



2014 Minerals Yearbook

GREECE

THE MINERAL INDUSTRY OF GREECE

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Greece is a moderately developed, mountainous country with a long coastline in southeastern Europe that borders Albania, Bulgaria, Macedonia, and Turkey. The country's territory consists of a peninsular mainland at the southern tip of the Balkan Peninsula and about 2,000 islands in the Aegean, Ionian, and Mediterranean Seas. Despite its relatively small size, Greece has significant extractable deposits of a variety of minerals, particularly metals, such as aluminum, bauxite, copper, gold, nickel, silver, and zinc; industrial minerals, such as bentonite, feldspar, gypsum, huntite (a magnesium carbonate mineral used as a fire retardant for polymers), kaolin, magnesite, perlite, and pumice; and mineral fuels, such as lignite coal. The total gross value of indicated resources of metals was EUR72 billion (\$92 billion¹), while that of indicated resources of industrial minerals and stones was about EUR60 billion (\$77 billion). The total gross value of indicated resources of mineral fuels and related materials was estimated to be EUR1,362 billion (\$1,739 billion), of which lignite coal made up EUR268 billion (\$342 billion); petroleum EUR685 billion (\$875 billion); and natural gas, EUR409 billion (\$522 billion). The total gross value of proven and probable reserves of minerals in Greece was estimated to be about EUR1.5 trillion (\$1.9 trillion) (Tsirambides and Flippidis, 2012a, p. 709; 2012c, p. 642; 2013, p. 1; Charalampides and others, 2013, p. 144–145; Encyclopedia of the Nations, 2014; U.S. Central Intelligence Agency, 2014).

The mineral industry of Greece continued to maintain leading positions regionally and globally in the production and exporting of bentonite, huntite, magnesite, perlite, and pumice, despite the lingering effects of the country's multiyear economic recession, which has significantly reduced investment in the mineral industry and domestic consumption of mineral commodities since 2008. In 2014, Greece was the world's 2d-ranked perlite producer, 3d-ranked pumice producer, 4th-ranked bentonite producer, and 12th-ranked bauxite producer. The country accounted for about 27% of world perlite production in 2014; pumice, 7%; bentonite, 6%; and bauxite, 1% (Tsirambides and Flippidis, 2012b, p. 38; Bennett, 2016; Bray, 2016a, b; Crangle, 2016; Flanagan, 2016).

Recent mineral exploration by private companies and geologic studies conducted by the Institute of Geology and Mining Exploration (IGME) onshore and the two-dimensional seismic survey of Greece's Exclusive Economic Zone (EEZ) offshore in the Ionian and Mediterranean Seas, which were completed in 2013, have increased estimates of the country's indicated resources of minerals, in particular precious metals and mineral fuels. Greece had estimated resources of 2.6 Mt of copper, 2.4 Mt of manganese, 1.5 Mt of nickel, 1.2 Mt of chromite, 2,800 metric tons (t) of silver, and 500 t of gold. Greece's industrial mineral resources were estimated to contain

1,200 million metric tons (Mt) of perlite, 600 Mt of zeolites, 400 Mt of pozzolan and pumice, 350 Mt of gypsum, 280 Mt of magnesite, 250 Mt of bauxite, 100 Mt each of bentonite and diatomite, 80 Mt of feldspar, 50 Mt each of olivinite and kaolin, 5 Mt of quartz, and 4 Mt of huntite. Mineral fuel resources were estimated to be 6,700 Mt of lignite coal, 10 billion barrels of petroleum, 3.5 trillion cubic meters of natural gas, and 1,800 t of uranium. Oil and gas shale reservoirs were also present in Greece (Charalampides and others, 2013, p. 144, 145; Tsirambides and Flippidis, 2013, p. 1, 4; GeoExPro, 2014; Institute of Geology and Mineral Exploration, 2014; Tsirambides, 2015, p. 1, 5).

Minerals in the National Economy

In 2014, Greece's real gross domestic product (GDP) increased by 0.8%, which was the first time that it increased since 2007. The nominal GDP was \$237.6 billion in 2014. The increase in economic activity after 5 years of continuous contraction in Greece was mainly owing to an increase in private consumption and net exports. Exports of services increased mainly owing to tourism and shipping sector exports; exports of goods also rose. Investment increased for the first time since 2008 mainly owing to investment in equipment by private industry (European Commission, 2015b, p. 80; Hellenic Statistical Authority, 2015a, p. 1; World Bank, 2015).

Historically, mineral extraction and processing has been an important segment of Greece's industrial production, but its significance has declined in the past 20 years. The contribution to GDP of the mineral industry, which included quarrying, processing, and production of intermediate and final products, decreased to 2% in 2014 from between 3% and 5% in past years. This decrease was owing in part to the continuing effects of the global economic downturn since 2009, which has reduced global demand for and global prices of key mineral commodities produced by Greece, such as cement and steel, and in part to reduced business investment in mineral extraction. The cumulative nominal value of Greece's mineral production for the 6 years between 2009 and 2014 was about EUR18 billion to EUR20 billion (\$23 billion to \$26 billion). The mineral industry employed about 23,000 workers in 2014 (Tsirambides and Flippidis, 2012b, p. 38; Charalampides and others, 2013, p. 144; Greek Mining Enterprises Association, 2014, p. 2; Tzeferis, 2015, p. 2, 3).

Most segments of Greece's industry continued to contract in 2014, but at a lower rate than they did in 2013. Total industrial production decreased by 2.7% in 2014, which was less than the 3.2% decrease in 2013, whereas manufacturing output increased by 0.7% compared with a decrease of 1.1% in 2013. Mining and quarrying output decreased by 0.5% in 2014 compared with a decrease of 11.5% in 2013. The mining of coal and lignite decreased by 6.7% in 2014 (14.4% in 2013); the extraction of crude petroleum and natural gas, by 15.5% (7.9% in 2013);

¹Where necessary, values have been converted from euro area euros (EUR) to U.S. dollars (US\$) at an average rate of EUR0.784=US\$1.00 for 2014 and EUR0.783=US\$1.00 for 2013.

the manufacture of nonmetallic mineral products, by 0.2% (1.9% in 2013); and the manufacture of fabricated metal products, by 1.3% (8.2% in 2013). The mining of metal ores increased by 4.0% in 2014 compared with a decrease of 15.3% in 2013, while the manufacture of base metals increased by 5.5% compared with a decrease of 4.9% in the previous year. The manufacture of coke and refined petroleum products increased by 7.3% in 2014 compared with an increase of 4.2% in 2013 (Hellenic Statistical Authority, 2015f, p. 4).

Government Policies and Programs

In 2014, the mineral industry was regulated by the Mining Code of 1973, Legislative Decree 210/1973, as amended by a number of laws and ordinances on technical and procedural issues, such as law No. 669/1977 on the exploitation of ornamental rocks and industrial minerals; law No. 428/84, as amended by law No. 2115/93 on the exploitation of aggregates; and the Regulation on Mining and Quarrying Activities, KMLE, MD2223/11, which included the Health and Safety Regulation for Mining. Greece's mineral industry was also subject to the European Union's Environmental Impact Directives 85/337/EC and 97/11/EC, the Habitats Directive 92/43/EC, and the Mining Waste Directive 2006/21/EC. In 2012, royalties were increased on the stages of mineral production. Specifically, a 12% royalty was imposed on the ore sale price "ex works," 8% on free on board (f.o.b.) price, 4% on f.o.b. price following mechanical preparation (crushing), 2% on concentrates, and 1.5% on final product (United Nations, 2012, p. 16; Bahas, Gramatidis and Partners, 2013; Greek Mining Enterprises Association, 2014, p. 7).

The Acceleration and Transparency Regarding the Realization of Strategic Investments Law of 2010, law No. 3894/2010 (known as the Fast-Track Law), set up expedited licensing by Enterprise Greece, the public investment promotion authority, for qualifying investments in industry and energy, among other sectors, if the invested funds exceed a specified threshold or create a specified number of new jobs. In June 2014, this law was supplemented by law No. 4262/2014, which simplified the licensing procedure for the exercise of business activities and other provisions in economically important sectors, such as mining and energy (G. Verveniotis and Partners, 2014, p. 2; Government Gazette of the Hellenic Republic, 2014; U.S. Department of State, 2015, p. 6).

Minerals are legally classified as either quarry minerals or ores. Quarry minerals are divided into three subcategories: aggregates, ornamental rocks, and industrial minerals. Quarries are required to be located in areas with suitable geologic resources in predefined quarrying areas in accordance with law No. 1428/84, as amended by law No. 2115/93. Ores include metals and their compounds, radioactive minerals, and mineral fuels, as well as asbestos, feldspar, fluoride, salt, sulfur, and talc. Quarry minerals belong to the owner of the land, who holds an exclusive right to explore and extract them, while ores belong to the State and are conceded with a presidential decree or in rare cases, leased. The National Policy for the Strategic Planning and Exploitation of Mineral Resources was adopted in February 2012 to ensure the supply of minerals to society in a sustainable way and in compliance with national

development policies (United Nations, 2012, p. 16, 17; Ministry of Environment, Energy, and Climate Change, 2013, p. 18; Greek Mining Enterprises Association, 2014, p. 7; Tzeferis, 2015, p. 7).

Licenses for mineral exploration (stage 1) and mining concessions (stage 2) are issued by a presidential decree after consultation with the Ministry of Reconstruction of Production, Environment and Energy (YPAPEN, formerly known as YPEKA). The mining concession only establishes the right of mine ownership for the holder of the exploration license. Mineral extraction at the site of the concession requires an exploitation permit (stage 3) that is contingent upon the approval of an Environmental Impact Assessment (EIA) study by the YPAPEN. The YPAPEN is the competent authority for controlling the technical and environmental impacts of mineral development activities and ensuring that mineral extraction is in line with the economic interests of Greece. The IGME advises the YPAPEN on geologic and technical aspects of projects. Inspectorates of Mines of Northern and Southern Greece are responsible for supervising the compliance of mines with the provisions of the mining laws and regulations (United Nations, 2012, p. 16–20; Greek Mining Enterprises Association, 2014, p. 7).

Upstream oil and gas activities in Greece are governed by the Hydrocarbons Law, Law No. 2289/1995, as amended in 2011 to incorporate the European Union (EU) Directive 94/22/EC on the conditions for granting and using authorizations for the prospecting, exploration, and production of hydrocarbons. The Hellenic Hydrocarbons Resources Management Company S.A. (HHRM) manages hydrocarbons prospecting, exploration, and exploitation rights onshore and offshore on behalf of the Government under supervision by the YPAPEN. Nonexclusive prospecting licenses are issued for a term of 18 months. Exclusive rights to hydrocarbons exploration and exploitation in specific areas are granted to private parties either through a lease agreement or a production-sharing agreement (PSA) with the HHRM following an invitation to tender. The maximum duration of the exploration stage is 7 years for onshore areas and 8 years for offshore, while that of the exploitation stage is 25 years and may be extended for two 5-year periods (Assimakis and others, 2015).

Production

In 2014, the output of the mineral industry of Greece continued to decrease in terms of both total value and volume, as it has done since 2009. The production of most minerals, however, did not change substantially from that of 2013. The production of screened perlite increased by 17%; crude perlite, by 11%; lead (mine output, Pb content) and nickel (metal, Ni content of ferronickel), by 9% each; iron ore, by 7%; and marble, by 5%. Silica output decreased by 100%; huntite, by 65%; salt, by 23%; crude petroleum, by 16%; gypsum and anhydrite, by 13%; lignite coal, by 8%; and natural gas, by 7% (table 1).

Structure of the Mineral Industry

The majority of Greece's mining companies were privately owned. Government ownership was limited primarily to the mineral fuels sector and nickel. The State owned 55.2% of the shares of LARCO G.M.M. S.A., which was the fifth-ranked nickel-producing company in the world. S&B Industrial Minerals S.A., which was the leading producer of such industrial minerals as bentonite and perlite in Greece, was acquired in November 2014 by Imerys S.A. of France, which was the world's leading industrial minerals group. The acquisition included the entire operations of the group except for its bauxite operations. Greece's major mineral commodities and the companies that produced them in 2014 are listed in table 2 (Enterprise Greece, 2012; Imerys S.A., 2014, p. 1; O'Driscoll, 2015, p. 1; Tzeferis, 2015, p. 6).

In 2014, 181 marble quarries were operating in Greece. About 80 of them (44%) were located in the Prefectures of Drama and Kavala in the Eastern Macedonia region and accounted for 82% of the country's total marble production. Ten marble quarries on the Cyclades Islands made up about 11% of marble output, and 25 quarries in Sterea Helles accounted for 4% of output. Approximately 150 quarries in about 120 authorized quarry sites in rural areas of Greece produced construction aggregates, such as gravel, sand, and stone; authorized quarries produced about one-half of the total annual aggregate output (Ministry of Environment, Energy, and Climate Change, 2013, p. 22; Laskaridis and others, 2014, p. 16, 17; Tzeferis, 2015, p. 7).

Mineral Trade

The total value of Greece's exports decreased by 1.3% to about EUR27.2 billion (\$34.7 billion) in 2014, whereas total imports increased by 2.3% to about EUR48.0 billion (\$61.2 billion). As a result, the country's trade deficit increased by 7.4% to reach EUR20.8 billion (\$26.5 billion). Other EU member states were Greece's leading trade partners, accounting for 48% of its exports and imports (Hellenic Statistical Authority, 2015b, p. 2; 2015d).

Mineral fuels, lubricants, and related materials continued to be the leading export and import goods of Greece. In 2014, they accounted for about 38% of total exports and about 33% of imports by value. The main destinations of Greece's exports of mineral fuels, lubricants, and related materials were Turkey (23%), Saudi Arabia (6%), Italy (6%), Gibraltar (6%), Lebanon (5%), Egypt (5%), Macedonia (4%), Cyprus (4%), and Bulgaria (2%). The main sources of Greece's imports of mineral fuels, lubricants, and related materials were Russia (28%), Iraq (24%), Kazakhstan (15%), Saudi Arabia (7%), Egypt (4%), Libya (4%), and Azerbaijan (2%) (Hellenic Statistical Authority, 2015c, d).

The mineral industry of Greece was highly export-oriented owing in large part to the significant decrease in the domestic consumption of minerals since 2008. Exports accounted for about 65% to 70% of the industry's total value of sales and were cumulatively valued at about EUR10 billion (\$13 billion) or about 7% of total exports for the 2009–14 time period. The leading mineral commodity exports were aluminum, bauxite, bentonite, magnesite, marble, nickel, perlite, and pumice in 2014. Greece exported about 1.0 Mt of bentonite, which

accounted for almost 100% of output. The country's marble exports increased substantially over the past 5 years to reach 776,000 t in 2014. China was the leading importer of marble from Greece and accounted for 57% of marble exports by weight and 38% by value; it was followed by the United States, the United Arab Emirates, Saudi Arabia, Singapore, Qatar, Italy, and Turkey. Greece exported 422,000 t of bauxite in 2014, which accounted for 22% of the country's bauxite output. It also exported most of its pumice output of about 430,000 t to the United States and other EU member states. Greece's aluminum exports to other EU member states increased to 106,800 t in 2014 from 100,900 t in 2013, while exports to non-EU countries worldwide increased to 5,500 t from 2,400 t in 2013. Exports accounted for 66% of aluminum (primary metal) output (Hellenic Statistical Authority, 2015e; Tzeferis, 2015, p. 3–10).

Greece's exports to the United States were valued at \$1.05 billion in 2014. Mineral exports to the United States included aluminum and bauxite, \$63.7 million; cement, sand, and stone, \$59.7 million; petroleum products, \$8.4 million; iron and steel products, \$2.2 million; organic chemicals, \$2.1 million; and nickel, \$204,000. Greece's imports from the United States were valued at \$773.2 million. Mineral imports from the United States, included petroleum products, \$58.3 million; copper, \$31.7 million; nonferrous metals, \$2.4 million; iron and steel products, \$854,000; aluminum and alumina, \$312,000; and natural gas liquids, \$246,000 (U.S. Census Bureau, 2015a, b).

Commodity Review

Metals

Bauxite and Alumina and Aluminum.—Greece continued to be a leading bauxite producer among EU countries. Total bauxite output remained at about the same level as in 2013, which provided for the entire domestic demand for metallurgical use by aluminum producers, and for nonmetallurgical use by cement and steel producers as well as contributing to the country's mineral exports. The three leading producers of bauxite in Greece were European Bauxites S.A., with output of 970,000 t; Delphi Distomon S.A., 633,000 t; and Hellenic Mining Enterprises S.A., 269,000 t (Tzeferis, 2015, p. 4).

Aluminium S.A., which was the largest integrated producer of aluminum and alumina in Greece and the EU, produced about the same amount of aluminum in 2014 as in 2013, consuming more than 75% of the country's production of bauxite ore. The company's production of alumina hydrate increased to match its 2011 levels, which allowed for increased production of ceramics and filters (Tzeferis, 2015, p. 4).

Gold, Lead, Silver, and Zinc.—Hellas Gold S.A., which was a subsidiary of Eldorado Gold Corp. of Canada, produced about 220,000 t of lead, zinc, and iron concentrates in 2014, which was about the same level as in 2013. The company exported about EUR18 million (\$23 million) worth of lead sulfide concentrates and EUR22 million (\$28 million) worth of zinc sulfide concentrates. It shipped its concentrates from the Ports of Stratoni and Thessaloniki to facilities in Europe (Tzeferis, 2015, p. 4–5).

In 2014, Hellas Gold mined and processed 219,861 t of ore grading at 178 grams per metric tons (g/t) silver, 5.9%

lead, and 10.5% zinc at the Stratoni underground silver-lead-zinc mine, which is located on the Halkidi Peninsula in northern Greece and produced 58,375 t of lead, silver, and zinc concentrate. The company used a multistage flotation process to extract a lead-zinc concentrate and a zinc concentrate. The Stratoni Mine's estimated proven and probable reserves (reported as "2P reserves") were 128 t of silver, 54,000 t of lead, and 80,000 t of zinc. In 2014, Hellas Gold also produced 503 kilograms (kg) of gold through tailings retreatment at the pre-existing Olympias gold-silver-lead-zinc mine at Halkidi. The Olympias Mine's estimated 2P reserves were 120 t of gold, 1,880 t of silver, 693,000 t of lead, and 921,000 t of zinc (Eldorado Gold Corp., 2015a, d).

Hellas Gold was in the process of developing the Skouries gold-copper porphyry deposit at Halkidi and the Perama Hill epithermal gold-silver deposit, which is located in the Thrace region of northern Greece. The estimated proven reserves were 86 t of gold, 9 t of silver, and 394,000 t of copper, and the estimated probable reserves were 78 t of gold, 31 t of silver, and 382,000 t of copper (Eldorado Gold Corp., 2015b, c).

Nickel.—Greece was the only country in the EU with extensive nickel laterite deposits. Larco G.M.M. S.A., which was a leading producer of nickel and ferronickel in Europe and the only European consumer of Greece's nickel ore output, mined sedimentary-type nickel laterite deposits by surface (open pit) and underground mining methods. In 2014, the company's nickel production increased by 10%, while its sales volume rose by 5%. Larco mined 2.4 Mt of nickeliferous laterite ore from the Agios Ioanis, Evia, and Kastoria Mines in 2014 compared with 2.2 Mt in 2013. The company continued to incur financial losses, although at a lower level than in the previous year. The Government explored the possibility of inviting a strategic investor for Larco and announced plans to restructure the company ahead of its privatization. In March 2014, the European Commission (EC) found that Larco had received state aid in breach of EU rules, which gave it an undue advantage over its competitors. The Commission ordered the company to pay back funds provided by the Government and public guarantees with interest. It also determined that the repayment obligation would not be assumed by prospective buyers of Larco's assets through privatization (European Commission, 2014b; Larco G.M.M. S.A., 2014; Tzeferis, 2015, p. 3–4).

Industrial Minerals

Bentonite and Perlite.—The production of bentonite and perlite ores from the island of Milos and other locations in the country remained about the same in 2014 as in 2013. S&B Industrial Minerals S.A. maintained its position as the leading producer of bentonite in Europe and the largest exporter of bentonite in the world. The company's sales of bentonite consisted entirely of exports. S&B Industrial Minerals was acquired by Imerys of France in November 2014. The acquisition of S&B Industrial Minerals constituted the largest ever foreign investment made into a Greek-owned business by monetary value (Tzeferis, 2015, p. 6).

Cement.—Cement production continued to increase at a slow rate and recovered some of its losses from the substantial

contraction of the Greek construction industry since 2008. Cement consumption in Greece was about 2.5 Mt in 2014, which was 80% below its 2006 peak of 11.6 Mt. It continued to be driven by public infrastructure projects, some of which were resumed during the year. Residential construction remained at a relatively low level (Hellenic Cement Industry Association, 2014; TITAN Group, 2015, p. 28, 29; Tzeferis, 2015, p. 3).

TITAN Group, which was the leading cement producer in Greece and Southeastern Europe, returned to profitability in 2014 after incurring losses in the previous 2 years. This was in part owing to increased demand for building materials and the relaunching of road building in Greece. Capacity utilization at TITAN's cement plants in Greece was dependent on exports and in particular the level of demand for cement by countries with low energy costs and no carbon dioxide emission constraints (Global Cement, 2015).

Magnesite.—Grecian Magnesite S.A., which was a leading magnesite producer and exporter in the EU and in the world, operated mines and production sites at Chalkidi on the Halkidi Peninsula in northern Greece. The Chalkidi deposits consisted of three main active concessions—Yerakini with an area of 7 square kilometers (km²); Ormilias, 10 km²; and Kastri, 23 km². The company also owned reserve concessions totaling 16 km² for future exploitation. In 2014, the company's production of magnesite ore from concessions 20, 21, and 22 at Halkidi decreased slightly to about 274,000 t. Grecian Magnesite produced 26,000 t of dead-burned magnesia, 61,000 t of caustic-calcined magnesia, and 41,000 t of refractory masses in 2014 (Grecian Magnesite, S.A., 2015; Tzeferis, 2015, p. 5).

Terna Magnesite S.A. (Terna Mag), which was a recently established company, took over operations at Biomagn in north Evia. The company planned to extract the old magnesite deposits of Gerorema and Kakkavos in north Evia and to modernize the old furnace installations at Mantoudi to produce magnesium compounds. In 2014, Terna Mag produced about 86,300 t of raw magnesite and, for the first time, 9,300 t of caustic magnesia (Tzeferis, 2015, p. 5–6).

Sibelco Hellas S.A.'s production of huntite from its concessions 72 and 74, which are located at Servia Kozania, continued to decline substantially. In 2014, the company's crude mineral output decreased to 5,300 t, while its sales of finished products decreased by about 38% compared with those of 2013 (Tzeferis, 2015, p. 6).

Mineral Fuels

In 2013 (the latest year for which comprehensive data were available), Greece's primary sources of energy were crude oil and petroleum products (46.2%), coal (30.1%), natural gas (14.1%), and renewable energy, such as biomass, hydropower, and solar thermal systems (9.6%). Electricity was generated mainly by lignite coal (50.3%), natural gas (23.5%), renewable energy sources (14%), and crude oil and petroleum products (10%). Greece was dependent on imports for about 68% of its energy needs. The Government's official target, which was established by the National Renewable Energy Action Plan in compliance with the EU Directive 2009/28/EC, was to increase Greece's share of renewable energy in gross final energy

consumption to 20% by 2020 (Ministry of Environment, Energy, and Climate Change, 2010, p. 7; European Commission, 2014a, p. 6; 2015a, p. 58; Tzeferis, 2015, p. 8).

Coal.—Greece was the third-ranked producer of lignite in the EU after Germany and Poland. Its estimated reserves of 7 billion metric tons were among the highest in Europe. Lignite was primarily used for electricity generation in powerplants owned by Public Power Corp. S.A. (PPC), which was also Greece's leading lignite producer. In 2014, PPC's lignite output decreased by 13% to about 48 Mt from about 54 Mt in 2013. The company extracted about 39.1 Mt of lignite at the West Macedonia Lignite Centre and 8.9 Mt at the Megalopolis Lignite Centre (Tzeferis, 2015, p. 8).

Petroleum and Natural Gas.—Greece was dependent on imports for almost 100% of its natural gas and 98% of its oil consumption. Kavala Oil S.A., which was a subsidiary of Energean Oil & Gas S.A., was the only hydrocarbons producer in Greece. The company produced about 1,300 barrels per day (bbl/d) of oil from its Prinos offshore oilfield, 200 bbl/d of oil from its Prinos North offshore oilfield, and 60,000 cubic meters of natural gas and 200 bbl/d of gas condensate from the South Kavala gasfield in the Gulf of Kavala (European Commission, 2014a, p. 6; Kavala Oil S.A., 2014; Energean Oil & Gas S.A., 2015d, e; Tzeferis, 2015, p. 8).

Energean expected to increase its oil production by about 5,000 bbl/d in 2015—2016 by drilling seven new producing wells and upgrading three existing wells at Prinos. The remaining 2P reserves of the Prinos oilfield were estimated to be 11.9 million barrels (Mbbbl) of oil. The company was also in the process of implementing extended reach drilling in the Prinos North oilfield, which would increase its production to 1,500 bbl/d. Prinos North was estimated to hold 3.4 Mbbbl of oil in 2P reserves. Energean also developed a field development plan of the Epsilon offshore oilfield, which was estimated to hold 15 Mbbbl of oil in 2P reserves (Energean Oil & Gas S.A., 2015a–c).

In September 2014, the Parliament ratified the hydrocarbon exploration and exploitation agreements for three areas that had been signed with three international consortia in July 2013 following Greece's first international hydrocarbons tender. Combined oil reserves for the concession areas onshore and offshore were estimated to be 305 Mbbbl of oil. The first concession was awarded to Energean and Petra Petroleum Inc. of Canada for an onshore block at Ioannina in northwestern Greece; the second, to Energean and Trajan Oil and Gas Ltd. of the United Kingdom for the area of Katakolo in western Peloponnese; and the third, to ELPE, Edison Hellenic Petroleum SA of Italy, and Petroceltic International PLC of Ireland for an offshore block in the Gulf of Patras. In November 2014, the YPEKA announced a second international tender for hydrocarbon exploration and exploitation of 20 offshore blocks in Greece's EEZ south of the island of Crete and in the Ionian Sea and 3 onshore sites in western Greece. Agreements with selected bidders were expected to be signed in the fall of 2015 (Hellenic Republic, 2014; Papamichalopoulos and others, 2015, p. 97, 98).

The four recently upgraded refineries in the country had a total crude oil distillation capacity of about 490,000 bbl/d in

2012 (the latest year for which data were available). About two-thirds of the capacity was held by the three refineries owned by Hellenic Petroleum S.A.; two of the refineries were located in the Athens area, and one was located near Thessaloniki. The remaining one-third of the total distillation capacity was held by the Corinth refinery, which was owned by Motor Oil Hellas. The four refineries processed more than 22 Mt (440,000 bbl/d) of crude oil in 2012, which was equivalent to a capacity utilization rate of 85%. Total refined products output was 474,000 bbl/d, which included distillate fuel oil (34%), gasoline (23%), residual fuel oil (21%), and liquefied petroleum gas (4%) (International Energy Agency, 2014, p. 221).

Outlook

Greece is expected to remain a globally significant producer and exporter of bauxite, bentonite, perlite, and pumice. The mineral industry of Greece is likely to continue to recover from the lingering effects of the global economic downturn of 2008 and the country's recent recession that substantially reduced domestic and global demand for minerals such as construction aggregates, cement, and steel. The metals and industrial minerals sectors will remain as two of the most competitive industries in the country and exports of aluminum, bauxite, bentonite, marble, magnesite, perlite, and pumice are likely to increase. Greece may become a significant producer of precious metals such as gold and silver in Europe in the medium term if mineral exploration projects by Eldorado Gold advance to the extraction phase as planned. Zeolite deposits in the Evros region may also be extracted in the future. New offshore and onshore hydrocarbon exploration by three international consortiums is expected to begin in 2015. Exploration activity may yield higher indicated oil and natural gas reserves in Greece's exclusive economic zone in the Ionian and Mediterranean Seas and significantly increase the country's hydrocarbons output. The success of these efforts in increasing Greece's mineral output, however, is contingent on the resolution of the political uncertainty regarding Government formation, the economic uncertainty related to debt negotiations with the EU and the International Monetary Fund in 2015, and on the ability of mineral extractors to overcome public opposition to their projects (Michaletos, 2013; European Commission, 2015b, p. 80; Tzeferis, 2015, p. 3, 5, 8, 10).

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TABLE 1
GREECE: PRODUCTION OF MINERAL COMMODITIES¹

(Metric tons unless otherwise specified)

Commodity ²	2010	2011	2012	2013	2014
METALS					
Aluminum:					
Bauxite	1,993,835 ^r	2,324,000 ^r	1,816,000	1,844,000	1,872,710
Alumina, Al ₂ O ₃	725,000	809,700	784,400	811,600 ^r	813,000
Metal, primary	136,765	165,147 ^r	165,046	169,457 ^r	173,164
Chromite, ore, crude	650 ^r	570 ^r	576 ^r	-- ^r	-- ^e
Iron and steel:					
Iron ore and concentrate, nickeliferous, gross weight	2,260,000 ^r	2,260,000 ^r	2,306,000	2,220,790	2,382,485
Fe content ^c	560,000	560,000	571,000 ^r	550,000	590,000 ^e
Steel, crude	1,821 ^r	1,934 ^r	1,247 ^r	1,030 ^r	1,000 ^e
Lead, mine output, Pb content	17,674 ^r	16,592	18,630 ^r	16,890 ^r	18,481
Nickel:					
Ore, gross weight	1,903 ^r	2,236 ^r	2,257 ^r	2,221 ^r	2,382 ^e
Metal, Ni content of ferronickel	13,960	18,527	18,630 ^r	16,890	18,481
Silver, mine output, Ag content	29,000	33,316 ^r	39,759 ^r	39,028	39,000 ^e
Zinc, mine output, Zn content	18,400 ^r	20,999 ^r	23,196 ^r	22,512 ^r	22,752
INDUSTRIAL MINERALS					
Cement, hydraulic ^c	10,010 ^r	6,110 ^r	6,918 ^r	7,819 ^r	8,000 ^e
Clays, bentonite, crude	1,381,643	1,188,442	1,235,105	1,000,000 ^r	1,011,485
Feldspar	45,200 ^r	27,500 ^r	33,800 ^r	-- ^r	--
Gypsum and anhydrite	749,768 ^r	590,000 ^r	700,000	760,000	664,288
Magnesite:					
Ore, crude	513,487 ^r	541,813	351,266	383,000 ^r	363,000
Huntite, crude	16,350 ^r	23,800	24,200	15,200	5,340
Perlite:					
Crude	816,873 ^r	842,870	876,396	890,000	985,328
Screened	440,000 ^r	507,235	400,000	435,000	507,336
Pozzolan, Santorin earth	550,000 ^r	350,000	285,000	266,000	270,000
Pumice	412,700 ^r	468,960	281,000 ^r	420,000	429,872
Salt, all types	164,000 ^r	174,500	191,970	189,500 ^r	146,402
Silica	5,742 ^r	1,671	-- ^r	10,000 ^r	--
Stone, marble	268,033 ^r	285,000	200,000 ^r	220,000 ^r	232,000
Sulfur, S content of mixed sulfide ore	230,134 ^r	214,943	227,197	230,000	230,000 ^e
MINERAL FUELS AND RELATED MATERIALS					
Coal, lignite	53,600	58,400	62,335 ^r	55,500 ^r	50,800
Gas, natural, gross production	6,125 ^r	5,927 ^r	6,402	5,415	5,062
Petroleum:					
Crude	894 ^r	676	662 ^r	609 ^r	514
Refinery products:^c					
Liquefied petroleum gas	8,030 ³	6,100 ^r	6,000 ^r	5,500 ^r	4,600
Gasoline	36,865 ³	27,900 ^r	27,300 ^r	25,100 ^r	21,200
Naphtha	8,400 ³	6,400 ^r	6,300 ^r	5,800 ^r	4,900
Jet fuel	12,775 ³	9,700 ^r	9,500 ^r	8,700 ^r	7,300
Kerosene	146 ³	110 ^r	110 ^r	100 ^r	80
Distillate fuel oil	51,468 ³	38,900 ^r	38,100 ^r	35,000 ^r	29,500
Refinery gas	4,800 ³	3,600 ^r	3,500 ^r	3,200 ^r	2,700
Residual fuel oil	37,814 ³	28,600 ^r	28,000 ^r	25,800 ^r	21,800
Bitumen	4,000	3,000 ^r	2,900 ^r	2,700 ^r	2,300
Other	1,800	1,400 ^r	1,400 ^r	1,300 ^r	1,100
Total	166,100	125,700 ^r	123,100 ^r	113,200 ^r	95,500

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. ^rRevised. do. Ditto. -- Zero.

¹Table includes data available through September 1, 2015.

²In addition to the commodities listed, dolomite, lignite briquets, manganese, and crude construction materials were produced, but available information was inadequate to make reliable estimates of output.

³Reported figure.

TABLE 2
GREECE: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Alumina, Al ₂ O ₃		Aluminium S.A. (Mytilineos Holdings S.A., 53%)	Agios Nikolaos, Boeotia area	1,100
Aluminum		do.	do.	180
Barite, BaSO ₄		S&B Industrial Minerals, S.A. (Imerys S.A., France)	Mines at Adamas, Milos Island	NA
Bauxite		European Bauxites S.A.	Mines at Amfissa and Distomon, plants at Phocis and Itea	2,000
Do.		Delphi-Distomon S.A. (Mytilineos Holdings S.A.)	Mines at Amfissa and Distomon	800
Do.		Hellenic Mining Enterprises. S.A.	Mines at Aga Marina, Lamia	500
Bentonite:				
Crude		Mediterranean Bentonite Co. S.A. (Industria Chimica Mineraria S.p.A.)	Surface mines on Milos Island	20
Do.		Mykobar Mining Co. S.A. (Silver & Baryte Ores Mining Co. S.A.)	Mines at Adamas, Milos Island	300
		do.	Plants at Adamas, Milos Island	200
Do.		S&B Industrial Minerals, S.A. (Imerys S.A.)	Mines at Adamas, Milos Island	600
Processed		do.	Plant at Voudia Bay, Milos Island	400
Cement		Halkis Cement Co. S.A. (Lafarge Group, 89%)	Micro-Vathi plant, west-central (closed)	3,000
Do.		Halyps Cement S.A. (Ciments Français Group)	Paralia Aspropyrgos plant, Athens	800
Do.		Heracles General Cement S.A. (Lafarge Group)	Plants at Evia, Milaki Evia, and Volos	9,600
Do.		TITAN Cement Co. S.A. (TITAN Group)	Elefsis plant, Athens area	400
Do.		do.	Kamari plant, Boeotia	2,600
Do.		do.	Patras plant, northern Peloponnesus	1,900
Do.		do.	Salonica plant, Salonica	1,650
Chromite		Financial-Mining-Industrial and Shipping Corp. (FIMISCO)	Tsingeli Mine, Volos	25
Coal, lignite		Public Power Corp. S.A. (PPC)	Megalopolis and Ptolemais Mines	63,000
Ferroalloys, ferronickel, Ni content		Larco G.M.M. S.A.	Larymna metallurgical plant	25
Gold, Au in concentrate	kilograms	Eldorado Gold Corp.	Kassandra Mines (Olympias)	5,000
Gypsum		Lava Mining and Quarrying Co. S.A.	Altsi, Crete Island	500
Do.		TITAN Cement Co. S.A. (TITAN Group)	do.	280
Huntite/Hydromagnesite		Microfine S.A.	Mines in Kozani Basin	100
Lead, mine, Pb in concentrate		Hellas Gold S.A. (Eldorado Gold Corp.)	Kassandra Mines (Olympias and Stratoni), northeastern Chalkidiki	30
Magnesite, concentrate		Grecian Magnesite S.A. (GM)	Mine and production facilities at Chalkidiki, Halkidiki, and Yerakini, northern Greece	300
Do.		Terna Magnesite (Terna Mag)	Gerorema Mine	100
Manganese, battery-grade MnO ₂		Eleusis Bauxite Mines Mining, Industrial and Shipping S.A. [National Bank of Greece (OAE)]	Nevrokopi, Drama	10
Marble, slab and tile	cubic meters	Aghia Marina Marble Ltd.	Various areas of northern Greece	NA
Do.	do.	Michelakis Marble S.A.	Kavala	NA
Do.	do.	Gourlis Group	Quarries at Levadia, Neurokopi, and Tiseo	NA
Natural gas	million cubic meters per day	Hellenic Petroleum S.A.	Prinos offshore gasfield and oilfield, east of Thasos Island	125
Do.	do.	Kavala Oil S.A. (Energean Oil and Gas S.A.)	South Kavala gasfield, east of Thasos Island	NA
Nickel, ore		Larco G.M.M. S.A. (Government, 55.2%; National Bank of Greece, 33.4%; Public Power Corporation, 11.4%)	Agios Ioannis Mine, Evia Mine, at Neo Kokkino near Larymna; and Kastoria Mine, near Albanian border	2,500
Do.		do.	Larymna smelter, near Athens	2,500
Nitrogen, N content of ammonia		Phosphoric Fertilizers S.A.	Nea Karvall	150

See footnotes at end of table.

TABLE 2—Continued
GREECE: STRUCTURE OF THE MINERAL INDUSTRY IN 2014

(Thousand metric tons unless otherwise specified)

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Perlite		S&B Industrial Minerals, S.A. (Imerys S.A.)	Mines on Milos Islands; plant at Pireaus	650
Do.		Otavi Minen Hellas S.A. (Otavi Minen AG)	Milos Island	150
Petroleum, crude	42-gallon barrels per day	Kavala Oil S.A. (Energean Oil and Gas S.A.)	Prinos offshore oilfield, east of Thassos Island	NA
Petroleum, refined	do.	Hellenic Petroleum S.A.	Aspropyrgos	115,000
Do.	do.	do.	Eleusis	120,000
Do.	do.	do.	Thessaloniki	92,000
Do.	do.	Motor Oil (Hellas) Corinth Refineries S.A.	Aghii Theodori, Corinth	163,000
Pozzolan (Santorin earth)		Lava Mining and Quarrying Co. (Heracles General Cement Co.)	Xylokeratia, Milos Island	600
Do.		TITAN Cement Co. S.A. (TITAN Group)	do.	300
Pumice		Lava Mining and Quarrying Co. (Heracles General Cement Co.)	Yali Island	1,000
Quartz (microcrystalline)		do.	Adamas, Milos Island	150
Steel, crude		Hellenic Halyvourgia	Volos plant	1,000
Do.		Sidenor Steel Products Manufacturing S.A.	Thessaaloniki and Almyros plants	2,800
Do.		Halyvourgiki S. A.	Eleusis plant	1,200
Do.		Hellenic Steel Co. S. A.	Thessaloniki plant	1,000
Steel products		Corinth Pipeworks S.A. (CPW)	Thisvi plant, Viotia, nears Athens	800
Zinc, mine, Zn in concentrate		Hellas Gold S.A. (Eldorado Gold Corp.)	Kassandra Mines (Olympias and Stratoni), northeastern Chalkidiki	30

Do., do. Ditto. NA Not available.