

Platinum and Palladium

Commodity Investments

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TIG | Trading & Investing Working Group

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Metals Mining & Production

*Important background information on Platinum &
Palladium*



Pt

Platinum

Palladium

Pd



Common Attributes:

- Extremely Dense
- Very High Melting Point
- Extremely Ductable & Malleable
- Chemically Inert - does not tarnish
- Rarer than Gold, with concentrations mostly in South Africa, Russia, and Canada

Applications:

- Automotive - catalytic converters
- Jewelry
- Industrial - chemical manufacturing & electronic contacts
- Medical Devices
- Hydrogen Electrolysis

Applications:

- Automotive - catalytic converters
 - Jewelry - used for “white gold”
 - Electronics - multilevel ceramic capacitors
 - Dentistry
 - Hydrogen Purification
-

Why We Care

While there is a shift to EVs from ICE vehicles, automotive use in catalytic converters, along with industrial and electronic manufacturing will continue to drive some base level of demand and slow sustained growth for the foreseeable future for both these metals.

Additionally, with alternative vehicle power coming from *Proton Exchange Membrane (PEM) Hydrogen Fuel Cells*, we see potential increased demand (*up to 35% total demand by 2040) and higher growth for investors as these metals are crucial for efficient production and use of clean hydrogen fuel. Both metals can be used as an anode catalyst to split hydrogen, producing electricity.

* CME Group, *Why palladium matters to the growth of the platinum market*, 17 Jan 24

Hydrogen Fuel Cells

The consumption of hydrogen fuel cells by vehicles could be a major boon for the economy and environment. EVs can't yet efficiently do long-haul trucking, and are ill-suited for heavy utilitarian vehicles like busses, garbage trucks, forklifts, and heavy machinery. The output of consuming hydrogen is simply water vapor, a little heat, and electricity. This makes it environmentally friendly, even in enclosed areas like mines and warehouses.

Hydrogen can be produced a few different ways.

Easiest is mixing natural gas (primarily methane) with steam at high temperatures to produce hydrogen and carbon monoxide. This, however, defeats the purpose if you are trying to reduce greenhouse gases and dependency on oil.

Electrolysis is much better, more sustainable, especially when paired with green energy such as wind, hydro, and solar. PEM electrolysis requires an anode catalyst using platinum and/or palladium.

Hydrogen is then compressed (10,000PSI) or cooled to liquid form and delivered to stations much like petrol. Similarly, refueling takes 3-5 minutes and offers similar range to gasoline/diesel fill-ups.

Platinum vs Palladium

While both metals, along with a few others including rhodium, are all part of the same Platinum Group Metals (PGMs) and have similar characteristics, they are not perfect substituted for each other. Platinum is more expensive and rare than Palladium, but works better for certain applications. Efforts are being made to improve substitution technology so that more Palladium can be used over Platinum.

Platinum is expected to continue to move to a market deficit, which it has been since post-COVID.

Palladium is expected to move to market surplus starting 2025 into the foreseeable future. A large portion of this is actually recovery from scrap, rising over 50% greater than 2022 levels.

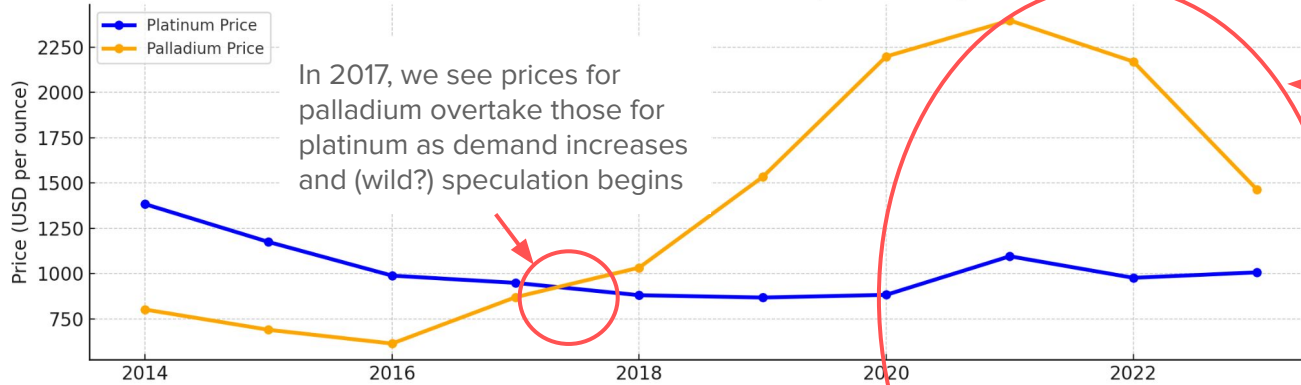
Demand Expectations

Platinum - Significant demand increase due to hydrogen, supported by sustained growth due to use in automotive, slight decline in demand for industrial. Expected market deficit and constrained supply will drive prices higher. 5-15% per annum returns in 1-2 year, 15-20% returns 3-5 years.

Palladium - Demand will increase significantly, but also will supply, partially due to increased recycling efforts. Expect 5-15% per annum returns in 1-2 year, 5-10% returns 3-5 years. Of significant note is that Russia produces 40% of the world's palladium. Any embargo or other punishment due to Ukraine escalations may significantly impact prices and availability. *Palladium prices tend to be highly volatile – see graph on next slide!*

Price and Demand, Market Volatility

Platinum and Palladium Prices (2014-2023)

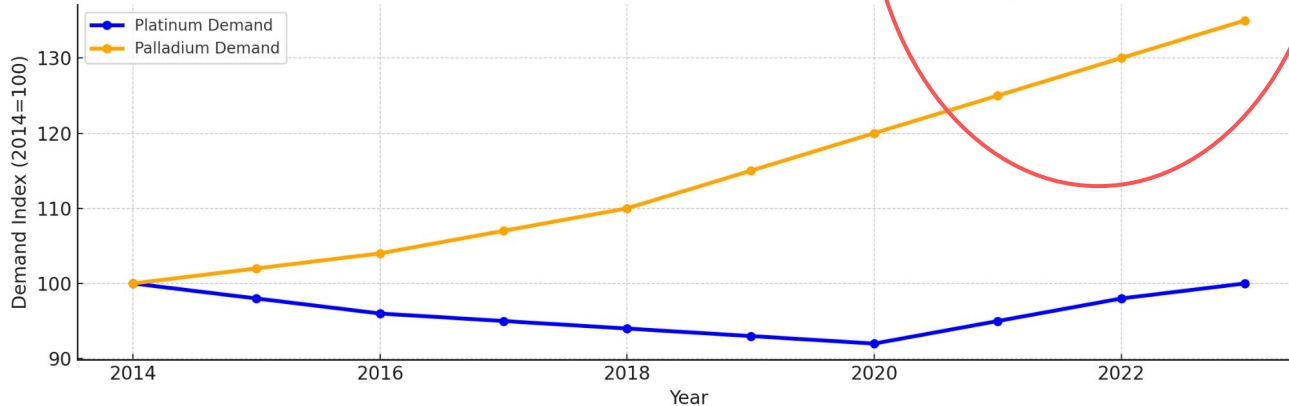


In 2021 - 2023, palladium prices were at an all time high *and* we saw significant increase in YoY demand (~15%), *however* a sharp decline in price (~38%)

Reasons include:

- Supply Recovery / Inventory Release
- Semiconductor Shortage
- Shift to battery EVs
- Market Speculation/Panic
- Platinum Substitution

Platinum and Palladium Market Demand (2014-2023)



Investment Options

ETFs

- Precious metal basket (GLTR)
- Mining, refining, or recycling

Recyclers

- Urban Waste (post-consumer)
- Industrial Waste (Umicore, Johnson Matthey)

Bullion Traders

- Companies that specialize in the sale and purchase of physical platinum and palladium bullion, such as bars and coins (e.g., A-Mark Precious Metals)

Domestic and Foreign Producers

- *Mining Companies*: Companies that mine platinum and palladium (e.g., Sibanye Stillwater, Anglo American Platinum).
- *Integrated Producers*: Companies that mine and refine, often also producing other metals like gold and nickel. Palladium has typically been a byproduct of mining nickel.

Industrial Manufacturers

- Hydrogen Fuel Cell Manufacturers (Ballard, Plug Power)
- Automotive Parts Manufacturers esp. catalytic converters (e.g. BASF, NGK, Continental AG, Bosch)

Refiners

- Precious metal refiners (Asahi, Johnson Matthey)

Jewelry Companies

- Smaller market but equally affected by price (e.g. Tiffany's & Signet)

Futures & Options Traders

- Firms or platforms that facilitate trading in speculating platinum and palladium futures, options, and other derivatives

Mining Equipment Manufacturers

- specialized machinery and equipment used in mining platinum and palladium, e.g. Caterpillar and Komatsu

Exchange Traded Funds

*ETFs are but one avenue for capitalizing on
emerging trends in Platinum & Palladium*

ETFs

PM ETFs allow for a straightforward and cost effective means to invest in PM markets. They provide (in cases of physical metal ETFs) direct exposure to price movements of the underlying metals, allow for portfolio diversification, hedge against inflation, are low cost and highly liquid.

The downside is that they typically do not pay any kind of dividend because the metal stores do not in and of themselves generate income. Equity-backed ETFs like iShares MSCI Global Metals & Mining Producers ETF (PICK) can pay dividends, but they tend to be smaller (2.61% as of 6/11/2024)

ETF: ABRDN Physical Precious Metal Basket Shares (GLTR)

- **Overview**: GLTR provides exposure to a basket of precious metals, including gold, silver, platinum, and palladium. This diversification can help mitigate risks associated with investing in a single metal.
- **Potential Returns**: Moderate. While GLTR offers exposure to platinum and palladium, its returns are also affected by the performance of gold and silver. The diversified nature of the ETF means that it may not capture the full upside of platinum or palladium price movements alone.
- **Expense Ratio**: Approximately 0.60%.

ETF: Aberdeen Standard Physical Palladium Shares (PALL)

- **Overview**: PALL is an ETF that offers direct exposure to the price of palladium by holding physical palladium bullion. It is one of the most popular ETFs for palladium investment.
- **Potential Returns**: High. This ETF has shown strong returns in recent years, especially during periods of high demand for palladium in the automotive industry for catalytic converters. Market conditions such as supply disruptions from major producers (like Russia) and strong demand in the automotive sector can lead to significant price gains.
- **Expense Ratio**: Approximately 0.60%.

ETF: Aberdeen Standard Physical Platinum Shares (PPLT)

- **Overview**: PPLT provides direct exposure to platinum prices by holding physical platinum bullion. This ETF is designed for investors seeking to invest in platinum without dealing with the complexities of storing and insuring physical metal.
- **Potential Returns**: High. The potential for returns is linked to factors such as the growing demand for platinum in hydrogen fuel cell technology, jewelry, and automotive catalytic converters (especially as a substitute for palladium). Additionally, platinum's increasing role in the hydrogen economy could drive future price appreciation.
- **Expense Ratio**: Approximately 0.60%.

ETF: Sprott Physical Platinum and Palladium Trust (SPPP)

- **Overview**: SPPP is a closed-end fund that invests in physical platinum and palladium bullion. It provides exposure to both metals, offering diversification within the precious metals market.
- **Potential Returns**: Moderate to High. The combination of platinum and palladium exposure allows investors to benefit from the price movements of both metals. The trust's performance depends on the demand dynamics for both metals, particularly in the automotive and clean energy sectors.
- **Expense Ratio**: Approximately 0.50%.

ETF: GraniteShares Platinum Trust (PLTM)

- **Overview**: PLTM is an ETF that seeks to reflect the performance of the price of platinum by holding physical platinum bars in vaults. It is designed to provide a simple, cost-effective way to gain exposure to platinum prices.
- **Potential Returns**: Moderate to High. Like PPLT, PLTM is influenced by industrial demand, especially from automotive and jewelry sectors. It also benefits from broader economic trends and inflationary pressures that drive investors toward precious metals.
- **Expense Ratio**: Approximately 0.50%.

Difference to PPLT: Smaller and newer with less liquidity. Less investor confidence and popularity.

Bullion Trader Equities

Platinum & Palladium trading & minted products

Bullion Traders

Bullion trader stocks that specialize in platinum and palladium are involved in the trading of bullion and minted products. These companies often engage in activities such as buying and selling bullion, providing storage services, and offering precious metals to both retail and institutional clients.

- **Market Conditions:** The potential returns of bullion trader stocks depend heavily on market conditions, including industrial demand, geopolitical risks, supply disruptions, and macroeconomic trends.
- **Operational Efficiency:** Companies that demonstrate strong operational efficiency, cost control, and strategic investments in expansion and innovation are more likely to deliver higher returns.
- **Geographic Exposure:** Companies with diversified geographic exposure may be better positioned to manage risks associated with regional supply disruptions or regulatory changes.

The only recommendable pure-play bullion trader we found was A-Mark, however all producers listed in the next section also trade in bullion they may not produce themselves.

Bullion Trader: A-Mark Precious Metals, Inc. (AMRK)

- **Overview**: A-Mark Precious Metals is a full-service precious metals trading company that deals in bullion products, including platinum and palladium. The company offers a range of services, including storage, logistics, and financing for precious metals.
- **Potential Returns**: Moderate. A-Mark offers moderate return potential due to its broad range of services and exposure to multiple precious metals markets. While not solely focused on platinum and palladium, the company's diversified business model provides stability and growth opportunities.

Bullion Trader: A-Mark Precious Metals, Inc. (AMRK)

- **Growth Drivers**: The increasing demand for precious metals as a hedge against inflation and economic uncertainty, as well as growth in trading and storage services, could support future profitability and returns.
- **Dividends**: Has paid quarterly dividends since 2022. Current yield is 2.21%

Producers Equities

Stocks of select Platinum & Palladium producers

Producers

Production stocks specializing in platinum and palladium focus on extracting, refining, and selling these precious metals. These companies are often among the largest producers globally, and their stock prices can be highly correlated with the prices of platinum and palladium

- **Market Conditions:** The potential returns of these mining and production stocks depend heavily on market conditions, including industrial demand, geopolitical risks, supply disruptions, and macroeconomic trends.
- **Operational Efficiency:** Companies demonstrating strong operational efficiency, cost control, and strategic investments in expansion and innovation are more likely to deliver higher returns.
- **Geopolitical Risks:** Companies operating in regions with political instability or regulatory uncertainty may face additional risks that could impact returns.

Producer: Sibanye Stillwater Ltd. (SBSW)

- **Overview**: Sibanye Stillwater is one of the world's largest producers of platinum group metals (PGMs), including platinum, palladium, and rhodium. The company operates in both South Africa and the United States, with a significant portion of its revenue coming from its PGM operations.
- **Potential Returns**: High. The potential returns are high due to Sibanye Stillwater's strong position in the PGM market, particularly palladium, which has seen strong demand and price increases due to its use in automotive catalytic converters. The company's diversified operations across multiple regions also help mitigate risks associated with geographic concentration. Additionally, Sibanye Stillwater has a robust dividend policy, which can enhance total returns for investors.

Producer: Sibanye Stillwater Ltd. (SBSW)

- **Growth Drivers**: Increasing demand for palladium and platinum in the automotive and industrial sectors, coupled with potential supply constraints from other major producing regions like Russia, positions Sibanye Stillwater well for future growth.
- **Dividends**: Dividend policy is to return at least 25% to 35% of normalised earnings to shareholders, netting 1.8% yield.

D/B/A Sibanye-Stillwater Limited, 1M, NYSE O5.03 H5.20 L4.34 C4.56 -0.51 (-10.06%)
SMA (55, close) 10.38
SMA (200, close)



Sibanye Stillwater

(SBSW, Mo. chart)

Producer: Anglo American Platinum Ltd. (ANGPY)

- **Overview**: Anglo American Platinum, a subsidiary of Anglo American plc, is the world's largest primary producer of platinum and a major producer of palladium and rhodium. The company operates extensive mining operations in South Africa and is a key supplier of PGMs globally.
- **Potential Returns**: High. Anglo American Platinum has high potential returns due to its dominant market position in platinum production and significant exposure to palladium and rhodium, which are crucial for catalytic converters. The company's vertically integrated operations, including mining, refining, and marketing, enhance its ability to capture value across the supply chain.

Producer: Anglo American Platinum Ltd. (ANGPY)

- **Growth Drivers**: The company's ability to leverage its market-leading position, coupled with investments in expanding production capacity and technological innovation, supports high growth potential.
- **Dividends**: ANGPY has paid dividends, but has been all over the board. 2023 Q2 was almost **13.5%**, but has sharply declined to almost nothing over the last year.

HI WATER MARK (MAY 2008)

Anglo American Platinum

(ANGPY, Mo. chart)



Producer: Impala Platinum Holdings Ltd. (IMPUY)

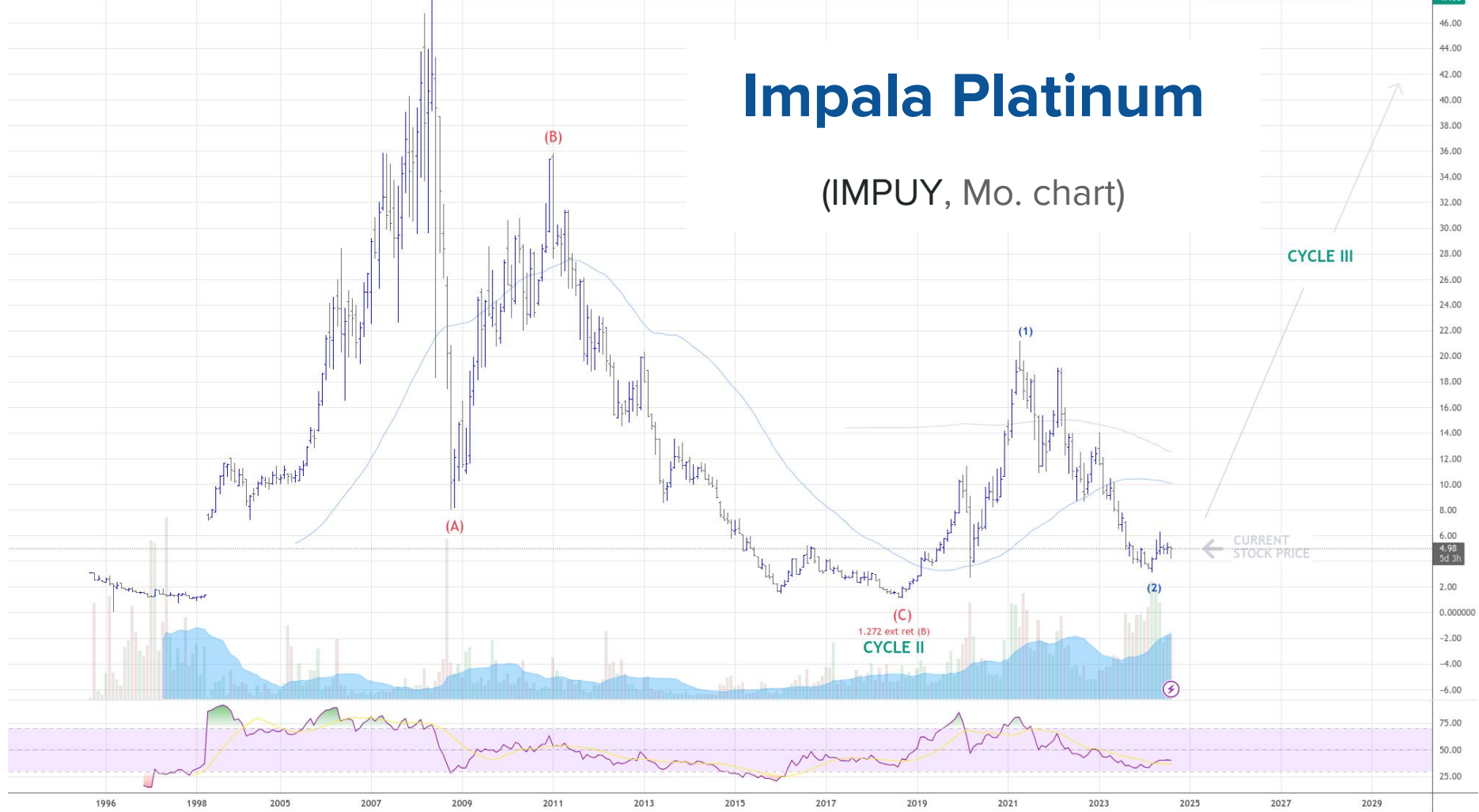
- **Overview**: Impala Platinum (Implats) is a major producer of platinum group metals, with operations primarily in South Africa and Zimbabwe. The company is known for its extensive platinum and palladium reserves and production capabilities.
- **Potential Returns**: High. Implats has high potential returns driven by its substantial platinum and palladium production and strategic position in key PGM-producing regions. The company's focus on operational efficiency and cost control further enhances its profitability and return potential.

Producer: Impala Platinum Holdings Ltd. (IMPUY)

- **Growth Drivers**: Strong demand for PGMs in automotive and industrial sectors, along with strategic initiatives to expand production and improve efficiency, positions Implats for substantial future growth.
- **Dividends**: Dividend yield has been variable as well; current of 1%, but Q2 2023 was at 6.5%.

Impala Platinum

(IMPUY, Mo. chart)



CYCLE III

← CURRENT STOCK PRICE

(C)
1.272 ext ret (B)
CYCLE II

CYCLE I

Producer: Northam Platinum Holdings Ltd. (JSE: NPH)

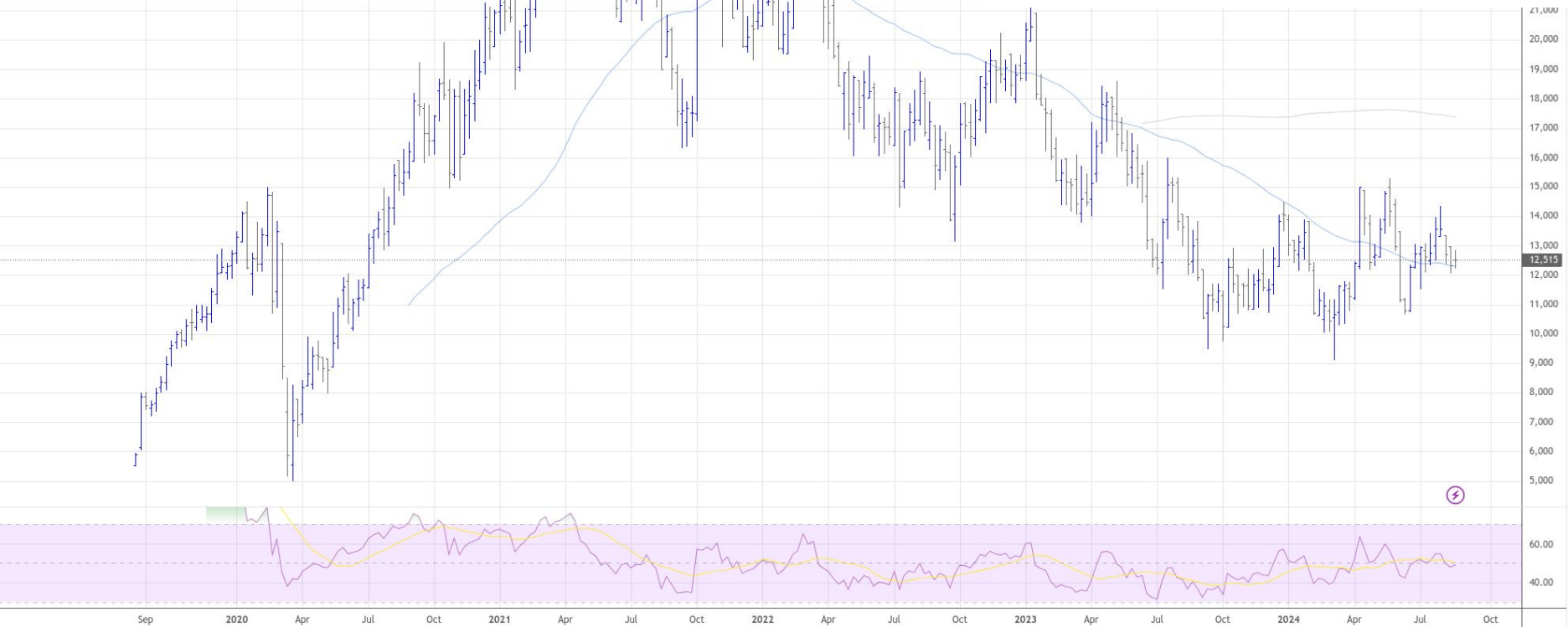
- **Overview**: Northam Platinum is a mid-tier South African producer of platinum group metals, with operations in the Bushveld Complex, one of the richest PGM-bearing areas in the world. The company focuses on platinum, palladium, and rhodium production.
- **Potential Returns**: Moderate to High. Northam Platinum offers moderate to high potential returns due to its focus on expanding production capacity and optimizing operations. The company's exposure to palladium and rhodium, which have seen strong demand growth, provides additional growth opportunities.

Producer: Northam Platinum Holdings Ltd. (JSE: NPH)

- **Growth Drivers**: Continued expansion of production capacity and favorable market conditions for palladium and rhodium could drive profitability and enhance returns for investors.
- **Dividends**: Outperforming dividend yield of 5%, better than almost 75% of global competitors.

Northam Platinum Holdings Ltd.

(NPH, weekly chart)



Fuel Cell Tech Equities

*Stocks of select Platinum & Palladium Fuel Cell Tech
Companies*

Fuel Cell Tech Companies

Hydrogen fuel cell technology companies that utilize platinum and palladium are key players in the transition to clean energy. Platinum and palladium are critical components in hydrogen fuel cells, particularly in Proton Exchange Membrane (PEM) fuel cells, where they act as catalysts for the chemical reactions that generate electricity from hydrogen.

- **Market Adoption and Expansion:** The potential returns of these stocks are heavily influenced by the pace of adoption of hydrogen fuel cell technology across various sectors, including transportation, industrial, and power generation.
- **Technological Advancements:** Companies that continue to innovate in fuel cell technology and reduce costs are more likely to capture a larger market share and deliver higher returns.
- **Policy and Regulatory Support:** Government incentives and policies promoting clean energy and hydrogen technology play a crucial role in driving demand and supporting the growth of these companies.
- **Partnerships and Collaborations:** Strategic partnerships with major automotive, industrial, and energy companies can accelerate market penetration and enhance growth prospects.

Fuel Cell Tech: Plug Power Inc. (PLUG)

- **Overview**: Plug Power is a leading provider of hydrogen fuel cell solutions for the material handling and stationary power markets. The company has expanded into on-road applications, including hydrogen-powered commercial vehicles and plans to develop a green hydrogen ecosystem.
- **Return Potential**: High. Plug Power has high potential returns due to its strong position in the hydrogen economy, aggressive expansion plans, and strategic partnerships with major companies like Amazon and Walmart. The company is investing heavily in building out hydrogen production facilities and fuel cell technology, which could drive significant revenue growth.

Fuel Cell Tech: Plug Power Inc. (PLUG)

- **Growth Drivers**: Increased demand for clean energy solutions, expansion into new markets (e.g., transportation and green hydrogen production), and strategic partnerships with global giants in logistics and retail.
- **Dividends**: Not currently paying dividends.

HI WATER MARK (\$75.49 - WILL BE EXCEEDED)

USD

75.49

72.00

68.00

64.00

60.00

56.00

52.00

48.00

44.00

40.00

36.00

32.00

28.00

24.00

20.00

16.00

12.00

8.00

4.00

2.20

0.0000

80.00

60.00

40.00

20.00

Plug Power Inc.

(PLUG, weekly chart)



Fuel Cell Tech: Ballard Power Systems Inc. (BLDP)

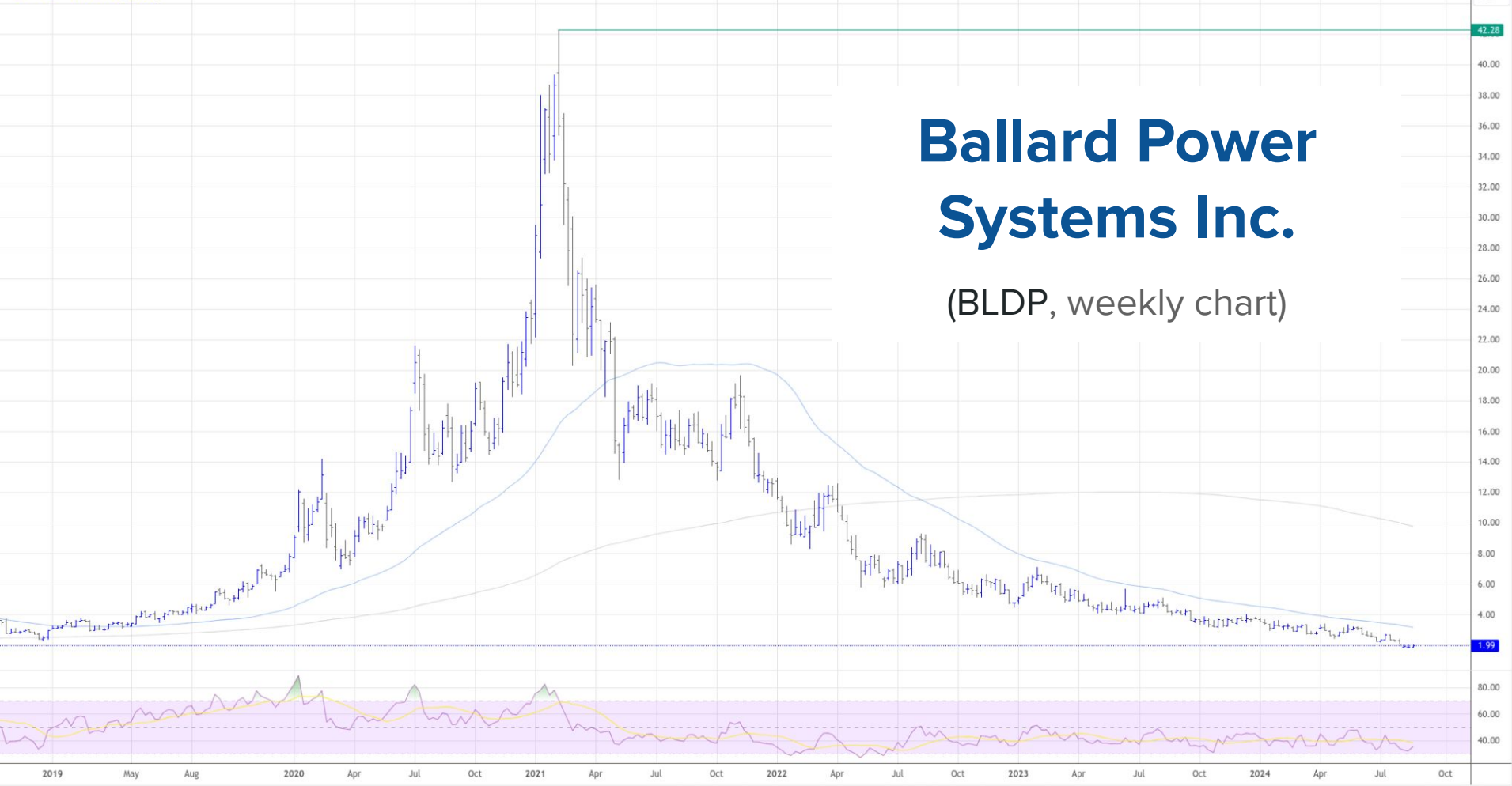
- **Overview**: Ballard Power Systems is a Canadian company that specializes in PEM fuel cell technology, which relies on platinum as a catalyst. Ballard's fuel cells are used in various applications, including buses, trucks, trains, marine vessels, and stationary power generation.
- **Return Potential**: High. Ballard Power has high return potential due to its focus on heavy-duty applications and the growing demand for hydrogen fuel cells in transportation and stationary power sectors. The company's partnerships with major players in the automotive and transportation industries position it well for future growth.

Fuel Cell Tech: Ballard Power Systems Inc. (BLDP)

- **Growth Drivers**: Expansion in the heavy-duty vehicle market, increased adoption of fuel cells for clean transportation solutions, and continued advancements in PEM fuel cell technology.
- **Dividends**: Not currently paying dividends.

H2.01 L1.81 C1.99 +0.11 (+5.85%)

USD



Ballard Power Systems Inc.

(BLDP, weekly chart)

42.28
40.00
38.00
36.00
34.00
32.00
30.00
28.00
26.00
24.00
22.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
1.99

2019 May Aug 2020 Apr Jul Oct 2021 Apr Jul Oct 2022 Apr Jul Oct 2023 Apr Jul Oct 2024 Apr Jul Oct

Fuel Cell Tech: Cummins Inc (CMI)

- **Overview**: Cummins, a global leader in power solutions, has expanded into hydrogen fuel cell technology through its acquisition of Hydrogenics, a company specializing in fuel cells and electrolyzers. Cummins is leveraging its expertise to develop integrated hydrogen solutions for commercial and industrial applications.
- **Return Potential**: Moderate to High. Cummins offers moderate to high return potential due to its established market presence in power solutions and its strategic move into hydrogen technology. The company's strong financial position and broad customer base provide stability, while its investment in hydrogen positions it for future growth.

Fuel Cell Tech: Cummins Inc (CMI)

- **Growth Drivers**: Increased demand for clean energy solutions in commercial and industrial applications, leveraging existing customer relationships and distribution networks to expand hydrogen fuel cell adoption.
- **Dividends**: Current 2.35% dividend yield.

Cummins Inc (CMI)

(monthly chart)



Potential Buy Level

Summary & Insights

Stocks of select Platinum & Palladium producers

Ranked Equity Criteria

Criteria Weighting Table	Description	Weight
Chart - Technicals	Recent 2-5 year performance and assess whether they appear to be undervalued or have high potential for growth	15%
Company Maturity	0-5 years, 6-10 years, 10+ years	25%
Diversity	Risk in single-item exposure	25%
Dividends	Relative weighting to dividends paid, if any	25%
Business Criticality	High weighting for critical piece of the production; ie needed by all consumers of the product or service	10%
Total Must be 100:		100%

Ranked Equity List

		Graded Criteria						
ETF / Fund / Stock	Type	Chart - Technicals	Maturity	Diversity	Dividends	Business Criticality	TOTAL SCORE	RANK
ANGPY: Anglo American Platinum Ltd.d	Stock	4	5	3	5	5	4.35	1
CMI: Cummins Inc	Stock	3	5	5	3	4	4.10	2
IMPUY: Impala Platinum Holdings Ltd.	Stock	4	5	3	4	5	4.10	3
SBSW: Sibanye Stillwater Ltd.	Stock	4	4	4	3	5	3.85	4
BLDP: Ballard Power Systems Inc.	Stock	5	5	3	1	4	3.40	5
NPH: Northam Platinum Holdings Ltd.	Stock	2	5	1	4	4	3.20	6
PLUG: Plug Power Inc.	Stock	5	4	3	1	4	3.15	7
GLTR: ABRDN Physical Precious Metal Basket Shares	ETF	1	4	5	1	2	2.85	8
SPPP: Sprott Physical Platinum and Palladium Trust	ETF	3	4	3	1	3	2.75	9
AMRK: A-Mark Precious Metals, Inc.	Stock	2	3	3	3	1	2.65	10
PALL: ABRDN Standard Physical Palladium	ETF	5	4	1	1	3	2.55	11
PPLT: ABRDN Standard Physical Platinum	ETF	3	4	1	1	3	2.25	12
PLTM: GraniteShares Platinum Trust	ETF	2	3	1	1	2	1.75	13

Recommended mix

We equally weighted Maturity, Diversity, and Dividends, with slightly less focus on Chart Technicals and Business Criticality.

- Using this ranking, Producers came out mostly on top, paying dividends, secure, long term operations while taking advantage of a potential demand increase.
- Fuel Cell Tech companies look strong, especially Cummings (CMI), with its diverse catalog and mature operating model.
- Some ETFs still look potentially interesting, particularly those like GLTR, where a diverse basket and mature fund management mitigates some risk. None of these ETFs paid dividends, so they were at a disadvantage in our scoring.
- Two clusters - one at top 1-5, another at bottom 8-13. Could be due to criteria bias.

Feedback Notes

Producers: Additional research should be done, investigating:

- Balance sheets.
- Many SA firms, particularly Impala, have deep rooted long term investors, pressuring high yield returns. Concerns about lack of modernization, labor and safety improvements and other investments in favor of shareholder returns.
- Platinum & Palladium Reserves each hold in store
- Which markets these stocks are offered in - e.g. what is maturity and stability of the SA Rand vs EU currencies, affecting share price net value and dividend yields

ETFs:

- Research the correlation of prices across PGMs as well as what else is in the basket of GLTR (gold, silver, etc) - does diversification in precious metals really reduce overall risk or do some of these metals trend together?