

## PLATINUM-GROUP METALS

(Platinum, palladium, rhodium, ruthenium, iridium, and osmium)  
(Data in kilograms of metal content unless otherwise noted)

**Domestic Production and Use:** In 2016, one domestic company produced about 17,000 kilograms of platinum-group metals (PGMs) with an estimated value of about \$390 million from its two mines in south-central Montana. Small quantities of primary PGMs were also recovered as byproducts of copper refining. The leading 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; in electronic applications, such as in computer hard disks, in multilayer ceramic capacitors, and in hybridized integrated circuits; in glass manufacturing; in jewelry; and in laboratory equipment. Platinum is used in the medical sector; platinum and palladium, along with gold-silver-copper-zinc alloys, are used as dental restorative materials. Platinum, palladium, and rhodium are used as investments as exchange-traded products, and individual holding of physical bars and coins.

| <b>Salient Statistics—United States:</b>                                  | <b>2012</b> | <b>2013</b> | <b>2014</b> | <b>2015</b> | <b>2016<sup>e</sup></b> |
|---|-------------|-------------|-------------|-------------|-------------------------|
| Mine production: <sup>1</sup>   |             |             |             |             |                         |
| Platinum  | 3,670       | 3,720       | 3,660       | 3,670       | 3,900                   |
| Palladium   | 12,300      | 12,600      | 12,400      | 12,500      | 13,200                  |
| Imports for consumption:  |             |             |             |             |                         |
| Platinum <sup>2,3</sup>   | 44,700      | 38,600      | 45,800      | 42,700      | 47,000                  |
| Platinum waste and scrap  | 127,000     | 77,200      | 112,000     | 123,000     | 189,000                 |
| Palladium   | 80,100      | 83,100      | 92,400      | 82,500      | 70,000                  |
| Rhodium   | 12,800      | 11,100      | 11,100      | 10,600      | 11,000                  |
| Ruthenium   | 10,200      | 15,300      | 11,100      | 8,230       | 7,000                   |
| Iridium   | 1,230       | 1,720       | 1,990       | 1,010       | 1,000                   |
| Osmium  | 130         | 77          | 322         | 8           | 3                       |
| Exports:  |             |             |             |             |                         |
| Platinum <sup>3</sup>   | 8,630       | 11,200      | 14,800      | 14,400      | 10,000                  |
| Platinum waste and scrap  | 84,800      | 364,000     | 254,000     | 246,000     | 287,000                 |
| Palladium   | 32,200      | 25,900      | 22,500      | 23,000      | 19,000                  |
| Rhodium   | 1,040       | 1,220       | 428         | 758         | 800                     |
| Other PGMs  | 1,640       | 1,320       | 901         | 782         | 600                     |
| Price, <sup>4</sup> dollars per troy ounce:                               |             |             |             |             |                         |
| Platinum  | 1,555.39    | 1,489.57    | 1,387.89    | 1,056.09    | 1,000.00                |
| Palladium   | 649.27      | 729.58      | 809.89      | 694.99      | 615.00                  |
| Rhodium   | 1,274.98    | 1,069.10    | 1,174.23    | 954.90      | 670.00                  |
| Ruthenium   | 112.26      | 75.63       | 65.13       | 47.63       | 42.00                   |
| Iridium   | 1,066.23    | 826.45      | 556.19      | 544.19      | 575.00                  |
| Employment, mine, number <sup>1</sup>                                     | 1,670       | 1,780       | 1,620       | 1,440       | 1,400                   |
| Net import reliance <sup>5</sup> as a percentage of apparent consumption: |             |             |             |             |                         |
| Platinum <sup>2</sup>   | 73          | 67          | 67          | 69          | 73                      |
| Palladium   | 57          | 60          | 65          | 52          | 48                      |

**Recycling:** About 125,000 kilograms of platinum, palladium, and rhodium was recovered globally from new and old scrap in 2016, including about 56,000 kilograms recovered from automobile catalytic converters in the United States.

**Import Sources (2012–15):** Platinum:<sup>2</sup> South Africa, 39%; Germany and United Kingdom, 13% each; Italy, 7%; and other, 28%. Palladium: South Africa, 27%; Russia, 24%; Italy, 13%; United Kingdom, 8%; and other, 28%.

**Tariff:** All unwrought and semimanufactured forms of PGMs are imported duty free.

**Depletion Allowance:** 22% (Domestic), 14% (Foreign).

### **Government Stockpile:**

#### **Stockpile Status—9–30–16<sup>6</sup>**

| <b>Material</b> | <b>Inventory</b> | <b>Disposal Plan<br/>FY 2016</b> | <b>Disposals<br/>FY 2016</b> |
|-----------------|------------------|----------------------------------|------------------------------|
| Platinum        | 261              | —                                | —                            |
| Iridium         | 15               | —                                | —                            |

## PLATINUM-GROUP METALS

**Events, Trends, and Issues:** Metal prices remained low in 2016. With the exception of iridium, the annual average prices for all PGMs decreased from 2015. The annual average price for rhodium, which dropped by about 30% to its lowest level since 2003, was in response to weak industrial demand and selloff by investors. From July through September, the monthly average price for rhodium was below that for palladium for the first time ever. In January, the average monthly price for platinum was at its lowest level since 2008. The monthly average prices for platinum and palladium trended upward from January through August before decreasing in September. Daily prices for platinum remained below those for gold for the entire year. Monthly average iridium prices increased significantly from July through September, owing to increased buying by industrial consumers in Asia and a lack of iridium available from producers in South Africa.

Production by the sole U.S. PGM-mining company increased by 6% from that in 2015. The company accelerated the schedule for expansion development adjacent to one of its mines, anticipating first production in late 2017 or early 2018. The company continued to increase recovery of PGMs from recycled catalytic converters.

Low metal prices continued to adversely affect the mining industry in South Africa, the world's leading producer of platinum. Faced with lower earnings, mining companies continued efforts to cut costs by lowering production, selling or closing mines, and reducing the workforce. Some mines were placed on care-and-maintenance status; one company placed all expansion plans on hold until 2017. Mines continued to face safety failures and labor unrest. The leading mining companies began wage negotiations with workers in July. In September, after wage negotiations with the two leading producers reached an impasse, workers at one of the companies went on strike. In 2014, a 5-month-long workers' strike significantly reduced production.

Introduction of more stringent emission standards for automobiles in some countries is expected to result in increased demand for palladium, platinum, and rhodium for use in catalytic converters. Automobile production increased in developing countries, which in turn is expected to increase demand for PGMs beyond 2016.

**World Mine Production and Reserves:** Reserves estimates for Zimbabwe were included based on company data.

|                       | Mine production |                   |           |                   | PGMs Reserves <sup>7</sup> |
|-----------------------|-----------------|-------------------|-----------|-------------------|----------------------------|
|                       | Platinum        |                   | Palladium |                   |                            |
|                       | 2015            | 2016 <sup>e</sup> | 2015      | 2016 <sup>e</sup> |                            |
| United States         | 3,670           | 3,900             | 12,500    | 13,200            | 900,000                    |
| Canada                | 7,600           | 9,000             | 21,000    | 23,000            | 310,000                    |
| Russia                | 22,000          | 23,000            | 81,000    | 82,000            | 1,100,000                  |
| South Africa          | 139,000         | 120,000           | 83,000    | 73,000            | 63,000,000                 |
| Zimbabwe              | 12,600          | 13,000            | 10,000    | 10,000            | 1,200,000                  |
| Other countries       | 4,000           | 3,400             | 8,300     | 6,600             | NA                         |
| World total (rounded) | 189,000         | 172,000           | 216,000   | 208,000           | 67,000,000                 |

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

**Substitutes:** Less-expensive palladium has been substituted for platinum in most gasoline-engine catalytic converters. About 25% 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.

<sup>e</sup>Estimated. NA Not available. — Zero.

<sup>1</sup>Estimates from published sources.

<sup>2</sup>Data series revised to exclude imports of waste and scrap.

<sup>3</sup>Includes data for the following HTS codes: 7110.11.0000, 7110.11.0010, 7110.11.0020, 7110.11.0050, 7110.19.0000, 7110.21.0000, 7110.29.0000, 7110.31.0000, 7110.39.0000, 7110.41.0000, 7110.41.0010, 7110.41.0020, 7110.41.0030, 7110.49.0000, 7110.49.0010, and 7118.90.0020.

<sup>4</sup>Engelhard Corp. unfabricated metal.

<sup>5</sup>Defined as imports – exports + adjustments for industry stock changes.

<sup>6</sup>See [Appendix B](#) for definitions.

<sup>7</sup>See [Appendix C](#) for resource and reserve definitions and information concerning data sources.