

PLATINUM-GROUP METALS

(Palladium, platinum, iridium, osmium, rhodium, and ruthenium)

[Data in kilograms, platinum-group-metal (PGM) content, unless otherwise specified]

Domestic Production and Use: One company in Montana produced PGMs with an estimated value of about \$510 million. Small quantities of primary PGMs also were recovered as byproducts of copper-nickel mining in Michigan; however, this material was sold to foreign companies for refining. The leading domestic use for PGMs was in catalytic converters to decrease harmful emissions from automobiles. PGMs are also used in catalysts for bulk-chemical production and petroleum refining; dental and medical devices; electronic applications, such as in computer hard disks, hybridized integrated circuits, and multilayer ceramic capacitors; glass manufacturing; investment; jewelry; and laboratory equipment.

Salient Statistics—United States:	2019	2020	2021	2022	2023^e
Mine production: ¹					
Palladium	14,300	14,600	13,700	10,100	9,800
Platinum	4,150	4,200	4,020	3,000	2,900
Imports for consumption: ²					
Palladium	84,300	76,400	72,600	65,200	64,000
Platinum	42,300	64,900	67,900	64,200	70,000
PGM waste and scrap	35,200	185,000	160,000	41,500	32,000
Iridium	875	1,620	2,310	1,610	1,900
Osmium	⁽³⁾	1	1	1	⁽³⁾
Rhodium	15,000	20,700	16,500	13,200	11,000
Ruthenium	11,200	13,900	18,000	13,300	11,000
Exports: ⁴					
Palladium	55,500	48,600	43,900	42,200	34,000
Platinum	17,400	28,900	29,400	23,100	12,000
PGM waste and scrap	20,800	33,200	37,800	35,200	13,000
Rhodium	1,210	1,480	1,350	677	180
Other PGMs	1,330	1,440	2,180	906	620
Consumption, apparent: ^{5, 6}					
Palladium	85,100	82,300	82,400	74,100	82,000
Platinum	37,000	47,300	51,500	53,100	70,000
Price, dollars per troy ounce: ⁷					
Palladium	1,544.31	2,205.27	2,419.18	2,133.81	1,500
Platinum	866.94	886.02	1,094.31	966.54	1,000
Iridium	1,485.80	1,633.51	5,158.40	4,581.93	4,600
Rhodium	3,918.78	11,205.06	20,254.10	15,585.00	7,700
Ruthenium	262.59	271.83	576.12	577.02	470
Employment, mine, number	1,379	1,475	1,598	1,555	1,500
Net import reliance ^{6, 8} as a percentage of apparent consumption:					
Palladium	34	34	35	31	37
Platinum	67	76	75	77	83

Recycling: About 120,000 kilograms of palladium and platinum were recovered globally from new and old scrap in 2023, including about 42,000 kilograms of palladium and 9,000 kilograms of platinum recovered from automobile catalytic converters in the United States.

Import Sources (2019–22): Palladium: Russia, 32%; South Africa, 31%; Italy, 8%; Canada, 7%; and other, 22%. Platinum: South Africa, 33%; Switzerland, 15%; Germany, 14%; Belgium, 9%; and other, 29%.

Tariff: All unwrought and semimanufactured forms of PGMs are imported duty free. See footnotes for specific Harmonized Tariff Schedule of the United States codes.

Depletion Allowance: 22% (domestic), 14% (foreign).

PLATINUM-GROUP METALS

Government Stockpile:⁹

<u>Material</u>	<u>FY 2023</u>		<u>FY 2024</u>	
	<u>Potential acquisitions</u>	<u>Potential disposals</u>	<u>Potential acquisitions</u>	<u>Potential disposals</u>
Iridium	—	15	—	15
Platinum	—	261	—	261

Events, Trends, and Issues: Production at a domestic mine continued but was constrained owing to an incident that occurred in March 2023 and damaged equipment in a vertical shaft. Production of PGMs in South Africa, the world's leading producer of PGM-containing mined material, decreased compared with that in 2022 owing to disruptions to the supply of electricity and multiple issues related to rail transport. Declining prices also contributed to decreased production. Production in Russia, the world's leading producer of palladium, increased owing to higher metal grades and ore recovery as well as increased processing of inventory. Estimated domestic automobile production increased by 10%, which could increase the demand for palladium, platinum, and rhodium used in catalytic converters. Demand for iridium, platinum, rhodium, and ruthenium in the chemical and electrochemical industries also increased.

The estimated annual average price for platinum in 2023 increased by 3%, and that for iridium was unchanged compared with the average prices in 2022. The estimated annual average price for other PGMs in 2023 decreased—by 51% for rhodium, by 30% for palladium, and by 19% for ruthenium—compared with annual average prices in 2022. Price decreases were attributed to oversupply and decreased demand.

World Mine Production and Reserves: Reserves for the United States were revised based on company reports.

	<u>Mine production</u>				<u>PGM reserves</u> ¹⁰
	<u>Palladium</u>		<u>Platinum</u>		
	<u>2022</u>	<u>2023^e</u>	<u>2022</u>	<u>2023^e</u>	
United States	10,100	9,800	3,000	2,900	820,000
Canada	16,100	16,000	5,400	5,500	310,000
Russia ^e	87,000	92,000	20,000	23,000	5,500,000
South Africa	73,100	71,000	124,000	120,000	63,000,000
Zimbabwe	14,300	15,000	17,000	19,000	1,200,000
Other countries	2,700	2,700	4,580	4,600	NA
World total (rounded)	<u>203,000</u>	<u>210,000</u>	<u>174,000</u>	<u>180,000</u>	<u>71,000,000</u>

World Resources:¹⁰ World resources of PGMs are estimated to total more than 100 million kilograms. The largest resources and reserves are in the Bushveld Complex in South Africa.

Substitutes: Palladium has been used as a substitute for platinum in most gasoline-engine catalytic converters because of the historically lower price for palladium relative to that of platinum. About 25% of palladium can routinely be substituted for platinum in diesel catalytic converters; the proportion can be as much as 50% in some applications. For some industrial end uses, one PGM can substitute for another, but with losses in efficiency.

^eEstimated. NA Not available. — Zero.

¹Estimated from published sources.

²Includes data for the following Harmonized Tariff Schedule of the United States codes: 7110.11.0010, 7110.11.0020, 7110.11.0050, 7110.19.0000, 7110.21.0000, 7110.29.0000, 7110.31.0000, 7110.39.0000, 7110.41.0010, 7110.41.0020, 7110.41.0030, 7110.49.0010, and 7118.90.0020 (2019–23); 7112.92.0000 (2019–21); and 7112.92.0100 (2022–23).

³Less than ½ unit.

⁴Includes data for the following Schedule B codes: 7110.11.0000, 7110.19.0000, 7110.21.0000, 7110.29.0000, 7110.31.0000, 7110.39.0000, 7110.41.0000, and 7110.49.0000 (2019–23); 7112.92.0000 (2019–21); and 7112.92.0100 (2022–23).

⁵Defined as primary production + secondary production + imports – exports.

⁶Excludes imports and (or) exports of waste and scrap.

⁷Engelhard unfabricated metal average annual prices. Source: S&P Global Platts Metals Week.

⁸Defined as imports – exports.

⁹See Appendix B for definitions.

¹⁰See Appendix C for resource and reserve definitions and information concerning data sources.