

More valuable than gold, what's next for palladium?

What is palladium, and why is everybody getting excited about palladium?

Palladium is a chemical element with symbol Pd and atomic number 46. It is a rare and lustrous silvery-white metal discovered in 1803. Palladium, platinum, rhodium, ruthenium, iridium and osmium form a group of elements referred to as the platinum group metals (PGMs). These have similar chemical properties, but palladium has the lowest melting point and is the least dense of them. It does not react with oxygen in normal temperature. Palladium can resist chemical erosion, intense heat and is electrically stable.

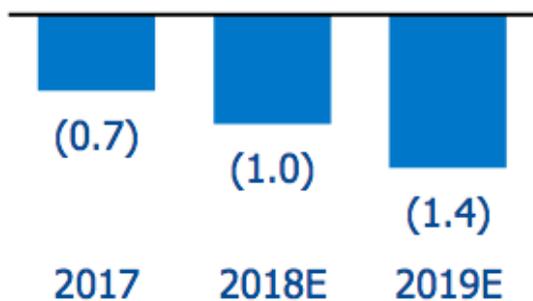
Palladium is a so called sister-metal to platinum and it is used mostly in car catalytic converters, and in electronic components, jewelry, and surgical instruments.

As of March 7, 2019 the price of palladium was USD 1,545/0z, higher than gold at USD 1,288/0z. Palladium prices are up 58% in the past year, making it a star performer.

Palladium demand versus supply

Palladium is considered a precious metal, and as a result, prices can fluctuate depending on supply and demand forces, as what we are seeing now. On the demand side, tightening auto-emissions rules are requiring larger volumes of platinum-group metals in exhaust catalysts. Manufacturers whose converters at present use more palladium than platinum are likely to take several years to switch back to the cheaper metal, which will continue to keep prices high.

Palladium deficit forecast in 2019



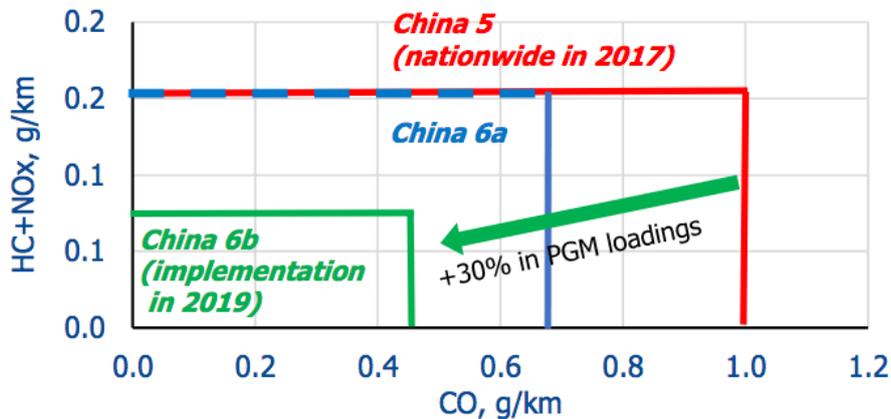
Palladium deficit forecast in 2019

For this reason alone we have this year's best performing commodity in palladium. The total primary refined palladium output in 2017 was around 7.54 million ounces or approximately 214 tons. Demand for palladium auto-catalysts has increased investment demand and awareness for the precious metal.

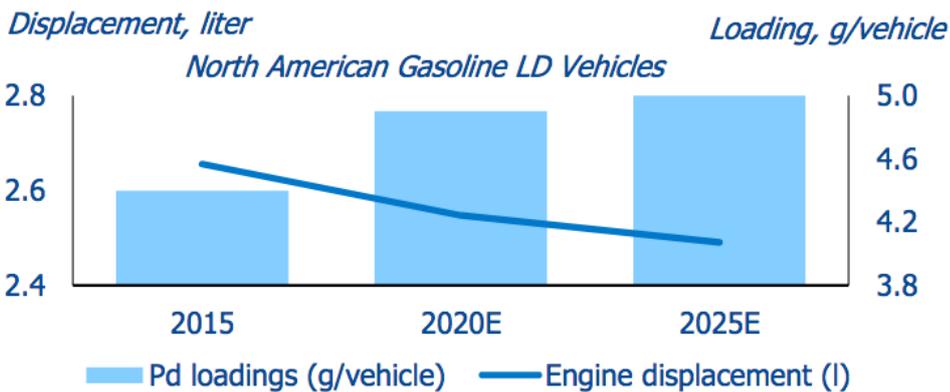
Reducing CO2 emissions requires more palladium

China: China 6 Regulation Pushes OEMs to Increase PGM Loadings

Tightening NOx and CO Targets in China



USA: Pd Loadings Expected to Rise on Stricter Emission Regulations Despite Engine Downsizing



Reducing CO₂ emissions requires more palladium

MMC Norilsk Nickel is the world's largest producer of palladium (41%), producing a total of 3,500,000 oz of palladium in 2017. The company extracts precious and platinum group metals as by-products from its nickel mines. Norilsk, Russia's largest mining company also extracts and refines cobalt, silver, gold, tellurium, and selenium as by-products.

Anglo American Platinum Limited is the world's second largest palladium producer, producing 1,600,000 oz in 2017. Anglo American has mines across South Africa and in Zimbabwe.

Impala Platinum Holdings Limited (Implats) operations are

focused around the Bushveld Complex in South Africa and the Great Dyke in Zimbabwe. Implats produced 849,000 oz of palladium by the end of the company's fiscal year on June 30, 2018.

Lonmin produced 330,000 oz of palladium in 2017. The company's primary operations, the Marikana Mine, is located on the western limb of the Bushveld complex. Lonmin also produces base metals, including copper and nickel, and other platinum group metals.

Sibanye Gold Limited's palladium production of 260,000 oz is done through Stillwater, which main assets are located along the 28-mile-long J-M Reef ore body in Montana. The location consists primarily of palladium, platinum and a minor amount of rhodium.

Vale SA is the world's largest second-largest mining company. Vale produced 250,000 oz of palladium in 2017, as a by-product of its nickel refining process.

Northam is an integrated PGM producer with operations focused around the Bushveld Complex in South Africa. The company's primary facility extracts roughly 300,000 oz of PGM concentrate annually.

North American Palladium is a primary palladium producer. The LDI mine is currently undergoing expansion with North American Palladium targeting a production level of 250,000 from its current 200,000 oz of palladium per year after completion.

Of the top 8 palladium producers it's easy to see the majority of producers come from one region in South Africa, and the palladium bubble is not going to burst overnight. New projects out of South Africa could take years to get up and running, before we see any major changes in current prices from over-supply.

It doesn't come cheap – what trades at US\$981 an ounce?

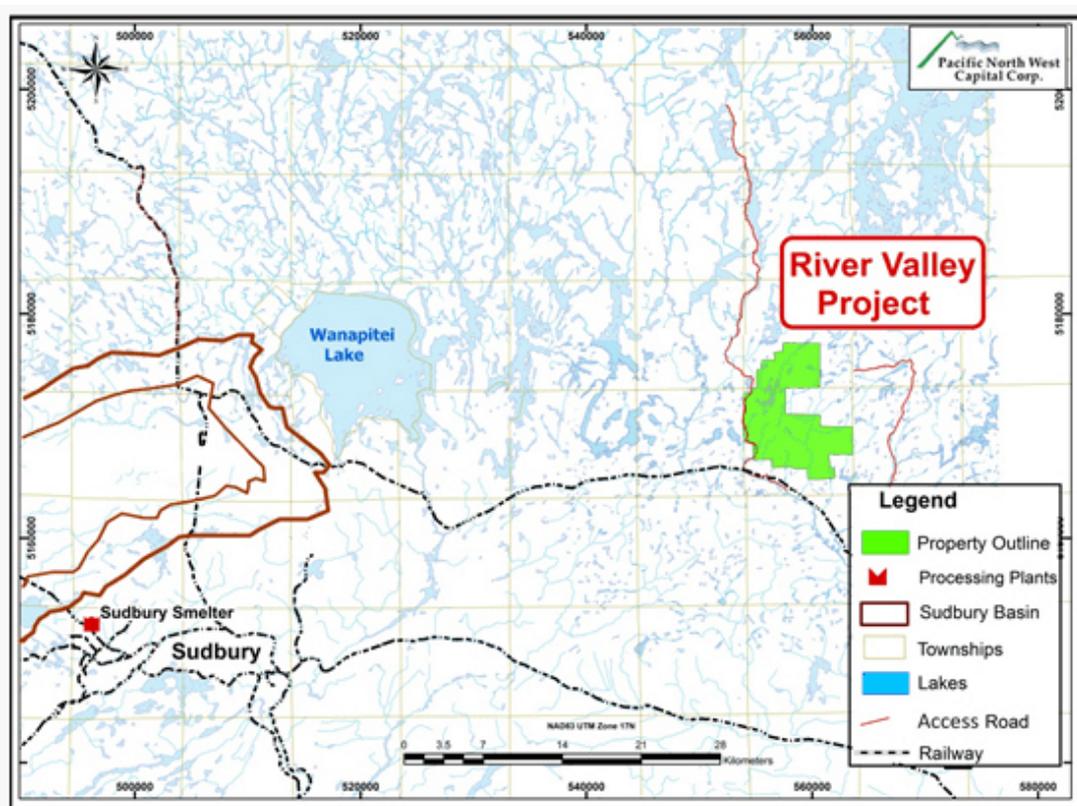
Palladium is a rare and lustrous silvery-white metal discovered in 1803 by William Hyde Wollaston. He named it after the asteroid Pallas. Being rare palladium does not come cheap, currently trading at US\$981/Oz, steadily rising since mid 2016. Platinum Group Metals (PGM) are classified as rare precious metals which include palladium, platinum, rhodium, ruthenium, iridium and osmium. Used in a variety of different applications, the primary use for PGMs (80%) is in catalytic converters, which convert harmful gases produced by hydrocarbon emissions in vehicles, into less-harmful substances.

New Age Metals Inc. (TSXV: NAM | OTCQB: NMTLF) is a mineral exploration company focused on the exploration and development of PGMs and lithium. The Company is divided in to two divisions – Platinum Group Metals and Lithium Canada Development.

River Valley PGM Project

New Age Metals flagship project is Canada's largest primary Platinum Group Metals deposit. Their 100% owned River Valley PGM Project, is located in the Sudbury region of Northern Ontario. The River Valley project is under two mining leases. Covering an approximate area of 12,000 acres of surface and mining rights. Presently the project is North America's largest undeveloped primary PGM deposit with a measured and indicated mineral resource of 160 million tonnes at 0.44 g/t palladium, 0.17 g/t platinum, 0.03 g/t gold; with a PdEq metal grade of 0.90 g/t with a cut-off grade of 0.4 g/t

PdEq, equating to 3,297,000 ounces PGM plus gold and 4,626,000 PdEq Ounces. This equates to 4,626,000 PdEq ounces in measured and indicated and 2,714,000 PdEq ounces in inferred classification. The Company has 16 km of mineralization with a total investment to date of \$45 million, having drilled 710 holes. NAM is currently conducting phase 4 of their proposed 2018 exploration and development program. The current program is based on recommendations of previous geophysical studies and reviews by the Company's consultants, recent drilling, ongoing advanced metallurgical and mineralogy studies, and selective pit design drill programs. NAM plan to complete River Valley's Preliminary Economic Assessment (PEA) by Q2/Q3 2019.



River Valley Project

Genesis PGM Project Alaska

On April 2018, New Age Metals announced that it had signed an agreement with Anglo Alaska Gold Corp. to purchase a 100% interest in their 10,240-acre Genesis PGM project. The Genesis

project sits in the Valdez and Chitina recording district of Alaska. New Age Metals is seeking a joint venture partner to help develop Genesis's 120 road km north of Valdez. The Genesis PGM Project is a road accessible, under explored, highly prospective multi-prospect drill ready property. The Company is actively seeking an option/joint-venture partner to further develop this project.

Lithium Canada Development

The Company's lithium division, Lithium Canada Development, has 8 lithium projects, and is the largest claim holder in the Winnipeg river pegmatite field in SE Manitoba. Field surface sampling at their Lithium One project yielded assays for the silver-leaf pegmatite up to 4.33% Li₂O, 2.08% Rb₂O and 0.04% Ta₂O₅. The summer exploration plan has begun for the Company's lithium division where their budget has allowed 2 of their 3 drill ready projects to be drilled.

As the world's governments legislate towards cleaner emissions from fossil fueled vehicles, New Age Metals should see demand for PGMs increase. Let's not forget the need for lithium in the coming years as the world's use for lithium in batteries continues to grow.

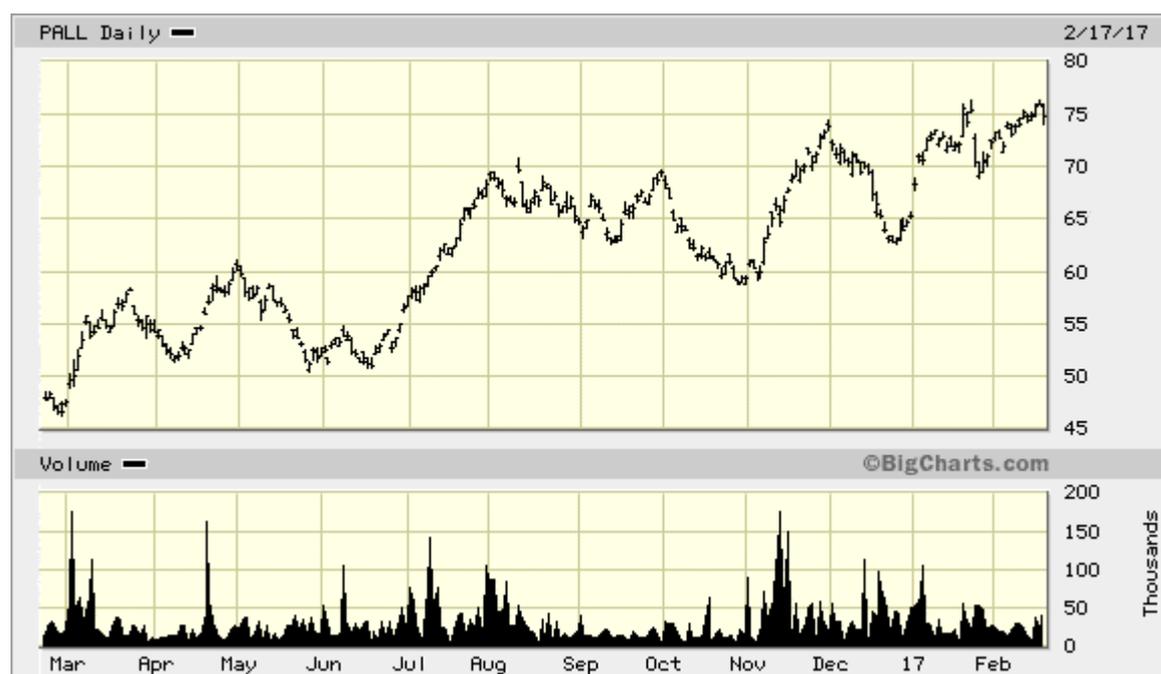
New Age Dawns for Palladium

While Lithium sets the pulse racing of some investors, in the case of New Age Metals Inc. (TSXV: NAM | OTCQB: PAWED) it is its PGM potential that is the standout feature. And of that, we particularly like that its Pd to Pt ratio is 2.5:1 as we are much more disposed to Palladium than Platinum at this time. As primary PGM deposits are rather rare beasts in North America (indeed everywhere outside Russia and South Africa),

the River Valley project of New Age Metals deserves special attention as PGMs are likely to become a subject of much interest in the next few years and the alternatives in terms of developers are few and far between. In this article we shall look at what makes New Age Metals interesting.

Palladium – Back on a Tear

This metal may be Platinum's less precious sister but it has been attracting more of the limelight in recent months. Despite substantial sell-offs from the South African-based ETFs (which was hoovered up by China apparently) the metal just kept bouncing back and as the chart below shows is heading into territory that represents multi-year highs. Indeed the last time it was at these levels was in early 2015.

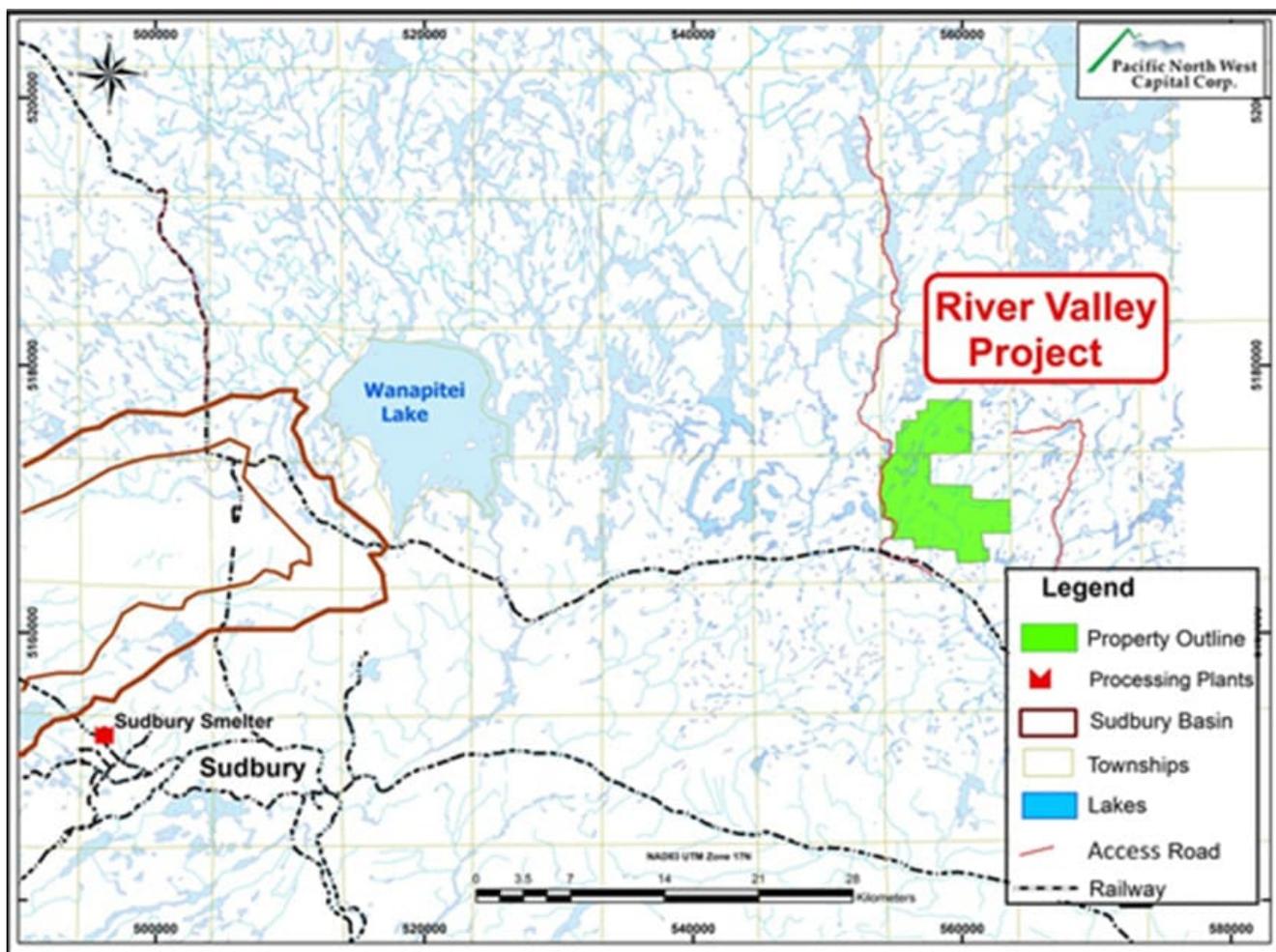


The increase is said to be attributable not only to a noticeable drop in production of platinum group metals in South Africa in November, but also to an extension of tax breaks for car buyers in China. However some market pundits have claimed that the tax breaks in China are not a sufficient factor to explain the moves. All attempts at propagating bad news about the metal tends to just precede a rebound.

As long as auto sales continue around about their recent healthy levels then the prospect is for palladium (and platinum) to continue their gradual rise.

New Age and PGMs

The company's River valley project is located in a road-accessible location in the Dana and Pardo townships of Northern Ontario, approximately 60km east of Sudbury, Ontario. The area is part of Canada's prime Ni-Cu-PGM mining and smelting district with excellent infrastructure and community support for mining activities.



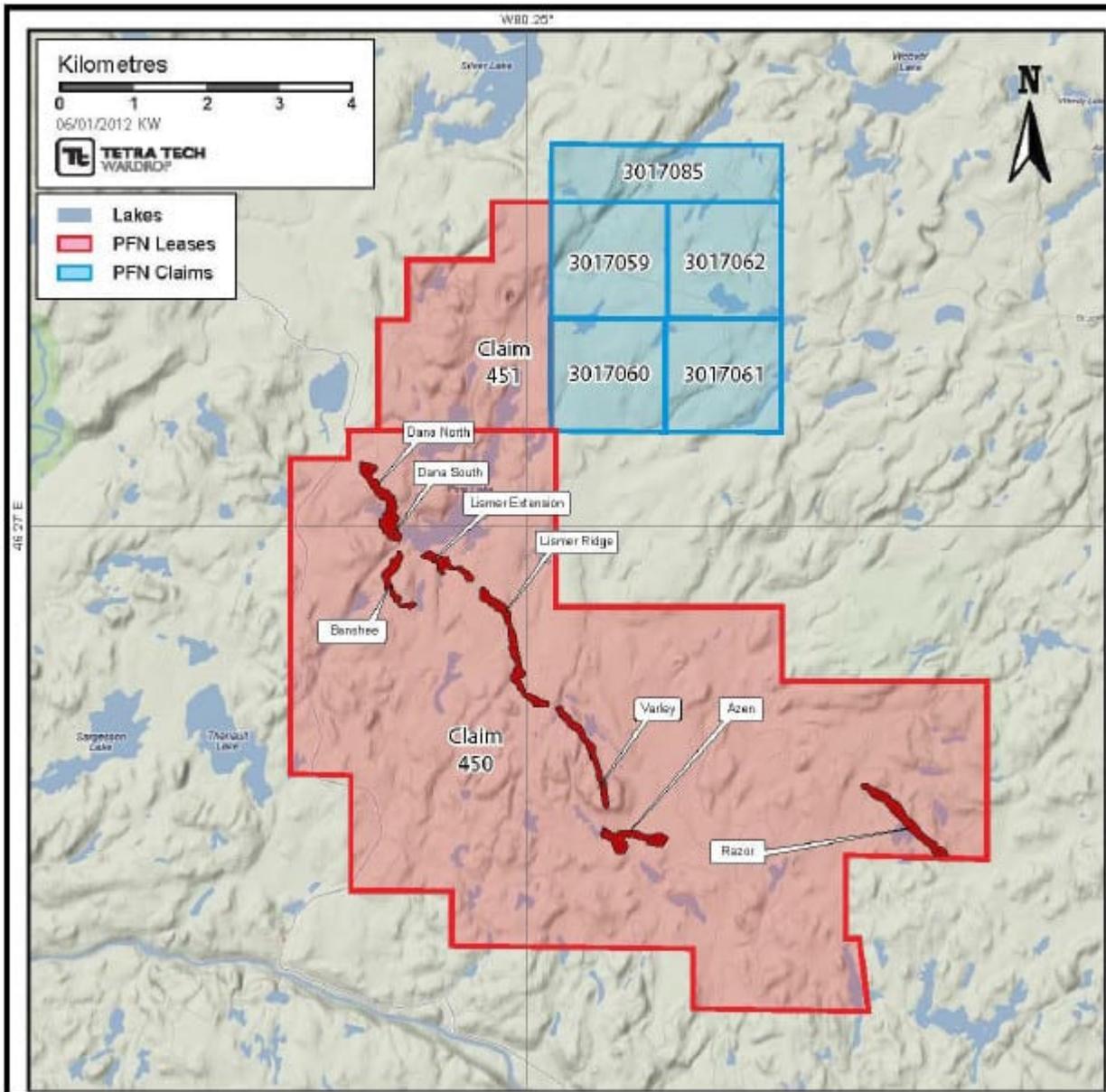
The River Valley PGM project became a target for Pacific North West Capital (PFN) in 1998. PFN discovered significant PGM occurrences on the property and entered into a joint venture agreement with Anglo Platinum in 1999. PFN was the operator of the joint venture. The project consists of two Mining leases

covering an area of 5,381 hectares, including 4,756 hectares of Surface and Mining Rights and an additional 624 hectares of Mining Rights. These Mining Leases cover all of the NI43-101 mineral resources of the River Valley PGM Project. In January 2011, the company completed the terms for the acquisition of 100% of the project from Anglo Platinum Limited. The property remains subject to a 3% NSR, with options to buy down.

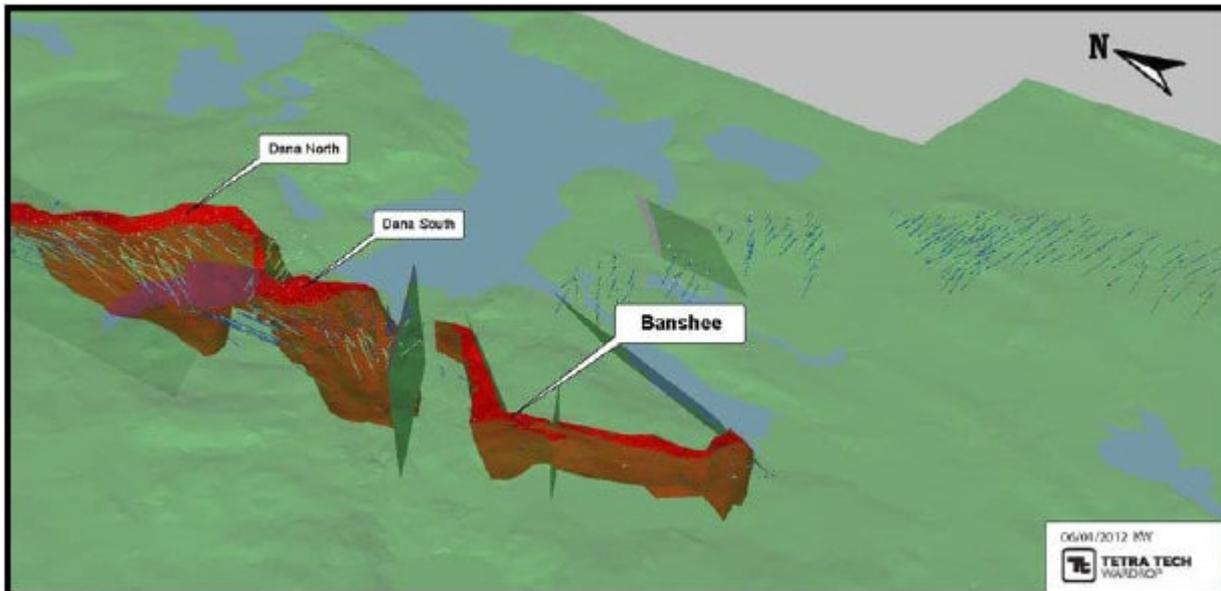
Geology

The River Valley intrusion (RVI) is shallow-dipping, layered, and approximately 900 m thick. There is an increase in metamorphic grade from the northwest part of the intrusion (middle greenschist facies) to the southeast part (lower amphibolite). The dominant rock types are leucogabbronite and leucogabbro with gabbros and anorthosites . Along the Grenville Front, the RVI is either in thrust contact with quartzite of the Huronian Mississagi Formation or is in contact with mafic and felsic metavolcanic rocks of the lower Huronian Supergroup where the nature of the contact is unknown.

The map below shows the concession and in dark red can be seen the main identified areas of PGM mineralisation.



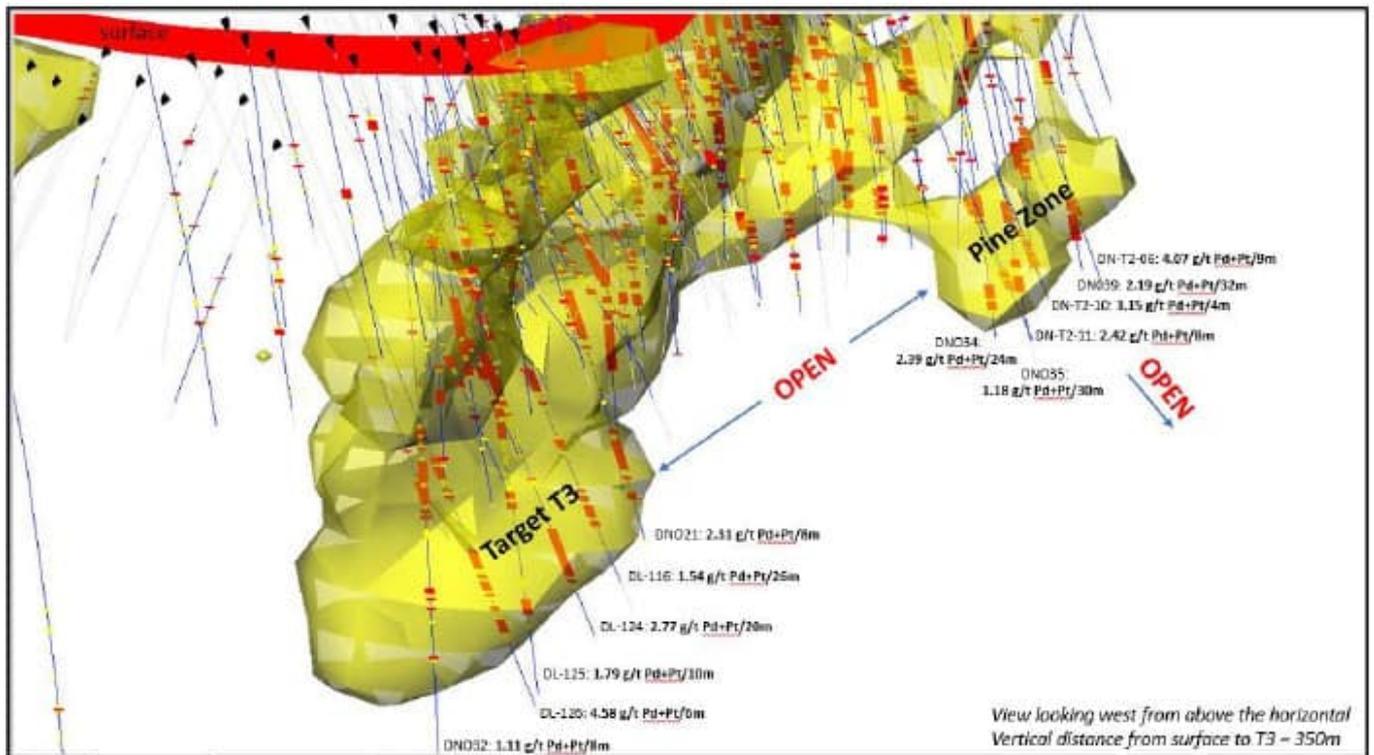
Two styles of mineralization have been observed at the Project; contact nickel-PGE and reef PGE mineralization. In the resource estimate Tetratech note that the presence of several highly anomalous assays from rocks lying within higher portions of the River Valley Intrusion's stratigraphy (i.e. Azen Creek Wonder Showing) suggests that there are opportunities for PGE mineralization such as reef or stratabound-type targets or, narrow, high-grade breccia zones. The image below shows an axonometric view of the Dana South and Dana North and Banshee segments of the deposit (which are located at the northern end thereof).



Exploration

The exploration history of the region dated back to the 1960s, with work on the property starting in earnest in 1999. Completed exploration and development programs on the River Valley property include more than 600 holes drilled since 2000 and several mineral resource estimates and metallurgical studies.

The 2015 drill program confirmed the new high-grade T2 discovery. Drill hole intercepts were much higher than the average grade of current mineral resource estimate. There is the possibility of a new mineralized zone at the north end of the River Valley deposit.



In 2015-16 seven drill holes at Pine Zone intersected high-grade PGM mineralization of:

- Hole 2015-DN002 intersected 9 m grading 3.909 g/t Pd+Pt from 145 m downhole
- Hole 2015-DN001 intersected 16 m grading 2.054 g/t Pd+Pt from 184 m downhole
- Hole 2016-DN-T2-06 intersected 9 m grading 4.065 g/t Pd+Pt from 178 m downhole
- Hole 2016-DN-T2-10 intersected 4m grading 3.093 g/t Pd+Pt from 202 m downhole

Resource

The most recent resource estimate dates from May 2012 and were prepared by Tetratech. The estimate utilized a Cut-Off Grade of 0.8 g/t PdEq.

The results of which were:

Class	PdEq Cut-off (g/t)	Tonnes	Pd (g/t)	Pt (g/t)	Rh (g/t)	Au (g/t)
Total Measured	0.80	25,584,850	0.63	0.23	0.022	0.04
Total Indicated	0.80	65,754,700	0.56	0.21	0.020	0.04
Total Measured+Indicated	0.80	91,339,550	0.58	0.22	0.021	0.04
Total Inferred	0.80	35,911,000	0.36	0.14	0.014	0.03

Of which the contained “precious” metals were:

Class	PGM+Au (oz)
Total Measured	742,130
Total Indicated	1,720,900
Total Measured+Indicated	2,463,030
Total Inferred	614,000

There are also showings of copper, nickel and silver but really this project will stand or fall on its PGM content and from the resource it is clear that these are starting to stack up as meaningful indeed.

Results for the most recent Metallurgical Testwork Study (prepared by Tetra Tech – Wardrop) are summarized below:

- High Confidence: Measured plus Indicated = 72% of total
- High Grade potential, particularly in the north part of River Valley deposit
- Resources under evaluation for development potential as open pit mining operation

Adding to the Patch

In August 2016 PFN acquired what it calls the River Valley Extension Project (to the southeast of the existing claims) from Mustang Minerals Corp. With this transaction the area of the strategic land position at River Valley increased to 64 km² (15,800 acres). More importantly the strike length of River Valley deposit increased from 12 km to 16 km. Not much work has been done as yet but surface grab samples returned assays of up to 10 g/t of PGMs.

Next Steps

The plan for 2017 is to undertake:

- Three-dimensional Geological and Structural Modelling
- IP geophysical surveys over the new Pine Zone
- Phase 3 Drilling of Pine Zone
- Develop additional structural PGM targets for priority drill testing
- Design Phase 4 Drill Plan

This work has a rather unchallenging provisional budget of around CAD\$1mn.

As far as a mine plan is concerned that company plans to take the roughly 600,000 ounces it has in the Northern Portion of the Project up to one million ounces and then wrap a PEA around that.

- Delineation and infill drilling of Pine Zone
- Updated Mineral Resource Estimate
- Phase 1 drill tests of other structural targets for higher grade mineralization (south from the Pine Zone in the area from T3 to T9)
- Carry out Phase 2 metallurgical testwork

The timing for PEA (if all goes well) might be 12 to 15 months. This work has a provisional budget of a more challenging CAD\$5mn.

Conclusion

The main priority for New Age now is its ongoing search for a strategic partner for the River Valley project. While the company has some secondary interests in Lithium, it's more PGM projects that the market needs at this juncture. With the prices for this rarified group of metals showing a healthy rebound, those investors in search of the next companies to move towards production have little beyond New Age and Wellgreen to conjure with.

Considering that the recovery in PGM prices is now no longer in question we must wonder why the market seems to have missed the intrinsic virtues of the River Valley Project. We suspect it is more a case of the Canadian investor community still being in thrall to the gold price even when the gold price is quite patently not delivering in the way that PGMs are. When one overlays the industrial necessity for PGMs and the fact that the two largest producer nations are somewhat erratic there would appear to be space for the two challenger companies to join the two existing plays (North American Palladium and Stillwater, the latter being taken over by Sibanye) in the universe for consideration. At its current market capitalization New Age is patently undervalued on the basis of its sizeable in situ resource of PGMs.

With the resurgence of Palladium (and Platinum), a name change to a more pertinent designation (and a stock rollback) a New Age, to belabor the pun, should be dawning for this company.

Platinum sector suffers

chronic underinvestment

The South African mining sector is suffering from lack of investment, falling head-grades, strike action, political strife and overall poor productivity. The platinum sector is suffering the same plight with the added issue of lower recycling rates and reduced market share of diesel cars.

In our opinion, the lack of investment in South African mining has little chance of reversing in the medium term, if at all. Our sentiment has been echoed in recent weeks by CEO's of South African platinum companies which is the largest source for platinum used in autocatalyst devices.

The World Platinum Investment Council adjusted its supply deficit forecast for 2016 upwards to 520,000 ounces from the prior estimate of 455,000 ounces. The increase cited lower than expected recycling growth and represents the fifth consecutive year of undersupply.

Implats' CEO indicated that they are forecasting South Africa's platinum supply to drop to below 3m ounces by the end of the decade and even if investment was made available, there would be too little time to bring new mines into production which takes decades.

Northams revealed that South African output would total just over 4m ounces in 2017, falling from 5.6m ounces in 2006. Out of this, around 5.5m ounces is expected to be needed for industrial use from the total demand of 8.7m ounces. As such, the company is planning to bring on an additional 800,000oz over the next six years to coincide with the increased demand.

Whilst the future demand/ supply imbalance is indisputable, the fact that a mine would take around 15 years to bring into production and to realise a return on investment has made it harder to attract investment as investors would have to be convinced of the long term sustainability of the industry.

In 2015, 2.25m ounces of platinum was used in the light duty diesel vehicle market and some 520,000 ounces and 250,000 ounces for heavy duty trucks and non-road vehicles respectively. Platinum demand is therefore reliant on the health of the diesel sector. With regards to heavy duty trucks, given that there are financial advantages to using more efficient diesel trucks over gasoline, diesel trucks should remain dominant and platinum demand to this sector could more than double by the end of the decade.

The outlook for the light duty trucks or passenger vehicle sector is more uncertain. New emission standards in Europe will require more complex emissions aftertreatment. This should result in an increase in the price of a typical diesel vehicle compared to gasoline equivalent, resulting in diesel engines losing some market share. It is unclear whether this decline in market share could potentially be offset by an increase in the amount of platinum required per car or truck in order to accommodate the cleaner emission standards. If this were the case, then the overall demand for platinum in this sector could potentially increase. However, until we have clarity around this potential, it will be hard to convince investors to develop new mines, especially for a return that will not be realised for more than a decade.

As such, investors remain cautious and the larger players are considering their respective strategies. Lonmin has stopped all loss-making mines and has not yet restarted its K4 mine which will deliver a low-cost platinum resource in Rustenburg. Anglo Platinum has switched its strategy to mining shallow, mechanised mines selling its deep level mines to Sibanye Gold. Sibanye will require large capital investment in order to produce platinum which is uncertain at this stage. Impala intends to replace its output from old mines with the development of 17 new shafts over the next few years, though currently the board has not expedited the deployment of these shafts.

Platinum – Swamped in the Backwash of Volkswagen’s Woes

Maybe I haven’t been looking too closely but it seems to  have been more in the context of Australian gold miners that managements tout the fact that gold is trading above \$1,500 in the local currency. Canadians don’t seem to have been so solicitous in touting the similar statistic as it pertains to Canadian gold production. Maybe they are afraid that it would only prompt the question “where are the profits then?”. Well may we ask!

Thoughts turned to the subject of the value of precious metals in commodity currencies when looking at platinum. Of course the two main producers are South Africa and Russia, with a bunch of wannabe producers in Canada having appeared over recent years. All three currencies have been plunging against the US dollar in recent years. Despite this, considerable gloom has besieged this sub-space of the mining sphere, particularly as regards to South African production.

With the currencies of producer countries hitting new lows, they have been followed down by the metal itself with platinum hitting 6 ^{1/2} year lows this week.

The latest leg down has been prompted by fears of a move away from diesel engines, particularly with the kerfuffle over Volkswagen’s misdemeanours. But for those who constantly bemoan the gold price’s sluggishness, the yellow looks like a great outperformer compared to platinum. Here our chart compares the Physical Gold ETF (GLD) to the Physical Platinum ETF (PPLT).



To Diesel or Not To Diesel

The latest bout of price weakness has been attributed to the various ructions relating to diesel engines in automobiles and more particularly to Volkswagen's travails. The latter are frankly neither here nor there to the price of the metal. The real question relates to the use of diesel automobiles. Governments have a rather schizophrenic attitude to this issue. While they love the fuel efficiency which makes better use of a scarce resource which in many cases (in Europe) needs to be imported and thus damages the balance of payments, they remain wary of environmental costs.

Commentators have noted that upcoming European legislation on CO₂ emissions will make it harder for the authorities to back a shift away from diesel. The measures dictate that from 2020, the fleet average CO₂ emissions to be achieved by all new cars should be just 95 grams per kilometre.

The European Union has a target to cut its greenhouse gas emissions by 20% on 1990 levels by 2020. While diesel cars have been criticised for producing more harmful particulate and higher nitrogen oxides air pollution, their CO₂ emissions are lower than those of petrol-fuelled cars.

Europe is by far the biggest diesel market, with diesel cars accounting for 53% of all new registrations in 2014, according to the ACEA, compared to around 33% in 2000.

Reuters reported that automotive analysts say a fall in market share by diesel cars is a real risk in the wake of the VW scandal. However increased scrutiny of car emissions could actually benefit the metals used in autocatalysts. Ultimately this is better for platinum demand though you would not guess it from the recent panic-selling.

Major Dynamics

When it comes down to it the whole diesel thing may prove to be a storm in a teacup. The real issues are far bigger than that. These can best be summarized as:

- Falling global mine supply for past nine years since peak in 2006
- The World Platinum Investment Council projects supply deficit to grow to 445,000 ozs in 2015
- South Africa, which accounts for around 70% of global platinum mine production, faces ongoing labour unrest and increasing costs
- Infrastructure issues, most notably power & water, further threaten the South African platinum industry
- Platinum available for recycling has been declining since 2010 due to thrifting & palladium substitution in autocatalysts

South Africa

Most countries, with the tailwind of a brutal devaluation (as the chart below shows) would be able to regain competitiveness but that alas is not happening for the South African mining sector. This is due to labour problems, energy problems and the age (and depth) of mines combining to make a perfect storm that has worked against capitalizing upon the lower currency.



Chief amongst the problems is the labour issue. This has gotten so bad that veteran companies in the sector are selling off once enormously profitable platinum mines to make space between themselves and the issue. The shootings at the Marikana mine last year, between rival unions, that left 34 dead just heightened the “event-risk” that internationally exposed miners can do without.

The South African labor unions consist of the dominant National Union of Mineworkers (NUM) and the upstart Association of Mineworkers and Construction Union (AMCU). The

latter group have not been prepared to indulge in the *faux*-struggles of years gone by with management and have used long and violent strikes as their chief bargaining technique.

The AMCU claimed that the NUM had become too cozy with the government and with mining companies. This smaller union is saying that the average mineworker in South Africa has seen no significant improvement to his lot in life since the end of apartheid.

In 2014 the conflict between AMCU and NUM come to a head in the platinum sector with the Rustenburg platinum mines suffered a 5-month strike over wages.

Anglo American Platinum, which owned the mines, reported that it had lost a third of annual production because of the strike. It then announced that it intended to sell the mines after the strike ended, and several weeks ago it sold several South African mines to Sibanye Gold for \$330 million in cash and stock.

The South African government is clearly conflicted as the mines produce revenue but the votes come from labor. Observers see it as a four-way struggle between the mining companies, NUM, AMCU and the South African government.

The main problem is the age and depth of the mines combined with an intransigent workforce unyielding to more modern methods. Work conditions are increasingly harsh as the mines become deeper and hotter, but they are too unprofitable to pay workers high salaries.

South Africa is not a total write-off though with new mines appearing in the platinum space but these are being developed using mechanization, employing a low number of skilled and highly-paid workers from the outset to avoid the turmoil that affecting older platinum mines in the country. New mechanized platinum mines, which employ fewer people and offer better pay and superior working conditions, might stand to benefit. An

example accessible to Canadian is Platinum Group Metals, a company that we have known for a long while now that is developing the Western Bushveld Joint Venture (WBJV) in league with a Black Enterprise Empowerment group, Wesizwe. Also investable is Eastern Platinum (TSX & AIM: ELR; JSE: EPS) which has three properties, two of which are currently producing.

Then there is the well-known name, Ivanhoe Mines, which is planning a multi-phased mine development on its 64%-owned Platreef discovery of platinum, palladium, nickel, copper, gold and rhodium in South Africa's Bushveld Complex. A pre-feasibility study released in January 2015 estimated a first phase of development mining four million tonnes per year could produce 433,000 ounces of platinum, palladium, rhodium (and gold) annually.

The lesson here is that the fantastic prospectivity in South Africa for PGEs is not going away. It's just that it needs to be exploited in an economic fashion.



The Players in Canada

Names to conjure with here which we may expand upon further in the future include Wellgreen Platinum which we also knew in its former guise as Prophecy Platinum. This holds the eponymous Wellgreen PGM-Ni-Cu project, located in the Yukon. Then there is St-Georges Platinum and Base Metals (CSE: SX and FSE: 85G1) is a sometime Platinum-Palladium & Nickel explorer with projects in the Province of Quebec, Canada. Its flagship project is the Julie property on Quebec's North Shore near the deep-seaport town of Baie-Comeau.

Then there is Pacific North West Capital (TSX.V: PFN, FSE: P7J). Its River Valley PGM project is located in the Dana and Pardo townships of Northern Ontario, approximately 60km east of Sudbury. On a PdEq basis, the Measured + Indicated

resources contain 3,944,000 ounces PdEq and the Inferred resources contain 1,201,000 ounces PdEq.

Conclusion

The old adage is that “what goes up must come down” while we would hope that in the case of platinum “what comes down, must go up”. As discussed a number of factors mitigate against platinum staying in the dumps long-term. The market at the moment has the look of shorters having had their way with it. Frankly the Volkswagen angle is overwrought and overdone. In a few weeks it will be forgotten as a negative stimuli for the price of this metal. Such has been the fall in recent weeks that there is the possibility of a sharp uptickng correction.

As we have seen there is a secular downturn working against most of the traditional South African producers, which implies a secular upturn for the producers outside that country, particularly Canada, as they move in to take up the slack in supply over the next decade. With Russia largely “beyond the pale” and Zimbabwe still a “no man’s land” the focus will increasingly turn to up and coming Canadian platinum miners as the main source of future production. Much will depend upon the Canadian dollar remaining at an advantageous position *vis-a-vis* the US dollar in which platinum is denominated and, of course, the resolution of the ever-present problem of financing.

Strategic Chess Pieces in a Russian Game

As tensions heat up again with Russia over the long-simmering Ukraine dispute things are likely to go one of two ways. Either the West will wimp out and let Russia keep doing what it's doing or the screws will be tightened. As I have written before the oil price fall has dealt a body blow to the Russian economy and exchange rate. This triggered soaring interest rates and raised questions amongst oligarchs as to whether Putin was in their own best interests. However while the West has indulged in financial sanctions (and may have orchestrated the oil price tumble) it has not restricted imports of mineral products from Russia, most noticeably Uranium or Palladium (and Platinum). This is rather a cynical move as restrictions of either or both would send prices of Uranium and the PGMs soaring. Of course, the Russians themselves might resolve to take some retaliatory action by restricting exports of these products. That could play merry hell as the Russians represent so much of the capacity in both metals that prices would go wild.

I thought it apt then to follow up my previous musings on Uranium and Palladium in light of the Russian "threat" with a review of PGMs with a tight focus on their supply and price dynamics without dallying on issues of metallurgy.

Uses – Cars Lead the Charge

PGM demand in recent years has been good with Platinum demand climbing 4.9% to 8.42 million ozs in 2013, according to the refiner, Johnson Matthey, however some of that may have been end-users stocking up in anticipation of industrial action in South Africa.

Platinum has a diverse consumer base with demand coming from

four main sectors: auto catalysts (37% in 2013), jewellery (33% in 2013), industry (21% in 2013) and investors (9% in 2013). The breakdown of the main users in industry are the chemical, electronics, glass, petroleum and medical industries.

While emerging market car demand is booming, that in major Western markets has never got back to the ebullience pre-2008. The US made a good recovery after the slump but not enough while Europe has only just started to fire up again (though the UK had been doing better than most of Europe). Interestingly Palladium has been stealing the thunder of Platinum because it is cheaper and it has captured an increasing part of the catalyst market.

Meanwhile the other industrial uses are pretty stable, jewellery fluctuates with economic growth, fashion and the metal prices. The Chinese have taken a particular shine to platinum jewellery in recent times (with 63% of all platinum jewellery demand). The industrial applications in electronics of the whole range of PGMs have been on the rise, but not enough as yet to quantify as a surge by any means in the broader usage of the metals. The investment usage of the metals was spurred by the strong prices prompted by the South African price which sucked interest into the ETFs and physical holding of the metals. That however mainly takes its lead from the rest of the usages. Therefore if the outlook for auto usage was down then price perceptions would be down and investment interest would fade as well.

However, all in all the industrial usages look good with Western auto demand now coming to the party and the slower Chinese economy not seemingly denting demand there. Indeed, with property so high in value, a car of any sort becomes the affordable status symbol.

The chart below belies this enthusiasm though looking rather sickly of late.



Supply – The Club of Three

PGMs are up there with a few very obscure metals in having a very tight range of supply sources. This is not to say that PGMs aren't found broadly around the world but the production side has evolved into one that is highly concentrated with Russia and Southern Africa (essentially South Africa and Zimbabwe) dominating the supply-side.

The chart below shows the sources of supply. South Africa has the dominant role in Platinum and Russia Palladium. In South Africa we have industrial disputes, latent political instability, energy supply issues and mediocre profitability while Russia is inefficient and now a political pariah. Output has generally been in decline in recent years with Johnson Matthey data showing that production peaked in 2001 at 1.3 million ozs, falling to a low of 785,000 ozs in 2009. It recovered to 835,000 ozs by 2011, but has since started to fall again. The weaker trend is expected to continue as ore grades deteriorate. It's interesting to mention that other basket case Zimbabwe where mining news tends to be dire. However production of platinum has been soaring there (from 165,000 oz in 2006 to 408,000 oz in 2013) so they must be doing something right. Indeed they have been taking up the slack left by falling Russian supply. Whether the growth will continue to match Russia's decline strikes me as unlikely.

The big mystery with Russia how much of its sales of Palladium are actually from stockpiles rather than production. The size of ex-Soviet stockpiles has long been a mystery as has been the rate at which they are being run-down. It has been thought in recent years that these are nearly exhausted.



Recycling is also worth a mention with the USGS estimating

that 155,000 kilograms of platinum, palladium and rhodium was recovered globally from new and old scrap in 2014, including about 50,000 kilograms recovered from automobile catalytic converters in the United States. Palladium is interesting from the recycling point of view as most of the metal goes into auto catalysts so it is very recyclable. In fact the second largest source of the metal is now recycling after Russian production and ahead of South African production.

Store of Value

Unlike the wild oscillations in perceptions of what the gold:silver ratio should be, the platinum price is more often spoken of in terms of parity with the gold price. As the chart below shows the gold price has risen and platinum has fallen and brought both back to near parity after a period of outperformance by platinum partly fired by the misconceptions engendered by last year's miners' strike in South Africa. I never bought into the argument that the strike was a turning point for the better, as no strike lasts forever. It shows the extent to which metals watchers like to grasp at straws. In any case the strike ended and platinum went on the skids heading back down to levels not seen since 2009.



Part of this slide was unwinding of stockpiles built up by users in anticipation of the strike. As the strike didn't last as long as many feared (and others hoped) not only was the disappointment reflected in the price but users then were able to sit out of the market and just use up their hoards of the PGMs they had paid up for in 2013. As the strike didn't last forever neither will the destocking and we expect the price to start ticking upwards again in the near future.

Names to Conjure With

We have dealt with North American Palladium and Stillwater

before so no need to say too much and of course, I remain very fond of the Palladium ETF (NYSE:PALL) as an avenue to specifically play that metal in the physical form.

We have long followed the eponymously named, Platinum Group Metals (PGM.to) which is one of the few TSX-listed names pursuing projects in South Africa. I have known them since they first appeared on the scene but slowly but surely they have inched through the thickets of BEE negotiations and are on the way to building themselves a mine on the famed WWW belt.

Another name to have recently surfaced is Wellgreen Platinum which comes with Greg Johnson of NovaGold fame as the head of the company. Its Wellgreen property is in the Yukon and was formerly a project of HudBay but many eons ago. The company describes its project as one of the largest undeveloped platinum group metals deposits outside of southern Africa or Russia. Maybe I shall elaborate on this more at a future opportunity.

I also met recently with another nickel/PGM project in West Africa, Sama Resources in Cote d'Ivoire which is run by an amalgam of ex-SEMAFO, ex-Xstrata and ex-Salares Lithium people. All of which I hold in high esteem. With a capex of only a tad over \$200mn it also comes in at one of the lowest capexes for either nickel OR PGMs that we are acquainted with. This is another one I hope to expand upon in the future.

Conclusion

The Russia/Ukraine matter is on the slow boil at the current time but this does not mean it has gone away. If the heat turns up it is not beyond the Machiavellian playbook of Putin to play the mineral export card selectively and Palladium, Uranium and to a lesser extent Platinum are powerful cards to play. Restricting supply would send prices ballistic which would then probably have the Russians leaking out supply to

the spot market. Russians do love chess and Palladium is a particularly strategic piece on the board.. will they play it?

Ecclestone on Palladium – Ignore the Mood Swings

We have long been Palladium bulls but found things were getting all a bit too crazy a few months back when pundits were justifying the metal as a buy on the basis of a strike at a major producer in South Africa. Strikes come and strikes go and going long on the basis of industrial action (unless you are a Just-in-time offtaker) is one of the most feeblest arguments we can think of.



Sure enough the strike ended and the wind went out of the sails and the metal has drifted lower, having made a couple of bottoms in recent times before perking up again.

PGEs have figured only slightly in our past writings with the main focus being upon Platinum Group Metals (PTM) and Duluth Metals (DMM.to). The latter succumbed earlier this month to a “spit bid” from Antofagasta while the former is soldiering on in the face of South Africa’s onerous and distortive BEE program towards program.

The evolution of the Palladium story in recent times though has prompted us to revisit the metal.

Our rationale for liking the current look of the palladium market includes:

- Mined palladium supply is concentrated and constrained

- Large Russian government palladium inventory is at or near depletion (having provided approximately 25% of total palladium supply since 1990)
- Recycling is increasing but insufficient to offset growing demand
- World-wide automobile production expected to increase significantly
- Use of palladium in diesel catalytic converters is increasing

Palladium (Pd) is a precious metal typically found together with Platinum and Rhodium in ore deposits. It is a rare and lustrous silvery-white metal discovered in 1803 by William Hyde Wollaston. He named it after the asteroid Pallas. Palladium, platinum, rhodium, ruthenium, iridium and osmium form a group of elements referred to as the platinum group metals. These have similar chemical properties, but palladium has the lowest melting point and is the least dense of them.

Over half of the supply of palladium and platinum goes into catalytic converters, which convert up to 90% of auto exhaust gases (hydrocarbons, carbon monoxide, and nitrogen dioxide) into less-harmful substances (nitrogen, carbon dioxide and water vapor). Palladium is also used in electronics, dentistry, medicine, hydrogen purification, chemical applications, and groundwater treatment. Palladium plays a key role in the technology used for fuel cells, which combine hydrogen and oxygen to produce electricity, heat, and water.



Source: Stillwater Mining

Ore deposits of palladium and other PGMs are not all that common, with the most extensive deposits being in the norite belt of the Bushveld Igneous Complex covering the Transvaal Basin in South Africa, the Stillwater Complex in Montana, USA, the Thunder Bay district of Ontario, Canada, and the Norilsk

complex in Russia. Recycling is also a source of palladium, mostly from scrapped catalytic converters. The numerous applications and limited supply sources of palladium result in the metal attracting considerable investment interest.

The ETF – Easy Access

In accessing this metal we prefer to go with a stake in the ETF Securities managed Physical Palladium ETF (NYSE:PALL) which offered the best pure palladium exposure in our estimation. The metal in the ETF is held by the custodian, HSBC Bank USA. Only metal that conforms to the London Platinum and Palladium Association's (LPPM) rules for Good Delivery can be accepted by the custodian. Each physical bar is segregated, individually identified and allocated.



As Palladium usually plays second fiddle to Platinum in virtually all PGM producers it would seem to us that eschewing the miners is the only way to get the best access. The metal has been on a slide of late, but as even the US auto industry is not very ill these days, we find little reason to be bearish on the prospects in any except a global meltdown scenario and the poor supply situation out of Russia, gives us nothing but good vibes on future price trends.

Stillwater Mining (NYSE:SWC)

As the only one primary palladium producer in the US it might merit consideration. It operates two mines in southern Montana. However the purchase in 2011 of the Argentine copper/gold explorer, Peregrine Mining, for \$487mn which many thought to be way too high a price, has put us off favoring this stock. Stillwater's mines in Montana exploit a palladium ore-bearing layer called the J-M (Johns-Manville) Reef, which that company claims is the richest known palladium deposit currently being exploited anywhere in the world. Mining from

this location produces a high-grade ore containing a palladium:platinum ratio of just over 3:1. After mining, the ore is refined by Stillwater at a site near Columbus, Montana, to a purity of 60% PGMs, then shipped to Johnson Matthey for final refining of palladium, platinum and other metals at a facility in New Jersey.

In recent weeks the company announced its results for the third quarter ended September 30, 2014. These showed consolidated quarterly net income of \$18.1 million and cash generation of \$37.2mn. Total cash and investments rose \$7.2mn during the quarter to a whopping \$509.1mn, after \$30mn in debt repayment. The party was spoiled though by an all-in sustaining cost of \$837 per mined ounce of palladium and platinum. This was despite corporate overhead expense, including exploration, having been reduced 9% YoY to \$10.7 million. The total mined palladium and platinum production of 123,000 ounces in the quarter.

Stillwater merits watching if one wants a corporate play on Pd but we are feeling safer at the moment with a physical ETF, or a lower-cost producer. A far better choice is the following name.

North American Palladium (NAP.to)

This stock has not hidden its light under a bushel when it came to naming itself. However, it has had this name from long before Palladium became the hot item of recent times. North American Palladium operates its flagship Lac des Iles mine (LDI) located in Ontario, some 90 miles from Thunder Bay. LDI is one of only two primary producers of palladium in the world and is currently undergoing a major expansion.



The Lac des Iles mine commenced production as an open pit in 1993 and expanded underground in 2006 mining the underground Roby Zone. The current mining method at the Lac des Iles mine

is longhole stoping with cemented rock fill (using a primary and secondary stoping block sequence).

In late 2010, NAP commenced an expansion of the underground mine to access the Offset Zone, and to transition operations from ramp haulage to shaft haulage. Mining from the Offset Zone commenced in late 2012 (via ramp haulage), and is expected to be transitioned to shaft-haulage in early Q4, 2013. Through the utilization of the shaft, operations are expected to benefit from increased underground mining rates and decreased operating costs, transforming the Lac des Iles mine into a low cost producer with a rising production profile. The mill has a design capacity of 15,000 tonnes per day.

The high palladium price gave a very nice tailwind to NAP in 2014. During the September quarter it sold 36,430 ounces of payable palladium at a cash cost per ounce of US\$589 (the YTD cash cost per ounce was US\$527). This produced revenue of \$46.4 million (an increase of \$13.1 million or 39% compared to the same period in 2013) The improvement was due to more favorable exchange rates, higher palladium ounces sold and higher palladium prices. The end result was adjusted EBITDA of \$8.3 million for the quarter and \$28.5 million year to date.

The company received a selling price of US\$860 per ounce, giving a palladium operating margin of US\$271 per ounce, or US\$9.9 million. This would have come down in the latest quarter with the severe price pullback. Nevertheless, NAP looks like the best and easiest exposure to an actual Pd producer as it's in a safe jurisdiction compared to the vagaries of South Africa.

Conclusion

While getting access to platinum mainly means playing in South African names, Palladium (despite its "joined at the hip" status) has, as we have demonstrated, at least three ways of

getting directly linked exposure to varying degrees without having the play in Johannesburg names.

While the metal has retraced on the expiry of the intellectually feeble bull argument regarding the South African industrial action, the dynamic of global tight supply and on-going demand in the auto sector provides an underlying impetus for a return to a gradually firming trend upwards.