium in steels was found in the chassis of the Ford Model T, inspired by French race cars. Vanadium steel allowed for reduced weight while simultaneously increasing tensile strength. At the moment, Vanadium is used mainly as an alloy in a wide range of specialty steels and titanium alloys to provide greater strength, toughness, and wear-resistance. It is for this reason that Vanadium consumption should rise in an infrastructure boom scenario.

Vanadium has been used as a steel additive since the late 1800s when "vanadium steel" was used to armour the hull of battleships making them impenetrable to explosive shells. Only a small amount of Vanadium significantly increases the strength, hardness, and high temperature stability of steel. Its electron deficient structure lends itself well to the formation of more stable nitrides and carbides when added to iron and as such Vanadium has been referred to as the "electric metal". Vanadium high-carbon steel alloys contain 0.15% to 0.25% vanadium, and high-speed tool steels (HSS) have a Vanadium content of 1% to 5%.

In recent times the incremental demand for Vanadium has been driven by increased steel production primarily in China, India and the developing world. At the same time, various economic and legislative factors are increasing the use of vanadium in the steel industry, like stronger rebar to reduce catastrophic destruction in earthquake prone regions as well as providing the necessary strength demanded by cutting edge architectural design. Some estimates suggest the demand for Vanadium might grow at 7% per annum from 2010 to 2025 based on the steel applications alone.

Sources – Primary and otherwise

The element occurs naturally in about 65 different minerals and in fossil fuel deposits and is the 17th most common element in the earth's crust. The important thing to note is that, beyond recycling from steel slag) the sources of Vanadium are either mineral deposits or, rather uniquely, as an oil by-product.

Vanadium occurs in deposits of phosphate rock, titaniferous magnetite, and uraniferous sandstone and siltstone, in which it usually constitutes less than 2% of the host rock. Significant amounts are also present in bauxite and carboniferous materials, such as coal, crude oil, oil shale, and tar sands. Amongst the major deposits are the titaniferrous magnetites of China, Russia, South Africa, Western Australia and

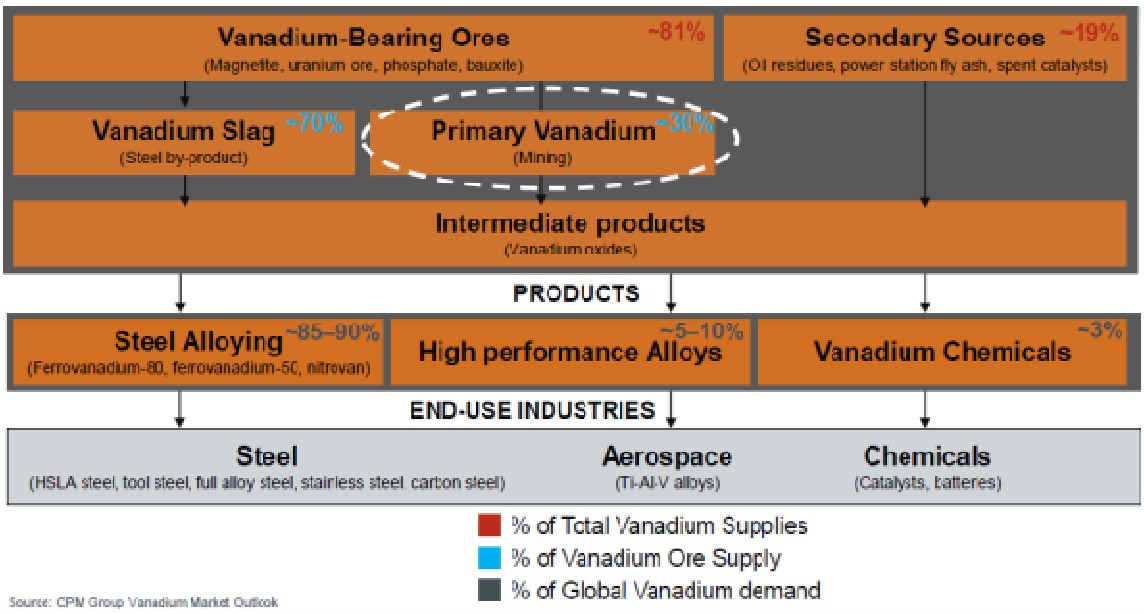
New Zealand, as well as the oil-related deposits of Venezuela, Alberta (Canada), the Middle East and Queensland (Australia), in addition to ore and clay deposits in the USA.

	Commercially Exploitable reserves (10.2mt)	Reserve Base (31.094mt)
	%	%
Australia	1.6	7.7
China	19.6	9.6
Russia	48.9	22.5
South Africa	29.4	40.2
U.S.A	-	12.9
Others	0.5	7.1

The table above shows the state of resources according to Vanitec, a Vanadium producer/user association. We suspect it is somewhat outdated as several new sources (such as Madagascar) have become apparent over recent years. In particular the Australian share should be lifted and Brazil is worthy of being considered a potential player of consequence. The USGS in its latest survey on the metal said that world resources of Vanadium exceed 63 million tons.

Dynamics

The dynamics of the Vanadium supply chain are interesting. In some ways we might compare the metal's supply chain to that of Lead, where the chief source is recycling. The chart below (from the consultants CPM) shows that much of the current Western supply is sourced primarily from steel scrap, then mining followed by secondary sources (which are also recycling in nature).



Vanadium is produced in China and Russia from steel smelter slag; other countries produce it either from the flue dust of heavy oil, or as a byproduct of uranium mining. It is mainly used to produce specialty steel alloys such as high speed tool steels. The most important industrial vanadium compound, Vanadium Pentoxide, is used as a catalyst for the production of sulfuric acid.

The metal is recovered as V_20_5 contained in an intermediate slag which is formed between iron-making and steel-making in integrated steelworks (eg Panzhihua in China, Highveld in South Africa and Nzhny Tagil in Russia). At these steel plants the Vanadium contained in the iron ore is taken into solution in the iron during the ironmaking process. The hot metal is then oxidised and a slag, which contains between 10% and 25% V_20_5, is formed and removed before the hot metal is passed on for final steelmaking. The slag containing l0-25% V_20_5 is then treated in a roast/leach process, the end product of which is Vanadates or Vanadium oxides.

The Vanadium Pentoxide prices have been soaring of late (Europe up 88.1%, China up 100% YoY):

Strategically Speaking

As the bulk of Vanadium production is concentrated in China, Russia and South Africa, where supply disruptions have occurred, one cannot be entirely sanguine about Vanadium's future accessibility. Those three countries account for around 90% of global supplies. Interestingly, the most recent British Geological Survey Risk List on Criticality of Supply (for 2015) had lifted Vanadium to number five on the

list whereas just a few years before it has ranked a lowly 33 out of 45 metals.

Speaking of US access to Vanadium the USGS commented, "While domestic resources and secondary recovery are adequate to supply a large portion of domestic needs, a substantial part of U.S. demand is currently met by foreign material".

Risks

The prime risk for the company is metal prices and country-risk. Ultimately other problems proceed from these two. If uranium firms up then financing will inevitably improve particularly for a company with the quality of the share register that it has currently.

Thus we would mention the major risks being:

- A retreat in the vanadium price and/or ongoing lassitude in the Uranium stock price
- Another Fukushima-like event or major renunciation (like Germany's) of the nuclear option
- Environmental considerations in Colorado
- Difficult financing conditions do not improve, or actually worsen (though worse is hard to contemplate from the recent nadir)

While environmental considerations recede and another country indulging in a Merkel-like leap into the abyss is unlikely, the greatest risk is the financing one.

The toughest task at this time is to pull off a financing in the absence of a move in the Uranium price. This requires an investor that is very committed to the space or an offtaker that is determined to add to their US-sourced supply. Therefore it is from this quarter (most probably a US-based nuclear generator) that Western Uranium is likely to find its largest source of support for the mill build and commitments to underpin the reactivation of the Sunday Mine complex.

We should not discount though in light of recent developments in Vanadium that a committed offtaker might intervene to ensure themselves access to a North American source of Vanadium supply. We would remind investors that Glencore has been a funder and is an offtaker for Largo's output from Brazil.

Conclusion

So unlike your average Uranium company, that finds itself beached like a whale during the current ebbtide in Uranium prices, Western Uranium is actually, depending what prism one is looking at it through, more of a Vanadium company than a Uranium company and probably needs a name change to reflect this dual personality.

Being bullish on the uranium outlook anyway we suspect that this company will be firing on two cylinders within a couple of years rather than just one. Its Ablation Mining technology works irrespective for sandstone-hosted Vanadium or Uranium (or both) so now it needs to get its Piñon Ridge Mill moving

forward so that it can harvest the upsurge in Vanadium. If Uranium had been the only string in its bow we would have rated that challenge as an uphill struggle but now with the tailwind of soaring Vanadium prices, combined with Vanadium being a prime "Infrastructure Metal" in Trumplandia and the prospect of "onshore" Vanadium production in the US make the WUC story so much more than just a uranium prospect.

We have Western Uranium as a Long position in the Model Mining Portfolio with a 12-month target price of CAD$4.80.

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.

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